Appendix A – Comparison of Land Uses and Area Regulations

Table 4-2: Use Comparison

Use	Existing TCB	Proposed C		Existing GB	Proposed C		Existing RLD	Proposed C
Accesssory Structure	P	P		P	P		A	P
Adult-oreitned Business	N	N		N	N			N
Ambulance Service (private)	N	P		N	P			P
Auto audio installation service	N	P		N	P			P
Auto body shop and collision repair	N	N		N	N			N
Auto brake service	N	P		N	P			P
Auto car wash (automated)	N	P		N	P			P
Auto car wash (self-service)	N	P		N	P			P
Auto detailing service	N	P		N	P			P
Auto diagnostic service	N	SP		N	SP			SP
Auto towing service (light duty)	N	P		N	P			P
Auto towing service (medium duty)	N	N		N	N			N
Auto towing service (heavy duty)	N	N		N	N			N
Auto muffler service	N	P		N	P			P
Auto quick lube and oil change	N	P		N	P			P
Auto repair (major)	N	SP		N	SP			SP
Auto sales (new car dealership)	N	P		N	P			P
Auto sales (used car dealership)	N	N		N	N			N
Auto state inspection service	N	P		N	P			P
Auto tire sales and service	N	P		N	P			P
Auto transmission service	N	N		N	N			N
Bank and financial institutions	P	P		P	P			P
Barber, beauty salon, nail salon	P	P		P	P			P

Key: Additional use permitted
(P=permitted, SP=special permitted, A=accessory permitted, M=mixed use permitted)

Not permitted

Table 4-2: Use Comparison

	Existing	*Proposed*	*Existing*	*Proposed*	*Existing*	*Proposed*
Use	**TCB**	**C**	**GB**	**C**	**RLD**	**C**
Bed & Breakfast	N	N	SP	N	SP	N
Cemetery	P	N	N	N	SP	N
Child care center	SP	P	SP	P		P
Clubhouse	P	N	SP	N		N
Commercial kennel	N	SP	SP	SP	SP	SP
Conference center	P	P	N	P		P
Contractors yard	N	P	N	P		P
Convenience store	P	P	P	P		P
Dance studio	P	P	P	P		P
Drive-in restaurant	SP	SP	SP	SP		SP
Drive-through service facility	A, SP	A, SP	A, SP	A, SP		A, SP
Dry cleaning and laundry service	P	P	P	P		P
Educational services	P	P	P	P		P
Essential services	P	P	P	P	P	P
Excavation or removal of earth, topsoil, sand, gravel, clay, or stone; soil and stone crushing, washing and processing operation	N	N	N	N		N
Farming/Farm	N	N	N	N	P	N
Farm stand	P	N	N	N		N
Fast food restaurant	M	SP	SPM	SP		SP
Fitness center/gymnasium	P	P	P	P		P
Food service business	P	P	P	P		P
Funeral parlor	P	P	SP	P		P
Gas station (fuel dispensing only)	N	SP	N	SP		SP
Gas mart	N	SP	N	SP		SP
Hotel	SP	P	SP	P		P
Indoor Theater	P	P	SP	P		P
Inn	P	SP	SP	SP		SP
Laboratory (testing & research)	N	SP	N	SP		SP
Land trust facility	P	P	P	P		P
Laundromat (self service)	N	P	P	P		P
Library	P	P	P	P		P
Light industry	N	SP	N	SP		SP
Livery/taxi service	N	P	N	P		P
Lumber yard (outdoor)	N	N	N	N		N
Medical and dental office	P	P	SP	P		P

Key: [blue] Additional use permitted
(P=permitted, SP=special permitted, A=accessory permitted, M=mixed use permitted)
[orange] Not permitted

Table 4-2: Use Comparison

	Existing	Proposed	Existing	Proposed	Existing	Proposed
Use	**TCB**	**C**	**GB**	**C**	**RLD**	**C**
Motel	N	SP	N	SP		SP
Museum	P	P	SP	P		P
Nightclub	SP	P	N	P		P
Office	P	P	P	P		P
Outdoor sports/recreation	SP	SP	SP	SP	SP	SP
Passive recreation	P	P	P	P		P
Place of public assembly	SP	P	P	P		P
Civic buildings and place of public assembly, e.g. commmunity buidlings, churches, schools	P	P	P	P	SP	P
Pharmacy	P	P	P	P		P
Print shop	P	P	P	P		P
Private school	SP	SP	AP	SP		SP
Public swimming pool	N	A	A	A		A
Radio and television stations	N	N	N	N		N
Residential health-care facilities, adutl homes and group homes (congregate housing)	SP	SP	SP	SP	P	SP
Single-family dwelling	SP	N	P	N	P	N
Townhouse	P	N	N	N	N	N
Two-family dwelling	N	N	N	N	N	N
Multifamily dwelling	P	N	N	N	N	N
Rental apartment	N	N	N	N	N	N
Accessory apartment	SP	N	N	N	A, SP	N
Detached accessory apartment	SP	N	N	N	A, SP	N
Carriage unit	SP	N	N	N	N	N
Residential mixed use	M	N	M, SP	N		N
Home occupation	A, SP	A	A	A	A	A
Restaurant	SP	P	P	P		P
Retail business	P	P	P	P		P
Retail sale of products of horticulture, as well as hand tools, fertilizer, seeds, bulbs, and other material customarily use din horticultreon parcels of 5 acres or more	SP	P	P	P	SP	P

Key: Additional use permitted
(P=permitted, SP=special permitted, A=accessory permitted, M=mixed use permitted)
Not permitted

Table 4-2: Use Comparison

	Existing	Proposed		Existing	Proposed		Existing	Proposed
Use	**TCB**	**C**		**GB**	**C**		**RLD**	**C**
Skating rink	N	N		N	N			N
Stables, riding establishments and clubs	N	N		SP	N		SP	N
Storage (self service)	N	P		N	P			P
Summer day camp	N	SP		SP	SP			SP
Tavern, bar and pub	P	SP		SP	SP			SP
Tennis club	N	N		N	N			N
Theaters	P	SP		SP	SP			SP
Veterinary clinic	SP	SP		SP	SP			SP
Veterinary office	P	P		P	P			P
Warehousing and wholesale goods	N	SP		N	SP			SP
Wireless telecommunications facilities	SP	SP		SP	SP		SP	SP
Solar panels (roof mounted)	A	A		A	A		A	A
Solar panels (ground mounted)	A, SP	A, SP		A, SP	A, SP		A, SP	A, SP
Solar farms	N	P, SP		P, SP	P, SP		P, SP	P, SP
Swimming pool	P	P		P	P		A	P
Pool house/cabana	A, SP	A, SP		A, SP	A, SP		A	A, SP
Outdoor kitchen	A	A		A	A		A	A
Outdoor fuel burning device	N	N		N	N		SP	N
Tennis/sport court	A	A		A	A		A	A
Second kitchen							A, SP	
Adaptive Reuse							SP	
Not permitted	45	27		47	27		5	27
Permitted	58	76		56	76		98	76
Change		18			20			-22

Key: Additional use permitted
(P=permitted, SP=special permitted, A=accessory permitted, M=mixed use permitted)
Not permitted

Table 4-3: Area Comparison

	TCB	C	GB	C	RLD	C
Minimum single-family residential lot area (SF)	N/A	30,000	40,000	30,000	120,000	30,000
Single-family residential with public sewers	6,000	N/A	N/A	N/A	120000	N/A
Townhouse lot area (square feet) with public sewers	2,500	N/A	N/A	N/A	N/A	N/A
Minimum width of lot along building line (feet)	25	150	150	150	200	150
Minimum width of lot at any point	25	50	50	50	150	50
Minimum dimension of building square on lot (feet)	N/A	100	100	100	200	100
Minimum lot frontage on Town right-of-way line (feet)	25	75	75	75	100	75
Minimum lot frontage on county or state highway	25	200	115	200	225	200
Maximum number of stories of a building	3	3	3	3	3	3
Maximum height of a building or structure (feet)	50	35	35	35	35	35
Minimum dimensions (in feet) from center line of NYS Route 55	48.5-58.5	N/A	N/A	N/A	N/A	N/A
Front yard, state or county road	48.5-58.5	45	45	45	90	45
Front yard, Town road	NOTE 1	40	40	40	55/80	40
Rear yard	6	20	20	20	40	20
Side yard	0	20	20	20	40	20
Residential district boundary line	25	30	30	30	30	30
Maximum lot coverage by buildings as percent of lot area	85%	30%	20%	30%	10%	30%
Maximum floor area of buildings as percent of lot area	N/A	60%	40%	60%	20%	60%
Maximum total lot coverage as percent of lot area (buildings, structures, outdoor deposit, paving)	90%	70%	50%	70%	15%	70%
Minimum floor area of dwelling unit (square feet)	500	N/A	N/A	N/A	1200	N/A
Minimum floor area of apartment	500	N/A	500	N/A	N/A	N/A

Increase
Decrease
No Change

	NYS Route 55
NOTE 1	
Required depth of sidewalk and landscaping measured out from edge of pavement	N/A
Required depth of sidewalk and landscaping measured out from center line of NYS Route 55	23.5-28.5
Front yard — minimum from sidewalk	10
Front yard — maximum from sidewalk	20

Appendix B – Additional Traffic Evaluation Information

Average Annual Daily Traffic Counts (NYS DOT)

STATION: **820080**

New York State Department of Transportation
Traffic Count Hourly Report

ROUTE #:	**NY 55**	ROAD NAME:	FROM: **ACC TSP RT 987G**	TO: **RT 82 BILLINGS**	COUNTY: **Dutchess**
DIRECTION:	Eastbound	FACTOR GROUP: 30	REC. SERIAL #: AD89	FUNC. CLASS: 14	TOWN:
STATE DIR CODE: 6		WK OF YR: 34	PLACEMENT: 0.453 Mi W of Rt 82	NHS: no	LION#:
DATE OF COUNT: 08/17/2015			@ REF MARKER:	JURIS: City	BIN: 1027150
NOTES LANE 1: EB travel lane			ADDL DATA: Class Speed	CC Stn:	RR CROSSING:
			COUNT TYPE: AXLE PAIRS	BATCH ID: DOT-R08C34aTST5195	HPMS SAMPLE:
COUNT TAKEN BY: ORG CODE: TST INITIALS: JA			PROCESSED BY: ORG CODE: DOT INITIALS: CEL		

DATE	DAY	12 TO 1 AM	1 TO 2 AM	2 TO 3 AM	3 TO 4 AM	4 TO 5 AM	5 TO 6 AM	6 TO 7 AM	7 TO 8 AM	8 TO 9 AM	9 TO 10 AM	10 TO 11 AM	11 TO 12 AM	12 TO 1 PM	1 TO 2 PM	2 TO 3 PM	3 TO 4 PM	4 TO 5 PM	5 TO 6 PM	6 TO 7 PM	7 TO 8 PM	8 TO 9 PM	9 TO 10 PM	10 TO 11 PM	11 TO 12 PM	DAILY TOTAL	DAILY HIGH COUNT	DAILY HIGH HOUR
1	S																											
2	S																											
3	M																											
4	T																											
5	W																											
6	T																											
7	F																											
8	S																											
9	S																											
10	M																											
11	T																											
12	W																											
13	T																											
14	F																											
15	S																											
16	S																											
17	M															**437**	**549**	**649**	**682**	**483**	**409**	**356**	**248**	**153**	**101**			
18	T	**60**	**27**	**24**	**14**	**32**	**102**	**220**	**332**	**504**	**344**	**400**	**416**	**452**	**388**	**476**	**581**	**668**	**686**	**504**	**400**	**445**	**279**	**154**	**86**	7594	686	17
19	W	**57**	**30**	**18**	**20**	**34**	**95**	**223**	**389**	**469**	**343**	**374**	**400**	**445**	**466**	**467**	**491**	**698**	**700**	**484**	**439**	**409**	**289**	**191**	**78**	7609	700	17
20	T	**75**	**28**	**20**	**17**	**29**	**96**	**229**	**396**	**471**	**342**	**375**																
21	F																											
22	S																											
23	S																											
24	M																											
25	T																											
26	W																											
27	T																											
28	F																											
29	S																											
30	S																											
31	M																											
AVERAGE WEEKDAY HOURS (Axle Factored, Mon 6AM to Fri Noon)		**64**	**28**	**21**	**17**	**32**	**98**	**224**	**372**	**481**	**343**	**383**	**408**	**448**	**427**	**460**	**540**	**672**	**689**	**490**	**416**	**403**	**272**	**166**	**88**	**ADT 7542**		

DAYS Counted	HOURS Counted	WEEKDAYS Counted	WEEKDAY Hours	AVERAGE WEEKDAY High Hour	AVERAGE WEEKDAY % of day	Axle Adj. Factor	Seasonal/Weekday Adjustment Factor	ESTIMATED AADT
4	69	4	69	689	9%	1.000	1.089	**6926**

STATION: **820080**

New York State Department of Transportation
Traffic Count Hourly Report

ROUTE #: **NY 55**	ROAD NAME:	FROM: **ACC TSP RT 987G**	TO: **RT 82 BILLINGS**	COUNTY:	**Dutchess**
DIRECTION: Westbound	FACTOR GROUP: 30	REC. SERIAL #: AD89	FUNC. CLASS: 14	TOWN:	
STATE DIR CODE: 7	WK OF YR: 34	PLACEMENT: 0.453 Mi W of Rt 82	NHS: no	LION#:	
DATE OF COUNT: 08/17/2015		@ REF MARKER:	JURIS: City	BIN:	1027150
NOTES LANE 1: WB travel lane		ADDL DATA: Class Speed	CC Stn:	RR CROSSING:	
		COUNT TYPE: AXLE PAIRS	BATCH ID: DOT-R08C34aTST5195	HPMS SAMPLE:	
COUNT TAKEN BY: ORG CODE: TST INITIALS: JA		PROCESSED BY: ORG CODE: DOT INITIALS: CEL			

DATE	DAY	AM 12 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	PM 12 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	DAILY TOTAL	DAILY HIGH COUNT	DAILY HIGH HOUR
1	S																											
2	S																											
3	M																											
4	T																											
5	W																											
6	T																											
7	F																											
8	S																											
9	S																											
10	M																											
11	T																											
12	W																											
13	T																											
14	F																											
15	S																											
16	S																											
17	M															**420**	**460**	**650**	**559**	**383**	**297**	**202**	**129**	**112**	**71**			
18	T	**36**	**11**	**9**	**18**	**29**	**114**	**333**	**575**	**703**	**504**	**496**	**416**	**455**	**404**	**416**	**412**	**618**	**521**	**385**	**290**	**198**	**158**	**90**	**57**	7248	703	8
19	W	**39**	**17**	**16**	**21**	**37**	**107**	**329**	**578**	**700**	**517**	**453**	**484**	**474**	**451**	**422**	**461**	**613**	**602**	**503**	**317**	**228**	**153**	**104**	**75**	7701	700	8
20	T	**40**	**18**	**15**	**23**	**39**	**130**	**308**	**535**	**693**	**510**	**447**																
21	F																											
22	S																											
23	S																											
24	M																											
25	T																											
26	W																											
27	T																											
28	F																											
29	S																											
30	S																											
31	M																											

AVERAGE WEEKDAY HOURS (Axle Factored, Mon 6AM to Fri Noon)

12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	ADT
38	**15**	**13**	**21**	**35**	**117**	**323**	**563**	**699**	**510**	**465**	**450**	**464**	**428**	**419**	**444**	**627**	**561**	**424**	**301**	**209**	**147**	**102**	**68**	**7443**

DAYS Counted	HOURS Counted	WEEKDAYS Counted	WEEKDAY Hours	AVERAGE WEEKDAY High Hour	AVERAGE WEEKDAY % of day	Axle Adj. Factor	Seasonal/Weekday Adjustment Factor
4	69	4	69	699	9%	1.000	1.089

ESTIMATED

AADT
6835

STATION: **820319**

New York State Department of Transportation
Traffic Count Hourly Report

ROUTE #: **NY 55**	ROAD NAME:	FROM: **CR 21 NOXON RD W JCT**	TO: **ACC TSP RT 987G**	COUNTY:	**Dutchess**
DIRECTION: Eastbound	FACTOR GROUP: 30	REC. SERIAL #: 0007	FUNC. CLASS: 14	TOWN:	**LAGRANGE**
STATE DIR CODE: 1	WK OF YR: 18	PLACEMENT: 0.45 MI W OF LAUER RD	NHS: yes	LION#:	
DATE OF COUNT: 05/02/2011		@ REF MARKER: 55 82032053	JURIS: NYSDOT	BIN:	
NOTES LANE 1: WK 19 EB		ADDL DATA: Class Speed	CC Stn:	RR CROSSING:	
		COUNT TYPE: VEHICLES	BATCH ID: DOT-SJWR8 19A	HPMS SAMPLE:	30034950
COUNT TAKEN BY: ORG CODE: TST INITIALS: ---		PROCESSED BY: ORG CODE: DOT INITIALS: SJW			

DATE	DAY	AM 12 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	PM 12 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	DAILY TOTAL	DAILY HIGH COUNT	DAILY HIGH HOUR
1	S																											
2	M												**529**	**620**	**563**	**628**	**691**	**752**	**836**	**755**	**525**	**357**	**240**	**144**	**96**			
3	T	**61**	**27**	**13**	**20**	**31**	**77**	**343**	**649**	**818**	**741**	**593**	**569**	**570**	**603**	**617**	**779**	**751**	**834**	**720**	**504**	**407**	**242**	**144**	**92**	10205	834	17
4	W	**55**	**29**	**12**	**14**	**43**	**79**	**311**	**595**	**857**	**717**	**538**	**507**	**669**	**583**	**629**	**816**	**847**	**849**	**663**	**468**	**343**	**219**	**138**	**88**	10069	857	8
5	T	**56**	**27**	**12**	**18**	**40**	**68**	**347**	**627**	**826**	**746**	**559**	**540**	**614**	**644**	**632**	**780**	**771**	**845**	**818**	**523**	**402**	**306**	**176**	**106**	10483	845	17
6	F	**71**	**23**	**17**	**14**	**44**	**89**	**341**	**603**	**849**	**726**	**594**	**615**	**683**	**659**	**691**	**776**	**872**	**805**	**782**	**553**	**437**	**346**	**228**	**168**	10986	872	16
7	S	**83**	**47**	**30**	**17**	**18**	**41**	**130**	**285**	**407**	**644**	**665**	**709**	**737**	**778**	**755**	**701**	**633**	**563**	**548**	**484**	**364**	**276**	**262**	**195**	9372	778	13
8	S	**101**	**55**	**43**	**24**	**15**	**33**	**73**	**138**	**232**	**393**	**492**	**620**	**710**	**617**	**532**	**484**	**473**	**384**	**370**	**363**	**275**	**227**	**130**	**89**	6873	710	12
9	M	**49**	**22**	**17**	**11**	**37**	**86**	**345**	**622**	**847**	**699**																	
10	T																											
11	W																											
12	T																											
13	F																											
14	S																											
15	S																											
16	M																											
17	T																											
18	W																											
19	T																											
20	F																											
21	S																											
22	S																											
23	M																											
24	T																											
25	W																											
26	T																											
27	F																											
28	S																											
29	S																											
30	M																											
31	T																											
AVERAGE WEEKDAY HOURS (Axle Factored, Mon 6AM to Fri Noon)		**61**	**26**	**14**	**16**	**40**	**78**	**337**	**619**	**839**	**726**	**571**	**552**	**618**	**598**	**626**	**766**	**780**	**841**	**739**	**505**	**377**	**252**	**150**	**96**	**ADT 10227**		

DAYS Counted	HOURS Counted	WEEKDAYS Counted	WEEKDAY Hours	AVERAGE WEEKDAY High Hour	AVERAGE WEEKDAY % of day	Axle Adj. Factor	Seasonal/Weekday Adjustment Factor
8	167	5	101	841	8%	1.000	1.091

ESTIMATED (one way)

AADT

9374

STATION: **820319**

New York State Department of Transportation
Traffic Count Hourly Report

ROUTE #: **NY 55** ROAD NAME:
DIRECTION: Westbound FACTOR GROUP: 30
STATE DIR CODE: 2 WK OF YR: 18
DATE OF COUNT: 05/02/2011
NOTES LANE 1: WK 19 WB

COUNT TAKEN BY: ORG CODE: TST INITIALS: ---

FROM: **CR 21 NOXON RD W JCT**
REC. SERIAL #: 0078
PLACEMENT: 0.45 MI W OF LAUER RD
@ REF MARKER: 55 82032053
ADDL DATA: Class Speed
COUNT TYPE: VEHICLES
PROCESSED BY: ORG CODE: DOT INITIALS: SJW

TO: **ACC TSP RT 987G**
FUNC. CLASS: 14
NHS: yes
JURIS: NYSDOT
CC Stn:
BATCH ID: DOT-SJWR8 19A

COUNTY: **Dutchess**
TOWN: **LAGRANGE**
LION#:
BIN:
RR CROSSING:
HPMS SAMPLE: 30034950

DATE	DAY	12 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	DAILY TOTAL	DAILY HIGH COUNT	DAILY HIGH HOUR
		AM												PM														
1	S																											
2	M												**453**	**538**	**562**	**586**	**805**	**902**	**934**	**674**	**564**	**457**	**365**	**253**	**118**			
3	T	**69**	**29**	**19**	**21**	**31**	**113**	**357**	**706**	**563**	**422**	**420**	**488**	**593**	**560**	**607**	**829**	**850**	**964**	**736**	**580**	**404**	**370**	**245**	**116**	10092	964	17
4	W	**49**	**32**	**14**	**16**	**32**	**104**	**364**	**653**	**476**	**425**	**450**	**476**	**553**	**579**	**599**	**818**	**812**	**885**	**721**	**551**	**487**	**382**	**246**	**124**	9848	885	17
5	T	**53**	**40**	**19**	**20**	**29**	**115**	**366**	**697**	**599**	**416**	**405**	**473**	**618**	**607**	**606**	**774**	**900**	**1031**	**775**	**570**	**456**	**391**	**260**	**119**	10339	1031	17
6	F	**77**	**44**	**26**	**32**	**54**	**114**	**365**	**651**	**535**	**455**	**474**	**559**	**624**	**658**	**678**	**772**	**913**	**917**	**699**	**519**	**420**	**396**	**352**	**208**	10542	917	17
7	S	**126**	**85**	**44**	**37**	**38**	**57**	**145**	**287**	**329**	**403**	**528**	**613**	**648**	**627**	**637**	**629**	**644**	**579**	**442**	**451**	**457**	**410**	**327**	**219**	8762	648	12
8	S	**137**	**73**	**57**	**50**	**33**	**42**	**70**	**146**	**241**	**320**	**405**	**473**	**478**	**598**	**569**	**524**	**491**	**488**	**431**	**381**	**313**	**220**	**125**	**74**	6739	598	13
9	M	**58**	**20**	**14**	**14**	**31**	**128**	**343**	**684**	**536**	**434**																	
10	T																											
11	W																											
12	T																											
13	F																											
14	S																											
15	S																											
16	M																											
17	T																											
18	W																											
19	T																											
20	F																											
21	S																											
22	S																											
23	M																											
24	T																											
25	W																											
26	T																											
27	F																											
28	S																											
29	S																											
30	M																											
31	T																											

AVERAGE WEEKDAY HOURS (Axle Factored, Mon 6AM to Fri Noon)

																								ADT
62	**36**	**20**	**22**	**36**	**112**	**359**	**678**	**542**	**430**	**437**	**490**	**576**	**577**	**600**	**806**	**866**	**954**	**726**	**566**	**451**	**377**	**251**	**119**	**10093**

DAYS Counted	HOURS Counted	WEEKDAYS Counted	WEEKDAY Hours	AVERAGE WEEKDAY High Hour	AVERAGE WEEKDAY % of day	Axle Adj. Factor	Seasonal/Weekday Adjustment Factor
8	167	5	101	954	9%	1.000	1.091

ESTIMATED (one way)

AADT
9251

New York State Department of Transportation
Classification Count Average Weekday Data Report

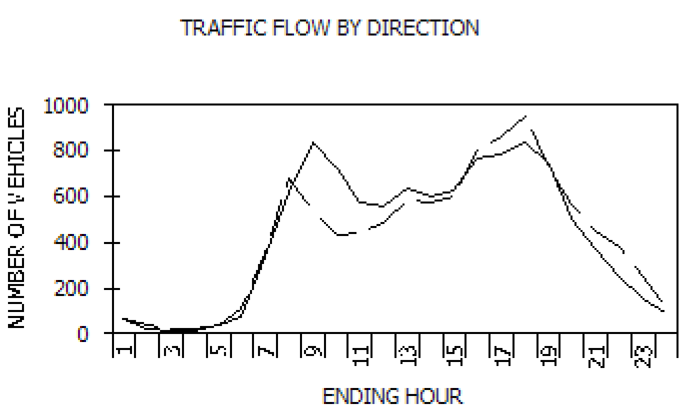
ROUTE #:	NY 55	ROAD NAME:	
COUNTY NAME:	Dutchess		
REGION CODE:	8		
FROM:	CR 21 NOXON RD W JCT		
TO:	ACC TSP RT 987G		
REF-MARKER:	55 82032053		
END MILEPOINT:	0310905	NO. OF LANES:	2
FUNC-CLASS:	14	HPMS NO:	30034950
STATION NO:	0319	LION#:	
COUNT TAKEN BY:	ORG CODE: TST INITIALS: ---		
PROCESSED BY:	ORG CODE: DOT INITIALS: SJW	BATCH ID: DOT-SJWR8 19A	

YEAR: 2011
MONTH: May

STATION: 820319

DIRECTION	East	West	TOTAL
NUMBER OF VEHICLES	**10229**	**10091**	**20320**
NUMBER OF AXLES	**20651**	**20376**	**41028**
% HEAVY VEHICLES (F4-F13)	**3.73%**	**4.10%**	**3.92%**
% TRUCKS AND BUSES (F3-F13)	**15.12%**	**16.27%**	**15.69%**
AXLE CORRECTION FACTOR	**0.99**	**0.99**	**0.99**

	VEHICLE CLASS	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**	**F8**	**F9**	**F10**	**F11**	**F12**	**F13**	**TOTAL**
	NO. OF AXLES	2	2	2	2.5	2	3	4	3.5	5	6	5	6	8.75	
ENDING HOUR	1:00	0	56	3	0	2	0	0	0	0	0	0	0	0	**61**
	2:00	0	22	2	0	1	0	0	0	0	0	0	0	0	**25**
	3:00	0	12	1	0	0	0	0	0	0	0	0	0	0	**13**
	4:00	0	15	1	0	0	0	0	0	0	0	0	0	0	**16**
	5:00	0	32	6	0	1	0	0	0	0	0	0	0	0	**39**
	6:00	0	55	18	1	2	0	0	0	2	0	0	0	0	**78**
	7:00	2	247	70	2	12	1	0	2	1	0	0	0	0	**337**
	8:00	0	516	76	13	8	3	0	2	1	0	0	0	0	**619**
	9:00	1	713	92	13	13	1	0	2	3	0	0	0	0	**838**
	10:00	1	606	88	3	21	2	0	2	3	0	0	0	0	**726**
DIRECTION	11:00	2	478	67	2	12	2	0	4	3	0	0	0	0	**570**
East	12:00	3	449	71	5	17	1	1	2	2	1	0	0	0	**552**
	13:00	2	520	83	3	16	1	1	2	3	0	0	0	0	**631**
	14:00	0	495	74	4	18	2	1	3	1	0	0	0	0	**598**
	15:00	2	516	67	17	19	2	0	2	1	0	0	0	0	**626**
	16:00	2	638	96	7	20	1	0	1	1	0	0	0	0	**766**
	17:00	2	666	83	9	16	1	0	1	2	0	0	0	0	**780**
	18:00	3	740	82	2	11	0	0	1	1	0	0	0	0	**840**
	19:00	3	653	68	2	11	1	0	1	0	0	0	0	0	**739**
	20:00	2	445	43	1	12	0	0	0	0	0	0	0	0	**503**
	21:00	1	336	35	0	2	0	0	1	0	0	0	0	0	**375**
	22:00	0	224	21	0	4	0	0	0	2	0	0	0	0	**251**
	23:00	0	137	10	0	2	0	0	0	2	0	0	0	0	**151**
	24:00	0	85	8	0	2	0	0	0	0	0	0	0	0	**95**
	TOTAL VEHICLES	**26**	**8656**	**1165**	**84**	**222**	**18**	**3**	**26**	**28**	**1**	**0**	**0**	**0**	**10229**
	TOTAL AXLES	52	17312	2330	210	444	54	12	91	140	6	0	0	0	20651
	1:00	0	54	6	0	2	0	0	0	0	0	0	0	0	**62**
ENDING HOUR	2:00	0	32	2	0	2	0	0	0	1	0	0	0	0	**37**
	3:00	0	17	2	0	0	0	0	0	0	0	0	0	0	**19**
	4:00	0	20	1	0	0	0	0	0	0	0	0	0	0	**21**
	5:00	0	29	4	0	2	0	0	0	0	0	0	0	0	**35**
	6:00	0	90	18	0	2	0	0	0	1	0	0	0	0	**111**
	7:00	0	292	46	6	11	0	0	1	1	0	0	0	0	**357**
	8:00	0	561	75	19	17	2	0	1	2	0	0	0	0	**677**
	9:00	0	416	91	2	22	2	0	4	4	0	0	0	0	**541**
	10:00	0	317	72	5	29	1	0	2	4	0	0	0	0	**430**
	11:00	1	337	71	4	15	4	0	4	2	0	0	0	0	**438**
DIRECTION	12:00	1	392	71	2	17	1	0	2	3	0	0	0	0	**489**
West	13:00	2	481	77	3	16	2	0	3	2	0	0	0	0	**586**
	14:00	2	456	77	14	20	2	0	1	4	0	0	0	0	**576**
	15:00	2	489	75	14	14	1	0	2	2	0	0	0	0	**599**
	16:00	4	667	105	9	18	0	0	2	1	0	0	0	0	**806**
	17:00	2	734	104	2	17	1	0	2	2	0	0	0	0	**864**
	18:00	4	820	108	1	17	1	0	2	1	0	0	0	0	**954**
	19:00	2	636	74	1	11	0	0	1	1	0	0	0	0	**726**
	20:00	3	498	57	0	7	0	0	0	0	0	0	0	0	**565**
	21:00	1	404	38	0	7	0	0	0	1	0	0	0	0	**451**
	22:00	0	343	28	0	6	0	0	0	0	0	0	0	0	**377**
	23:00	0	229	18	0	3	0	0	0	0	0	0	0	0	**250**
	24:00	1	110	8	0	1	0	0	0	0	0	0	0	0	**120**
	TOTAL VEHICLES	**25**	**8424**	**1228**	**82**	**256**	**17**	**0**	**27**	**32**	**0**	**0**	**0**	**0**	**10091**
	TOTAL AXLES	50	16848	2456	205	512	51	0	94	160	0	0	0	0	20376
	GRAND TOTAL VEHICLES	**51**	**17080**	**2393**	**166**	**478**	**35**	**3**	**53**	**60**	**1**	**0**	**0**	**0**	**20320**
	GRAND TOTAL AXLES	102	34160	4786	415	956	105	12	186	300	6	0	0	0	41027



--- East - -West

PEAK HOUR DATA

DIRECTION	HOUR	COUNT	2-WAY	HOUR	COUNT
East	**18**	**840**	**A.M.**	**9**	**1379**
West	**18**	**954**	**P.M.**	**18**	**1794**

VEHICLE CLASSIFICATION CODES:

F1. Motorcycles
F2. Autos*
F3. 2 Axle, 4-Tire Pickups, Vans, Motorhomes*
F4. Buses
F5. 2 Axle, 6-Tire Single Unit Trucks
F6. 3 Axle Single Unit Trucks
F7. 4 or More Axle Single Unit Trucks
F8. 4 or Less Axle Vehicles, One Unit is a Truck
F9. 5 Axle Double Unit Vehicles, One Unit is a Truck
F10. 6 or More Double Unit Vehicles, One Unit is a Truck
F11. 5 or Less Axle Multi-Unit Trucks
F12. 6 Axle Multi-Unit Trucks
F13. 7 or More Axle Multi-Unit Trucks

* INCLUDING THOSE HAULING TRAILERS

FUNCTIONAL CLASS CODES:

RURAL	URBAN	SYSTEM
01	11	PRINCIPAL ARTERIAL-INTERSTATE
02	12	PRINCIPAL ARTERIAL-EXPRESSWAY
02	14	PRINCIPAL ARTERIAL-OTHER
06	16	MINOR ARTERIAL
07	17	MAJOR COLLECTOR
08	17	MINOR COLLECTOR
09	19	LOCAL SYSTEM

SOURCE: NYSDOT DATA SERVICES BUREAU

Date: 07/26/2011

New York State Department of Transportation
Speed Count Average Weekday Report

Station:	820319	Start date:	Mon 05/02/2011 11:00	Count duration:	173 hours
Route #: NY 55	Road name:	End date:	Mon 05/09/2011 15:45	Functional class:	14
From:	CR 21 NOXON RD W JCT	County:	Dutchess	Factor group:	30
To:	ACC TSP RT 987G	Town:	LAGRANGE	Batch ID:	DOT-SJWR8 19A
Direction:	East	Speed limit:	45	Count taken by:	Org: TST Init: ---
		LION#:		Processed by:	Org: DOT Init: SJW

Counts have been summarized into NYSDOT EI standard bins

Speeds, mph

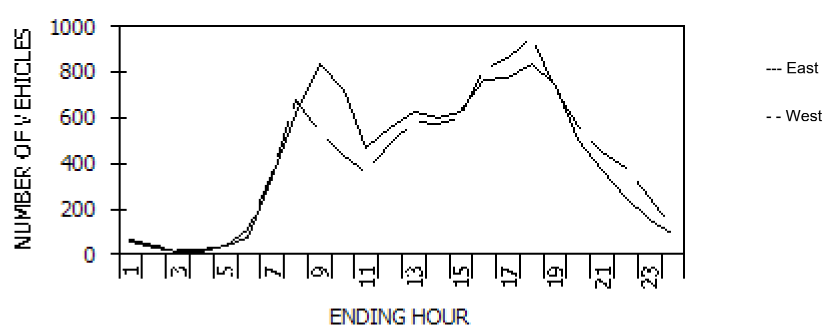
Hour	0.0-20.0	20.1-25.0	25.1-30.0	30.1-35.0	35.1-40.0	40.1-45.0	45.1-50.0	50.1-55.0	55.1-60.0	60.1-65.0	65.1-70.0	70.1-75.0	75.1-95.0	% Exc 45.0	% Exc 50.0	% Exc 55.0	% Exc 60.0	% Exc 65.0	Avg	50th%	85th%	Total
1:00	0	0	0	0	0	5	17	15	13	7	2	1	0	91.7	63.3	38.3	16.7	5.0	52.5	52.7	60.8	60
2:00	0	0	0	0	1	3	7	10	4	1	0	0	0	84.6	57.7	19.2	3.8	0.0	49.9	51.0	56.4	26
3:00	0	0	0	0	0	1	3	5	2	2	0	0	0	92.3	69.2	30.8	15.4	0.0	52.3	52.6	60.2	13
4:00	0	0	0	0	0	3	3	6	2	1	0	0	0	80.0	60.0	20.0	6.7	0.0	50.2	51.3	56.9	15
5:00	0	0	0	0	1	4	8	13	9	3	1	0	0	87.2	66.7	33.3	10.3	2.6	51.6	52.6	59.0	39
6:00	0	0	0	0	0	3	19	30	19	5	1	0	0	96.1	71.4	32.5	7.8	1.3	52.5	52.8	58.6	77
7:00	0	0	1	1	2	12	80	151	73	15	2	1	0	95.3	71.6	26.9	5.3	0.9	51.9	52.5	57.8	338
8:00	0	0	0	1	11	72	236	226	61	11	1	0	0	86.4	48.3	11.8	1.9	0.2	49.3	49.8	54.6	619
9:00	2	1	1	3	24	116	328	277	78	9	1	0	0	82.5	43.5	10.5	1.2	0.1	48.3	49.2	54.4	840
10:00	0	0	0	3	12	94	251	273	80	11	1	0	0	85.0	50.3	12.7	1.7	0.1	49.4	50.1	54.7	725
11:00	0	0	0	0	3	52	158	188	59	10	2	0	0	88.3	54.9	15.0	2.5	0.4	50.1	50.7	55.1	472
12:00	1	0	2	5	8	60	221	187	59	9	1	0	0	86.3	46.3	12.5	1.8	0.2	48.8	49.6	54.7	553
13:00	0	0	0	3	8	78	236	232	62	10	1	0	0	85.9	48.4	11.6	1.7	0.2	49.3	49.8	54.6	630
14:00	0	0	0	0	11	68	220	222	64	10	2	0	0	86.8	49.9	12.7	2.0	0.3	49.5	50.0	54.7	597
15:00	0	0	0	0	11	82	225	232	68	8	0	0	0	85.1	49.2	12.1	1.3	0.0	49.3	49.9	54.7	626
16:00	1	0	1	3	18	101	290	258	82	10	1	0	0	83.8	45.9	12.2	1.4	0.1	48.8	49.5	54.6	765
17:00	0	0	0	1	14	85	268	302	97	12	0	0	0	87.2	52.8	14.0	1.5	0.0	49.7	50.4	54.9	779
18:00	0	0	0	0	4	68	303	356	97	11	1	0	0	91.4	55.4	13.0	1.4	0.1	50.2	50.7	54.8	840
19:00	1	0	0	1	12	82	271	282	79	11	0	0	0	87.0	50.3	12.2	1.5	0.0	49.3	50.1	54.7	739
20:00	1	0	0	0	4	35	166	210	76	10	1	0	0	92.0	59.0	17.3	2.2	0.2	50.3	51.1	55.8	503
21:00	0	0	0	0	6	34	142	138	49	6	0	0	0	89.3	51.5	14.7	1.6	0.0	49.8	50.2	55.0	375
22:00	0	0	0	0	2	20	95	98	32	3	1	0	0	91.2	53.4	14.3	1.6	0.4	50.1	50.5	55.0	251
23:00	0	0	0	0	2	14	53	56	20	5	0	0	0	89.3	54.0	16.7	3.3	0.0	50.1	50.6	55.7	150
24:00	0	0	0	0	0	11	28	34	16	2	2	1	0	88.3	58.5	22.3	5.3	3.2	50.8	51.2	57.2	94
Avg. Daily Total	6	1	5	21	154	1103	3628	3801	1201	182	21	3	0	87.3	51.4	13.9	2.0	0.2	49.6	50.2	54.9	10126
Percent	0.1%	0.0%	0.0%	0.2%	1.5%	10.9%	35.8%	37.5%	11.9%	1.8%	0.2%	0.0%	0.0%									
Cum. Percent	0.1%	0.1%	0.1%	0.3%	1.8%	12.7%	48.6%	86.1%	98.0%	99.8%	100.0%	100.0%	100.0%									
Average hour	0	0	0	1	6	46	151	158	50	8	1	0	0									422

	Avg. Speed	50th% Speed	85th% Speed
East	49.6	50.2	54.9
West	52.0	52.5	57.6

Peak Hour Data

Direction	Hour	Count	2-way	Hour	Count
East	9	840	A.M.	9	1381
West	18	952	P.M.	18	1792

TRAFFIC FLOW BY DIRECTION



New York State Department of Transportation
Speed Count Average Weekday Report

Station:	820319	Start date:	Mon 05/02/2011 11:00	Count duration:	173 hours
Route #: NY 55	Road name:	End date:	Mon 05/09/2011 15:45	Functional class:	14
From:	CR 21 NOXON RD W JCT	County:	Dutchess	Factor group:	30
To:	ACC TSP RT 987G	Town:	LAGRANGE	Batch ID:	DOT-SJWR8 19A
Direction:	West	Speed limit:	45	Count taken by:	Org: TST Init: ---
		LION#:		Processed by:	Org: DOT Init: SJW

Counts have been summarized into NYSDOT EI standard bins

Speeds, mph

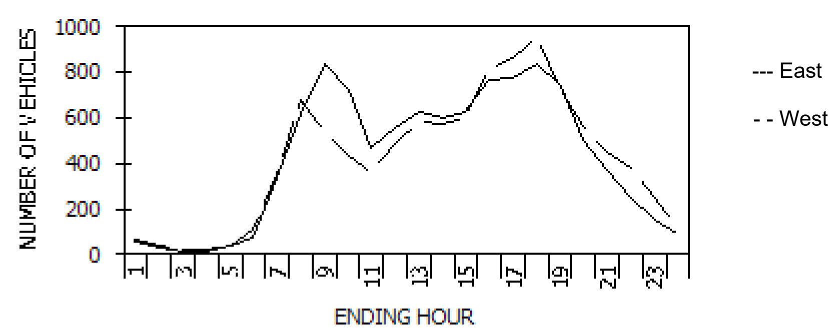
Hour	0.0-20.0	20.1-25.0	25.1-30.0	30.1-35.0	35.1-40.0	40.1-45.0	45.1-50.0	50.1-55.0	55.1-60.0	60.1-65.0	65.1-70.0	70.1-75.0	75.1-95.0	% Exc 45.0	% Exc 50.0	% Exc 55.0	% Exc 60.0	% Exc 65.0	Avg	50th%	85th%	Total
1:00	0	0	0	0	0	2	13	23	16	7	2	0	0	96.8	76.2	39.7	14.3	3.2	53.4	53.6	59.9	63
2:00	0	0	0	0	0	1	8	16	9	2	1	0	0	97.3	75.7	32.4	8.1	2.7	52.9	53.0	58.6	37
3:00	0	0	0	0	0	2	3	8	4	2	0	0	0	89.5	73.7	31.6	10.5	0.0	52.2	52.9	59.0	19
4:00	0	0	0	0	0	2	5	8	4	2	1	0	0	90.9	68.2	31.8	13.6	4.5	52.2	52.6	59.7	22
5:00	0	0	0	0	2	1	8	10	11	3	0	0	0	91.4	68.6	40.0	8.6	0.0	51.8	53.3	59.0	35
6:00	0	0	0	0	0	2	20	45	30	8	3	1	1	98.2	80.0	39.1	11.8	4.5	53.8	53.7	59.5	110
7:00	0	0	0	0	1	13	64	147	104	25	3	0	1	96.1	78.2	37.2	8.1	1.1	53.1	53.5	58.9	358
8:00	0	0	0	0	6	42	176	292	140	19	2	0	0	92.9	66.9	23.8	3.1	0.3	51.4	52.0	57.2	677
9:00	0	0	0	0	1	28	148	220	126	17	1	0	0	94.6	67.3	26.6	3.3	0.2	51.7	52.2	57.5	541
10:00	0	0	2	1	0	12	90	194	108	21	2	0	0	96.5	75.6	30.5	5.3	0.5	52.3	52.9	58.1	430
11:00	0	0	0	1	1	13	76	159	90	19	2	1	1	95.9	74.9	31.1	6.3	1.1	52.5	52.9	58.3	363
12:00	0	0	0	1	3	17	104	218	123	21	2	0	0	95.7	74.4	29.9	4.7	0.4	52.3	52.8	58.0	489
13:00	0	0	0	0	1	20	129	270	144	18	2	0	0	96.4	74.3	28.1	3.4	0.3	52.2	52.7	57.7	584
14:00	0	0	0	0	0	24	155	256	119	19	2	0	0	95.8	68.9	24.3	3.7	0.3	51.8	52.2	57.3	575
15:00	0	0	0	0	2	28	166	265	119	18	0	0	0	95.0	67.2	22.9	3.0	0.0	51.5	52.0	57.0	598
16:00	1	2	2	1	4	56	242	346	136	16	2	0	0	91.8	61.9	19.1	2.2	0.2	50.4	51.4	56.3	808
17:00	0	0	0	0	0	34	239	396	177	17	2	0	0	96.1	68.4	22.7	2.2	0.2	51.6	52.1	56.9	865
18:00	0	0	0	0	5	36	251	458	182	19	1	0	0	95.7	69.3	21.2	2.1	0.1	51.5	52.1	56.7	952
19:00	0	0	0	0	0	12	136	361	192	23	1	0	0	98.3	79.6	29.8	3.3	0.1	52.8	53.0	57.8	725
20:00	0	0	0	0	1	14	89	268	170	20	3	0	0	97.3	81.6	34.2	4.1	0.5	53.0	53.4	58.2	565
21:00	0	0	0	0	0	8	110	215	103	13	1	0	0	98.2	73.8	26.0	3.1	0.2	52.2	52.5	57.5	450
22:00	0	0	0	0	0	8	77	176	102	13	1	0	0	97.9	77.5	30.8	3.7	0.3	52.7	53.0	58.0	377
23:00	0	0	0	0	0	6	47	110	72	14	2	0	0	97.6	78.9	35.1	6.4	0.8	53.0	53.3	58.5	251
24:00	0	0	0	0	0	2	22	49	36	7	2	0	0	98.3	79.7	38.1	7.6	1.7	53.4	53.6	58.8	118
Avg. Daily Total	1	2	4	4	27	383	2378	4510	2317	343	38	2	3	95.8	72.0	27.0	3.9	0.4	52.0	52.5	57.6	10012
Percent	0.0%	0.0%	0.0%	0.0%	0.3%	3.8%	23.8%	45.0%	23.1%	3.4%	0.4%	0.0%	0.0%									
Cum. Percent	0.0%	0.0%	0.1%	0.1%	0.4%	4.2%	28.0%	73.0%	96.1%	99.6%	100.0%	100.0%	100.0%									
Average hour	0	0	0	0	1	16	99	188	97	14	2	0	0									417

	Avg. Speed	50th% Speed	85th% Speed
East	49.6	50.2	54.9
West	52.0	52.5	57.6

Peak Hour Data

Direction	Hour	Count	2-way	Hour	Count
East	9	840	A.M.	9	1381
West	18	952	P.M.	18	1792

TRAFFIC FLOW BY DIRECTION



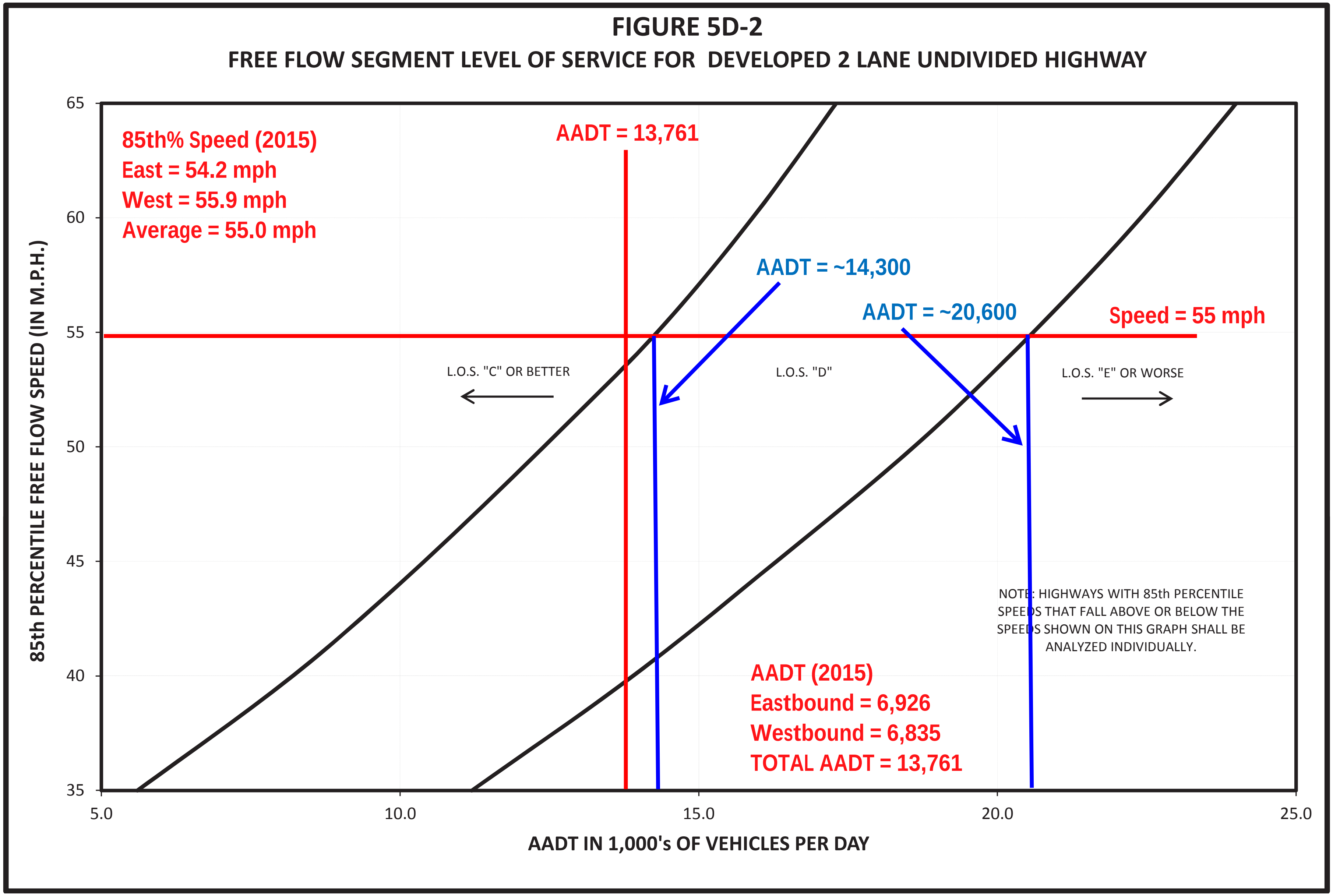


FIGURE 5D-2
FREE FLOW SEGMENT LEVEL OF SERVICE FOR DEVELOPED 2 LANE UNDIVIDED HIGHWAY
85th% Speed (2015)
East = 54.2 mph
West = 55.9 mph
Average = 55.0 mph
AADT = 13,761
AADT = ~14,300
AADT = ~20,600
Speed = 55 mph
L.O.S. "C" OR BETTER
L.O.S. "D"
L.O.S. "E" OR WORSE
NOTE: HIGHWAYS WITH 85th PERCENTILE SPEEDS THAT FALL ABOVE OR BELOW THE SPEEDS SHOWN ON THIS GRAPH SHALL BE ANALYZED INDIVIDUALLY.
AADT (2015)
Eastbound = 6,926
Westbound = 6,835
TOTAL AADT = 13,761
85th PERCENTILE FREE FLOW SPEED (IN M.P.H.)
65
60
55
50
45
40
35
5.0
10.0
15.0
20.0
25.0
AADT IN 1,000's OF VEHICLES PER DAY

Institute of Traffic Engineers (ITE) Land Use Categories

Gasoline/Service Station
(944)

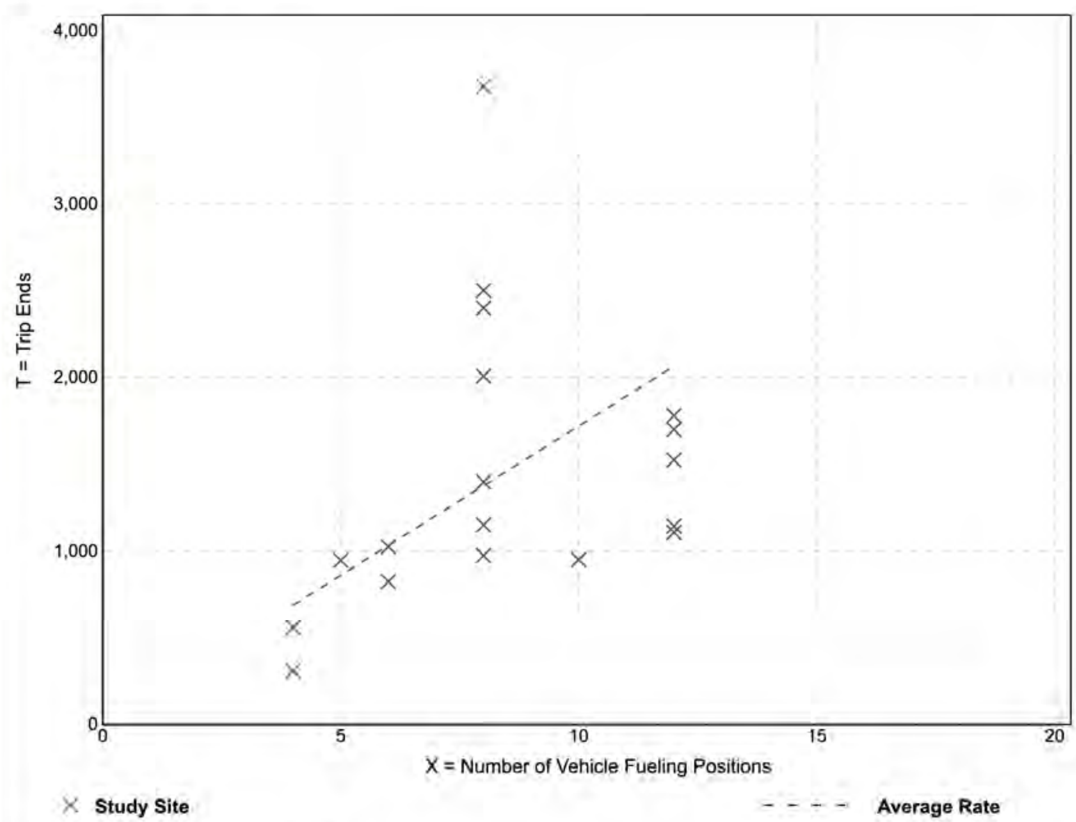
Vehicle Trip Ends vs: Vehicle Fueling Positions
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 18
Avg. Num. of Vehicle Fueling Positions: 8
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Vehicle Fueling Position

Average Rate	Range of Rates	Standard Deviation
172.01	77.00 - 460.00	96.45

Data Plot and Equation



Fitted Curve Equation: Not Given

R^2= ****

Gasoline/Service Station
(944)

Vehicle Trip Ends vs: Vehicle Fueling Positions
On a: Sunday

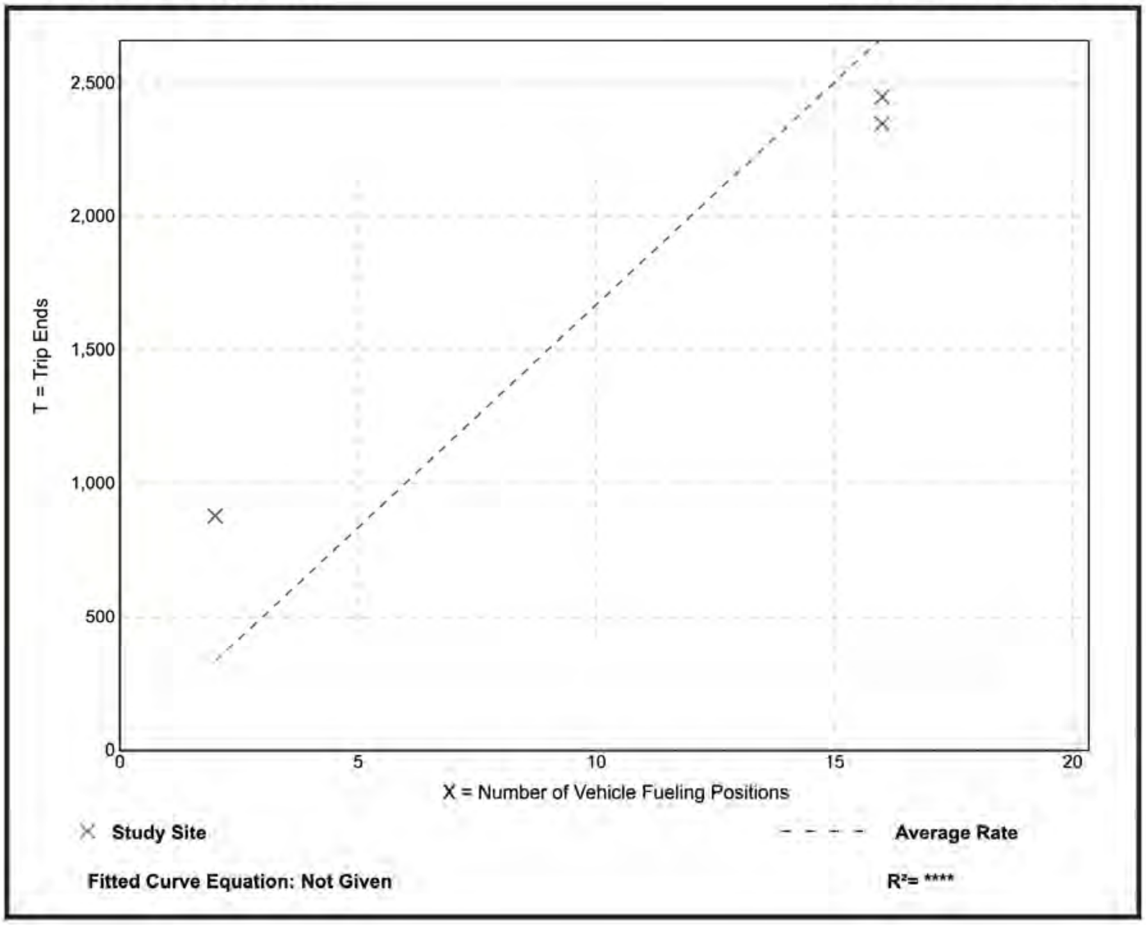
Setting/Location: General Urban/Suburban
Number of Studies: 3
Avg. Num. of Vehicle Fueling Positions: 11
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Vehicle Fueling Position

Average Rate	Range of Rates	Standard Deviation
166.88	146.75 - 439.00	344.72

Data Plot and Equation

Caution – Small Sample Size



Gasoline/Service Station
(944)

Vehicle Trip Ends vs: Vehicle Fueling Positions
On a: Saturday

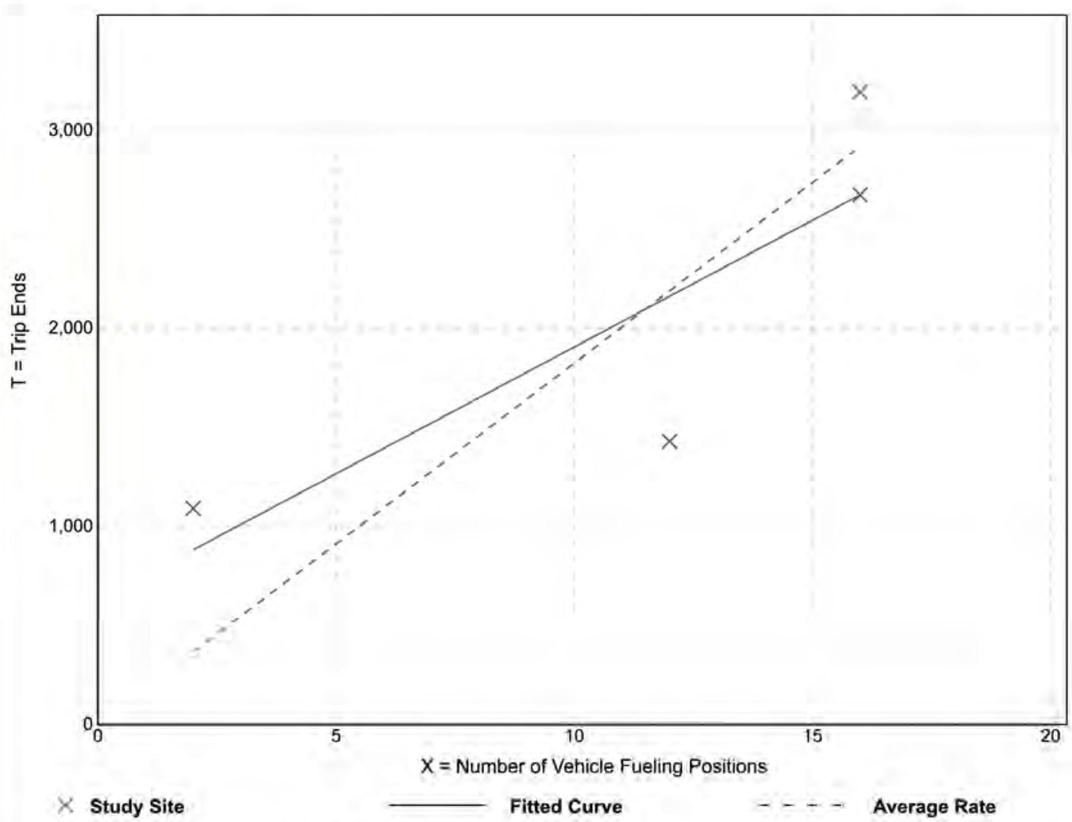
Setting/Location: General Urban/Suburban
Number of Studies: 4
Avg. Num. of Vehicle Fueling Positions: 12
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Vehicle Fueling Position

Average Rate	Range of Rates	Standard Deviation
182.17	119.00 - 545.00	96.27

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: T = 127.77(X) + 625.63

R^2= 0.72

Small Office Building
(712)

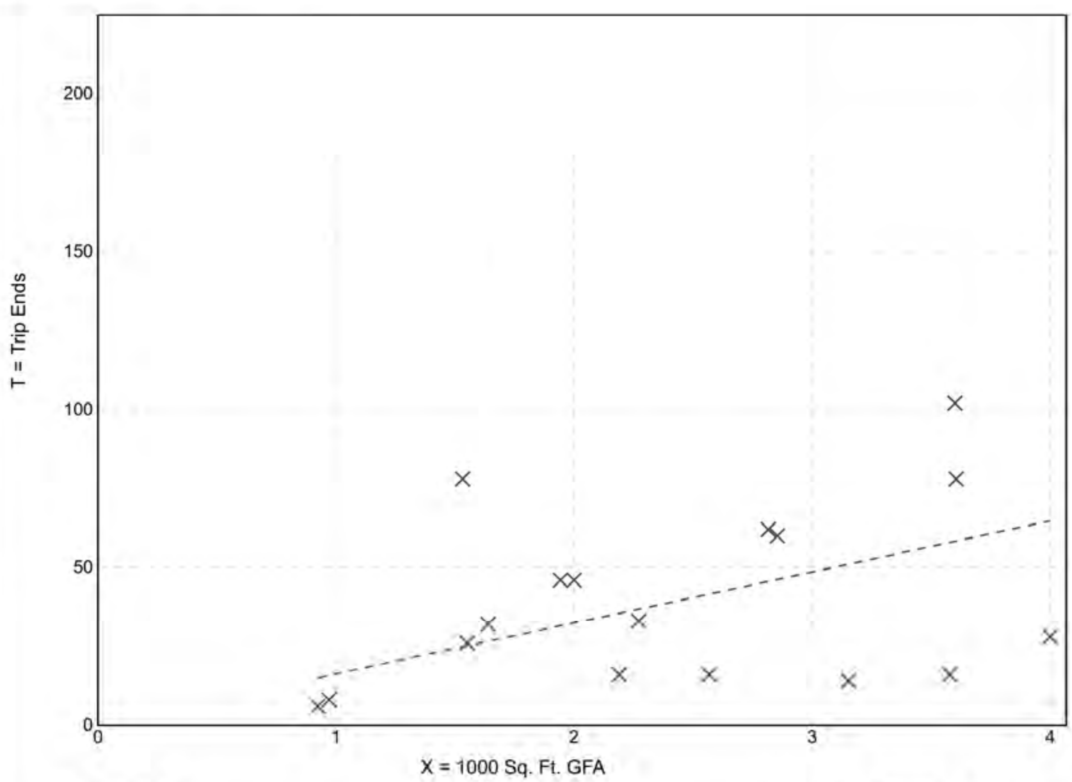
Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 17
1000 Sq. Ft. GFA: 2
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
16.19	4.44 - 50.91	11.03

Data Plot and Equation



Fitted Curve Equation: Not Given

R^2= ****

Hotel
(310)

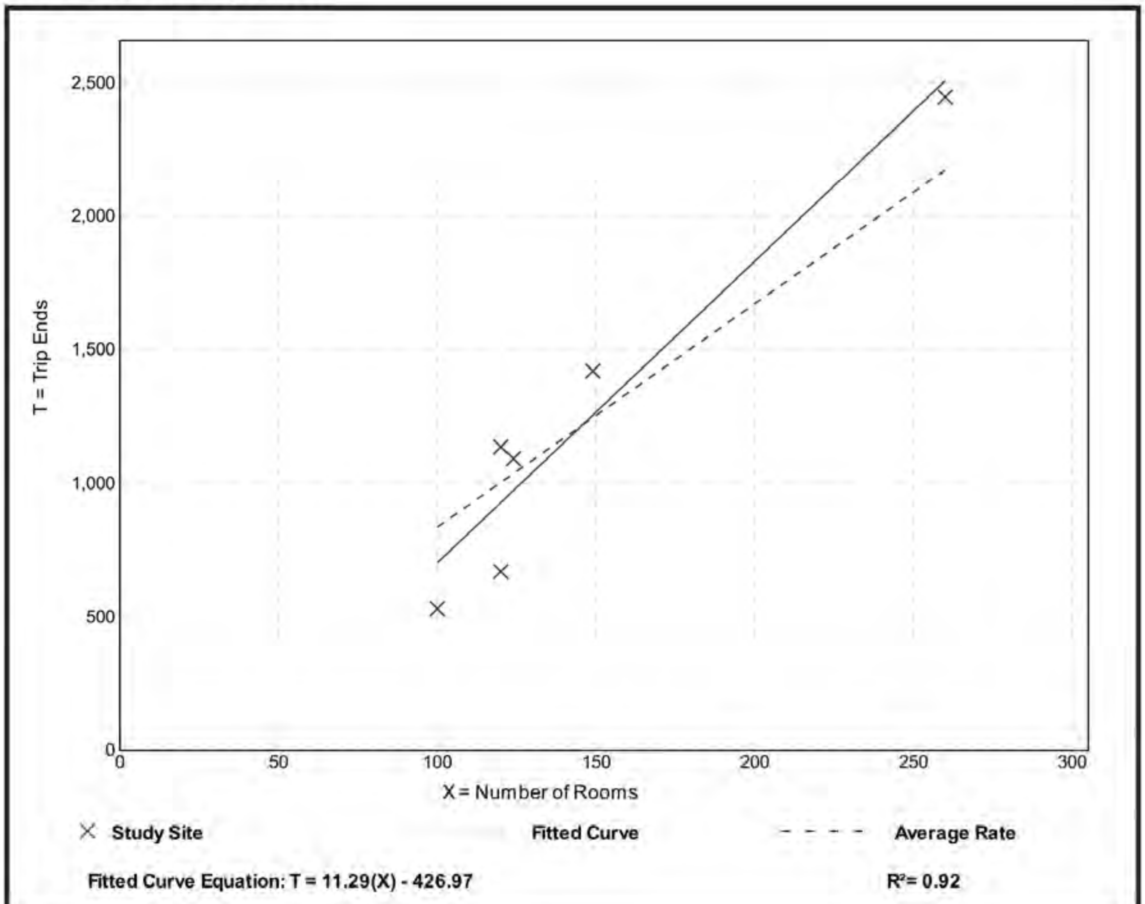
Vehicle Trip Ends vs: Rooms
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 6
Avg. Num. of Rooms: 146
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Room

Average Rate	Range of Rates	Standard Deviation
8.36	5.31 - 9.53	1.86

Data Plot and Equation



Hotel
(310)

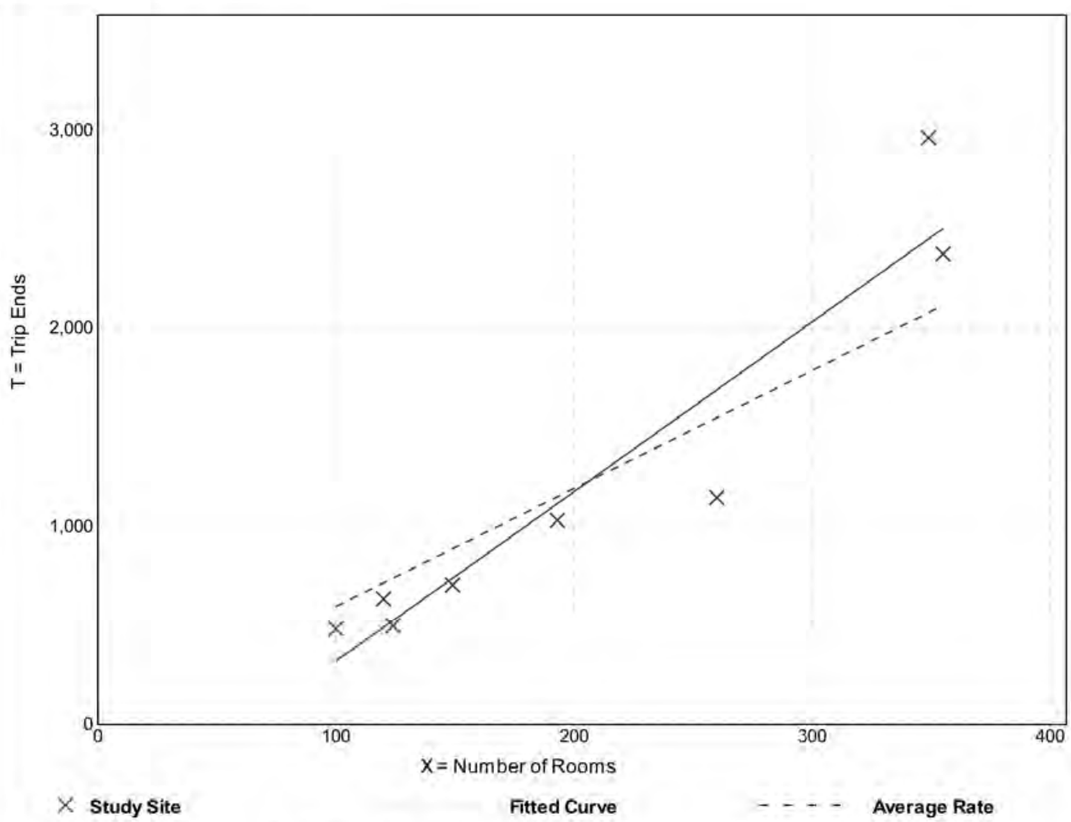
Vehicle Trip Ends vs: **Rooms**
On a: **Sunday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 8
Avg. Num. of Rooms: 206
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Room

Average Rate	Range of Rates	Standard Deviation
5.95	4.01 - 8.48	1.66

Data Plot and Equation



Fitted Curve Equation: T = 8.56(X) - 538.12 **R^2 = 0.90**

Hotel
(310)

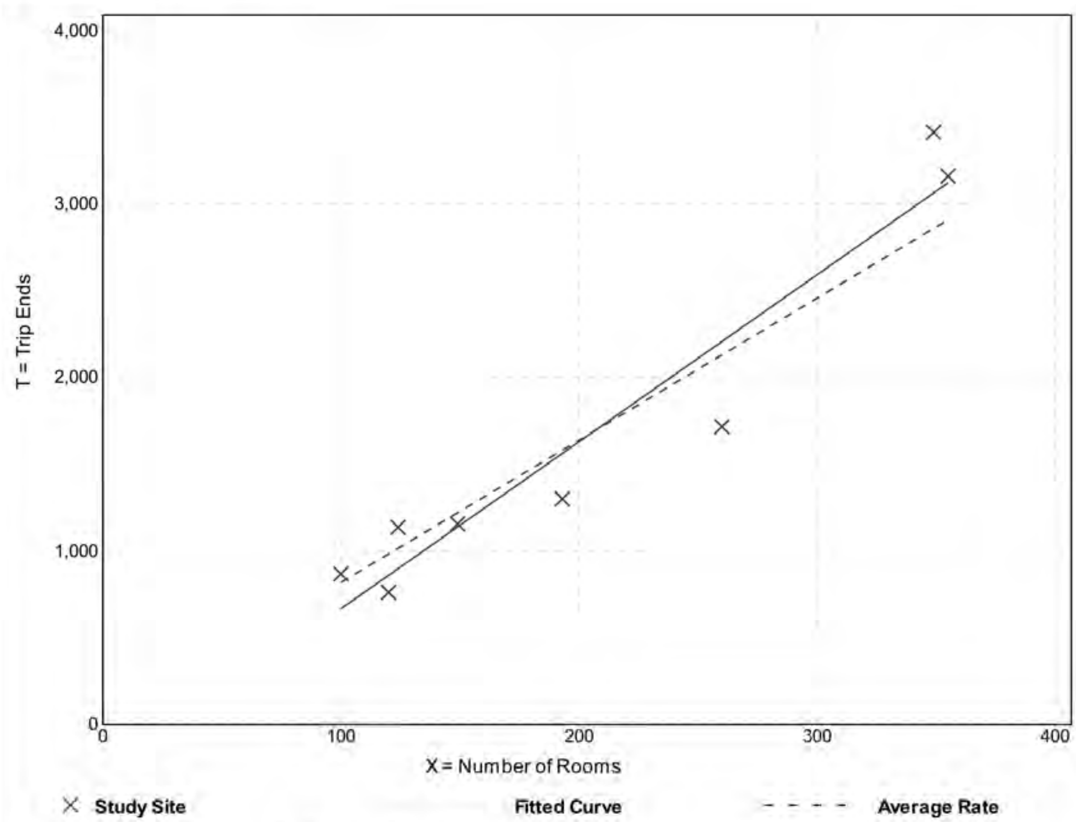
Vehicle Trip Ends vs: Rooms
On a: Saturday

Setting/Location: General Urban/Suburban
Number of Studies: 8
Avg. Num. of Rooms: 206
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Room

Average Rate	Range of Rates	Standard Deviation
8.19	6.35 - 9.79	1.37

Data Plot and Equation



Fitted Curve Equation: $T = 9.62(X) - 294.56$ **$R^2 = 0.93$**

Multifamily Housing (Low-Rise)
(220)

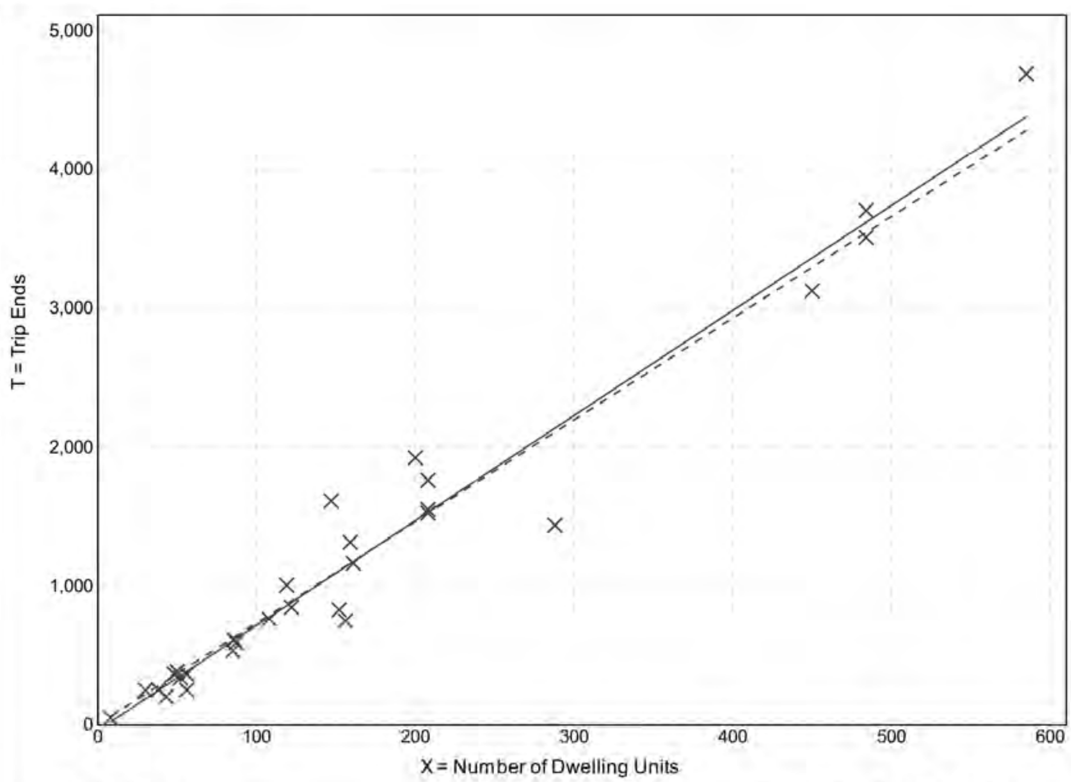
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 29
Avg. Num. of Dwelling Units: 168
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
7.32	4.45 - 10.97	1.31

Data Plot and Equation



× **Study Site** **Fitted Curve** - - - - **Average Rate**

Fitted Curve Equation: T = 7.56(X) - 40.86 **R^2= 0.96**

Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs: Dwelling Units
On a: Sunday

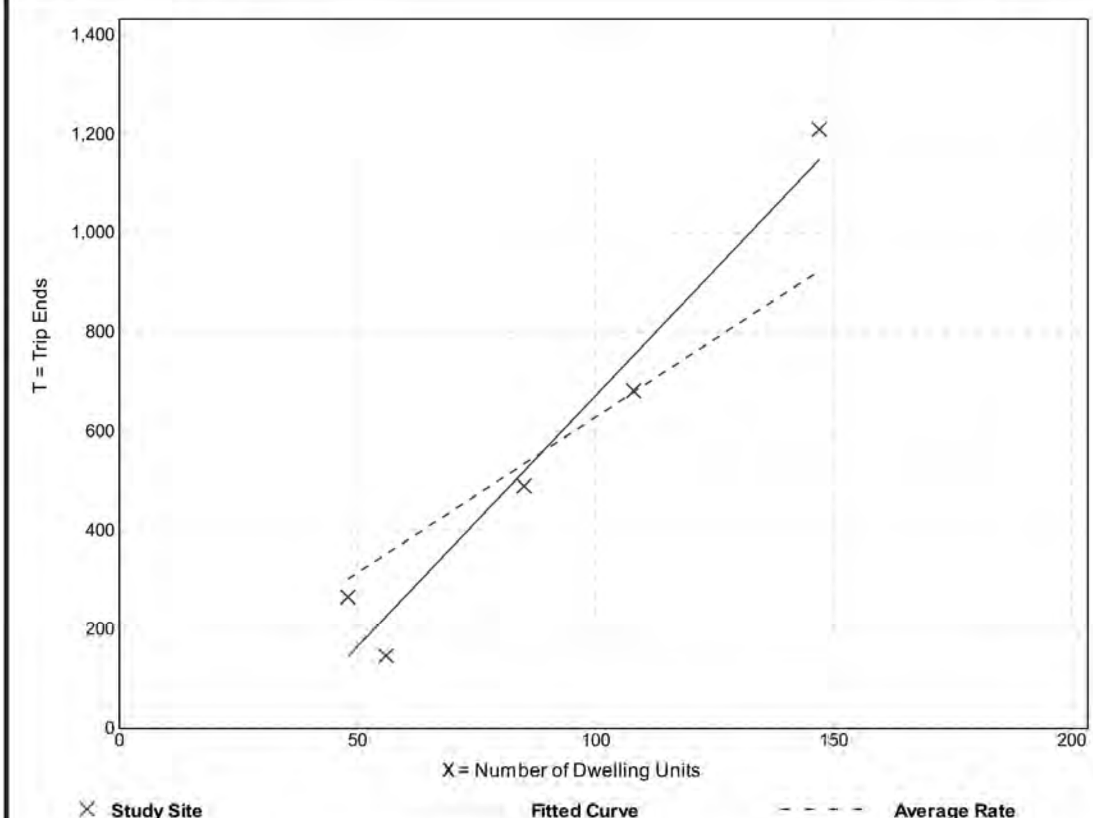
Setting/Location: General Urban/Suburban
Number of Studies: 5
Avg. Num. of Dwelling Units: 89
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
6.28	2.61 - 8.22	1.96

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: T = 10.13(X) - 341.89 **R^2 = 0.96**

Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs: Dwelling Units
On a: Saturday

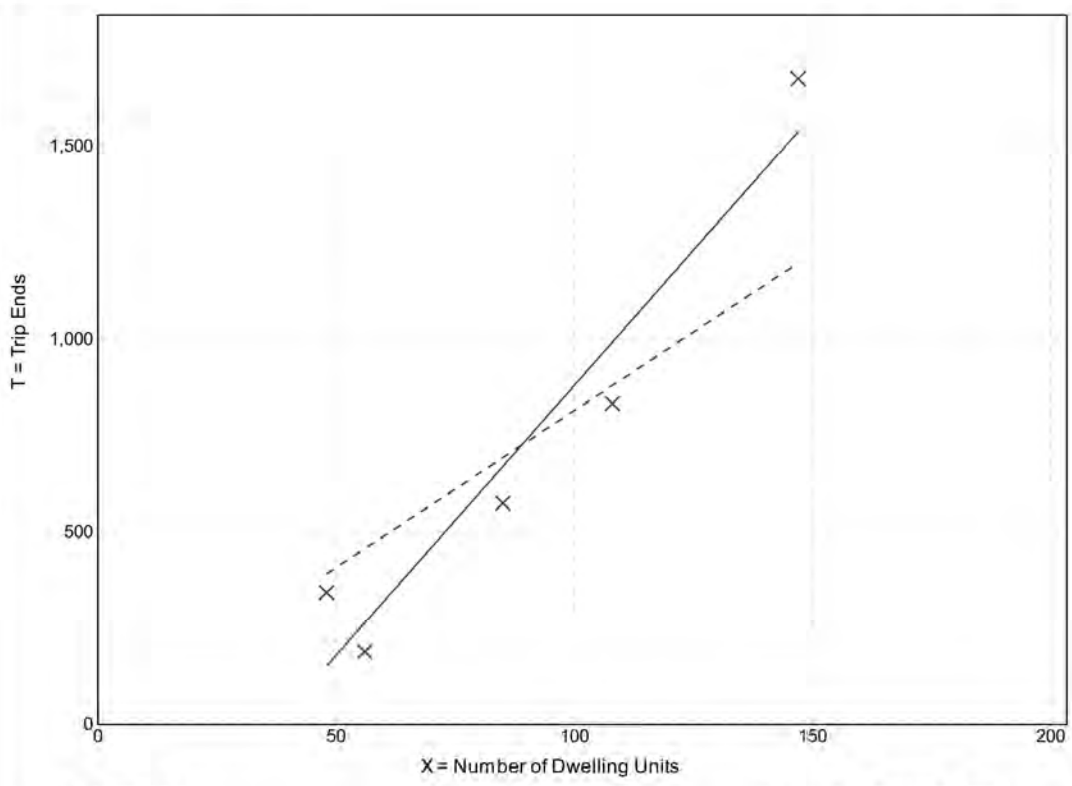
Setting/Location: General Urban/Suburban
Number of Studies: 5
Avg. Num. of Dwelling Units: 89
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
8.14	3.36 - 11.40	2.94

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: T = 14.01(X) - 521.69 **R^2 = 0.93**

Single-Family Detached Housing
(210)

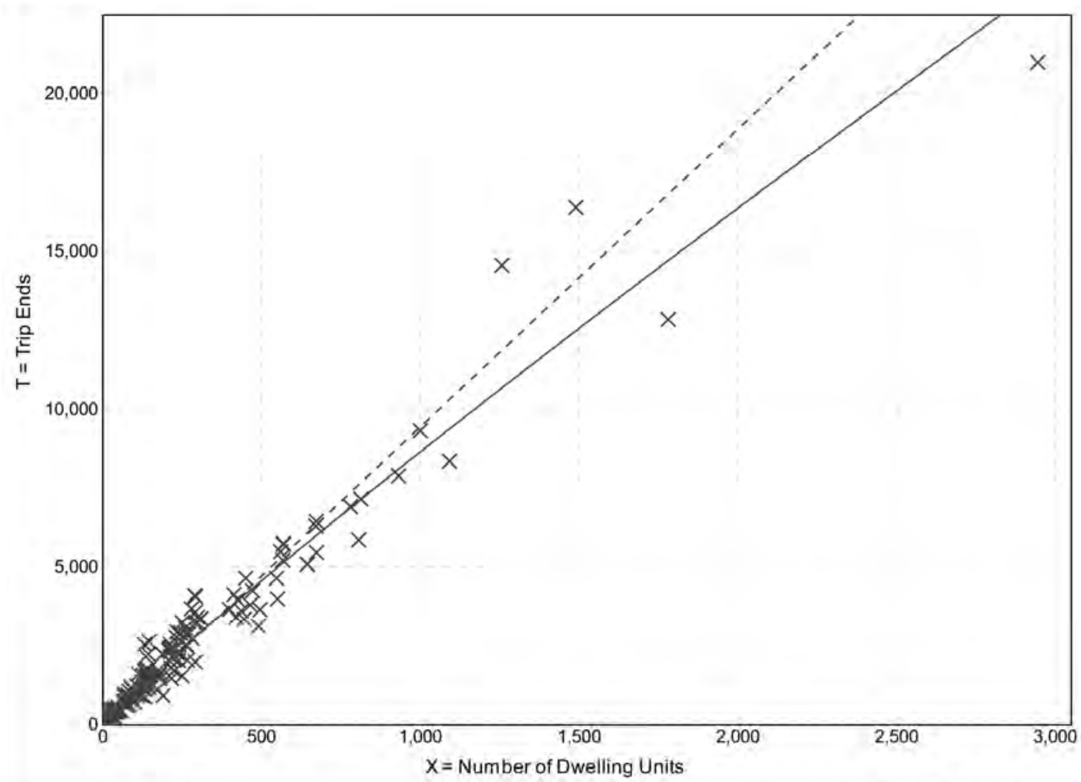
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 159
Avg. Num. of Dwelling Units: 264
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.44	4.81 - 19.39	2.10

Data Plot and Equation



Fitted Curve Equation: $Ln(T) = 0.92\ Ln(X) + 2.71$

$R^2 = 0.95$

Single-Family Detached Housing
(210)

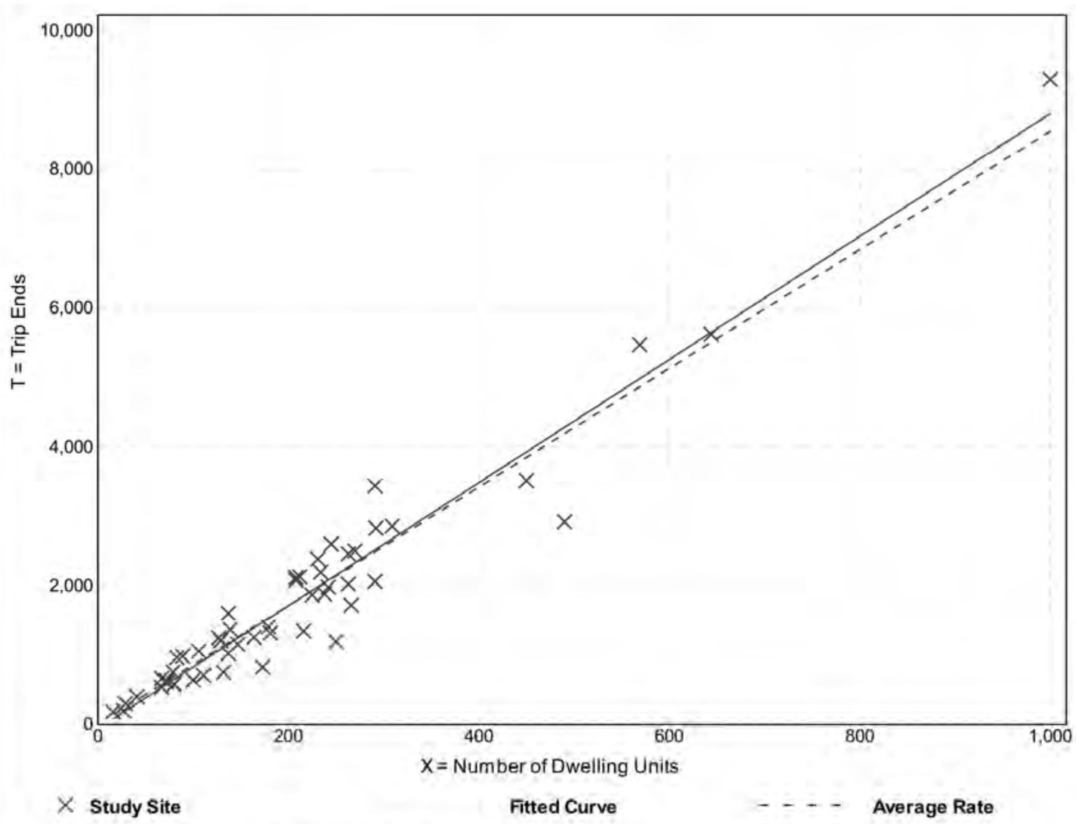
Vehicle Trip Ends vs: Dwelling Units
On a: Sunday

Setting/Location: General Urban/Suburban
Number of Studies: 51
Avg. Num. of Dwelling Units: 209
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
8.55	4.74 - 11.82	1.65

Data Plot and Equation



Fitted Curve Equation: $T = 8.87(X) - 65.12$

$R^2 = 0.94$

Single-Family Detached Housing
(210)

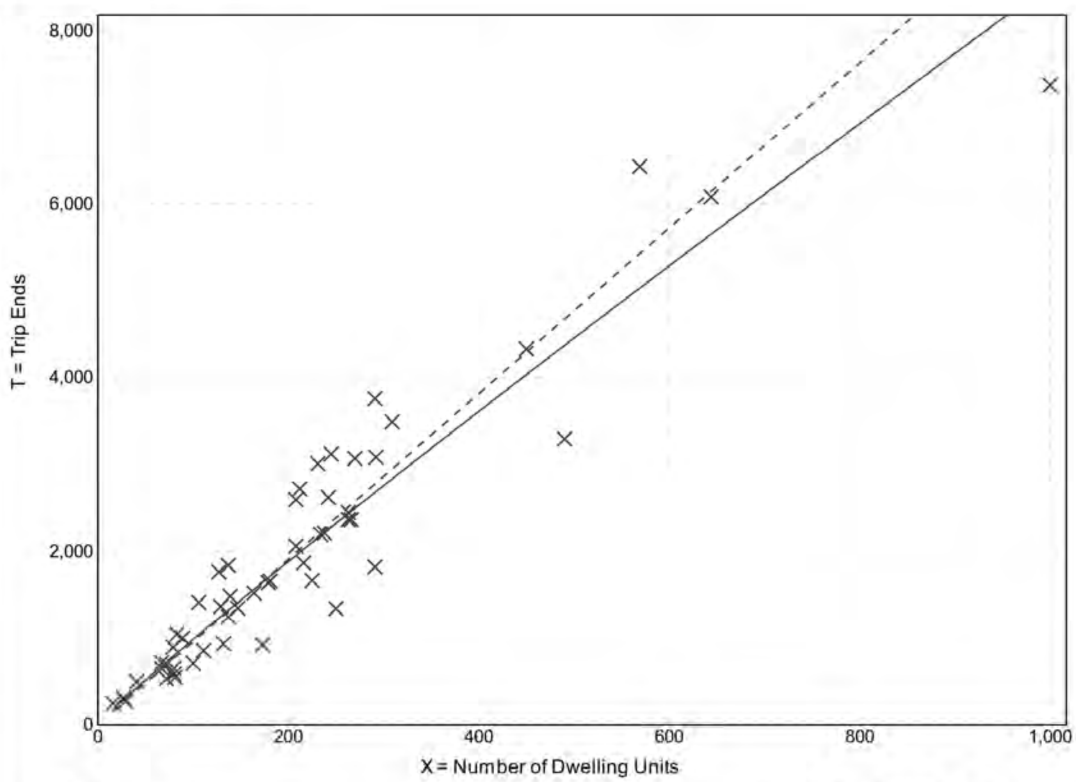
Vehicle Trip Ends vs: Dwelling Units
On a: Saturday

Setting/Location: General Urban/Suburban
Number of Studies: 52
Avg. Num. of Dwelling Units: 207
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.54	5.32 - 15.25	2.17

Data Plot and Equation



Study Site   Fitted Curve   Average Rate

Fitted Curve Equation: Ln(T) = 0.94 Ln(X) + 2.56   **R^2 = 0.91**

Specialty Trade Contractor
(180)

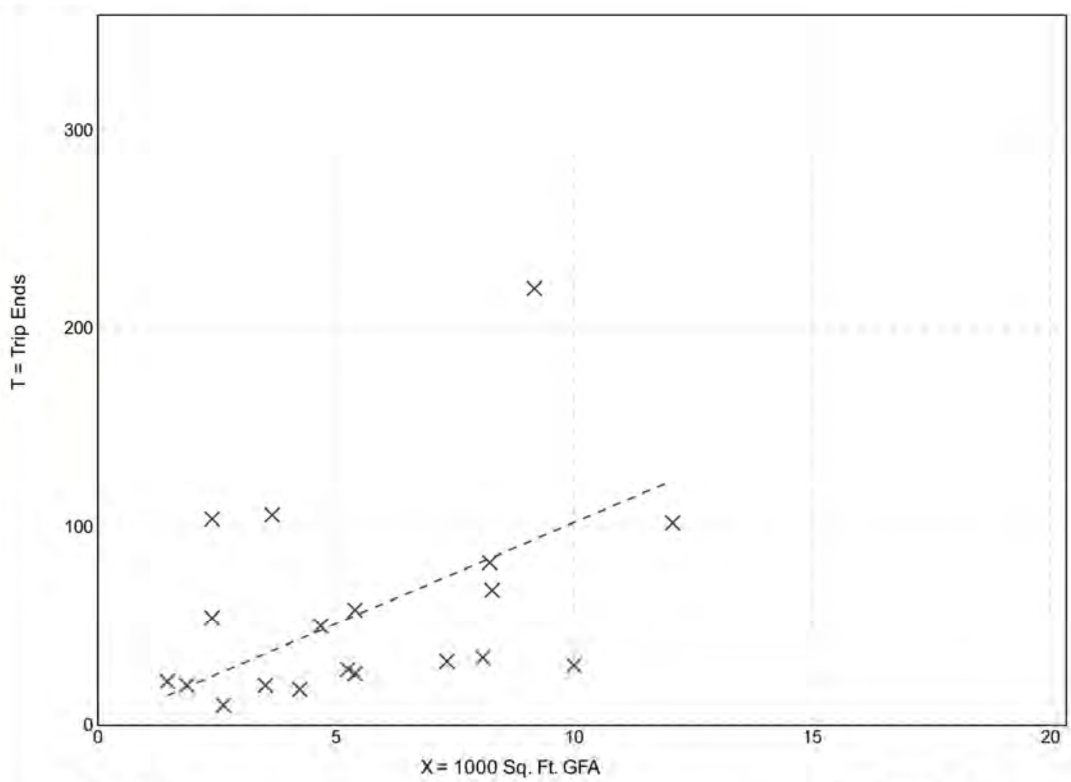
Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 19
1000 Sq. Ft. GFA: 6
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
10.22	3.00 - 43.33	8.82

Data Plot and Equation



× **Study Site** - - - - **Average Rate**

Fitted Curve Equation: Not Given **R^2= ******

Mini-Warehouse
(151)

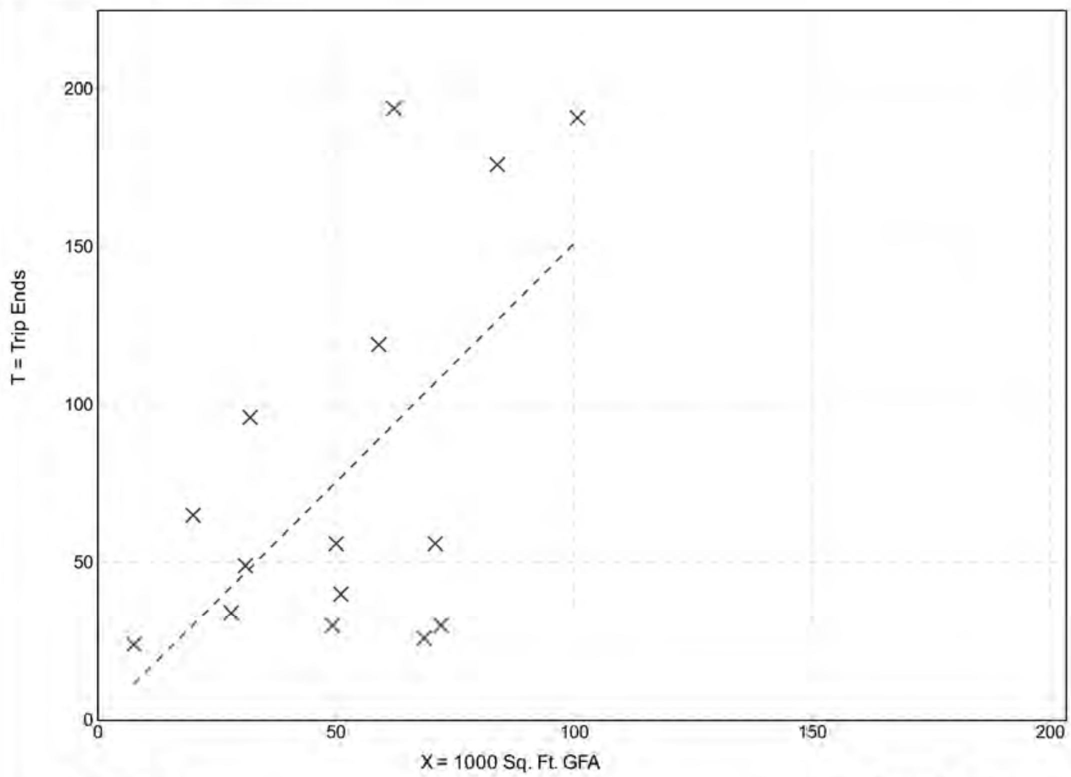
Vehicle Trip Ends vs: **1000 Sq. Ft. GFA**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 15
1000 Sq. Ft. GFA: 52
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.51	0.38 - 3.25	0.95

Data Plot and Equation



× **Study Site**

- - - - **Average Rate**

Fitted Curve Equation: Not Given

R^2= ****

Mini-Warehouse
(151)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Sunday

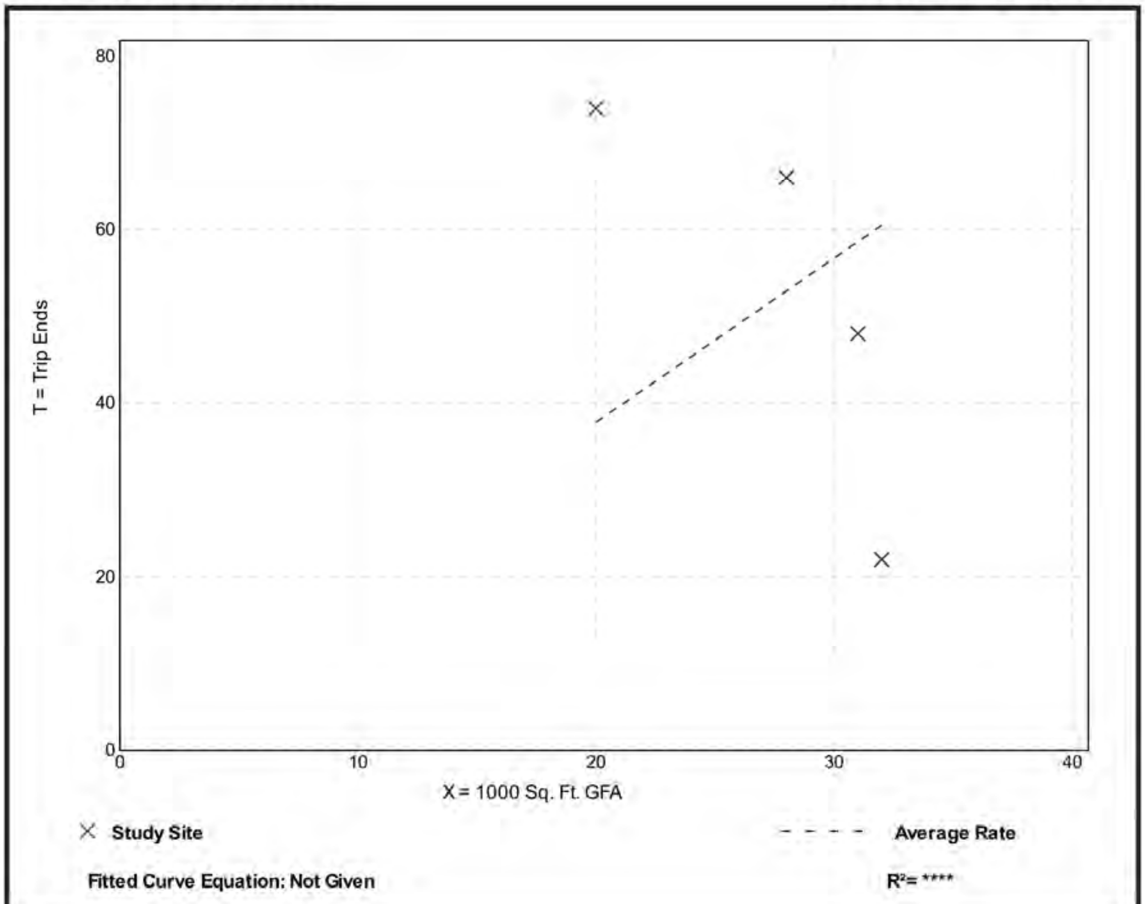
Setting/Location: General Urban/Suburban
Number of Studies: 4
1000 Sq. Ft. GFA: 28
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.89	0.69 - 3.70	1.21

Data Plot and Equation

Caution – Small Sample Size



Mini-Warehouse
(151)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Saturday

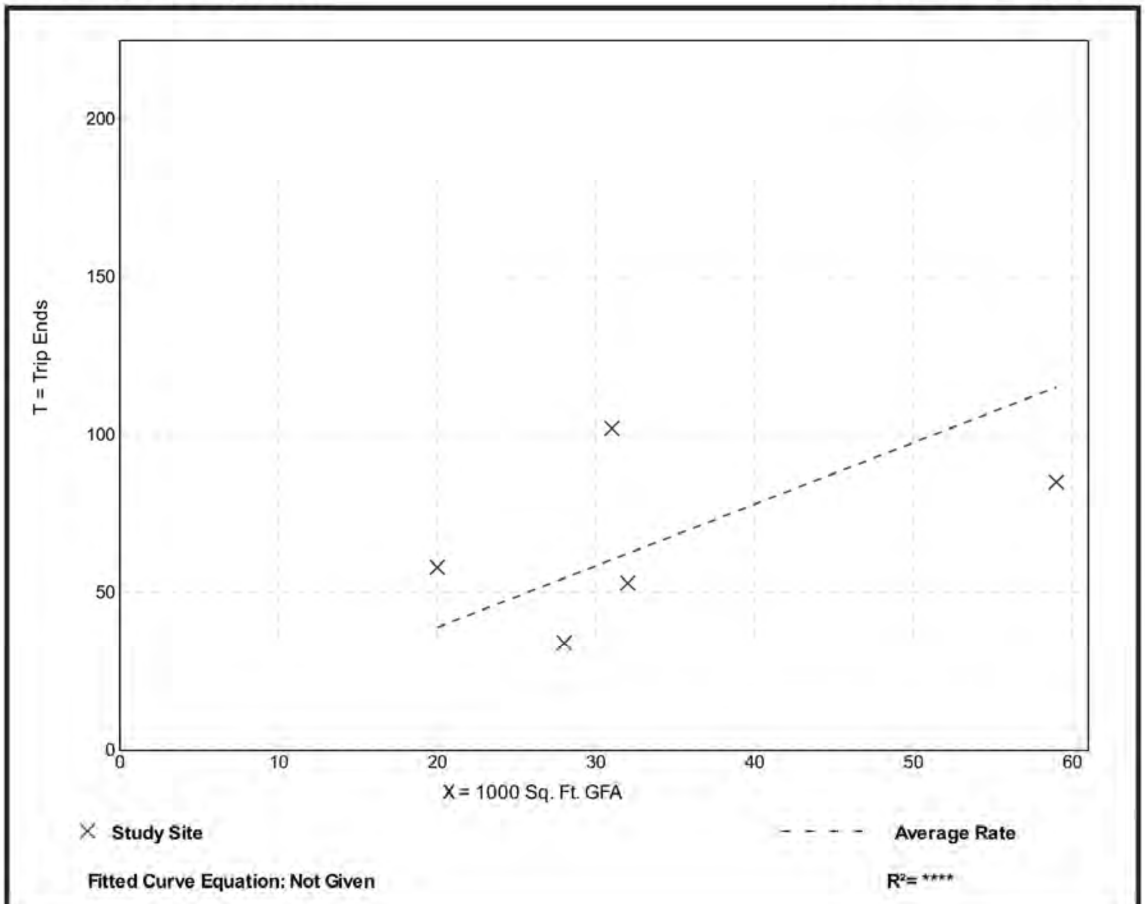
Setting/Location: General Urban/Suburban
Number of Studies: 5
1000 Sq. Ft. GFA: 34
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.95	1.21 - 3.29	0.89

Data Plot and Equation

Caution – Small Sample Size



Local Property Information

ParcelAccess

Final Roll

Parcel Grid Identification #:
133400-6460-02-802900-0000
Municipality: La Grange

Parcel Location
1215 Route 55

Owner Name on March 1
M Spiegel & Sons Oil Corp , *(P)*

Primary *(P)* Owner Mail Address
E Village Rd
PO Box 833
Tuxedo NY 109870000

Parcel Details

Size (acres):	0.87 Ac	Land Use Class:	(432) Commercial: Motor Vehicle Services: Service and Gas Stations
File Map:		Agri. Dist.:	(0)
File Lot #:		School District:	(134601) Arlington School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$107300	$883200	$883200	$883200	$883200	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
N: Non-Homestead	1	100	$ 883200

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$400000	2/23/1999 12:00:00 AM	2025	0124	(J)	1

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(2) Private	(2) Private	(2) Fair	TCB	(H01) Full srv gas

Commercial/Industrial/Utility Building Information:
Site Number: 1
Bldg Sec.: 1 Bldg. Number: 1

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
0	0	1400	(0712) Service sta with bays load sup	(3) Above Average

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
0	0	0	0	1400

Number Identical:	Condition Code:
1	3

Commercial Rental Information:
Site Number: 1
Use Number: 1
Used As: (H01) Full srv gas

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	1400	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
2	0	0	0

Site Number: 1
Use Number: 2
Used As: (Z98) Non-contrib

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	1400	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Improvements:
Site Number: 1
Improvement Number: 4

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(TK4) Tank-undrgrn	0	0	1	1983

Condition:	Grade	Sq. Ft.
(3) Normal	C	1000

Site Number: 1
Improvement Number: 5

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(LP4) Pavng-asphlt	10500	4	1	1978

Condition:	Grade	Sq. Ft.
(3) Normal	C	0

Site Number: 1
Improvement Number: 6

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(CP8) Canpy-com st	0	0	1	1993

Condition:	Grade	Sq. Ft.
(3) Normal	C	2112

Site Number: 1
Improvement Number: 1

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(TK4) Tank-undrgrn	0	0	1	1983

Condition:	Grade	Sq. Ft.
(3) Normal	C	10000

Site Number: 1
Improvement Number: 2

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(TK4) Tank-undrgrn	0	0	1	1978

Condition:	Grade	Sq. Ft.
(3) Normal	C	8000

Site Number: 1
Improvement Number: 3

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(TK4) Tank-undrgrn	0	0	1	1983

Condition:	Grade	Sq. Ft.
(3) Normal	C	6000

Special District Information:
Special District: LF018

Spec. Dist. Name:	Primary Units:	Advalorem Value
La Grange Fire	0	883200

Special District: WD02X

Spec. Dist. Name:	Primary Units:	Advalorem Value
Town Ctr Water Imp	203	0

ParcelAccess

Final Roll

Parcel Grid Identification #:
133400-6460-02-823867-0000
Municipality: La Grange

Parcel Location
1220-1224 Route 55

Owner Name on March 1
Gasland Petroleum Inc , *(P)*

Primary *(P)* Owner Mail Address
785 Broadway
Kingston NY 124010000

Parcel Details

Size (acres):	1.81 AC (C)	Land Use Class:	(432) Commercial: Motor Vehicle Services: Service and Gas Stations
File Map:		Agri. Dist.:	(0)
File Lot #:		School District:	(134601) Arlington School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$134100	$882200	$882200	$882200	$882200	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
N: Non-Homestead	1	100	$ 882200

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$635000	12/20/2011 2:19:10 PM	22012	27	(J)	2

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(3) Comm/public	(2) Private	(4) Good	TCB	(H02) High vol gas

Commercial/Industrial/Utility Building Information:
Site Number: 1
Bldg Sec.: 1 Bldg. Number: 1

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
1997	1	2574	(0711) Service sta no bays load sup	(3) Above Average

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
100	0	0	0	0

Number Identical:	Condition Code:
0	3

Commercial Rental Information:
Site Number: 1
Use Number: 1
Used As: (H02) High vol gas

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	2574	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Special District Information:

Special District: LF018

Spec. Dist. Name:	Primary Units:	Advalorem Value
La Grange Fire	0	882200

Special District: WD02X

Spec. Dist. Name:	Primary Units:	Advalorem Value
Town Ctr Water Imp	170	0

ParcelAccess

Final Roll

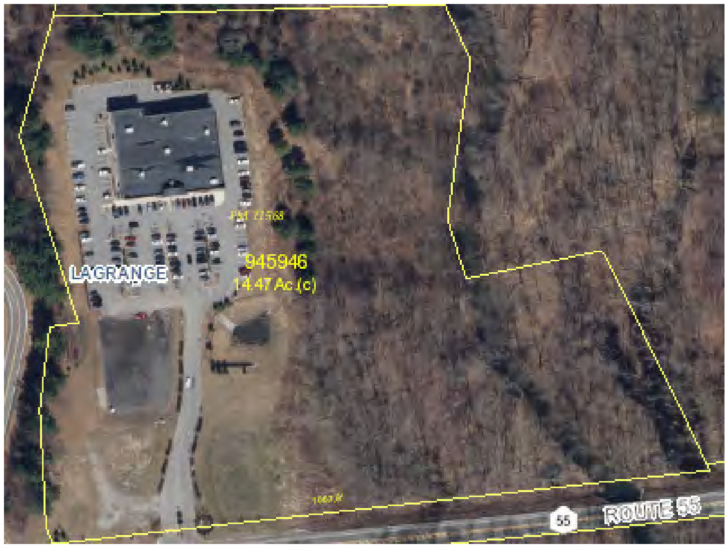
Parcel Grid Identification #:
133400-6460-02-945946-0000
Municipality: La Grange

Parcel Location
22 Taconic Center Ln

Owner Name on March 1
Page Park Associates LLC , *(P)*

Primary *(P)* Owner Mail Address

PO Box 792
Poughkeepsie NY 126020000



Parcel Details

Size (acres):	14.47 ac (c)	Land Use Class:	(544) Recreation and Entertainment: Indoor Sports Facilities: Health Spa
File Map:		Agri. Dist.:	(0)
File Lot #:		School District:	(134601) Arlington School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$700000	$2700000	$2700000	$2700000	$2700000	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
N: Non-Homestead	1	100	$ 2700000

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$0	0	22010	900	( )	0

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(2) Private	(2) Private	(4) Good	C2	(Z02) Spa/NoPool/YMCA

Commercial/Industrial/Utility Building Information:
Site Number: 1
Bldg Sec.: 1 Bldg. Number: 1

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
2011	1	21504	(0313) 1 sty store pre-eng steel	(1) Average -

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
100	100	0	0	1408

Number Identical:	Condition Code:
0	4

Commercial Rental Information:
Site Number: 1
Use Number: 1
Used As: (Z02) Spa/NoPool/YMCA

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
(01) Square feet	21504	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
1	0	0	0

Site Number: 1
Use Number: 2
Used As: (Z98) Non-contrib

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	1408	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Special District Information:
Special District: LF018

Spec. Dist. Name:	Primary Units:	Advalorem Value
La Grange Fire	0	2700000

ParcelAccess

Final Roll

Parcel Grid Identification #:
133400-6560-01-417899-0000
Municipality: La Grange

Parcel Location
1456 Route 55

Owner Name on March 1
John Page Development LLC , *(P)*

Primary *(P)* Owner Mail Address
1456 Route 55
Lagrangeville NY 125400000

Parcel Details

Size (acres):	21.0 Ac (C)	Land Use Class:	(449) Commercial: Storage, Warehouse and Distribution Facilities: Other Storage, Warehouse and Distribution Facilities
File Map:		Agri. Dist.:	(0)
File Lot #:		School District:	(134601) Arlington School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$435100	$2473000	$2473000	$2473000	$2473000	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
N: Non-Homestead	1	100	$ 2473000

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$0	7/31/2015 2:25:39 PM	22015	4689	(B)	1

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(2) Private	(2) Private	(3) Normal	C1	(E05) Main bank

Commercial/Industrial/Utility Building Information:
Site Number: 1
Bldg Sec.: 1 Bldg. Number: 1

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
0	0	49190	(0211) 1 sty office load sup	(3) Above Average

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
100	0	0	0	7440

Number Identical:	Condition Code:
1	3

Site Number: 1
Bldg Sec.: 1 Bldg. Number: 2

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
1984	1	840	(0108)	(2) Average

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
0	0	0	0	0

Number Identical:	Condition Code:
1	4

Site Number: 1
Bldg Sec.: 1 Bldg. Number: 3

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
1984	1	7500	(0734) Mini-wrhouse pre-eng steel	(2) Average

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
0	0	0	0	0

Number Identical:	Condition Code:
1	4

Site Number: 1
Bldg Sec.: 1 Bldg. Number: 4

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
1985	1	6600	(0734) Mini-wrhouse pre-eng steel	(2) Average

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
0	0	0	0	0

Number Identical:	Condition Code:
2	4

Site Number: 1
Bldg Sec.: 1 Bldg. Number: 5

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
1987	1	12000	(0734) Mini-wrhouse pre-eng steel	(2) Average

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
0	0	0	0	0

Number Identical:	Condition Code:
1	4

Commercial Rental Information:

Site Number: 1
Use Number: 1
Used As: (E02) Walk-up off

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	1850	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Site Number: 1
Use Number: 2
Used As: (A07) External apt

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	0	840	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Site Number: 1
Use Number: 3
Used As: (F10) Mini-wrhouse

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	45000	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Site Number: 1
Use Number: 4
Used As: (Z98) Non-contrib

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	43320	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Improvements:

Site Number: 1

Improvement Number: 1

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(CP6) Canpy-w/slab	10	6	1	1984

Condition:	Grade	Sq. Ft.
(3) Normal	C	0

Site Number: 1

Improvement Number: 2

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(LP4) Pavng-asphlt	42000	3	1	1985

Condition:	Grade	Sq. Ft.
(3) Normal	D	0

Special District Information:

Special District: LF018

Spec. Dist. Name:	Primary Units:	Advalorem Value
La Grange Fire	0	2473000

ParcelAccess

Final Roll

Parcel Grid Identification #:
133400-6560-01-473908-0000
Municipality: La Grange

Parcel Location
1474 Route 55

Owner Name on March 1
Roger Realty Inc , *(P)*

Primary *(P)* Owner Mail Address
1474 Route 55
Lagrangeville NY 125400000

Parcel Details

Size (acres):	2.81 Ac (D)	Land Use Class:	(464) Commercial: Banks and Office Buildings: Office Building
File Map:		Agri. Dist.:	(0)
File Lot #:		School District:	(134601) Arlington School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$157800	$529900	$529900	$529900	$529900	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
N: Non-Homestead	1	100	$ 529900

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$0	0	1995	0177	( )	0

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(2) Private	(2) Private	(2) Fair	C1	(E02) Walk-up off

Commercial/Industrial/Utility Building Information:
Site Number: 1
Bldg Sec.: 1 Bldg. Number: 1

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
0	0	5588	(0211) 1 sty office load sup	(3) Above Average

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
100	0	0	0	2940

Number Identical:	Condition Code:
1	3

Site Number: 1
Bldg Sec.: 1 Bldg. Number: 2

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
1988	1	2940	(0311) 1 sty store load sup	(1) Economy

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
0	0	0	0	0

Number Identical:	Condition Code:
1	3

Commercial Rental Information:

Site Number: 1
Use Number: 1
Used As: (E02) Walk-up off

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	2648	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Site Number: 1
Use Number: 2
Used As: (F05) Row storage

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	2940	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Site Number: 1
Use Number: 3
Used As: (Z98) Non-contrib

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	0	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Site Number: 1
Use Number: 4
Used As: (Z98) Non-contrib

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	5880	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Improvements:

Site Number: 1
Improvement Number: 1

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(RP2) Porch-coverd	11	6	1	1988

Condition:	Grade	Sq. Ft.
(3) Normal	C	0

Site Number: 1
Improvement Number: 2

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(RP5) Porch-up opn	16	4	1	1988

Condition:	Grade	Sq. Ft.
(3) Normal	C	0

Site Number: 1
Improvement Number: 3

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(LP4) Pavng-asphlt	10000	2	1	1988

Condition:	Grade	Sq. Ft.
(2) Fair	C	0

Special District Information:

Special District: LF018

Spec. Dist. Name:	Primary Units:	Advalorem Value
La Grange Fire	0	529900

ParcelAccess

Final Roll

Parcel Grid Identification #:
133400-6560-01-492906-0000
Municipality: La Grange

Parcel Location
1482 Route 55

Owner Name on March 1
RPLF LLC , *(P)*

Primary *(P)* Owner Mail Address
1482 Route 55
Lagrangeville NY 125400000

Parcel Details

Size (acres):	2.027 Ac (D)	Land Use Class:	(422) Commercial: Dining Establishments: Diners and Luncheonettes
File Map:		Agri. Dist.:	(0)
File Lot #:		School District:	(134601) Arlington School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$80400	$388800	$388800	$388800	$388800	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
N: Non-Homestead	1	100	$ 388800

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$445000	5/31/2012 11:32:13 AM	22012	3040	(J)	1

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(2) Private	(2) Private	(2) Fair	C1	(D08) Small retail

Commercial/Industrial/Utility Building Information:
Site Number: 1
Bldg Sec.: 1 Bldg. Number: 1

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
0	2	3815	(0311) 1 sty store load sup	(3) Above Average

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
42	0	0	0	2215

Number Identical:	Condition Code:
1	3

Commercial Rental Information:
Site Number: 1
Use Number: 1
Used As: (Z98) Non-contrib

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	1600	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Site Number: 1
Use Number: 2
Used As: (D09) Sm food mkt

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	0	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Site Number: 1
Use Number: 3
Used As: (A07) External apt

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	0	0	0	1600

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Site Number: 1
Use Number: 4
Used As: (Z98) Non-contrib

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	4430	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Improvements:
Site Number: 1
Improvement Number: 3

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(LP4) Pavng-asphlt	0	0	1	1950

Condition:	Grade	Sq. Ft.
(3) Normal	C	7000

Site Number: 1
Improvement Number: 4

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(RP1) Porch-open/deck	0	0	0	2005

Condition:	Grade	Sq. Ft.
(3) Normal	C	252

Site Number: 1
Improvement Number: 1

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(RP2) Porch-coverd	4	6	1	1947

Condition:	Grade	Sq. Ft.
(3) Normal	C	0

Site Number: 1
Improvement Number: 2

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(RP6) Porch-up cov	6	8	1	1947

Condition:	Grade	Sq. Ft.
(3) Normal	C	0

Special District Information:
Special District: LF018

Spec. Dist. Name:	Primary Units:	Advalorem Value
La Grange Fire	0	388800

ParcelAccess

Final Roll

Parcel Grid Identification #:
133400-6560-02-504909-0000
Municipality: La Grange

Parcel Location
1486 Route 55

Owner Name on March 1
ARCOS Construction Management , *(P)*

Primary *(P)* Owner Mail Address
1723 Route 82
Lagangeville NY 125400000

Parcel Details

Size (acres):	3.05 Ac (C)	Land Use Class:	(210) Residential: One Family Year-Round Residence
File Map:	NYSDOT	Agri. Dist.:	(0)
File Lot #:	313	School District:	(134601) Arlington School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$96300	$181300	$181300	$181300	$181300	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
H: Homestead	1	100	$ 181300

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$270000	9/29/2014 10:29:02 AM	22014	6419	(G)	1

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(2) Private	(2) Private	(2) Typical	C1	( )

Residential Building Information:
Site Number: 1

Year Built:	Year Remod.:	Building Style:	No. Stories:	Sfla:	Overall Cond.:
1920	0	(08) Old style	1.5	902	(2) Fair

No. Kitchens:	No. Full Baths:	No. Half Baths:	No. Bedrooms:	No. Fire Places:	Basement Type:
1	1	0	2	0	(4) Full

Central Air:	Heat Type:	Fuel Type:	First Story:	Second Story:	Addl. Story:
0	(3) Hot wtr/stm	(4) Oil	(4) 660	(4) 0	(4) 0

Half Story:	3/4 Story:	Fin. Over. Gar.:	Fin. Attic:	Unfin 1/2 Story:	Unfin 3/4 Story:
242	0	0	0	0	0

Fin Rec Room:	No. Rooms:	Grade:	Grade Adj. Pct.:
200	0	(D) Economy	95

Improvements:

Site Number: 1
Improvement Number: 2

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(RG4) Gar-1.0 det	25	40	0	2016

Condition:	Grade	Sq. Ft.
(4) Good	B	0

Site Number: 1
Improvement Number: 1

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(RG4) Gar-1.0 det	0	0	1	1920

Condition:	Grade	Sq. Ft.
(3) Normal	D	247

Special District Information:
Special District: LF018

Spec. Dist. Name:	Primary Units:	Advalorem Value
La Grange Fire	0	181300

ParcelAccess

Final Roll

Parcel Grid Identification #:
133400-6560-02-530919-0000
Municipality: La Grange

Parcel Location
1496 Route 55

Owner Name on March 1
Petro Inc , *(P)*

Primary *(P)* Owner Mail Address
47 Patrick Ln
Poughkeepsie NY 12603

Parcel Details

Size (acres):	1.27 Ac (C)	Land Use Class:	(441) Commercial: Storage, Warehouse and Distribution Facilities: Gasoline, Fuel, Oil, Liquid Petroleum Storage and or Distribution
File Map:	NYSDOT	Agri. Dist.:	(0)
File Lot #:	4/4	School District:	(134601) Arlington School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$63200	$375400	$375400	$375400	$375400	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
N: Non-Homestead	1	100	$ 375400

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$0	0	1954	0593	( )	0

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(1) None	(1) None	(1) Poor	C1	(F07) Ptrl tnk trm/St

Commercial Rental Information:
Site Number: 1
Use Number: 1
Used As: (F07) Ptrl tnk trm/St

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
(16) Barrels	0	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
9000	0	0	0

Site Number: 1
Use Number: 2
Used As: (F07) Ptrl tnk trm/St

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
(16) Barrels	0	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
9000	0	0	0

Site Number: 1
Use Number: 3
Used As: (F07) Ptrl tnk trm/St

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
(16) Barrels	0	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
7000	0	0	0

Improvements:
Site Number: 1
Improvement Number: 1

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(TK3) Tank-petrolm	0	0	2	1973

Condition:	Grade	Sq. Ft.
(3) Normal	C	500000

Site Number: 1
Improvement Number: 2

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(CP8) Canpy-com st	30	28	1	1973

Condition:	Grade	Sq. Ft.
(3) Normal	C	0

Site Number: 1
Improvement Number: 3

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(AP1) Fence-chn lk	600	6	1	1973

Condition:	Grade	Sq. Ft.
(3) Normal	C	0

Site Number: 1
Improvement Number: 4

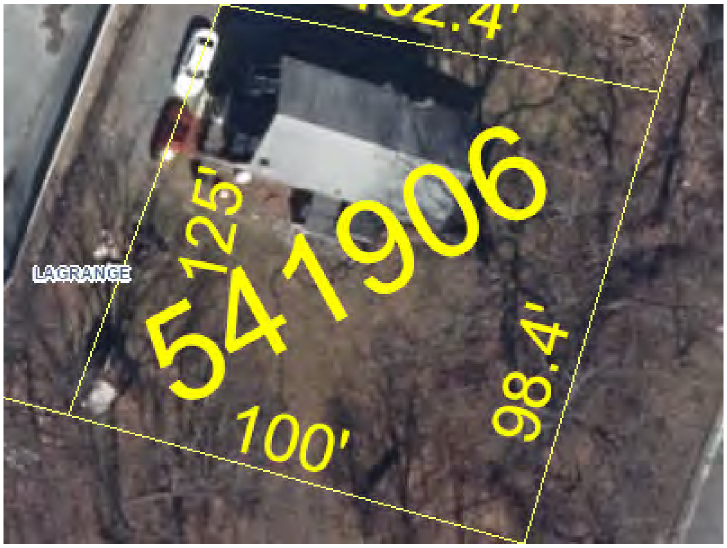
Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(TK6) Tank-hz bulk	25000	0	2	1975

Condition:	Grade	Sq. Ft.
(3) Normal	C	0

Special District Information:
Special District: LF018

Spec. Dist. Name:	Primary Units:	Advalorem Value
La Grange Fire	0	375400

Parcel Access



Final Roll

Parcel Grid Identification #:
133400-6560-02-541906-0000
Municipality: La Grange

Parcel Location
1498 Route 55

Owner Name on March 1
D'souza , Ronald R *(P)*
D'souza , Rosalie M *(A)*

Primary *(P)* Owner Mail Address
9 Cross Rd
Lagrangeville NY 125400000

Parcel Details

Size (acres):	0.24 Ac	Land Use Class:	(220) Residential: Two Family Year-Round Residence
File Map:		Agri. Dist.:	(0)
File Lot #:		School District:	(134601) Arlington School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$39700	$167200	$167200	$167200	$167200	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
H: Homestead	1	100	$ 167200

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$0	0	1671	0605	( )	0

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(2) Private	(2) Private	(2) Typical	C1	( )

Residential Building Information:
Site Number: 1

Year Built:	Year Remod.:	Building Style:	No. Stories:	Sfla:	Overall Cond.:
1920	0	(08) Old style	2	2112	(3) Normal

No. Kitchens:	No. Full Baths:	No. Half Baths:	No. Bedrooms:	No. Fire Places:	Basement Type:
2	2	0	4	0	(4) Full

Central Air:	Heat Type:	Fuel Type:	First Story:	Second Story:	Addl. Story:
0	(1) No central	(1) None	(1) 1056	(1) 1056	(1) 0

Half Story:	3/4 Story:	Fin. Over. Gar.:	Fin. Attic:	Unfin 1/2 Story:	Unfin 3/4 Story:
0	0	0	0	0	0

Fin Rec Room:	No. Rooms:	Grade:	Grade Adj. Pct.:
0	0	(D) Economy	110

Improvements:

Site Number: 1
Improvement Number: 1

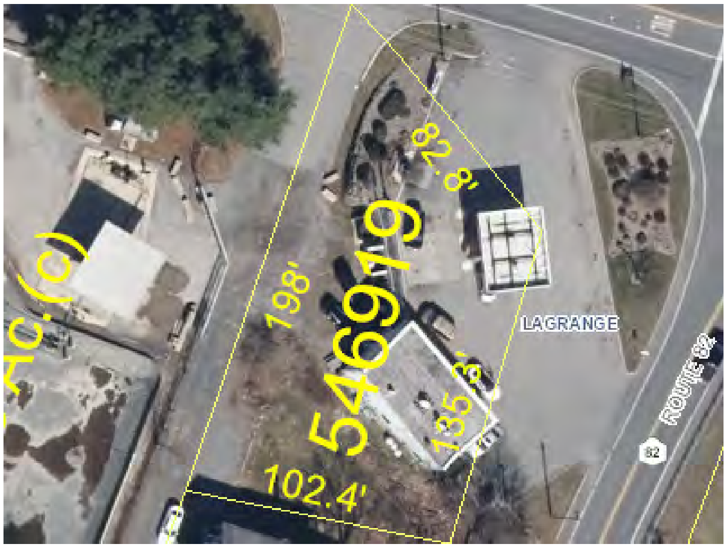
Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(FC1) Shed-machine	10	14	1	1920

Condition:	Grade	Sq. Ft.
(3) Normal	D	0

Special District Information:
Special District: LF018

Spec. Dist. Name:	Primary Units:	Advalorem Value
La Grange Fire	0	167200

ParcelAccess



Final Roll

Parcel Grid Identification #:
133400-6560-02-546919-0000
Municipality: La Grange

Parcel Location
1502-1504 Route 55

Owner Name on March 1
Majac Enterprises Inc , *(P)*

Primary *(P)* Owner Mail Address
120 Northfield Ave
Dobbs Ferry NY 105220000

Parcel Details

Size (acres):	0.32 Ac	Land Use Class:	(432) Commercial: Motor Vehicle Services: Service and Gas Stations
File Map:		Agri. Dist.:	(0)
File Lot #:		School District:	(134601) Arlington School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$28900	$441600	$441600	$441600	$441600	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
N: Non-Homestead	1	100	$ 441600

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$0	0	1896	0150	( )	0

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(2) Private	(2) Private	(2) Fair	C1	(G03) Body shop

Commercial/Industrial/Utility Building Information:
Site Number: 1
Bldg Sec.: 1 Bldg. Number: 1

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
0	0	1400	(0712) Service sta with bays load sup	(3) Above Average

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
0	0	0	0	1400

Number Identical:	Condition Code:
1	3

Commercial Rental Information:
Site Number: 1
Use Number: 1
Used As: (G03) Body shop

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
(10) Bays	0	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Site Number: 1
Use Number: 2
Used As: (D08) Small retail

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
( )	1400	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Site Number: 1
Use Number: 3
Used As: (Z98) Non-contrib

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
(10) Bays	1400	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Improvements:
Site Number: 1
Improvement Number: 4

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(TK4) Tank-undrgrn	0	0	2	1984

Condition:	Grade	Sq. Ft.
(3) Normal	C	2000

Site Number: 1
Improvement Number: 5

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(LP4) Pavng-asphlt	9200	4	1	1984

Condition:	Grade	Sq. Ft.
(3) Normal	C	0

Site Number: 1
Improvement Number: 1

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(TK4) Tank-undrgrn	0	0	1	1984

Condition:	Grade	Sq. Ft.
(3) Normal	C	10000

Site Number: 1
Improvement Number: 2

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(TK4) Tank-undrgrn	0	0	1	1984

Condition:	Grade	Sq. Ft.
(3) Normal	C	5000

Site Number: 1
Improvement Number: 3

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(TK4) Tank-undrgrn	0	0	1	1984

Condition:	Grade	Sq. Ft.
(3) Normal	C	3000

Special District Information:
Special District: LF018

Spec. Dist. Name:	Primary Units:	Advalorem Value
La Grange Fire	0	441600

ParcelAccess

Final Roll

Parcel Grid Identification #:
133400-6560-01-457972-0000
Municipality: La Grange

Parcel Location
Route 55

Owner Name on March 1
Red Wing Properties Inc , *(P)*

Primary *(P)* Owner Mail Address
675 Leetown Rd
Stormville NY 125820000

Parcel Details

Size (acres):	6.76 AC (S)	Land Use Class:	(210) Residential: One Family Year-Round Residence
File Map:		Agri. Dist.:	(0)
File Lot #:		School District:	(134601) Arlington School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$155400	$212200	$212200	$212200	$212200	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
H: Homestead	1	100	$ 212200

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$0	0	22006	8401	( )	0

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(2) Private	(2) Private	(2) Typical		( )

Residential Building Information:
Site Number: 1

Year Built:	Year Remod.:	Building Style:	No. Stories:	Sfla:	Overall Cond.:
1930	0	(09) Cottage	1	576	(2) Fair
No. Kitchens:	**No. Full Baths:**	**No. Half Baths:**	**No. Bedrooms:**	**No. Fire Places:**	**Basement Type:**
1	1	0	1	0	(4) Full
Central Air:	**Heat Type:**	**Fuel Type:**	**First Story:**	**Second Story:**	**Addl. Story:**
0	(3) Hot wtr/stm	(4) Oil	(4) 576	(4) 0	(4) 0
Half Story:	**3/4 Story:**	**Fin. Over. Gar.:**	**Fin. Attic:**	**Unfin 1/2 Story:**	**Unfin 3/4 Story:**
0	0	0	0	0	0
Fin Rec Room:	**No. Rooms:**	**Grade:**	**Grade Adj. Pct.:**		
0	0	(D) Economy	0		

Improvements:

Site Number: 1
Improvement Number: 1

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(RP1) Porch-open/deck	0	0	0	1980

Condition:	Grade	Sq. Ft.
(2) Fair	C	144

Site Number: 1
Improvement Number: 2

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(FC1) Shed-machine	0	0	0	2010

Condition:	Grade	Sq. Ft.
(3) Normal	C	160

Special District Information:
Special District: LF018

Spec. Dist. Name:	Primary Units:	Advalorem Value
La Grange Fire	0	212200

Final Roll

Parcel Grid Identification #:
133400-6560-02-501968-0000
Municipality: La Grange

Parcel Location
1477 Route 55

Owner Name on March 1
KH Properties LLC , *(P)*

Primary *(P)* Owner Mail Address
1320 Route 44
Pleasant Valley NY 125690000

Parcel Details

Size (acres):	1.53 AC (D)	Land Use Class:	(400) Commercial
File Map:		Agri. Dist.:	(0)
File Lot #:		School District:	(134601) Arlington School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$237500	$309275	$309275	$309275	$309275	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
N: Non-Homestead	1	100	$ 309275

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$250000	2/7/2009 1:13:48 PM	22009	1018	(J)	1

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(2) Private	(2) Private	(2) Typical	C2	( )

Improvements:
Site Number: 1
Improvement Number: 1

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(FB7) Barn-pole	50	80	1	2012

Condition:	Grade	Sq. Ft.
(4) Good	B	0

Special District Information:
Special District: LF018

Spec. Dist. Name:	Primary Units:	Advalorem Value
La Grange Fire	0	309275

ParcelAccess

Final Roll

Parcel Grid Identification #:
133400-6560-02-515970-0000
Municipality: La Grange

Parcel Location
1489 Route 55

Owner Name on March 1
Betancourt , Steven Jr *(P)*

Primary *(P)* Owner Mail Address
1489 Route 55
Lagrangeville NY 125400000

Parcel Details

Size (acres):	2.28 Ac (D)	Land Use Class:	(210) Residential: One Family Year-Round Residence
File Map:		Agri. Dist.:	(0)
File Lot #:		School District:	(134601) Arlington School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$77000	$210200	$210200	$210200	$210200	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
H: Homestead	1	100	$ 210200

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$30000	5/9/2003 4:03:36 PM	22003	6323	(C)	1

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(2) Private	(2) Private	(2) Typical	C2	( )

Residential Building Information:
Site Number: 1

Year Built:	Year Remod.:	Building Style:	No. Stories:	Sfla:	Overall Cond.:
1940	0	(08) Old style	2	1254	(3) Normal

No. Kitchens:	No. Full Baths:	No. Half Baths:	No. Bedrooms:	No. Fire Places:	Basement Type:
1	1	0	3	0	(3) Partial

Central Air:	Heat Type:	Fuel Type:	First Story:	Second Story:	Addl. Story:
0	(3) Hot wtr/stm	(4) Oil	(4) 759	(4) 495	(4) 0

Half Story:	3/4 Story:	Fin. Over. Gar.:	Fin. Attic:	Unfin 1/2 Story:	Unfin 3/4 Story:
0	0	0	0	0	0

Fin Rec Room:	No. Rooms:	Grade:	Grade Adj. Pct.:
0	0	(C) Average	100

Special District Information:
Special District: LF018

Spec. Dist. Name:	Primary Units:	Advalorem Value
La Grange Fire	0	210200

ParcelAccess

Final Roll

Parcel Grid Identification #:
133400-6560-02-546974-0000
Municipality: La Grange

Parcel Location
1493 Route 55

Owner Name on March 1
Page , Brian W *(P)*

Primary *(P)* Owner Mail Address
100 Salt Point Tpke
Poughkeepsie NY 126030000

Parcel Details

Size (acres):	4.04 Ac (D)	Land Use Class:	(449) Commercial: Storage, Warehouse and Distribution Facilities: Other Storage, Warehouse and Distribution Facilities
File Map:		Agri. Dist.:	(0)
File Lot #:		School District:	(134601) Arlington School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$132800	$250000	$250000	$250000	$250000	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
N: Non-Homestead	1	100	$ 250000

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$695000	8/8/2005 4:51:15 PM	22005	7325	(J)	1

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(2) Private	(2) Private	(3) Normal	C1	(F03) Dstr wrhouse

Commercial/Industrial/Utility Building Information:
Site Number: 1
Bldg Sec.: 1 Bldg. Number: 1

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
1940	1	4800	(0831) 1 sty warehouse load sup	(1) Average -

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
0	0	0	0	0

Number Identical:	Condition Code:
1	2

Commercial Rental Information:
Site Number: 1
Use Number: 1
Used As: (F07) Ptrl tnk trm/St

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
(01) Square feet	4800	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
1	0	0	0

Improvements:

Site Number: 1
Improvement Number: 2

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(CP8) Canpy-com st	10	10	1	1973

Condition:	Grade	Sq. Ft.
(3) Normal	D	0

Site Number: 1
Improvement Number: 4

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(CP5) Canpy-roof	43	5	1	1935

Condition:	Grade	Sq. Ft.
(2) Fair	C	0

Site Number: 1
Improvement Number: 6

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(LP4) Pavng-asphlt	14600	3	1	1972

Condition:	Grade	Sq. Ft.
(3) Normal	C	0

Special District Information:

Special District: LF018

Spec. Dist. Name:	Primary Units:	Advalorem Value
La Grange Fire	0	250000

ParcelAccess

Final Roll

Parcel Grid Identification #:
133400-6560-02-564958-0000
Municipality: La Grange

Parcel Location
Route 82

Owner Name on March 1
Tallini , Reuccio *(P)*
Tallini , Muzzio *(A)*
Tallini , Sisto *(A)*

Primary *(P)* Owner Mail Address
1311 Hempstead Tpke
Elmont NY 110030000

Parcel Details

Size (acres):	3 Ac	Land Use Class:	(330) Vacant Land Located in Commercial Areas
File Map:	6209	Agri. Dist.:	(0)
File Lot #:	1	School District:	(134601) Arlington School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$80000	$80000	$80000	$80000	$80000	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
N: Non-Homestead	1	100	$ 80000

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$0	8/25/2010 12:57:07 PM	22010	6535	(A)	1

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(1) None	(1) None	(2) Typical	C1	(Z98) Non-contrib

Special District Information:
Special District: LF018

Spec. Dist. Name:	Primary Units:	Advalorem Value
La Grange Fire	0	80000

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ParcelAccess

Final Roll

Parcel Grid Identification #:
133400-6560-02-601974-0000
Municipality: La Grange

Parcel Location
2295 Route 82

Owner Name on March 1
Parsons , Joseph Kenneth Jr *(P)*
Parsons , Geodi *(A)*

Primary *(P)* Owner Mail Address
2295 Route 82
Lagrangeville NY 125400000

Parcel Details

Size (acres):	2 Ac	Land Use Class:	(220) Residential: Two Family Year-Round Residence
File Map:		Agri. Dist.:	(0)
File Lot #:		School District:	(134601) Arlington School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$76100	$278700	$278700	$278700	$278700	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
H: Homestead	1	100	$ 278700

Tent. Roll:	Final. Roll:	Valuation:
5/1/2017	7/1/2017	7/1/2016

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$315000	7/2/2001 12:00:00 AM	22001	06016	(J)	1

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(2) Private	(2) Private	(2) Typical	R120	( )

Residential Building Information:
Site Number: 1

Year Built:	Year Remod.:	Building Style:	No. Stories:	Sfla:	Overall Cond.:
1920	0	(08) Old style	2	2594	(3) Normal

No. Kitchens:	No. Full Baths:	No. Half Baths:	No. Bedrooms:	No. Fire Places:	Basement Type:
1	2	0	4	1	(4) Full

Central Air:	Heat Type:	Fuel Type:	First Story:	Second Story:	Addl. Story:
0	(3) Hot wtr/stm	(4) Oil	(4) 1474	(4) 1120	(4) 0

Half Story:	3/4 Story:	Fin. Over. Gar.:	Fin. Attic:	Unfin 1/2 Story:	Unfin 3/4 Story:
0	0	0	0	0	0

Fin Rec Room:	No. Rooms:	Grade:	Grade Adj. Pct.:
0	0	(C) Average	100

Improvements:

Site Number: 1
Improvement Number: 1

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(RP2) Porch-coverd	0	0	1	1920

Condition:	Grade	Sq. Ft.
(3) Normal	C	20

Site Number: 1
Improvement Number: 2

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(RG1) Gar-1.0 att	0	0	1	1920

Condition:	Grade	Sq. Ft.
(3) Normal	C	440

Site Number: 1
Improvement Number: 3

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(RP5) Porch-up opn	0	0	1	1980

Condition:	Grade	Sq. Ft.
(3) Normal	C	300

Site Number: 1
Improvement Number: 4

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(RP1) Porch-open/deck	0	0	1	1992

Condition:	Grade	Sq. Ft.
(3) Normal	C	300

Site Number: 1
Improvement Number: 5

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(FC1) Shed-machine	0	0	0	1995

Condition:	Grade	Sq. Ft.
(3) Normal	C	432

Special District Information:
Special District: LF018

Spec. Dist. Name:	Primary Units:	Advalorem Value
La Grange Fire	0	278700

Exemption Information:
Exemption: 41854

Name:	Amount:
BAS STAR	$38380

ParcelAccess

Final Roll

Parcel Grid Identification #:
133400-6560-02-715980-0000
Municipality: La Grange

Parcel Location
2296-2332 Route 82

Owner Name on March 1
Red Wing Properties , *(P)*

Primary *(P)* Owner Mail Address
Ny Rte 52
PO Box 408
Stormville NY 125820000

Parcel Details

Size (acres):	68.5 Ac	Land Use Class:	(720) Industrial: Mining and Quarrying
File Map:		Agri. Dist.:	(0)
File Lot #:		School District:	(134601) Arlington School District
Split Town			

Assessment Information (Current)

Land:	Total:	County Taxable:	Town Taxable:	School Taxable:	Village Taxable:
$359400	$942700	$942700	$942700	$942700	$0

Tax Code:	Roll Section:	Uniform %:	Full Market Value:
N: Non-Homestead	1	98	$ 961900

Tent. Roll:	Final. Roll:	Valuation:
5/1/2020	7/1/2020	7/1/2019

Last Sale/Transfer

Sales Price:	Sale Date:	Deed Book:	Deed Page:	Sale Condition:	No. Parcels:
$0	0	1323	0419	( )	0

Site Information:
Site Number: 1

Water Supply:	Sewer Type:	Desirability:	Zoning Code:	Used As:
(2) Private	(2) Private	(1) Poor	C1	(G03) Body shop

Commercial/Industrial/Utility Building Information:
Site Number: 1
Bldg Sec.: 1 Bldg. Number: 1

Year Built:	No. Stories:	Gross Floor Area:	Boeck Model	Const. Qual.:
0	0	5720	(0856) Utility bldg pre-eng	(3) Above Average

Air Cond. %:	Sprinkler %:	Alarm %:	No. Elevator:	Basement sf.:
0	0	0	0	720

Number Identical:	Condition Code:
1	3

Commercial Rental Information:
Site Number: 1
Use Number: 1
Used As: (Z98) Non-contrib

Unit Code:	Total Rent Area:	Area 1 Bdrms Apts	Area 2 Bdrms Apts	Area 3 Bdrms Apts
(0)	6440	0	0	0

Total Units:	No. 1 Bdrms Apts	No. 2 Bdrms Apts	No. 3 Bdrms Apts
0	0	0	0

Improvements:

Site Number: 1
Improvement Number: 1

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(MH5) Mobile home	60	12	1	1970

Condition:	Grade	Sq. Ft.
(3) Normal	C	0

Site Number: 1
Improvement Number: 2

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(FC1) Shed-machine	14	14	1	1977

Condition:	Grade	Sq. Ft.
(3) Normal	C	0

Site Number: 1
Improvement Number: 3

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(LP4) Pavng-asphlt	11600	6	1	1977

Condition:	Grade	Sq. Ft.
(3) Normal	C	0

Site Number: 1
Improvement Number: 4

Structure Code:	Dim 1:	Dim 2	Quantity	Year Built
(TK4) Tank-undrgrn	0	0	1	1980

Condition:	Grade	Sq. Ft.
(3) Normal	C	8000

Special District Information:
Special District: LF018

Spec. Dist. Name:	Primary Units:	Advalorem Value
La Grange Fire	0	942700

Additional Trip Generation Data – Proposed Stewarts Shops Development

Environmental, Planning, and Engineering Consultants
34 South Broadway
Suite 401
White Plains, NY 10601
tel: 914 949-7336
fax: 914 949-7559
www.akrf.com

Memorandum

To:	Wanda Livigni; Administrator of Planning and Public Works, Town of LaGrange
From:	Alex Auld, Anthony Russo; AKRF, Inc.
Date:	October 18, 2018
Re:	Stewart's Shops, LaGrange – Trip Generation
cc:	Tyler Fronte; Stewart's Shops

This memorandum presents the potential trip generation associated with the proposed Stewart's Shops convenience market and gas station to be developed on the land parcel at the northeast corner of the intersection of NYS Route 55 and NYS Route 82 in the Hamlet of Billings, Town of LaGrange, NY.

The proposed development would comprise of a 3,695 SF convenience store with 4 pumps (8 fueling positions). Trip generation rates for this type of land use researched in the Institute of Transportation Engineers (ITE) *Trip Generation Manual*[1]. Based on the land use descriptions provided in the manual, ITE Land Use Code (LUC) 853, "Convenience Market with Gasoline Pumps" was determined to be the most appropriate LUC for use the corresponding trip generation rate, as shown in **Table 1**.

The new primary site generated trips for the Weekday AM, Weekday PM, and Saturday Midday peak hours were calculated based on the ITE trip generation rates. A Pass-by trip (trips that are attracted to the proposed development that would have already be present on a street adjacent to the proposed development) rate of 63% was applied to the primary site generated trips based on information provided in the ITE *Trip Generation Handbook, 3rd Edition (Revised February 6, 2018).* The pass-by trips were subtracted from the primary site generated trips to determine the overall net trip generation for the proposed development. The net new trips generated by the proposed project would be 55, 68, and 63 new vehicle trips during the Weekday AM, Weekday PM, and Saturday Midday peak hours, respectively, as shown in **Table 1**.

[1] The ITE *Trip Generation Manual, 10th Edition* (the most recent edition) only provides trip generation rates for the Weekday AM and Weekday PM peak hours. Trip generation rates for the Saturday Midday Peak hour were sourced from the ITE *Trip Generation Manual, 9th Edition*.

Table 1
Project Trip Generation
Stewart's Shops, LaGrange

Building Component	ITE Code	Units	Weekday AM Peak Hour[1]			Weekday PM Peak Hour[2]			Saturday Midday Peak Hour[3]		
			In	Out	Total	In	Out	Total	In	Out	Total
Convenience Market with Gasoline Pumps	853	3.695 SF	75	75	150	91	91	182	87	83	170
Pass-by Trips[4]			*-47*	*-48*	*-95*	*-57*	*-57*	*-114*	*-55*	*-52*	*-107*
Net New Trips[5]			28	27	55	34	34	68	32	31	63

Notes:

(1) ITE rate of 40.59/1,000 SF (50% entering, 50% exiting) was used for the Weekday AM Peak Hour (Source: ITE *Trip Generation Manual, 10th Edition)*

(2) ITE rate of 49.29/1,000 SF (50% entering, 50% exiting) was used for the Weekday PM Peak Hour (Source: ITE *Trip Generation Manual, 10th Edition)*

(3) ITE rate of 45.94/1,000 SF (51% entering, 49% exiting) was used for the Saturday Midday Peak Hour (Source: ITE *Trip Generation Manual, 9th Edition*--ITE *Trip Generation Manual 10th Edition* does not provide trip generation rates for the Saturday Peak Hour)

(4) Pass-by trip percentage of 63% utilized, based on average of pass-by trip percentages presented in the Institute of Transportation Engineers (ITE) *Trip Generation Handbook, 3rd Edition (February 6, 2018 Revision)* for ITE Land Use Code 853.

(5) If trips associated with the former day care center on the site (currently inactive) were accounted for, the number of net new trips generated would be lower.

STATION: **820320**

New York State Department of Transportation
Traffic Count Hourly Report

ROUTE #: NY 55 ROAD NAME:
DIRECTION: Eastbound FACTOR GROUP: 30
STATE DIR CODE: 6 WK OF YR: 34
DATE OF COUNT: 08/17/2015
NOTES LANE 1: EB travel lane

FROM: **RT 82 BILLINGS**
REC. SERIAL #: AQ24
PLACEMENT: .780 Mi N of CR 21
@ REF MARKER:
ADDL DATA: Class Speed
COUNT TYPE: AXLE PAIRS
PROCESSED BY: ORG CODE: DOT INITIALS: CEL

TO: **CR 21 NOXON RD E JCT**
FUNC. CLASS: 14
NHS: no
JURIS: City
CC Stn:
BATCH ID: DOT-R08C34aTST5195

COUNTY: **Dutchess**
TOWN:
LION#:
BIN: 1027160
RR CROSSING:
HPMS SAMPLE:

COUNT TAKEN BY: ORG CODE: TST INITIALS: JA

DATE	DAY	AM 12 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	PM 12 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	DAILY TOTAL	DAILY HIGH COUNT	DAILY HIGH HOUR
1	S																											
2	S																											
3	M																											
4	T																											
5	W																											
6	T																											
7	F																											
8	S																											
9	S																											
10	M																											
11	T																											
12	W																											
13	T																											
14	F																											
15	S																											
16	S																											
17	M														**288**	**275**	**339**	**414**	**445**	**297**	**234**	**244**	**160**	**92**	**64**			
18	T	**39**	**17**	**18**	**9**	**23**	**84**	**163**	**242**	**322**	**236**	**274**	**273**	**284**	**254**	**324**	**317**	**413**	**413**	**300**	**226**	**288**	**177**	**93**	**54**	4843	413	16
19	W	**32**	**16**	**17**	**13**	**26**	**72**	**161**	**278**	**300**	**231**	**251**	**264**	**272**	**289**	**293**	**317**	**415**	**442**	**312**	**259**	**268**	**175**	**101**	**51**	4855	442	17
20	T	**45**	**23**	**19**	**9**	**22**	**75**	**170**	**289**	**293**	**224**	**246**	**216**															
21	F																											
22	S																											
23	S																											
24	M																											
25	T																											
26	W																											
27	T																											
28	F																											
29	S																											
30	S																											
31	M																											

AVERAGE WEEKDAY HOURS (Axle Factored, Mon 6AM to Fri Noon)

																								ADT
39	**19**	**18**	**10**	**24**	**77**	**165**	**270**	**305**	**230**	**257**	**251**	**278**	**277**	**297**	**324**	**414**	**433**	**303**	**240**	**267**	**171**	**95**	**56**	**4820**

DAYS Counted	HOURS Counted	WEEKDAYS Counted	WEEKDAY Hours	AVERAGE WEEKDAY High Hour	AVERAGE WEEKDAY % of day	Axle Adj. Factor	Seasonal/Weekday Adjustment Factor
3	71	3	71	433	9%	1.000	1.089

ESTIMATED

AADT
4426

New York State Department of Transportation
Traffic Count Hourly Report

ROUTE #: NY 55 ROAD NAME:
DIRECTION: Westbound FACTOR GROUP: 30
STATE DIR CODE: 7 WK OF YR: 34
DATE OF COUNT: 08/17/2015
NOTES LANE 1: WB travel lane

FROM: RT 82 BILLINGS
REC. SERIAL #: AQ24
PLACEMENT: .780 Mi N of CR 21
@ REF MARKER:
ADDL DATA: Class Speed
COUNT TYPE: AXLE PAIRS
PROCESSED BY: ORG CODE: DOT INITIALS: CEL

TO: **CR 21 NOXON RD E JCT**
FUNC. CLASS: 14
NHS: no
JURIS: City
CC Stn:
BATCH ID: DOT-R08C34aTST5195

COUNTY: **Dutchess**
TOWN:
LION#:
BIN: 1027160
RR CROSSING:
HPMS SAMPLE:

COUNT TAKEN BY: ORG CODE: TST INITIALS: JA

DATE	DAY	AM 12 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	PM 12 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	DAILY TOTAL	DAILY HIGH COUNT	DAILY HIGH HOUR
1	S																											
2	S																											
3	M																											
4	T																											
5	W																											
6	T																											
7	F																											
8	S																											
9	S																											
10	M																											
11	T																											
12	W																											
13	T																											
14	F																											
15	S																											
16	S																											
17	M														281	283	299	399	398	258	195	138	90	80	50			
18	T	24	9	6	11	20	66	217	377	441	324	285	300	275	251	268	341	428	364	266	223	140	110	67	38	4851	441	8
19	W	29	13	11	15	22	70	193	409	453	315	330	315	309	281	254	312	405	389	339	210	153	95	79	56	5057	453	8
20	T	28	16	11	11	25	87	190	382	410	330	312	256															
21	F																											
22	S																											
23	S																											
24	M																											
25	T																											
26	W																											
27	T																											
28	F																											
29	S																											
30	S																											
31	M																											

AVERAGE WEEKDAY HOURS (Axle Factored, Mon 6AM to Fri Noon)

12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	ADT
27	13	9	12	22	74	200	389	435	323	309	290	292	271	268	317	411	384	288	209	144	98	75	48	4908

DAYS Counted	HOURS Counted	WEEKDAYS Counted	WEEKDAY Hours	AVERAGE WEEKDAY High Hour	AVERAGE WEEKDAY % of day	Axle Adj. Factor	Seasonal/Weekday Adjustment Factor
4	71	4	71	435	9%	1.000	1.089

ESTIMATED

AADT
4507

STATION: **820342**

New York State Department of Transportation
Traffic Count Hourly Report

ROUTE #: **NY 82** ROAD NAME:
DIRECTION: Northbound FACTOR GROUP: 30
STATE DIR CODE: 6 WK OF YR: 20
DATE OF COUNT: 05/12/2015
NOTES LANE 1: NB travel lane

COUNT TAKEN BY: ORG CODE: TST INITIALS: BEK

FROM: **RT 55 BILLINGS**
REC. SERIAL #: AC64
PLACEMENT: 185 Yds N of Burdick Rd
@ REF MARKER:
ADDL DATA:
COUNT TYPE: AXLE PAIRS
PROCESSED BY: ORG CODE: DOT INITIALS: jh

TO: **CR 89 WATERBURY RD**
FUNC. CLASS: 17
NHS: no
JURIS: City
CC Stn:
BATCH ID: DOT-R08V20aTST5112

COUNTY: **Dutchess**
TOWN: **LAGRANGE**
LION#:
BIN:
RR CROSSING:
HPMS SAMPLE:

DATE	DAY	AM 12 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	PM 12 TO 1	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	DAILY TOTAL	DAILY HIGH COUNT	DAILY HIGH HOUR
1	F																											
2	S																											
3	S																											
4	M																											
5	T																											
6	W																											
7	T																											
8	F																											
9	S																											
10	S																											
11	M																											
12	T														**223**	**269**	**325**	**385**	**428**	**320**	**282**	**240**	**125**	**71**	**46**			
13	W	**31**	**8**	**10**	**5**	**11**	**26**	**121**	**176**	**226**	**158**	**205**	**228**	**216**	**236**	**285**	**361**	**415**	**413**	**346**	**281**	**226**	**148**	**97**	**58**	4287	415	16
14	T	**38**	**17**	**6**	**10**	**13**	**23**	**97**	**192**	**200**	**175**	**199**	**191**	**234**	**250**	**296**	**348**	**398**	**432**	**360**	**299**	**252**	**169**	**111**	**45**	4355	432	17
15	F	**28**	**20**	**5**	**8**	**9**	**47**	**153**	**264**	**253**																		
16	S																											
17	S																											
18	M																											
19	T																											
20	W																											
21	T																											
22	F																											
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24	S																											
25	M																											
26	T																											
27	W																											
28	T																											
29	F																											
30	S																											
31	S																											
AVERAGE WEEKDAY HOURS (Axle Factored, Mon 6AM to Fri Noon)		**32**	**15**	**7**	**8**	**11**	**32**	**124**	**211**	**226**	**166**	**202**	**210**	**225**	**236**	**283**	**345**	**399**	**424**	**342**	**287**	**239**	**147**	**93**	**50**	**ADT 4314**		

DAYS Counted	HOURS Counted	WEEKDAYS Counted	WEEKDAY Hours	AVERAGE WEEKDAY High Hour	AVERAGE WEEKDAY % of day	Axle Adj. Factor	Seasonal/Weekday Adjustment Factor	ESTIMATED
4	68	4	68	424	10%	1.000	1.077	**AADT 4006**

New York State Department of Transportation
Traffic Count Hourly Report

ROUTE #: NY 82 ROAD NAME:
DIRECTION: Southbound FACTOR GROUP: 30
STATE DIR CODE: 7 WK OF YR: 20
DATE OF COUNT: 05/12/2015
NOTES LANE 1: SB travel lane

FROM: **RT 55 BILLINGS**
REC. SERIAL #: AC64
PLACEMENT: 185 Yds N of Burdick Rd
@ REF MARKER:
ADDL DATA:
COUNT TYPE: AXLE PAIRS

TO: **CR 89 WATERBURY RD**
FUNC. CLASS: 17
NHS: no
JURIS: City
CC Stn:
BATCH ID: DOT-R08V20aTST5112

COUNTY: **Dutchess**
TOWN: **LAGRANGE**
LION#:
BIN:
RR CROSSING:
HPMS SAMPLE:

COUNT TAKEN BY: ORG CODE: TST INITIALS: BEK
PROCESSED BY: ORG CODE: DOT INITIALS: jh

DATE	DAY	12 TO 1 (AM)	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	12 TO 1 (PM)	1 TO 2	2 TO 3	3 TO 4	4 TO 5	5 TO 6	6 TO 7	7 TO 8	8 TO 9	9 TO 10	10 TO 11	11 TO 12	DAILY TOTAL	DAILY HIGH COUNT	DAILY HIGH HOUR
1	F																											
2	S																											
3	S																											
4	M																											
5	T																											
6	W																											
7	T																											
8	F																											
9	S																											
10	S																											
11	M																											
12	T														**221**	**229**	**260**	**276**	**299**	**226**	**162**	**121**	**61**	**25**	**16**			
13	W	**13**	**9**	**2**	**12**	**32**	**121**	**264**	**374**	**371**	**261**	**234**	**219**	**227**	**233**	**253**	**290**	**262**	**321**	**240**	**148**	**117**	**90**	**46**	**30**	4169	374	7
14	T	**17**	**14**	**5**	**18**	**46**	**126**	**274**	**376**	**368**	**217**	**231**	**228**	**201**	**205**	**247**	**299**	**326**	**317**	**266**	**151**	**167**	**158**	**79**	**49**	4385	376	7
15	F	**46**	**16**	**11**	**20**	**39**	**118**	**260**	**378**	**375**	**217**	**229**	**185**															
16	S																											
17	S																											
18	M																											
19	T																											
20	W																											
21	T																											
22	F																											
23	S																											
24	S																											
25	M																											
26	T																											
27	W																											
28	T																											
29	F																											
30	S																											
31	S																											
AVERAGE WEEKDAY HOURS (Axle Factored, Mon 6AM to Fri Noon)		**25**	**13**	**6**	**17**	**39**	**122**	**266**	**376**	**371**	**232**	**231**	**211**	**214**	**220**	**243**	**283**	**288**	**312**	**244**	**154**	**135**	**103**	**50**	**32**	**ADT 4187**		

DAYS Counted	HOURS Counted	WEEKDAYS Counted	WEEKDAY Hours	AVERAGE WEEKDAY High Hour	AVERAGE WEEKDAY % of day	Axle Adj. Factor	Seasonal/Weekday Adjustment Factor
4	71	4	71	376	9%	1.000	1.077

ESTIMATED

AADT
3888

ROUTE #: **NY 82** ROAD NAME: FROM: **RT 55 BILLINGS** TO: **CR 89 WATERBURY RD** COUNTY: **Dutchess**
STATION: **820342** STATE DIR CODE: **7** PLACEMENT: **185 Yds N of Burdick Rd** **DATE OF COUNT: 05/12/2015**

Appendix C – Proposed Comprehensive Plan Amendment

Town of LaGrange
2005 Comprehensive Plan Proposed Amendments

June 6, 2018

Background

The Town of LaGrange's Comprehensive Plan, adopted in July 2005, outlined various goals and objectives to preserve the unique character of the community, including active farmlands, natural resources, and important community assets. Additionally, the Plan encouraged commercial and residential development in appropriate locations and in a balanced fashion. One key component of the Plan is the development of a "Town Center" in the center of the community as the primary activity area with a more dense, traditional pattern of development. Outside of this area, commercial development is encouraged in a nodal fashion where similar land uses already exist.

While much of the efforts have centered around the development of Town Center, including water, sewer, and other infrastructure to support future growth, there are instances where other commercial areas of the Town have remained stagnant or otherwise not materialized with past changes in zoning, the primary driver for land use changes. As such, the Town Board desires to seek a new direction and vision for commercial nodes east of Town Center along Route 55 to expand development opportunities that take advantage of their location and potential market changes.

Rationale

The overall vision, goals, and objectives noted in Section 3.0 of the plan for the Town of LaGrange remain valid and pertinent, with the Town continuing to support the growth and development of Town Center as it is currently outlined on Route 55 west of the Taconic State Parkway. The intent of this addendum is to provide further clarification to address strategic commercial areas in the Town that reflect development trends that have occurred since the 2005 Plan.

Specifically, the areas of interest include the intersections of:

- Route 55 and 82
- Route 55 and the Taconic State Parkway

These locations fall under the "nodes of commercial development within existing commercial districts" as noted in Section 3.2 *Goals and Objectives* (page 115) and are also noted in Section 2.2 *Land Use Trends* (page 18):

> "The Town's commercial development is located primarily along NYS Route 55 and County Route 21 (Noxon Road). The commercial areas along Route 55 are limited to the segments of road west of Mandalay Drive and east of the Taconic State Parkway, while Noxon Road's commercial uses are concentrated to the west of Titusville Road."

Commercial activity and uses here are more suburban in nature, characteristics that were present in 2005 and continue today, though in regard to intersections of interest above, still retain the nodal style of development that is desired in the Town.

Existing development found in the State Route 82/55 area shown above.

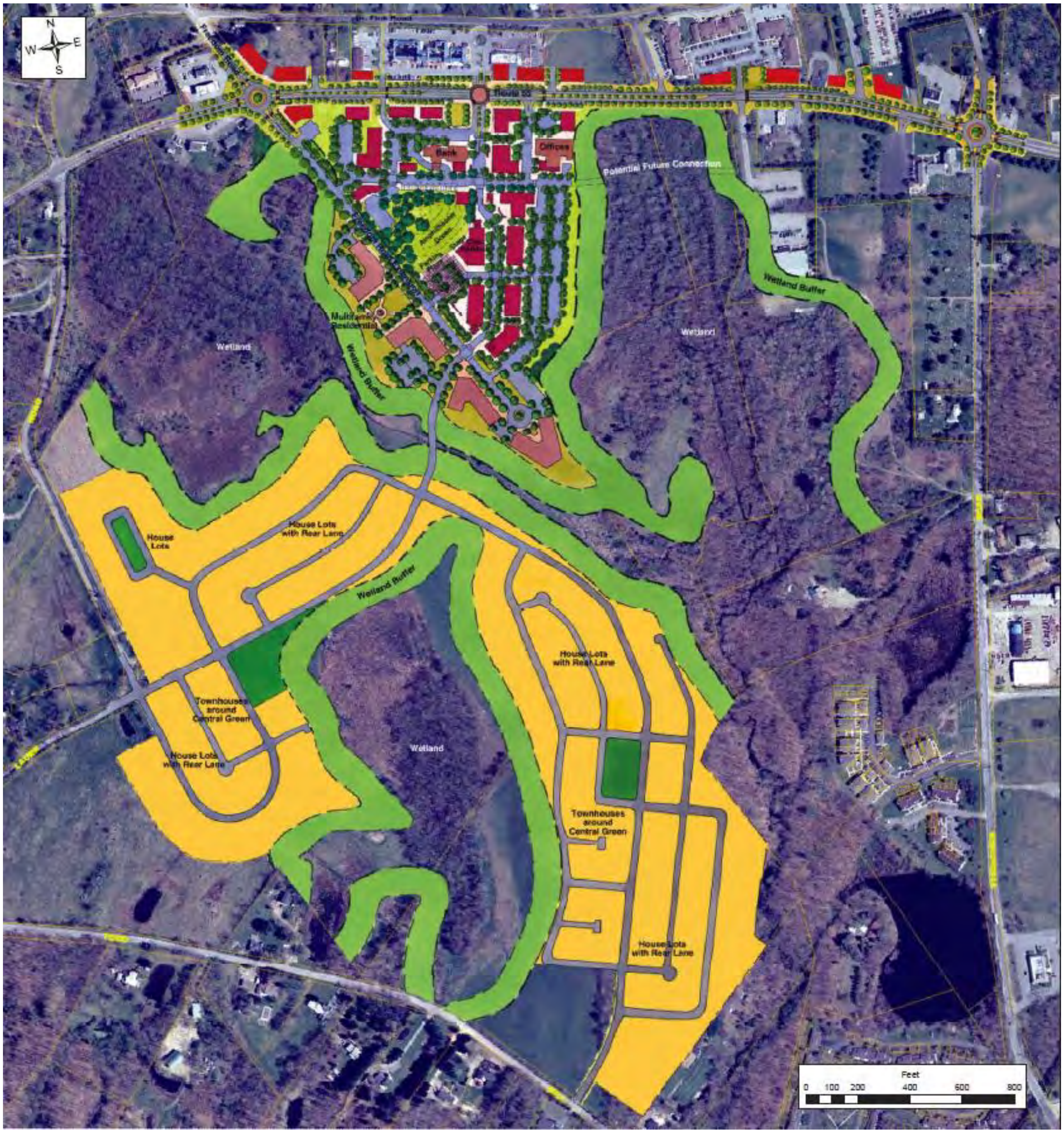
Looking back prior to 2005 at the zoning that was in place, the eastern portion of Route 55/Taconic State Parkway was zoned as part of the Town Center Business (TCB) District while the Route 55/82 intersection was zoned as Commercial 1 (C1), similar to the commercial areas surrounding Titusville/Noxon Road and Titusville Road/Route 55 and the corridors along Noxon Road and Route 55 to the western Town line. The rationale for the changes at Route 55/Taconic intersection are noted on page 123 (with current clarifications noted):

> "In addition, the [proposed] Commercial 2 area [now referred to as General Business/GB], shown adjacent to the Town Center designation on the east side of the Taconic, is recommended to replace the existing Town Center Business designation at that location. It reflects the emphasis on public infrastructure planning west of the Taconic, as well as the barrier that the Taconic presents for pedestrian mobility and accessibility."

The Taconic still is a barrier regarding mobility and accessibility, but it also represents a barrier to the denser commercial style of development that is desired in Town Center – interchanges tend to cater to a specific subset of commercial development that favor automobile-centric uses (such as, but not limited to gas stations, fast food, lodging, or other transient uses) or light industrial uses, taking advantage of the proximity of access and regional distribution. Successful developments at interchanges typically follow this trend though access and design standards can and still should be implemented to provide for more aesthetically-pleasing structures and sites.

In addition, the 2005 Plan sought to condense the three dedicated commercial districts (C-1, C-2, and C-3) into two to accommodate the lower density, commercial centers that are found outside of Town Center. Generally, this future zoning classification was carried out, with slight changes in nomenclature (Commercial 2/C-2 was renamed to General Business/GB) and the extent of the properties that were included in each. The primary difference between these two districts as they are outlined in the Comprehensive Plan are the emphasis on strip commercial developments versus a "smaller scale, lower impact" style, respectively, while including design standards to address scale, design, access, and other site elements. The existing uses in this area are more consistent with the intent of those uses in the Commercial District than they are of the General Business designation.

Development of Town Center, an important component of the 2005 Plan and a long-term vision for LaGrange since the 1960's, continued to receive additional emphasis with an illustrative conceptual plan along with supporting narrative. This plan, created in 2005, outlined access and proposed development areas for Town Center between Freedom Road/Freedom Road Extension and Stringham Road and State Route 55 down to Todd Hill Road. It should be noted that the intent was to have Town Center fall between these two areas and then develop south, taking advantage of larger, more available land for future mixed-use residential development; improvements and developments continue today to be primarily concentrated in this area, though the Town Center District extends well beyond this to the east. For these reasons, as well as the distinctly unique characteristics noted above regarding interchange areas, the Town Center District is likely overextended in its extent to the east, ultimately reducing the redevelopment potential of the properties in the interchange, observed in the +/- 10 years since the 2005 Plan.



The 2005 concept plan for Town Center is shown in a limited area west of Stringham Road.

The proposed changes in preferred land use designations and zoning provide greater opportunities to the areas of interest noted above by allowing existing businesses to enhance their currently underperforming operations – many of them are now considered pre-existing non-conforming with limitations on changes, expansion, or growth. In addition, the changes in zoning designations for these commercial areas will, in essence, support the development and growth that is desired in Town Center (more of a “village” feel) by directing uses that are less desirable to other designated commercial areas. The goals of the 2005 Comprehensive Plan continue to be valid with these changes by supporting the encouragement of commercial development in a nodal fashion.

Proposed Changes

While the intent for these changes as noted in the 2005 were valid, and though there have been some small improvements made, the results have not materialized for these intersections of interest. Therefore, the following changes are proposed for Section 3.3 (Land Use Recommendations) under item #3 of the 2005 Comprehensive Plan (**additions** and ~~revisions~~ noted where applicable):

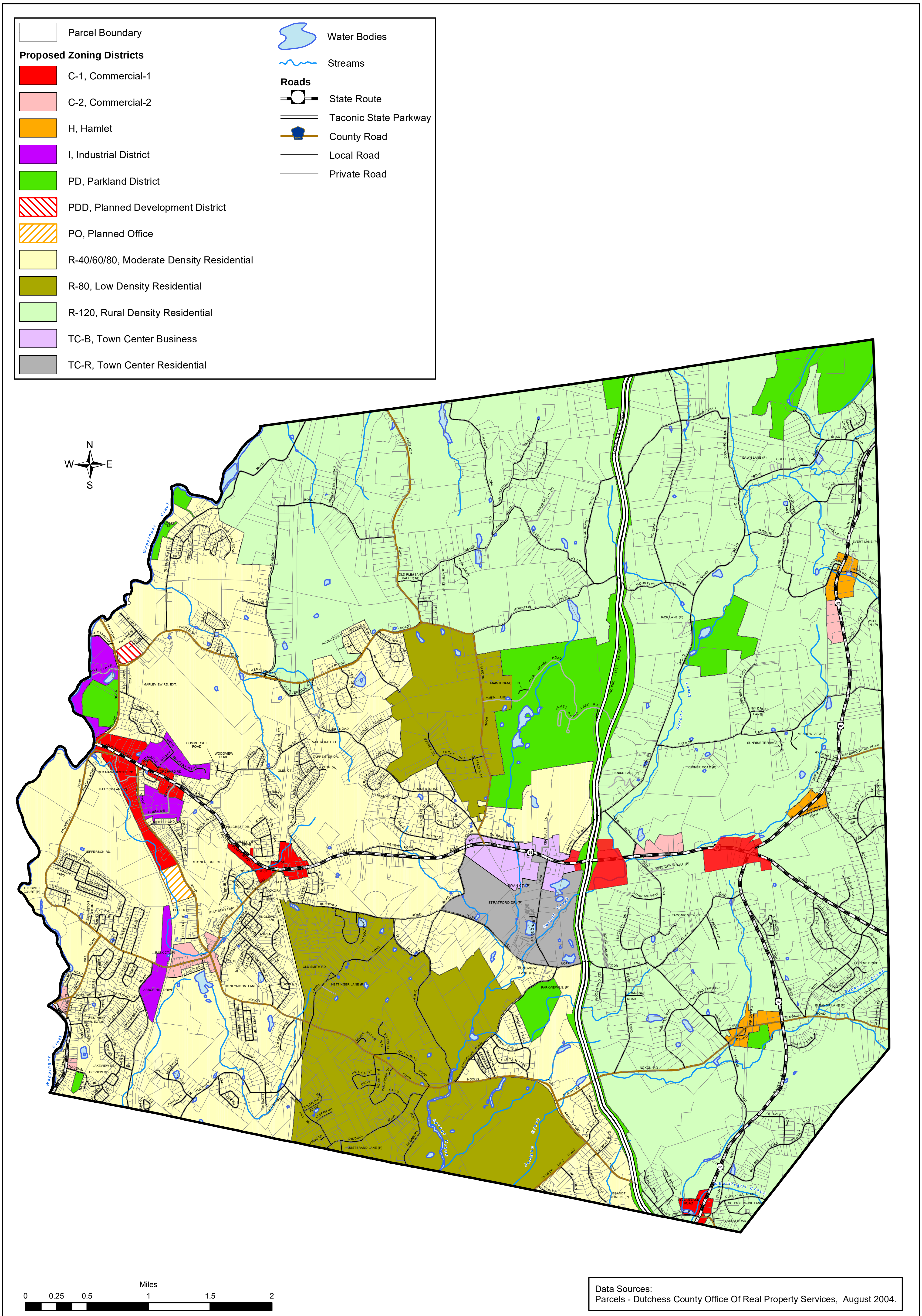
Commercial Districts (C-1 and C-2): **Following the development of the 2005 Comprehensive Plan, the Commercial 3 District was dissolved and absorbed into the newly designated General Business (GB) District – formerly called out as the Commercial 2 District.** ~~The existing Commercial 3 Zoning District encompasses one property on Route 82. This zoning designation is not recommended to continue. In addition, the existing Commercial 1 and Commercial 2 designations are shown on the Proposed Zoning Map in a number of locations.~~ The Commercial 1 designation is applied primarily to older strip commercial centers, while the Commercial 2 **(General Business)** designation is intended as a smaller scale, lower impact commercial district. **The State Route 82/55 intersection has and continues to be of a similar nature to the uses found in the Commercial 1 District; rezoning to General Business has not successfully revitalized this area nor increased the marketability/attractiveness given the extent of uses allowed here. With infrastructure improvements and development attraction focused on Town Center, providing additional commercial opportunities that are different from, but do not compete with, those in Town Center should be encouraged in the State Route 82/55 area as offered by the Commercial 1 District. This takes advantage of the existing building stock and infrastructure that is in place, providing opportunities for revitalization of the area, responding to current market trends and conditions, as well as infill development.**

The properties in and around the Taconic State Parkway intersection with State Route 55
(Note: The following section was formerly the last paragraph, reformatted for flow/legibility)
The 2005 Plan noted both the benefits and the constraints brought on with the Taconic State Parkway, providing visibility and easy access to LaGrange, but also limiting connections. The formerly designated ~~In addition, the~~ Commercial 2 **(General Business)** area, ~~shown~~ adjacent to the Town Center designation on the east side of the Taconic, ~~is~~ **was** recommended to replace the existing Town Center Business designation at that location. It reflects the emphasis on public infrastructure planning west of the Taconic, as well as the barrier that the Taconic presents for pedestrian mobility and accessibility. **In a similar fashion to the lack of revitalization and development attributed to the State Route 82/55 intersection, the rezoning following the 2005 Plan has not materialized and many properties remain underutilized. For this reason, it is the desire of the Town to providing more opportunities for commercial development in this area under the Commercial 1 District, while balancing the desire to create a more defined gateway into Town Center through design. Physical development on lands in this area are constrained due to environmental features, as outlined in earlier sections of the Plan; therefore, the actual extent and intensity of any future development would be dictated, in part, by the environmental constraints.** Lastly, the Master Plan goal of encouraging revitalization of the Manchester Bridge Area should also be noted and the redevelopment of underutilized properties should be a priority in the future, especially as sewer infrastructure improvements are completed.

In addition to the mapped areas for these Districts, design standards ~~are~~ **continue to be** recommended to address building size, scale, location, setbacks, landscaping, access and provision of pedestrian facilities, where feasible. Many of the goals and recommendations of the County's

Greenway Connections are applicable in ensuring the appropriate design and scale of existing and future commercial development and redevelopment. For example, the ~~Commercial 2~~ **commercial land use** designations **proposed** along Route 55 east of the Taconic ~~are~~ **remain** intentionally nodal in form, rather than circumscribing a continuous strip.

The Proposed Zoning Districts Map (Figure 3.4-1) in the 2005 Comprehensive Plan is also amended to reflect these changes in preferred land uses for the Town, as shown in the attached.



THE Chazen COMPANIES
Engineers/Surveyors
Planners
Environmental Scientists
GIS Consultants

CHAZEN ENGINEERING & LAND SURVEYING CO., P.C.

Dutchess County Office:	Orange County Office:	Capital District Office:	North Country Office:
21 Fox Street	256 Meadow Avenue	20 Gurley Avenue	110 Glen Street
Poughkeepsie, New York 12601	Newburgh, New York 12550	Troy, New York 12182	Glens Falls, New York 12801
Phone: (845) 454-3980	Phone: (845) 567-1133	Phone: (518) 235-8050	Phone: (518) 812-0513

Town Of LaGrange 2005 Comprehensive Plan
2018 Amendment

Figure 3.4-1 Proposed Zoning Districts

Town Of LaGrange
Dutchess County, New York

Created by: Carol Conolly
Date: **Revised 05/15/2018**
Scale: 1:46,000
Project #: 89324.GD

Map Document: (R:\8\89324.GD\GIS\maps\FinalMaps\89324GD_ProposedZoningDistricts_Option2_04-11-2005_11x17.mxd)
4/13/2005 -- 10:54:31 AM

Appendix D – Local Regulations

Chapter 120 – Flood Damage Prevention

Chapter 120

FLOOD DAMAGE PREVENTION

GENERAL REFERENCES

Building construction — See Ch. 83.

Subdivision of land — See Ch. 203.

Wetlands and water ways — See Ch. 124.

Zoning — See Ch. 240.

§ 120-1. Findings.

The Town Board of the Town of LaGrange finds that the potential and/or actual damages from flooding and erosion may be a problem to the residents of the Town of LaGrange and that such damages may include destruction or loss of private and public housing, damage to public facilities, both publicly and privately owned, and injury to and loss of human life. In order to minimize the threat of such damages and to achieve the purposes and objectives hereinafter set forth, this chapter is adopted.

§ 120-2. Statement of purpose.

It is the purpose of this chapter to promote the public health, safety and general welfare, and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:

A. Regulate uses which are dangerous to health, safety and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;

B. Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;

C. Control the alteration of natural floodplains, stream channels, and natural protective barriers which are involved in the accommodation of floodwaters;

D. Control filling, grading, dredging and other development which may increase erosion or flood damages;

E. Regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands; and

F. Qualify for and maintain participation in the National Flood Insurance Program.

§ 120-3. Objectives.

The objectives of this chapter are to:

A. Protect human life and health;

B. Minimize expenditure of public money for costly flood control projects;

C. Minimize the need for rescue and relief efforts associated with flooding and generally undertaken at the expense of the general public;

D. Minimize prolonged business interruptions;

E. Minimize damage to public facilities and utilities such as water and gas mains, electric, telephone and sewer lines, streets and bridges located in areas of special flood hazard;

F. Help maintain a stable tax base by providing for the sound use and development of areas of special flood hazard so as to minimize future flood blight areas;

G. Provide that developers are notified that property is in an area of special flood hazard; and

H. Ensure that those who occupy the areas of special flood hazard assume responsibility for their actions.

§ 120-4. Word usage and definitions.

A. Unless specifically defined below, words or phrases used in this chapter shall be interpreted so as to give them the meaning they have in common usage and to give this chapter its most reasonable application.

B. As used in this chapter, the following terms shall have the meanings indicated:

APPEAL — A request for a review of the local administrator's interpretation of any provision of this chapter or a request for a variance.

AREA OF SHALLOW FLOODING — A designated AO, AH, or VO Zone on a community's Flood Insurance Rate Map (FIRM) with a one-percent-or-greater annual chance of flooding to an average annual depth of one to three feet where a clearly defined channel does not exist, where the path of flooding is unpredictable and where velocity flow may be evident. Such flooding is characterized by ponding or sheet flow.

AREA OF SPECIAL FLOOD HAZARD — The land in the floodplain within a community subject to a one-percent-or-greater chance of flooding in any given year. This area may be designated as Zone A, AE, AH, AO, A1-A30, A99, V, VO, VE, or V1-V30. It is also commonly referred to as the base floodplain or one-hundred-year floodplain. For purposes of this chapter, the term "special flood hazard area (SFHA)" is synonymous in meaning with the phrase "area of special flood hazard."

BASE FLOOD — The flood having a one-percent chance of being equaled or exceeded in any given year.

BASEMENT — That portion of a building having its floor subgrade (below ground level) on all sides.

BUILDING — See "structure."

CELLAR — See "basement."

CRAWL SPACE — An enclosed area beneath the lowest elevated floor, 18 inches or more in height, which is used to service the underside of the lowest elevated floor. The elevation of the floor of this enclosed area, which may be of soil, gravel, concrete or other material, must be equal to or above the lowest adjacent exterior grade. The enclosed crawl space area shall be properly vented to allow for the equalization of hydrostatic forces which would be experienced during periods of flooding.

DEVELOPMENT — Any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, paving, excavation or drilling operations or storage of equipment or materials.

ELEVATED BUILDING —

(1) A non-basement building built, in the case of a building in Zones A1-A30, AE, A, A99, AO, AH, B, C, X, or D, to have the top of the elevated floor, or in the case of a building in Zones V1-V30, VE or V, to have the bottom of the lowest horizontal structure member of the elevated floor, elevated above the ground level by means of pilings, columns (posts and piers) or shear walls parallel to the flow of the water; and adequately anchored so as not to impair the structural integrity of the building during a flood of up to the magnitude of the base flood.

(2) In the case of Zones A1-A30, AE, A, A99, AO, AH, B, C, X, or D, "elevated building" also includes a building elevated by means of fill or solid foundation perimeter walls with openings sufficient to facilitate the unimpeded movement of floodwaters.

(3) In the case of Zones V1-V30, VE or V, "elevated building" also includes a building otherwise meeting the definitions of "elevated building," even though the lower area is enclosed by means of breakaway walls that meet the federal standards.

FEDERAL EMERGENCY MANAGEMENT AGENCY — The Federal Agency that administers the National Flood Insurance Program.

FLOOD BOUNDARY AND FLOODWAY MAP (FBFM) — An official map of the community published by the Federal Emergency Management Agency as part of a riverine community's Flood Insurance Study. The FBFM delineates a regulatory floodway along watercourses studied in detail in the Flood Insurance Study.

FLOOD ELEVATION STUDY — An examination, evaluation and determination of the flood hazards and, if appropriate, corresponding water surface elevations, or an examination, evaluation and determination of flood-related erosion hazards.

FLOOD HAZARD BOUNDARY MAP (FHBM) — An official map of a community, issued by the Federal Emergency Management Agency, where the boundaries of the areas of special flood hazard have been designated as Zone A but no flood elevations are provided.

FLOOD INSURANCE RATE MAP (FIRM) — An official map of a community, on which the Federal Emergency Management Agency has delineated both the areas of special flood hazard and the risk premium zones applicable to the community.

FLOOD INSURANCE STUDY — See "flood elevation study."

FLOOD or FLOODING —

(1) A general or temporary condition of partial or complete inundation of normally dry land areas from:

  (a) The overflow of inland or tidal waters;

  (b) The unusual and rapid accumulation or runoff of surface waters from any source.

(2) The collapse or subsidence of land along the shore of a lake or other body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels or suddenly caused by an unusually high water level in a natural body of water, accompanied by a severe storm, or by an unanticipated force of nature, such as a flash flood or an abnormal tidal surge, or by some similarly unusual and unforeseeable event which results in flooding as defined in Subsection (1) above.

FLOODPLAIN or FLOOD-PRONE AREA — Any land area susceptible to being inundated by water from any source. (See "flooding.")

FLOODPROOFING — Any combination of structural and nonstructural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents.

FLOODWAY — See "regulatory floodway."

FUNCTIONALLY DEPENDENT USE — A use which cannot perform its intended purpose unless it is located or carried out in close proximity to water, such as a docking or port facility necessary for the loading and unloading of cargo or passengers, shipbuilding, and ship repair facilities. The term does not include long-term storage, manufacturing, sales, or service facilities.

HIGHEST ADJACENT GRADE — The highest natural elevation of the ground surface, prior to construction, next to the proposed walls of a structure.

HISTORIC STRUCTURE — Any structure that is:

(1) Listed individually in the National Register of Historic Places (a listing maintained by the Department of the Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;

(2) Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;

(3) Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of the Interior; or

(4) Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either:

(a) By an approved state program as determined by the Secretary of the Interior; or

(b) Directly by the Secretary of the Interior in states without approved programs.

LOCAL ADMINISTRATOR — The person appointed by the community to administer and implement this chapter by granting or denying development permits in accordance with its provisions. This person is often the Building Inspector, Code Enforcement Officer, or employee of an engineering department.

LOWEST FLOOR — The lowest floor of the lowest enclosed area (including basement or cellar). An unfinished or flood-resistant enclosure, usable solely for parking of vehicles, building access, or storage in an area other than a basement area is not considered a building's lowest floor; provided, that such enclosure is not built so as to render the structure in violation of the applicable nonelevation design requirements of this chapter.

MANUFACTURED HOME — A structure, transportable in one or more sections, which is built on a permanent chassis and designed to be used with or without a permanent foundation when connected to the required utilities. The term does not include a recreational vehicle.

MANUFACTURED HOME PARK OR SUBDIVISION — A parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

MEAN SEA LEVEL — For purposes of the National Flood Insurance Program, the National Geodetic Vertical Datum (NGVD) of 1929, the North American Vertical Datum of 1988 (NAVD 88), or other datum, to which base flood elevations shown on a community's Flood Insurance Rate Map are referenced.

MOBILE HOME — See "manufactured home."

NEW CONSTRUCTION — Structures for which the start of construction commenced on or after the effective date of a floodplain management regulation adopted by the community and includes any subsequent improvements to such structure.

ONE-HUNDRED-YEAR FLOOD or 100-YEAR FLOOD — See "base flood."

PRINCIPALLY ABOVE GROUND — At least 51% of the actual cash value of the structure, excluding land value, is above ground.

RECREATIONAL VEHICLE — A vehicle which is:

(1) Built on a single chassis;

(2) Four hundred square feet or less when measured at the largest horizontal projection;

(3) Designed to be self-propelled or permanently towable by a light-duty truck; and

(4) Not designed primarily for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

REGULATORY FLOODWAY — The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height as determined by the Federal Emergency Management Agency in a Flood Insurance Study or by other agencies as provided in § 120-14B of this chapter.

START OF CONSTRUCTION — The date of permit issuance for new construction and substantial improvements to existing structures, provided that actual start of construction, repair, reconstruction, rehabilitation, addition placement, or other improvement is within 180 days after the date of issuance. The actual start of construction means the first placement of permanent construction of a building (including a manufactured home) on a site, such as the pouring of a slab or footings, installation of pilings or construction of columns. Permanent construction does not include land preparation (such as clearing, excavation, grading, or filling), or the installation of streets or walkways, or excavation for a basement, footings, piers or foundations, or the erection of temporary forms, or the installation of accessory buildings such as garages or sheds not occupied as dwelling units or not part of the main building. For a substantial improvement, the actual start of construction means the first alteration of any wall, ceiling, floor, or other structural part of a building, whether or not that alteration affects the external dimensions of the building.

STRUCTURE — A walled and roofed building, including a gas or liquid storage tank that is principally above ground, as well as a manufactured home.

SUBSTANTIAL DAMAGE — Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before damaged condition would equal or exceed 50% of the market value of the structure before the damage occurred.

SUBSTANTIAL IMPROVEMENT — Any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50% of the market value of the structure before the start of construction of the improvement. The term includes structures which have incurred substantial damage, regardless of the actual repair work performed. The term does not, however, include either:

(1) Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the local code enforcement official and which are the minimum necessary to assure safe living conditions; or

(2) Any alteration of an historic structure, provided that the alteration will not preclude the structure's continued designation as an a historic structure

VARIANCE — A grant of relief from the requirements of this chapter which permits construction or use in a manner that would otherwise be prohibited by this chapter.

VIOLATION — The failure of a structure or other development to be fully compliant with the community's floodplain management regulations.

§ 120-5. Applicability.

This chapter shall apply to all areas of special flood hazard within the jurisdiction of the Town of LaGrange, Dutchess County, New York.

§ 120-6. Basis for establishing areas of special flood hazard. [Amended 5-11-2016 by L.L. No. 3-2016]

A. The areas of special flood hazard for the Town of LaGrange, Community Number 361011, are identified and defined on the following documents prepared by the Federal Emergency Management Agency:

(1) Flood Insurance Rate Map Panel Numbers: 36027C0367E, 36027C0377E, 36027C0378E, 36027C0379E, 36027C0381E, 36027C0385E, 36027C0386E, 36027C0387E, 36027C0388E, 36027C0389E, 36027C0391E, 36027C0392E, 36027C0393E, 36027C0394E, 36027C0401E, 36027C0403E, 36027C0411E, 36027C0413E whose effective date is May 2, 2012, for all Map Panel Numbers with the exception of 36027C0394E, whose record

effective date is August 11, 2014, and any subsequent revisions to these map panels that do not affect areas under our community's jurisdiction.

(2) A scientific and engineering report entitled "Flood Insurance Study, Dutchess County, New York, All Jurisdictions," dated May 2, 2012.

(3) Letter of Map Revision (LOMR), Case Number 14-02-0734P, effective August 11, 2014, amending Panel 36027C0349E of the Flood Insurance Rate Map, Flood Profile 292 and 293P and Summary of Discharge Table 7 of the Flood Insurance Study.

B. The above documents are hereby adopted and declared to be a part of this chapter. The Flood Insurance Study and/or maps are on file at: Town of LaGrange Town Hall, office of the Town Clerk, 120 Stringham Road, LaGrangeville, New York 12540.

§ 120-7. Interpretation and conflict with other laws.

A. This chapter includes all revisions to the National Flood Insurance Program through October 27, 1997, and shall supersede all previous laws adopted for the purpose of flood damage prevention.

B. In their interpretation and application, the provisions of this chapter shall be held to be minimum requirements, adopted for the promotion of the public health, safety, and welfare. Whenever the requirements of this chapter are at variance with the requirements of any other lawfully adopted rules, regulations, ordinances, or local laws, the most restrictive, or that imposing the highest standards, shall govern.

§ 120-8. Severability.

The invalidity of any section or provision of this chapter shall not invalidate any other section or provision thereof.

§ 120-9. Penalties for offenses.

No structure in an area of special flood hazard shall hereafter be constructed, located, extended, converted, or altered and no land shall be excavated or filled without full compliance with the terms of this chapter and any other applicable regulations. Any infraction of the provisions of this chapter by failure to comply with any of its requirements, including infractions of conditions and safeguards established in connection with conditions of the permit, shall constitute a violation. Any person who violates this chapter or fails to comply with any of its requirements shall, upon conviction thereof, be fined no more than $250 or imprisoned for not more than 15 days, or both. Each day of noncompliance shall be considered a separate offense. Nothing herein contained shall prevent the Town of LaGrange from taking such other lawful action as necessary to prevent or remedy an infraction. Any structure found not compliant with the requirements of this chapter for which the developer and/or owner has not applied for and received an approved variance under §§ 120-20 and 120-21 will be declared noncompliant, and notification will be sent to the Federal Emergency Management Agency.

§ 120-10. Warning and disclaimer of liability.

The degree of flood protection required by this chapter is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by man-made or natural causes. This chapter does not imply that land outside the areas of special flood hazard or uses permitted within such areas will be free from flooding or flood damages. This chapter shall not create liability on the part of the Town of LaGrange, any officer or employee thereof, or the Federal Emergency Management Agency, for any flood damages that result from reliance on this chapter or any administrative decision lawfully made thereunder.

§ 120-11. Designation of local administrator.

The Zoning Enforcement Officer is hereby appointed local administrator to administer and implement this chapter by granting or denying floodplain development permits in accordance with its provisions.

§ 120-12. Floodplain development permit.

A. Purpose. A floodplain development permit is hereby established for all construction and other development to be undertaken in areas of special flood hazard in this community for the purpose of protecting its citizens from increased flood hazards and ensuring that new development is constructed in a manner that minimizes its exposure to flooding. It shall be unlawful to undertake any development in an area of special flood hazard, as shown on the Flood Insurance Rate Map enumerated in § 120-6, without a valid floodplain development permit. Application for a permit shall be made on forms furnished by the local administrator and may include, but not be limited to, plans, in duplicate, drawn to scale and showing the nature, location, dimensions, and elevations of the area in question; and existing or proposed structures, fill, storage of materials, drainage facilities, and the location of the foregoing.

B. Fees. All applications for a floodplain development permit shall be accompanied by an application fee as set forth on the prevailing fee schedule adopted by resolution of the Town Board, and as such schedule is modified from time to time by resolution of the Town Board. In addition, the applicant shall be responsible for reimbursing the Town of LaGrange for the actual amount of any additional costs, including professional consulting fee expenses, necessary for review, inspection and approval of this project. The local administrator may require an advance deposit toward recovery of these additional costs.

§ 120-13. Permit application.

The applicant shall provide the following information as appropriate. Additional information may be required on the permit application form.

A. The proposed elevation, in relation to mean sea level, of the lowest floor (including basement or cellar) of any new or substantially improved structure to be located in Zones A1-A30, AE or AH, or Zone A if base flood elevation data is available. Upon completion of the lowest floor, the permittee shall submit to the local administrator the as-built elevation, certified by a licensed professional engineer or surveyor.

B. The proposed elevation, in relation to mean sea level, to which any new or substantially improved nonresidential structure will be floodproofed. Upon completion of the floodproofed portion of the structure, the permittee shall submit to the local administrator the as-built floodproofed elevation, certified by a professional engineer or surveyor.

C. A certificate from a licensed professional engineer or architect that any utility floodproofing will meet the criteria in § 120-16C, Utilities.

D. A certificate from a licensed professional engineer or architect that any nonresidential floodproofed structure will meet the floodproofing criteria in § 120-18, Standards for nonresidential structures.

E. A description of the extent to which any watercourse will be altered or relocated as a result of proposed development. Computations by a licensed professional engineer must be submitted that demonstrate that the altered or relocated segment will provide equal or greater conveyance than the original stream segment. The applicant must submit any maps, computations or other material required by the Federal Emergency Management Agency (FEMA) to revise the documents enumerated in § 120-6, when notified by the local administrator, and must pay any fees or other costs assessed by FEMA for this purpose. The applicant must also provide assurances that the conveyance capacity of the altered or relocated stream segment will be maintained.

F. A technical analysis, by a licensed professional engineer, if required by the local administrator, which shows whether proposed development to be located in an area of special flood hazard may result in physical damage to any other property.

G. In Zone A, when no base flood elevation data is available from other sources, base flood elevation data shall be provided by the permit applicant for subdivision proposals and other proposed developments (including proposals for manufactured home and recreational vehicle parks and subdivisions) that are greater than either 50 lots or five acres.

§ 120-14. Duties and responsibilities of local administrator.

Duties of the local administrator shall include, but not be limited to the following:

A. Permit application review. The local administrator shall conduct the following permit application review before issuing a floodplain development permit:

(1) Review all applications for completeness, particularly with the requirements of § 120-13, Permit application, and for compliance with the provisions and standards of this chapter.

(2) Review subdivision and other proposed new development, including manufactured home parks to determine whether proposed building sites will be reasonably safe from flooding. If a proposed building site is located in an area of special flood hazard, all new construction and substantial improvements shall meet the applicable standards of §§ 120-15 through 120-19 and, in particular, § 120-15A, Subdivision proposals.

(3) Determine whether any proposed development in an area of special flood hazard may result in physical damage to any other property (e.g., stream bank erosion and increased flood velocities). The local administrator may require the applicant to submit additional technical analyses and data necessary to complete the determination, including but not limited to the submission of a stormwater pollution prevention plan (SWPPP) consistent with the requirements of Town of LaGrange Town Code Chapter 197. If the proposed development may result in physical damage to any other property or fails to meet the requirements of §§ 120-15 through 120-19, no permit shall be issued. The applicant may revise the application to include measures that mitigate or eliminate the adverse effects and re-submit the application.

(4) Determine that all necessary permits have been received from those governmental agencies from which approval is required by state or federal law.

B. Use of other flood data.

(1) When the Federal Emergency Management Agency has designated areas of special flood hazard on the community's Flood Insurance Rate map (FIRM) but has neither produced water surface elevation data (these areas are designated Zone A or V on the FIRM) nor identified a floodway, the local administrator shall obtain, review and reasonably utilize any base flood elevation and floodway data available from a federal, state or other source, including data developed pursuant to § 120-13G, as criteria for requiring that new construction, substantial improvements or other proposed development meet the requirements of this chapter.

(2) When base flood elevation data is not available, the local administrator may use flood information from any other authoritative source, such as historical data, to establish flood elevations within the areas of special flood hazard, for the purposes of this chapter.

C. Alteration of watercourses.

(1) Notification to adjacent communities and the New York State Department of Environmental Conservation prior to permitting any alteration or relocation of a watercourse, and submittal of evidence of such notification to the Regional Director, Region II, Federal Emergency Management Agency.

(2) Determine that the permit holder has provided for maintenance within the altered or relocated portion of said watercourse so that the flood-carrying capacity is not diminished.

D. Construction stage.

(1) In Zones A1-A30, AE and AH, and also Zone A if base flood elevation data is available, upon placement of the lowest floor or completion of floodproofing of a new or substantially improved structure, obtain from the permit holder a certification of the as-built elevation of the lowest floor or floodproofed elevation, in relation to mean sea level. The certificate shall be prepared by or under the direct supervision of a licensed land surveyor or professional engineer and certified by the same. For manufactured homes, the permit holder shall submit the certificate of elevation upon placement of the structure on the site. A certificate of elevation must also be submitted for a recreational vehicle if it remains on a site for 180 consecutive days or longer (unless it is fully licensed and ready for highway use).

(2) Any further work undertaken prior to submission and approval of the certification shall be at the permit holder's risk. The local administrator shall review all data submitted. Deficiencies detected shall be cause to issue a stop work order for the project unless immediately corrected.

E. Inspections. The local administrator and/or the developer's engineer or architect shall make periodic inspections at appropriate times throughout the period of construction in order to monitor compliance with permit conditions and enable said inspector to certify, if requested, that the development is in compliance with the requirements of the floodplain development permit and/or any variance provisions.

F. Stop work orders.

(1) The local administrator shall issue, or cause to be issued, a stop work order for any floodplain development found ongoing without

a development permit. Disregard of a stop work order shall subject the violator to the penalties described in § 120-9 of this chapter.

(2) The local administrator shall issue, or cause to be issued, a stop work order for any floodplain development found noncompliant with the provisions of this chapter and/or the conditions of the development permit. Disregard of a stop work order shall subject the violator to the penalties described in § 120-9 of this chapter.

G. Certificate of compliance.

(1) In areas of special flood hazard, as determined by documents enumerated in § 120-6, it shall be unlawful to occupy or to permit the use or occupancy of any building or premises, or both, or part thereof hereafter created, erected, changed, converted or wholly or partly altered or enlarged in its use or structure until a certificate of compliance has been issued by the local administrator stating that the building or land conforms to the requirements of this chapter.

(2) A certificate of compliance shall be issued by the local administrator upon satisfactory completion of all development in areas of special flood hazard.

(3) Issuance of the certificate shall be based upon the inspections conducted as prescribed in Subsection E of this section, Inspections, and/or any certified elevations, hydraulic data, floodproofing, anchoring requirements or encroachment analyses which may have been required as a condition of the approved permit.

H. Information to be retained. The local administrator shall retain and make available for inspection copies of the following:

(1) Floodplain development permits and certificates of compliance;

(2) Certifications of as-built lowest floor elevations of structures, required pursuant to § 120-14D(1) and (2), and whether or not the structures contain a basement.

(3) Floodproofing certificates required pursuant to § 120-14D(1) and whether or not the structures contain a basement;

(4) Variances issued pursuant to §§ 120-20 and 120-21.

(5) Notices required under § 120-14C, Alteration of watercourses.

§ 120-15. General construction standards.

The following standards apply to new development, including new and substantially improved structures, in the areas of special flood hazard shown on the Flood Insurance Rate Map designated in § 120-6.

A. Subdivision proposals. The following standards apply to all new subdivision proposals and other proposed development in areas of special flood hazard (including proposals for manufactured home and recreational vehicle parks and subdivisions):

(1) Proposals shall be consistent with the need to minimize flood damage;

(2) Public utilities and facilities such as sewer, gas, electrical and water systems shall be located and constructed so as to minimize flood damage; and,

(3) Adequate drainage shall be provided to reduce exposure to flood damage.

B. Encroachments.

(1) Within Zones A1-A30 and AE, on streams without a regulatory floodway, no new construction, substantial improvements or other development (including fill) shall be permitted unless:

(a) The applicant demonstrates that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any location; or

(b) The Town of LaGrange agrees to apply to the Federal Emergency Management Agency (FEMA) for a conditional FIRM revision, FEMA approval is received and the applicant provides all necessary data, analyses and mapping and reimburses the Town of LaGrange for all fees and other costs in relation to the application. The applicant must also provide all data, analyses and mapping and reimburse the Town of LaGrange for all costs related to the final map revision.

(2) On streams with a regulatory floodway, as shown on the Flood Boundary and Floodway Map or the Flood Insurance Rate Map adopted in § 120-6, no new construction, substantial improvements or other development in the floodway (including fill) shall be permitted unless:

(a) A technical evaluation by a licensed professional engineer shows that such an encroachment shall not result in any increase in flood levels during occurrence of the base flood; or

(b) The Town of LaGrange agrees to apply to the Federal Emergency Management Agency (FEMA) for a conditional FIRM and floodway revision, FEMA approval is received and the applicant provides all necessary data, analyses and mapping and reimburses the Town of LaGrange for all fees and other costs in relation to the application. The applicant must also provide all data, analyses and mapping and reimburse the Town of LaGrange for all costs related to the final map revisions.

§ 120-16. Standards for all structures.

The following standards apply to new development, including new and substantially improved structures, in the areas of special flood hazard shown on the Flood Insurance Rate Map designated in § 120-6.

A. Anchoring. New structures and substantial improvement to structures in areas of special flood hazard shall be anchored to prevent flotation, collapse, or lateral movement during the base flood. This requirement is in addition to applicable state and local anchoring requirements for resisting wind forces.

B. Construction materials and methods.

(1) New construction and substantial improvements to structures shall be constructed with materials and utility equipment resistant to flood damage.

(2) New construction and substantial improvements to structures shall be constructed using methods and practices that minimize flood damage.

(3) Enclosed areas.

(a) For enclosed areas below the lowest floor of a structure within Zones A1-A30, AE or AH, and also Zone A if base flood elevation data is available, new and substantially improved structures shall have fully enclosed areas below the lowest floor that are useable solely for parking of vehicles, building access or storage in an area other than a basement and which are subject to flooding, designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwater. Designs for meeting this requirement must either be certified by a licensed professional engineer or architect or meet or exceed the following minimum criteria:

[1] A minimum of two openings having a total net area of not less than one square inch for every square foot of enclosed area subject to flooding; and

[2] The bottom of all such openings no higher than one foot above the lowest adjacent finished grade.

(b) Openings may be equipped with louvers, valves, screens or other coverings or devices provided they permit the automatic entry and exit of floodwaters. Enclosed areas subgrade on all sides are considered basements and are not permitted.

C. Utilities.

(1) New and replacement electrical equipment, heating, ventilating, air conditioning, plumbing connections, and other service equipment shall be located at least two feet above the base flood elevation or be designed to prevent water from entering and accumulating within the components during a flood and to resist hydrostatic and hydrodynamic loads and stresses. Electrical wiring and outlets, switches, junction boxes and panels shall also be elevated or designed to prevent water from entering and accumulating within the components unless they conform to the appropriate provisions of the electrical part of the Building Code of New York State or the Residential Code of New York State for location of such wet items in wet locations;

(2) New and replacement water supply systems shall be designed to minimize or eliminate infiltration of floodwaters into the system.

(3) New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of floodwaters. Sanitary sewer and storm drainage systems for buildings that have openings below the base flood elevation shall be provided with automatic backflow valves or other automatic backflow devices that are installed in each discharge line passing through a building's exterior wall; and

(4) On-site waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

§ 120-17. Standards for residential structures.

A. Elevation. The following standards, in addition to the standards in § 120-15A, Subdivision proposals, and § 120-15B, Encroachments, and § 120-16, Standards for all structures, apply to new and substantially improved residential structures located in areas of special flood hazard as indicated:

(1) Within Zones A1-A30, AE and AH and also Zone A if base flood elevation data is available, new construction and substantial improvements shall have the lowest floor (including basement) elevated to or above two feet above the base flood elevation.

(2) Within Zone A, when no base flood elevation data is available, new construction and substantial improvements shall have the lowest floor (including basement) elevated at least three feet above the highest adjacent grade.

(3) Within Zone AO, new construction and substantial improvements shall have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as two feet above the depth number specified in feet on the community's Flood Insurance Rate Map enumerated in § 120-6 (at least two feet if no depth number is specified).

B. Within Zones AH and AO, adequate drainage paths are required to guide floodwaters around and away from proposed structures on slopes.

§ 120-18. Standards for nonresidential structures.

The following standards apply to new and substantially improved commercial, industrial and other nonresidential structures located in areas of special flood hazard, in addition to the requirements in § 120-15A, Subdivision proposals, and § 120-15B, Encroachments, and § 120-16, Standards for all structures.

A. Within Zones A1-A30, AE and AH, and also Zone A if base flood elevation data is available, new construction and substantial improvements of any nonresidential structure shall either:

  (1) Have the lowest floor, including basement or cellar, elevated to or above two feet above the base flood elevation; or

  (2) Be floodproofed so that the structure is watertight below two feet above the base flood elevation, including attendant utility and sanitary facilities, with walls substantially impermeable to the passage of water. All structural components located below the base flood level must be capable of resisting hydrostatic and hydrodynamic loads and the effects of buoyancy.

B. Within Zone AO, new construction and substantial improvements of nonresidential structures shall:

  (1) Have the lowest floor (including basement) elevated above the highest adjacent grade at least as high as two feet above the depth number specified in feet on the community's FIRM (at least two feet if no depth number is specified); or

  (2) Together with attendant utility and sanitary facilities, be completely floodproofed to that level to meet the floodproofing standard specified in § 120-18A(2).

C. If the structure is to be floodproofed, a licensed professional engineer or architect shall develop and/or review structural design, specifications, and plans for construction. A floodproofing certificate or other certification shall be provided to the local administrator that certifies that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions of § 120-18A(2), including the specific elevation (in relation to mean sea level) to which the structure is to be floodproofed.

D. Within Zones AH and AO, adequate drainage paths are required to guide floodwaters around and away from proposed structures on slopes.

E. Within Zone A, when no base flood elevation data is available, the lowest floor (including basement) shall be elevated at least three feet above the highest adjacent grade.

§ 120-19. Standards for manufactured homes and recreational vehicles.

The following standards, in addition to the standards in § 120-15, General standards, and § 120-16, Standards for all structures, apply, as indicated, in areas of special flood hazard to manufactured homes and to recreational vehicles which are located in areas of special flood hazard.

A. Recreational vehicles.

(1) Recreational vehicles placed on sites within Zones A1-A30, AE and AH shall either:

(a) Be on site fewer than 180 consecutive days;

(b) Be fully licensed and ready for highway use; or

(c) Meet the requirements for manufactured homes in Subsections B, C and D.

(2) A recreational vehicle is ready for highway use if it is on its wheels or jacking system, is attached to the site only by quick-disconnect-type utilities and security devices and has no permanently attached additions.

B. A manufactured home that is placed or substantially improved in Zones A1-A30, AE and AH shall be elevated on a permanent foundation such that the lowest floor is elevated to or above two feet above the base flood elevation and is securely anchored to an adequately anchored foundation system to resist flotation, collapse and lateral movement.

C. Within Zone A, when no base flood elevation data is available, new and substantially improved manufactured homes shall be elevated such that the manufactured home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and are securely anchored to an adequately anchored foundation system to resist flotation, collapse or lateral movement.

D. Within Zone AO, the floor shall be elevated above the highest adjacent grade at least as high as the depth number specified on the Flood Insurance Rate Map enumerated in § 120-6 (at least two feet if no depth number is specified).

§ 120-20. Appeals Board.

A. The Zoning Board of Appeals as established by the Town of LaGrange shall hear and decide appeals and requests for variances from the requirements of this chapter.

B. The Zoning Board of Appeals shall hear and decide appeals when it is alleged that there is an error in any requirement, decision, or determination made by the local administrator in the enforcement or administration of this chapter.

C. Those aggrieved by the decision of the Zoning Board of Appeals may appeal such decision to the Supreme Court pursuant to Article 78 of the Civil Practice Law and Rules.

D. In passing upon such applications, the Zoning Board of Appeals, shall consider all technical evaluations, all relevant factors, standards specified in other sections of this chapter and:

(1) The danger that materials may be swept onto other lands to the injury of others;

(2) The danger to life and property due to flooding or erosion damage;

(3) The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner;

(4) The importance of the services provided by the proposed facility to the community;

(5) The necessity to the facility of a waterfront location, where applicable;

(6) The availability of alternative locations for the proposed use which are not subject to flooding or erosion damage;

(7) The compatibility of the proposed use with existing and anticipated development;

(8) The relationship of the proposed use to the Comprehensive Plan and floodplain management program of that area;

(9) The safety of access to the property in times of flood for ordinary and emergency vehicles;

(10) The costs to local governments and the dangers associated with conducting search and rescue operations during periods of flooding;

(11) The expected heights, velocity, duration, rate of rise and sediment transport of the floodwaters and the effects of wave action, if applicable, expected at the site; and

(12) The costs of providing governmental services during and after flood conditions, including search and rescue operations, maintenance and repair of public utilities and facilities such as sewer, gas, electrical, and water systems and streets and bridges.

E. Upon consideration of the factors of Subsection D and the purposes of this chapter, the Zoning Board of Appeals may attach such conditions to the granting of variances as it deems necessary to further the purposes of this chapter.

F. The local administrator shall maintain the records of all appeal actions including technical information and report any variances to the Federal Emergency Management Agency upon request.

§ 120-21. Conditions for variances.

A. Generally, variances may be issued for new construction and substantial improvements to be erected on a lot of 1/2 acre or less in size contiguous to and surrounded by lots with existing structures constructed below the base flood level, provided that the items in § 120-20D(1) through (12) have been fully considered. As the lot size increases beyond the 1/2 acre, the technical justification required for issuing the variance increases.

B. Variances may be issued for the repair or rehabilitation of historic structures upon determination that:

(1) The proposed repair or rehabilitation will not preclude the structure's continued designation as an historic structure; and

(2) The variance is the minimum necessary to preserve the historic character and design of the structure.

C. Variances may be issued by a community for new construction and substantial improvements and for other development necessary for the conduct of a functionally dependent use provided that:

(1) The criteria of Subsections A, D, E and F of this section are met.

(2) The structure or other development is protected by methods that minimize flood damages during the base flood and create no additional threat to public safety.

D. Variances shall not be issued within any designated floodway if any increase in flood levels during the base flood discharge would result.

E. Variances shall only be issued upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief.

F. Variances shall only be issued upon receiving written justification of:

(1) A showing of good and sufficient cause;

(2) A determination that failure to grant the variance would result in exceptional hardship to the applicant; and

(3) A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety or extraordinary public expense, create nuisances, cause fraud on or victimization of the public or conflict with existing chapters, local laws or ordinances.

G. Notice to applicant.

(1) Any applicant to whom a variance is granted for a building with the lowest floor below the base flood elevation shall be given written notice over the signature of a community official that:

(a) The issuance of a variance to construct a structure below the base flood level will result in increased premium rates for flood insurance up to amounts as high as $25 for $100 of insurance coverage; and

(b) Such construction below the base flood level increases risks to life and property.

(2) Such notification shall be maintained with the record of all variance actions as required in § 120-14H of this chapter.

Chapter 124 – Freshwater Wetlands, Watercourses and Waterbodies

Chapter 124

FRESHWATER WETLANDS, WATERCOURSES AND WATER BODIES

GENERAL REFERENCES

Building construction — See Ch. 83.

Flood damage prevention — See Ch. 120.

Subdivision of land — See Ch. 203.

Zoning — See Ch. 240.

§ 124-1. Title.

This chapter shall be known as the "Freshwater Wetlands, Watercourse and Water Body Law of the Town of LaGrange."

§ 124-2. Declaration of policy.

A. It is declared to be the public policy of the Town of LaGrange to preserve, protect and conserve freshwater wetlands, watercourses and water bodies and the benefits derived therefrom; to prevent despoilation and destruction of freshwater wetlands, watercourses and water bodies; and to regulate development in such wetlands and protect such watercourses and water bodies in order to secure the natural benefits derived therefrom consistent with the general welfare and the beneficial economic, social and agricultural development of the Town.

B. It is declared to be the policy of the Town of LaGrange to exercise shared authority to regulate wetlands, watercourses and water bodies with the Department of Environmental Conservation under the provisions of Article 24 of New York State Environmental Conservation Law.

§ 124-3. Legislative intent.

A. It is the intent of the Town of LaGrange to insure that activities in and adjacent to wetlands, watercourses and water bodies do not unduly impact the public safety, the natural environment or cause environmental degradation.

B. This chapter shall apply to all lands defined as wetlands, wetland buffers, watercourses and water bodies in § 124-5, and to any proposed regulated activity as defined in § 124-7.

§ 124-4. Findings.

A. The freshwater wetlands, watercourses and water bodies located in the Town of LaGrange are invaluable resources for flood protection, wildlife habitat, open space, and water resources.

B. Considerable acreage of freshwater wetlands in the Town may be lost, despoiled or impaired by unregulated draining, dredging, filling, excavating, building, pollution or other acts.

C. Recurrent flooding, aggravated or caused by loss of freshwater wetlands, has serious effects upon natural ecosystems.

D. Freshwater wetlands, watercourse and water body conservation is a matter of the Town's concern.

E. Loss of freshwater wetlands and degradation of watercourses and water bodies deprives the people of the Town of LaGrange of some or all of the multiple benefits to be derived therefrom, as follows:

(1) Flood and storm control by the hydrologic absorption and storage capacity of freshwater wetlands.

(2) Wildlife habitat by providing breeding, nesting and feeding grounds and cover for many forms of wildlife and rare species.

(3) Protection of subsurface water resources and provision for valuable watersheds and recharging ground supplies.

(4) Recreation by providing areas of hunting, fishing, boating, birdwatching, photography, camping and other uses, if permission is given by owners.

(5) Pollution treatment by serving as biological and chemical oxidation basins.

(6) Erosion control by serving as sedimentation areas and filtering basins, absorbing silt and organic matter.

(7) Educational and scientific research by providing readily accessible outdoor biophysical laboratories, living classrooms and training and education resources, if permission is given by owners.

(8) Open space and aesthetic appreciation.

(9) Sources of nutrients in freshwater food cycles and nursery grounds and sanctuaries for freshwater fish.

F. The wetlands, watercourses and water bodies in the Town of LaGrange are invaluable resources for aquatic fish and bird habitat, fishing, boating and aesthetic appreciation.

G. The wetlands, watercourses and water bodies in the Town of LaGrange may be endangered by rapid development and the resulting degradation caused by the following:

(1) Siltation resulting from surface runoff from construction sites, road, bridge and pipeline construction and lack of erosion control on steep slopes.

(2) Pollution by road salt, chemical pollution from parking lot and tennis court runoff.

(3) Pollution by garbage, litter and refuse.

(4) Potential pollution, thermal, chemical and bacteriological, from numerous approved or planned residential sewage treatment plants.

(5) Reduction in flow of watercourses due to destruction of wetlands and lowering of the water table due to the rapid increase in water demands of residential development.

§ 124-5. Definitions.

As used in this chapter, the following terms shall have the meanings indicated:

AGRICULTURAL ACTIVITY — The activity of an individual farmer or other landowner in grazing and watering livestock, making reasonable use of water resources for agricultural purposes, harvesting the natural products of wetlands, selective harvesting of trees, but excluding peat mining. Agricultural activity does not include clear-cutting of trees, filling or deposition of spoil, soil mining or draining of wetlands for growing agricultural products or for other purposes.

APPLICANT — Any person who files an application for any permit issued by the approval authority pursuant to this chapter; applicants may include owners, the agent of the owner, or a contract vendee.

APPROVAL AUTHORITY — The administrative board or public official empowered to grant or deny permits under this chapter. The approval authority shall be empowered to require posting of bonds, as necessary, and to revoke or suspend a permit where lack of compliance is established. The approval authority shall be the Planning Board of the Town of LaGrange.**[Amended 5-10-2000 by L.L. No. 4-2000]**

BOARD — The Freshwater Wetlands Appeal Board established under Article 14 of the New York Environmental Conservation Law.

BUFFER AREA — Protective areas surrounding or adjacent to wetlands, watercourses or water bodies that are subject to regulation. The size or extent of the buffer areas are defined under "wetland/watercourse/water body buffer" in this section.

CLEAR-CUTTING — Any cutting of more than 30% of trees four inches or more in diameter at breast height (4.5 feet) over any ten-year cutting cycle as determined on the basis of wetland area per lot or group of lots under single ownership, including cutting of trees which results in the total removal of one or more naturally occurring species, whether or not the cut meets or exceeds the 30% threshold.

CONSERVATION ADVISORY COUNCIL (CAC) — The duly appointed Conservation Advisory Council of the Town of LaGrange.

DEPOSIT — To fill, grade, discharge, emit, dump or place any material.

DISCHARGE — The emission of any water, substance or material into a wetland, watercourse or water body or their buffers, whether or not such substance causes pollution.

DOMINANT(S) or DOMINANCE — A dominant species is either the dominant plant species (i.e., the only species dominating a vegetative unit) or a codominant species (i.e., when two or more species dominate a vegetative unit). The measures of spatial extent are percent area cover for all vegetation units other than trees and basal area for trees. In this chapter, dominance refers to the spatial extent of a vegetative species because spatial extent is directly measurable or discernible in the field.

DRAIN — To deplete or empty of water by drawing off by degrees or in increments.

DREDGE — To excavate or remove sediment, sand, soil, mud, shells, gravel or other aggregate.

ECOLOGIST/BOTANIST — A person having special knowledge by reason of education or experience of the physical, chemical and biological sciences related to the physiology, identification and distribution of native plants and vegetative associations in wetland and upland systems and of methods to describe, classify and delineate vegetative species.

FACULTATIVE SPECIES — Vegetative species that can occur in both wetland and upland systems. There are three subcategories of facultative species: facultative wetland, straight facultative and facultative upland. Under natural conditions a facultative wetland species is usually (estimated probability 67% to 99%) found in wetlands, but occasionally in uplands. A straight facultative species has basically a similar likelihood (estimated probability of 34% to 66%) of occurring in both wetlands and uplands. A facultative upland species is usually (estimated probability 67% to 99%) found in uplands, but occasionally in wetlands. Facultative species for the Northeast are listed in the "National List of Plant Species That Occur in Wetlands, New York State; 1988," or as amended and updated.

FLAGGING — Placement of visible markers at the wetland boundary which, upon the approval of the Town, may be transferred by a qualified surveyor onto the site plan or other project map.

GRADING — To adjust the degree of inclination of the natural contours of the land, including leveling, smoothing and other modification of the natural land surface.

HYDRIC SOIL — A soil that is saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions in its upper portions and as further defined under "wetland" in this section.

HYDROPHYTIC VEGETATION — Plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content and as further defined under "wetland" in this section.

MUNICIPALITY — The Town of LaGrange.

MUNSELL SOIL COLOR CHART — A soil color designation system that specifies the relative degree of the three simple variables of color: hue, value and chroma, produced by the Kollmorgen Corporation, 1975, or as amended and updated.

OBLIGATE UPLAND SPECIES — Plant species that, under natural conditions, always occur in uplands (i.e., 99% of the time).

OBLIGATE WETLAND SPECIES — Plant species that, under natural conditions, always occur in wetlands (i.e., greater than 99% of the time).

ORGANIC SOILS/HISTOSOILS — A taxonomic order composed of organic soils (mostly peats and mucks) that have organic materials in over half the upper 32 inches unless the depth to rock or to fragmental materials is less than 32 inches (a rare condition) or the bulk density is very low, and as further defined under "wetland" in this section.

PERMIT or WETLANDS/WATERCOURSE/WATER BODY PERMIT — That form of written Town approval required by this chapter for the conduct of a regulated activity.

PERSON — Any corporation, firm, partnership, association, trust or estate; one or more individuals and any unit of government agency or subdivision thereof.

PLANNING BOARD — The duly appointed Planning Board of the Town of LaGrange.

POLLUTION — The presence of conditions or contaminants in quantities which are, or may be, injurious to humans, plants, animals or property.

PROJECT — Any collection of actions which may result in direct or indirect physical or chemical impact on a freshwater wetland, wetland buffer, watercourse or water body, including but not limited to a regulated activity.

REGULATED ACTIVITY — Those activities to be conducted in wetlands, wetland buffers, watercourses or water bodies that require a permit from the Town.

SELECTIVE CUTTING — The annual or periodic removal of trees, individually or in small group, in order to realize the yield and establish a new crop and to improve the forest which removal does not involve the total elimination of one or more species of trees.

SOIL SCIENTIST — A person having special knowledge by reason of education or experience of the physical, chemical and biological sciences applicable to the genesis and morphology of soils as natural bodies and of the methods to describe, classify and map soil units.

STATE AGENCY — Any department, bureau, commission, board or other agency or public authority of the State of New York.

STATE ENVIRONMENTAL QUALITY REVIEW ACT (SEQRA) — The law promulgated at Article 8 of the New York State Environmental Conservation

Law, and the regulations promulgated thereunder by the Commissioner of the Department of Environmental Conservation.

STRUCTURE — Anything constructed or erected, the use of which requires location on or within the ground or attachment to something having location on the ground, including but not limited to buildings, tennis courts, swimming pools, as examples.

SUBDIVISION OF LAND — The division of any parcel of land into two or more lots in accordance with the provisions of Chapter 203 of the Town Code of the Town of LaGrange.

TOWN — Town of LaGrange.

TOWN BOARD — The duly elected Town Board of the Town of LaGrange.

TOWN CLERK — The duly elected Town Clerk of the Town of Lagrange.

TOWN ENGINEER — Any person or firm designated by or contracted by the Town of LaGrange as Town Engineer.

WATER BODY — Any natural or artificial pond, lake, reservoir or other area which ordinarily contains water, has a discernible shoreline and an area of one acre or more, but not including a watercourse as defined in this chapter.

WATERCOURSE — A running stream of water; a natural stream fed from permanent or natural sources, including rivers, creeks, runs and rivulets. There must be a stream, generally flowing in a definite channel, having a bed or banks and usually discharging itself into some other stream or body of water. It must be something other than mere surface drainage over the entire face of a tract of land, occasioned by unusual freshets or other extraordinary causes.

WETLAND — Any area which meets one or more of the following criteria:

A. Lands and waters that meet the definition provided in § 24-0107.1 of the New York State Environmental Conservation Law, "Freshwater Wetlands Act," or as amended and updated. The approximate boundaries of such lands and waters are indicated on the official wetlands map promulgated by the Commissioner of the New York State Department of Environmental Conservation, or as amended and updated. **[Amended 6-26-2002 by L.L. No. 6-2002]**

B. All areas of one acre or more in area that comprise hydric soils and/or are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and under normal conditions do support, a prevalence of hydrophytic vegetation as defined by the Federal Interagency Committee for Wetlands Delineation, 1989, in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands, Washington, DC, and adopted by the US Army Corps of Engineers, US Environmental Protection Agency, and the US Fish and Wildlife Service, or as amended and updated. Hydric soils referenced above shall include the soil types taken from the revised Dutchess County Soil Survey Series, 1991, or such revised, updated and adjusted soil surveys as may be completed.

WETLAND ADMINISTRATOR — An official(s) designated to enforce this chapter.**[Amended 11-14-2012 by L.L. No. 6-2012]**

WETLAND DELINEATION —

A. The process of determining wetlands and their boundaries. The boundaries of a wetland shall ordinarily be determined by field investigation, flagging and survey. Identification of the general location of wetlands shall be aided by reference to:

  (1) The Freshwater Wetlands Map filed with the Clerk of the Town of LaGrange by the New York State Department of Environmental Conservation, as amended and updated; and

  (2) The Soils Map of Dutchess County — Soil Survey Series 1991, or as from time to time updated; and

  (3) Other maps such as the 1990 US Fish and Wildlife Service Map which may assist in the location and delineation of wetlands.

B. Wetlands not depicted on any such maps are not thereby exempted from regulation under the provisions of this chapter.

WETLAND HYDROLOGY — The sum total of wetness characteristics in areas that are inundated or have saturated soils for a sufficient duration to support hydrophytic vegetation.

WETLAND PLANTS OF THE STATE OF NEW YORK — The list of obligate and facultative wetland and upland species developed by the United States Department of Interior, Fish and Wildlife Service, "National List of Plant Species that Occur in Wetlands, New York State: 1988," in cooperation with the National and Regional Wetland Plant List Review Panels, or as amended and updated.

WETLAND/WATERCOURSE/WATER BODY BUFFER — The wetland/watercourse/water body buffer areas surrounding or adjacent to a wetland, watercourse or water body are also subject to regulation. The size and extent of the buffers shall be as follows:

A. For wetlands and water bodies of at least one acre but less than two acres, the buffer shall be 50 feet. For wetlands and water bodies of at least two acres but less than three acres, the buffer shall be 75 feet. For wetlands of three acres and more, the buffer shall be 100 feet. The buffers cited above may be greater where designated by either the Commissioner of the DEC or local approval authority. The buffers shall be measured horizontally and away from and paralleling the wetland or water body boundary.

B. The buffer for certain watercourses shall be as described in § 240-31B(1), (2), (3) and (4) of Chapter 240, Zoning, of the Town Code of the Town of LaGrange, to wit, buffer zones of 200 feet on either side of the center lines of Wappingers, Sprout and Jackson Creeks, and such other tributaries as the Town Board may designate.

C. For all other watercourses, the buffer zone shall extend to a minimum of 20 feet to either side to the bank of the stream.

ZONING ADMINISTRATOR — The duly appointed Zoning Administrator of the Town of LaGrange.

§ 124-6. Rules for establishing and interpreting wetland boundaries.

The boundaries of a wetland ordinarily shall be determined by field investigation. Flagging and subsequent survey by a licensed land surveyor may be required by the approval authority. The approval authority may consult and/or may require the applicants to consult with approved biologists, hydrologists, soil scientists, ecologists, botanists, legal counsel, engineers, or other experts necessary to make this determination.

§ 124-7. Permitted, regulated and prohibited activities.

A. Regulated activities are not prohibited by this chapter, but no regulated activity shall be conducted in a wetland, watercourse or water body, nor the adjacent buffer zones, without a written permit from the approval authority and full compliance with the terms of this chapter.

B. Permitted activities. No permit is required for the following activities within a wetland, watercourse or water body nor adjacent buffer zones, provided they do not constitute a pollution or erosion hazard or interfere with proper drainage; and do not require structures, grading, fill, draining or dredging for which a permit may be required:

(1) Normal ground maintenance including mowing, trimming of vegetation, but excluding removal of vegetation that may cause erosion of sediment into a wetland, watercourse or water body.

(2) Repair of existing decorative landscaping and planting in a wetland, watercourse or water body buffer zones.

(3) Repair of existing walkways, walls and driveways.

(4) Public health activities, in emergencies only, of the Dutchess County Department of Health and/or New York State Department of Health.

(5) Operation of existing dams and water control devices.

(6) The activities of farmers in grazing and watering livestock to the extent that such grazing and watering does not cause erosion of sediment into a watercourse, making reasonable use of water resources, harvesting natural products of wetlands and wetland buffers, but excluding clear-cutting of timber and draining of wetlands.

C. Regulated activities that require a wetlands/watercourse/water body permit. Except as provided in § 124-7B of this chapter, a written permit issued by the approval authority is required for any of the following activities in any wetland, watercourse, water body or buffer area:

(1) Any form of draining, dredging, excavation or removal of soil, mud, sand, shells, gravel or other aggregate from any wetland, watercourse, water body or buffer area, either directly or indirectly.

(2) Any form of dumping, filling or depositing of any soil, stones, sand, gravel, mud, rubbish or fill of any kind, either directly or indirectly.

(3) Erecting any structures or roads, the driving of pilings or placing of any other obstructions, whether or not changing the ebb and flow of the water.

(4) Any form of pollution, including but not limited to installing a septic tank, running a sewer outfall or discharging sewage treatment effluent or any other wastes directly into or so as to drain into a wetland, watercourse or water body.

(5) Installation of any pipes, wells, service lines and cable conduits.

(6) Alteration and modification of natural drainage patterns and contours.

(7) Construction of docks, pilings, bridges, dams or other water control devices whether or not they change the natural drainage characteristics.

(8) Any other activity which impairs any of the several functions served by freshwater wetlands, watercourses, water bodies and buffer areas or the benefits derived therefrom as set forth in § 124-4 of this chapter.

D. Prohibited activities. It shall be unlawful for any person to place or deposit chemical wastes or to introduce influents of sufficiently high thermal content as to cause deleterious ecological effects in any wetland, watercourse, water body or buffer area.

§ 124-8. Procedures for permits. [Amended 5-10-2000 by L.L. No. 4-2000]

The issuance of permits for regulated activities under this chapter shall be the responsibility of the Planning Board, which shall be referred all permit applications deemed to be complete by the Zoning Administrator. Applications for permits for regulated activities shall be filed with the Zoning Administrator.

§ 124-9. Permit procedure. [Amended 5-10-2000 by L.L. No. 4-2000]

A. No person shall undertake, permit, conduct or cause to be conducted a regulated activity in a wetland, watercourse, water body or buffer area without applying for and obtaining a written permit as provided for in this chapter.

B. Application procedure; preapplication consultation. The applicant, prior to filing an application for a permit under the provisions of this chapter, will consult with the Zoning Administrator on the compliance requirements related to wetlands, watercourses and water bodies as well as application procedures for the Town of LaGrange. The applicant shall describe the general nature of the proposed project as it relates to this chapter.

C. Application for a wetlands/watercourse/water body permit.

(1) The applicant shall file with the Wetlands Administrator an application, in such form and with such information as the approval authority shall prescribe along with the required application fee. The application fee shall be in an amount as set forth on the prevailing fee schedule adopted by resolution of the Town Board and as such schedule is modified from time to time by resolution of the Town Board. At a minimum, the following information shall be required: **[Amended 7-22-2009 by L.L. No. 2-2009]**

(a) A written explanation of why the proposed activity cannot be located at another site, i.e., out of the wetland, watercourse, water body or buffer areas.

(b) Applications affecting the water retention capacity, water flow, or other drainage characteristics of any wetland, watercourse or water body shall include a statement of the impact of the project on upstream and downstream areas giving appropriate consideration to flood and drought levels and the amount of rainfall.

(c) A map showing all wetlands, watercourses, water bodies and buffer areas on the site under review and within 200 feet of the site boundaries.

(d) A description of the vegetative cover of the area, including dominant species.

(e) A description of the soil types on the site.

(f) Where creation of a lake or pond is proposed, details of the construction of any dams, embankments, outlets or other water control devices and an analysis of the wetland hydrologic system including seasonal water fluctuation, inflow/outflow calculations and subsurface soil, geology and groundwater conditions.

(g) An environmental assessment form under SEQRA.

(2) Additional information. The approval authority may require additional information in order to make a determination on the

application. Additional information may include, but shall not be limited to, a schedule and sequence of proposed activities and the type of equipment to be used, the study of flood, erosion and other hazards at the site, and any other information deemed necessary to evaluate the proposed use in terms of the standards of this chapter.

(3) Filings shall be maintained on file in the office of the Zoning Administrator.

D. Transmittal of the application. Upon completion of the application, the approval authority shall transmit a copy of the application to:

(1) The Conservation Advisory Council; and

(2) In the case of a regulated activity within 500 feet of the Town line on a watercourse that crosses a Town line, or any regulated activity on a wetland that crosses the Town line, to the clerk of the abutting Town.

E. Public hearings. A public hearing shall be conducted upon public notice published in the Town's official newspaper and posted in a conspicuous place at the LaGrange Town Hall, each to occur at least 10 days before the date designated for the public hearing.

§ 124-10. Standards for permit decisions.

In granting or denying or conditioning any application for a permit, the approval authority shall consider the following:

A. All evidence offered at any public hearing.

B. Any reports from other environmental councils, boards or commissions and/or federal, county, state or Town agencies.

C. The environmental impact of the proposed action.

D. Irreversible and irretrievable commitments of natural resources that would be involved in the proposed activity.

E. The suitability or unsuitability of the activity to the area for which it is proposed.

F. The effect of the proposed activity to the protection or enhancements of functions of wetlands, watercourses and water bodies and the benefits they provide as set forth in § 124-4 of this chapter.

G. The possibility of avoiding further reduction of the wetlands', watercourses', or water bodies' natural capacity to support desirable biological life, prevent flooding, supply water, control sedimentation, prevent erosion, assimilate wastes, facilitate drainage and provide recreation and open space.

H. The extent to which the exercise of property rights and the public benefit to be derived from such use may or may not outweigh or justify the possible degradation of the wetland, watercourse or water body, the interference with the exercise of other property rights and the impairment or endangerment of public health, safety and welfare.

I. Whether the property is grandfathered by virtue of approvals predating the adoption of Article 24 of the Environmental Conservation Law, and the extent to which it might be deemed unfair or unreasonable to regulate wetlands under this chapter to limit development which is accordingly grandfathered from state regulation. **[Added 5-10-2000 by L.L. No. 4-2000]**

J. The comments of the Zoning Administrator, which shall be submitted in writing to the Planning Board. **[Added 5-10-2000 by L.L. No. 4-2000]**

§ 124-11. Findings.

A. Permits will be issued by the approval authority pursuant to this chapter only if the approval authority shall find that:

(1) The proposed regulated activity is consistent with the policy of this chapter to preserve, protect and conserve wetland, watercourse and water body functions and the benefits derived therefrom.

(2) The permit issued for the proposed regulated activity is at least as restrictive as would result under application of the Freshwater Wetlands Act of the State of New York.[1]

(3) The proposed activity is compatible with the public health and welfare.

(4) The proposed regulated activity cannot practicably be relocated on site to eliminate or reduce the intrusion into the wetland, watercourse or water body or the buffer areas adjacent thereto.

(5) The proposed regulated activity minimizes the degradation to, or loss of, any part of the wetland, watercourse or water body buffer and minimizes the adverse effects on the benefits of wetlands, watercourses and water bodies as set forth in § 124-4 of this chapter.

(6) The proposed regulated activities are in compliance with the standards set forth in 6 NYCRR 665.7(e) and 665.7(g), or as amended and updated.

B. The applicant shall have the burden of proof in demonstrating that the proposed activity will be in accordance with the policies and provisions of this chapter.

1. Editor's Note: See Environmental Conservation Law § 24-0501 et seq.

§ 124-12. Permit conditions.

Any permit issued pursuant to this chapter may be issued with conditions to assure the preservation and protection of affected wetlands, watercourses and water bodies, and compliance with the policy and provisions of this chapter.

§ 124-13. Effect of other laws and regulations.

No permit granted pursuant to this chapter shall remove an applicant's obligation to also comply in all respects with the applicable provisions of any other federal, state or local laws or regulations, including but not limited to, the acquisition of any other permit or approval.

§ 124-14. Expiration of permit.

A. All wetland/watercourse/water body permits shall expire upon completion of the activities specified and, unless otherwise indicated, shall be valid for a period of one year from the date of issue. No original permit granted pursuant to this ordinance shall be valid for a period longer than three years from the date of issue. The approval authority may extend the time in which the activities specified in the permit must be completed if, in its opinion, such extension is warranted by the particular circumstances thereof for not to exceed two additional periods of 90 days each. A request for extension shall be made in writing to the approval authority at least 30 days prior to the expiration date of the original permit, or the first ninety-day extension.

B. Should a permittee fail to complete the activities specified in the permit prior to the expiration of the second ninety-day extension, the original permit shall become null and void and a new permit must be applied for. The request for a new permit shall follow the same form and procedure as the original application except that the approval authority shall have the option of not holding a hearing if the original intent of the permit is not altered or extended in a significant way.

C. Notice of change of ownership of the parcel covered by the permit must be filed with the Zoning Administrator within 30 days of the transfer. This shall be a condition attached to all permits issued under this chapter.

§ 124-15. Violations; penalties for offenses. [Amended 11-14-2012 by L.L. No. 6-2012]

A. Violations.

   (1) Unless exempted under § 124-7B, it shall be unlawful to conduct any regulated activity, as described in § 124-7C, in a wetland, watercourse, water body or buffer area without a permit issued pursuant to this chapter.

(2) It shall be unlawful to conduct a prohibited activity, as described in § 124-7D, in a wetland, watercourse, water body or buffer area.

(3) It shall be unlawful to conduct any activity in a wetland, watercourse, water body or buffer area in a manner which deviates from an approved wetlands permit unless previously approved, in writing, by the approval authority who issued the permit.

B. Penalties for offenses.

(1) Any violation of this chapter is an offense punishable by:

(a) A fine not exceeding $1,000 or imprisonment for a period not to exceed 15 days, or both, for conviction of a first offense;

(b) A fine of not less than $1,000 nor more than $5,000 or imprisonment for a period not to exceed 15 days, or both, for conviction of a second offense, both of which offenses were committed within a period of five years; and

(c) A fine of not less than $2,000 nor more than $15,000 or imprisonment for a period not to exceed 15 days, or both, upon conviction of a third or subsequent offense, all of which offenses were committed within a period of five years.

(2) Each day that a violation continues shall constitute a separate offense.

§ 124-16. Enforcement.

A. This chapter shall be enforced by the Town Administrator of Public Works, the Building Inspector or Deputy Building Inspector(s), or such other officials as may be designated by resolution of the Town Board. All enforcement officials designated under this section shall have the authority to issue appearance tickets under Article 150 of the Criminal Procedure Law of this state for purposes of enforcement of this chapter. **[Amended 11-14-2012 by L.L. No. 6-2012]**

B. The Town is specifically empowered to seek injunctive relief restraining any violation, threatened violation or breach of any permit condition under the provisions of this chapter, and/or to compel the restoration of the affected wetland, watercourse, water body or buffer to its condition prior to the violation, or breach of any permit condition. If the Town is successful in obtaining preliminary and/or permanent injunctive relief, it shall be entitled to an award by the court of its reasonable attorney's fees.

§ 124-17. Severability; consultant fees.

In order to carry out the purposes and provisions of this chapter, and in addition to the provisions specified elsewhere in this chapter, the following general provisions shall apply:

A. Severability. The provisions and sections of this chapter shall be deemed to be severable and the invalidity of any portion of this chapter by a court of competent jurisdiction shall not affect the validity of the remainder of this chapter.

B. The applicant, and the owner of the property which is the subject of an application for a permit under this chapter, shall be responsible for the actual consultant fees incurred by the Town in the review of the application, and the provisions of § 240-88 of the LaGrange Town Code shall apply procedurally and substantively to define this responsibility.

Chapter 240 – Zoning

(§240-31, Preservation Overlay Districts; §240-35, Town Center Design Standards; §240-39, Design Standards for Commercial (C) and General Business Districts, §240-65 Automotive Repair and Gasoline Filling Stations, & §240 Attachment A1, A2)

§ 240-31. Preservation Overlay Zones.

A. General provisions.

(1) The Town of LaGrange declares that the protection of its stream corridors, groundwater resources, historic resources, scenic areas, important farmlands, hilltops, and ridgelines is an important public purpose and that, to the extent practicable, future development of the Town should minimize intrusive alteration of or construction in these areas.

(2) In furtherance of this objective, the Town hereby creates the overlay zones herein which regulate the use of these areas of public importance. The restrictions applicable in these zones are supplementary to, and do not replace, the underlying use and bulk regulations in each zoning district. If there is any conflict between the requirements of the overlay zone and the zoning district, the more restrictive requirement shall apply.

(3) In considering any special permit, project development plan or subdivision plan, the Planning Board shall, to the maximum extent practicable, maintain the areas delineated in all overlay zones except the Groundwater Protection Overlay Zone as perpetual open space, directing allowable development into those areas not mapped as overlay zones. In the case of the Ridgeline Protection Overlay Zone, applicants are encouraged to site projects off of the viewable areas on ridgetops and hilltops, out of sight lines from the valleys, and below the tree canopy.

(4) The Town Board may adopt and revise from time to time, as a supplement to the Zoning Map, an overlay zone map or maps delineating the zones established herein. One or more of the overlay zones herein may also be placed on the Zoning Map itself. The provisions of this section shall take effect only if, as and when each overlay zone created herein has been referred to a specific map.

(5) In the event of uncertainty as to the exact boundaries of any overlay zone, the Zoning Board of Appeals shall interpret this chapter by designating the exact boundary pursuant to the criteria established below for creating each overlay zone.

B. Stream Corridor Overlay Zone.

(1) Purpose. The protection of stream corridors is essential to the maintenance of water quality. It is, therefore, necessary to create a buffer zone to protect these stream corridors from

development encroachment, erosion, and water pollution from surface or subsurface runoff.

(2) Boundaries. The Stream Corridor Overlay Zone shall consist of all lands lying within 200 feet on either side of the center line of Wappinger Creek, Jackson Creek, Sprout Creek, and such other stream and tributaries as may be designated by the Town Board. Where these creeks are split into two or more channels by islands, the district shall include such islands, and zone boundaries shall be measured from the center lines of the outer channels.

(3) Restrictions. The Stream Corridor Overlay Zone strictly limits activities within the delineated corridors. Within this zone, no construction, filling, excavation, clearing of mature trees, grading or other alteration of the natural landscape shall be permitted except by special permit. No application of fertilizers, pesticides, or herbicides or dumping or disposal of any materials shall be permitted except by special permit.

(4) The Planning Board may issue a special permit to allow one or more activities restricted in Subsection B(3) above if the Board finds that:

(a) The restrictions in Subsection B(3) are unreasonable as applied to a particular parcel; and

(b) The restrictions in Subsection B(3) are an unreasonable economic burden upon the owner; and

(c) The granting of such special permit, with appropriate conditions attached, will not result in erosion or stream pollution from surface or subsurface runoff.

(5) When considering the standards for the issuance of a special permit, as required by Subsection B(4)(a) through (c) above, the Planning Board shall consider the following facts:

(a) The use of the parcel;

(b) The natural topography of the parcel; and/or

(c) That the restricted activity may be necessary to protect health and safety (for example, a rotting tree that is in danger of falling).

C. Farmland Preservation Overlay Zone.

(1) Purpose. It is in the interest of the Town to protect the best agricultural lands from development in order to maintain their availability for productive use. The Town therefore seeks to channel development away from such farmland and to permit sufficient flexibility in its zoning to maintain agriculture as a viable industry in the Town.

(2) Boundaries. The Farmland Preservation Overlay Zone shall consist of those farmlands designated as Class I or Class II by the Soil Conservation Service of the United States Department of Agriculture which have been determined by the Town Board to be of special significance to the Town and have been specifically identified on a map adopted by the Town Board.

(3) Procedure.

(a) Any site plan or subdivision plan that includes the subdivision or development of mapped farmlands shall, to the maximum extent practicable, designate such farmlands as perpetual open space.

(b) The Planning Board shall require an applicant for subdivision to cluster lots, insofar as practical, on those portions of a tract of land lying outside this overlay zone. An applicant who is able to place 80% or more of such farmland lying on his tract in perpetual open space, dedicated to agricultural use, shall be entitled to a density bonus of 40% above the number of residential units that would be permitted using a standard plan as defined in § 240-32A(34)(a). In order to achieve this density bonus, an applicant may be permitted to construct multifamily housing, provided that he complies with all provisions of § 240-51 and that adequate buffer between residential and agricultural uses is provided to minimize conflicts between agricultural and residential uses.

(c) In considering any project development plan application, the Planning Board shall require that structures and impermeable surfaces be located, insofar as practical, on those portions of a tract of land lying outside this overlay zone.

(4) Special use permit for auxiliary uses. Notwithstanding any other provision of this chapter, the owner of a bona fide commercial farming operation may request a special use permit to allow uses not permitted in the underlying Zoning

use district if such uses would contribute to the economic viability of the farming operation without detracting from the rural character of the surrounding area. Such uses would include, without limitation, construction, reconstruction and reuse of farm buildings for agriculturally related light industry, farm labor housing and roadside stands for sale of products that include locally grown or processed products.

D. Historic Overlay Zone.

(1) Purpose. The Town wishes to preserve its historic sites, lands, places, areas, structures, buildings, features and landmarks by channeling intensive new development away from those historic areas and onto lands that do not have historic significance. Where development occurs in these sensitive areas, the Town wishes to assure that such development is consistent with maintaining the existing character of such areas.

(2) Boundaries. In furtherance of this purpose, the Town has conducted a historic resource survey that specifically identifies historic resources worthy of preservation. At such time as the Town Board approves a map identifying historic resources based on this survey, those locations identified on that map shall be protected by the provisions of this section. The specific area to be protected shall include all lands within 500 feet of any identified historic resource which are visible from that resource. Visibility shall be determined when there are no leaves on the trees.

(3) No structure or building shall be constructed, altered, repaired, moved or demolished in a Historic Overlay Zone unless a certificate of approval is issued pursuant to the requirements of this section.

(4) Duties and powers of the Planning Board.

(a) In addition to any and all other powers possessed by the Planning Board, the Planning Board shall have the following powers and duties:

[1] To recommend to the Town Board the addition of any historic resource to the map described in Subsection D(2), above.

[2] To review and determine applications for a certificate of approval.

[3] To require all structures and buildings proposed to be built on property that includes land within a Historic Overlay Zone to be sited and clustered in such a way as to avoid occupying lands in the Historic Overlay Zone.

[4] To require, as a condition of approval, the execution of a perpetual historic conservation easement to assure the maintenance of the historic character of the site.

(b) The certificate of approval required by this section shall be in addition to, and not in lieu of, any building or other permit or approval that may be required by any ordinance, local law, code, rule or regulation of the Town of LaGrange.

(c) In reviewing the plans, the Planning Board shall give consideration to the following criteria:

[1] The compatibility of the proposed construction, repair, alteration, movement or demolition with the historical significance of the neighboring properties and the Historic Overlay Zone as a whole. In applying the principle of compatibility, the Planning Board shall consider the following factors:

[a] The general design, character and appropriateness of the proposed construction, repair, alteration, movement or demolition.

[b] The scale of the proposed construction, repair, alteration, movement or demolition in relation to the property itself and neighboring properties.

[c] The texture, materials and color of the proposed construction, repair, or alteration and its relation to similar features of other properties in the neighborhood.

[2] The visual compatibility of the proposed construction, repair, alteration, movement or demolition with the Historic Overlay Zone's existing buildings, structures, special character and general appearance in regard to style, material, scale, location, proposition, composition, mass, line, detail, setback, landscaping and related items.

[3] Any other factors relating to historical or aesthetic considerations which are deemed pertinent to the benefit of the Historic Overlay Zone.

(5) Procedure.

(a) Application for a certificate of approval shall be made to the Planning Board in such form and providing such information as may be required by the Planning Board.

(b) An application for a certificate of approval which is not part of a site plan shall be made to the Planning Board, which shall approve, approve with modifications or deny the application within 62 days of the receipt of the completed application.

(c) If an application for a certificate of approval is part of a site plan, the application shall be made to the Planning Board simultaneously with the site plan application. The application shall be reviewed by the Planning Board simultaneously with the Board's review of the site plan. When the application for a certificate of approval is part of a site plan, the Planning Board shall approve, approve with modifications or deny the application at the same time it is required to render a decision on the site plan application pursuant to New York State Town Law and the Town Code of the Town of LaGrange.

(d) No building permit shall be issued for such proposed work covered by this section until a certificate of approval to perform the proposed construction, alteration, movement or demolition has been issued by the Planning Board.

(e) Any person aggrieved by a decision of the Planning Board under this section shall have the right to appeal the decision of the Planning Board within 30 days after the decision of the Planning Board is filed in the office of the Town Clerk.

(6) Nothing in this section shall be construed to prevent the ordinary maintenance and repair of any exterior architectural feature of property within a Historic Overlay Zone which does not involve a change in design, material or outward appearance.

(7) Application fees. A nonrefundable filing and administration fee shall accompany all applications for a certificate of

approval as specified in the fee schedule adopted by the Town Board of the Town of LaGrange, which is on file with the Town Clerk's office.

(8) Applicants for a certificate of approval are responsible for the actual cost of all engineering, legal and consulting fees incurred by the Town for the review of the application, as provided in § 240-88 of the Town Code.

(9) Penalties for offenses. Violations of this section are subject to the enforcement penalties provided by § 240-86 of the Town Code.

E. Scenic Overlay Zone.

(1) Purpose. The Town wishes to preserve the views from its roadways and public recreation areas by channeling intensive new development away from those areas and onto lands that do not have scenic significance. Where development occurs in these sensitive areas, the Town wishes to assure that such development is consistent with maintaining the existing character of such scenic areas.

(2) Boundaries. At such time as the Town Board approves a map identifying scenic resources, those locations identified on that map shall be protected by the provisions of this section. The specific area to be protected shall include all lands visible within 1,200 feet of public viewing areas specifically identified on the map. Visibility shall be determined when there are no leaves on the trees.

(3) Procedure.

(a) No new structures, including single-family homes, or major exterior modifications of existing structures may be constructed within a Scenic Overlay Zone without first obtaining site plan approval from the Planning Board.

(b) To the extent practicable, all structures to be built on a tract of land that includes land within a Scenic Overlay Zone shall be sited and clustered on their tracts in such a way as to avoid occupying or obstructing views of lands in the overlay zone. Any structures to be built within the Scenic Overlay Zone shall be reviewed for architectural compatibility with the existing landscape and surrounding architectural styles, and the Planning Board must find that such structures will not detract from the scenic character of the area. The Planning Board may require, as a condition of approval, the execution of a perpetual scenic conservation easement to assure the protection of the viewshed.

F. Ridgeline Protection Overlay Zone.

(1) Purpose. It is the purpose of this overlay zone to protect the aesthetic, scenic, and ecological character and nature of the higher-elevation areas. Ridgelines and hilltops are exceptional aesthetic and ecological resources, and ensuring that tree lines are uninterrupted and ridgetops are free from visually instrusive man-made structures will prevent the degradation of the rural character and scenic beauty of the Town. This overlay zone provides standards for regulating the numbers, height, design, placement, and impacts of any structures on hilltops and ridgelines in order to minimize structural intrusions upon the visual landscape, to preserve ecological integrity, and to maintain the rural, rustic character of the Town.

(2) Boundaries. The Ridgeline Protection Overlay Zone shall consist of all lands labeled as "Ridgeline Protection Zones" on the Ridgeline Protection Overlay Zone Map, which is included as part of this section.[1] The method used to determine the boundaries of the Ridgeline Protection Overlay Zone, as shown on the map, is as follows: Any hill with a USGS elevation of 500 feet or higher at the highest point is classified as within a Ridgeline Protection Overlay Zone, the boundary of which zone is 200 feet in elevation below the highest point of the hill.

(3) General provisions.

(a) With the exception of construction of a single-family home and structures accessory thereto on a lot separately and lawfully existing as of the effective date of Town of LaGrange Local Law No. 1 of 1998, any proposed new construction or development within a Ridgeline Protection Overlay Zone, including but not limited to projects involving subdivision of land for purposes of residential development, shall require a special permit from the Planning Board, and such new construction or development shall constitute a Type I action pursuant

1. Editor's Note: The Ridgeline Protection Overlay Zone Map is included in the online version of the Code (eCode 360®). Hard copies of said map may be obtained from the Town Clerk's office.

to the State Environmental Quality Review Act.[2] The application process for development within this area is outlined in § 240-31F(5), Application procedures for ridgeline development special permits, which supplements the procedures and requirements of § 240-71, Standards for special permits, and § 240-72, Project development plans.

(b) Should an applicant request a variance from the regulations in this section, the regulations in §§ 240-72E and/or 240-71, or the relevant bulk and area restrictions of this chapter, the proposed action will be considered a Type I action.

(4) Standards. In preparing its decision concerning any special permit application, the Planning Board shall consider the standards detailed in Article VII, §§ 240-72E and 240-71H, as well as the following:

(a) Lot siting. All structures, access roads, buffers, setbacks, fences, and all other facility appurtenances shall be located on one lot and shall not straddle a boundary line.

(b) Height. The total height of proposed buildings, structures and/or accessory elements of buildings and structures shall not extend more than 35 feet above ground level. The total height of any building, structure or accessory element shall be measured as defined generally within § 240-26O and P of this chapter.

(c) Lighting. The location, height, design, arrangement and intensity of outside lighting shall minimize glare and shall be directed and shaded such that light shall not be directed off the site. Residential and nonresidential structures may be lit to the minimum extent required to provide safe ingress and egress to the structure, and the applicant shall demonstrate compliance with the governing regulations.

(d) Clearing. The maximum area permitted to be cleared shall be no more than 50 feet in extent from the outer edge of the primary structure's footprint. During construction and installation of facilities and structures, only the minimum amount of existing vegetation shall be cleared.

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2. Editor's Note: See Environmental Conservation Law § 8-0101 et seq.

(e) Buffer strip. A buffer strip is required to minimize, to the maximum extent possible, any visual impacts of the proposed freestanding facilities.

[1] The buffer shall be a minimum of 25 feet wide and shall begin at the outer edge of the cleared area. The buffer strip shall contain, or be planted with, vegetation of sufficient height and density as determined by the Planning Board.

[2] The buffer strip shall be free of any man-made structures, including but not limited to fences, facilities, and roads.

(f) Setbacks. The proposed yard setbacks from the property line must be no less than 1.5 times the height of the proposed structure or the setback requirements in the existing zoning regulations, whichever are greater.

(g) In cases where a special permit is sought in furtherance of a clustered open space subdivision of land for residential purposes, under § 240-32 of this chapter, the Planning Board shall have the authority to modify the standards set forth above in Subsection F(4)(d), (e) and (f) of this section. The Planning Board shall consider the following criteria in determining whether to, and the extent to which it will, modify those standards:

[1] The extent to which the proposed clustered improvements are to be located outside the Ridgeline Protection Overlay Zone.

[2] The extent to which the proposed area of open space exceeds the minimum open space requirements of § 240-32A(7)(e)[5].

[3] The extent to which proposed areas of open space are situated within the Ridgeline Protection Overlay Zone.

[4] The extent to which improvements clustered on Ridgeline Protection Overlay Zone portions of the project, or related physical disturbances of the land, are visible from, or shielded from, external viewing points and/or the extent to which existing tree lines remain uninterrupted on portions of the project within the Ridgeline Protection Overlay Zone.

(h) For noncluster conventional single-family residential development within a Ridgeline Protection Overlay Zone, the Planning Board shall have the discretion to modify the maximum clearing distance set forth in Subsection F(4)(d) of this section to the minimum extent necessary to accommodate an individual in-ground septic system.

(5) Application procedures for ridgeline development special permits. When applying for a special permit for ridgeline development, the applicant shall follow all procedures and shall submit all forms, plans, documentation, and fees required by Article VII, § 240-71D, Application and referral; § 240-71G, Required plan; and § 240-72C, Application procedures. In addition, applicants shall meet with a representative of the Zoning Department prior to submitting a formal application for a proposed development within the Ridgeline Protection Overlay Zone. The purpose of the preapplication meeting is for the applicant to disclose to the representative of the Zoning Department the specific location and nature of the proposed development. **[Amended 7-22-2009 by L.L. No. 2-2009]**

(6) Submittal requirements. An application for development in an area designated as a Ridgeline Protection Overlay Zone shall be complete and in a form acceptable to the Planning Board and shall contain the following:

(a) A SEQRA full environmental assessment form (Parts I, II, III).

(b) For residential subdivisions, a full buildout plan of the site, including building envelopes, lot lines, clearing limits, and accessory structures.

(c) A visual analysis, the methodology of which is to be approved by the Planning Board prior to the commencement of this analysis.

(d) Identification of and remediation plans for proposed landscaping and buffer screening areas.

(e) Additional information as requested by the Planning Board and/or the Town Zoning Administrator.

(7) Duration of special use permits. For residential structures, the special permit will not require renewal. For nonresidential structures, the special permit will expire after

two years from date of issue. If construction does not begin with within one year of the date of issue of the special permit, the permit shall expire.

(8) Alterations. All modifications to a structure shall require that the applicant submit a new special use permit application to the Planning Board. The following exceptions do not require a new special use permit but shall require a building permit:

(a) Increasing the originally approved size of any structure's building footprint a maximum of 250 square feet; and

(b) Increasing the originally approved height of the structure by a maximum of 10 feet.

(9) Renewal of special use permits.

(a) Renewal must not be unreasonably withheld if the applicant is in conformance with the original approval and all conditions attached thereto.

(b) No less than 60 days prior to the expiration of a special use permit, the holder of the special use permit must submit to the Zoning Administrator a renewal application for a special use permit. If the holder fails to submit the application within the sixty-day period, and has not arranged with the Zoning Administrator for an extension of the sixty-day period the special use permit will expire. The renewal application shall contain the following:

[1] A current, updated buildout plan.

[2] A special use permit renewal application.

[3] Clear and convincing proof of the continued necessity for the structure.

[4] Other materials or information deemed necessary by the Zoning Administrator.

(c) Within 45 days of the submission of a completed application and a determination by the Zoning Administrator that the application is technically sufficient, the Zoning Administrator shall act to renew or revoke the special use permit. A copy of the Administrator's decision shall be filed in the offices of the Town Clerk, Zoning Administrator and mailed to the applicant.

(10) Structure removal. If a special permit has been revoked per § 240-71L of this chapter or has expired, all nonresidential structures and improvements shall be removed.

G. Groundwater Protection Overlay Zone.

(1) Purpose. The Groundwater Protection Overlay Zone is intended to protect the public health, safety, and general welfare by preserving and maintaining the quality and quantity of the Town's major groundwater resources in order to ensure an adequate and safe potable water supply for present and future residents, employees, and the general public. One of the primary groundwater quality threats in residential areas comes from wastewater releases from septic systems, which can degrade groundwater and well water quality if placed at densities that do not allow sufficient ground area for wastewater dilution. The designation of a Groundwater Protection Overlay Zone and the establishment of density standards based on the underlying aquifer characteristics will further the preservation of groundwater resources quality for public or private water supply.

(2) Boundaries.

(a) The Groundwater Protection Overlay Zone consists of all designated areas as shown on the Groundwater Protection Overlay Zone Map, which is included by reference as part of this section and which is on file at the Town Hall.[3] There are distinct, delineated areas included within the District which are defined based on the characteristics of the surficial geology underlying the Town according to data presented in the 1989 Surficial Geology Map Sheet prepared by the New York State Geological Survey and New York State Museum, the existence of public water and sewer in the area, and the underlying zoning of the area. As public water and sewer districts are enlarged or established within the Town, the boundaries of said map may be changed.

(b) In the event that the boundaries of this Groundwater Protection Overlay Zone are in doubt or in dispute, the burden of proof shall be upon the owner(s) of the land in question to show where the boundaries should properly

3. Editor's Note: The Groundwater Protection Overlay Zone Map is included in the online version of the Code (eCode 360®). Hard copies of said map may be obtained from the Town Clerk's office.

be located. The Town may engage a qualified hydrogeologist, soil scientist, or registered professional engineer to review analysis performed by an owner's agent to determine the location of the Groundwater Protection Overlay Zone boundary, and the Town shall charge the owner(s) for the cost of such review. The Zoning Board shall determine any and all disputes regarding the location of the Groundwater Protection Overlay Zone boundaries.

(3) Applicability. The provisions of § 240-31G shall apply to all new development and uses within the Groundwater Protection Overlay Zone as identified on the Groundwater Protection Overlay Zone Map;[4] however, only the general provisions in Subsection G(4) below shall apply to new development and uses in those areas that are served by both public water and sewer. The term "served by both public water and sewer" shall mean the owner has received all required regulatory approvals to establish public water and sewer districts, and/or has agreed to connect to the existing public water and sewer districts, and the Town or respective water and/or sewer district has agreed to provide sufficient system capacity in order to serve the proposed development. Lawful development and uses located within the Groundwater Protection Overlay Zone existing as of the effective date of the local law adding this Subsection G to this chapter are not subject to this subsection and shall be considered lawfully nonconforming. Alteration of lawfully nonconforming uses and buildings shall be subject to the requirements of § 240-29, Nonconformity.

(4) General provisions. The following conditions shall apply to all land in the Groundwater Protection Overlay Zone:

(a) The installation of any underground fuel tank or tanks whose combined capacity is less than 1,100 gallons is prohibited. (The installation of underground fuel tanks with a combined capacity of 1,100 gallons or more requires a permit from the New York State Department of Environmental Conservation.)

(b) Farm animal wastes shall not be concentrated and stored in one area except where provisions have been made to

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4. Editor's Note: The Groundwater Protection Overlay Zone Map is included in the online version of the Code (eCode 360®). Hard copies of said map may be obtained from the Town Clerk's office.

prevent seepage of said animal wastes into groundwater. Suitable storage facilities, such as those having a concrete liner or other impervious lining material, are required when it is not possible to spread or dispense of wastes on a daily basis. Animal waste storage facilities shall be located as far from water wells as is practical.

(c) All bulk storage of artificial fertilizers for agricultural or commercial use must be within a completely enclosed building or structure that will prevent any seepage and runoff. Fertilizer storage facilities shall be located as far from water wells as is practical.

(d) New septic systems within the Groundwater Protection Overlay Zone shall be located a minimum of 400 feet from any public water system wellhead.

(5) Residential density regulations. The following standards apply to all land in the Groundwater Protection Overlay Zone where use of wells and/or septic systems is proposed:

(a) In areas mapped on the Groundwater Protection Overlay Zone Map[5] as sand and gravels (outwash or kame) with higher rates of aquifer recharge (18 inches of aquifer recharge annually), the maximum residential density shall be one unit per 40,000 square feet.

(b) In all other aquifer areas on the Groundwater Protection Overlay Zone Map, the maximum residential density shall be one unit per 120,000 square feet.

(c) With the exception of the maximum density established in Subsection G(5)(a) and (b), and the general provisions in Subsection G(4) above, which are intended to provide for groundwater protection, all other standards of the underlying zoning district of a site shall remain unchanged and shall correspond with the standards listed within the Schedule of Bulk Regulations and Coverage Limitations.

(6) The Planning Board may issue a special permit to allow one or more activities restricted in Subsection G(4) above if the Board finds that:

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5. Editor's Note: The Groundwater Protection Overlay Zone Map is included in the online version of the Code (eCode 360®). Hard copies of said map may be obtained from the Town Clerk's office.

(a) The restrictions in Subsection G(4) are unreasonable as applied to a particular parcel; and

(b) The restrictions in Subsection G(4) are an unreasonable economic burden upon the owner; and

(c) The granting of such special permit, with appropriate conditions attached, will not result in pollution of groundwater.

(7) When considering the standards for the issuance of a special permit, as required by Subsection G(4)(a) through (c) above, the Planning Board shall consider the following facts:

(a) The use of the parcel;

(b) The natural topography of the parcel; and/or

(c) That the restricted activity may be necessary to protect health and safety (for example, a rotting tree that is in danger of falling).

§ 240-35. Town Center design standards. [Amended 9-10-2014 by L.L. No. 4-2014]

A. Purpose.

(1) The Town Center Business (TCB) District and the Town Center Residential (TCR) District in Freedom Plains are intended to implement the goals and objectives of the Town of LaGrange Comprehensive Plan adopted in 2005 and the Town Center Illustrative Plan (the Illustrative Plan) adopted in 2003 as part of the Comprehensive Plan. The Illustrative Plan is not a mandatory design plan; rather, it is intended to serve as a template for the application of specified design principles in order to achieve a desired form and appearance of development.

(2) The general design pattern for the Town Center is to create walkable, highly integrated, multifunctional public and private spaces, through a network of connected streets, sidewalks, and uses. Structures in the TCB District are generally to have two to three stories, with retail on the ground floor and office or residential uses above. The TCR District provides for higher-density residential development and selected uses compatible with residential streets in the immediate area surrounding the TCB District.

(3) The provisions of this section, when in conflict, shall take precedence over other sections of the Zoning Law.

B. Design principles: Town Center Business (TCB). Design principles for this district are shown in the Illustrative Plan. The primary objective of the TCB District is to create a traditional main street area. New buildings should relate to a traditional main street design as well as enhance the positive qualities that currently exist. Specifically, the design principles for the TCB District are to:

(1) Establish a coordinated image for the Town Center.

(2) Bring buildings up toward the sidewalk and street edge.

(3) Promote a mix of commercial and residential uses in multistory buildings.

(4) Promote the prominent positioning of civic buildings and central green spaces in order to enhance community identity and public interaction.

(5) Promote pedestrian activity through a safe and walkable environment.

(6) Create narrow, tree-lined streets to slow traffic.

(7) Minimize the visual impact of the automobile by managing the placement and screening/landscaping of parking areas.

(8) Create an interconnected street system for both pedestrian and vehicular traffic.

(9) Encourage the development of both on-street parking and shared parking areas between nearby uses.

(10) Provide multiple housing options.

(11) Protect important natural and historic features.

C. Design principles: Town Center Residential (TCR). Design principles for this district are shown in the Illustrative Plan. The primary objective of the TCR District is to create a traditional neighborhood development. New buildings and street layouts should relate to a traditional neighborhood design as well as enhance the positive qualities that currently exist. Specifically, the design principles for the TCR District are to:

(1) Establish a coordinated image for the Town Center.

(2) Provide a variety of housing options.

(3) Promote pedestrian activity through a safe and walkable environment.

(4) Create narrow, tree-lined streets to slow traffic.

(5) Promote the prominent positioning of civic buildings and central green spaces in order to enhance community identity and public interaction.

(6) Create an interconnected street system for both pedestrian and vehicular traffic.

(7) Protect important natural and historic features.

D. Location of TCB and TCR. As per § 240-22, the location of the TCB and TCR Districts is shown on the map entitled "Zoning Map of the Town of LaGrange," adopted by the Town Board.

E. TCB and TCR Schedule of Permitted Uses. The schedule of permitted uses and specially permitted uses for the TCB and TCR Districts is found in § 240-27, Schedules A1, A2 and A3, Permitted Uses and Special Permit Uses.[6]

F. Bulk requirements for TCB and TCR. The bulk requirements for the TCB and TCR Districts are found in § 240-28, Schedules B1 and B2, Schedules of Bulk Regulations and Coverage Limitations, Residential and Nonresidential, and Schedule B3, Schedule of Bulk Regulations and Coverage Limitations for TCB, and Schedule B4, Schedule of Bulk Regulations and Coverage Limitations for TCR.[7]

G. Planning Board review of projects in TCB and TCR.

(1) The design standards of this section are intended to provide guidance to the Planning Board in its review of projects within the TCB and TCR Districts. It is the intent of these standards to provide the Planning Board and applicants with guidance as to favored forms and principles of site design.

(2) The following terms have meanings as follows:

(a) The word "shall" means the standard is mandatory;

6. Editor's Note: Schedules A1, A2 and A3 are attached to this chapter as Appendix A.

7. Editor's Note: Schedules B1 through B4 are attached to this chapter as Appendix B.

(b) The words "should" or "may" mean the standard is recommended, and its application is optional at the discretion of the Planning Board.

(3) The Planning Board is empowered to require a mix of uses in any development project. Further, the Planning Board is empowered to require that a development be phased to ensure the required mix of uses is implemented. Applicants are encouraged to meet with the Planning Board prior to an application to discuss concepts, clarify procedures, and coordinate all applicable zoning in this chapter.

(4) The Planning Board may modify those standards that are mandatory upon written finding that such modification is warranted. Circumstances that may warrant modification of any mandatory standard include, but are not limited to, physical constraints such as the location of existing buildings or changes in grade between adjacent properties.

(5) In reviewing any proposed modification of a mandatory standard, the Planning Board shall consider whether granting the modification will be consistent with the purpose of this section, the Comprehensive Plan, and the design principles in § 240-35B and C.

H. Design standards. The TCB District encourages a mixture of retail uses, restaurants, services, workplaces, entertainment and civic facilities, and moderate- to high-density housing in a compact pattern that balances automobile access with strong pedestrian elements to create a walkable environment. The TCR District encourages complete traditional neighborhoods with a diverse range of dwelling types, such as single- and two-family houses, attached townhouses, and condominium or apartments mixed together for a moderate- to high-density compact pattern of development that balances automobile access with strong pedestrian elements to create a walkable environment. The following are the specified standards for the TCB and TCR Districts:

(1) Streetscape standards.

(a) Street standards.

[1] The design and construction of streets within the TCB District should be consistent with the TCB street standards as shown in Figure 1.[8]

[a] "Commercial town center street" should be defined as streets within the TCB District and will exclude Route 55.

[2] The design of streets within the TCR District should be consistent with the TCR street standards as shown in Figure 2.[9]

[a] "Residential collector streets" should be defined as streets within the TCR District providing access between the TCB District and any of the following roads: Lauer Road, Todd Hill Road, and/or Stringham Road.

[b] "Residential access streets" should be defined as streets within the TCR District providing primarily residential access to a residential collector street.

[c] "Residential rear lane" should be defined as a secondary means of access to the rear of residences generally to the property abutting along its length. The residential rear lane will provide access to garages and accessory structures.

[3] Intersections should be at right angles whenever possible.

[4] New streets should connect to existing streets and use a block system to avoid dead ends whenever practicable.

(b) Blocks and lots.

[1] Street layouts should provide for a variety of block and lot sizes. Blocks should be generally in the range of 200 to 400 feet deep by 400 to 800 feet long, to create shorter walking distances and help diffuse traffic on multiple access routes. Blocks exceeding 600 feet should have a rear lane access or a pedestrian right-of-way for midblock access.

[2] Multiple buildings and uses are permitted on a lot in the TCB District.

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8. Editor's Note: Figure 1 is included at the end of this chapter.

9. Editor's Note: Figure 2 is included at the end of this chapter.

[3] Multiple buildings are permitted on a lot in the TCR District.

[4] In order to facilitate fewer curb cuts, shared driveways should be used for access to parking lots behind buildings.

[5] Residential rear access lanes should be used for access to garages and parking lots behind buildings.

(c) Sidewalks.

[1] Sidewalks in the TCB District should be consistent with the TCB street standards as shown in Figure 1.[10] All sidewalks should be ADA compliant.

[2] Sidewalks in the TCR District should be consistent with the TCR Street Standards as shown in Figure 2.[11] All sidewalks should be ADA compliant.

[3] Restaurants may be permitted to operate outdoor cafes in front of and on public sidewalks as long as at least seven feet are maintained free for sidewalk passage.

[4] A retail business may be permitted to have a temporary sidewalk display of store merchandise on up to 25% of its sidewalk frontage.

(d) Landscaping.

[1] A landscaped area shall be provided along both sides of all streets within the TCB District. The landscaped area shall be consistent with the TCB street standards shown in Figure 1.[12] Within the landscaped area, one shade tree (minimum of three-inch caliper diameter at four feet in height) should be provided per every 25 to 30 linear feet.

[2] Landscaped areas shall be provided along both sides of streets, as shown in the TCR street standards.[13] The landscaped area shall be consistent with the TCR street standards as shown in Figure 2. Within the

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10. Editor's Note: Figure 1 is included at the end of this chapter.

11. Editor's Note: Figure 2 is included at the end of this chapter.

12. Editor's Note: Figure 1 is included at the end of this chapter.

13. Editor's Note: The TCR street standards, provided in Figure 2, are included at the end of this chapter.

landscaped area, one shade tree (minimum of three-inch caliper at four feet in height) should be provided per every 30 to 40 linear feet.

[3] Street trees should be tolerant of urban conditions, especially salt and sand deposited with snow removal. Mulched tree wells should be placed around the base of each tree for protection and moisture retention.

[4] Shrubbery shall be no higher than four feet above existing street grades, nor shall any tree with foliage extend below 10 feet above the established street grades. All landscaping (trees, shrubs, planted beds) shall be maintained within 20 feet of any street intersection or 10 feet of driveway/street intersections. This restriction is for the purposes of maintaining visibility at all times.

[5] Where parking lots and drives abut the landscaped strip along the street right-of-way, evergreen shrubs and/or a three-foot stone wall, as approved by the Planning Board, should be provided for screening. The screening should be a plant species that is a minimum of three feet high and a maximum of six feet high and extend along the entire street frontage of the parking lot, exclusive of driveways and visibility lines.

[6] Visibility. Street-level landscaping shall not interfere with visibility and safety.

[7] Street trees are a major means of providing a pedestrian amenity as well as visual coherence. Property owners shall have responsibility for planting and maintaining trees along street frontage(s) within the Town's right-of-way.

[8] Maintenance of landscaping within the Town's right-of-way shall be the responsibility of the property owner.

(e) Lighting. Streetlights and other lighting shall be 10 to 15 feet in height. Lighting shall be metal halide or other full-spectrum fixture and should avoid illumination above the horizontal level into the night sky. All exterior lights shall be designed and located in such a manner as to prevent objectionable light and glare to spill across property lines.

(f) Furniture and waste receptacles. Street furniture and waste receptacles approved by the Planning Board should be provided along street frontages.

(g) On-street parking.

[1] On-street parking arrangements within 500 feet of each new building are strongly encouraged along TCB commercial streets, as illustrated in the TCB street standards. See Figure 1.[14]

[2] On-street parking shall be permitted along residential collector and access streets, as illustrated in the TCR street standards. See Figure 2.[15]

[3] On-street parking along and adjacent to the property frontage may apply toward the minimum parking requirements.

(2) Site standards.

(a) TCB site development.

[1] Connections between the parking lots to the rear and the main retail frontage are desirable. Wherever practical, through-store passages should be provided.

[2] The frequency of store entrances along commercial Town Center streets is important in maintaining retail continuity and viability. In new buildings, a maximum distance of 60 feet between individual store entrances is encouraged.

[3] Two- or three-story buildings are required for the entire TCB District. Larger-scale, single-use facilities (conference spaces, theaters, supermarkets or department stores, for example) shall occur behind smaller-scale buildings or storefronts with pedestrian orientation and may be one story with a two-story facade.

[4] The ground floor should reinforce retail continuity along specified street frontages within the TCB

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14. Editor's Note: Figure 1 is included at the end of this chapter.

15. Editor's Note: Figure 2 is included at the end of this chapter.

District (see the Illustrative Plan). Second stories and above may be used for a mix of residential, commercial, and/or office space.

[5] Buildings should be brought up toward the right-of-way line, consistent with the TCB street standards as shown in Figure 1 for the TCB District.[16]

[6] Balconies, bay windows and cornice features, open porches, canvas-type awnings, and projecting signs may encroach up to six feet into the front setback or up to six feet over the sidewalk area above seven feet six inches.

[7] The Planning Board may waive height and setback requirements for landmark civic buildings, including government buildings, churches, schools, or libraries, and for pedestrian-oriented places such as plazas or outdoor eating areas.

[8] Drive-through service facilities are not permitted for restaurants, fast-food restaurants, or the retail sale and distribution to vehicle occupants of food or beverage as either a primary or subordinate commercial activity. **[Amended 1-11-2012 by L.L. No. 1-2012; 4-9-2014 by L.L. No. 2-2014]**

[9] Gas station pump canopies shall be located to the rear of the building.

(b) TCR site development.

[1] A variety of housing types from single-family houses on lots of 6,000 square feet to 10,000 square feet to attached townhouses and apartments are permitted, with an overall density of up to 12 dwelling units per acre.

[2] Side yard and rear yard setbacks for garages or accessory structures shall be a minimum of six feet.

[3] Access to driveways and garages should be from the rear access drive. Any lot with a front driveway shall recess the garage 20 feet from the front building line.

16.Editor's Note: Figure 1 is included at the end of this chapter.

[4] Balconies, bay windows, cornice features, and/or open porches may encroach up to six feet into the front setback for the TCR District.

[5] Residential units should be located toward Route 55 to preserve the more rural qualities and open fields facing Lauer Road and Todd Hill Road, as shown on the Illustrative Plan.

(c) Parking.

[1] Parking lots and garages shall be located to the rear of a building wherever possible, and access to parking and garages should be from a rear access lane.

[2] Shared driveways should be used to access parking lots behind buildings and facilitate fewer curb cuts. Shared driveways and/or entrances for ingress and egress access between neighboring buildings and parking lots is strongly encouraged for the TCB District.

[3] Interior parking lot landscaping. Interior parking lots shall be landscaped in accordance with the off-street parking, loading and driveway standards (§ 240-42E) as determined necessary by the Planning Board.

[4] Exterior parking lot landscaping. A landscaped strip should be provided around the perimeter of parking lots, exclusive of driveways. The landscaped strip should be a minimum of five feet wide.

[5] Each parking space shall be nine feet wide and 18 feet long, except handicap-accessible spaces that are to be eight feet by 20 feet parking along with the required side aisle space (five feet). Back-up and maneuvering aisles between rows of parking spaces shall be at least 24 feet wide, except where the Planning Board approves a lesser dimension as adequate to serve parking spaces arranged at less than a ninety-degree angle or landscaped area.

[6] The Planning Board may, at its sole discretion, approve the joint use of a parking facility and allow a reduction in the parking requirement of up to 30% for two or more principal buildings or uses, either on the same, adjacent, or nearby parcels, where it is clearly

demonstrated that the reduction in spaces and shared use of the parking facility will substantially meet the intent of the parking requirements by reason of variation in time of use by patrons or employees among such establishments (offset peak parking demand). There shall be a covenant on the separate parcel or lot guaranteeing the maintenance of the required off-street parking facilities during the existence of the principal use. Such covenant shall be:

[a] Executed by the owner of said lot or parcel of land and by all other parties having beneficial use of, or some other legal interest in, the property, such as, but not limited to, a collateral or security interest;

[b] Enforceable by any of the parties having shared beneficial use of the facility; and

[c] Enforceable against the owner, the parties having beneficial use, and their heirs, successors and assigns.

[7] Parking spaces shall not exceed minimum requirements unless clearly justified by parking generation data submitted by the applicant.

[8] Minimum off-street parking space requirements are found in § 240-35H(2)(c)[9] and § 240-42J. The Planning Board shall interpret these requirements in light of the design purposes of the Town Center Districts, and may reduce parking space requirements based on shared parking or availability of on-street parking. For single-family dwellings, garage parking spaces may be counted toward required parking spaces, provided that a homeowners' association's (HOA) restrictions, or other community restrictions, require the continued availability of such spaces for parking. **[Amended 8-27-2008 by L.L. No. 7-2008]**

[9] Minimum off-street parking space requirements apply to the following uses within the TCB District; all other uses within the TCB District apply to the parking requirements found in § 240-42J: **[Amended 8-27-2008 by L.L. No. 7-2008]**

Use	Minimum Off-Street Parking Spaces
Retail or service business	1 for each 275 square feet of gross floor area
Restaurant	1 for each 250 square feet of gross floor area
Office for business or professional use	1 for each 275 square feet of gross floor area
Apartments within a mixed-use building	1.65 spaces per unit
Carriage units	1 space per unit
Hotel	1 per key

[10] Waiver of improvement. Where the authority approving a site plan or special permit application determines that less than the required number of parking spaces will satisfy the intent of this chapter, said Board may waive the requirement in part, but not in excess of 50% of the number required according to this section. In all cases, it shall be expressly demonstrated on the site plan that sufficient space remains for the provision of the total amount of off-street parking required, and the site plan shall bear such designation. All such undeveloped parking space shall be used and maintained as additional landscaped grounds until required for parking. Written guarantees shall be submitted by the applicant for the eventual improvement of any such spaces that may have been waived; these spaces must be constructed by the property owner within six months of the date of written notice to the property owner by the Planning Board that such spaces have been determined as necessary and must be constructed. Written guarantees and proposed designs of future parking shall be shown on the site plan.

(d) Landscaping.

[1] Landscaping should be designed to avoid existing overhead or underground utility lines. Where the location of existing overhead or underground utility lines conflicts with the required landscaping strip and

tree planting, the Planning Board may approve an alternate plan.

[2] Required landscaping shall be permanently maintained in a healthy growing condition at all times. The property owner is responsible for regular weeding, the mowing of grass, irrigating, fertilizing, pruning, and other permanent maintenance of all plantings as needed.

[3] Site trees should be no smaller than three-inch caliper diameter at four feet in height. Density of site trees shall be at the discretion of the Planning Board as determined necessary.

(e) Lighting.

[1] All exterior lights shall be designed and located in such a manner as to prevent objectionable light and glare to spill across property lines.

[2] Exterior lighting should be architecturally compatible with the building style, material, and colors. Cutoff fixtures are preferred over cobra-type light fixtures and directional floodlights.

[3] Streetlights and other lights shall be 10 to 15 feet in height, except pole lights in parking lots, which shall be a maximum of 20 feet high.

(f) Loading areas. Loading and delivery areas may be shared between nearby uses and shall be determined by the Planning Board on a case-by-case basis.

(g) Mechanical equipment, garbage containers, and electrical transformers. Mechanical equipment, garbage containers, and electrical transformers should be concealed from public view on all sides by architectural elements and/or landscaping satisfactory to the Planning Board's approval.

(h) Fencing and walls.

[1] The design of fences and walls should be compatible with the architecture of the principal building(s) and should use similar materials.

[2] All fences or walls 50 feet in length or longer, and four feet in height or taller, should be designed to

minimize visual monotony by changing plane, height, material, or material texture, or significant landscape massing.

[3] Chain link fencing is discouraged.

(i) Utilities.

[1] Site design is predicated on connection to central water and central sewer with improvements built by the private developer. If access to central sewer is not immediately available, the project should still be consistent with Town Center principles and standards to accommodate a later connection to a central sewer system.

[2] All new utilities shall be underground.

(j) Open space. Where appropriate and practical, new development should create public open spaces and should maintain existing public open space.

(3) Architectural standards.

(a) The architectural standards are intended for buildings that are compatible with the design standards in § 240-35H(3). Design compatibility includes complementary building style, form, size, color, materials, and detailing. In reviewing projects, the Planning Board shall consider each of the following principal features contributing to the identity of buildings within the TCB and TCR Districts:

[1] Size: the relationship of the project to the site.

[2] Scale: the relationship of the building to those around it.

[3] Massing: the relationship of the building's various parts to each other.

[4] Fenestration: the placement of windows and doors.

[5] Rhythm: the relationship of fenestration, recesses, and projections.

[6] Setback: the relation of a building setback to its immediate surroundings.

[7] Materials: their compatibility with other buildings constructed under the Town Center standards in the Town Center District.

[8] Context: the overall relationship of the project to its surroundings.

(b) The following architectural design concepts are encouraged:

[1] Street-level continuity of shopfronts.

[2] Street-level expression line, visually tying together the retail base and separating the upper stories.

[3] Diversity of architectural design should be encouraged.

[4] Multiple buildings on the same lot should be designed to create a cohesive visual relationship between the buildings.

[5] Blank wall areas and long, uninterrupted rooflines shall be avoided and should exhibit more detail and elements appropriate for close-range pedestrian view. Building surfaces over 50 feet in length should be relieved with changes of wall plane (i.e., recesses and projections) that provide strong visual interest.

[6] All sides of a building may have an impact on its surroundings and should be considered for treatment with an architectural finish. Architectural features, materials, windows, and articulation of a facade of a building should be continued on all sides visible from a street or public parking areas.

[7] Exterior building materials on the primary structure should not include smooth-faced concrete block, tilt-up concrete panels, or prefabricated steel panels, highly reflective, shiny, or mirrorlike materials, mill-finish (noncolored) aluminum metal windows or door frames; exposed, unfinished foundation walls; exposed plywood or particle board; and unplastered, exposed concrete masonry blocks.

[8] Facade colors should be low-reflectance colors. High-intensity colors, metallic colors, black, or fluorescent

colors should not be used. Building trim and accent areas may feature brighter colors.

[9] Building colors should be carefully chosen so that each building's color complements that of its neighbors.

[10] The scale of a building should be compatible with the surrounding buildings.

[11] Pitched roofs with gables/dormers or symmetrically shaped parapet roofs are encouraged.

[12] Consideration should be given to the height of the cornice line or other expression lines.

[13] The use of canvas-type awnings on buildings is recommended to provide protection from sun, wind, and rain and to improve the aesthetics of the building exterior.

[14] Existing structures, if deemed historic or architecturally significant, should be protected from demolition or incompatible adjacent development.

(c) Finish materials should include:

[1] Facades:

[a] Brick.

[b] Stone.

[c] Stucco.

[d] Wood.

[e] Wood shingles.

[f] Fiber cement siding.

[2] Roofs:

[a] Pitched.

[b] Shingles, wood, imitation wood asphalt.

[c] Metal, aluminum (Kynar), copper, terne, zinc (standing seam or batten seam).

[d] Architectural-style asphalt shingles.

[3] Windows:

[a] Windows should be greater in height than width or at least of equal proportion.

[b] Mirrored, reflective, or darkly tinted glass, all-glass walls, or exterior roll-down security gates shall not be permitted.

§ 240-39. Design standards for Commercial (C) and General Business (GB) Districts. [Amended 10-24-2007 by L.L. No. 4-2007; 9-10-2014 by L.L. No. 4-2014]

A. Purpose; conflict with other provisions.

(1) The intent of the C District is to provide for the development of traditional, higher-intensity commercial uses that are concentrated in centers rather than in strip developments. The GB District is intended to provide for lower-intensity, smaller-scale neighborhood-oriented development.

(2) The purpose of these design standards for commercial development is to provide positive examples of the forms and patterns of development that are desirable within the C and GB Districts of the Town of LaGrange and consistent with Greenway Design Principles. They are also intended to encourage development that is in keeping with the Town's semirural character and its aesthetic environment.

(3) The provisions of this section, when in conflict, shall take precedence over other sections of the Zoning Law.

B. Design principles: Commercial (C) District. The primary objective of the C District is to create commercial centers with larger-scale uses. New buildings should relate to and enhance the positive qualities that currently exist. Specifically, the design principles for the C District are to:

(1) Locate buildings close to the sidewalk and street edge.

(2) Promote pedestrian activity through a safe and walkable environment.

(3) Minimize the visual impact of the automobile by managing curb cuts and the placement and screening/landscaping of parking areas.

(4) Create an interconnected street system for both pedestrian and vehicular traffic.

(5) Create opportunities for shared and interconnected systems of driveways in instances where these elements can be designed compatible with the uses and when it promotes safe vehicular and pedestrian movement.

(6) Encourage the development of both on-street parking and shared parking areas between nearby uses.

(7) Protect important natural and historic features.

(8) Facilitate transitions and site planning for commercial development so that it is compatible and in context with adjacent zoning districts and residential neighborhoods.

C. Design principles: General Business (GB) District. The primary objective of the GB District is to create smaller-scale, neighborhood-oriented commercial areas. Specifically, the design principles for the GB District are to:

(1) Promote pedestrian activity through a safe and walkable environment.

(2) Promote development on a scale that is consistent with adjacent neighborhood uses.

(3) Create an interconnected street system for both pedestrian and vehicular traffic.

(4) Protect important natural and historic features.

D. Location of C and GB. As per § 240-22, the location of the C and GB Districts is shown on the map entitled "Zoning Map of the Town of LaGrange," adopted by the Town Board.

E. C and GB Schedule of Permitted Uses. The schedule of permitted uses and specially permitted uses for the C and GB Districts is found in § 240-27, in Schedules A1, A2 and A3, Schedules of Permitted Uses and Special Permit Uses.[17]

F. Bulk requirements for C and GB. The bulk requirements for the C and GB Districts are found in § 240-28, Schedule B2, Schedule of Bulk Regulations and Coverage Limitations, Nonresidential.[18]

G. Planning Board review of projects in C and GB.

(1) The design standards of this section are intended to guide the Planning Board in its review of projects within the C and GB

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17. Editor's Note: Schedules A1, A2 and A3 are attached to this chapter as Appendix A.

18. Editor's Note: Schedule B2 is attached to this chapter as part of Appendix B.

Districts and to guide the Planning Board and applicants as to favored forms and principles of site design.

(2) The following terms have meanings as follows:

(a) The word "shall" means the standard is mandatory;

(b) The words "should" or "may" mean the standard is recommended and its application is optional at the discretion of the Planning Board.

(3) The Planning Board may modify those standards that are mandatory upon written finding that such modification is warranted. Circumstances that may warrant modification of any mandatory standard include, but are not limited to, physical constraints such as the location of existing buildings or changes in grade between adjacent properties.

(4) In reviewing any proposed modification of a mandatory standard, the Planning Board shall consider whether granting the modification will be consistent with the purpose of this section, the Comprehensive Plan, and the design principles in § 240-39B and C.

H. Design standards. The C District encourages a mix of retail uses, restaurants, services, workplaces, and entertainment and civic facilities. The GB District encourages a similar mix of commercial and retail uses, in addition to single-family uses, in a nodal form and a more compact pattern than the C District. The following are the specified standards for the C and GB Districts:

(1) Streetscape standards.

(a) Blocks and lots.

[1] Multiple buildings and uses are permitted on a lot in the C and GB Districts.

[2] In order to facilitate fewer curb cuts, shared driveways should be used for access to parking lots behind buildings. Curb cuts should be the minimum width required for safe ingress and egress in order to provide for managed access and egress onto public roads as well as to provide a safe pedestrian environment. Large expanses of street frontage with open, uncurbed lengths should be avoided as it can increase the likelihood of accidents.

[3] Residential rear access lanes should be used for access to garages and parking lots behind buildings.

[4] Pavers or similar hardscape should be utilized at all block corners to enhance the pedestrian environment, increase pedestrian safety, and have a traffic-calming effect. The crosswalk should continue the materials and theme across the street. The role of these physical enhancements is to influence slower vehicle speeds at these locations and to help people perceive that there is a transition in the road, driveway and sidewalk network.

Source: Dutchess County Greenway Connections, Dutchess County Department of Planning and Development.

(b) Sidewalks.

[1] Sidewalks should be at least five feet wide to easily accommodate pedestrians, joggers, and bicyclists and shall be ADA compliant. Sidewalks may be wider to accommodate outdoor seating and cafes.

[2] Restaurants may be permitted to operate outdoor cafes in front of and on public sidewalks as long as at least seven feet are maintained free for sidewalk passage.

[3] A retail business may be permitted to have a temporary sidewalk display of store merchandise on up to 25% of its sidewalk frontage.

(c) Landscaping.

[1] A landscaped area shall be provided along both sides of all streets within the C and GB Districts. Within the landscaped area, one shade tree (minimum of three-inch caliper diameter at four feet in height) should be provided per every 30 linear feet to 35 linear feet.

[2] Street trees are a major means of providing a pedestrian amenity as well as visual coherence. Property owners shall have responsibility for planting

and maintaining trees along street frontage(s) within the Town's right-of-way.

[3] Street trees should be tolerant of salt and sand deposited with snow removal. Mulched tree wells should be placed around the base of each tree for protection and moisture retention.

[4] Street trees should have a canopy that is sufficiently high (at least eight feet) so as not to block views of storefronts, conflict with streetlighting, or inhibit safe sight distances for vehicles at intersections. Street trees should be no smaller than four-inch caliper diameter at four feet in height. Trees should be of a type that does not create droppings, that would mar the sidewalk and parked cars.

[5] Shrubbery shall be no higher than four feet above existing street grades, nor shall any tree with foliage extend below eight feet above the established street grades. It shall be the responsibility of the property owner to maintain all landscaping (trees, shrubs, planted beds) within 20 feet of any street intersection or 10 feet of driveway/street intersections to the above standards. This restriction is for purposes of maintaining visibility at all times.

[6] Where parking lots and drives abut the landscaped strip along the street right-of-way, evergreen shrubs and/or a three-foot stone wall, as approved by the Planning Board, should be provided for screening. The screening should be a plant species that is a minimum of three feet high and a maximum of six feet high and extend along the entire street frontage of the parking lot, exclusive of driveways and visibility lines.

[7] Street-level landscaping shall not interfere with visibility and safety.

[8] Maintenance of landscaping within the Town's right-of-way shall be the responsibility of the property owner.

(d) Lighting. Streetlights and parking lot lights shall be no more than 15 feet in height. Lighting shall be metal halide or other full-spectrum fixture and should avoid illumination above the horizontal level into the night sky. All exterior lights shall be designed and located in such a manner as to prevent objectionable light and glare and to minimize spillage.

(2) Site standards.

(a) Site development.

[1] Connections between the parking lots to the rear and the main retail frontage are desirable. Wherever practical, sidewalks accessed along landscaped alleys and/or access through store passages should be provided.

[2] Building entrances and storefronts should face the main roadway frontage. Additional entrances should be provided if parking is located to the side and/ or rear of the buildings. (As noted below, distinct building architecture and landscaping should help guide and orient users to the main entrances.)

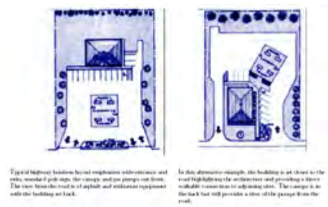
[3] Two- and three-story buildings are encouraged in the Commercial Districts. Depending on the site context, larger-scale, single-use facilities (conference spaces, theaters, supermarkets or department stores, for example) should occur behind smaller-scale (one- or two-story) buildings or storefronts in order to aid the sense of scale of buildings, particularly in relation to the pedestrian.

[4] Second stories and above may be used for a mix of commercial and/or office space.

[5] The Planning Board may waive height and setback requirements for landmark civic buildings, including government buildings, churches, schools, or libraries and for pedestrian-oriented places such as plazas or outdoor eating areas or vest pocket parks, such as where there is seating and landscaping adjacent to sidewalk or open space.

[6] There should be careful consideration of the location of gas station pump canopies on the site. Gas station canopies should be located to the rear of the building whenever possible and shall not exceed 50% of the floor area of the parcel or 2,500 square feet, whichever is less. See the illustration below. Canopies

shall have downward-facing lights and no internally illuminated signage or lettering. As noted in § 240-39H(3), there should also be consideration of the design and treatment of the facades and roofs associated with these structures.



Source: Town of Warwick Design Guidelines, 2002.

(b) Parking.

[1] Parking lots and garages shall be located to the rear of a building wherever possible, and access to parking and garages should be from a rear access lane. Alternatively, there should be an attempt to locate parking in the side yard, such as on corner lots. Parking lots as the terminal vista of an approach should be avoided wherever possible. See the illustration below.

Left: Traditional siting of building and parking lot

Right: Preferred siting of building and parking lot

Source: Dutchess County Greenway Connections, Dutchess County Department of Planning and Development.

[2] Shared driveways should be used to access parking lots behind buildings and to facilitate fewer curb cuts. Shared driveways and/or entrances for ingress and egress access between neighboring buildings and parking lots are strongly encouraged.

[3] Parking lot buffers and landscaping.

[a] For large parking lots (20,000 square feet or larger), a minimum of 10% of the interior of the

parking lot should be landscaped with trees and other plants. Where feasible, large lots should be broken up into smaller sections by use of landscaping and site planning.

Source: Dutchess County Greenway Connections, Dutchess County Department of Planning and Development.

[b] Landscaped planters and tree islands should be located among the parking spaces in a lot. Diagonal islands, such as the one illustrated below, provide aesthetic and shade benefit without resulting in the loss of parking spaces.

Source: Dutchess County Greenway Connections, Dutchess County Department of Planning and Development.

[c] (Reserved)[19]

[d] Curbing around the perimeter of parking areas is encouraged in higher density developments within the C District and said curbing is to be granite or cast concrete curbing.

[4] (Reserved)[20]

[5] Parking lots should not be composed entirely of asphalt. It is strongly encouraged that, to provide visual interest and to reduce water runoff, bricks, pavers, and/or textured surfaces should be used for

19. Editor's Note: Former Subsection H(2)(b)[3][c], regarding landscaped strips around parking lots, was repealed 12-14-2016 by L.L. No. 15-2016.

20. Editor's Note: Former Subsection H(2)(b)[4], regarding dimensions of parking spaces and backup and maneuvering aisles, was repealed 12-14-2016 by L.L. No. 15-2016.

crosswalks and stalls, where possible. Grass block or other pervious landscaping treatment is encouraged for overflow/reserved parking areas.

[6] An area for snow and ice storage should be identified that does not impact vehicle sight lines or the view of a site from public roads.

[7] Joint parking.

[a] Joint parking between uses is encouraged, as it reduces the amount of impervious surface area and is more economical to install and maintain. It also serves to reduce the visual impact of parking lots. Joint parking standards can be found in § 240-42 of the Town Code. **[Amended 12-14-2016 by L.L. No. 15-2016[21]]**

[8] (Reserved)[22]

[9] Minimum off-street parking space requirements are found in § 240-35H(2)(c)[9] and § 240-42J.

[10] Since C and GB Districts have the potential for high levels of impervious coverage, stormwater management practices should ideally be addressed across sites and the use of high-quality landscaping should be integrated with the stormwater management objectives. Specifically, where feasible, stormwater management should be coordinated across sites, and new commercial development or redevelopment may be well-suited for applications of innovative stormwater management technology, such as subsurface stormwater management systems. Similarly, small vegetated and landscaped alternative stormwater quality treatment systems, such as rain gardens or bioretention practices, should also be considered.

[11] (Reserved)[23]

(c) Landscaping.

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21. Editor's Note: This local law also repealed former Subsection H(2)(b)[7][b] through [e].

22. Editor's Note: Former Subsection H(2)(b)[8], regarding minimum requirements for parking spaces, was repealed 12-14-2016 by L.L. No. 15-2016.

23. Editor's Note: Former Subsection H(2)(b)[11], waiver of improvement, was repealed 12-14-2016 by L.L. No. 15-2016.

[1] A landscape plan should be prepared by a qualified professional, such as a landscape architect.

[2] Landscaping should be designed to avoid conflicts with existing overhead or underground utility lines. Where the location of existing overhead or underground utility lines conflicts with the required landscaping strip and tree planting, the Planning Board may approve an alternate plan.

[3] Required landscaping shall be permanently maintained in a healthy growing condition at all times. The property owner is responsible for regular weeding, mowing of grass, irrigating, fertilizing, pruning, and other permanent maintenance of all plantings as needed.

[4] Site trees should be no smaller than three-inch caliper diameter at four feet in height at the time of planting. Density of site trees shall be at the discretion of the Planning Board as determined necessary.

[5] Loading areas shall be screened from view with landscaping, decorative fencing, and/or earthen berms.

[6] Aboveground or in-ground open drainage features, such as swales, catch basins, and detention ponds, should be treated as design elements and as part of the overall site landscaping plan. These features should be modeled after the naturally occurring swales, wetlands, and ponds found throughout the Town.

(d) Lighting.

[1] All exterior lights shall be designed and located in such a manner as to prevent objectionable light and glare to spill across property lines.

[2] Exterior lighting should be architecturally compatible with the building style, material, and colors. Cutoff

fixtures are preferred over cobra-type light fixtures and directional floodlights.

[3] Accent lighting or decorative lighting is encouraged but should be of a low wattage (no more than 100 watts) and should not cast light upward except to light a building facade.

(e) Loading and delivery areas may be shared between nearby uses and shall be determined by the Planning Board on a case-by-case basis.

(f) Mechanical equipment, garbage containers, and electrical transformers, including rooftop installations, should be concealed from public view on all sides by architectural elements and/or landscaping satisfactory to the Planning Board's approval.

(g) Fencing and walls.

[1] The design of fences and walls should be compatible with the architecture of the principal building(s) and should use similar materials. The Planning Board should determine whether a fence is desirable along a public street frontage given surrounding landscape and land use patterns.

[2] All fences or walls 50 feet in length or longer, and four feet in height or taller, should be designed to minimize visual monotony by changing plane, height, material, or material texture or significant landscape massing.

[3] Chain link fencing is discouraged.

(h) Utilities. All new utilities shall be underground.

(i) Open space. Where appropriate and practical, new development should create public open spaces and should maintain and/or relate to existing public open space.

Source: Town of Warwick Design Guidelines, 2002.

(3) Architectural standards.

(a) The architectural standards are intended to provide for design compatibility between new and existing buildings. Design compatibility includes complementary building style, form, size, color, materials, and detailing. In reviewing projects, the Planning Board shall consider each of the following principal features contributing to the identity of buildings within the C and GB Districts and shall determine whether site or building locations warrant special architectural detail:

[1] Size: the relationship of the project to the site.

[2] Scale: the relationship of the building to those around it.

[3] Massing: the relationship of the building's various parts to each other.

[4] Fenestration: the placement of windows and doors.

[5] Rhythm: the relationship of fenestration, recesses, and projections.

[6] Setback: the relation of a building setback to its immediate surroundings.

[7] Materials: their compatibility with other buildings constructed in the Commercial Districts.

[8] Context: the overall relationship of the project to its surroundings.

(b) The following architectural design concepts are encouraged:

[1] Street-level expression line, visually tying together the retail base and separating the upper stories. Entrances and doors shall be defined and articulated by architectural elements compatible with the style, materials, colors and details of a building as a whole. Window fenestration should be compatible with the style, materials, colors and details of a building as a whole.

[2] Diversity of architectural design. Trim and decorative lighting are examples of features that may provide emphasis. Any residential uses should have a porch,

covered portico, or otherwise architecturally defined entrance on the street facade of the building.

[3] Multiple buildings on the same lot should be designed to create a cohesive visual relationship between the buildings.

[4] Blank wall areas and long, uninterrupted rooflines shall be avoided and should exhibit more detail and elements appropriate for close-range pedestrian view. Building surfaces over 50 feet in length should be relieved with changes of wall plane (i.e., recesses and projections) that provide strong visual interest.

[5] Buildings should incorporate visual separation between the lower facade and upper facades, as this creates a strong orientation toward the pedestrian scale. Some design elements that are successful in creating this separation include utilizing canopies, varying textures, varying window patterns, and incorporating storefront cornices.

[6] Buildings should be located to front towards public streets, both functionally and visually (building should not be oriented to front towards a parking lot). There should be special consideration of buildings on the edges of the District which may serve as gateways and which mark a transition. Buildings on corner lots shall be considered significant structures, and there should be consistent architectural treatment on all sides facing public streets. Architectural features, materials, windows, and articulation of a facade of a building should be continued on all sides visible from a street or public parking areas.

[7] Exterior building materials on the primary structure should be durable and of high quality and should not include smooth-faced concrete block, tilt-up concrete panels, or prefabricated steel panels, highly reflective, shiny, or mirror-like materials, mill-finish (noncolored) aluminum metal windows or door frames; exposed, unfinished foundation walls; exposed plywood or particle board; and unplastered, exposed concrete masonry blocks. Facade finish materials should include the following: brick, stone, stucco, wood, wood shingles, and fiber cement siding.

[8] Facade colors should be low-reflectance colors. High-intensity colors, metallic colors, black, or fluorescent colors shall not be used. Building trim and accent areas may feature brighter colors.

[9] Building colors should be carefully chosen so that each building color complements that of its neighbors.

[10]The scale of a building should be compatible with the surrounding buildings.

[11]Pitched roofs with gables/dormers or symmetrically shaped parapet roofs are encouraged to provide visual interest to buildings. Considerations should be given to the height of cornice line or other expression lines. Minimum pitch should be 6/12, and flat roofs should be avoided. See the illustration below.

Source: Town of Warwick Design Guidelines, 2002.

[12]Roof design should be functional and in keeping with the scale and character of the building and surroundings. Roofs should not make up more than 50% of the visible facade area of the building.

[13]The use of canvas-type awnings on buildings is recommended to provide protection from sun, wind, and rain and to improve the aesthetics of the building exterior.

[14]Existing structures, if deemed historic or architecturally significant, should be protected from demolition or incompatible adjacent development.

[15]Windows should be greater in height than width or at least of equal proportion. Mirrored, reflective, or darkly tinted glass, all-glass walls, or exterior roll-down security gates shall not be permitted.

[16]First-floor windows and display signs should create a sense of transparency on the ground floor of the building. Signage on windows may be appropriate in

some instances but should be limited as it can detract from the sense of transparency and the identity of a district.

(c) Architectural standards applicable to gas stations. The following guidelines are encouraged in gas station uses:

[1] Gas stations should have an overall architectural theme. Separate structures on the site (canopy, cashier booth, carwash, etc.) must have consistent architectural detail and design elements to provide a cohesive project site.

[2] The canopy must incorporate design elements that are found on the main building, including color, roof pitch, and materials. The canopy must not act as an attention-getting device. Canopy support poles must incorporate decorative corbels consistent with the overall theme of the site or pole covers 18 inches or wider with similar surface material and architectural treatments as the dominant masonry material on the main structure.

(4) Signage standards. The purpose of this subsection is to provide standards for signage. The standards are in addition to, but override in the event of inconsistency, the regulations for signs found in § 240-43, Signs. The following standards are intended to assist the Planning Board in improving the quality of signage in the C and GB Districts:

(a) Signs should be compatible with surroundings and appropriate to the architectural character of the buildings on which they are placed.

Source: Dutchess County Greenway Connections, Dutchess County Department of Planning and Development.

§ 240-65. Automotive repair and gasoline filling stations.

Gasoline filling stations and establishments for motor vehicle repairing shall conform to the following special standards:

A. The lot on which a gasoline filling station is located shall have an area of not less than 20,000 square feet and a frontage of not less than 150 feet on a street right-of-way line.

B. All pumps and lubricating and other dispensing devices shall not extend within less than 50 feet of any property line, 40 feet of any street right-of-way line, nor 20 feet of any building on the lot.

C. All motor fuel shall be stored in underground tanks, and such tanks shall be located not less than 35 feet from any property line or street right-of-way line. Facilities shall be provided to prevent corrosion of underground tanks and piping in order to prevent release of flammable substances. Plans for such corrosion control facilities shall be prepared by a competent corrosion engineer, and the details of such plans shall be included with the site plan. All vents and fill pipes for underground storage tanks shall be located at least 20 feet from any building. **[Amended 5-23-2018 by L.L. No. 6-2018]**

D. Outdoor storage and display of accessories may be permitted in areas where they do not constitute a safety hazard to pedestrians or vehicles entering or leaving the filling station. There shall be no display or storage of motor vehicles, trailers, boats or farm equipment unless permitted in the district and approved by the Planning Board.

E. Adjacent to residential districts (RFD, RMD, RLD and TCR), the area required for setback from a property line shall be provided with fences, walls, embankments or evergreen shrubs or trees, to a height of at least six feet, so as to screen the filling station from adjoining property. **[Amended 9-10-2014 by L.L. No. 4-2014]**

F. All repair work, lubricating work and service work shall be performed indoors. All vehicles awaiting repair shall be stored indoors or within a screen enclosure conforming to the setback required for buildings.

G. No filling station shall be located within 500 feet of the property line of any school, playground, place of public assembly, surface water, drainage channel, or environmentally sensitive area such as wetlands or aquifer recharge areas. No site plan shall be approved unless the Planning Board finds that the proposal contains adequate safeguards to prevent pollution of surface water or groundwater. **[Amended 5-23-2018 by L.L. No. 6-2018]**

H. Retail sales of nonautomotive items and of automotive items not installed in automobiles on the premises shall require additional approval of the Planning Board pursuant to § 240-72.

240 Attachment A1

APPENDIX A

Town of LaGrange

Schedule A1 (§ 240-27)

Permitted Uses and Special Permit Uses

Residential Districts

[Amended 10-28-2015 by L.L. No. 2-2015; 12-14-2016 by L.L. No. 15-2016; 5-23-2018 by L.L. No. 6-2018; 11-28-2018 by L.L. No. 13-2018; 5-8-2019 by L.L. No. 2-2019; 5-8-2019 by L.L. No. 3-2019]

Key:

P	Permitted	RFD	Residential Flexible-Density
SP	Special permit (§ 240-71)	RFS	Residential Frank & Sleight
N	Not permitted	RMD	Residential Moderate-Density
A	Permitted only as accessory use	RLD	Residential Low-Density
M	Permitted only as a mixed use	TCR	Town Center Residential
		OPD	Overlook Planned Development

NOTE: Uses omitted from this table are not permitted

	Residential Districts							
Use[1]	**RFD**			**RMD**	**RLD**	**RFS**	**TCR**	**OPD**
	40	**60**	**80**					
Single-family dwelling	P	P	P	P	P	P	P	P
Two-family dwelling	N	N	N	N	N	N	P	N
Townhouse[37]	N	N	N	N	N	N	P	N
Multifamily[37]	N	N	N	N	N	N	P[19]	P
Rental apartment	N	N	N	N	N	N	P	P
Accessory apartment[37]	A, SP[12, 11, 17]	A, SP[12, 11, 17]	A, SP[12, 11, 17]	A, SP[12, 11, 17]	A, SP[12, 11, 17]	A, SP[12, 11, 17]	A, SP[12, 11, 17]	N
Carriage unit[37]	N	N	N	N	N	N	SP[12, 11, 15]	N
Detached accessory apartment	A, SP[12, 11, 17]	A, SP[12, 11, 17]	A, SP[12, 11, 17]	A, SP[12, 11, 17]	A, SP[12, 11, 17]	A, SP[12, 11, 17]	A, SP[12, 11, 17]	N
Second kitchen	A, SP[12, 11]	A, SP[12, 11]	A, SP[12, 11]	A, SP[12, 11]	A, SP[12, 11]	A, SP[12, 11]	A, SP[12, 11, 15]	N
Accessory structure[37]	A[22]	A[22]	AP[22]	A[22]	A[22]	A[22]	A[22]	A[22]
Adaptive reuse	SP	SP	SP	SP	SP	N	N	N
Home occupation[37]	A[29]	A[29]	A[29]	A[29]	A[29]	A[29]	A[29]	N
Bed-and-breakfast[37]	SP[12, 11, 30]	SP[12, 11, 30]	SP[12, 30]	SP[12, 11, 30]	SP[12, 11, 30]	SP[12, 11, 30]	SP[12, 11, 30]	N
Residential health-care facilities, adult homes and group homes (congregate housing)[37]	P[20]	P[20]	P[20]	P[20]	P[20]	P[20]	N	N
Cemeteries	N	N	N	SP[12, 11, 23]	SP[12, 11, 23]	N	N	N
Civic buildings and place of public assembly, e.g., community buildings, churches, schools	SP[12, 11]	SP[12, 11]	SP[12, 11]	SP[12, 11]	SP[12, 11]	SP	SP[12, 11]	N
Commercial kennels[37]	N	N	N	SP[12, 11, 24]	SP[12, 11, 24]	N	N	N
Essential services[37]	P	P	P	P	P	P	P	

	Residential Districts							
Use[1]	**RFD**			**RMD**	**RLD**	**RFS**	**TCR**	**OPD**
	40	**60**	**80**					
Excavation or removal of earth, topsoil, sand, gravel, clay, or stone; soil and stone crushing, washing and processing operations[3] (§ 240-67)								
Farming[37]	P	P	P	P	P	P	P	N
Farm stand	N	N	N	P[34]	P[34]	N	N	N
Retail sale of products of horticulture, as well as hand tools, fertilizer, seeds, bulbs, and other materials customarily used in horticulture on parcels of 5 acres or more	SP[12, 11]	SP[12, 11]	SP[12, 11]	SP[12, 11]	SP[12, 11]	N	N	N
Solar panels (roof mounted)	A[39]	A[39]	A[39]	A[39]	A[39]	A[39]	A[39]	A[39]
Solar panels (ground mounted)	A, SP[12, 11, 39]	A, SP[12, 11, 39]	A, SP[12, 11, 39]	A, SP[12, 11, 39]	A, SP[12, 11, 39]	A, SP[12, 11, 39]	A, SP[12, 11, 39]	N
Solar farms	P, SP[12, 11, 39]	P, SP[12, 11, 39]	P, SP[12, 11, 39]	P, SP[12, 11, 39]	P, SP[12, 11, 39]	P, SP[12, 11, 39]	P, SP[12, 11, 39]	N
Stables, riding establishments and clubs[37]	N	N	N	SP[12, 11, 31]	SP[12, 11, 31]	N	N	N
Swimming pool	A	A	A	A	A	A	SP[12, 11, 15]	A
Pool house/cabana	A[22]	A[22]	A[22]	A[22]	A[22]	A[22]	A[22]	SP
Outdoor kitchen	A	A	A	A	A	A	A	SP
Outdoor fuel-burning device	SP[12, 11, 38]	SP[12, 11, 38]	SP[12, 11, 38]	SP[12, 11, 38]	SP[12, 11, 38]	SP[12, 11, 38]	SP[12, 11, 38]	N
Tennis/sport court	A	A	A	A	A	A	A	SP
Wireless communications facilities[7, 40]	SP[12, 11, 32]	SP[12, 11, 32]	SP[12, 11, 32]	SP[12, 11, 32]	SP[12, 11, 32]	SP[12, 11, 32]	SP[12, 11, 32]	SP[12, 11, 32]
Outdoor sports/recreation	SP[12, 11, 37]	SP[12, 11, 37]	SP[12, 11, 37]	SP[12, 11, 37]	SP[12, 11, 37]	N	N	N

240 Attachment B1

APPENDIX B

Schedule B1 (§ 240-28)

Schedule of Bulk Regulations and Coverage Limitations

Residential Districts

[Amended 11-28-2018 by L.L. No. 13-2018]

Key:

RMD Residential Moderate-Density

RFS Residential Frank & Sleight

RFD Residential Flexible-Density`

RLD Residential Low-Density

TCR Town Center Residential

TPK Town Park

OPD Overlook Planned Development

	Residential Districts						
	RFD	**RLD**	**RMD**	**RFS[16]**	**TCR**	**TPK**	**OPD**
Minimum lot area (square feet) for single-family residential	40,000[1] 60,000 80,000	120,000	80,000	Note 16	N/A[2]	NA	N/A
Minimum lot area for single-family residential with public sewers	40,000	120,000	80,000	N/A	6,000[2]	NA	N/A
Minimum lot area (square feet) for townhouses with public sewers	N/A	N/A	N/A	N/A	2,500[2]	N/A	N/A
Minimum width of lot along building line (feet)	150	200	200	100	25	NA	500
Minimum width of lot at any point	50 (40,000) 75 (60,000) 100 (80,000)	150	100	60	25	NA	500
Minimum dimension of square on building lot (feet)[3]	150	200	200	75	NA	150	200
Minimum lot frontage on Town right-of-way line	50 (40,000) 50 (60,000) 75 (80,000)	100[4]	75[4]	60	25	N/A	N/A
Minimum lot frontage on county or state highway	125 (40,000) 125 (60,000) 200 (80,000)	225	200	Note 16	25	N/A	500
Maximum number of stories of a building	3	3	3	3	3	N/A	3
Maximum height of a building or structure	35	35	35	35	35	35	35
Minimum dimensions (in feet) from center line of NYS Route 55				N/A	48 1/2 to 58 1/2		N/A
Front yard, state or county road	90	90	90	N/A		100	25
Front yard, Town road	55/80 See Note 6	55/80 See Note 6	55/80 See Note 6	35/60 See Note 6	Note 7	35	N/A
Rear yard[13]	20	40	30	20	Note 7	100	75
Side yard[13]	20	40	30	[14] 10/15 combo 25	Note 7	100	100

	Residential Districts						
	RFD	RLD	RMD	RFS[16]	TCR	TPK	OPD
Side yard for accessory structures[15]	20	40	30	10		N/A	N/A
Residential district boundary line	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Maximum lot coverage by buildings as percent of lot area	15% - 40,000 15% - 60,000 10% - 80,000	10%	10%	Note	40%	N/A	15%
Maximum floor area of buildings as percent of lot area	30% - 40,000 25% - 60,000 20% - 80,000	20%	20%	Note	70%[10]	N/A	25%
Maximum total lot coverage as percent of lot area (buildings, structures, outdoor deposit, paving)	30% - 40,000 25% - 60,000 20% - 60,000	15%	20%	Note	60%	N/A	70%
Minimum floor area of dwelling unit (square feet)[11]	1,000	1,200	1,000	1,000	500	600	1,000
Minimum floor area of apartment	N/A	N/A	N/A	N/A	400	400	400

Chapter 126 – Noise

Chapter 162

NOISE

GENERAL REFERENCES

Animals — See Ch. 69.

Zoning — See Ch. 240.

Peddling and soliciting — See Ch. 176.

§ 162-1. Findings; purpose.

The proliferation of unreasonably loud, disturbing and unnecessary noises in the Town of LaGrange of such character, intensity, duration or repetition as to be detrimental to the life, health or safety of any individual or of the public has reached such proportions that the Town Board, pursuant to the authority of § 130 of the Town Law of the State of New York, to preserve, protect and promote the public health, safety and welfare, has enacted a Noise Control Local Law which, pursuant to the standards hereinafter set forth, shall delineate permitted noise levels within the Town of LaGrange.

§ 162-2. Definitions.

For the purposes of this chapter, the terms used herein shall be defined as follows:

A-WEIGHTED SOUND LEVEL — The frequency-weighted sound-pressure level (in decibels) measured on a sound-level meter with an A-weighted scale as specified in the American National Standards Institute (ANSI) specifications for sound-level meters (ANSI No. 4-1971).

DECIBEL — A unit for measuring the volume of sound equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure which is 20 micropascals (20 micronewtons per square meter).

EMERGENCY — A public calamity or the exposure of any person or property to imminent danger.

EMERGENCY WORK — Work or activity that is necessary to prevent or recover from an emergency, including but not limited to work to repair electric, gas, water, sewerage and telephone services.

NOISE OF AN IMPULSIVE CHARACTER — Bursts of sound usually less than one second's duration, for example explosions and gunshots.

NOISE OF A PERIODIC CHARACTER — A sound of short duration punctuated by pauses of indefinite duration, for example a power saw.

OWNER — Any person who has regular control of a device or site, including but not limited to the owner of a freehold of the premises or lesser estate therein or mortgagee thereof or an agent of such person.

PERSON — Any individual, partnership, company, public or private corporation, association, firm, organization, political subdivision, governmental agency, administration or department, municipality, trust estate, group of individuals or any other legal entity whatsoever.

RECREATIONAL VEHICLE — Any vehicle which is propelled by any power other than muscular power that is designated for or capable of cross-country travel, such as a motorcycle, trail bike or minibike, but not a snowmobile. A "recreational vehicle" is also classed as a motor vehicle when such "recreational vehicle" is operated or driven upon a public highway.

SOUND-LEVEL METER — An instrument, including a microphone, an amplifier, an output meter and frequency-weighing network for the measurement of sound levels.

TOWN — The Town of LaGrange situate within the County of Dutchess and the State of New York.

UNNECESSARY NOISE — Any excessive or unusually loud sound or any sound which either annoys, disturbs, injures or endangers the comfort, repose, health, peace or safety of a person or which causes injury to animal life or damages to property or business. Standards to be considered in determining whether unnecessary noise exists in a given situation include, but are not limited to, the following:

A. The intensity of noise.

B. Whether the nature of the noise is usual or unusual.

C. Whether the origin of the noise is natural or unnatural.

D. The volume and intensity of the background noise, if any.

E. The proximity of the noise to sleeping facilities.

F. The nature and the zoning districts of the area within which the noise emanates.

G. The time of day or night in which the noise occurs.

H. The time duration of the noise.

I. Whether the sound source is temporary.

J. Whether the noise is continual or of a periodic or impulsive character.

ZONING DISTRICT — The zoning district within which a particular premises is situated shall be as indicated by Chapter 240, Zoning, of the Code of the Town of LaGrange then in effect.

§ 162-3. Violations of certain provisions.

Any act or violation of any of the provisions of this chapter is deemed to be in violation of § 162-4 of this chapter without in any way limiting the generality of the provisions of § 162-4 of this chapter.

§ 162-4. Unnecessary noise; exemption.

No person shall make, continue or cause or permit to be made or continued any unnecessary noise. Noncommercial public speaking and public assembly activities conducted in any public space shall be exempt from the operation of this section.

§ 162-5. Prohibited acts enumerated.

The following acts, and the causing thereof, are declared to be in violation of this chapter, but any enumeration herein shall not be deemed to be exclusive:

A. The operation of or the permitting of the operation of a radio, television set, phonograph, drum, musical instrument, sound amplifier or similar device which produces, reproduces or amplifies sound which creates unnecessary noise at the adjoining property line or, in the case of a multiple residence, within the adjoining or adjacent apartment.

B. The projection of sound by an electronic device, musical instrument or otherwise, directly onto the public way, for any purpose whatsoever so as to create unnecessary noise. Nothing contained herein shall be construed as prohibiting the normal emanation of sound from a vehicle playing a car radio, tape recorder or similar device or the normal emanation of sound from the demonstration or use of a musical instrument within a store or within a music department of a department store; provided, however, that there is no unnecessary noise therefrom at a distance of 50 feet or more from said vehicle or store.

C. Operating or permitting the operation of any tool or equipment used in construction, drilling or demolition work, including excavation and the alteration or repair of any building between the hours of 9:00 p.m. and 6:30 a.m. so as to create unnecessary noise except in the case of an emergency or the interests of public safety and then only with the permit of the Building Inspector, which permit may be issued for a maximum period of three days and may be renewed once for a maximum period of three days during the existence of the emergency period.

D. The operation of an appliance, including but not limited to a pump, fan, exhaust fan, air-conditioning device or similar mechanical device between the hours of 11:00 p.m. and 7:00 a.m. so as to create unnecessary noise at the adjoining property line or, in the case of a multiple residence, within the adjoining or adjacent apartment.

E. The loading or unloading of any vehicle or in the opening and destruction of bales, boxes, crates and containers in such a manner as to create unnecessary noise at the adjoining property line or, in the case of multiple residence, within the adjoining or adjacent apartment. Without limiting the above language, it shall be a violation of this chapter to load or unload any vehicle or open or destroy any bales, boxes, crates and/or containers between the hours of 11:00 p.m. and 7:00 a.m. within 300 feet of the boundary line of a residential district as established by the Zoning Law of the Town of LaGrange, so as to create unnecessary noise at the adjoining property line or in the case of a multiple-dwelling residence, within the adjoining or adjacent apartment.

F. The shouting and crying of peddlers, hawkers and vendors in such a manner as to create unnecessary noise.

G. The creation of any unnecessary noise on any street adjacent to any court, public or parochial school, college or institution of learning while the same is in session or adjacent to a hospital which unreasonably interferes with the workings of such institution, provided that conspicuous signs are displayed at such streets indicating that the same is a court, school or hospital street and that quiet is required. Such areas are to be designated by the Town Board by resolution.

H. The use of any drum, loud speaker or other instrument or device for the purposes of attracting attention to any performance, show or sale or display of merchandise by the creation of unnecessary noise.

I. The use of or playing or performing upon any musical instrument by any person upon any street or in any other public place within the Town outside of the limits of an incorporated village without a permit to so authorize, issued by the Town Board of the Town of LaGrange.

J. The use of any automobile, motorcycle, truck or other vehicle so out of repair or loaded in such a manner as to create unnecessary noise by grating, grinding, rattling or other noise.

K. The blowing of any steam whistle attached to a stationary boiler, except to give notice of the time to start work or stop work or as a warning of danger.

L. The discharge into the open air of the exhaust of any steam engine, stationary internal combustion engine, recreation vehicle, snowmobile or any other motor vehicle unless equipped with a muffler or other device in good order and in constant operation which will prevent unnecessary noise from being emitted therefrom.

M. The sounding of a horn or signal device on any automobile, motorcycle, bus or other vehicle so as to create unnecessary noise, except as a warning signal pursuant to the provisions of the motor vehicle laws of the State of New York.

N. The use or operation of any sound-producing device in any public place in such a manner as to create unnecessary noise to any person other than the operator of the device.

O. The harboring of any animal, including a bird, which animal, whether by its barking, growling, howling, squawking, scratching or otherwise, creates unnecessary noise at the adjoining property line or, in the case of a multiple residence, within the adjoining or adjacent apartment.[1]

P. The operation of a vehicle in such a manner as to cause unnecessary noise by the spinning or squealing of the tires of such vehicle.

§ 162-6. Objective standards for determination of unnecessary noise.

It shall be prima facie evidence that an act is in violation of this chapter when a sound-measuring meter determines that the decibel level of a particular activity is in excess of the standards hereinafter set forth. All measurements will be made on the A-weighted sound level of a sound-level meter, which level is most in accord with human perception of sound.

§ 162-7. Recreational vehicles.

No person shall operate or permit to be operated any recreational vehicle off a public highway at any time, at any speed or under any condition of grade, load, acceleration or deceleration or in any manner whatsoever as to exceed 92 dB(A)'s. The limit shall apply at a distance of 50 feet from such recreational vehicle.

§ 162-8. Air-conditioning and air-handling devices.

A. Except as provided by Subsection D of this section, no person shall operate or permit to be operated an air-conditioning or air-handling device that exceeds the maximum sound-level limitations provided in this section.

B. In areas zoned as residential, continuous sound in air which has crossed a property line shall not exceed any of the following sound levels:

(1) Fifty-five dB(A)'s at any point; or

(2) Fifty dB(A)'s outside of a living area window with the microphone not more than three feet from the window opening.

C. In areas zoned for multiple dwellings or apartments, continuous sound shall not exceed 50 dB(A)'s outside any living area window with the microphone not more than three feet from the window opening.

D. The provisions of this section shall not apply if the sound from the air conditioner or air-handling device produces less than a five dB(A)'s increase in the sound level that exists in the absence of such sound.

§ 162-9. Places of public entertainment.

No person shall operate or permit to be operated a place of public entertainment, including but not limited to a restaurant, bar, cafe,

1. Editor's Note: See also § 69-3C, re: barking and howling dogs.

discotheque or dance hall, in which the sound level is equal to or exceeds 95 dB(A)'s sustained for more than 30 seconds measured at the location of the spectators.

§ 162-10. Permitted noises.

The following sounds shall not be deemed to be in violation of this chapter:

A. Sounds created by church bells or chimes.

B. Sounds created by any government agency by the use of public warning devices.

C. Sounds created by lawnmowers and home power tools in good working order in use between the hours of 7:00 a.m. to 9:00 p.m. weekdays and 8:00 a.m. to 8:00 p.m. on Sundays and holidays.

D. Sounds created by public utilities in carrying out the operations of their franchise.

E. Sounds connected with sporting events of any public or private school or authorized carnival, fair, exhibition or parade authorized by permit of the Town Board.

F. The sounds created by crop cultivation, production, harvesting and livestock production.

G. Sounds created by safety and protective devices.

§ 162-11. Penalties for offenses.

For each and every violation of the provisions of this chapter, the person violating the same shall be guilty of an offense and shall be punished by not more than a fine of $250 or by imprisonment of not more than 15 days, or by both such fine and imprisonment. Each and every day that the violation continues after the owner has been notified of violation shall be deemed to be a separate and distinct violation.

Appendix E – Additional Environmental Supporting Information

Online Environmental Database Results

NYSDEC Spill Incidents Database search details – 1609996, 2005323

USFWS/IPaC (Information for Planning and Consultation) Database – Threatened/Endangered Resource List

NYSDEC Environmental Resource Mapper search results – Significant Natural Communities and Rare Plants/Animals

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Spill Incidents Database Search Details

Spill Record

Administrative Information

DEC Region: 3
Spill Number: 2005323

Spill Date/Time

Spill Date: 09/11/2020 **Spill Time:** 07:00:00 AM
Call Received Date: 09/11/2020 **Call Received Time:** 07:00:00 AM

Location

Spill Name: PAVEMENT / DRY WELL
Address: 1144 ROUTE 55
City: LA GRANGE **County:** Dutchess

Spill Description

Material Spilled	Amount Spilled	Resource Affected
diesel	25 Gal.	Unknown

Cause: Human Error
Source: Commercial/Industrial
Waterbody:
PBS #: 3-175072

Record Close

Date Spill Closed: 11/18/2020
"Date Spill Closed" means the date the spill case was closed by the case manager in the Department of Environmental Conservation (the Department). The spill case was closed because either; a) the records and data submitted indicate that the necessary cleanup and removal actions have been completed and no further remedial activities are necessary, or b) the case was closed for administrative reasons (e.g., multiple reports of a single spill consolidated into a single spill number). The Department however reserves the right to require additional remedial work in relation to the spill, if in the future it determines that further action is necessary.

If you have questions about this reported incident, please contact the Regional Office where the incident occurred.

Return To Results

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Spill Incidents Database Search Details

Spill Record

Administrative Information

DEC Region: 3
Spill Number: 1609996

Spill Date/Time

Spill Date: 02/01/2017 **Spill Time:** 10:30:00 AM
Call Received Date: 02/01/2017 **Call Received Time:** 11:56:00 AM

Location

Spill Name: GETTY S/S SITE
Address: 1144 ROUTE 55
City: LAGRANGE **County:** Dutchess

Spill Description

Material Spilled	Amount Spilled	Resource Affected
gasoline	UNKNOWN	Soil

Cause: Unknown
Source: Commercial/Industrial
Waterbody:
PBS #: 3-175072

Record Close

Date Spill Closed: 02/28/2019
"Date Spill Closed" means the date the spill case was closed by the case manager in the Department of Environmental Conservation (the Department). The spill case was closed because either; a) the records and data submitted indicate that the necessary cleanup and removal actions have been completed and no further remedial activities are necessary, or b) the case was closed for administrative reasons (e.g., multiple reports of a single spill consolidated into a single spill number). The Department however reserves the right to require additional remedial work in relation to the spill, if in the future it determines that further action is necessary.

If you have questions about this reported incident, please contact the Regional Office where the incident occurred.

Return To Results

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Dutchess County, New York

Local office

New York Ecological Services Field Office

(607) 753-9334
(607) 753-9699

3817 Luker Road
Cortland, NY 13045-9385

http://www.fws.gov/northeast/nyfo/es/section7.htm

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS

Indiana Bat Myotis sodalis | Endangered

Wherever found

There is **final** critical habitat for this species. The location of the critical habitat is not available.

https://ecos.fws.gov/ecp/species/5949

Reptiles

NAME	STATUS
Bog Turtle Clemmys muhlenbergii No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6962	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Bobolink Dolichonyx oryzivorus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Jul 31
Canada Warbler Cardellina canadensis This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 10
Prairie Warbler Dendroica discolor This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31

Wood Thrush *Hylocichla mustelina* Breeds May 10 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

- PEM1C

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1C
- PFO1E

FRESHWATER POND

- PUBHh

RIVERINE

- R2UBH
- R3UBH

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

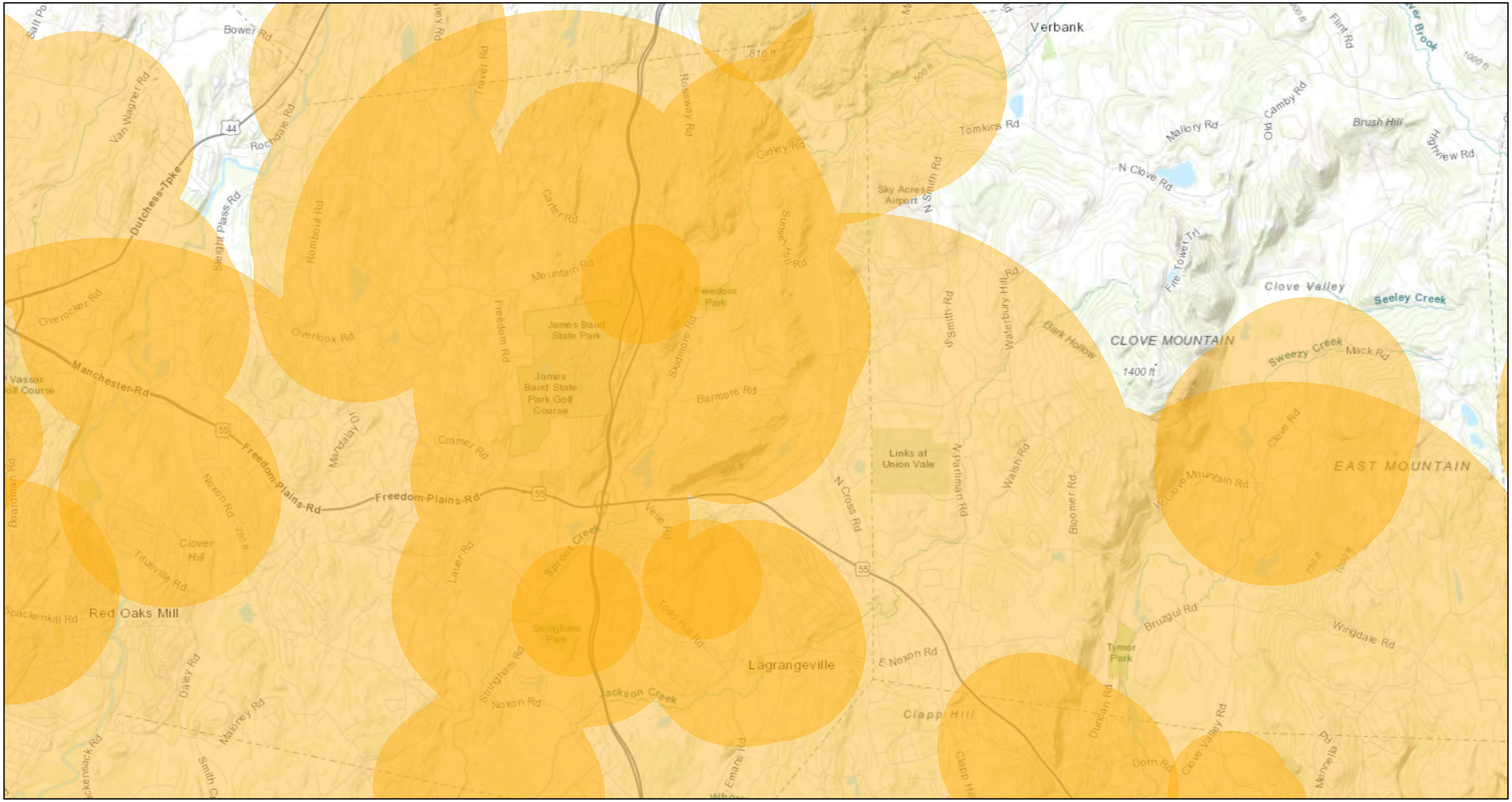
Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Rare Plants or Animals



January 20, 2021

1:72,224

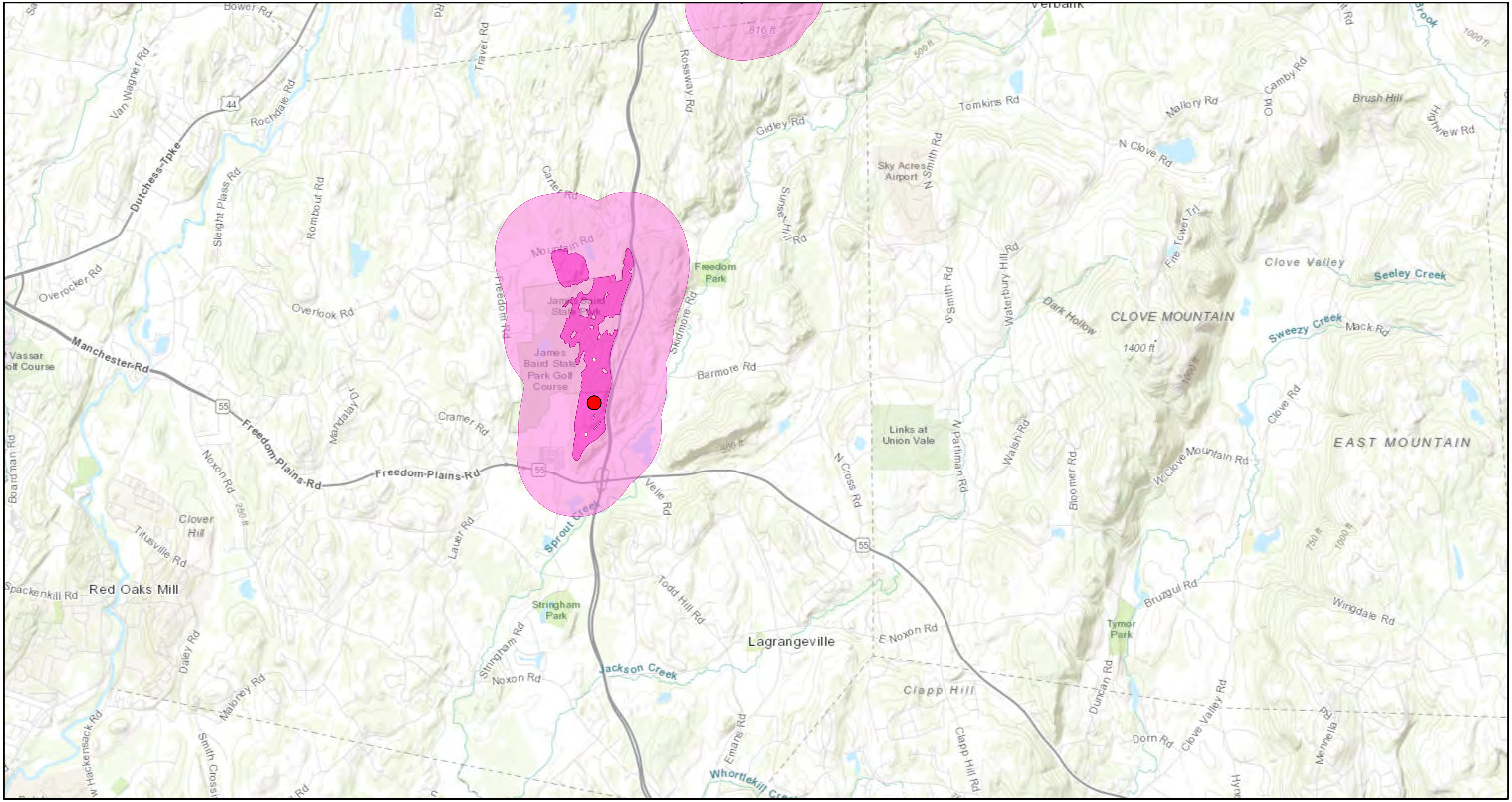
0 0.5 1 2 mi

0 1 2 4 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Author: CPL
Not a legal document

Significant Natural Communities



January 20, 2021

1:72,224

0 0.5 1 2 mi

0 1 2 4 km

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Author: CPL
Not a legal document

Other Referenced Environmental Documents

Local results of the Dutchess County Comprehensive Countywide Private Well Testing Initiative
Additional information and source data: https://www.dutchessny.gov/Departments/DBCH/private-well-tests.htm

Natural Resources Management Plan for the Fishkill Creek Watershed (2005)
Available at http://frobbi.org/watershed/pubs/mgtplan/FishkillCreekMgtPlan.pdf

Significant Habitats in the Fishkill and Sprout Creek Corridors, Hudsonia Ltd. (2005)
Available at https://hudsonia.org/wp-content/uploads/2019/05/Significant-Habitats-in-the-Fishkill-and-Sprout-Creek-Corridors_optimized.pdf

Blanding's Turtle Habitats in Southern Dutchess County, Hudsonia Ltd. (2009)
Available at https://hudsonia.org/wp-content/uploads/2019/05/Blandings-turtle-Habitats_optimized.pdf

NYSDEC Biological Assessment Profile/BAP Fact Sheet

NYSDEC Groundwater Assessment

NYSDEC Bulk Petroleum Storage Database information

Trend Report on MTBE in Public Water Supplies

Prepared by the Dutchess County Department of Health
Division of Environmental Health & Division of Health Planning and Education

April 28, 2014

Purpose:
To describe trends in methyl tertiary butyl ether (MTBE) levels in Dutchess County public water supplies over the past decade.

Background:

Between 1979 and 2005, methyl tertiary butyl ether (MTBE) was added to reformulated gasoline in place of lead to promote oxygenation and reduce pollution from combustion. MTBE dissolves easily in water, and historically appeared as a contaminant in water supplies primarily as the result of gasoline spills and leakage from gasoline tanks. In 2004, New York State joined California and several other states in issuing a complete ban on MTBE. By 2005, twenty-five states signed onto the ban and refiners across the United States rapidly switched from MTBE to ethanol, which in addition to promoting oxygenation also met new renewable fuel standards passed by Congress that same year. The United States Environmental Protection Agency's (EPA) reformulated gasoline survey indicates that very little MTBE has been used in gasoline since 2005 (http://www.epa.gov/mtbe).

To date, the EPA concludes that there is insufficient research to quantify human health risks of low-level exposure to MTBE in drinking water, but recognizes it as a potential carcinogen at very high levels of exposure on the basis of animal studies. Since 2004, the New York State Department of Health has required testing for MTBE, setting the maximum contaminant level at 0.01 mg/L, or 10 parts per billion.

The Dutchess County Department of Health regulates and monitors nearly 700 county public water supplies in compliance with County and State Sanitary Codes and the Federal regulations. Drinking water is regulated on many levels to protect health; such regulations apply to the source location, system construction, treatment (e.g., clarification, filtration, disinfection, and aeration), sampling frequency, water quality, and public notification. The following report summarizes sample results for MTBE in public water supply sources in Dutchess County since 2000. The samples reflect MTBE levels occurring in the supply source ***prior to*** the processes of treatment and filtration, which are designed to significantly reduce exposure to all potential contaminants including MTBE and ensure water is safe for consumption. The findings therefore represent a highly conservative estimate of potential exposure.

Analysis of MTBE Sample Data:

MTBE has ***not*** been found in detectable levels in any ***surface*** water sources (e.g., reservoir intakes) ever sampled in Dutchess County. On the other hand, detectable but declining levels of MTBE have been found in a portion of samples taken from public water supply wells fed by ***groundwater***. The data presented in this report show that the ***average concentration*** of MTBE detected in public water supply wells sampled in Dutchess County (Figure 1) decreased by 96%, from a high of 0.024 mg/L in 2000 to a low of 0.001 mg/L in 2013. Likewise, the ***maximum*** MTBE concentration declined by 98%, from 3.80 mg/L in 2003 to 0.09 mg/L in 2013 (Table 1). The data also indicate that since 2005 no ***new*** public water supplies have been found to have MTBE contamination above the MCL and that by 2013, only 7 out of 109 supplies sampled had MTBE concentrations above 0.01 mg/L.

Figure 1.

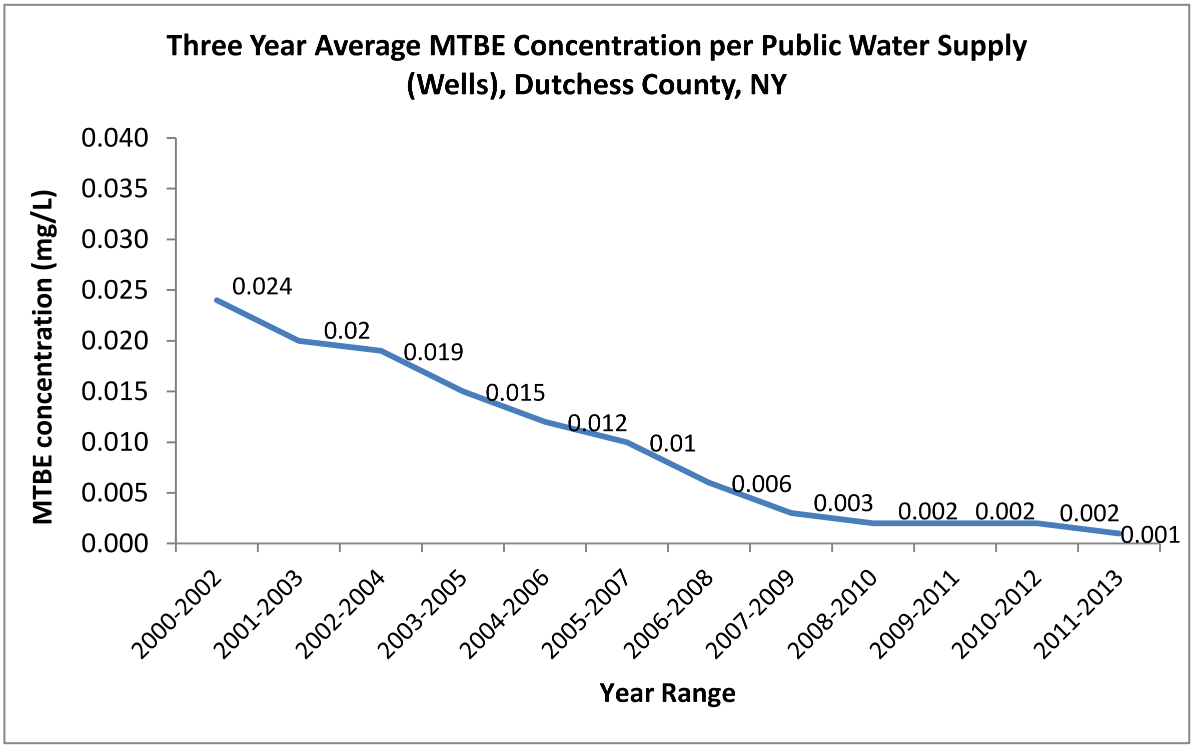


Table 1. Public Water Supply Sampling Results for MTBE in Dutchess County, NY (Wells)

Year	Total number of wells sampled	No. of samples with detectable level of MTBE > 0 mg/L	No. of samples above the MCL (0.01 mg/L)	Maximum MTBE concentration detected (mg/L)
2003	191	69	27	3.80
2004	158	56	24	0.69
2005	194	50	18	2.20
2006	123	40	14	2.50
2007	130	43	13	0.70
2008	155	34	11	0.36
2009	151	38	12	0.27
2010	140	35	12	0.18
2011	139	30	9	0.11
2012	154	29	6	0.11
2013	109	24	7	0.09

Geospatial Analysis:

The two maps in Appendix 1 illustrate the localized occurrence of MTBE contamination and widespread decline in MTBE measured in public wells in Dutchess County, comparing the early 2000s to the present day.

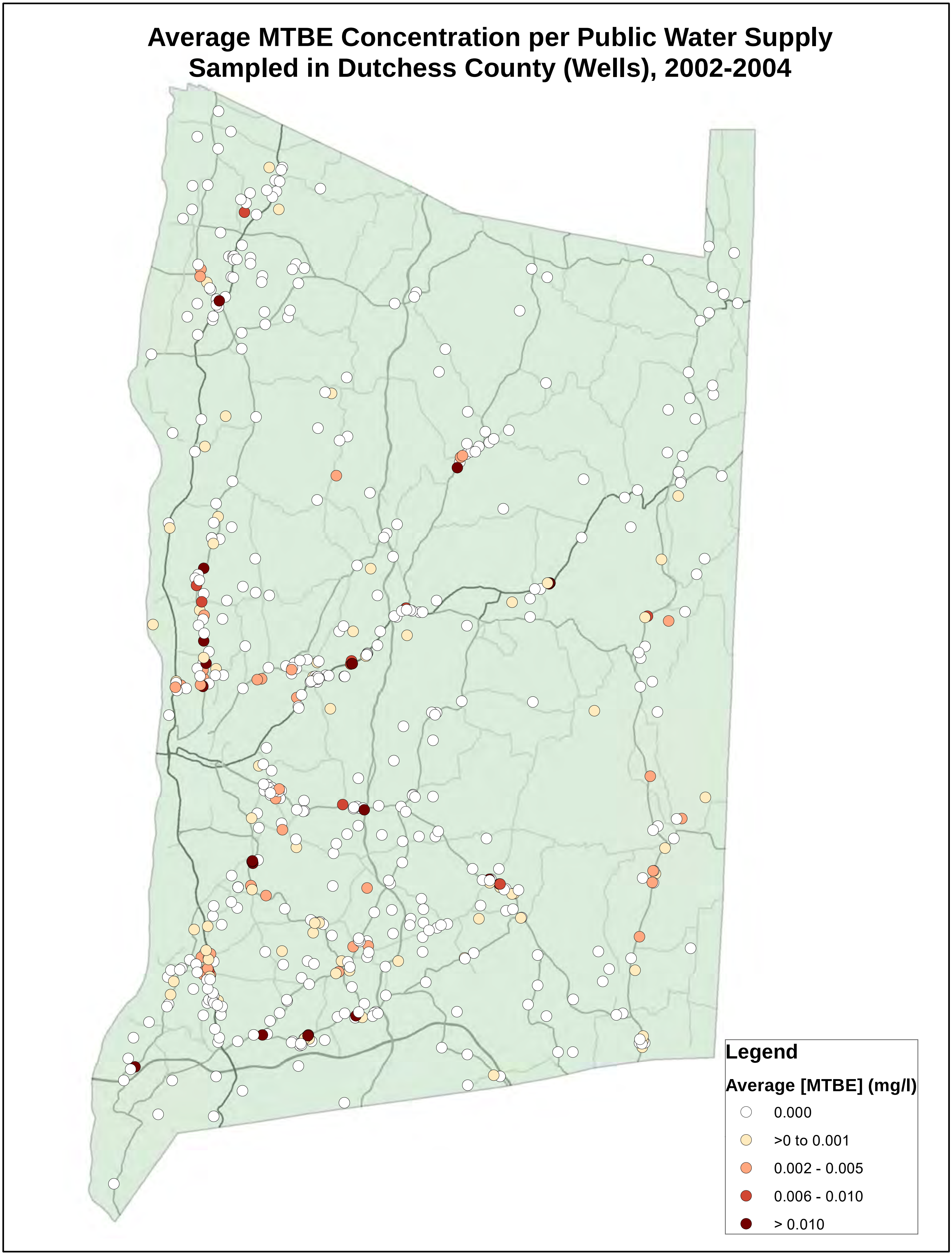
Private Well Water Sampling:

The Dutchess County Comprehensive Private Well Testing Initiative was conducted in 2007-2009 to collect information about private well water quality. Of 250 sites sampled throughout the county, ***no*** private wells were found to have MTBE above the maximum contaminant level. Detailed sampling data are available online: http://www.dutchessny.gov/CountyGov/Departments/Health/14361.htm.

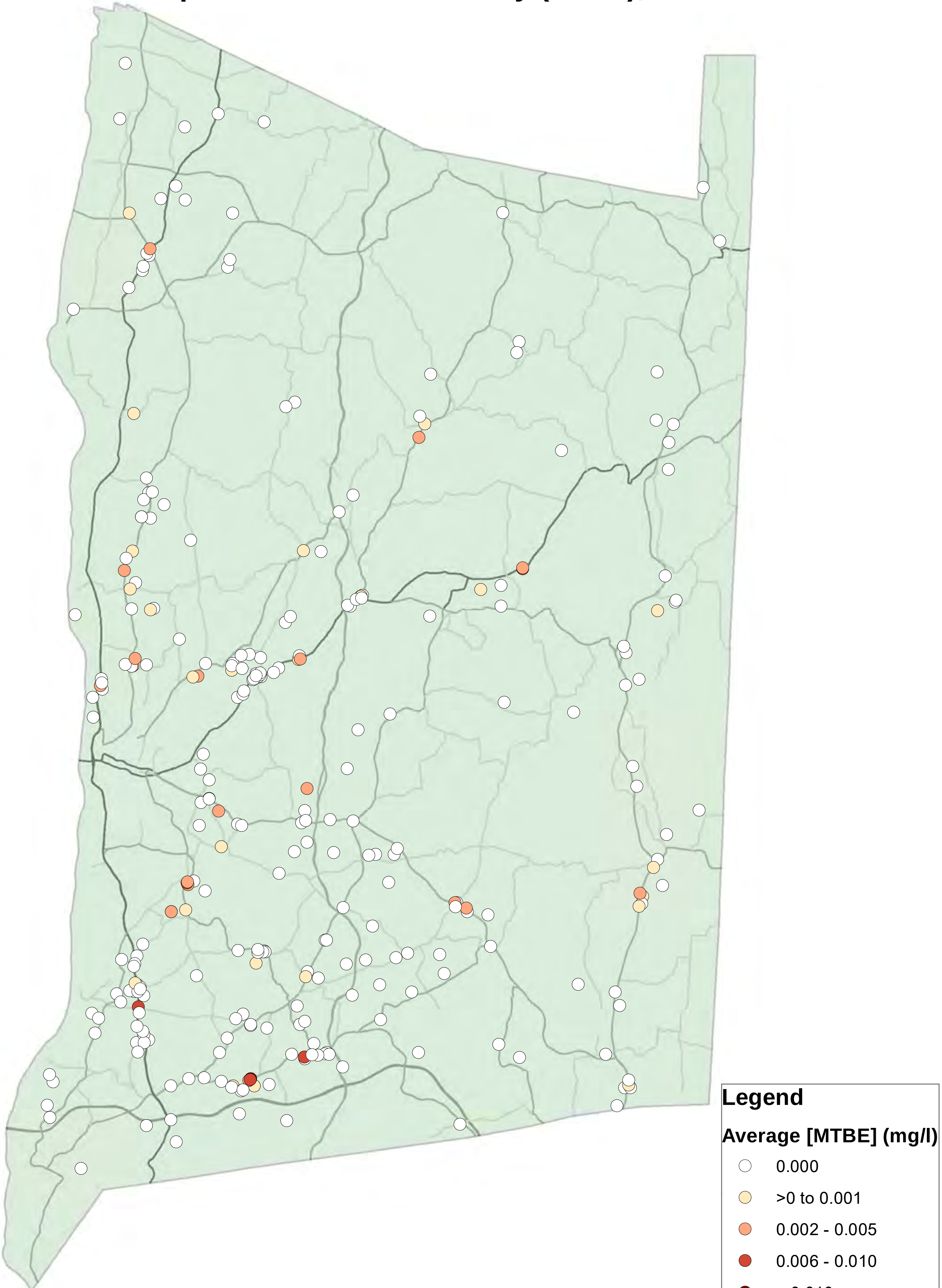
Conclusions and Limitations:

Ongoing sampling of public water supplies in Dutchess County shows very significant reductions in groundwater contamination with MTBE over the past decade. As previously stated, public water supply samples taken prior to filtration and treatment do not reflect exposure levels at the tap and provide an extremely conservative (high end) estimate of potential exposure. Because contaminated public water supplies are required to be sampled more frequently per New York State regulations, the number of supplies sampled each year decreased as levels of contamination decreased (Table 1). Similarly, historically uncontaminated public water supplies were not sampled in all three-year periods listed in Figure 1. As a result, the estimated three-year averages are likely to be slightly higher than they would have been had all uncontaminated sites been included in the measurements recorded for each time period. Finally, for those supplies from which multiple samples were taken per time period, results were averaged such that each supply was given an equal weight in the overall average.

The long-term downward trends in groundwater contamination by MTBE illustrate the substantial impact of New York State gasoline and drinking water regulations, as well as improvements in gasoline storage and handling practices (http://www.dec.ny.gov/chemical/287.html) on the protection of groundwater. For comprehensive information about water sampling in Dutchess County, visit: http://www.co.dutchess.ny.us/CountyGov/Departments/Health/22609.htm.


Average MTBE Concentration per Public Water Supply
Sampled in Dutchess County (Wells), 2002-2004
Legend
Average [MTBE] (mg/l)
0.000
>0 to 0.001
0.002 - 0.005
0.006 - 0.010
> 0.010

Average MTBE Concentration per Public Water Supply Sampled in Dutchess County (Wells), 2011-2013



Click on the following link for Field Definitions.
For analytes and their MCLs, see Analyte and MCL list (.pdf) (https://www.dutchessny.gov/Departments/DBCH/docs/HDAnalyteMCLlist.pdf).

Demographic and Test Results Information For: 14 Vervalen Drive, Town of LaGrange
Parcel Number: 133400-6461-03-229095

Demographic Information

Latitude/Longitude	Sampling Points	Treated Sample	ELAP #	Matrix	Data Submitted to Client	Comments	Reason for Testing	Project Type
41.405600/73.487560	Pressure tank tap	N	10924	Water	True		Owner-Occupied Residence	Dutchess County

Test Results

Analyte Name	Date/Time of Analysis	Method Code	Result*	Detect Flag	Failure to meet Standard	DL	Unit of Measure	Dilution Factor
benzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
bromobenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
bromochloromethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
bromomethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
n-butylbenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
sec-butylbenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
tert-butylbenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
carbon tetrachloride	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
chlorobenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
chloroethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

chloromethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
2-chlorotoluene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
4-chlorotoluene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
dibromomethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2-dichlorobenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,3-dichlorobenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,4-dichlorobenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
dichlorodifluoromethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1-dichloroethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2-dichloroethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1-dichloroethene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
cis-1,2-dichloroethene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trans-1,2-dichloroethene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2-dichloropropane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

1,3-dichloropropane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
2,2-dichloropropane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1-dichloropropene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
cis-1,3-dichloropropene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trans-1,3-dichloropropene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
ethylbenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
hexachlorobutadiene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
isopropylbenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
p-isopropyltoluene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
methylene chloride	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
n-propylbenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
styrene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,1,2-tetrachloroethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,2,2-tetrachloroethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

tetrachloroethene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
toluene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,3-trichlorobenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,4-trichlorobenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,1-trichloroethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,2-trichloroethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trichloroethene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trichlorofluoromethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,3-trichloropropane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,4-trimethylbenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,3,5-trimethylbenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
o-xylene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
m,p-xylene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
methyl-tertiary-butyl-ether	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

vinyl chloride	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
alkalinity	3/10/2009 12:00:00 AM	SM183230B	114	Y	N	10	mg/l	1
antimony	3/4/2009 12:00:00 AM	EPA200.9	0	N	N	0.003	mg/l	1
arsenic	3/4/2009 12:00:00 AM	EPA200.9	0	N	N	0.005	mg/l	1
barium	3/4/2009 12:00:00 AM	EPA200.7	0.067	Y	N	0.001	mg/l	1
beryllium	3/4/2009 12:00:00 AM	EPA200.7	0	N	N	0.001	mg/l	1
cadmium	3/4/2009 12:00:00 AM	EPA200.7	0	N	N	0.002	mg/l	1
chloride	3/3/2009 12:00:00 AM	EPA300.0	82	Y	N	2	mg/l	1
chromium	3/4/2009 12:00:00 AM	EPA200.7	0	N	N	0.002	mg/l	1
cyanide	3/3/2009 12:00:00 AM	SM184500CNE	0	N	N	0.01	mg/l	1
hardness	3/4/2009 12:00:00 AM	EPA200.7	259	Y	N	0.03	mg/l	1
iron	3/4/2009 12:00:00 AM	EPA200.7	0.037	Y	N	0.004	mg/l	1
lead	3/11/2009 12:00:00 AM	EPA200.9	0	N	N	0.001	mg/l	1
manganese	3/4/2009 12:00:00 AM	EPA200.7	0.232	Y	N	0.003	mg/l	1

mercury	3/4/2009 12:00:00 AM	EPA245.1	0	N	N	0.0004	mg/l	1
nickel	3/4/2009 12:00:00 AM	EPA200.7	0	N	N	0.004	mg/l	1
nitrate	2/28/2009 10:18:00 PM	EPA300.0	0	N	N	0.2	mg/l	1
nitrite	2/28/2009 10:18:00 PM	EPA300.0	0	N	N	0.01	mg/l	1
pH	2/28/2009 3:45:00 PM	SM184500HB	7.3	Y	N	0	unitless	1
selenium	3/3/2009 12:00:00 AM	EPA200.9	0	N	N	0.002	mg/l	1
sodium	3/4/2009 12:00:00 AM	EPA200.7	8.54	Y	N	0.1	mg/l	1
sulfate	2/28/2009 12:00:00 AM	EPA300.0	38	Y	N	2	mg/l	1
thallium	3/9/2009 12:00:00 AM	EPA200.9	0	N	N	0.001	mg/l	1
turbidity	2/28/2009 5:38:00 PM	EPA180.1	0.1	Y	N	0.05	NTU	1
total coliform	2/28/2009 5:15:00 PM	SM209223	1	Y	Y	1	colonies/100ml	1
Escherichia coli	2/28/2009 5:15:00 PM	SM209223	0	N	N	1	colonies/100ml	1

Dutchess County Comprehensive Countywide Private Well Testing Initiative (https://www.dutchessny.gov/Departments/DBCH/private-well-tests.htm)

Town Mandated Private Well Water Test Lists (https://www.dutchessny.gov/Municipalities/mandated-private-well-water-testing.htm)

Click on the following link for Field Definitions.
For analytes and their MCLs, see Analyte and MCL list (.pdf) (https://www.dutchessny.gov/Departments/DBCH/docs/HDAnalyteMCLlist.pdf).

Demographic and Test Results Information For: 2464 Route 82, Town of LaGrange
Parcel Number: 133400-6561-04-938254

Demographic Information

Latitude/Longitude	Sampling Points	Treated Sample	ELAP #	Matrix	Data Submitted to Client	Comments	Reason for Testing	Project Type
41.408070/73.449530	Pressure tank tap	N	10924	Water	True		Owner-Occupied Residence	Dutchess County

Test Results

Analyte Name	Date/Time of Analysis	Method Code	Result*	Detect Flag	Failure to meet Standard	DL	Unit of Measure	Dilution Factor
benzene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
bromobenzene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
bromochloromethane	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
bromomethane	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
n-butylbenzene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
sec-butylbenzene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
tert-butylbenzene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
carbon tetrachloride	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
chlorobenzene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
chloroethane	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

chloromethane	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
2-chlorotoluene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
4-chlorotoluene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
dibromomethane	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2-dichlorobenzene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,3-dichlorobenzene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,4-dichlorobenzene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
dichlorodifluoromethane	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1-dichloroethane	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2-dichloroethane	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1-dichloroethene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
cis-1,2-dichloroethene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trans-1,2-dichloroethene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2-dichloropropane	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

1,3-dichloropropane	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
2,2-dichloropropane	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1-dichloropropene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
cis-1,3-dichloropropene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trans-1,3-dichloropropene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
ethylbenzene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
hexachlorobutadiene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
isopropylbenzene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
p-isopropyltoluene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
methylene chloride	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
n-propylbenzene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
styrene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,1,2-tetrachloroethane	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,2,2-tetrachloroethane	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

tetrachloroethene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
toluene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,3-trichlorobenzene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,4-trichlorobenzene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,1-trichloroethane	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,2-trichloroethane	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trichloroethene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trichlorofluoromethane	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,3-trichloropropane	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,4-trimethylbenzene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,3,5-trimethylbenzene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
o-xylene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
m,p-xylene	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
methyl-tertiary-butyl-ether	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

vinyl chloride	2/19/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
alkalinity	2/20/2009 12:00:00 AM	SM183230B	87	Y	N	10	mg/l	1
antimony	2/19/2009 12:00:00 AM	EPA200.9	0	N	N	0.003	mg/l	1
arsenic	2/19/2009 12:00:00 AM	EPA200.9	0	N	N	0.005	mg/l	1
barium	2/19/2009 12:00:00 AM	EPA200.7	0.062	Y	N	0.001	mg/l	1
beryllium	2/19/2009 12:00:00 AM	EPA200.7	0	N	N	0.001	mg/l	1
cadmium	2/19/2009 12:00:00 AM	EPA200.7	0	N	N	0.002	mg/l	1
chloride	2/17/2009 12:00:00 AM	EPA300.0	7	Y	N	2	mg/l	1
chromium	2/19/2009 12:00:00 AM	EPA200.7	0	N	N	0.002	mg/l	1
cyanide	2/18/2009 12:00:00 AM	SM184500CNE	0	N	N	0.01	mg/l	1
hardness	2/19/2009 12:00:00 AM	EPA200.7	103	Y	N	0.03	mg/l	1
iron	2/20/2009 12:00:00 AM	EPA200.7	0.022	Y	N	0.004	mg/l	1
lead	2/20/2009 12:00:00 AM	EPA200.9	0.002	Y	N	0.001	mg/l	1
manganese	2/20/2009 12:00:00 AM	EPA200.7	0.003	Y	N	0.003	mg/l	1

mercury	3/4/2009 12:00:00 AM	EPA245.1	0	N	N	0.0004	mg/l	1
nickel	2/19/2009 12:00:00 AM	EPA200.7	0	N	N	0.004	mg/l	1
nitrate	2/17/2009 10:17:00 PM	EPA300.0	0	N	N	0.2	mg/l	1
nitrite	2/17/2009 10:17:00 PM	EPA300.0	0	N	N	0.01	mg/l	1
pH	2/16/2009 1:00:00 PM	SM184500HB	7.2	Y	N	0	unitless	1
selenium	2/18/2009 12:00:00 AM	EPA200.9	0	N	N	0.002	mg/l	1
sodium	2/19/2009 12:00:00 AM	EPA200.7	7.72	Y	N	0.1	mg/l	1
sulfate	2/17/2009 12:00:00 AM	EPA300.0	24	Y	N	2	mg/l	1
thallium	2/19/2009 12:00:00 AM	EPA200.9	0	N	N	0.001	mg/l	1
turbidity	2/16/2009 4:42:00 PM	EPA180.1	0.15	Y	N	0.05	NTU	1
total coliform	2/16/2009 4:25:00 PM	SM209223	1	Y	Y	1	colonies/100ml	1
Escherichia coli	2/16/2009 4:25:00 PM	SM209223	0	N	N	1	colonies/100ml	1

Dutchess County Comprehensive Countywide Private Well Testing Initiative (https://www.dutchessny.gov/Departments/DBCH/private-well-tests.htm)

Town Mandated Private Well Water Test Lists (https://www.dutchessny.gov/Municipalities/mandated-private-well-water-testing.htm)

Click on the following link for Field Definitions.
For analytes and their MCLs, see Analyte and MCL list (.pdf) (https://www.dutchessny.gov/Departments/DBCH/docs/HDAnalyteMCLlist.pdf).

Demographic and Test Results Information For: 10 Nied Drive, Town of LaGrange
Parcel Number: 133400-6461-00-215967

Demographic Information

Latitude/Longitude	Sampling Points	Treated Sample	ELAP #	Matrix	Data Submitted to Client	Comments	Reason for Testing	Project Type
41.419910/73.487664	Pressure tank tap	N	10924	Water	True		Owner-Occupied Residence	Dutchess County

Test Results

Analyte Name	Date/Time of Analysis	Method Code	Result*	Detect Flag	Failure to meet Standard	DL	Unit of Measure	Dilution Factor
benzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
bromobenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
bromochloromethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
bromomethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
n-butylbenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
sec-butylbenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
tert-butylbenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
carbon tetrachloride	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
chlorobenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
chloroethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

chloromethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
2-chlorotoluene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
4-chlorotoluene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
dibromomethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2-dichlorobenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,3-dichlorobenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,4-dichlorobenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
dichlorodifluoromethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1-dichloroethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2-dichloroethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1-dichloroethene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
cis-1,2-dichloroethene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trans-1,2-dichloroethene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2-dichloropropane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

1,3-dichloropropane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
2,2-dichloropropane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1-dichloropropene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
cis-1,3-dichloropropene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trans-1,3-dichloropropene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
ethylbenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
hexachlorobutadiene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
isopropylbenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
p-isopropyltoluene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
methylene chloride	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
n-propylbenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
styrene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,1,2-tetrachloroethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,2,2-tetrachloroethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

tetrachloroethene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
toluene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,3-trichlorobenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,4-trichlorobenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,1-trichloroethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,2-trichloroethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trichloroethene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trichlorofluoromethane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,3-trichloropropane	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,4-trimethylbenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,3,5-trimethylbenzene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
o-xylene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
m,p-xylene	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
methyl-tertiary-butyl-ether	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

vinyl chloride	3/9/2009 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
alkalinity	3/9/2009 12:00:00 AM	SM183230B	218	Y	N	10	mg/l	1
antimony	3/4/2009 12:00:00 AM	EPA200.9	0	N	N	0.003	mg/l	1
arsenic	3/4/2009 12:00:00 AM	EPA200.9	0	N	N	0.005	mg/l	1
barium	3/4/2009 12:00:00 AM	EPA200.7	0.215	Y	N	0.001	mg/l	1
beryllium	3/4/2009 12:00:00 AM	EPA200.7	0	N	N	0.001	mg/l	1
cadmium	3/4/2009 12:00:00 AM	EPA200.7	0	N	N	0.002	mg/l	1
chloride	3/3/2009 12:00:00 AM	EPA300.0	290	Y	Y	2	mg/l	1
chromium	3/4/2009 12:00:00 AM	EPA200.7	0.011	Y	N	0.002	mg/l	1
cyanide	3/3/2009 12:00:00 AM	SM184500CNE	0	N	N	0.01	mg/l	1
hardness	3/4/2009 12:00:00 AM	EPA200.7	424	Y	N	0.03	mg/l	1
iron	3/4/2009 12:00:00 AM	EPA200.7	0.561	Y	Y	0.004	mg/l	1
lead	3/11/2009 12:00:00 AM	EPA200.9	0.062	Y	Y	0.001	mg/l	1
manganese	3/4/2009 12:00:00 AM	EPA200.7	0.215	Y	N	0.003	mg/l	1

mercury	3/4/2009 12:00:00 AM	EPA245.1	0	N	N	0.0004	mg/l	1
nickel	3/4/2009 12:00:00 AM	EPA200.7	0	N	N	0.004	mg/l	1
nitrate	2/28/2009 7:13:00 PM	EPA300.0	0	N	N	0.2	mg/l	1
nitrite	2/28/2009 7:13:00 PM	EPA300.0	0	N	N	0.01	mg/l	1
pH	2/28/2009 10:30:00 AM	SM184500HB	6.5	Y	N	0	unitless	1
selenium	3/3/2009 12:00:00 AM	EPA200.9	0	N	N	0.002	mg/l	1
sodium	3/5/2009 12:00:00 AM	EPA200.7	80.3	Y	N	0.1	mg/l	1
sulfate	2/28/2009 12:00:00 AM	EPA300.0	31	Y	N	2	mg/l	1
thallium	3/9/2009 12:00:00 AM	EPA200.9	0	N	N	0.001	mg/l	1
turbidity	2/28/2009 5:30:00 PM	EPA180.1	0.9	Y	N	0.05	NTU	1
total coliform	2/28/2009 5:15:00 PM	SM209223	0	N	N	1	colonies/100ml	1
Escherichia coli	2/28/2009 5:15:00 PM	SM209223	0	N	N	1	colonies/100ml	1

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Click on the following link for Field Definitions.
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Demographic and Test Results Information For: 52 Todd Hill Road, Town of LaGrange
Parcel Number: 133400-6460-03-483481

Demographic Information

Latitude/Longitude	Sampling Points	Treated Sample	ELAP #	Matrix	Data Submitted to Client	Comments	Reason for Testing	Project Type
41.395550/73.481880	Kitchen Tap	N	10924	Water	True	Lab estimated level of toluene	Owner-Occupied Residence	Dutchess County

below normal equipment detection limit (DL) of .5 ug/L.

Test Results

Analyte Name	Date/Time of Analysis	Method Code	Result*	Detect Flag	Failure to meet Standard	DL	Unit of Measure	Dilution Factor
benzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
bromobenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
bromochloromethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
bromomethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
n-butylbenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
sec-butylbenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
tert-butylbenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
carbon tetrachloride	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

chlorobenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
chloroethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
chloromethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
2-chlorotoluene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
4-chlorotoluene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
dibromomethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2-dichlorobenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,3-dichlorobenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,4-dichlorobenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
dichlorodifluoromethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1-dichloroethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2-dichloroethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1-dichloroethene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
cis-1,2-dichloroethene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

trans-1,2-dichloroethene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2-dichloropropane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,3-dichloropropane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
2,2-dichloropropane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1-dichloropropene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
cis-1,3-dichloropropene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trans-1,3-dichloropropene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
ethylbenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
hexachlorobutadiene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
isopropylbenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
p-isopropyltoluene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
methylene chloride	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
n-propylbenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
styrene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

1,1,1,2-tetrachloroethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,2,2-tetrachloroethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
tetrachloroethene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
toluene	3/22/2008 12:00:00 AM	EPA502.2	0.4	Y	N	0.4	ug/l	1
1,2,3-trichlorobenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,4-trichlorobenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,1-trichloroethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,2-trichloroethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trichloroethene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trichlorofluoromethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,3-trichloropropane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,4-trimethylbenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,3,5-trimethylbenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
o-xylene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

m,p-xylene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
methyl-tertiary-butyl-ether	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
vinyl chloride	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
alkalinity	3/18/2008 12:00:00 AM	SM183230B	144	Y	N	10	mg/l	1
antimony	3/27/2008 12:00:00 AM	EPA200.9	0	N	N	0.003	mg/l	1
arsenic	3/27/2008 12:00:00 AM	EPA200.9	0	N	N	0.005	mg/l	1
barium	3/18/2008 12:00:00 AM	EPA200.7	0.222	Y	N	0.001	mg/l	1
beryllium	3/18/2008 12:00:00 AM	EPA200.7	0	N	N	0.001	mg/l	1
cadmium	3/18/2008 12:00:00 AM	EPA200.7	0	N	N	0.002	mg/l	1
chloride	3/15/2008 12:00:00 AM	EPA300.0	12	Y	N	2	mg/l	1
chromium	3/18/2008 12:00:00 AM	EPA200.7	0	N	N	0.002	mg/l	1
cyanide	3/17/2008 12:00:00 AM	SM184500CNE	0	N	N	0.01	mg/l	1
hardness	3/19/2008 12:00:00 AM	EPA200.7	66.3	Y	N	0.03	mg/l	1
iron	3/19/2008 12:00:00 AM	EPA200.7	0.133	Y	N	0.004	mg/l	1

lead	3/24/2008 12:00:00 AM	EPA200.9	0.001	Y	N	0.001	mg/l	1
manganese	3/19/2008 12:00:00 AM	EPA200.7	0.027	Y	N	0.003	mg/l	1
mercury	3/27/2008 12:00:00 AM	EPA245.1	0	N	N	0.0004	mg/l	1
nickel	3/18/2008 12:00:00 AM	EPA200.7	0	N	N	0.004	mg/l	1
nitrate	3/15/2008 10:45:00 PM	EPA300.0	0	N	N	0.2	mg/l	1
nitrite	3/15/2008 10:45:00 PM	EPA300.0	0	N	N	0.01	mg/l	1
pH	3/15/2008 5:59:00 PM	SMA184500HB	8.5	Y	N	0	unitless	1
selenium	3/29/2008 12:00:00 AM	EPA200.9	0	N	N	0.002	mg/l	1
sodium	3/19/2008 12:00:00 AM	EPA200.7	43	Y	N	0.1	mg/l	1
sulfate	3/15/2008 12:00:00 AM	EPA300.0	9	Y	N	2	mg/l	1
thallium	4/1/2008 12:00:00 AM	EPA200.9	0	N	N	0.001	mg/l	1
turbidity	3/15/2008 5:59:00 PM	EPA180.1	1	Y	N	0.05	NTU	1
total coliform	3/15/2008 4:30:00 PM	SM209223	0	N	N	1	colonies/100ml	1
Escherichia coli	3/15/2008 4:30:00 PM	SM209223	0	N	N	1	colonies/100ml	1

Click on the following link for Field Definitions.
For analytes and their MCLs, see Analyte and MCL list (.pdf) (https://www.dutchessny.gov/Departments/DBCH/docs/HDAnalyteMCLlist.pdf).

Demographic and Test Results Information For: 45 Amandas Way, Town of LaGrange
Parcel Number: 133400-6560-01-027724

Demographic Information

Latitude/Longitude	Sampling Points	Treated Sample	ELAP #	Matrix	Data Submitted to Client	Comments	Reason for Testing	Project Type
41.395630/73.465940	Kitchen Tap	N	10924	Water	False		Owner-Occupied Residence	Dutchess County

Test Results

Analyte Name	Date/Time of Analysis	Method Code	Result*	Detect Flag	Failure to meet Standard	DL	Unit of Measure	Dilution Factor
benzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
bromobenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
bromochloromethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
bromomethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
n-butylbenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
sec-butylbenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
tert-butylbenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
carbon tetrachloride	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
chlorobenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
chloroethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

chloromethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
2-chlorotoluene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
4-chlorotoluene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
dibromomethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2-dichlorobenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,3-dichlorobenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,4-dichlorobenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
dichlorodifluoromethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1-dichloroethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2-dichloroethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1-dichloroethene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
cis-1,2-dichloroethene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trans-1,2-dichloroethene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2-dichloropropane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

1,3-dichloropropane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
2,2-dichloropropane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1-dichloropropene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
cis-1,3-dichloropropene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trans-1,3-dichloropropene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
ethylbenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
hexachlorobutadiene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
isopropylbenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
p-isopropyltoluene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
methylene chloride	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
n-propylbenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
styrene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,1,2-tetrachloroethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,2,2-tetrachloroethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1

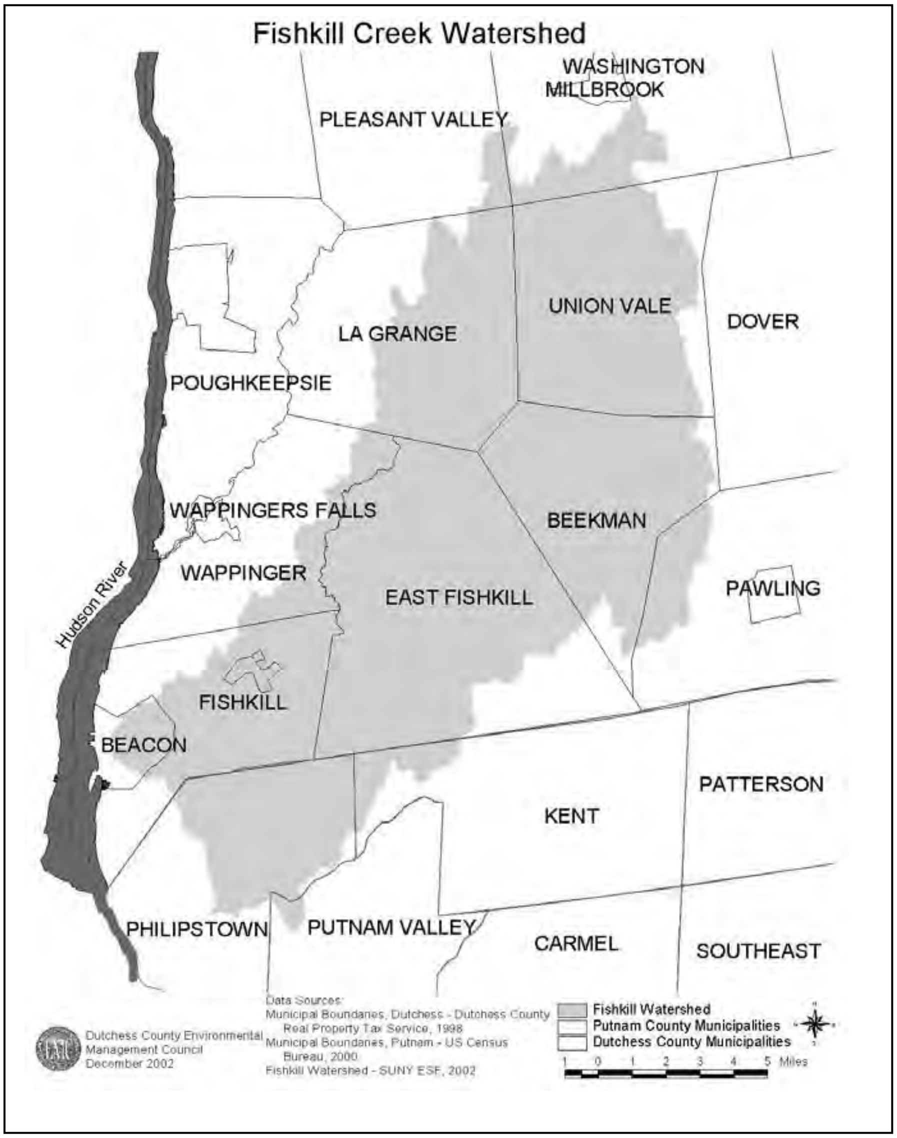
tetrachloroethene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
toluene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,3-trichlorobenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,4-trichlorobenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,1-trichloroethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,1,2-trichloroethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trichloroethene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
trichlorofluoromethane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,3-trichloropropane	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,2,4-trimethylbenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
1,3,5-trimethylbenzene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
o-xylene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
m,p-xylene	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
methyl-tertiary-butyl-ether	3/22/2008 12:00:00 AM	EPA502.2	0.6	Y	N	0.5	ug/l	1

vinyl chloride	3/22/2008 12:00:00 AM	EPA502.2	0	N	N	0.5	ug/l	1
alkalinity	3/18/2008 12:00:00 AM	SM183230B	110	Y	N	10	mg/l	1
antimony	3/27/2008 12:00:00 AM	EPA200.9	0	N	N	0.003	mg/l	1
arsenic	3/27/2008 12:00:00 AM	EPA200.9	0	N	N	0.005	mg/l	1
barium	4/3/2008 12:00:00 AM	EPA200.7	0.006	Y	N	0.001	mg/l	1
beryllium	4/3/2008 12:00:00 AM	EPA200.7	0	N	N	0.001	mg/l	1
cadmium	4/3/2008 12:00:00 AM	EPA200.7	0	N	N	0.002	mg/l	1
chloride	3/19/2008 12:00:00 AM	EPA300.0	39	Y	N	2	mg/l	1
chromium	4/3/2008 12:00:00 AM	EPA200.7	0	N	N	0.002	mg/l	1
cyanide	3/27/2008 12:00:00 AM	SM184500CNE	0	N	N	0.01	mg/l	1
hardness	3/19/2008 12:00:00 AM	EPA200.7	171	Y	N	0.03	mg/l	1
iron	3/19/2008 12:00:00 AM	EPA200.7	0.274	Y	N	0.004	mg/l	1
lead	3/24/2008 12:00:00 AM	EPA200.9	0	N	N	0.001	mg/l	1
manganese	3/19/2008 12:00:00 AM	EPA200.7	0.147	Y	N	0.003	mg/l	1

mercury	3/27/2008 12:00:00 AM	EPA245.1	0	N	N	0.0004	mg/l	1
nickel	4/3/2008 12:00:00 AM	EPA200.7	0	N	N	0.004	mg/l	1
nitrate	3/18/2008 2:45:00 PM	EPA300.0	0	N	N	0.2	mg/l	1
nitrite	3/18/2008 2:45:00 PM	EPA300.0	0	N	N	0.01	mg/l	1
pH	3/17/2008 4:55:00 PM	SMA184500HB	7.7	Y	N	0	unitless	1
selenium	3/30/2008 12:00:00 AM	EPA200.9	0	N	N	0.002	mg/l	1
sodium	3/19/2008 12:00:00 AM	EPA200.7	6.56	Y	N	0.1	mg/l	1
sulfate	3/18/2008 12:00:00 AM	EPA300.0	23	Y	N	2	mg/l	1
thallium	4/1/2008 12:00:00 AM	EPA200.9	0	N	N	0.001	mg/l	1
turbidity	3/17/2008 4:55:00 PM	EPA180.1	1	Y	N	0.05	NTU	1
total coliform	3/17/2008 12:00:00 AM	SM209223	0	N	N	1	colonies/100ml	1
Escherichia coli	3/17/2008 12:00:00 AM	SM209223	0	N	N	1	colonies/100ml	1

Natural Resources Management Plan For The Fishkill Creek Watershed

A Natural Resources Inventory and Conservation Strategy



Fishkill Creek in Tymor Park, Union Vale

Fishkill Creek near Carpenter Road in East Fishkill

Fishkill Creek in Beacon, NY

A Project of the Fishkill Creek Watershed Committee, May, 2005

FishkillCreekWatershed.org

Natural Resource Management Plan
for the
Fishkill Creek Watershed

June 2005

Prepared by the:

Dutchess County
Environmental Management Council
and
Fishkill Creek Watershed Committee

Primary support provided by:

New York State Department of Environmental Conservation,
Hudson River Estuary Program

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Acknowledgements

The *Natural Resources Management Plan for the Fishkill Watershed* was accomplished as a collaborative effort between several agencies, municipalities, non-governmental organizations, and most importantly, the citizens of the watershed. Upon completion of the *Natural Resources Management Plan for the Wappinger Creek Watershed* in October of 2000, municipal officials in the Fishkill Creek watershed began expressing interest in a watershed planning effort focused in Southern Dutchess County. Utilizing financial support from the Hudson River Estuary Program, the Dutchess County Environmental Management Council (EMC) and Dutchess County Soil and Water Conservation District (SWCD) hosted a Fishkill Watershed Symposium in May of 2002. Special thanks should be extended to our host, the Town of East Fishkill, and our symposium presenters: Barbara Kendall (Hudson Valley Greenway), Scott Cuppett (Hudson River Estuary Program), and Dr. Karin Limburg (State University of NY, Environmental School of Forestry). Following the symposium, a dedicated group of citizens, agency representatives, non-governmental organizations, and municipal representatives formed the Fishkill Creek Watershed Committee.

The following members of the Fishkill Creek Watershed Committee provided important information and news, valuable insights, and innovative ideas: Tim Sweeney, Carolyn Plage, Jane Geisler, Robert Hoose, Paul Wise, Marion Wise, Peter Rostenberg, Dan Troge, Kerri Brady, Noreen O' Rourke, Denis Callinan, Judy Lacombe, Candace Coates, Diana Hesse, Janet Swentusky, Jeff Green, Karen Bard, Sonja Sjoholm-DeHaas, Mary Schmalz, Cliff Schwark, Peter Idema, Camile Price, George Hanson, Bernard Ruf, Ellen and Robert Delocis, Rich Taylor, Tom Farmer, John Morabito, Dorothy Bermann, Marshall Seddon, Louis Chara, Malcolm Mills, Joan Pagones, Donald Groff, Marlene Woodason, Verna Wren, Laura Heady, Ed Heiser, Gretchen Stevens, Vincent Fabiano, Gerry Iagallo, Dennis Zach, Joe Ruggiero, Richard Nunez, Amanda Long, Joel Sholtes, Scott Cuppett, Sky Shook, Ryan Palmer, Rebecca Hale, Cathy Weick, and Becky Thornton.

Lynn Robbins, the first Chair of the Fishkill Watershed Committee, demonstrated the value of strong and compassionate leadership in leading a fledgling watershed group through their initial trials and tribulations. Rick Oestrike chaired the Committee through its second and into its third year and accomplished many projects such as the stream walk, a public service announcement, and many public presentations, to name a few. We further acknowledge Ed Hoxsie and Brian Scoralick from the Dutchess County Soil and Water Conservation District for providing technical support. Additionally, the committee's listserv and web page wouldn't have come to fruition if not for Fred Robbins, the web master. Lou Sebesta and Rick Oestrike provided invaluable resources for the forestry and geology sections of this management plan. Jesse Sayles and Barbara Kendall (Hudson River Estuary Program, NYSDEC) each contributed to the plan by writing sections on dams and the NYS Stormwater Program, respectively. Russell Urban-Mead offered insights and contributed to the groundwater section. Finally, special thanks are due Dan Shapley for his timely and educational environmental articles that provides a means for more public involvement in the watershed planning process.

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Executive Summary

Background

The Fishkill Creek Watershed Committee developed the *Natural Resources Management Plan for the Fishkill Creek Watershed* over a three-year period. The plan is designed as a comprehensive review of existing Fishkill watershed characteristics, data and maps compiled in a single document. Ultimately, the plan is meant to assist the fourteen watershed municipalities in planning for a sustainable future for their water and biological resources. Ensuring the health of the watershed's environmental resources will also help secure a future of prosperous economic growth and a good quality of life for watershed residents.

The Fishkill Creek watershed, located in Dutchess and Putnam Counties, NY drains approximately 193 square miles (123,627 acres) in eleven Dutchess County and three Putnam County municipalities. The main stem of the Fishkill Creek begins in the center of Union Vale and flows southwest, entering the Hudson River in Beacon. Located less than 90 miles from New York City, the watershed has experienced intense growth over the past thirty years. Land uses in the watershed are diverse, ranging from predominantly residential and forested land in the eastern portion, with mixed agricultural in the northern sections, to urban and commercial in the western half. During the period between 1990 and 2000 the population of Dutchess County increased by eight-percent (U.S. Census Bureau, 2001). As the population of Dutchess County rapidly increases it is imperative that measures are taken to protect the health of our water and maintain community resources.

Due to the complicated composition of the rural/urban land use interface of Southern Dutchess/Northern Putnam Counties, and the rapid rate of change, a broad range of challenges face the watershed. The primary sources of pollutants in the Fishkill Creek watershed are from nonpoint sources. Nonpoint source pollutants arise from a number of sources rather than just one (i.e. parking lot runoff, stormwater, septic system effluent, agriculture or construction runoff). Impacts from nonpoint source pollution threaten the quality of the recreational fishery, boating, and swimming in the Fishkill watershed streams, lakes, and ponds. Water supply wells and wildlife in watershed communities can also be negatively affected. Water quality impairment has been documented by several studies and detailed in the following plan. In addition to surface water problems, a portion of southern Dutchess County's groundwater was contaminated by organic chemicals.

The Fishkill Creek Watershed Committee (FCWC) benefited by the experiences and outcomes of the Wappinger Creek Watershed Planning Committee (WCWPC). The WCWPC was formed in 1995, conducted numerous research projects and trainings, and completed a watershed management plan in 2000. Since 2000, a watershed-based Intermunicipal Council has been formed and adopted measurable goals to be accomplished on a watershed scale. Many of the municipalities in the Wappinger Creek watershed also contain a portion of the Fishkill Creek watershed. However, a few municipalities outside the Wappinger watershed, or predominantly in the Fishkill, expressed an interest in starting an intermunicipal council to address issues specific to the Fishkill Creek watershed. In May of 2002, in collaboration with the Town of East Fishkill and the New York State Department of Environmental Conservation's Hudson River Estuary Program, the Dutchess County Environmental Management Council (DCEMC) and Dutchess County Soil and Water Conservation District (SWCD) hosted a symposium to initiate the Fishkill watershed planning process. Following the symposium, a group of watershed citizens, municipal representatives, and agency personnel started the Fishkill Creek Watershed Planning Committee (FCWC) in an attempt to address the threats identified at the symposium.

Water Quality Analysis of the Fishkill Creek Watershed

Water quality of the Fishkill Creek and its major tributaries was assessed between 1973 and 2002 by different scientific research groups including, Neuderfer (1977), Schmidt and Kiviat (1985), Bode et al. (1991), Bode et al. (1999), Stainbrook (2001), and Bode (2004). The primary component of these studies was an analysis of biological communities, including benthic macroinvertebrates and fish. In addition to the biological analysis, water samples were collected and analyzed for chemical and physical parameters.

Comprising 42% of the Fishkill Creek watershed, the Fishkill Creek main stem subwatershed encompasses 52,783 acres in the towns of Union Vale, Beekman, East Fishkill, Fishkill and Wappinger. The watershed's major stream is the main stem of the Fishkill Creek, originating in the town of Union Vale and flowing southwest until it empties into the Hudson River in the City of Beacon. Based on previous studies of the Fishkill Creek (1973 through 2001), it seemed the stream water quality improved slightly in the downstream portions of the stream since 1973. These improvements can most likely be accounted for by the passage and implementation of the Clean Water Act in 1972, and the subsequent reduction of point (end-of-pipe) source discharges. Upstream of the Route 9 Bridge (FC 6.9), the Fishkill Creek remained in good ecological health throughout the period of study (1973 through 2001). In this section, the primary impact to biological communities appeared to be the many dams in the creek, but this does not necessarily translate into water quality degradation. From the Route 9 bridge (FC 6.9) to its confluence with the Hudson River, the Fishkill Creek was impacted by various sources of pollution including sewage inputs, construction and historical industrial inputs.

The Sprout Creek watershed encompasses 29,342 acres representing 24 percent of the Fishkill Creek Watershed. This subwatershed is located within five municipalities including the towns of Washington, Pleasant Valley, Union Vale, La Grange, East Fishkill and Wappinger. The Sprout Creek appeared to be in good (non- to slightly-impacted) shape throughout the period of study (1973-2002). However, at various points throughout the period of study there were pollution sources that acted to slightly degrade the stream. The most likely sources of nutrient enrichment were sewer treatment plant effluents, faulty septic systems, and agricultural operations that weren't following best management guidelines.

Clove Creek watershed encompasses an area of approximately 12,960 acres in the town of Fishkill in Dutchess County, and the towns of Philipstown and Putnam Valley in Putnam County, representing 10 % of the Fishkill Creek Watershed. The major stream in the subwatershed is the Clove Creek, which originates in Putnam County on the east side of Route 9 and continues to flow northward to the town of Fishkill. The Clove Creek flows parallel to the Fishkill Ridge on the northern side, and continues west, where it empties into the Fishkill Creek near the intersection of Route 9 and Interstate 84. Clove Creek aquifer is a significant feature located in the northwest corner of Putnam and southwest corner of Dutchess Counties'. Designated as a critical environmental area by the town of Fishkill, the Clove Creek aquifer is underlain by sand and gravel, and is a very permeable and productive aquifer with wells yielding an average of 189 gallons of water per minute (Snavely, 1980). Macroinvertebrate analysis indicated the Clove Creek was a good (non- to slightly-impacted) quality stream, and fish sampling indicated the fish community of the Clove Creek hadn't changed since a previous sampling in 1936 (Schmidt and Kiviat, 1985). The researchers also found reproducing brown trout populations, which can also be an indicator of good water quality.

Jackson Creek watershed encompasses an area of 5,524 acres in the towns of Union Vale, La Grange and Beekman. The watershed encompasses 4 percent of the total area of the Fishkill Creek Watershed. Schmidt and Kiviat (1985) assessed the fish populations of Jackson Creek and found naturally reproducing trout populations. Healthy brook and brown trout populations were also documented in 2001, despite poor physical conditions due to the lack of flow and only pockets of water (Stainbrook, 2004). Finally, in the summer of 2002, Bode et al. (2004) found the Jackson Creek fauna dominated by clean-water mayflies, and based on macroinvertebrate metrics assessed the water quality as nonimpacted.

Whaley Lake Brook watershed encompasses 11,481 acres, accounting for 9 percent of the Fishkill Creek watershed area. This watershed is located within three municipalities including the towns of Union Vale, Beekman and Pawling. Researchers visited Whaley Lake Brook in 1988 through 1989 at river mile WL 0.4. According to Stevens et al. (1994), Whaley Lake Brook had substantially higher chloride concentrations than existed in the 1985 analysis. Despite the increase in chloride concentrations, Whaley Lake Brook had good water quality (slightly impacted), a substantial fish community, and clean-water diatoms (Stevens et al., 1994). Additionally, spawning brown trout were documented in 1988 and 1989, again indicating good water quality.

The Whortlekill Creek watershed encompasses approximately 4,269 acres, accounting for 3 percent of the total Fishkill Creek watershed area. The Whortlekill Watershed is located in three municipalities including the towns of Beekman, La Grange and East Fishkill. Researchers visited Whortlekill Creek in 1988 through 1989 at river mile WK 0.35. According to Stevens et al. (1994), the stream contained a diatom community that was dominated by pollution sensitive species, especially in the fall and winter. Additionally, the stream contained the best fish community of all the Fishkill Creek sampling stations (Stevens et al., 1994). The researchers found a reproducing population of brook trout, which are very pollution sensitive. Combined, these factors indicated good (non- to slightly-impacted) water quality. In 2001, the brook trout populations were still present despite a large increase in developed land (Stainbrook, 2004).

Wiccopee Creek watershed (H-95-8) encompasses 7,267 acres, accounting for 6 percent of the Fishkill Creek watershed area. This Fishkill Creek subwatershed is located within four municipalities including the towns of East Fishkill and Fishkill in Dutchess County and the towns of Kent and Philipstown in Putnam County. The stream was assessed in 1985 when Schmidt and Kiviat found the Putnam County headwaters contained healthy brown trout and slimy sculpin populations. Slimy sculpins require clean and clear streams for survival, and thus their presence indicated good (non-impacted) water quality in the headwaters of the Wiccopee. The researchers went as far as to compare the headwaters to pristine Catskill streams, particularly due to the cold-water temperatures (Schmidt and Kiviat, 1986). Overall, Wiccopee fish populations appeared not to have changed significantly since a previous fish study in 1936 (Schmidt and Kiviat, 1986).

Researchers visited the Wiccopee Creek again in 1988 through 1989 at river mile WC .82 (Route 52 bridge). They found the macroinvertebrate community indicated high water quality (non-impacted) in the summer, but mediocre (slightly impacted) in other seasons (Stevens et al., 1994). The fish communities were the poorest in the Fishkill basin with only two species collected in 1988, and by 1991 the fish communities hadn't recovered (Stevens et al., 1994). Although the lower portions of the Wiccopee appeared to have been damaged, the headwater portion remained pristine. Despite the poor fish community, the water chemistry parameters measured as good (non- to slightly-impacted).

Management Strategies for Achieving Watershed Conservation Goals and Objectives

To protect the Fishkill Creek watershed for future generations, efforts need to be made to protect the stream corridor through the establishment of effective forested stream buffers. The stream buffers will function to offer some measure of protection against encroaching land uses. Additionally, watershed groundwater withdrawals for the expansion of suburban land uses need to be balanced to protect in-stream flows. In conjunction with this, a watershed-wide approach should be employed to determine the amount of regulated discharges that can be added to the various streams during low-flow periods without causing degradation. Stormwater run-off, from parking lots, roads, and subdivisions, should be treated before reaching the streams. In addition, serious investments should be made into impervious surface alternatives.

Water quality monitoring should continue to be conducted to track changes in biological community structure and water chemistry. Dissolved oxygen, temperature, conductivity, nitrate, phosphate, sulfate and chloride are water quality constituents of particular interest for tracking human-induced changes. Finally, failing and out-of-date sewage systems need to be upgraded to protect water quality and human health.

Following these guidelines should allow the Fishkill Creek to thrive along with the communities it touches. Ignoring the water quality of the Fishkill Creek during this period of extensive expansion will act to erode the health of the Fishkill Creek, and ultimately the surrounding communities. In depth recommendations developed by the Fishkill Creek Watershed Committee include:

Watershed Conservation Objectives

1) The Dutchess County Environmental Management Council and various environmental organizations should collect, organize, evaluate and make public existing data on the Fishkill Creek watershed.

2) Municipalities, government agencies and environmental organizations should continue to monitor water quality and quantity, biodiversity, land use, stream flow regime and other parameters within the watershed with the objective of identifying areas of concern to its integrity. Wherever possible this new data should be incorporated into the database mentioned in objective number one.

3) Municipalities, residents and businesses (i.e. property owners) should work toward remediation of the problems identified through analysis of the database developed through objectives one and two. Environmental groups should assist with the remediation efforts.

4) Businesses, municipalities, environmental groups and residents (the stakeholders) should collaborate to protect the watershed.

5) Environmental organizations, residents, businesses and municipalities should encourage locally based water resource education.

6) All stakeholders should help maintain a good quality-of-life within the watershed by protecting the health of the watershed.

Specific Recommendations

- Efforts should be made to protect the stream corridor through the establishment of effective forested stream buffers. The stream buffers will offer some measure of protection against encroaching land uses.

- Groundwater withdrawals for the expansion of suburban land uses need to be balanced with groundwater recharge to protect in-stream flows. In conjunction with this, a watershed-wide approach should be employed to determine the amount of regulated discharges that can be added to the stream during low-flow periods without causing degradation.

- Stormwater run-off, from parking lots, roads, and buildings, should be treated before reaching the stream. This can be accomplished by replacing old infrastructure with modern systems that remove many pollutants (see additional watershed protection measures section).

- In addition, serious investments should be made into impervious surface alternatives and ordinances to limit the amount of impervious surfaces in new developments.

- Water quality monitoring should continue to be conducted to track changes in biological community structure and water chemistry. Macroinvertebrate studies should be repeated approximately every 5 years. Dissolved oxygen, temperature, conductivity, nitrate, phosphate, sulfate, and chloride are water quality constituents of particular interest for tracking human-induced as well as natural changes in the drainage.

- Mapping of riparian and in-channel habitats should be completed. The remote-sensing based mapping should be updated on a 5 year basis in order to track changes.
- Identify streams routinely use for swimming and check to see if NYSDEC classifies them as B (suitable for primary contact recreation). If necessary, request a classification upgrade to class B.
- Cumulative impacts should be considered before issuance of state pollution discharge (SPDES) permits.
- Best Management Practices (BMPs) issued by the NYSDEC, NYSDOT, USEPA and others should always be followed.
- Many of the dams within the watershed are no longer in use. These dams should be systematically evaluated and removed where practical.

Implementation of the Plan

The Fishkill Creek Watershed Committee is committed to accomplishing the recommendations set forth in this management plan. To this end, the Committee members will concentrate their collective efforts in identifying funding opportunities to move implementation forward. In addition, resource partners (agencies and non-governmental agencies) should identify the goals and objectives that they can move forward under the pretext of their operational mandate.

One of the primary components necessary for the success of this planning project is public involvement. To this end, the Committee has already had a good start with the watershed symposium, watershed plan, education grant to complete watershed-based lesson plans, completion of the streamwalk project, numerous publications, presentations, and displays, creation of the listserv and the watershed website (FishkillCreekWatershed.org). In addition to continuing these efforts, the Committee should work towards formal intermunicipal cooperation, including the municipal adoption of measurable watershed conservation goals.

For more information on the Fishkill Creek Watershed Committee, please visit FishkillCreekWatershed.org.

I. Introduction

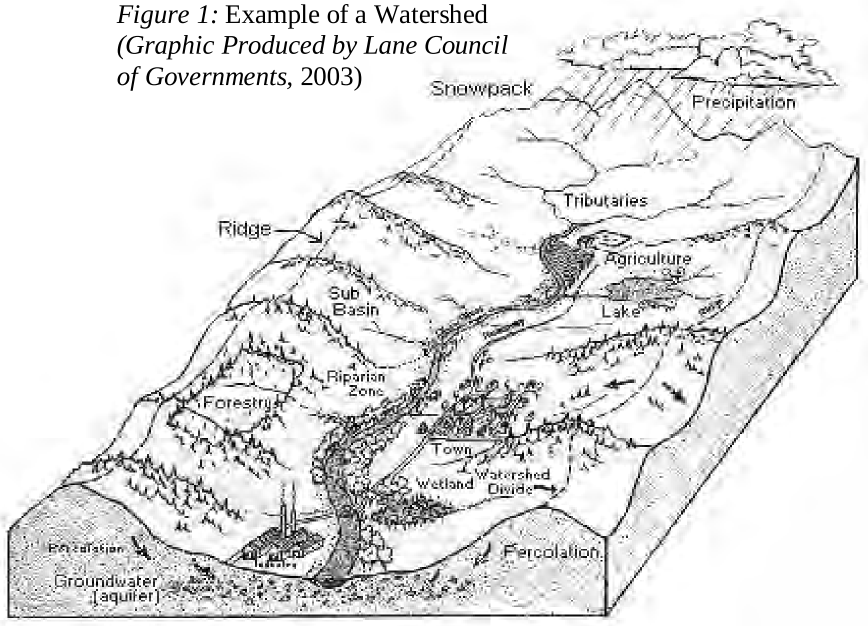
Purpose of Fishkill Watershed Plan

The *Natural Resources Management Plan for the Fishkill Creek Watershed* is designed as a comprehensive review of existing Fishkill watershed characteristics, data and maps compiled in a single document. Subject areas addressed in the plan include wetland information, subwatershed characteristics, water quality data, land use information, and natural resources. A watershed protection plan is also included, and potential funding sources are identified. Ultimately, the plan is meant to assist the fourteen watershed municipalities in planning for a sustainable future for their water and biological resources. Ensuring the health of the watershed's environmental resources will also help secure a future of prosperous economic growth and a good quality of life for watershed residents.

The Fishkill Creek and its Watershed

A watershed can be defined as the land area that water flows across (surface water), and under (groundwater), on its way to a stream, river, or lake (Figure 1). Watersheds vary in size, from the Atlantic Ocean, to the Hudson River, to the Fishkill Creek, down to small tributaries that drain into the Fishkill Creek. Basically, a watershed is an area of land that drains to a single outlet. Everyone lives in a watershed.

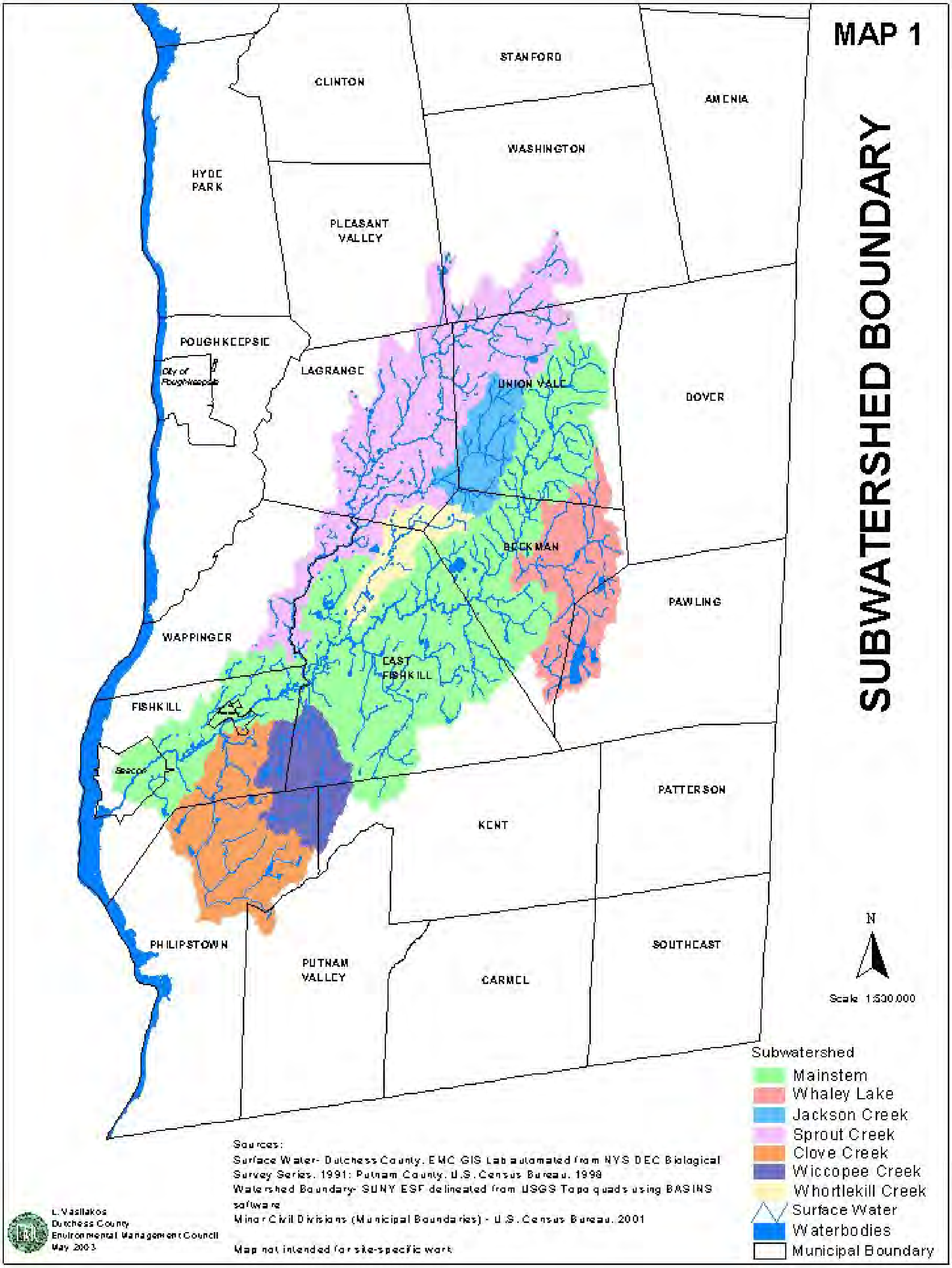
Figure 1: Example of a Watershed
(Graphic Produced by Lane Council of Governments, 2003)



The Fishkill Creek watershed, located in Dutchess and Putnam Counties, NY drains approximately 193 square miles (123,627 acres) in eleven Dutchess County and three Putnam County municipalities (Map 1). The main stem of the Fishkill Creek begins in the center of Union Vale and flows southwest, entering the Hudson River in Beacon (Map 1). In between, through its various tributaries, it drains large sections of Union Vale, Beekman, East Fishkill, and Fishkill, along with smaller portions of western Pawling, southeastern Pleasant Valley, northwestern Kent, northern Philipstown, and southwestern Washington (Map 1). The Sprout Creek, Fishkill Creek's largest tributary, drains major sections of La Grange, and Union Vale, and smaller portions of Wappinger and East Fishkill. In Putnam County, the Clove Creek drains a large section of Philipstown, and a very small section of northwest Putnam Valley. Finally, Wiccopee Creek drains a small portion of western Kent.

Elevations in the watershed vary from a high of approximately 1,610 feet above sea level on Mount Beacon, to almost sea level at the confluence of the Fishkill Creek and Hudson River. The average elevation of the watershed is approximately 635 feet above sea level. In the upper reaches of the basin the stream drops slightly more than 200 feet in 10 miles. In the lower portion, where the Fishkill Creek flows over shale and limestone ledges, the gradient is 200 feet in 5 miles. The main stem of the Fishkill Creek ranges from 420 feet above sea level in the four corners region of Union Vale, La Grange, Pleasant Valley, and Washington to sea level at the confluence of the Fishkill Creek and Hudson River.

Located less than 90 miles from New York City, the watershed has experienced intense growth over the past thirty years. Land uses in the watershed are diverse, ranging from predominantly residential and forested land in the eastern portion, with mixed agricultural in the northern sections, to urban and commercial in the western half. During the period between 1990 and 2000 the population of Dutchess County increased by eight-percent (U.S. Census Bureau, 2001). As the population of Dutchess County rapidly increases it is imperative that measures are taken to protect the health of our water and maintain community resources. If we fail to incorporate environmental protections during this period of rapid urbanization and sub-urbanization, the future integrity of our water and environmental resources may be severely compromised. Additionally, the increases in sub-urbanization will lead to extremely large and costly infrastructure projects to replace the natural drinking water filtration and sewage disposal functions currently performed for free by nature. Watershed and environmental health also depend on a healthy and vibrant economy. Knowing this, watershed communities must develop and implement plans that combine environmental protections, economic growth, and healthy communities. Ultimately, the health of our local environment drives the quality of life of our residents. In the following management plan, recommendations are proposed to assist in maintaining a healthy environment, while promoting sustainable community development.


MAP 1
SUBWATERSHED BOUNDARY
STANFORD
CLINTON
AMENIA
WASHINGTON
HYDE PARK
PLEASANT VALLEY
POUGHKEEPSIE
City of Poughkeepsie
LAGRANGE
UNION VALE
DOVER
BEEKMAN
PAWLING
WAPPINGER
EAST FISHKILL
FISHKILL
Beacon
PATTERSON
KENT
PHILIPSTOWN
PUTNAM VALLEY
CARMEL
SOUTHEAST
N
Scale 1:530,000
Subwatershed
Mainstem
Whaley Lake
Jackson Creek
Sprout Creek
Clove Creek
Wiccopee Creek
Whortlekill Creek
Surface Water
Waterbodies
Municipal Boundary
Sources:
Surface Water- Dutchess County, EMC GIS Lab automated from NYS DEC Biological Survey Series, 1991; Putnam County, U.S. Census Bureau, 1998
Watershed Boundary- SUNY ESF delineated from USGS Topo quads using BASINS software
Minor Civil Divisions (Municipal Boundaries) - U.S. Census Bureau, 2001
Map not intended for site-specific work
L. Vasilakos
Dutchess County
Environmental Management Council
May 2003

How we are connected to the Fishkill Creek Watershed and *Why you should care*

Wherever you live in the watershed, what you do at your home and its surroundings can have a direct impact on your neighbor's water resources. As Fishkill Creek watershed land uses evolved over the last 200 years, the natural water balance has been altered. Natural forest cover and wetlands have been replaced with roads, driveways, parking lots, and buildings. These hard surfaces, or impervious surfaces, increase the amount of rainfall that flows over land and reduce the amount of rainfall that percolates into the soil or is consumed by plants and trees. Increasing the amount of rainfall that runs off the land leads to flooding, and as water flows over these paved surfaces, it collects soil, pet wastes, salt, fertilizers, oils, and other pollutants. Increased impervious surfaces can lead to increased storm flow intensity that can exacerbate flooding and stream erosion. It doesn't matter if your house does not border a stream or river, local rainwater flows down the street into a catch basin. Storm sewers often carry this runoff from your neighborhood directly to the nearest body of water, taking dirt and pollutants along with it. In order to meet both surface and groundwater planning needs, both quality and quantity, a comprehensive watershed approach is required to document the magnitude of potential impairment, and involve watershed stakeholders in recommending strategies for remediation and management.

What are the primary concerns in the Fishkill Creek Watershed?

Due to the complicated composition of the rural/urban land use interface of Southern Dutchess/Northern Putnam Counties, and the rapid rate of change, a broad range of challenges face the watershed. To understand the threats to the Fishkill Creek watershed we must differentiate between point and nonpoint source pollutants. Point sources of pollution can usually be traced to a specific source or pipe that is discharging effluent to a receiving water body (i.e. sewage or industry discharges). The State Pollution Discharge Elimination System (SPDES) permitting program was designed to address point source pollution (Map 5). In 1972 approximately 2000 miles of streams and rivers were impaired by point source pollution (NYSDEC, 1996). However, by regulating industrial and sewage discharges, the number of stream and river miles impaired by point source pollutants had been reduced to approximately 300 miles by 1996 (NYSDEC, 1996).

The primary sources of pollutants in the Fishkill Creek watershed are from nonpoint sources. Nonpoint source pollutants arise from a number of sources rather than just one (i.e. parking lot runoff, stormwater, septic system effluent, agriculture or construction runoff) (Figure 2). Impacts from nonpoint source pollution threaten the quality of the recreational fishery, boating, and swimming in the Fishkill watershed streams, lakes, and ponds. Water supply wells and wildlife in watershed communities can also be negatively affected. Water quality impairment has been documented by several studies. Based on 1991, 1997, and 1998 biological monitoring data of the Fishkill Creek, the New York State Department of Environmental Conservation (NYSDEC) found that the reach from Fishkill to Beacon is considered slightly impacted, probably by sewage and heavy metal wastes (NYSDEC, 1999). This same study also suggested that agricultural activity in the upper watershed might be contributing to elevated nutrient loads (NYSDEC, 1999).

Additionally, in a 1994 study, Hudsonia, Ltd. found a strong upstream-to-downstream pollution gradient in the Fishkill system, with pollution increasing as you moved downstream (Stevens et al., 1994). Based on these studies and local observation, the lower five miles of the Fishkill Creek were placed on the NYSDEC's Priority Water List (PWL) in 1996 due to impairments from runoff.

Anything dumped into the stormdrain may eventually end up in the local stream, lake, or wetland (University of Wisconsin. 1999).

In a recent intensive study by the NYSDEC, the Fishkill Creek was identified as one of four streams in the Hudson Basin with a "medium" need for remediation from multiple urban nonpoint sources of pollution (Bode et al., 2001). Only two streams in the Hudson Valley, receiving point source pollutants, ranked higher for remediation. Bode et al. (2001) also demonstrated through tissue analysis of aquatic organisms, that there were elevated levels of polycyclic aromatic hydrocarbons (PAHs) at Hopewell Junction and Beacon monitoring sites in the Fishkill Creek, elevated levels of lead and selenium at a Beacon site, and high levels of lead in crayfish at the Beacon site. PAHs result as a by-product of combustion from sources such as incineration of municipal and solid waste, burning fossil fuels, forest fires, and other industrial processes (USGS, 1998). Finally, Hillside Lake, a small lake surrounded by development in the town of East Fishkill, has also been placed on the NYSDEC Priority Water List due to nutrient loading from failing on-site septic systems and urban runoff (NYSDEC, 1999).

Surface water reservoirs in Fishkill, Philipstown and Beekman have been relatively clean to date, but long-term land use planning is needed to protect these important resources. In addition, Hudsonia (1994) researchers demonstrated that the Fishkill Creek provided a variety of aquatic habitats, comprised of a diverse array of fishes ranging from upland cold water forms (slimy sculpin and brook trout) to slow-moving water forms (banded killifish and largemouth bass). In a study of the estuarine portion of the Fishkill Creek, researchers theorized that increased urbanization in the Fishkill watershed caused a decrease in the amount of Hudson River fish spawning in the creek (Schmidt and Limburg, 1989). The recommendations proposed in chapter four are intended to protect the unaffected fishery and may help restore the degraded fishery.

In addition to surface water problems, a portion of southern Dutchess County's groundwater was contaminated by organic chemicals. The chemical solvents trichloroethylene (TCE), trichloroethane (TCA), and perchloroethylene (PCE) were discharged into the aquifer. PCE and TCE were commonly used to degrease metal parts, and PCE was also used in the dry cleaning process. TCA was used as an ingredient in degreasers, paints and glues until being banned in 1996 because it contributes to the depletion of the earth's ozone layer. In 2003, there were 141 private wells contaminated by either TCE, TCA, PCE, or a combination of the three. Additionally, wells throughout Dutchess County have been contaminated with methyl tertiary-butyl ether (MTBE). MTBE is a chemical that was a component of gasoline since 1979, when it was introduced to take the place of lead as an octane enhancer. However, it was not until 1992 that the chemical became a large part of gasoline by volume. In 1992, the amendments to the Clean Air Act mandated that non-attainment areas for the ambient standards set by the Act use reformulated gasoline. MTBE turned out to be such a threat to drinking water because of its chemical properties. It is hydrophilic and fast moving, meaning it is attracted to water, and as such moves more quickly through the ground than other components of gasoline. Most people can smell MTBE in contaminated water at levels as low as 100 parts per billion (ppb). On May 24, 2000, legislation banning the use, sale or importation of fuels containing MTBE in New York State was signed into law. The ban on MTBE went into effect in the beginning of 2004.

In conclusion, it is extremely important that the citizens of the Fishkill Creek watershed work collaboratively with government agencies, non-governmental agencies, and businesses to design a plan for a sustainable watershed future. The plan should address the surface and ground water contamination issues outlined above. In addition, the plan should ensure that sufficient quantities of water are available to sustain the unique biodiversity, and wide-ranging habitats, of the watershed. The *Natural Resource Management Plan for the Fishkill Creek Watershed* is designed as a guide to initiate and sustain the planning process.

Goals and Objectives of the Fishkill Creek Watershed Committee

The Fishkill Creek Watershed Committee developed a mission statement and goals in 2002 (Table 1).

Table 1. Mission Statement and Goals of the Fishkill Creek Watershed Committee

Mission Statement(s)

- To involve individuals, groups and other interested entities, both public and private, within the Fishkill Creek watershed for the long-term planning of sustainable communities and protection of our natural environment including but not limited to ground and surface water quality and quantity.

  and/or

- To encourage individuals and entities, both public and private to work for the protection of the natural environment within the Fishkill Creek watershed.

Goals

- Protect wetlands and aquifers, and protect and restore naturally vegetated forested stream buffers.
- Identify and encourage financial incentives to residents and businesses that conserve and protect the watershed.
- Identify human activities taking place in the watershed that could damage the aquifer. Assign generally accepted levels of risk to them, then work with businesses and residences to reduce those risks.
- Promote awareness and education within the watershed.
- Educate and empower local landowners.
- Identify and remediate problem areas and future issues that arise within the watershed.
- Promote biodiversity.
- Maintain water quality where it is currently satisfactory.
- Start water quality monitoring program to identify existing water quality problems in the watershed.

Past, Current, and Future Activities

The Fishkill Creek Watershed Committee (FCWC) benefited by the experiences and outcomes of the Wappinger Creek Watershed Planning Committee (WCWPC). The WCWPC was formed in 1995, conducted numerous research projects and trainings, and completed a watershed management plan in 2000. Since 2000, a watershed-based Intermunicipal Council has been formed and adopted measurable goals to be accomplished on a watershed scale. Many of the municipalities in the Wappinger Creek watershed also contain a portion of the Fishkill Creek watershed. However, a few municipalities outside the Wappinger watershed, or predominantly in the Fishkill, expressed an interest in starting an intermunicipal council to address issues specific to the Fishkill Creek Watershed. In May of 2002, in collaboration with the Town of East Fishkill and the New York State Department of Environmental Conservation's Hudson River Estuary Program, the Dutchess County Environmental Management Council (DCEMC) and Dutchess County Soil and Water Conservation District (SWCD) hosted a symposium to initiate the Fishkill watershed planning process. Following the symposium, a group of watershed citizens, municipal representatives, and agency personnel started the Fishkill Creek Watershed Committee (FCWC) in an attempt to address the identified threats (Table 2). The following is a list FCWC activities that have been either accomplished or are on-going.

- Hosted a watershed symposium, formed planning committee, adopted mission and goals, and hold monthly meetings (often with speakers).
- Received funding for the development of the Natural Resources Management Plan for the Fishkill Creek Watershed, and for an education campaign.
- Received support from watershed municipalities through board appointed representatives.
- Completed a Fishkill watershed land use analysis based on year 2000 digital orthophotos.
- Collaborated with the DCEMC and State University of New York, Environmental School of Forestry on an ecological health assessment of watershed.
- Started an education subcommittee that received funding for a watershed education program from the Hudson River Estuary Program.
- Completed physical assessments of 16-miles of the Fishkill Creek.
- Started a watershed internet/email group and a web-based education campaign (Table 3).
- Worked with Hudsonia Ltd. to incorporate a biodiversity component in the watershed planning process.

Table 2.	Top Ten Threats To The Fishkill Watershed Identified By Participants Of The May 9, 2002 Symposium
1.	High rate of development
2.	Quantity of groundwater
3.	Lack of enforcement of existing regulations
4.	Public health (due to groundwater contamination)
5.	Surface water reductions (due to over withdrawal)
6.	Land uses with potentially hazardous by-products in close proximity to residential areas
7.	Land use regulations that don't necessarily protect water quality
8.	Sewage discharges to creek
9.	Lack of research
10.	Lack of cooperation

Table 3. Website & Online Discussion Group Information

(by Fred Robbins, December, 2004)

The Fishkill Creek Watershed Committee's Website provides an introduction to watersheds, maps, pictures, results of Streamwalk 2004, tips for watershed care, meeting information, and links to many other websites. Visit FishkillCreekWatershed.org.

The Committee's **Online Discussion Group** (sometimes called a "listserv") is a service that provides an email "bulletin board" which we can all use to exchange information and thoughts. Any member can "post" a message that will be seen by all other members. Joining the group will also enable you to view the email archive (letters, media articles, meeting minutes, email from other members), as well as to control your message viewing preferences.

Just go to groups.yahoo.com/group/Fishkillwatershed and click on "Join this Group!" Then you can post messages by sending email to Fishkillwatershed@yahoogroups.com.

II. Description of the Watershed

Watershed Boundary

The Fishkill Creek watershed encompasses fourteen municipalities within Dutchess and Putnam counties (Map 1, Table 4). Within Dutchess County, the watershed covers sections of the towns of Beekman, East Fishkill, Fishkill, La Grange, Pawling, Pleasant Valley, Union Vale, Wappinger, Washington, City of Beacon and Village of Fishkill. Within Putnam County, the watershed covers portions of the towns of Kent, Philipstown and Putnam Valley.

Table 4. Municipalities in the Watershed

Municipality	Percent of Municipality in the Watershed (%)	Percent of Watershed in the Municipality (%)
BEACON (C)	57.4	1.4
BEEKMAN	92.5	14.7
EAST FISHKILL	84.1	25.1
FISHKILL (T)	54.9	8.9
FISHKILL (V)	100.0	0.4
KENT	7.6	1.7
LAGRANGE	56.9	11.9
PAWLING	11.4	2.5
PHILIPSTOWN	33.7	9.0
PLEASANT VALLEY	4.8	0.8
PUTNAM VALLEY	1.5	0.3
UNION VALE	86.4	16.7
WAPPINGER	22.7	3.3
WASHINGTON	10.5	3.1

Subwatersheds

The Fishkill Creek watershed is made up of seven subwatersheds including the Fishkill Creek Main stem, Clove Creek, Jackson Creek, Sprout Creek, Whaley Lake Creek, Wiccopee Creek, and Whortlekill Creek (Map1, Table 5). The State University of New York School of Environmental Science and Forestry (SUNY ESF) delineated the subwatersheds from the United States Geological Survey (USGS) topographic quadrangles using BASINS software. Biological, physical and chemical data were collected from 16 sites within these subwatersheds during the 2001 sampling season (June-August) (Map 11).

Land Use

Land use in the Fishkill Creek watershed is diverse consisting of agriculture, urban/commercial, extractive,

Table 5. Subwatershed Acreage

Subwatershed	Total Area (Acres)
Fishkill Creek Mainstem	52,783
Clove Creek	12,960
Jackson Creek	5,524
Sprout Creek	29,342
Wiccopee Creek	7,267
Whaley Lake	11,481
Whortlekill Creek	4,270
TOTAL	**123,627**

forest, industrial, outdoor recreation, public, residential, transportation, inactive, and water resources as defined using the New York State Land Use and Natural Resources Inventory (LUNR) (CLEARS, 1995) (Map 2). In the LUNR classification system, agricultural land includes orchards, vineyards, horticulture or floriculture, high intensity cropland, cropland and cropland pasture, pasture and specialty farms. Commercial land is categorized as areas predominately connected with the sale of products and services including central business districts, shopping centers, resorts and strip development. Extractive land consists of surface and subsurface material extraction including stone quarries, sand and gravel pits, underground mining, oil and gas wells, salt mining and other areas for both open and underground mining. Forest land consists of forest brushland (i.e. regenerating forest with more than 10 % brush cover), forest lands (land areas with natural stands where 50 % or more of the trees are over 50 years old and over 30' high) and plantations.

Industrial lands are characterized as areas used for product manufacturing and research including light manufacturing and industrial parks and heavy manufacturing. Outdoor recreation areas are predominantly utilized for outdoor recreation including golf courses, ski areas, swimming areas, marinas, yacht clubs and boat launch sites, public and private campgrounds, fairgrounds, public parks, etc. Public land provides services to the public including educational institutions, religious institutions, health institutions, military bases, solid waste disposal, cemeteries, water supply treatment facilities, sewage treatment plants, road and street equipment centers, etc. Residential land consists of high, medium and low density residential areas, strip developments, rural hamlets, farm labor camps, rural estates, cluster housing, cottages and vacation homes, apartment buildings, mobile homes, and rural non-farm residences. Transportation is categorized as highways, railways, airports, barge canals, marine shipping areas, and communication and utilities. Inactive land consists of an area that is not being utilized as a particular land use including inactive agricultural land and urban inactive. Water resources are categorized as lakes and ponds, streams and rivers, wetlands, marine lakes, rivers and seas and the Hudson River.

In 2003, a study was conducted by the DCEMC, with funding from the Hudson Valley Regional Council (HVRC), designed to analyze the land use and land cover characteristics of the Fishkill watershed. The final product of the study was the development of a land use/land cover data layer in the LUNR classification system that was based upon the Dutchess County's Year 2000 aerial photography. Using this layer, land use was aggregated into 11 categories and calculations were made to determine percent land use for the entire watershed. The completed layer was also compared with a LUNR layer that was developed from 1995 aerial photography to determine land use change over the five-year period for the Dutchess County portion of the Fishkill Creek watershed.

In 2000, the dominant land use in the Fishkill Creek watershed was forest cover comprising nearly 50 % of the watershed (Table 6, Map 2). The second largest category was residential land uses encompassing approximately 21 percent. Other land use categories included agriculture (10.7%), water/wetlands (8.9%), outdoor recreation (2.4%), inactive land (1.8%), transportation (1.5%), urban/commercial (1.3%), public/semipublic (1.2 %), extractive (0.7 %) and industrial (0.6%) (Table 6). In the Dutchess County portion of the watershed, the major land use types were forest cover (45.8 %), residential (22.7 %) and agriculture (11.8 %) (Table 7). In the Putnam County portion of the watershed, the major land use types were forest cover (82.4 %), residential (8.5 %) and water/wetlands (5.1 %) (Table 8). In the Fishkill Creek watershed from 1995 to 2000, the largest percentage increase was in urban land use with a 111 percent change (Table 9). There were also considerable percent increases over the five-year period in commercial and outdoor recreation land uses with 52 and 46 percent change, respectively (Table 9). Finally, there was a 21 percent decrease in the percentage of agricultural land uses (Table 9).

Table 6. Land Use in the Fishkill Creek Watershed.
(Source: DCEMC GIS Lab digitized from March 2000 Aerial Photography, 2003)

Land Use Category	Percentage (%)
Agriculture	10.7
Urban/Commercial	1.3
Extractive	0.7
Forestland	49.8
Industrial	0.6
Outdoor Recreation	2.4
Public/Semipublic	1.2
Residential	21.1
Transportation	1.5
Inactive	1.8
Water/Wetlands	8.9
TOTAL	**100**

Table 7. Land Use in the Dutchess County Portion of Fishkill Creek Watershed.
(Source: DCEMC GIS Database, Derived from Fishkill Creek Watershed
Land Use Cover, Based on Dutchess County Aerial Photography, 2003)

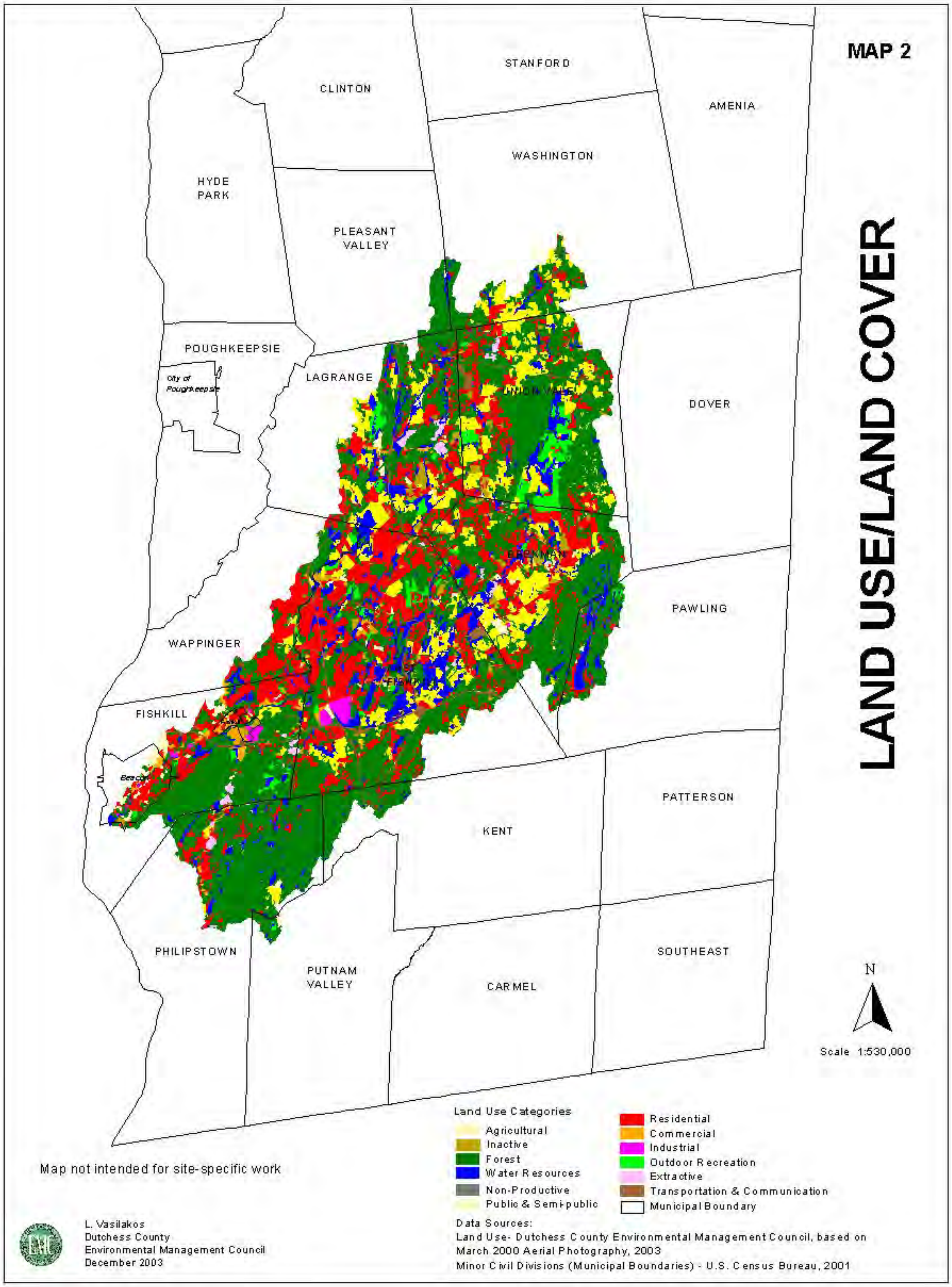
Land Use Category	Percentage (%)
Agriculture	11.8
Urban/Commercial	1.4
Extractive	0.7
Forest	45.8
Industrial	0.6
Outdoor Recreation	2.7
Public	1.2
Residential	22.7
Transportation	1.7
Inactive	2.0
Water/Wetlands	9.3
TOTAL	**100**

Table 8. Land Use in the Putnam County Portion of Fishkill Creek Watershed. (Source: DCEMC GIS Database, Derived from Fishkill Creek Watershed Land Use Cover, Based on Putnam County Aerial Photography, 2003)

Land Use Category	Percentage (%)
Agriculture	1.5
Urban/Commercial	0.8
Extractive	0.7
Forest	82.4
Outdoor Recreation	0.2
Public	0.6
Residential	8.5
Transportation	0.2
Inactive	0.1
Water/Wetlands	5.1
TOTAL	**100**

Table 9. Land Use Comparison for the Fishkill Creek Watershed from 1995 to 2000. (Source: Dutchess County Environmental Management Council, 2003)

LAND USE CATEGORY	ACRES 1995	ACRES 2000	ACRES DIFF	PCT 1995 (%)	PCT 2000 (%)	PCT DIFF (%)	PCT CHANGE (%)
Agricultural	16585	13139	-3446	15.0	11.8	-3.2	-20.8
Commercial	999	1518	519	0.9	1.4	0.5	51.9
Extractive	583	764	182	0.5	0.7	0.2	31.2
Forest	52652	50839	-1813	47.6	45.8	-1.8	-3.4
Industrial	654	701	47	0.6	0.6	0	7.2
Outdoor Recreation	2016	2946	931	1.8	2.7	0.9	46.2
Public & Semi-public	1234	1384	150	1.1	1.2	0.1	12.2
Residential	21850	25177	3327	19.8	22.7	2.9	15.2
Transportation & Communication	1800	1885	85	1.6	1.7	0.1	4.7
Urban (Transitional)	1051	2216	1165	0.9	2.0	1.1	110.9
Water & Wetlands	11169	10354	-815	10.1	9.3	-0.8	-7.3


MAP 2
LAND USE/LAND COVER
STANFORD
CLINTON
AMENIA
WASHINGTON
HYDE PARK
PLEASANT VALLEY
POUGHKEEPSIE
City of Poughkeepsie
LAGRANGE
UNION VALE
DOVER
BEEKMAN
PAWLING
WAPPINGER
FISHKILL
Beacon
PATTERSON
KENT
PHILIPSTOWN
PUTNAM VALLEY
CARMEL
SOUTHEAST
N
Scale 1:530,000
Land Use Categories
Agricultural
Inactive
Forest
Water Resources
Non-Productive
Public & Semi-public
Residential
Commercial
Industrial
Outdoor Recreation
Extractive
Transportation & Communication
Municipal Boundary
Map not intended for site-specific work
L. Vasilakos
Dutchess County
Environmental Management Council
December 2003
Data Sources:
Land Use- Dutchess County Environmental Management Council, based on March 2000 Aerial Photography, 2003
Minor Civil Divisions (Municipal Boundaries) - U.S. Census Bureau, 2001

Surface Water

The Fishkill Creek is the watershed's major stream beginning in the town of Union Vale and flowing ~ 35 miles southwest until it empties into the Hudson River in the City of Beacon. The Fishkill Creek is fed by approximately 338 miles of tributaries including Sprout Creek, Jackson Creek, Whortlekill Creek, Whaley Lake Stream, Wiccopee Creek, and Clove Creek (Maps 1, 3). The Sprout Creek is a major tributary of the Fishkill Creek draining large sections of La Grange, Union Vale, and small portions of Wappinger and East Fishkill. Jackson Creek drains a large portion of Union Vale and small portions of La Grange and Beekman. The Whortlekill Creek, located in the central part of the watershed, drains sections of La Grange, Beekman and East Fishkill. Whaley Lake Stream drains sections of Union Vale, Beekman and Pawling. The Wiccopee Creek drains the towns of East Fishkill, Fishkill and Kent. The Clove Creek drains a section of the town of Fishkill in Dutchess County and the towns of Philipstown and Putnam Valley in Putnam County.

Fishkill Creek discharge at Beacon, NY ranged from a high of 6,970 cubic feet per second on August 20, 1955 to a low of 1.1 cubic feet per second on September 12, 1964 (USGS, 2003). Annual discharge at the Fishkill Creek gauging station in Beacon decreased during the gauge's period of operation, 1945 through 1967 (Figure 3). However, discharge from the Fishkill Creek gauging station in Hopewell Junction showed an increase in average annual discharge during the period of operation between 1964 through 1975 (Figure 4).

Figure 3: Fishkill Creek Average Annual Discharge, Beacon - 1945-1967

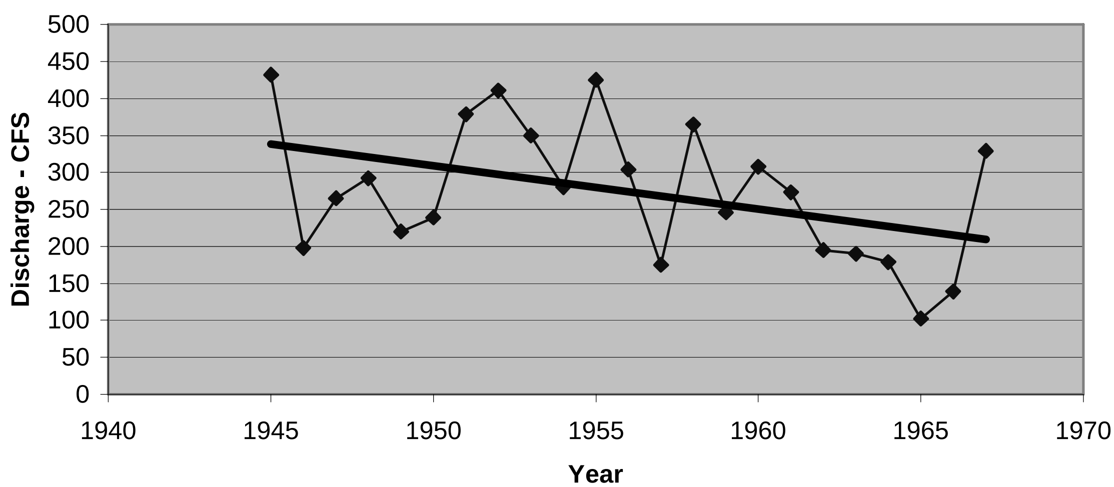
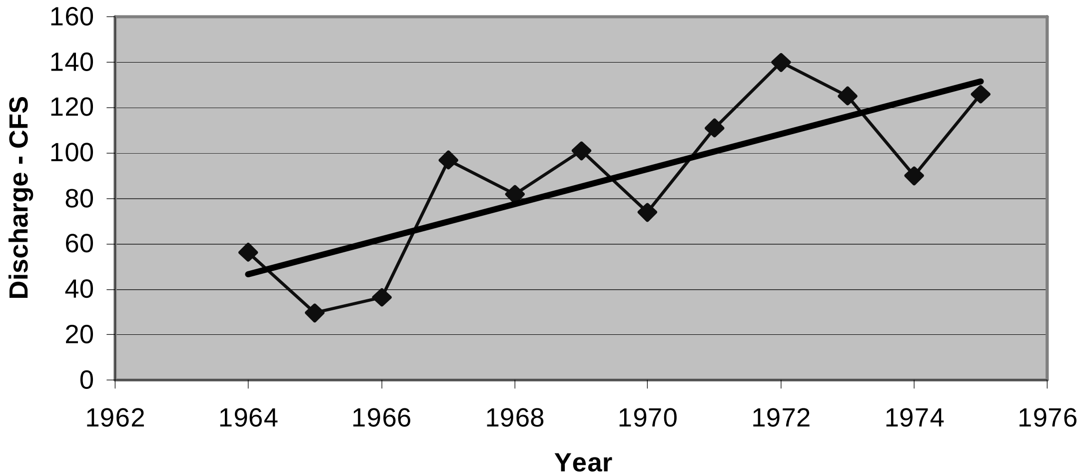
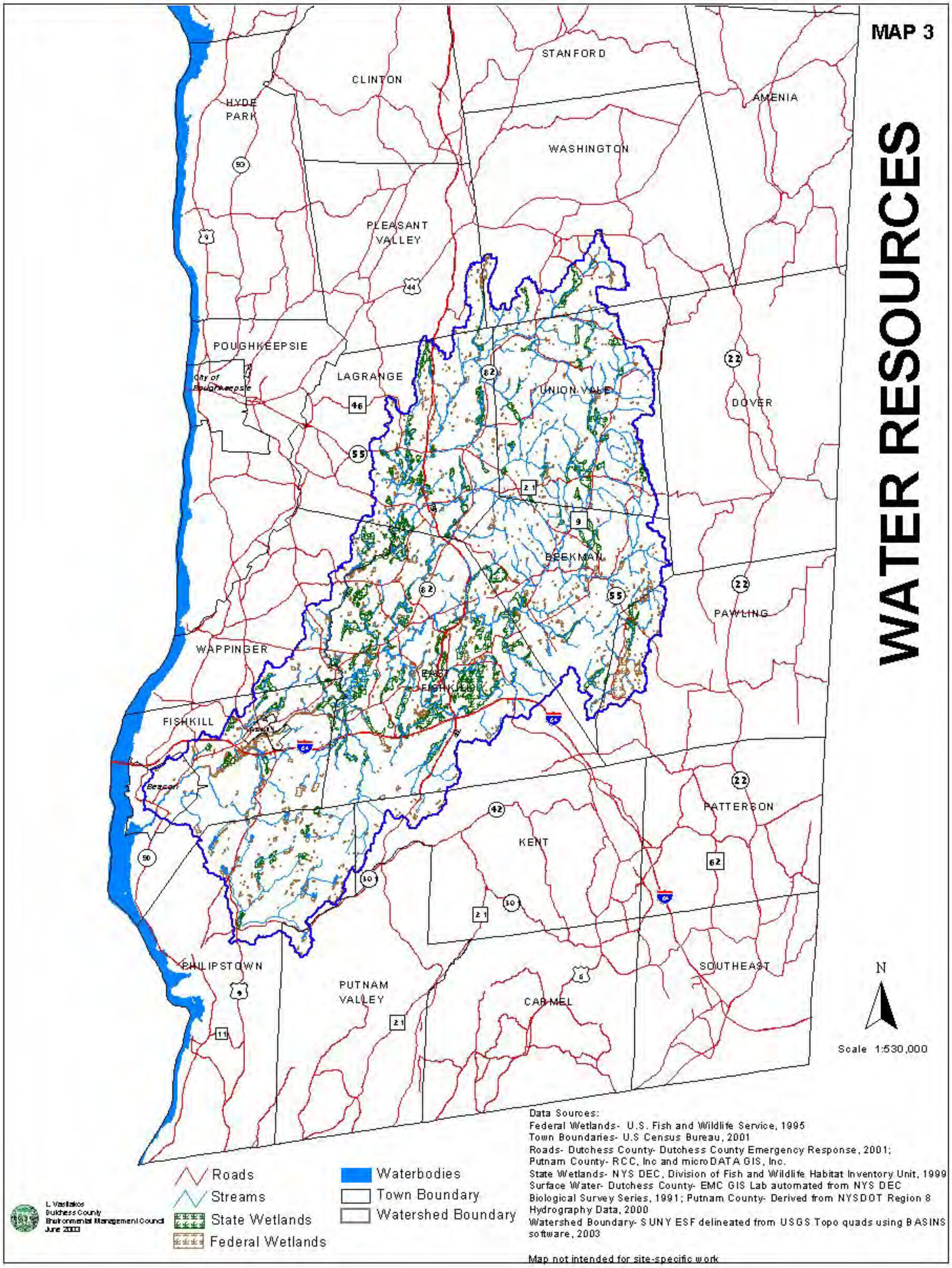


Figure 4: Fishkill Creek Average Annual Discharge, Hopewell Junction - 1964-1975



Figures 3 and 4 are meant to demonstrate the fluctuations that naturally occur in stream discharge. The discharge is primarily driven by precipitation, but land uses can dramatically alter the hydrologic cycle. Unfortunately, the United States Geological Survey removed the last gauge in the Fishkill watershed in 1975, so tracking the impacts of increasing development and impervious surfaces will be difficult. Precipitation will remain the primary driver of stream discharge, but increasing water withdrawals, increasing impervious surfaces and resulting infrastructure, and global climate change will undoubtedly affect the Fishkill Creek in coming years. Impacts of global warming on stream flows are poorly understood, but will vary over space and time. Due to seasonal changes in precipitation and temperature, stream flows may decrease during some months and increase during others (Tung and Haith, 1995). In any case, climate change due to increases in atmospheric CO_2 and other gases are likely to substantially impact water resources. Predictions have been made, based on hydrologic and demographic statistics, that the Sprout and Fishkill basins will experience zero flow periods of seven consecutive days with a ten year occurrence interval by the year 2035 (Horsley and Witten, 1992). These impacts are predicted to occur due to large withdrawals for water supply and export of wastewater for discharge to the Hudson River. It would be prudent to update this study based on current demographics and water supply plans.

The discharge in the Fishkill ranges from 2 to 11 cubic meters/second (Stevens et al., 1994), and the average Hudson River discharge below the Federal Dam at Troy is approximately 392 cubic meters/second (Limburg et al., 1986). Knowing this, the Fishkill Creek contributes approximately 0.5 to 2.8 percent of the freshwater flow to the Hudson River. The percentage of freshwater flow may not be significant, but the transported pollutants could impact the Hudson River ecosystem.


MAP 3
WATER RESOURCES
STANFORD
CLINTON
AMENIA
HYDE PARK
WASHINGTON
PLEASANT VALLEY
POUGHKEEPSIE
City of Poughkeepsie
LAGRANGE
UNION VALE
DOVER
BEEKMAN
PAWLING
WAPPINGER
EAST FISHKILL
FISHKILL
Beacon
PATTERSON
KENT
PHILIPSTOWN
PUTNAM VALLEY
CARMEL
SOUTHEAST
N
Scale 1:530,000
Data Sources:
Federal Wetlands- U.S. Fish and Wildlife Service, 1995
Town Boundaries- U.S Census Bureau, 2001
Roads- Dutchess County- Dutchess County Emergency Response, 2001;
Putnam County- RCC, Inc and microDATA GIS, Inc.
State Wetlands- NYS DEC, Division of Fish and Wildlife Habitat Inventory Unit, 1999
Surface Water- Dutchess County- EMC GIS Lab automated from NYS DEC
Biological Survey Series, 1991; Putnam County- Derived from NYSDOT Region 8
Hydrography Data, 2000
Watershed Boundary- SUNY ESF delineated from USGS Topo quads using BASINS software, 2003
Map not intended for site-specific work
Roads
Streams
State Wetlands
Federal Wetlands
Waterbodies
Town Boundary
Watershed Boundary
L. Vasilakos
Dutchess County
Environmental Management Council
June 2003

The watershed has approximately 1,575 acres of lakes and ponds ranging in size from one-tenth of an acre to 252 acres (Map 3). The New York State Department of Environmental Conservation classifies surface waters based on their best usages (Table 10 and appendix IV). Waterbodies exceeding 20 acres (smallest to largest) include Beacon Reservoir (Town of Fishkill), Deer Lake, Hillside Lake, Lake Valhalla (Town of Philipstown), Lake Walton, Beaver Lake, Little Whaley Lake, Nuclear Lake, Tyrell Lake, Sylvan Lake and Whaley Lake (Table 11).

Table 10. Water Quality Classifications and Standards of Quality and Purity (Source: NYSDEC, 1991)

Part 701- Classification (freshwater)	
N	Natural – Drinking (no disposal of sewage allowed)
AA-S	Drinking (no disposal of sewage allowed)
A-S	Drinking (International boundary waters)
AA	Drinking (disinfection required)
A	Drinking (coagulation, sedimentation, filtration and disinfection required)
B	Bathing – primary contact recreation
C	Secondary contact recreation – fishing and boating; will support fish propagation
D	Fishing; will not support fish propagation
Part 703 - Standards of Quality and Purity	
(T)	indicates a waterbody that will support trout survival
(TS)	indicates a waterbody that will support trout spawning
	Chemicals, pH, bacteria, and turbidity are also regulated

Table 11. Waterbodies Greater Than 10 Acres in the Fishkill Creek Watershed (with the exception of Furnace Pond) (Source: Dutchess County Environmental Management Council GIS Database- Dutchess County data for waterbodies automated from NYS DEC Biological Survey Series, 1991; Putnam County data derived from NYSDOT Region 8 Hydrography data, 2000)

Waterbody Name	DEC Code	Area (acres)	Municipality	DEC Classification
Unnamed Pond or Lake	unknown	10.17	Philipstown	Unknown
McKinney Pond	H-95-P357	10.26	Unionvale	C(T)
Jordan Pond	unknown	11.06	Philipstown	Unknown
Pray Pond	H-95-P359	11.19	Unionvale	C(T)
Tributary of Wiccopee Creek	H-95-13-1a-P350aa	11.32	East Fishkill	D
Christie Pond	H-95-24-P358a	11.48	Unionvale	C
Tributary of Wiccopee Creek	H-95-13-2-2-P350e	17.84	East Fishkill	D
Tributary of Whaley Lake Brook	H-95-19-3-P351h	18.39	Beekman	A
Barrett Pond	unknown	18.49	Philipstown	Unknown
Beacon Reservoir	H-95-2-P345	20.25	Fishkill	A
Beacon Reservoir	H-95-2-P-345	23.09	Philipstown	A
Unnamed pond	H-95-7-P5237	23.42	Fishkill	Unknown
Hillside Lake	P345g	26.36	East Fishkill	B
Tributary of Fishkill Creek, unnamed pond	H-95-11a-1-P345w	27.44	East Fishkill	D
Lake Valhalla	H-95-5-2-P345k	29.15	Philipstown	A
Unnamed pond of Wiccopee Creek	H-95-10-13-P5695	32.85	Unionvale	Unknown
Lake Walton	H-95-11a-P345y	41.31	East Fishkill	B
Unnamed pond	H-P5235	41.55	Fishkill	Unknown
Little Whaley Lake	H-95-19-P353-1-P354	44.1	Pawling	B
Unnamed pond of Whaley Lake Brook	H-95-19-4a-P5222	49.27	Pawling	D
Tyrell Lake	H-95-10-10-P348o	49.44	Pleasant Valley	C
Furnace Pond	H-95-P356	8.7	Unionvale	C(T)
Sylvan Lake	P352	116.09	Beekman	B
Whaley Lake	H-95-19-P353	252.04	Pawling	B

Beacon Reservoir

This 20.2-acre reservoir is located adjacent to Mount Beacon Monument Road in the town of Fishkill. Beacon Reservoir is located less than one-tenth of a mile from the Dutchess/Putnam County boundary. In 2004, the reservoir was surrounded entirely by forest. This reservoir provides drinking water for the City of Beacon and may provide ideal habitat for many plants and animals due to its intact-forested surroundings.

Deer Lake

Deer Lake is a 23.4-acre man-made lake on the Sharpe Reservation property in the town of Fishkill. Totaling 227.3 acres, the lake's watershed is surrounded primarily by forest with some recreation and residential land uses. The elevation of the lake is 732 feet above sea level. A water quality study conducted by Grim (1996) indicated high turbidity with visibility up to 6.5 feet (maximum lake depth- 26 ft). Water chemistry tests revealed concentrations of nitrate, total phosphorus and total dissolved solids of 0.09

mg/L, 0.12 mg/L, and 142 mg/L, respectively (Grim, 1996). Deer Lake exhibited a neutral pH of 7.0, and dissolved oxygen levels ranging from 2.0 to 10.0 mg/L. The lake's fish population was diverse consisting of largemouth bass, brown bullhead, pumpkinseed, bluegill and yellow perch (Grim, 1996). Phytoplankton and zooplankton were prevalent in the lake and consisted of diatoms, filamentous cyanobacteria, chlorophytes, chrysophytes, rotifers, cladocerans, cyclopoid copepodids and copepod nauplii (Grim, 1996).

Hillside Lake

Hillside Lake is a 26.4-acre lake in the Town of East Fishkill that is the centerpiece of a park district. In 2000, the lake's surrounding land use was predominantly residential with some forested land south of the lake. The lake is in close proximity to two state-regulated wetlands including HJ-73, a Class 3, 85.2-acre wetland and HJ-9, a Class 2, 40.5-acre wetland. The NYS DEC has designated this lake as a priority water body and has placed it on the State's priority water body list due to water quality problems. Efforts are ongoing to remediate the problems in the lake.

Lake Valhalla

Lake Valhalla is a 29.1-acre lake located in the Town of Philipstown. In 2003, the lake was surrounded by two federally regulated wetlands consisting of lacustrine unconsolidated bottom and palustrine forest. The lacustrine unconsolidated bottom wetland totaled 31.1 acres, and is diked/impounded and permanently flooded. The palustrine-forested wetland is 4.6 acres and is seasonally flooded.

Lake Walton

Lake Walton is a 41.3-acre lake located in the Town of East Fishkill. In 2000, land use surrounding the lake was quite diverse consisting of primarily forest (251.2 acres) with some recreation (14.2 acres), and residential (34.7 acres) land uses. Sections of a state-regulated wetland classified as HJ-15 (200-acres, Class 1) are located northeast and south and southwest of the lake. Ranging in size from 0.21 to 21.8 acres, federally regulated wetlands overlap HJ-15. The wetlands consist of palustrine scrub shrub, palustrine forested, palustrine emergent marsh and palustrine unconsolidated bottom. There is also a small section of agricultural land northeast of lake Walton. The lake is characterized as eutrophic and has a high abundance of native and invasive aquatic plants. Recently, most of the land was purchased and plans are underway to subdivide the area to possibly construct homes.

Beaver Lake

Beaver Lake is a 41.5-acre man-made lake on the Sharpe Reservation property in the town of Fishkill. In 2000, the lake's watershed, totaling 177.4 acres, was surrounded by forest and recreation land uses. The lake contained a variety of fish species including largemouth bass, brown bullhead, white perch, banded killifish, and bluegill (Grim, 1996). Plankton communities were comprised of both phytoplankton and zooplankton species. The dominant phytoplankton species consisted of diatoms, chlorophytes and the chrysophyte dinobryon (Grim, 1996). The dominant zooplankton species included rotifers, ciliated protists and dinoflagellates (Grim, 1996). Turbidity of the lake was 7.2 feet (maximum lake depth- 33 feet) indicating low water clarity. Water quality analyses indicated a nitrate concentration of less than 0.05 mg/L, total phosphorus concentration of less than 0.05 mg/L and total dissolved solids of 180 mg/L (Grim, 1996). Beaver Lake also exhibited a pH of 7.1 and dissolved oxygen levels ranging from 3 to 9 mg/L (Grim, 1996).

Little Whaley Lake

Refer to Significant Area section for description

Nuclear Lake

Nuclear Lake is a 49.3-acre lake located on a 1,137-acre parcel in the towns of Pawling and Beekman. The National Park Service owns the entire parcel. The lake's watershed is located in the eastern section of the Fishkill Creek drainage basin with the west and north edges of the property draining into Gardner Hollow Brook. An outlet stream flows from the southern end of the lake in a westerly direction passing through several wetlands. These wetlands form a connection with wetlands in the Whaley Lake watershed. The bedrock geology of the lake property is primarily schist and gneiss. Soils within the area are mostly derived from glacial till and are acidic with the exception of wetland and calcareous soils (Nuclear Lake Management Site Clearance Subcommittee, 1982). The wetland soils are composed of fine material and more plant organic material than the till soils. In the southwestern section of the property, calcareous soils derived from carbonate rock outwash and alkaline are present in small areas (Nuclear Lake Management Site Clearance Subcommittee, 1982). The lake surface elevation is 758 feet with steep slopes greater than 15% throughout most of the area (Nuclear Lake Management Site Clearance Subcommittee, 1982).

This lake is recognized locally for its scenic beauty, diversity of plant life, and public access. The terrestrial vegetation is comprised predominantly of hardwood forest supporting white oak, red oak, hemlock, tulip tree, black birch, flowering dogwood, witch-hazel, mountain laurel and other trees and shrubs (Nuclear Lake Management Site Clearance Subcommittee, 1982). Wetland vegetation includes, but is not limited to red maples, yellow birch, alder, royal fern, skunk cabbage, and tussock sedge. Purple loosestrife, cattail and alder occur along the lake shoreline. The lake also serves as an ideal habitat for birds, mammals, reptiles, amphibians and fish. Mammals that utilize this area include beaver, eastern chipmunk, woodchuck, bobcat and whitetail deer. Reptiles and amphibians include snapping turtles, painted turtles and spring peepers. Fish commonly found include northern pike, chain pickerel, creek chub sucker, brown bullhead, white perch, pumpkinseed, bluegill, largemouth bass, yellow perch, and possibly brown and brook trout (Nuclear Lake Management Site Clearance Subcommittee, 1982). The lake is prime habitat for migratory waterfowl in the early spring and late fall. The Ralph T. Waterman Bird Club sited sixty-four bird species including great blue heron, black-capped chickadee, belted kingfisher, warblers, woodpeckers, water thrushes, and sparrows. The lake is a prime recreational area for hikers due to the presence of the Appalachian Trail along the lakeshore.

In December of 1972, two chemical explosions accidentally occurred in the Plutonium Laboratory Building located on the property. The explosions resulted in the release of small amounts of plutonium and uranium material to the atmosphere, building's interior, and surrounding soils (National Park Service, 1993). Following a clean up of the radioactive contamination, the facility ceased operations, and in 1979 the National Park Service purchased the property as part of the Appalachian Trail. In 1993 the National Park Service recommended further nuclear decontamination and site restoration so the entire site could be opened to the public. In 1994, the final clean up was completed and the park was opened to the public.

Tyrell Lake

Tyrell Lake is a 49.4-acre lake located in the town of Pleasant Valley. In 2000, the surrounding land use was primarily forestland, with some residential use (15.5 acres) in the northeast corner and recreation (13.8 acres) land use in the northwest corner. VB-43, a 21.2-acre, Class 2 designated New York State regulated wetland is contiguous to the lake and extends southward. United States Fish and Wildlife Service wetland classification types adjacent to the lake include lacustrine unconsolidated bottom, palustrine scrub shrub, palustrine forested, and palustrine emergent marsh. Pond Gut Creek, a perennial Class C(t) designated stream flows from the southern outlet of the lake connecting to subtributaries of the Sprout Creek. This lake is located in close proximity to the Taconic-Hereford State Forest, a 909-acre multiple use area. It is also less than a mile from Innisfree Gardens, which includes 200 acres of landscaped gardens inspired by Chinese concepts.

Sylvan Lake

Located in the town of Beekman, Sylvan Lake is the second largest lake in the Fishkill Watershed. The lake covers 116-acres with a watershed of 0.81 square miles. It is also the deepest lake in Dutchess County with a maximum depth of 140 feet. In 2000, land uses surrounding the lake were mixed, consisting of residential, outdoor recreation, and interspersed forestland. HJ-13, a Class 2, state-regulated wetland totaling 91.4 acres is adjacent to the lake. Eighteen smaller federally regulated wetlands overlap HJ-13 and continue south forming a connection with the main stem of the Fishkill Creek. The types of federally regulated wetlands consist of lacustrine unconsolidated bottom, palustrine forested, palustrine unconsolidated bottom, palustrine scrub shrub and palustrine aquatic bed. The lake supports fish species including largemouth bass, chain pickerel, cisco (lake herring), and panfish.

Whaley Lake

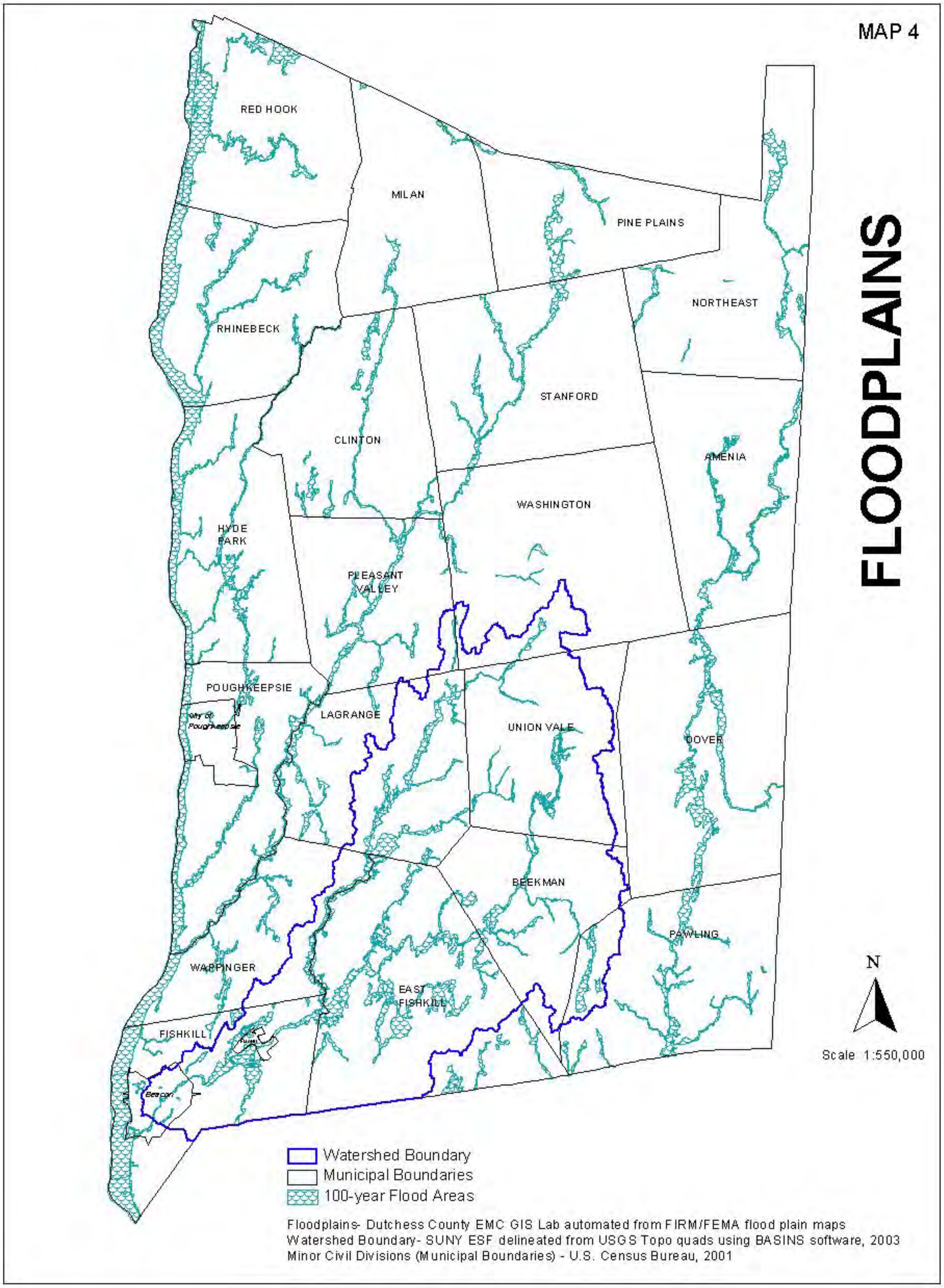
Located in the town of Pawling, the 252-acre Whaley Lake is the largest lake in the Fishkill Creek watershed and Dutchess County. A dam was constructed between 1837 and 1838 (Johnson, 2000) to enclose the pond that was already present. The dam was used to impound water used by several mills located downstream on the Fishkill Creek. The mills, which benefited from the dam, were Brandley Dye Works, the Groveville Mill, the Dutchess Hat Works and the New York Rubber Company (Johnson, 2000). In 2000, the surrounding land uses consisted of residential (~200 acres) and public/semipublic (~20 acres) land interspersed with forest. Whaley Lake's watershed encompasses 3.7 square miles and includes Little Whaley Lake, Sunset Lake and Willow Lake.

The aesthetic and ecological health of Whaley Lake was assessed through the Citizens Statewide Lake Assessment Program (CSLAP) from 1998 to 2001, a volunteer lake monitoring program conducted by the NYSDEC and NYS Federation of Lake Associations. Water quality parameters were measured in order to characterize the trophic state of the lake. The mean concentrations for total phosphorus, chlorophyll a concentrations and sechi depth clarity were 0.013 mg/L, 7.8 ug/L, and 3.2 m, respectively (Kishbaugh, S. and B. Hohenstein, 2000). Based on these water quality measurements, Whaley Lake was characterized as a mesotrophic or moderately productive lake. Other water quality parameters measured included pH, conductivity, color and nitrate. These parameters indicated that the lake continued to support most aquatic organisms. Animals that utilized the area included beaver, muskrat, turtles and frogs. Fish species included largemouth bass, chain pickerel, yellow perch, brown bullhead and panfish. Aquatic plants included Eurasian watermilfoil (invasive), coontail, Illinois pondweed, Robbins' pondweed and large leaf pondweed. Since 1998, recreational perception improved from slightly impaired to closer to excellent, probably coinciding with the decrease in weed densities (Kishbaugh, S. and B. Hohenstein, 2000). However, the recent introduction of two invasive species including Eurasian watermilfoil and curly-leaf pondweed are cause for concern.

Floodplains

Floodplains perform many important functions, including the temporary storage of floodwaters, the moderation of peak flows, the maintenance of water quality, the recharge of groundwater, and the prevention of erosion. Floodplains also provide habitat for wildlife, recreational opportunities, and aesthetic benefits. The preservation of floodplains and associated wetlands is very important for watershed health.

The Federal Emergency Management Administration (FEMA) Flood Insurance Rate Maps (FIRM) provides detailed floodplain data. Floodplain maps show areas within a 100-year flood boundary, as defined as an area that has a 1 percent chance or greater probability of the flood stage being reached, or exceeded, in any given year. Floodplains within the Dutchess County portion of the Fishkill watershed consist of A zone (A, AE, and AO zones) floodplains (Map 4). Floodplains characterized as zone A are commonly found along lakes, streams, rivers or other watercourses and subject to 100-year floods. In addition, zone A floodplains are areas with base flood elevations and flood hazard factors not determined. Zone AE are subject to 100-year floods with known base flood elevations. Zone AE include non-tidal floodplain areas that consist of floodway (high velocity water) or floodway fringe (low velocity water) along streams or rivers. Zone AO are subject to 100-year shallow flooding. Within the Dutchess County portion of the watershed, there are 227.4 square miles of floodplains (Map 4). Digital data was not available for the Putnam County portion of the watershed.


MAP 4
FLOODPLAINS
RED HOOK
MILAN
PINE PLAINS
RHINEBECK
NORTHEAST
STANFORD
CLINTON
AMENIA
WASHINGTON
HYDE PARK
PLEASANT VALLEY
POUGHKEEPSIE
LAGRANGE
UNION VALE
DOVER
BEEKMAN
PAWLING
WAPPINGER
EAST FISHKILL
FISHKILL
Beacon
N
Scale 1:550,000
Watershed Boundary
Municipal Boundaries
100-year Flood Areas
Floodplains- Dutchess County EMC GIS Lab automated from FIRM/FEMA flood plain maps
Watershed Boundary- SUNY ESF delineated from USGS Topo quads using BASINS software, 2003
Minor Civil Divisions (Municipal Boundaries) - U.S. Census Bureau, 2001

State Pollution Discharge Elimination System (SPDES)

Under Article 17 (Water Pollution Control) of the Environmental Conservation Law (ECL), the State Pollution Discharge Elimination System (SPDES) permit program was instituted to work towards the elimination of pollution and maintain the highest quality of New York's water resources. The goals of instituting the program were to protect public health, enhance public enjoyment of water resources, protection and propagation of fish and wildlife and industrial development. Regulated activities under the program include construction or use of an outlet or discharge pipe ("point source") that discharges wastewater into the surface waters or ground waters of the state. Additionally, construction or operation of a disposal system, such as a sewage treatment plant, and discharge of stormwater require a SPDES permit. Permits are required for discharges of more than 1,000 gallons per day to surface and ground waters. Discharges to groundwater containing sewage, non-sewage or non-industrial wastes fewer than 1,000 gallons per day require approval from city, county or state health departments.

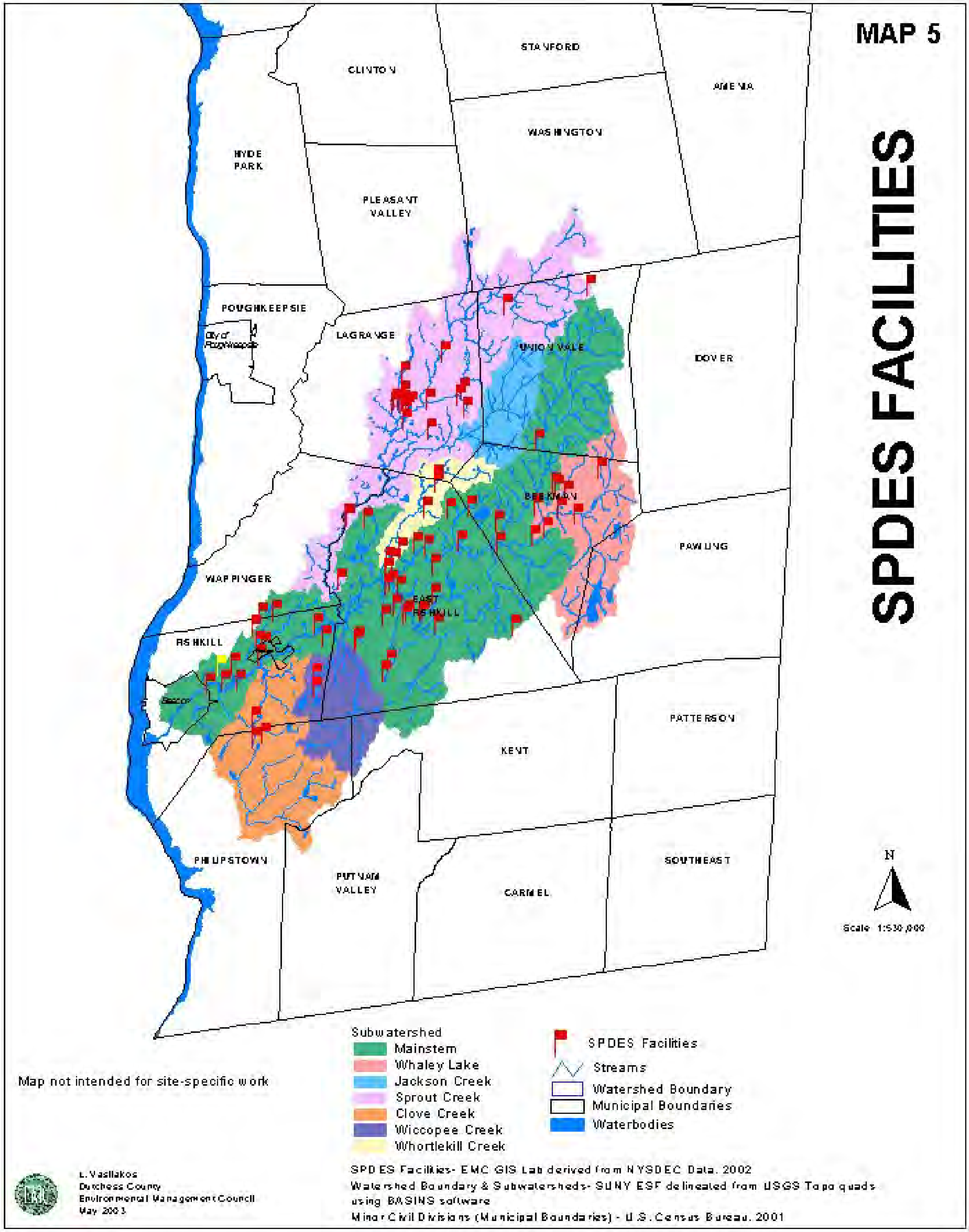
In 2002, the Fishkill Creek watershed contained 25 SPDES regulated facilities discharging to surface water and 64 facilities to ground water (Map 5, Tables 12 & 13). The location of SPDES facilities was determined using Geographic Information System (GIS) software. Surface water discharging facilities were geographically located by latitude and longitude information provided by the NYSDEC. Ground water facilities were determined by comparing NYSDEC data (permittee name, permittee address, contact information) with parcel information provided by the Dutchess County Real Property Tax Service and Putnam County Department of Planning.

Table 12. Fishkill Creek Watershed *Surface* Water SPDES Discharge Sites
(Source: DCEMC GIS Database, Developed from NYSDEC SPDES data layer, 2002)

SPDES Number	Facility Name	Municipality	Waterbody Name	DEC Classification
0032972	Chelsea Cove WWTP	Beekman	Sylvan Lake Outlet (H-95-14)	B
0164933	Dover Ridge Estates- Sections 1 & 2	Beekman	Gardiner Hollow Bk Trib (H-95-19-3-3)	A
0214531	Dalton Farms Sewage Treatment Plant	Beekman	Whaley Lake Brook (H-95-19)	C(TS)
0071153	Green Haven Correctional Facility	Beekman (T)	Fishkill Creek (H-95)	C(T)
0005096	IBM East Fishkill Facility	East Fishkill	Wiccopee Creek (H-95-8)	C(T)
0035939	Stormville/East Fishkill Rest Areas	East Fishkill	Wiccopee Creek Trib (H-95-13-2)	C
0037281	Beekman Country Club Subdiv Sewage TP	East Fishkill	Fishkill Creek Trib (H-95-13A)	C
0207888	Twin Creeks Development	East Fishkill	Fishkill Creek (H-95)	B(T)
0208299	Wildflower Hills Stp	East Fishkill	Wiccopee Creek (H-95-13)	C(T)
0249815	East Fishkill Facility	East Fishkill	Wiccopee Creek (H-95-13-1)	C
0263982	Sagamor WWTP	East Fishkill	Sylvan Lake Outlet (H-95-14)	B
0084301	Hopewell Inn	East Fishkill (T)	Whortlekill Creek (H-95-12)	C(TS)
0090093	Royal Inn	East Fishkill (T)	Wiccopee Creek (H-95-13)	C(T)
0005754	Texaco at Beacon	Fishkill (T)	Fishkill Creek (H-95)	C
0024848	Mountain View Apts.	Fishkill (T)	Fishkill Creek Trib. (H-95-3B)	C
0084298	Bardo's Fishkill Motor Inn	Fishkill (T)	Forge Brook (H-95-4)	C
0208400	Resident Subhqtrs.- Fishkill	Fishkill (T)	Clove Creek (H-95-5)	C(TS)
0264237	Fishkill/East Fishkill Joint Landfill	Fishkill (T)	Bloomer Creek Trib (H-95-7-2)	C
0060992	Fishkill (V) Sewage Treatment Plant	Fishkill (V)	Fishkill Creek (H-95)	B(T)
0105457	Service Station- Rt. 55 & Taconic	LaGrange	Sprout Creek (H-95-10)	C(T)
0250031	Ryan Oil, Inc.	LaGrange	Jackson Creek Trib (H-95-10-2-5B)	C
0248282	Billings Plant	LaGrange	Sprout Creek Sub Trib (H-95-10-70-1)	C(TS)
0219002	Tymor Park	Union Vale	Fishkill Creek (H-95)	C(T)
0103829	Cooper Road Trailer Park	Wappinger	Fishkill Creek Trib (H-95-4-1)	C
0076066	182 Old Rt. 9 Warehouse	Wappinger (T)	Fishkill Creek Subtrib (H-95-4-1)	C

Table 13. Fishkill Creek Watershed *Groundwater* SPDES Discharge Sites
(Source: DCEMC GIS Database, Developed from NYSDEC SPDES data layer, 2002 and parcel data from the Dutchess County Real Property Tax Service and Putnam County Department of Planning)

SPDES	Parcel Number	Facility Name	Municipality	Waterbody Name
0207977	6161-08-837825	Roseview Farms/Mursellos Food Market	Beekman	GW-Gardner Hollow Brook
0250015	6558-03-262285	Town Plaza	Beekman	Groundwater
0142174	6759-04-685204	Claudio's Restaurant Inc	Beekman	Groundwater
0079847	6759-00-876096	Pine Grove Motel	Beekman	Groundwater
0076015	6758-02-725770	Beekman Fire Dist Fire House	Beekman	Groundwater
0249891	6658-00-507504	Lake Plaza	Beekman	Groundwater
0208469	6758-00-203186	Lime Ridge Farms	Beekman	Groundwater
0234354	6758-00-421355	Sugar Maple Farm	Beekman	Groundwater
0073121	6259-02-635855	Hopewell Gardens Inc.	East Fishkill	Groundwater
0207543	6559-03-327315	Arthursburg Plaza	East Fishkill	Groundwater
0185027	6558-01-098780	Hopewell Precision	East Fishkill	Groundwater
0248312	6558-02-547736	Swiss Hamlet Recreation Area	East Fishkill	GW-Sylvan Lake Brook
0250643	6358-02-561646	Lot 3-376 Business Park	East Fishkill	GW-Sprout Creek
0250490	6358-02-533640	Lot 1 - 376 Business Park	East Fishkill	GW-Sprout Creek
0250635	6358-02-535612	Lot 2 - 376 Business Park	East Fishkill	GW-Sprout Creek
0250651	6358-02-562615	Lot 4 - 376 Business Park	East Fishkill	GW-Sprout Creek
0063959	6358-02-911567	Super Seven Plaza	East Fishkill	Groundwater
0185604	6458-04-887068	Clove Branch Apts.	East Fishkill	GW-Fishkill Creek
0095800	6457-01-371939	Red Wing Park Wastewater Disposal Facility	East Fishkill	Groundwater
0145467	6457-02-591969	A Kessler Mobile Homes	East Fishkill	Groundwater
0145688	6457-01-470744	Stockyard Restaurant	East Fishkill	GW-Whortlekill
0250236	6557-01-235639	Muscoot Restaurant North	East Fishkill	Groundwater
0185426	6457-01-328570	Grand Union Plaza	East Fishkill	GW-Fishkill Creek
0165654	6357-03-385343	Tots n Us	East Fishkill	GW-Fishkill Creek Tributary
0164917	6557-03-242048	Lechambord Restaurant & Inn	East Fishkill	GW-Fishkill Creek Tributary
0248444	6456-01-249613	Cinnamon Tree Day Care	East Fishkill	GW-Pennywater Pond
0247880	6455-00-300810	Maintenance Facility- East Fishkill	East Fishkill	GW-Fishkill Creek Tributary
0215481	6556-01-036716	Concord Office Park	East Fishkill	GW-Wiccopee Creek Tributary
0219037	6456-02-988681	Taconic Plaza	East Fishkill	Groundwater
0142026	6456-02-680640	Probst Stores	East Fishkill	Groundwater
0142352	6456-01-463820	East Fishkill Corporate Park	East Fishkill	Groundwater
0068471	6158-10-260574	BGB Mobile Homesites	Fishkill (T)	Fishkill Creek Subtributary
0066656	6256-04-931444	Fishkill Bowling Alley	Fishkill (T)	Groundwater
0250678	6156-04-717443	Splash Down Park	Fishkill (T)	GW-Wetland WF-11
0142638	6156-04-718417	Southern Dutchess Derby Inc	Fishkill (T)	GW-Green Fly Swamp
0165875	6356-03-107207	Administration Bldg	Fishkill (T)	Groundwater
0078417	6055-01-182629	Glenham Elementary School	Fishkill (T)	Groundwater
0185779	6155-01-306679	Professional Office Bldg.	Fishkill (T)	Fishkill
0185817	6255-00-885170	Sharpe Reservation	Fishkill (T)	GW-Fishkill Creek Tributary
0149284	6154-00-683590	Snow Valley Mobile Home Park	Fishkill (T)	Clove Brook
0207870	6160-04-801372	Billings Plaza	LaGrange	GW-Sprout Creek Tributary
0249874	6261-04-868334	Manchester Shopping Center	LaGrange	Groundwater
0235431	6460-01-480927	LaGrange Town Center	LaGrange	Groundwater
0248321	6460-02-678933	Villa Marissa Restaurant	LaGrange	Gw-Sprout Creek
0185051	6460-02-611894	The Full Gospel Center	LaGrange	Groundwater
0143588	6460-02-702756	Elliott Apts	LaGrange	Groundwater
0081035	6260-02-510715	Freedom Park (Rest Rooms)	LaGrange	Groundwater
0235181	6460-02-701540	Arlington High School	LaGrange	GW-Sprout Creek
0250783	6460-04-877280	Coach House Restaurant	LaGrange	GW-Southorly Pond
0248142	6559-03-316413	LaGrange Commons Shopping Center	LaGrange	GW-Whortlekill Creek
0235199	6461-04-668121	Arlington High School	LaGrange	GW-Sprout Creek Tributary
0166588	6460-02-521968	Freedom Business Center	LaGrange	Groundwater
0207560	6460-02-604956	Lexington Park	LaGrange	GW-Sprout Creek Tributary
0235245	6560-03-185350	LaGrange Elementary School	LaGrange	GW-Sprout Creek Tributary
0093017	6461-04-713516	James Baird State Park	LaGrange	GW-Sprout Creek
0185396	6163-04-600353	IBM Building #930	LaGrange	Groundwater
0149004	6171-00-912250	Country Side Restaurant	Philipstown	GW-Pond
0219053	5955-02-798930	Pemm Corp.	Philipstown	Groundwater
0008591	no parcel info.	Brookside Trailer Park	Philipstown	GW- Highland Creek
0214914	6662-00-716842	Union Vale Community Residence	Union Vale	GW-Willow Brook
0219592	7164-00-039612	Verbank Ira	Union Vale	Groundwater
0088986	6161-54-192393	Fountains at Millbrook	Union Vale	GW-Sprout Creek Tributary
0145432	6359-03-056187	Mid-Hudson Castle Ltd.	Wappinger (T)	GW- Sprout Creek Tributary
0023931	6258-03-100235	John Jay High School Sewage Treatment Plant	Wappinger (T)	Gildersleeve Brook


MAP 5
SPDES FACILITIES
CLINTON
STANFORD
AMENIA
WASHINGTON
HYDE PARK
PLEASANT VALLEY
POUGHKEEPSIE
City of Poughkeepsie
LAGRANGE
UNION VALE
DOVER
BEEKMAN
PAWLING
WAPPINGER
EAST FISHKILL
FISHKILL
Beacon
PATTERSON
KENT
PHILIPSTOWN
PUTNAM VALLEY
CARMEL
SOUTHEAST
N
Scale 1:530,000
Subwatershed
Mainstem
Whaley Lake
Jackson Creek
Sprout Creek
Clove Creek
Wiccopee Creek
Whortlekill Creek
SPDES Facilities
Streams
Watershed Boundary
Municipal Boundaries
Waterbodies
Map not intended for site-specific work
L. Vasilakos
Dutchess County
Environmental Management Council
May 2003
SPDES Facilities- EMC GIS Lab derived from NYSDEC Data, 2002
Watershed Boundary & Subwatersheds- SUNY ESF delineated from USGS Topo quads using BASINS software
Minor Civil Divisions (Municipal Boundaries) - U.S. Census Bureau, 2001

Dams

The following section, Knowledge flow: a Hudson River Estuary Watershed citizens' tool for ecological discussions about stream barriers and barrier removal, was written by Jesse S. Sayles from the NYSDEC, Hudson River Estuary Program as an overview of the function of dams within stream systems. This section also outlines the rationale and challenges behind restoring the natural flow of a stream.

Introduction

There are at least 350 known dams and many more unknown dams, culverts, and buried stream segments in the Hudson River Estuary watershed (Personal Communication, NYSDEC, March 2005). The Hudson River Estuary Action Plan of 2001 strives to promote local community stewardship of estuary tributaries. As community groups discuss stream barriers they will need supporting information for decision-making. Recently, authors have published many literature reviews about the ecological and geomorphic effects of dams and removal (Bednark, 2001; Hart et al., 2002; Pizzuto, 2002; Poff and Hart, 2002; Shafroth et al., 2002; Stanely and Doyle, 2002; Larke et al., 2003). This article is not intended as another literature review. Instead it will: (1) differentiate between the restoration, rehabilitation, enhancement, protection and conservation studies (2) discuss the ecological effects of barriers and (3) their removal on the stream ecosystem, and (4) conclude with how to use this information for community discussion about barrier mitigation. Important concepts for proceeding from discussion to research and action will be put forward.

Generally there are two types of dams, run of the river and impounding. Run of the river dams store little or no water, have short residence times and little or no control over water release rate (Poff and Hart, 2002). Storage dams have large hydraulic heads and storage volume, long hydraulic residence times and controlled release rates (Poff and Hart, 2002). Culverts are enclosed pipes through which stream flow is directed, and are often used in road crossings or development over a streambed. In buried streams, the stream has been paved or developed over, but stream interactions with soils may still exist.

Field of study differentiation

The concepts of restoration, rehabilitation and enhancement aim at some level of site improvement, while protection and conservation try to maintain what is present (Hambler, 2004). Restoration and rehabilitation have a historic reference point in mind (Shields et al., 2003; Hampler, 2004). In the strictest sense, restoration is achieved only if an original historical reference ecosystem is produced; a partial return to such a reference point, either in form or function, is rehabilitation (Hampler; 2004). In most cases it is not feasible to completely return a site back to an historic reference point due to complex interactions of changes, large-scale environmental change, or species extinction (Ormerod, 2004). Often, even in scientific literature, when one talks about restoration it is actually rehabilitation. Enhancement involves alteration of a site to a non-preexisting state (Lewis, 1989; Gwein et al., 1999).

Ecological effects of stream barriers

Barriers affect river systems; the river, river bed, riparian zone, flood plain, associated ecosystem communities, and temporal legacy, in many ways (Bednark, 2001; Hart et al., 2002). For conceptual facilitation, the affects of barriers will be discussed in four dimensions: longitudinal (up-to-down-stream interactions), lateral (river channel, riparian and floodplain interactions), vertical (benthos, water column, atmosphere and riparian canopy cover interactions) and temporal (biotic and abiotic changes). The literature used in this analysis primarily pertains to dams, but, in most cases, the discussion can be inferred to culverts and buried streams.

Longitudinal interaction effects

Dams impede or prevent movement or dispersal of anadromous fish, riparian species, and plant propagules (Poff and Hart, 2002; Boedeltje et al., 2004). Sediment flow downstream is reduced due to deposition behind both dam types (Bednark, 2001; Stanely and Doyle, 2002), and dramatic temperature changes upstream and downstream of dams are often created (Bednark, 2001). In addition, nutrient and oxygen regimes are altered in the river due to temperature stratification in many reservoirs (Bednark, 2001; Poff and Hart, 2002). Nutrients settle out of the water column above both dam types reducing downstream delivery (Stanely and Doyle, 2002). Furthermore, changes in water flow rate above and below dams alter species and food web composition (Bednark, 2001; Suren et al., 2003a, Suren et al., 2003b), and lake ecosystems are created behind many dams (Bednark, 2001). Overall, the integrity of the river as a continuous functioning system is altered (Bednark, 2001; Pejchar and Warner, 2001; Clark et al., 2003). The interactions and disturbances of dams associated with tidal areas are even more complex (Bednark, 2001) because water flows in multiple directions. Culverts and buried streams that are too small to accommodate stream flow may have small reservoirs behind them causing some of the above-mentioned affects. If there were a vertical drop upon discharge, the barrier would again have similar affects.

Lateral interaction effects

Reduced flooding to riparian zones due to flow reduction associated with impounded water (Poff and Hart, 2002) and deepening and widening of the river channel from sediment erosion due to behind dam deposition (Moffat, 2003) alters nutrient deposit to, and delivery from, riparian zones (Haberstock et al., 2000; Dodds, 2002), seed dispersal (Boedeltje et al., 2004), and necessary habitat moistening for many organisms (Bednark, 2001). Bank erosion (Moffat, 2003) may also harm riparian plant stability. Changes to groundwater tables, due to reservoirs, can affect sensitive species and alter community patterns and composition (Shafroth et al., 2002). Above dams, riparian communities are transformed often resulting in decreased biodiversity (Nilsson, et al., 1997). Culverts, depending on length, would eliminate such interactions entirely. Finally, interactions of buried streams may be limited to ground seepage.

Vertical interaction effects

Sediment deposition above dams smothers important microhabitats (Bednark, 2001), and sediment erosion below dams also results in a loss of microhabitats (Poff and Hart, 2002). Flow rate changes effect benthic invertebrate and algal community compositions (Suren et al., 2003a; Suren et al., 2003b). In-stream woody debris could be decreased from dam retention resulting in a loss of detrital food webs (Hauer et al, 2003), feeding grounds, and habitat for many species (Crook and Robertson, 1999). Any riparian canopy cover loss would allow greater light infiltration, altering algal and macroinvertebrate community composition (Bunn and Davies, 2000; Suren et al., 2003a, Suren et al., 2003b). Culverts and buried streams would virtually eliminate any vertical interactions, with the exception of downward ground seepage associated with buried streams.

Temporal interaction effects

Stream channels naturally meander and change because of normal sediment movement (Dodds, 2002). In time scales of river morphology, a dam's lifetime, 50-120 years (Pejchar et al., 2001; Doyle et al., 2003) is short. It is unknown how long and to what extent the physical impacts of dams will affect river morphology. Dams alter biotic composition and trajectories of river systems (Poff and Hart, 2002), and may promote invasive or non-native species (Pejchar et al., 2001). Presumably culverts and buried streams have similar affects.

Ecological effects of stream barrier mitigation or removal

Unimpeded longitude, lateral and vertical interactions are vital to proper long-term functioning of river systems (Jungwirth et al., 2002). Proper barrier mitigation or removals allow these interactions to occur. However, there is the potential for negative impacts during dam removal. If PCB, heavy metal or other contaminated sediments are built up behind dams there is a large potential negative ecological impact of dam removal (Bednark, 2001) and appropriate management must take place prior to removal. With or without contaminants, sediment discharge associated with dam removal acts like a sand blaster, damaging invertebrates, fish, and riparian root structures (Bednark, 2002). Sediment discharge may, but not always (Stanley et al., 2002), destroy in-stream habitat (Bednark, 2001), and bury riparian plants (Shafroth et al., 2002). The time it takes for stored sediments to be mobilized varies with dam size, natural sediment load of the river and flow rate (Bednark, 2001). Changes to water tables during dam removal can negatively impact sensitive species (Stanley and Doyle, 2003) that may have developed in association with the long-term presence of the dam (Bednark, 2001). Barrier removal can act as a source or sink for species invasion (MCA/WCS, 2002, Shafroth et al., 2002), and facilitate movement of pollutants downstream via current or upstream by contaminated fish and other organisms.

Barrier removal decision

Though there are negative impacts associated with dam removal most are relatively short-term in duration, and the benefits of removal are thought to outweigh the adverse impacts (Hart et al., 2002). Contaminated sediments pose a big problem to removal operations, and should be dredged and moved. This relocation of contaminated sediments raises a new problem. It is important to analyze habitat conditions above and below barriers because the upstream and downstream communities, good or bad, will be able to interact following dam removal. The past century has seen a loss of 54% of wetland acreage in the U.S. (Dodds, 2002). It could be argued that some dams, in the upper reaches of watersheds, replace some of this lost wetland habitat. It is important to consider whether these reservoirs are rapidly filling with sediment, or if they behave like natural wetlands (Hammer, 1997). There are also economic, legal, safety, recreational, and aesthetic reasons for and against removing barriers (Bowman, 2002; Johnson and Graber, 2002; Whitelaw and MacMullan, 2002).

Information for consideration before proceeding with mitigation or removal

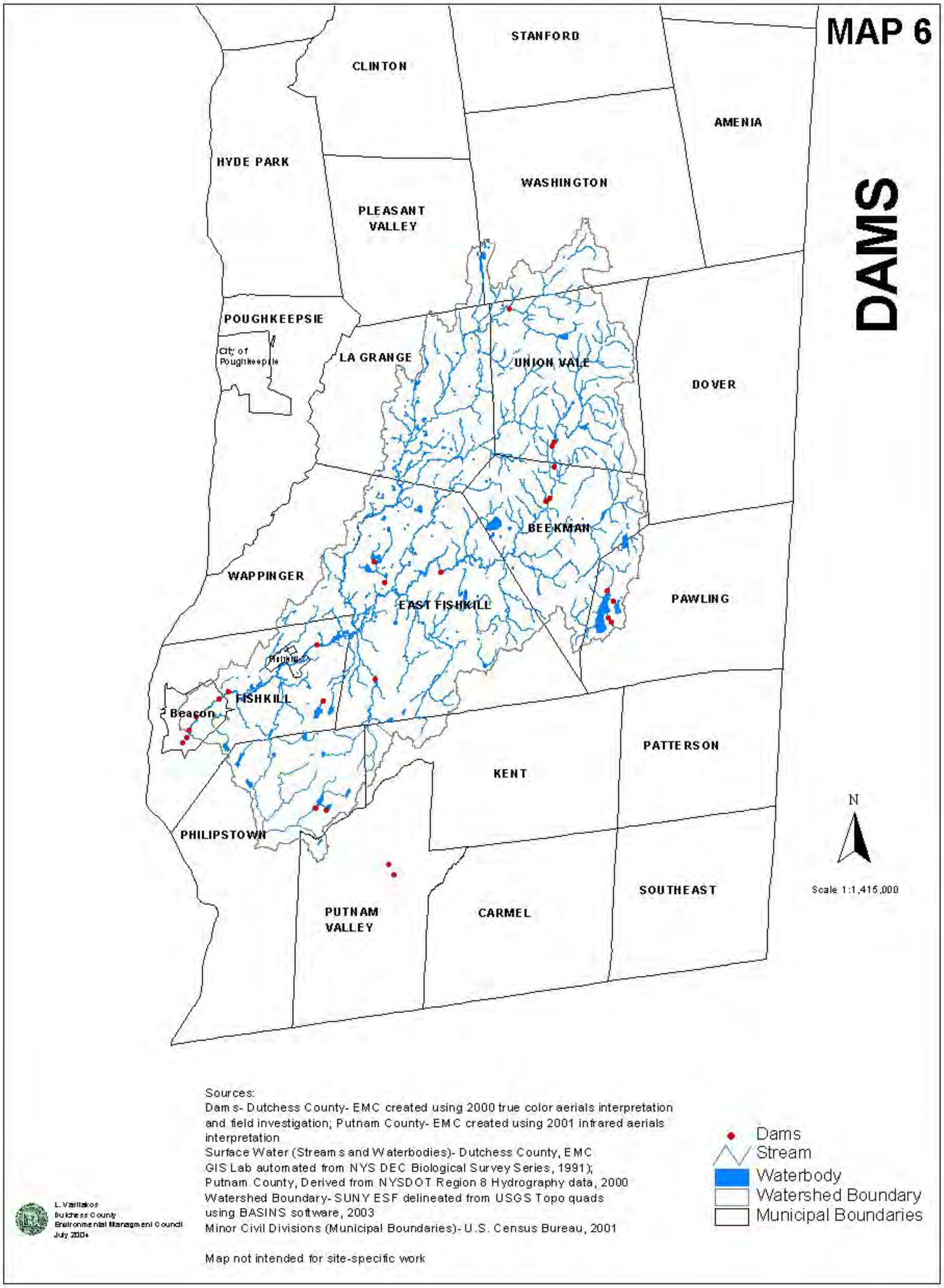
Barrier mitigation and removal is just one of many strategies for river restoration (Hart et al., 2002). It is important to look at the context of a given barrier within the overall system. It may make more ecological sense to address issues of surface or storm water runoff in the barrier site catchments, or riparian buffer quality downstream, before thinking about mitigation or removal of the dam. For impounding dams it is also important to look at any human structures downstream, such as small bridges, which are not designed for increased flows. Though this section illustrates ecological effects of stream barriers and removal, each barrier entering decision-making discussions must be treated individually. For example, downstream sediment deposition from removal may be detrimental to riparian communities because of burial, or it may benefit them by creating new alluvial surfaces depending on community succession levels (Shafroth et al., 2002).

There are numerous examples of successful and beneficial dam removals. The Edwards Dam removal on the Kennebeck River, Maine, enabled fish species migration (Stanley and Doyle, 2003). A dam removal on the Baraboo River, Wisconsin, saw rapid and desired upstream changes in macroinvertebrate communities, and no detrimental effect on healthy downstream communities (Stanley et al., 2002). There are also examples of negative impacts from removal. The Fort Edwards Dam on the Hudson River, Upstate New York, discharged PCB laden sediments downstream (Shuman, 1995). Dam removal on the Kettle River, Minnesota, resulted in downstream mussel population declines, but did restore fish access (Hart et al., 2002).

Monitoring and research must be part of the removal/mitigation and restoration/rehabilitation decision process, and must precede action (Hart et al., 2002). Preliminary research is somewhat proportional to the size of the barrier (primarily dam in this case) and its reservoir (Babbitt, 2002). Barrier mitigation or removal discussions should take climatic, hydrologic, ecologic and biologic variability into account (Bilby et al., 2003; Edmonds et al., 2003; Hauer et al., 2003; Montgomery and Bolton, 2003; Wissmar et al., 2003), as well as potential random events. There are 26 documented dams in the Fishkill watershed (Table 14, Map 6). Each dam should be analyzed on an individual basis, with an individual context. However, the dams also need to be considered collectively, as dams have cumulative impacts on river systems.

Table 14. Dams in the Fishkill Creek Watershed
(Source: DCEMC developed using 2000 aerial photography)

Dam Name	Municipality	Waterbody Name
Glenham Dam (Groveville Mill)	Beacon	Fishkill Creek
Braendly Fishkill Dam	Beacon	Fishkill Creek
Tuck Dam	Beacon	Fishkill Creek
New York Rubber Co. Dam	Beacon	Fishkill Creek
Unnamed Dam (Wolcott Ave.)	Beacon	Fishkill Creek
McKinney Dam	Beekman	Fishkill Creek
Furnace Pond Dam	Beekman	Fishkill Creek
Unnamed Dam	Beekman	Pond- Fishkill Creek
Unnamed Dam	Beekman	Constructed Pond
Unnamed Dam	Beekman	Fishkill Creek
Greenburg Henderson Dam	East Fishkill	Fishkill Creek
Fishkill Farms Pond	East Fishkill	Wiccopee Creek
Lake Walton Dam	East Fishkill	Lake Walton
Unnamed Dam	East Fishkill	Tributary of FC-H95-11A
Texaco Dam	Fishkill	Fishkill Creek
Sydeman Dam (Brinkerhoff Dam)	Fishkill	Fishkill Creek
Sunset Lake Dam	Pawling	Subtributary of Whaley Lake Creek
Little Whaley Lake Dam	Pawling	Little Whaley Lake
Willow Lake Dam	Pawling	Willow Lake
Whaley Lake Dam	Pawling	Whaley Lake Creek
Perkins Estate Pond Dam	Philipstown	Clove Creek
Jordan Pond Dam	Philipstown	Clove Creek
Lower (South) Wiccopee Dam	Putnam Valley	Wiccopee Creek
Upper (North) Wiccopee Dam	Putnam Valley	Wiccopee Creek
Unnamed Dam	Union Vale	Fishkill Creek
Verbank Village Dam	Union Vale	Sprout Creek


MAP 6
DAMS
STANFORD
CLINTON
AMENIA
HYDE PARK
WASHINGTON
PLEASANT VALLEY
POUGHKEEPSIE
City of Poughkeepsie
LA GRANGE
UNION VALE
DOVER
BEEKMAN
WAPPINGER
PAWLING
EAST FISHKILL
FISHKILL
Beacon
PATTERSON
KENT
PHILIPSTOWN
SOUTHEAST
PUTNAM VALLEY
CARMEL
N
Scale 1:1,415,000
Sources:
Dams- Dutchess County- EMC created using 2000 true color aerials interpretation and field investigation; Putnam County- EMC created using 2001 infrared aerials interpretation
Surface Water (Streams and Waterbodies)- Dutchess County, EMC GIS Lab automated from NYS DEC Biological Survey Series, 1991);
Putnam County, Derived from NYSDOT Region 8 Hydrography data, 2000
Watershed Boundary- SUNY ESF delineated from USGS Topo quads using BASINS software, 2003
Minor Civil Divisions (Municipal Boundaries)- U.S. Census Bureau, 2001
Map not intended for site-specific work
Dams
Stream
Waterbody
Watershed Boundary
Municipal Boundaries
L. Vasiliakos
Dutchess County
Environmental Management Council
July 2004

Wildlife and Fisheries

The Fishkill Creek watershed is literally crawling with life. An amazing variety of habitats, people, plants, and animals are all interconnected in a fragile web of life, often called "biodiversity". Every member is essential to keeping this web in balance. For example, the list of species required for the life cycle of a single tree may be in the hundreds or thousands. Moreover, the list of animals that will utilize a single fallen tree is in the thousands, but a few of the more well known creatures include squirrels, woodpeckers, grouse, bears, foxes, skunks, mice, and shrews as well as worms, salamanders, beetles, ants, centipedes, sowbugs, and insect larvae. There are twice as many species of beetles that live on dead and dying wood as there are species of mammals, birds, reptiles, and amphibians in the entire world (Kyker-Snowman, 2003). The fallen tree also provides critical habitat, steady moisture, and food for a multitude of mosses, fungi, trees, and vascular plants. If our fallen tree had been removed either during land use changes or during "clean up" after falling, the ramifications would reverberate throughout the web. Certainly, this doesn't preclude us from taking a few trees for firewood, but if enough fallen trees are removed, the structure of the overall community would likely change.

The fallen tree example was meant to demonstrate the complexity of the web of life, and how eliminating one organism will ultimately affect many. It is very difficult to predict the consequences of removing individual pieces from the web of life. Therefore, as an integral piece of the web, humans should work toward protection and preservation of the functions necessary for our survival. There are many ecosystem functions we receive from nature including cleaner air through vegetation, cleaner water through soil and wetland filtration, soil formation from forests, pollination of food crops from our native insects, natural flood water retention/groundwater recharge, and pest control from our native bats, birds, and insects (i.e. dragonflies/damselflies). For example, bees pollinate about a trillion apple blossoms each year in New York State, micro-organisms biodegrade much of our garbage as well as fallen leaves and other dead animal and plant matter, earthworms turn over soil and keep it aerated, soil bacteria turn nitrogen into nitrate fertilizer and plants use up carbon dioxide and produce oxygen, thereby slowing global warming. LoGiudice et al. (2003) demonstrated that maintaining healthy biodiversity and community structure can reduce the incidence of Lyme disease; and Allan et al. (2003) suggested that forest fragmentation can increase white-footed mouse populations which in turn increases the human risk of exposure to Lyme disease. Therefore, the benefits of a healthy and diverse ecosystem extend far beyond clean air and water and into the fabric of human health and quality of life.

In the United States the economic services provided by a vibrant/healthy biological web of life (biodiversity) contribute an estimated $319 billion per year, or 5% of the gross domestic product (Pimentel et al., 1997). The worldwide benefits are estimated to be $2,928 billion per year, or approximately 11% of the world economy (Pimentel et al., 1997). Closer to home, the economic impact of recreational use of the Wappinger Creek exceeds 1.2. million in a normal season (Black and Winne, 1998). It is important to note that the Wappinger Creek contributions to the Dutchess County economy were only calculated for recreation uses. Clearly, our economic vitality depends on maintaining healthy biodiversity.

The plants and animals that inhabit the Fishkill Creek watershed are suited to the habitats provided by our temperate climate. The other major factor is human alteration of the landscape. Pre-colonization Dutchess County was predominantly forested, but by the mid-1800s much of the county had been converted to farmland. By 2004 much of the farmland had been converted to residential, commercial, and forested landscapes.

The reaction of wildlife has varied to the changing land use. A few, such as the timber wolf and passenger pigeon have gone extinct in this region (passenger pigeon is extinct worldwide). Beaver, pileated woodpeckers, and bald eagles were once gone from this region due to over hunting, habitat loss, and pesticide poisoning respectively, but have since returned with reduced hunting pressure, an increase in second-growth forests, and a ban on DDT. Some species, such as the bobcat, black bear, osprey, and Atlantic sturgeon are less common than they were prior to European colonization. However, other species, such as the white tailed deer, raccoon, skunk, red fox, robin, and painted turtle have thrived in our suburban landscape (Kiviat, 1984).

According to the New York State Natural Heritage Program (2003 and 2004; Reschke 1990), the list of endangered (imminent threat of extirpation) animal and plant species that occur, or once occurred, in the Fishkill watershed include the bog turtle (Clemmys muhlengergii), Northern Cricket frog (*Acris crepitans* - possibly occurred), wild hydrangea (Hydrangea arborescens), and live-forever (Sedum telephioides). The list of threatened (likely to become an endangered species within the foreseeable future) animal and plant species includes the timber rattlesnake (Crotalus horridus), blandings turtle (Emydoidea blandingii), bald eagle (Haliaeetus leucocephalus), least bittern (Ixobrychus exilis), pied-billed grebe (Podilymbus podilymbus), stiff-leaf goldenrod (Solidago rigida), swamp cottonwood (Populus heterophylla), and blazing star (Chamaelirium luteum). Species of special concern that may also inhabit the watershed include the wood turtle (Clemmys insculpta), spotted turtle (Clemmys guttata), eastern box turtle (Terrapene carolina), jefferson salamander (Ambystoma jeffersonianum), and marbled salamander (Ambystoma opacum). Finally, rare communities in the watershed include the acidic talus slope woodland, Appalachian oak-hickory forest, chestnut oak forest, floodplain forest, oak-tulip tree forest, pitch pine-oak heath rocky summit, red cedar rocky summit, rich shrub fen, and the rich sloping fen. For more in-depth information on the endangered and threatened plants and communities please see the vegetation section of this plan.

In Dutchess County, human-induced land use changes are currently the dominant factor in habitat and natural landscape changes. However, many wildlife species in the Fishkill watershed also influence the landscape. Heavy deer browsing of seeds, seedlings, and saplings can dramatically alter the composition of a forest to encourage the growth of species that deer find less palatable (Curtis, 2004). Species imported from other areas that thrive in our region, often called invasive species, can also have dramatic effects on the landscape. For example, Eurasian water milfoil (*Myriophyllum spicatum*) is native to Europe and Asia, but has run rampant in Dutchess County waterbodies choking out native species. Eurasian water milfoil spreads rapidly since it can reproduce by seed or fragmentation (one small clipping can grow into an entire plant), and in our nutrient rich lakes it flourishes. The wooly adelgid (*Adelges tsugae*), a small aphid-like insect pest native to China and Japan, is threatening to decimate our eastern hemlock (*Tsuga canadensis*) populations. Once infested, hemlock mortality rates range between 50%-99% (Orwig, 2002). The plant species most likely to replace hemlocks are hardwood tree species and possibly other invasive species. Ultimately, this will have a dramatic effect on the structure of these communities. For example, the distribution and abundance of brook trout and diversity of aquatic insects will likely decline with the hemlock forests (Evans, 2002). Hemlock forests maintain stable, lower water temperatures and more stable hydrologic regimes (i.e. they don't dry up as much) than the hardwood forests that will likely replace them (Snyder et al., 2002). These are just a few examples of how, in a global society, careless actions can import and release species that can drastically change our ecological communities.

The Fishkill Creek watershed contains cold (headwater) and warm (closer to Hudson) water habitats. Many sections of the Fishkill are stocked with brown trout, and a few sections maintain reproducing populations. The lower creek has largemouth and smallmouth bass populations, along with a variety of other warm water species. Tables 15 and 16 contain the fish species collected throughout the watershed in 1988 (Stevens et al., 1994) and 2001 (Stainbrook, 2004). Tables 15 and 16 are meant as a general guide to some of the species present in those time periods, but shouldn't be compared due to inconsistencies in habitats and sites sampled. According to the 1994 researchers, the Whortlekill, Clove Creek, and Whaley Lake Creek had the highest quality fish habitat (Stevens et al., 1994). In general, the watershed contains good potential habitats, but is threatened primarily by sediment and thermal pollution brought on by increased intrusion into the stream's immediate riparian area. This intrusion not only includes the destruction of the forested buffer areas surrounding the main stem of the Fishkill, but also the many miles of tributaries that supply water to the main stem. Protection and/or restoration of the forested buffer zones surrounding the Fishkill and its tributaries is crucial to the survival of a robust fishery that includes cold water species (sculpins/trout) as well as warm water species (bass).

Benthic Macroinvertebrates are organisms without backbones that live at least a portion of their lives on the bottom of a water body. Typically, these invertebrates are large enough to see with the naked eye, but a working technical definition could be large enough to not pass through a number 30 sieve. Benthic macroinvertebrates include aquatic insects such as mayflies (ephemeroptera), stoneflies (plecoptera), caddisflies (tricoptera), true flies (black flies, crane flies, midges, deer flies, etc.)(diptera), dobson flies (megaloptera), dragonflies and damselfiles (odonata), and beetles (coleoptera). Additionally, crayfish, worms, clams, and snails are benthic macroinvertebrates. These organisms live year-round in the streams and lakes of Dutchess County, and with limited mobility, are fairly restricted in their individual geographic range. The assemblage of macroinvertebrates found living in a section of river or stream can directly reflect the quality of the water of that segment. Tables 17 and 18 list the macroinvertebrates identified in the Fishkill Creek in 1991 and 1999, respectively.

Table 15: Fish Collected in the Fishkill Basin in July and October 1988 (Stevens et. al, 1994)

Common Name	**Scientific Name**
Redfin Pickeral	*Esox americanus*
Blacknose Dace	*Rhinichthys atratulus*
Brown Trout	*Salmo trutta*
Rock Bass	*Ambloplites rupestris*
Largemouth Bass	*Micropterus salmoides*
Longnose Dace	*Rhinichthys cataractae*
Fallfish	*Semotilus corporalis*
Tessellated Darter	*Etheostoma olmstedi*
Common Shiner	*Luxilus cornutus*
Creek Chub	*Semotilus atromaculatus*
White Sucker	*Catostomus commersoni*
Blue Gill	*Lepomis macrochirus*
Cutlips Minnow	*Exoglossum maxillingua*
American Eel	*Anguilla rostrata*
Goldfish	*Carassius auratus*
Redbreast Sunfish	*Lepomis auritus*
Pumpkinseed	*Lepomis gibbosus*
Striped Bass	*Morone saxatilis*
Smallmouth Bass	*Micropterus dolomieu*
Yellow Perch	*Perca flavescens*
Spotfin Shiner	*Cyprinella spiloptera*
Golden Shiner	*Notemigonus crysoleucas*
Banded Killifish	*Fundulus diaphanus*
Brook Trout	*Salvelinus fontinalis*

Table 16: Fish Collected in the Fishkill basin during summer, 2001 (Stainbrook, 2004)

Common Name	**Scientific Name**
Redfin Pickeral	*Esox americanus*
Blacknose Dace	*Rhinichthys atratulus*
Brown Trout	*Salmo trutta*
Rock Bass	*Ambloplites rupestris*
Largemouth Bass	*Micropterus salmoides*
Longnose Dace	*Rhinichthys cataractae*
Fallfish	*Semotilus corporalis*
Tessellated Darter	*Etheostoma olmstedi*
Common Shiner	*Luxilus cornutus*
Creek Chub	*Semotilus atromaculatus*
White Sucker	*Catostomus commersoni*
Blue Gill	*Lepomis macrochirus*
Cutlips Minnow	*Exoglossum maxillingua*
American Eel	*Anguilla rostrata*
Sclupin	*Cottus cognatus*
Rainbow trout	*Oncorhynchus mykiss*
Pumpkinseed	*Lepomis gibbosus*
Spot tail shiner	*Notropis hudsonius*
Smallmouth Bass	*Micropterus dolomieu*
Yellow Perch	*Perca flavescens*
Spotfin Shiner	*Cyprinella spiloptera*
Golden Shiner	*Notemigonus crysoleucas*
Banded Killifish	*Fundulus diaphanus*
Brook Trout	*Salvelinus fontinalis*
Brown bullhead	*Ameiurus nebulosus*
Yellow bullhead	*Ameiurus natalis*
Blunt nose	*Pimephales notatus*
Fathead minnow	*Pimephales promelas*
Black crappie	*Pomoxis nigromaculatus*
Green sunfish	*Lepomis cyanellus*

Table 17: Fishkill Creek Macroinvertebrate Community present in 1991. Samples collected and data combined from Clove Valley above Dorn Rd., Hopewell Junction below Augusta Dr. bridge, Sarah Taylor Park in Fishkill and Main St. in Beacon (Bode et. al, 1991).

STREAM SITE:	Fishkill Creek	
DATE:	August 29-30, 1991	
SAMPLE TYPE:	Kick sample	
SUBSAMPLE:	100 individuals	
PLATYHELMINTHES	Undetermined Turbellaria	
TURBELLARIA		
NEMERTA	*Prostoma graecense* (=rubrum)	
ANNELIDA		
OLIGOCHAETA	Undetermined Lumbricina	
ARTHROPODA		
CRUSTACEA		
AMPHIPODA	Gammaridae	*Gammarus* sp.
MOLLUSCA		
GASTROPODA	Lymnaeidae	Undetermined
	Planorbidae	Undetermined
	Ancylidae	*Ferrissia rivularis*
	Hydrobiidae	*Amnicola* sp.
	Spaeriidae	*Sphaerium sp.*
PELECYPODA		
INSECTA		
EPHEMEROPTERA	Baetidae	*Acentrella* sp.
		Baetis intercalaris
		Baetis flavistriga
		Baetis sp.
	Oligoneuriidae	*Isonychia bicolor*
	Heptageniidae	*Stenonema* sp.
		Stenomema modestum
		Stenacron interpunctatum
	Ephemerellidae	*Serratella deficiens*
	Caenidae	*Caenis* sp.
ODONATA	Aeschnidae	*Boyeria* sp.
PLECOPTERA	Perlidae	*Paragnetina media*
COLEOPTERA	Elmidae	*Optioservus* sp.
		Optioservus trivittas
		Oulimnius latiusculus
		Stenelmis concinna
		Stenelmis crenata
		Stenelmis sp.
	Psephenidae	*Psephenus* sp.
TRICHOPTERA	Philopotamidae	*Chimarra aterrima(?)*
	Hydropsychidae	*Cheumatopsyche* sp.
		Hydropsyche betteni
		Hydropsyche bronta
		Hydropsyche morosa
		Hydropsyche sparna
	Hydroptilidae	*Hydroptila* sp.
		Hydroptila consimilis(?)

Table 17 cont'd.

		Leucotrichia sp.
	Psychomyiidae	*Psychomyia flavida*
DIPTERA	Simuliidae	*Simulium venustum*
		Simulium jenningsi
		Simulium sp.
	Tipulidae	*Antocha* sp.
		Limonia sp.
	Rhagionidae	*Atherix* sp.
	Chironomidae	
	Tanypodinae	*Thienemannimyia gr.* spp.
	Orthocladiinae	*Cricotopus trifascia gr*
		Limnophyes sp.
		Orthocladius carlatus
		Rheocricotopus robacki
		Tvetenia vitracies
	Chironominae	
	Chironomini	*Dicrotendipes neomodestus*
		Microtendipes rydalensis gr
		Parachironomus frequens
		Phaenopsectra flavipes
		Polypedilum illinoense
		Polypedilum convictum
		Polypedilum aviceps
	Tanytarsini	*Rheotanytarsus distinctissimus gr*
		Rheotanytarsus exiguus gr
		Tanytarsus glabrescens gr.
		Tanytarsus guerlus gr

Station 1: Clove Valley, NY, 10 m above Dorn Rd. bridge
Station 3: Hopewell Junction, NY, 150 m below Augusta Dr. bridge
Station 5: Fishkill, NY, access through Sarah Taylor Park
Station 7: Beacon, NY, 100 meters above Main St. bridge

Table 18: 1999 Macroinvertebrate data from the Fishkill Creek at Sarah Taylor Park in Fishkill (Station 5) and Main Street in Beacon (Station 7) (Bode et al., 2001)

STREAM SITE:	Fishkill Creek			
DATE:	July 14, 1999			
SAMPLE TYPE:	Kick sample			
SUBSAMPLE:	100 individuals			
			Sta. 5	Sta. 7
PLATYHELMINTHES				
TURBELLARIA		Undetermined Turbellaria	1	3
ANNELIDA				
OLIGOCHAETA		Undetermined Lumbricina		1
ARTHROPODA				
CRUSTACEA				
ISOPODA	Asellidae	Caecidotea communis		6
AMPHIPODA	Gammaridae	Gammarus sp.		1
INSECTA				
EPHEMEROPTERA	Baetidae	Acentrella ampla		1
		Baetis brunneicolor		8
		Baetis flavistriga	3	6
	Heptageniidae	Stenonema sp		1
	Perlidae	Paragnetina media	2	
	Elmidae	Optioservus sp.	2	6
		Promoresia elegans	2	
		Stenelmis sp	1	24
	Philopotamidae	Chimarra obscura	1	
	Hydropsychidae	Cheumatopsyche sp.	18	
		Hydropsyche betteni	1	17
		Hydropsyche bronta	5	1
	Hydroptilidae	Hydroptila sp.		2
	Simuliidae	Simulium fibrinflatum		9
		Simulium jenningsi	38	
	Chironomidae	Thienemannimyia gr. spp.	1	
		Diamesa sp.		1
		Cardiocladius obscurus	3	
		Cricotopus bicinctus		2
		Tvetenia vitracies	9	2
		Polypedilum convictum	1	
		Polypedilum illinoense	1	
		Rheotanytarsus distinctissimus gr.	1	
		Rheotanytarsus exiguus gr.	3	6
		Tanytarsus glabrescens gr.	1	
		Tanytarsus guerlus gr.	1	
		SPECIES RICHNESS	19	20
		BIOTIC INDEX	4.72	5.4
		EPT RICHNESS	5	8
		MODEL AFFINITY	50	60
		ASSESSMENT OF IMPACT	slight	slight

Vegetation

Prior to European settlement, oak-dominated forests and white pine probably covered approximately fifty to seventy-five percent of Dutchess County (Kiviat, 1984a). During the 19th century more than ninety percent of the county was cleared for agricultural purposes (Kiviat, 1984). As agricultural land uses changed and declined through the twentieth century forest cover began to increase. In 2000, based on a land use analysis conducted by the DCEMC employing the land use for natural resources classification system, the Fishkill Creek watershed was dominated by six land use/vegetation types including wooded wetlands, marshes and bogs, plantations, brush lands and agriculture, forest, and developed land.

Bottomlands, floodplains, riparian zones, marshes, bogs and wooded wetland forests offer a diversity of plant species due to different hydrologic regimes ranging from dry to permanently wet. Within these habitats, common species consist primarily of hardwoods including, but not limited to, red and silver maple, pin and swamp white oaks, green ash, red or slippery elm, tulip tree, sycamore, American basswood, bitternut and shagbark hickory, eastern cottonwood, black and weeping willows. American elm can occasionally be found in the less disturbed areas where isolated survivors of Dutch elm disease exist. In drier areas, sugar maple, red oak and white ash may be found. Butternut may be present in areas isolated from the canker, which has devastated the species elsewhere. Common understory trees include spicebush, American hornbeam, gray and red osier dogwoods, hawthorn and buckthorn. Common plants found in marshes include purple loosestrife, marsh marigold, bulrushes, rushes, tussock sedge, cattail, and reed. Other plants commonly found in non-tidal wetlands include spicebush, silky dogwood, pickerelweed, jewelweed, buttonbush, cinnamon fern, and skunk cabbage.

Plantations are comprised of stands of planted trees, consisting of pure stands or alternating patches of conifers. Conifers may include eastern white pine, eastern or Canada hemlock (which is being devastated by the alien hemlock wooly adelgid insect) as well as plantations of non-native Norway spruce and larch. Brushlands, commonly referred to as old agriculture fields, may contain gray dogwood, red cedar, gray birch, staghorn sumac, black locust, white pine, quaking aspen, black cherry, red maple, arrowwood, and American prickly ash in the canopy layer. Beneath the canopy layer, typical plants found include little bluestem (grass), goldenrods, asters, dewberry, blackberry, sassafras, sweet fern, chokecherry and common juniper.

Upland forests are primarily composed of northern hardwoods, including but not limited to sugar maple, red maple, red, white, black and chestnut oaks, black cherry, black locust, American beech, black and yellow birch, white and green ash, shagbark and pignut hickory, tulip tree, hackberry, black gum, black walnut, and eastern hophornbeam. Alien invasives like ailanthus and buckthorn are proliferating on more disturbed, exposed sites. Developed land typically contains landscaped vegetation and nonnative grasses.

According to the New York Natural Heritage Program (2004), there are eight plant species of rare, endangered, or threatened status in the Fishkill watershed. These plant species include live-forever, swamp cottonwood, blazing star, heartleaf plantain, seaside goldenrod, stiff-leaf goldenrod, spongy arrowwood and wild hydrangea. In addition, there are ten plant communities of special concern in the watershed including floodplain forest, rocky summit grassland (Scofield Ridge), acidic talus slope woodland, Appalachian oak-hickory forest, chestnut oak forest, oak-tulip tree forest, pitch pine-oak-heath rocky summit, red cedar rocky summit, rich shrub fen and rich sloping fen.

Acidic Talus Slope Woodland

Acidic Talus Slope Woodland consists of an open or closed canopy and forms on talus slopes composed of non-calcareous bedrock such as granite, quartzite, or schist (Reschke, 1990). Common trees include sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), chestnut oak (*Quercus montana*), red oak (*Q. rubra*), white oak (*Q. alba*), striped maple (*Acer pensylvanicum*) and mountain maple (*A. spicatum*). Many species of ferns are found in the ground layer including bulblet fern (*Cystopteris bulbifera*), fragile fern (*Cystopteris fragilis*), Christmas fern (*Polystichum acrostichoides*), marginal wood fern (*Dryopteris marginalis*), silvery spleenwort (*Athyrium thelypteroides*), and maidenhair fern (*Adiantum pedatum*) (Reschke, 1990). Other herbs commonly found in this type of woodland are ricegrass (*Oryzopsis racemosa*), bloodroot (*Sanguinaria canadensis*), blue cohosh (*Caulophyllum thalictroides*), ginseng (*Panax quinquefolius*) and zig-zag goldenrod (*Solidago flexicaulis*). Two snakes found in this habitat are the copperhead (*Agkistroden contortrix*) and timber rattlesnake (*Crotalus horridus*) (Reschke 1990).

Appalachian Oak-Hickory Forest

Appalachian Oak-Hickory forests are comprised of hardwoods that occur on well-drained sites, predominately on ridge tops, upper slopes, or south and west-facing slopes. Soils within this community are primarily loams and sandy loams. Trees that dominate this community include red oak (Quercus rubra), white oak (Q. alba) and black oak (Q. velutina). Other trees that occur in this community include pignut hickory (Carya glabra), shagbark hickory (C. ovata), sweet pignut hickory (C. ovalis), white ash (Fraxinus americana), red maple (Acer rubrum), and Eastern hop hornbeam (Ostrya virginiana) (Reschke, 1990). Flowering dogwood (Cornus florida), witch hazel (Hamamelis virginiana), shadbush (Amelanchier arborea) and choke cherry (Prunus virginiana) are commonly found in the subcanopy (Reschke, 1990). Smaller shrubs include maple-leaf viburnum (Viburnum acerifolium), blueberries (Vaccinium angustifolium, V. pallidum), red raspberry (Rubus idaeus), gray dogwood (Cornus foemina ssp. racemosa), and beaked hazelnut (Corylus cornuta) (Reschke, 1990). The ground layer is also composed of many herb species including wild sarsaparilla (Aralia nudicaulis), false Solomon’s seal (Smilacina racemosa), Pennsylvania sedge (Carex pensylvanica), tick trefoil (Desmodium glutinosum, D. paniculatum), black cohosh (Cimicifuga racemosa), rattlesnake root (Prenanthes alba), white goldenrod (Solidago bicolor) and hepatica (Hepatica americana) (Reschke, 1990). Animals that are commonly found in this community include red-bellied woodpecker (Melanerpes carolinus), whip-poorwill (Caprimulgus vociferous), and wild turkey (Meleagris gallopavo) (Reschke, 1990).

Chestnut Oak Forest

Chestnut Oak Forest is a hardwood forest that is found on well-drained soils in glaciated portions of the Appalachians, and on the coastal plain. Trees that dominate the canopy layer are chestnut oak (*Quercus montana*) and red oak (*Q. rubra*) (Reschke, 1990). Other trees commonly found in this community include white oak (*Q. alba*), black oak (*Q. velutina*) and red maple (*Acer rubrum*) (Reschke, 1990). Plants found in the shrub layer include black huckleberry (*Gaylusscia baccata*), mountain laurel (*Kalmia latifolia*) and blueberry (*Vaccinium palladium*) (Reschke, 1990). The ground layer contains Pennsylvania sedge (*Carex pensylvanica*), wild sasparilla (*Aralia nudicaulis*), wintergreen (*Gaultheria procumbens*) and the moss *Leucobryum glaucum* (Reschke, 1990). The decimation of American chestnut (*Castanea dentate*) by disease has reduced its presence in this community.

Floodplain Forest

A floodplain forest is comprised of hardwoods that occur on mineral soils on low terraces of river floodplains and river deltas. The flooding regime consists of annual flooding in the spring within the low areas, and irregular flooding in the high areas. The plant community in the floodplain forest is variable but may exhibit a high diversity. Canopy tree species include silver maple (*Acer saccharinum*), red maple (*A. rubrum*), sycamore (*Platanus occidentalis*), cottonwood (*Populus deltoides*), butternut (*Juglans cinerea*), black willow (*Salix nigra*), bitternut hickory (*Carya cordiformis*), swamp white oak (*Quercus bicolor*), white ash (*Fraxinus americana*), black ash (*F. nigra*), and basswood (*Tilia americana*) (Reschke, 1990). The white willow (*Salix alba*), an introduced tree, is often present in floodplain forests. In the ground layer, common species include sensitive fern (*Onoclea sensibilis*), white snakeroot (*Eupatorium rugosum*), Canada goldenrod (*Solidago canadensis*), jewelweed (*Impatiens capensis*), jumpseed (*Polygonum virginianum*), and spicebush (*Lindera benzoin*) (Reschke, 1990). Bird species that utilize the floodplain forest as habitat include yellow-throated vireo (*Vireo flavifrons*), tufted titmouse (*Parus bicolor*), red-bellied woodpecker (*Melanerpes carolinus*), and pileated woodpecker (*Dryocopus pileatus*) (Reschke, 1990).

Oak-Tulip Tree Forest

Oak-Tulip Tree Forest is a hardwood forest that is found on moist, well-drained sites. The community is composed of plants that are adapted to a moderately moist environment. Trees which dominate the canopy layer include red oak (*Quercus rubra*), tulip tree (*Liriodendron tulipifera*), beech (*Fagus grandifolia*), black birch (*Betula lenta*), red maple (*Acer rubrum*), scarlet oak (*Quercus coccinea*), black oak (*Q. velutina*), and white oak (*Q. alba*) (Reschke, 1990). Beneath the canopy, the dominant species is flowering dogwood (*Cornus florida*). Other species in the subcanopy layer include witch-hazel (*Hamamelis virginiana*), sassafras (*Sassafras albidum*), red maple (*Acer rubrum*), and black cherry (*Prunus serotina*) (Reschke, 1990). The shrub layer is comprised of maple-leaf viburnum (*Viburnum* *acerifolium*), northern blackberry (*Rubus allegheniensis*) and blueberries (*Vaccinium angustifolium*, *V. pallidum*) (Reschke, 1990). The ground layer is comprised of herb species including white wood aster (*Aster divaricatus*), New York fern (*Thelypteris noveboracensis*), Virginia creeper (*Parthenocissus quinquefolia*), jack-in-the-pulpit (*Arisaema triphyllum*), wild geranium (*Geranium maculatum*), solomon's seal (*Polygonatum biflorum*), and false solomon's seal (*Smilacina racemosa*) (Reschke, 1990).

Pitch-Pine-Oak-Heath Rocky Summit

This community forms on warm, dry, rocky ridge tops and summits composed of non-calcareous bedrock such as quartzite, sandstone, or schist. The plant community may be sparse but tolerates acidic soils. Plant species commonly found include pitch pine (*Pinus rigida*), chestnut oak (*Quercus montana*), scrub oak (*Q. ilicifolia*), common juniper (*Juniperus communis*), blueberry (*Vaccinium angustifolium*), sweet fern (*Comptonia peregrina*), black huckleberry (*Gaylussacia baccata*), Pennsylvania sedge (*Carex pensylvanica*), poverty-grass (*Danthonia spicata*), common hairgrass (*Deschampsia flexuosa*), three-toothed cinquefoil (*Potentilla tridentata*) and cow-wheat (*Melampyrum lineare*) (Reschke, 1990). Two lichens commonly found in this community are *Cetraria arenaria* and *Cladonia* spp. (Reschke, 1990)

Red Cedar Rocky Summit

This community forms on warm, dry, rocky ridge tops and summits where bedrock is calcareous, such as limestone or dolomite. Vegetation may be sparse or patchy with many rock outcrops. Very little data is available on the species commonly found in this community. Known species include eastern red cedar (*Juniperus virginiana*), shagbark hickory (*Carya ovata*), eastern hop hornbeam (*Ostrya virginiana*), serviceberry (*Amelanchier* spp.), little bluestem (*Schizachyrium scoparium*), sedge (*Carex eburnea*), and everlasting (*Antennaria plantaginifolia*) (Reschke, 1990).

Rich Sloping Fen

A rich sloping fen is a small, gently sloping, mineral-rich wetland, with shallow peat deposits that occurs in a shallow depression on a slope composed of calcareous glacial deposits (Reschke, 1990). Rich sloping fens are headwater wetlands that are fed by small springs or ground water seepage. The vegetation community is comprised of trees and shrubs, and a ground layer of herbs and bryophytes. This habitat may occur upstream from, and transition into, hemlock-hardwood swamps. The species diversity is high including a variety of shrubs, herbs, and mosses. Common shrubs include red osier dogwood (Cornus sericea), willows (Salix discolor, S. sericea, S. bebbiana), dwarf raspberry (Rubus pubescens), northern gooseberry (Ribes hirtellum), alder-leaf buckthorn (Rhamnus alnifolia), arrowwood (Virburnum dentatum var. lucidum), highbush blueberry (Vaccinium corymbosum), red maple (Acer rubrum), eastern red cedar (Juniperus virginiana), and hemlock (Tsuga canadensis) (Reschke, 1990). Herb species include the sedges (Carex flava, C. interior, C. sterilis, C. leptalea, C. lacustris, C. hystericina and C. aquatilis), cottongrass (Eriophorum viride-carinatum), cattail (Typha latifolia), marsh fern (Thelypteris palustris), crested wood fern (Dryopteris cristata), cinnamon fern (Osmunda cinnamomea), common horsetail (Equisetum arvense), black-eyed Susan (Rudbeckia laciniata), marsh marigold (Caltha palustris), roundleaf sundew (Drosera rotundifolia), and skunk cabbage (Symplocarpus foetidus) (Reschke, 1990). Rich sloping fens also include various species of mosses including Aulacomnium palustre, Sphagnum warnstorfii, Tomenthypnum nitens, Campylim stellatum and Cratoneuron filicinum (Reschke, 1990).

Wetlands

Wetlands are very important features in the Fishkill Creek watershed providing valuable functions including water quality protection, flood control, wildlife and fish habitat, nutrient cycling, and groundwater storage. They also provide visual and aesthetic quality and offer recreational and educational opportunities. Many wetlands are designated as significant natural areas supporting habitat for threatened or endangered species or unusually diverse plant and animal communities. They also act to enhance the quality of life in Dutchess County. In 2000, wetlands covered approximately 10,753 acres (DCEMC GIS Laboratory, 2003) in the watershed (Map 3). This included a total of 10,092 wetland acres in Dutchess County and 661 acres in Putnam County (DCEMC GIS Laboratory, 2003). A list of federally regulated wetlands exceeding 50 acres is provided in Table 19, and state regulated wetlands exceeding 100 acres is provided in Table 20.

Within the Fishkill watershed, some towns have developed wetland and watercourse protection ordinances in an effort to provide for the protection, preservation, proper maintenance and use of wetlands, waterbodies and watercourses. Protection measures in the ordinance may include preventing damage from erosion and siltation, minimizing disturbance, protecting forested buffer zones, preserving natural habitats and protecting against flood and pollution through the establishment of a water control commission. As of 2004, towns in the watershed that adopted wetland protection ordinances included La Grange, Fishkill, Pleasant Valley, Pawling and Wappinger.

Table 19. Federal Wetlands over 50 acres in the Fishkill Creek Watershed
(Source: (DCEMC GIS Database, Derived from U.S. Fish and Wildlife Service Data, 1995)

Wetland Type	Acreage	Municipality	Description	Access Roads
PFO1E	185.6	East Fishkill	Tributary of Wiccopee Creek	Rt. 52, Cosmo Dr.
L1UBHh	112.6	East Fishkill	Slyvan Lake	Slyvan Drive
PFO1E	98.7	East Fishkill	Tributary of Wiccopee Creek	Rt. 52, Shenandoah Rd., Schlueter Rd.
PFO1A	77.2	East Fishkill	Fishkill Creek, Tributary of Fishkill Creek	New Hackensack Rd.
PFO1E	67.0	East Fishkill	Tributary of Wiccopee Creek	TSP South and Rt. 52
PFO1A	60.2	East Fishkill	Fishkill Creek Mainstem	New Hackensack Rd. & Carpenter Rd.
PFO1E	56.4	East Fishkill	Fishkill Creek Mainstem	I-84, Old Town Rd., Greenwood Dr.
PFO1E	56.3	East Fishkill	Subtributary of Wiccopee Creek	I-84, Townsend Rd.
R2UBH	50.8	East Fishkill	Fishkill Creek Mainstem	I-84, Old Town Rd., Greenwood Dr.
L1UBHh	248.4	Pawling	Waterbody- Whaley Lake	Rt. 292
PFO1Ed	54.9	Wappinger	Tributary of Whaley Lake Brook	Rt 9, Cedar Hill Rd.

Table 20. New York State Regulated Wetlands over 100 acres in the Fishkill Creek Watershed
(Source: DCEMC GIS Database, Derived from NYSDEC, Division of Fish and Wildlife Habitat Inventory Unit, 1999)

Wetland ID	Area (Acres)	Municipality	Description- Streams and Waterbodies	Access Roads
HJ-15	173.3	East Fishkill	Stream- tributary of Fishkill Creek	Lake Walton Rd.
HJ-20	112.4	East Fishkill	Fishkill Creek Mainstem	TSP North, Stormville Rd, Carpenter Rd.
HJ-37	540.2	East Fishkill	Fishkill Creek Mainstem	Rt. 52, Palen Rd.
HJ-44	121.1	East Fishkill	Tributary of Fishkill Creek and Penneywater pond	Harrigan Rd.-off Rt. 52
HJ-49	552.5	East Fishkill	none	I-84 and Rt. 52
HJ-49 UPL	165.2	East Fishkill	Tributaries of Wiccopee Creek	I-84 and Rt. 52
HJ-53	128.0	East Fishkill	Tributary of Wiccopee Creek	Blue Hill Rd., Rt. 52, Shenandoah Rd.
HJ-54	209.6	East Fishkill	Wiccopee Creek, Tributaries of Wiccopee Creek	I-84, Townsend Rd., Shenandoah Rd.
HJ-73	144.7	East Fishkill	Sprout Creek	Robinson Lane, Hillside Lake Rd.
PQ-10	119.4	Beekman, Pawling	Whaley Lake,outlet and tribs of Whaley Lake	RT. 292, Old Rt. 55 and Rt. 55
PQ-8	262.8	Beekman, East Fishkill	Fishkill Creek, Tributaries of Fishkill Creek	Benton Moore Rd., New Hacksensack Rd
PV-53	204.2	LaGrange	Sprout Creek, subtributary of Sprout Cr., Jackson Cr.	Noxon Rd., Hillside Lake Rd., Robinson Ln.
PV-57	101.0	LaGrange	Tributaries of Sprout Creek	Robinson Lane, Diddell Rd.
VB-16	176.3	Union Vale	Clove Valley Cr., Sweezy Cr., Pray Pond, Tribs of Clove Valley and Sweezy Creeks	Clove Rd. and North Clove Rd.
VB-26	231.7	Union Vale	McKinney Pond, Trib of Fishkill Cr.and Clove Valley Cr.	Bruzgul Rd.,West Clove Mountain Rd.
VB-3	141.1	Washington	Sprout Creek, tributary of Sprout Cr., Tyrell Lake	Oak Summit Road
VB-37	121.7	Beekman	Tributary of Whaley Lake Brook	Rt. 55, Hynes Rd., Clove Valley Rd.
WF-12	111.5	Fishkill, Wappinger	Tributary and Subtributaries of Whaley Lake Brook	Smithtown Rd., Cooper Rd., Rt. 9

Description of Selected Fishkill Watershed wetlands

(NWI and DEC wetland classifications are detailed in appendix III)

HJ-49

HJ-49 is a 552-acre wetland bordered by Route 52, the Taconic State Parkway, Hosner Mountain Rd., and Interstate 84 in the Town of East Fishkill. Upland areas in this wetland total 165 acres, and the wetland is entirely in private ownership. This New York State designated class 2 wetland is characterized as an emergent marsh serving as prime wildlife habitat. According to a field survey conducted by the Dutchess County Environmental Management Council (1977), wetland plants present included dogwood, purple loosestrife, willow, red maple, false nettle, stinging nettle, jewelweed, slippery elm and New York ironweed. Rare plants included cardinal flower and arrowhead. Wildlife present included frogs, ducks, catbirds, and bluejays. The wetland contains a class C (suitable for secondary contact recreation), perennial stream that is a subtributary of Wiccopee Creek. A total of 42 US Fish and Wildlife Survey classified wetlands overlap HJ-49. The wetland types include palustrine scrub shrub, palustrine forested, palustrine emergent and palustrine unconsolidated bottom wetland types (PFO1E, PSS1E, PEM1E, PEM1C, PEM1C, PSS1/EM1E, PEM1A, PEM1Cd, PFO1Cd, PFO1C, PSS1C, PUBHh, and PUBHx) with permanent, temporary or seasonal flooding regimes. The total acreage of wetland identified by the US Fish and Wildlife service in the National Wetland Inventory was 470.7 acres (DCEMC, 1995).

HJ-37

This 540-acre wetland is located near Route 52, Rt. 82 and Palen Rd. in the Town of East Fishkill. Ownership within this wetland is primarily private, with IBM Corporation owning multiple parcels totaling 185 acres. The Town of East Fishkill owns a small portion totaling 16.5 acres. The wetland is designated by the state as a class 2 wetland and an environmentally significant area due to the presence of a rare plant species. The wetland contains the Fishkill Creek main stem, classified as B(T), which is suitable for primary contact recreation and trout survival. It also contains tributaries to the Fishkill Creek including Sprout Creek, Gildersleeve Brook, Trout Creek, and Bloomer Brook. In 1995, a total of 67 U.S. Fish and Wildlife Service National Wetlands Inventory classified wetlands overlapped HJ-37. The wetland types consisted of lacustrine limnetic unconsolidated bottom, palustrine emergent marsh, palustrine forested, palustrine scrub shrub, palustrine unconsolidated shore, and riverine lower perennial unconsolidated bottom (L1UBHh, PEM1/SS1C, PEM1E, PFO1A, PFO1C, PFO1Cd, PFO1Ch, PFO1E, PSS1E, PUBHx, PUSCh, and R2UBH) with permanent, temporary or seasonal flooding regimes. The federally identified wetlands ranged in size from 0.2 to 40 acres, totaling 225 acres. HJ-37 provides a linkage to other wetlands in the watershed including HJ-56 (Class 2, 43 acres), HJ-69 (Class 3, 22 acres), HJ-70 (Class 4, 29 acres), HJ-57 (Class 2, 21 acres), HJ-43 (Class 3, 15 acres), HJ-41 (Class 2, 38 acres), and HJ-33 (Class 2, 41 acres).

PQ-8

This wetland located in the Towns of East Fishkill and Beekman encompasses 263 acres. A portion (94 acres) of this wetland is owned by the NYS Green Haven Prison, and the remaining portion is in private ownership. PQ-8 is located near New Hackensack Road (Rt. 216), Phillips Road, Benton Moore Road and Moonlight Drive. It is designated as a class 2 wetland and regulated entirely by the state government. The upper portion is characterized as a sensitive site. The Fishkill Creek and a tributary to the creek flow through this wetland. The stream is capable of supporting trout and other fish species. In 1995, a total of 23 U.S. Fish and Wildlife Service National Wetlands Inventory classified wetlands overlapped PQ-8. The wetland types included palustrine emergent marsh, palustrine forested, palustrine scrub shrub and palustrine unconsolidated bottom with artificial, seasonal, semi permanent and temporary flooding regimes. The federal wetlands ranged in size from 0.1 to 77 acres, totaling 154 acres.

VB-26

VB-26 is a state-regulated, class 2 wetland totaling 232 acres that are entirely in private ownership. The wetland is located in close proximity to Bruzgul Rd (CR. 21), West Clove Mountain Rd. and Clove Rd (CR. 9) in the Town of Unionvale. The Fishkill Creek (Class C(T)) and a tributary to Clove Valley Creek (Class C) flow through this wetland. McKinney Pond is also located within this wetland. In 1995, a total of 52 U.S. Fish and Wildlife Service National Wetlands Inventory classified wetlands overlapped VB-26. The wetland types consisted of palustrine emergent marsh, palustrine forested, palustrine scrub shrub and palustrine unconsolidated bottom with temporary, permanent, seasonal, and semi permanent flooding regimes. The national wetland inventory wetlands ranged in size from 0.13 to 42 acres, totaling 290 acres. According to a field survey conducted by the Dutchess County Environmental Management Council (1977), wetland plants consisted of red maple, dogwood, willow, alder, tussock sedge, bulrush, water plantain, cattail, buttonbush, false nettle, jewelweed, white ash, spicebush, and skunk cabbage. Three rare plants were present including royal, lady and cinnamon ferns. Wildlife present on the wetland included deer, fox sparrow, red-winged blackbird, blue jay, white-throated sparrow, catbird, gold finch, rabbit and grouse.

HJ-54

HJ-54, commonly known as Townsend Swamp, is a class 1 wetland in the Town of East Fishkill designated as New York Significant Habitat. This wetland encompasses 210 acres in close proximity to I-84, Townsend Rd. and Shenandoah Road. In 1995, a total of 24 U.S. Fish and Wildlife Service National Wetlands Inventory classified wetlands overlapped HJ-54. The wetland types consisted of palustrine forested, palustrine scrub shrub, palustrine emergent, and palustrine unconsolidated bottom with temporary, seasonal, semi permanent, and permanent flooding regimes. The total acreage of national wetland inventory wetlands was 187 acres, with the three largest federal wetlands characterized as palustrine forested. Streams that flow through this wetland include Wickopee Creek (HR-95-13) (Class C(T)) and tributaries to Wickopee Creek. (Note, Wickopee Creek (HR-95-13) and Wiccopee Creek (HR-95-8) are different streams).

PV-53

PV-53 is a 204-acre wetland located adjacent to Robinson Lane and Hillside Lake Road (CR. 33) in the towns of La Grange, East Fishkill and Wappinger. This class 1 wetland is designated as a sensitive site by the state due to the presence of a NYS threatened animal (the name of which remains classified for its safety). Sprout Creek (Class C(T)), a subtributary to Sprout Creek (Class C) and Jackson Creek (Class C(TS)) flow through this wetland. According to a Dutchess County Environmental Management Council survey (1977), vegetation present in this wetland included red maple, dogwood, spicebush and purple loosestrife. In 1995, a total of 22 U.S. Fish and Wildlife Service National Wetlands Inventory classified wetlands overlapped PV-53, totaling 111 acres. The wetland types present included palustrine emergent, palustrine forested, palustrine scrub shrub and palustrine unconsolidated bottom with temporary, seasonal, semi-permanent and permanent flooding regimes. This wetland is surrounded by residential development owned by private landowners.

VB-16

VB-16 is a 176-acre, NYSDEC class 2 wetland located near Clove Rd., North Clove Rd. and West Clove Mountain Rd in the Town of Union Vale. In 1995, a total of 17 U.S. Fish and Wildlife Service National

Wetlands Inventory classified wetlands overlapped VB-16, totaling 115 acres. The wetlands types included palustrine forested, palustrine scrub shrub, palustrine emergent marsh and palustrine unconsolidated bottom with temporary, seasonal, and permanent flooding regimes. Streams that flow through this wetland include Clove Valley Creek and Sweezy Creek, both classified as C(T), offering suitable habitat for trout. This wetland also contains Pray Pond (11 acres), which flows into a stream that connects to a larger state wetland (VB-26) made up of three sections totaling 232 acres. The wetland complex and various streams form the headwaters of the Fishkill Creek. According to a survey conducted by the Dutchess County Environmental Management Council (1977), wetland plants consisted of red maple, black ash, swamp white oak, tussock sedge, cattail, elm, speckled alder, willow and dogwood. Other plants (either rare, endangered, unique or protected) included purple-fringed orchis, New York fern, Massachusetts fern, ground pine, cardinal flower, grass of parnassis and stargrass. Wildlife included painted turtles, house wren, deer, minnows, black-capped chickadees, redwing blackbirds, catbirds, cedar waxwings, blue jays, green heron and brook trout.

HJ-44

This NYSDEC, class 2 wetland consists of two separate wetlands totaling 121 acres in the Town of East Fishkill. HJ-44 is adjacent to Harrigan and Binnewater Rds., both off of Rt. 52. In 1995, a total of 14 U.S. Fish and Wildlife Service National Wetlands Inventory classified wetlands overlapped HJ-44, totaling 84 acres. Ranging in size from .36 to 37 acres, the wetland types included palustrine emergent, palustrine forested and palustrine unconsolidated bottom with temporary, seasonal, semi permanent and permanent flooding regimes. Streams and waterbodies within this wetland include a tributary of Wickopee Creek and Penneywater pond (8.3 acres).

PQ-10

PQ-10 is a NYSDEC, class 2 wetland made up of 8 wetland areas totaling 119 acres in the Town of Pawling. The portion of this wetland south of Route 55 was designated an environmentally sensitive area by the town of Pawling. In 1995, a total of 15 U.S. Fish and Wildlife Service National Wetlands Inventory classified wetlands overlapped PQ-10. Ranging in size from 0.2 to 33 acres, the wetland types included palustrine forested and palustrine scrub shrub with seasonal flooding regimes. At the southern end of this wetland is Whaley Lake (NYSDEC Class B), which totals 252 acres and is designated as a critical environmental area. Flowing through this wetland is a perennial stream, Whaley Lake Brook (Class C (TS)) that is the outflow of Whaley Lake. At the northern end of the wetland is Nuclear Lake, which drains into a tributary of Whaley Lake Brook. The Appalachian Trail runs north of this wetland. Ownership is both public and private with the northern half, and adjacent area, owned by the National Park Service and the southern half and adjacent area owned by private landowners.

VB-3

VB-3 is a NYSDEC, class 2 wetland consisting of two wetland areas totaling 141 acres in the Town of Union Vale. In 1995, a total of 15 U.S. Fish and Wildlife Service National Wetlands Inventory classified wetlands overlapped VB-3, totaling 107 acres. Wetland types included palustrine emergent marsh, palustrine forested, palustrine unconsolidated bottom and palustrine scrub shrub with seasonal and permanent flooding regimes. Streams that flow through this wetland include Sprout Creek and a tributary to Sprout Creek. The Sprout Creek tributary continues to flow through a network of streams into wetland VB-43 (13 acres), eventually reaching Tyrell Lake (49 acres). The southern portion of this wetland is designated an environmentally sensitive area that extends to VB-43.

HJ-73

This wetland is located between Robinson Lane and Hillside Lake Rd (CR. 33) in the Towns of East Fishkill and Wappinger. HJ-73 is a NYSDEC, class 3 wetland consisting of three areas totaling 145 acres. The upper portion of this wetland is within an environmentally significant area that connects to PV-53 and PV-57 (101 acres). Sprout Creek flows through this wetland, which then continues to flow to nearby wetlands including HJ-6 (32 acres), HJ-72 (33 acres), HJ-33 (40 acres), and HJ-37 (540 acres). Hillside Lake is also in close proximity to HJ-73. In 1995, a total of 18 U.S. Fish and Wildlife Service National Wetlands Inventory classified wetlands overlapped HJ-73, totaling 115 acres. Wetland types included palustrine forested, palustrine scrub shrub, palustrine emergent marsh and palustrine unconsolidated bottom with temporary, seasonal and permanent flooding regimes.

VB-37

This 122-acre wetland is located in the Town of Beekman, with the upper portion between Hynes Rd. and Rt. 55 and the lower portion off of Beekman-Poughquag Rd. VB-37 is a NYSDEC, class 2 wetland that provides a connection to various wetlands in the town of Union Vale, as well as Whaley Lake in the town of Pawling. Streams that flow through this wetland include a tributary of Whaley Lake Brook and a subtributary of the Fishkill Creek. The tributary of Whaley Lake Brook continues to flow through interconnected streams to PQ-10 in the Town of Pawling. A subtributary of the Fishkill Creek flows from VB-37 to VB-33, a 21-acre, class 3 designated wetland and VB-36, a 13-acre, class 2 designated wetland. The subtributary of the Fishkill Creek flows into a tributary of Clove Valley Creek, which reaches its terminus below the southern portion of VB-26, a 232-acre, class 2 wetland. In 1995, a total of 18 U.S. Fish and Wildlife Service National Wetlands Inventory classified wetlands overlapped VB-37, totaling 66 acres. Ranging in size from 0.1 to 13 acres, wetland types included palustrine emergent marsh, palustrine forested, palustrine scrub shrub, and palustrine unconsolidated bottom with temporary, seasonal and permanent flooding regimes.

WF-12

This 111-acre, class 2 designated wetland is located in the towns of Fishkill and Wappinger. It is located adjacent to Smithtown Rd., Cooper Rd. and Route 9 and is entirely in private ownership. WF-12 is designated as an environmentally significant area due to the presence of a rare plant. Stephens Brook (Class C(T)) flows through this wetland, into a national wetland inventory wetland classified as PFO1Ed (14 acres) and continues until it empties into the Fishkill Creek. In 1995, a total of 15 U.S. Fish and Wildlife Service National Wetlands Inventory classified wetlands overlapped WF-12, totaling 85 acres. Wetland types included palustrine forested and palustrine scrub shrub with seasonal flooding regimes.

HJ-15

This 173-acre, class 1 designated wetland is located off of Lake Walton Rd. in the town of East Fishkill. The wetland is made up of 7 areas with the lower portion (94 acres) designated as an environmentally significant area. Private landowners primarily own HJ-15 with the exception of a 3-acre parcel (adjacent to Lake Walton) owned by the Town of East Fishkill. Streams, which flow through this wetland, consist of two unnamed tributaries of the Fishkill Creek. Lake Walton, a 41-acre, NYSDEC, class B designated lake and five unnamed ponds are also within the wetland system. The unnamed tributaries of the Fishkill Creek flow southward connecting to HJ-18, a 35-acre, NYSDEC class 2 designated wetland, which then connects to HJ-77. HJ-77 is a 29-acre, class 2 designated wetland that connects to HJ-37 (class 2, 540-acres), which connects to many wetlands in the Town of East Fishkill (for further information, refer to description above). In 1995, a total of 22 U.S. Fish and Wildlife Service National Wetlands Inventory classified wetlands overlapped HJ-15, totaling 138 acres. Wetland types included lacustrine unconsolidated bottom, palustrine forested, palustrine scrub shrub and palustrine unconsolidated bottom with seasonal, semi permanent and permanent flooding regimes.

HJ-20

HJ-20 is a NYSDEC class 3, 112-acre wetland in the Town of East Fishkill. It is located adjacent to New Hackensack Rd. between Stormville Rd. and Carpenter Rd. Ownership within the wetland is primarily private, with the exception of a 17-acre parcel owned by the Town of East Fishkill. A tributary of Wickopee Creek flows through HJ-20, and continues to flow through other wetlands including HJ-29 (class 2, 16 acres), HJ-40 (class 3, 88 acres), HJ-48 (class 3, 34 acres) and HJ-54 (231 acres). In 1995, a total of 11 U.S. Fish and Wildlife Service National Wetlands Inventory classified wetlands overlapped HJ-20, totaling 110 acres. Wetland types included palustrine emergent marsh, palustrine forested, palustrine scrub shrub and palustrine unconsolidated bottom with temporary, seasonal and permanent flooding regimes.

HJ-53

This NYSDEC, class 3 wetland encompasses 128 acres in the Town of East Fishkill. HJ-53, located between Rt. 52 and Shenandoah Rd, is entirely in private ownership. A tributary of the Wiccopee Creek flows through this wetland connecting it to national wetlands inventory wetlands including PEM1/SS1Cd (4 acres), PFO1A (27 acres), PFO1A (17 acres), and PUBHh (12 acres). In 1995, a total of 6 U.S. Fish and Wildlife Service National Wetlands Inventory classified wetlands overlapped HJ-53, totaling 110 acres. Wetland types included, palustrine forested, palustrine emergent marsh and palustrine scrub shrub with seasonal flooding regimes.

Geology and Groundwater

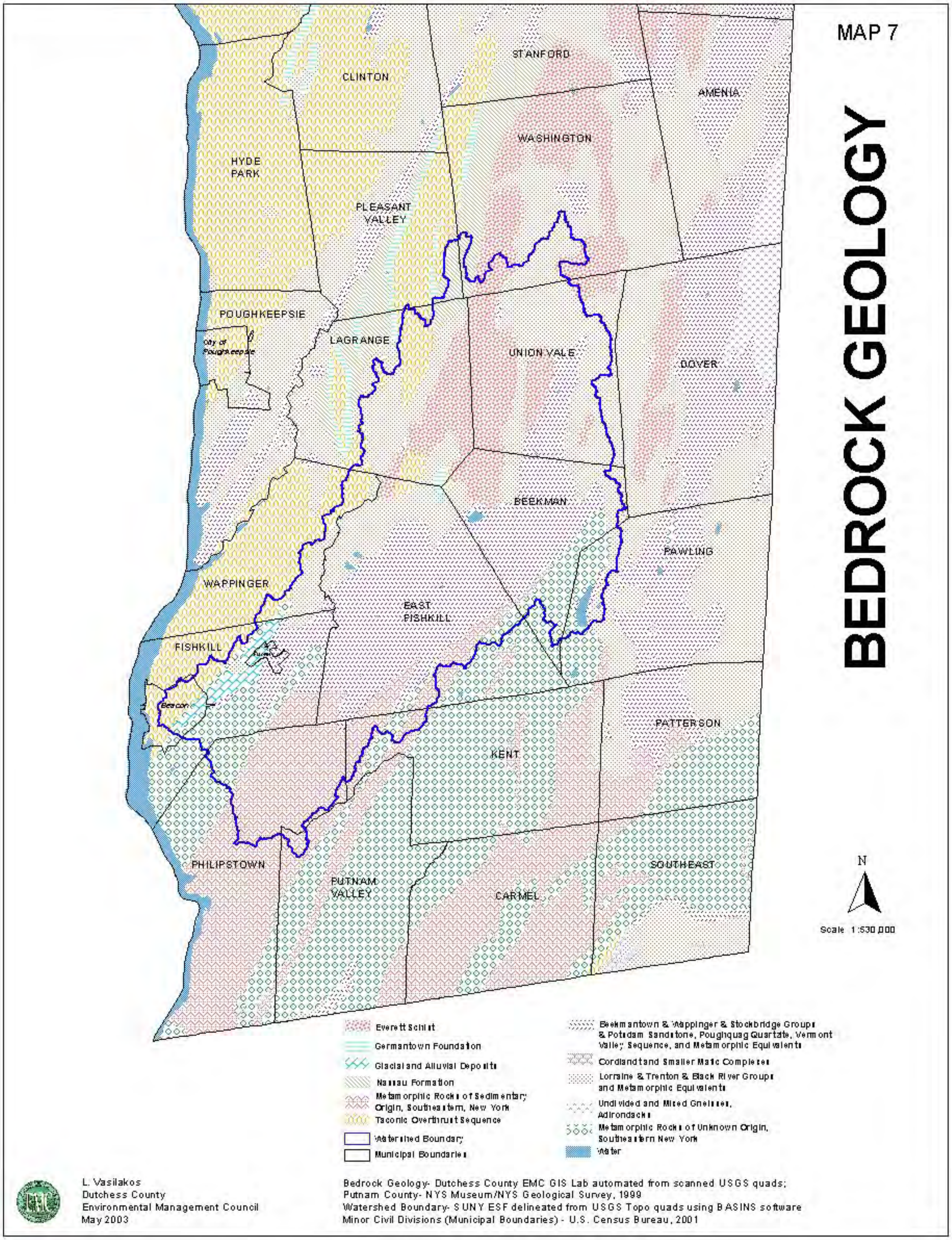
Bedrock Geology

The Fishkill Creek watershed covers portions of two physiographic regions including the Hudson Highlands and Mid-Hudson Valley. Distinctly different types of bedrock dominate each physiographic region. Most of the watershed covers a portion of the Mid-Hudson Valley and is underlain by sedimentary and meta-sedimentary rocks formed in the early Paleozoic Era (540 million years old to 450 million years old). The remainder of the watershed covers part of the Hudson Highlands where the bedrock is predominantly high temperature and pressure metamorphic gneisses of Pre-Cambrian age (more than 1 billion years old).

The bedrock exposed in the Mid-Hudson Valley was formed as shales, siltstones, sandstones and dolomitic limestones during the Cambrian and Ordovician Periods within the early Paleozoic Era (NYS Museum, 1991). These rocks include the Everett Schist, Germantown Formation, Nassau Formation and the Taconic Overthrust Sequence units shown in Map 7. These rocks were modified by metamorphism and a series of large faults during the formation of the Appalachian Mountains. Metamorphism by higher and higher temperatures and pressures can be observed as one travels eastward across Dutchess County (Barth, 1936). What occurs as shale in western Dutchess County has been modified to the rock phyllite in central Dutchess County and schist in the east. The limestones of western Dutchess County become marbles as you move eastward. Finally, sandstone in the west becomes quartzite in the eastern part of the county. According to the Geologic Map of New York (1986), large thrust faults cross the area and trend roughly northeast-southwest. Enormous masses of rock were displaced along these thrust faults toward the northwest during the formation of the Appalachian Mountains. Bedrock categorized as the "Taconic Overthrust Sequence" was moved great distances along the thrust faults (Map 7).

The limestones and marbles within the watershed are significant because these rocks may create better aquifers than the shales, which are very common in the Mid-Hudson Valley. These rock units are designated by the Beekmantown, Wappinger and Stockbridge Groups (Map 7). A comparison of the Bedrock Geology map with the Aquifer Map (Map 9) shows that most of the aquifer within the watershed is underlain by limestone and marble.

The bedrock of the Hudson Highlands is dominated by ancient and very high temperature and pressure metamorphic gneisses with lesser amounts of granite, amphibolite, etc. The gneisses have been sub-divided according to mineralogy (e.g. "biotite-quartz-plagioclase gneiss" and "garnet-biotite-quartz-feldspar gneiss"). Minor amounts of granite, amphibolite and mafic composition igneous rocks also occur in the Hudson Highlands. The Poughquag Quartzite is Cambrian in age and often located along the margins of the Hudson Highlands on topographically high ground.


MAP 7
BEDROCK GEOLOGY
STANFORD
CLINTON
AMENIA
WASHINGTON
HYDE PARK
PLEASANT VALLEY
POUGHKEEPSIE
City of Poughkeepsie
LAGRANGE
UNION VALE
DOVER
BEEKMAN
PAWLING
WAPPINGER
EAST FISHKILL
FISHKILL
Beacon
PATTERSON
KENT
PHILIPSTOWN
PUTNAM VALLEY
CARMEL
SOUTHEAST
N
Scale 1:530,000
Everett Schist
Germantown Foundation
Glacial and Alluvial Deposits
Nassau Formation
Metamorphic Rocks of Sedimentary Origin, Southeastern, New York
Taconic Overthrust Sequence
Watershed Boundary
Municipal Boundaries
Beekmantown & Wappinger & Stockbridge Groups & Potsdam Sandstone, Poughquag Quartzite, Vermont Valley Sequence, and Metamorphic Equivalents
Cordlandt and Smaller Mafic Complexes
Lorraine & Trenton & Black River Groups and Metamorphic Equivalents
Undivided and Mixed Gneisses, Adirondacks
Metamorphic Rocks of Unknown Origin, Southeastern New York
Water
L. Vasilakos
Dutchess County
Environmental Management Council
May 2003
Bedrock Geology- Dutchess County EMC GIS Lab automated from scanned USGS quads;
Putnam County- NYS Museum/NYS Geological Survey, 1999
Watershed Boundary- SUNY ESF delineated from USGS Topo quads using BASINS software
Minor Civil Divisions (Municipal Boundaries) - U.S. Census Bureau, 2001

Surficial Geology

Surficial deposits are loose sand, gravel, silt and mud that often overlie the bedrock of our region (Map 8). These deposits can be divided into glacial deposits left behind by the glaciers during the Ice Ages, and alluvial deposits, which were left by flowing water after the retreat of the glaciers. Alluvial deposits are usually confined to stream and river valley bottoms. Alluvial fans are cone-shaped piles of sediment deposited when a fast flowing mountain stream abruptly slows down upon leaving the mountains. Glacial deposits can be sub-divided into many different categories such as till, outwash, kames and lake (lacustrine) deposits. Some of the glacial deposits make good aquifers, while others do not.

Till is the most abundant surficial deposit within the watershed (Map 8) and is characterized by a great variety of different particle sizes ranging from boulders through sand to microscopic clay particles mixed together. Till is deposited directly from glacial ice. Outwash deposits usually consist of layered sand and gravel, which were left behind by streams as the glaciers melted. As the glaciers melted, temporary lakes were also created. Sediments deposited in these lacustrine environments can range from sand to silt to clay. Lacustrine deposits usually have only one-grain size in a given location. Kame deposits consist of layered sand and gravel that form near the edge of the glacier. Outwash, kame and lacustrine sand deposits are sometimes utilized as aquifers. Glacial till and lacustrine silt and clay are rarely used as aquifers because they do not have the necessary water storage characteristics.

Aquifer Characteristics

Three important characteristics of aquifers are porosity, permeability and recharge. Porosity is simply the amount of pore space within the material. A material with abundant pore space can hold a large amount of groundwater. Permeability is the ease with which water can move through the material. Its value depends upon how interconnected and large the pore spaces are. An aquifer with high permeability can have water pumped out of it rapidly. Recharge is the process whereby precipitation (rain and snow) replenishes the water in the aquifer. Fortunately, in this region there is adequate rainfall to recharge our aquifers except during prolonged periods of drought.

Outwash, kame and lacustrine sand deposits usually have both high porosity and high permeability and therefore can be used as aquifers. However, these same characteristics mean that any contamination will spread rapidly through the aquifer. The limestones and marbles of the Mid-Hudson Valley had rather low porosity and permeability originally. However, limestone slowly dissolves in water so thin fractures widen over time. This can create a series of interconnected openings (even caverns) through which groundwater travels rapidly. Limestone deposits that have these solution features make excellent aquifers but are at risk of contamination similar to the aforementioned surficial deposits.

Generally speaking, the shales of the Mid-Hudson Valley and the gneisses of the Hudson Highlands make mediocre to poor aquifers. However, these can often be utilized by individual homes especially if the well intersects a fracture containing water.

The Groundwater Connection

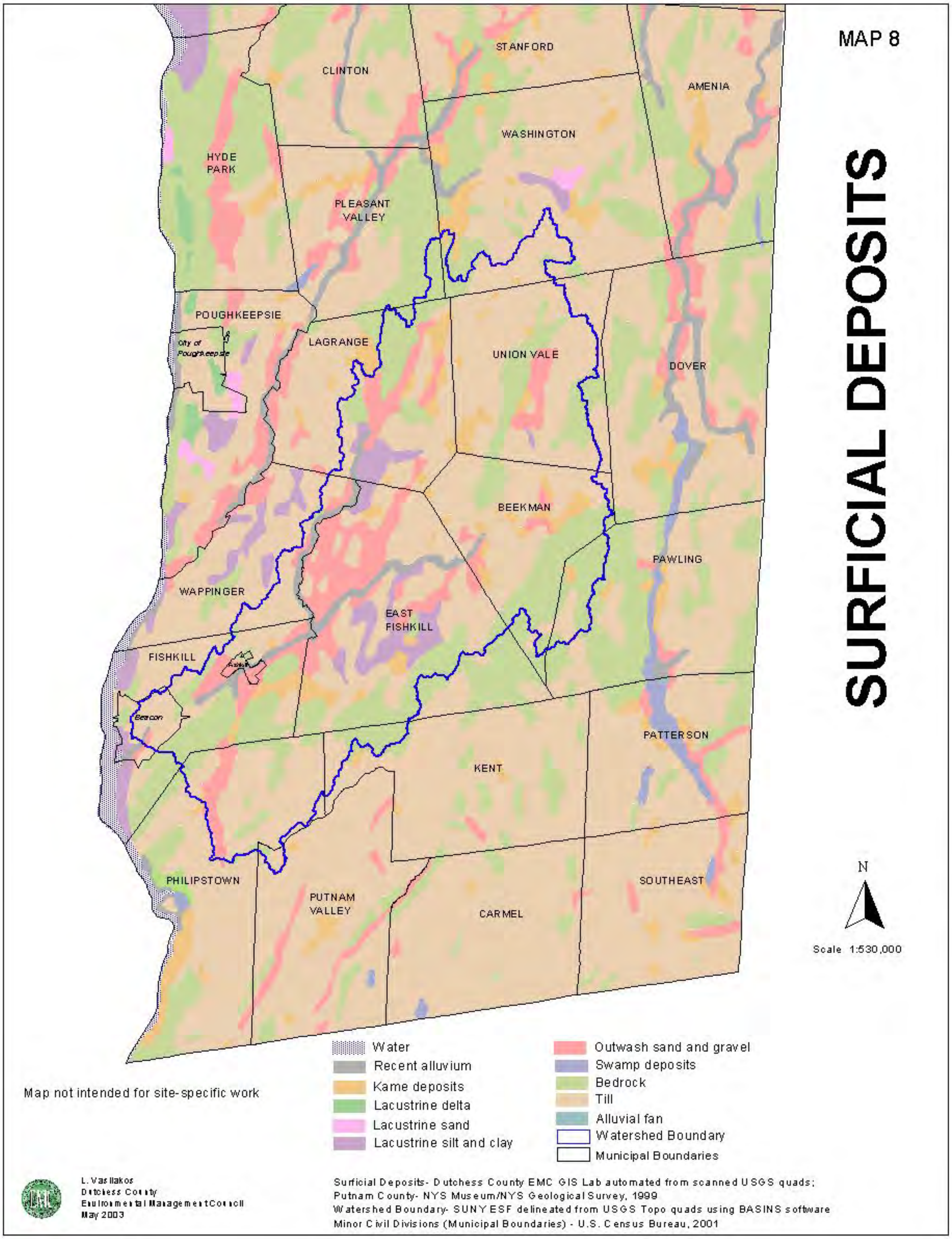
1. During dry periods, water in the Fishkill Creek consists solely of groundwater discharging from aquifers in the watershed, and treated wastewater returns from wastewater treatment plants.
2. Under 10-year drought conditions, Fishkill Creek flows measured at Beacon drops to approximately 4 million gallons per day (gpd).
3. The Watershed above Beacon contains 190 square miles, or 121,600 acres.
4. This means that during drought periods, the aquifers under each acre in the watershed contribute approximately 33 gallons per day to the Fishkill Creek or its tributaries.
5. Since the average person consumes 20 or more gallons per day*, wherever population equals 2 persons per acre and local wells are in use, groundwater no longer reaches the Fishkill Creek during droughts.
6. And wherever populations using local wells exceed 2 persons per acre, deficit withdrawals are occurring and stream flow is reduced, affecting fish survival, wildlife habitat, swimming, boating, and water quality.

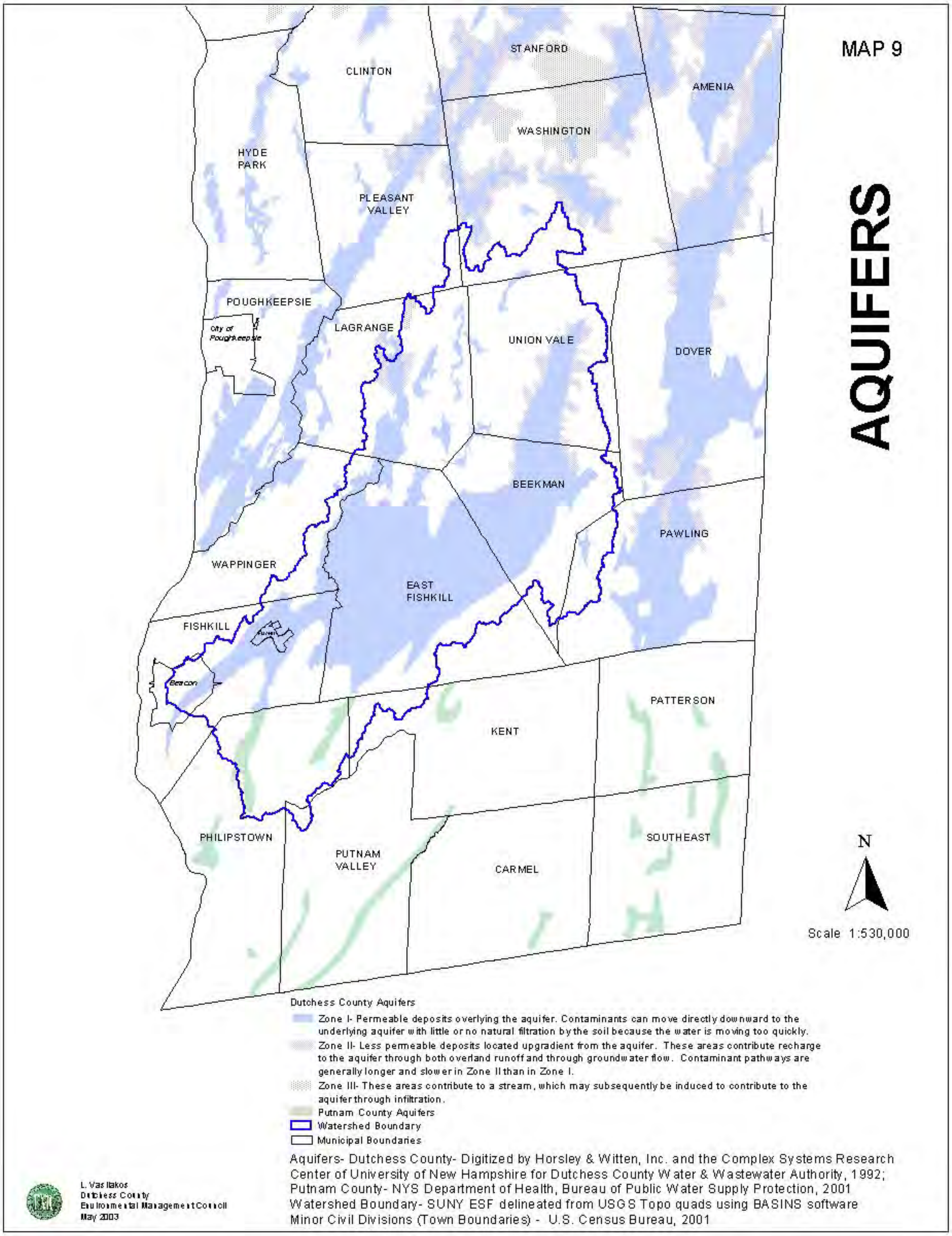
*Consumption is the difference between water entering the home and water returned to nature through septic systems or sewage treatment plants. Per capita water consumption for individuals using septic systems is probably higher than 20 gpd due to evapotranspiration losses off leaching fields.

Other Groundwater Factors

1. Where individual wells and septic systems are used, a USGS model predicts that groundwater quality suffers if average lot sizes drop below 3 acres where soils contain clay or silt or below 1.5 acres in areas with sandy soils.
2. Road salt can locally harm groundwater quality if melting snow-salt mixture drains to low areas near wells.
3. A Dutchess County Water & Wastewater Authority study shows that E-coli levels in private wells can increase during extended drought periods, potentially as a result of proximity to septic systems.
4. The Dutchess County Water & Wastewater Authority monitors groundwater levels in a network of groundwater wells across Dutchess County.
5. Phase II stormwater regulations offer an opportunity to preserve groundwater recharge if synergies are sought between soil conservation and groundwater preservation objectives.

Provided by Russell Urban-Mead, Hydrogeologist, The Chazen Companies


MAP 8
SURFICIAL DEPOSITS
CLINTON
STANFORD
AMENIA
WASHINGTON
HYDE PARK
PLEASANT VALLEY
POUGHKEEPSIE
City of Poughkeepsie
LAGRANGE
UNION VALE
DOVER
BEEKMAN
PAWLING
WAPPINGER
EAST FISHKILL
FISHKILL
Beacon
PATTERSON
KENT
PHILIPSTOWN
PUTNAM VALLEY
CARMEL
SOUTHEAST
N
Scale 1:530,000
Water
Recent alluvium
Kame deposits
Lacustrine delta
Lacustrine sand
Lacustrine silt and clay
Outwash sand and gravel
Swamp deposits
Bedrock
Till
Alluvial fan
Watershed Boundary
Municipal Boundaries
Map not intended for site-specific work
L. Vasilakos
Dutchess County
Environmental Management Council
May 2003
Surficial Deposits- Dutchess County EMC GIS Lab automated from scanned USGS quads;
Putnam County- NYS Museum/NYS Geological Survey, 1999
Watershed Boundary- SUNY ESF delineated from USGS Topo quads using BASINS software
Minor Civil Divisions (Municipal Boundaries) - U.S. Census Bureau, 2001


MAP 9
AQUIFERS
STANFORD
CLINTON
AMENIA
WASHINGTON
HYDE PARK
PLEASANT VALLEY
POUGHKEEPSIE
City of Poughkeepsie
LAGRANGE
UNION VALE
DOVER
BEEKMAN
PAWLING
WAPPINGER
EAST FISHKILL
FISHKILL
Beacon
PATTERSON
KENT
PHILIPSTOWN
PUTNAM VALLEY
CARMEL
SOUTHEAST
N
Scale 1:530,000
Dutchess County Aquifers
Zone I- Permeable deposits overlying the aquifer. Contaminants can move directly downward to the underlying aquifer with little or no natural filtration by the soil because the water is moving too quickly.
Zone II- Less permeable deposits located upgradient from the aquifer. These areas contribute recharge to the aquifer through both overland runoff and through groundwater flow. Contaminant pathways are generally longer and slower in Zone II than in Zone I.
Zone III- These areas contribute to a stream, which may subsequently be induced to contribute to the aquifer through infiltration.
Putnam County Aquifers
Watershed Boundary
Municipal Boundaries
Aquifers- Dutchess County- Digitized by Horsley & Witten, Inc. and the Complex Systems Research Center of University of New Hampshire for Dutchess County Water & Wastewater Authority, 1992;
Putnam County- NYS Department of Health, Bureau of Public Water Supply Protection, 2001
Watershed Boundary- SUNY ESF delineated from USGS Topo quads using BASINS software
Minor Civil Divisions (Town Boundaries) - U.S. Census Bureau, 2001
L. Vasilakos
Dutchess County
Environmental Management Council
May 2003

Climate

The Fishkill Creek watershed has a humid continental climate with strong seasonal temperature variability and periods of unusually warm or cold weather (Mackenzie, 2001). Coldest weather occurs when Arctic air masses from Canada cover the region. Warmest weather generally occurs when a stationary high-pressure region forms over the Atlantic Ocean and the circulation around the high draws warm air into our region from the south or southwest for extended periods of time. The presence of the Atlantic Ocean nearby tends to moderate temperature fluctuations somewhat and provide a source of moisture for precipitation (DCDPD and DCEMC, 1985). Weather data was recorded at the Dutchess County Airport, Wappinger, NY and in Millbrook, NY. The airport station is located a few miles west of the Fishkill Creek watershed, while the Millbrook station is located just north of the watershed.

At the Dutchess County Airport, the average annual temperature for a 30-yr period was 49.3 °F, with monthly mean temperatures ranging from 24.7 °F in January to 72.4 °F in July (Mackenzie, 2001). Average annual precipitation was 43.8 inches, and varies from a minimum monthly mean of 2.6 inches in February to 4.8 inches in May (Mackenzie, 2001). Average annual snowfall was 34.5 inches, with the maximum monthly mean snowfall of 10.6 inches occurring in January (Mackenzie, 2001). The average annual heating degree-days was 6,267, while the average annual cooling degree days was 645 (Mackenzie, 2001). Similar statistics have been generated for the Dutchess County Airport station over a twenty-nine year period from 1951 to 1980 (NOAA, 1985). At the airport, the average annual temperature was 47.4 F, and average annual precipitation was 40.6 inches (NOAA, 1985). A weather station at the Institute of Ecosystem Studies (IES) in Millbrook has measured pH (acidity) of precipitation since 1984. The average pH of precipitation was 4.27, with monthly averages ranging from 4.00 in July to 4.54 in November (Kelly et al., 2002). In 2003, the average pH of precipitation was 4.52, ranging from 4.18 in July to 4.87 in January. The pH of precipitation in Dutchess County is 10 times more acidic than natural precipitation, which typically has an average pH of 5.2.

Comparison of Precipitation and Stream flow

Stream flow within the watershed was measured by the United States Geological Survey (USGS) at several locations: Fishkill Creek at Bridge Street in Beacon (station #01373500) from 1944 to 1968, Fishkill Creek at Hopewell Junction (#01372800) from 1964 to 1975, East Mt. South on Clove Creek (#01372950) from 1956 to 1962 and the Highway Department on Clove Creek on various days from 1962 to 1973. The USGS also measured stream flow during the passage of Tropical Storm Floyd in September of 1999 at the Beacon station. Finally, base flow of the Fishkill Creek was measured at the Beacon station on three days in 2001 and 2002 by The Chazen Companies (Chazen Companies, 2003). The total volume of stream flow depends in part on the amount of surface runoff due to precipitation, and in part on base flow due to discharge of groundwater into the stream in a "gaining" stream. If water from the stream percolates downward into the ground it is called a "losing" stream. In a losing stream, the stream flow is determined by the amount of surface runoff minus the water lost downward.

The average annual discharge from the Beacon gauging station (1945-1967) showed a downward trend over time with an R-squared value of 0.183 (Figure 5). This equation suggests that stream flow at Beacon should decrease to zero late in the year 2002. This has not been observed, in fact, the Chazen Companies (2003) measured base flow in the same location in 2001 and 2002, which ranged from 13.5 cubic feet per second (cfs) to 26.7 cfs (these are minimum flows, the average annual discharge would be significantly higher). Unfortunately, there isn't any data from 1967 until 2001 to resolve the discrepancy. Possible reasons include, the 22-year USGS data could be unrepresentative of the long-term trend, conditions in the watershed may have changed since 1967, and/or precipitation patterns or measurement methodology were different in the 1945 to 1967 study period. For example, a very significant drought occurred in the mid-1960s and may have biased the USGS data set. Land use has also changed significantly since 1967 in the Fishkill Creek watershed. Deforestation and increased amounts of impervious surfaces tend to increase the proportion of precipitation running off into streams. Since 1967, the construction of several sewage treatment plants may have contributed to stream flow additions to the Fishkill Creek. It remains to be verified, which if any of these changes account for the discrepancy mentioned above. While the minimum discharge measured was 13.5 cfs in September 2002, the maximum monthly stream flow was 1,075 cfs in October 1955 when a hurricane traveled across the area.

The annual average discharge at the Beacon station versus the annual precipitation measured at the Millbrook weather station results in a best-fit trendline with the equation - $Y = 10.775X - 141.45$; R squared = 0.698 (Figure 6). This equation is a simple mathematical model of the stream flow response to variations in precipitation. The equation suggests that the Fishkill Creek is a losing stream with approximately 140 cfs of water disappearing. The best-fit trendline also suggests that stream flow would fall to zero if annual precipitation dropped to about 13 inches.

Based on USGS discharge measurements recorded between 1964 and 1975, annual discharge of the Fishkill Creek near Hopewell Junction, about 20 miles upstream of the Beacon station showed an increase in stream flow (Figure 7). The best-fit trendline to this data follows the equation – Y = 7.7238X – 15123; R squared = 0.626. This data set only spans twelve years, and the first three data points are unusually low due to the drought in the mid-1960s, thus the data set may be unrepresentative of a long-term average. The apparent increase in stream flow over time may be due to deforestation, increased amount of impervious surfaces, the construction of sewage treatment plants that discharge into the Fishkill Creek upstream or an unusual set of weather data. In September of 1999, the USGS measured the discharge at this location as 2,370 cfs during the passage of Tropical Storm Floyd.

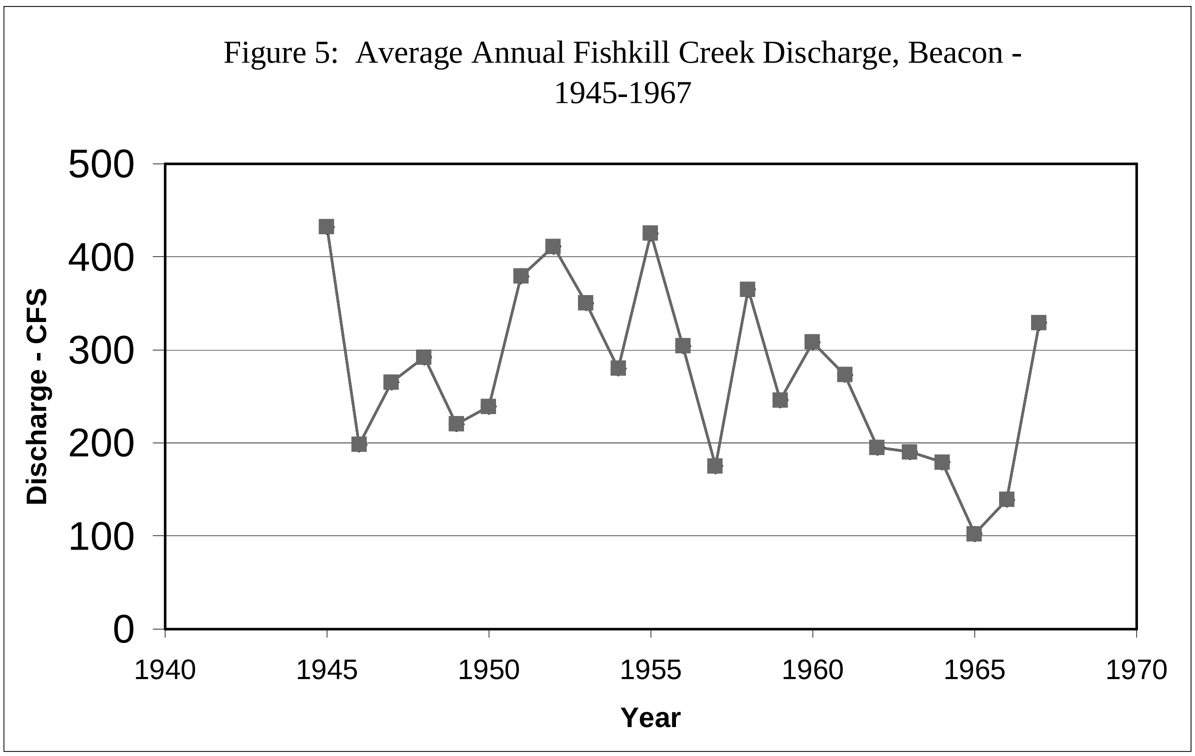


Figure 6. Mean Annual Precipitation vs. Annual Discharge for Beacon, NY - 1950-1967

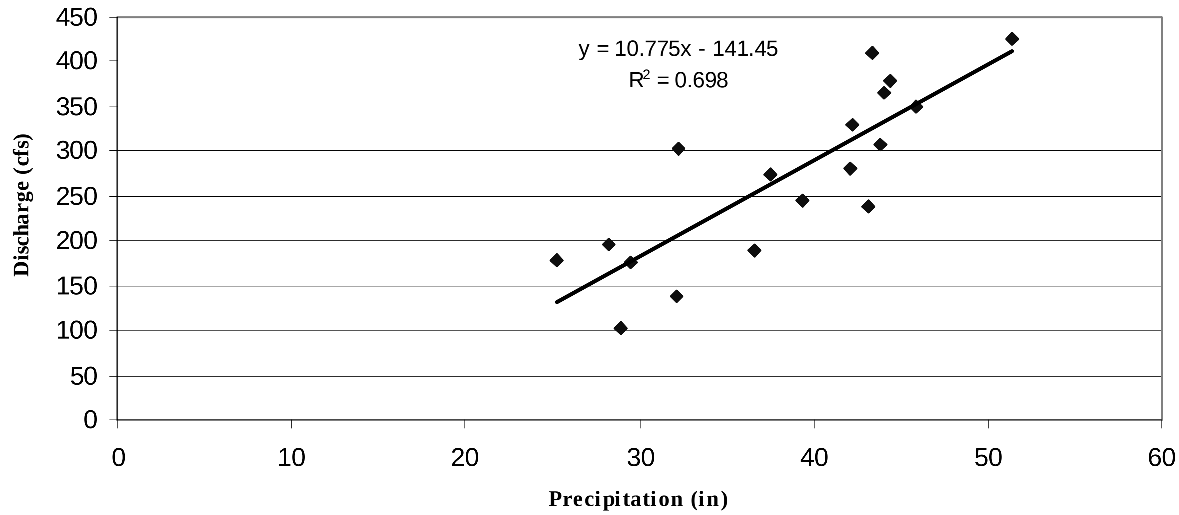
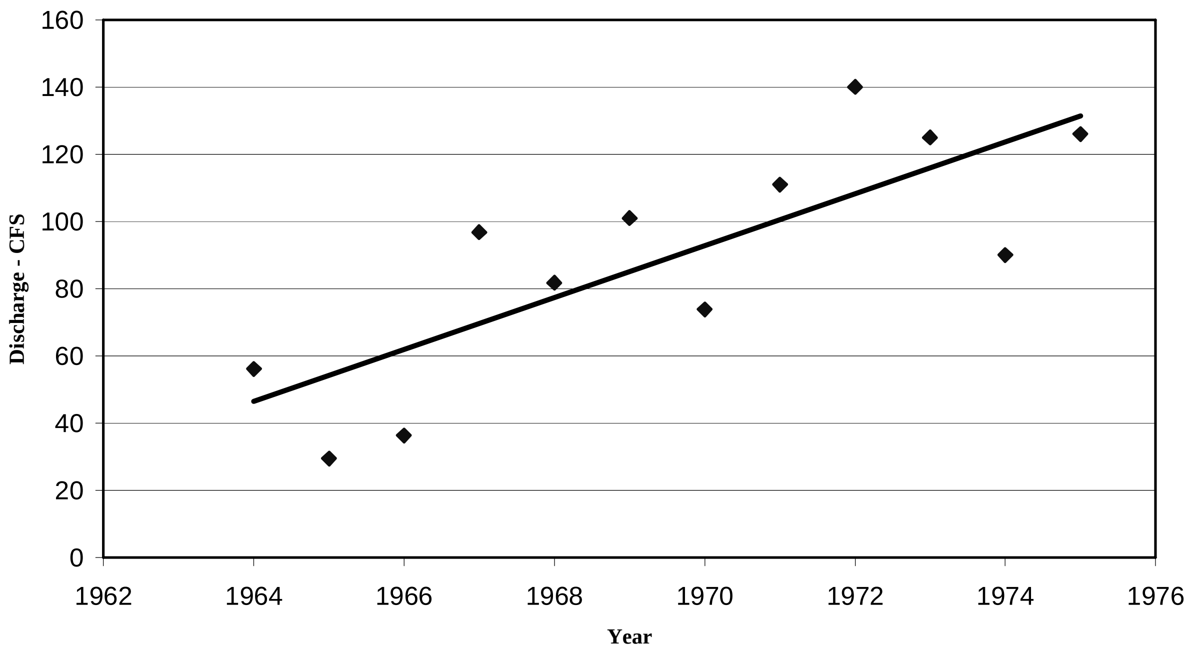


Figure 7. Average Annual Fishkill Creek Discharge, Hopewell Junction - 1964 - 1975



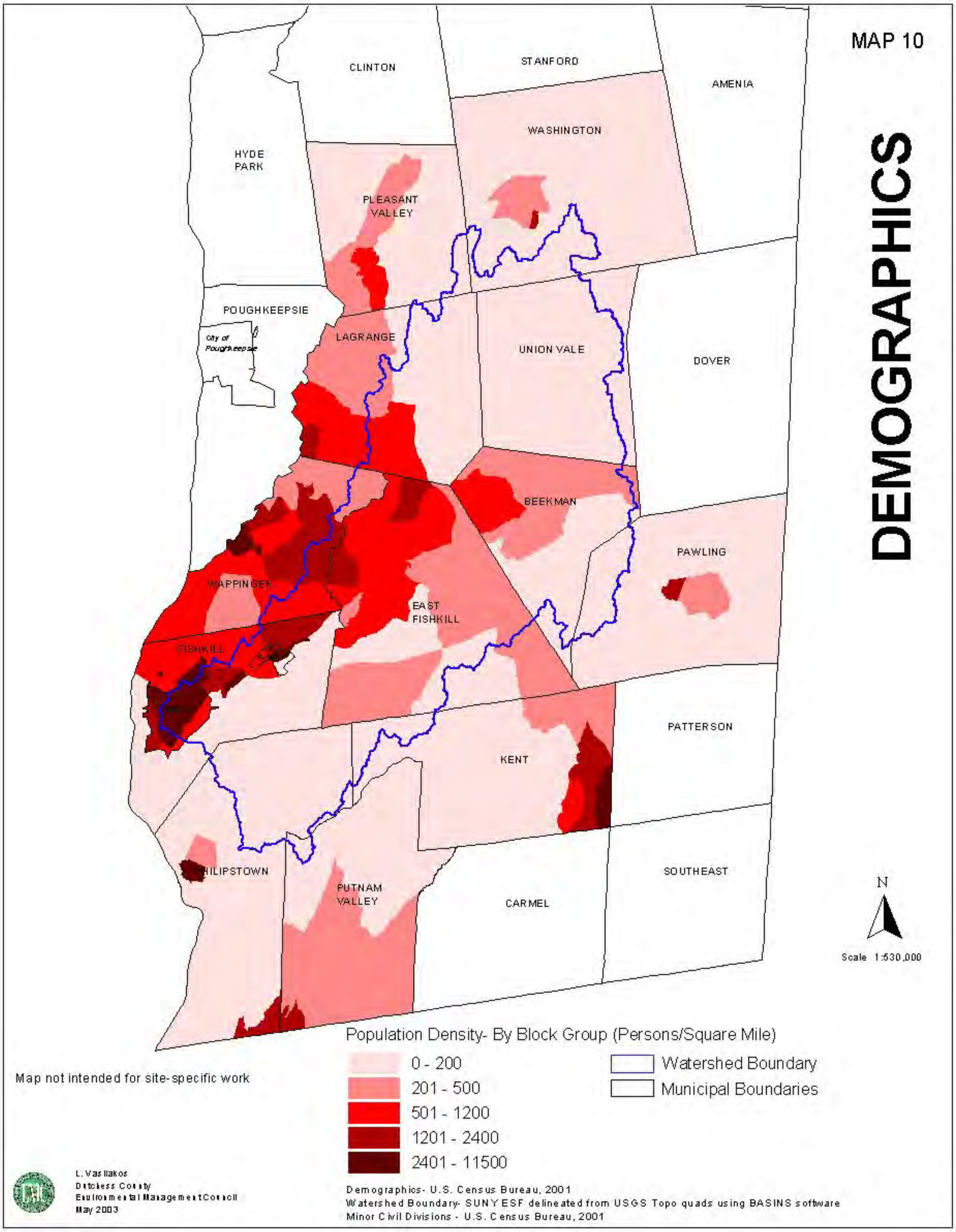
Demographics

In 2000, the population of watershed municipalities ranged from 1,735 in the Village of Pawling to 26,274 in the Town of Wappinger (Table 21). The City of Beacon had the highest population density with 2,892 persons per square mile, while the Town of Washington had the lowest with 80 persons per square mile (Table 21, Map 10). The southern portion of the watershed has experienced the most growth, with the towns of Fishkill, East Fishkill and Wappinger exceeding 20,000 people. The population growth in these towns has contributed to intense development, which can greatly impact the quality and quantity of water in the watershed.

Table 21. Demographics for Municipalities in the Fishkill Creek Watershed.
(Source: Census 2000 Summary File 1 (SF1) [New York]/prepared by U.S. Census Bureau, 2001)

Municipality	Total Population	Population Density (persons/square mile)
BEACON (C)	13,808	2,892
BEEKMAN	11,452	382
EAST FISHKILL	25,589	450
FISHKILL (T)	20,258	625
FISHKILL (V)	1,735	608
KENT	14,009	345
LA GRANGE	14,928	376
PAWLING	7521	167
PHILIPSTOWN	9422	183
PLEASANT VALLEY	9,066	275
PUTNAM VALLEY	10,686	258
UNION VALE	4,546	121
WAPPINGER	26,274	919
WASHINGTON	4,742	80

Note: Town of Fishkill, Town of Pawling, Town of Philipstown, Town of Wappinger and Town of Washington were adjusted to account for population within the town without the incorporated villages (e.g. The Town of Pawling population does not include the Village of Pawling)


MAP 10
DEMOGRAPHICS
CLINTON
STANFORD
AMENIA
WASHINGTON
HYDE PARK
PLEASANT VALLEY
POUGHKEEPSIE
City of Poughkeepsie
LAGRANGE
UNION VALE
DOVER
BEEKMAN
PAWLING
WAPPINGER
EAST FISHKILL
FISHKILL
PATTERSON
KENT
PHILIPSTOWN
PUTNAM VALLEY
CARMEL
SOUTHEAST
N
Scale 1:530,000
Population Density- By Block Group (Persons/Square Mile)
0 - 200
201 - 500
501 - 1200
1201 - 2400
2401 - 11500
Watershed Boundary
Municipal Boundaries
Map not intended for site-specific work
L. Vasilakos
Dutchess County
Environmental Management Council
May 2003
Demographics- U.S. Census Bureau, 2001
Watershed Boundary- SUNY ESF delineated from USGS Topo quads using BASINS software
Minor Civil Divisions - U.S. Census Bureau, 2001

Recreation

Within the Fishkill Creek watershed, there are many recreational areas composed of state and town parks, state forests, and private preserves (Table 22). These areas offer many recreational opportunities including hiking, swimming, fishing, mountain biking, horseback riding, boating, picnicking, cross-country skiing, and snowshoeing. Many towns in the watershed also have athletic fields and playgrounds that are less than an acre in size and therefore do not appear in Table 22. The Appalachian Trail also passes through the watershed, covering approximately 20 miles from Pawling to Philipstown.

Table 22. Recreation Areas in Fishkill Creek Watershed

Name	Municipality	Acreage	Description
Madam Brett Park	City of Beacon	12	private park
Memorial Park	City of Beacon	4.53	municipal park
Hammond Field	City of Beacon	0.80	playground
Depot Hill Multi-Use Area	Beekman, Pawling	260	public, state land, Appalachian Trail
Beekman Recreation Area	Beekman	2.42	park
Hopewell Complex Park	East Fishkill	1.83	municipal park
Brettview Acres	East Fishkill, Wappinger	2.96	municipal park
Slyvan Lake Beach Park	East Fishkill	95	public
Red Wing Park	East Fishkill	2.04	municipal park
Soccer Complex Park	East Fishkill	3.28	municipal park
Wiccopee Park	East Fishkill	0.38	municipal park
Jean Van Pelt Park	Fishkill (T)	1.80	public, town park
Maurer/Geering Park	Fishkill (T)	24.80	public, town park
Doug Phillips Memorial Park	Fishkill (T)	10.00	public, town park
Bob Shepheard Memorial Park	Fishkill (T)	16.30	public, town park
Dutchess Park Lake	Fishkill (T)	11.30	public
Dutchess Junction Park	Fishkill (T)	NA	state park, town use
Sharpe Reservation	Fishkill (T)	3000	private preserve, camps
Fishkill Ridge Conservation Area	Fishkill (T)	1030	private preserve
Sarah Taylor Park	Fishkill (T)	3.95	municipal park
Mt. Beacon	Fishkill (T)	17.59	hiking, scenic views
Freedom Park	LaGrange	91.26	public, swimming
Stringham Park	LaGrange	6.28	public, town park
LaGrange Park	LaGrange	1.54	public, town park
James Baird State Park	LaGrange	50.59	state park
NYS Taconic Hereford State Forest	LaGrange	909	state forest, multi-use area
Edward R. Murrow Park	Pawling	65	town park
Clarence Fahnstock State Park	Philipstown, Putnam Valley & Kent	12,000	state park, Appalachian Trail
Innisfree Gardens	Pleasant Valley,Washington	160	private park, picnicking
Tymor Park	Union Vale,Beekman	500	town park
Frederick E. Godfrey Memorial Park	Union Vale	12	town park
Firefighter's Memorial Park	Union Vale	1.00	town park
Robinson Lane Park	Wappinger (T)	4.77	athletic field
Rockingham Park	Wappinger (T)	1.08	municipal park
Ye Old Apple Orchard Pond Park	Wappinger (T)	0.40	park

Significant Areas in the Fishkill Creek Watershed

Significant natural areas consist of geological formations (i.e. mountains, steep ravines), hydrologic features (rivers, lakes, wetlands) and other areas of special importance such as critical habitat for threatened, endangered or rare species. These areas provide several environmental benefits such as sustaining the quantity and quality of water, offering habitat for plant and animal communities, providing recreational and educational areas, and providing scenic view sheds. The significant areas described were designated by the Dutchess County Environmental Management Council to encourage their protection and sustain the environmental benefits they provide.

Hosner Mountain

Hosner Mountain is a rocky ridge area located in the Town of East Fishkill that provides open space, scenic beauty, wildlife habitat and recreational opportunities. A section of the Appalachian Trail is accessible via Hosner Mountain Road, which is owned and maintained by the U.S. Department of Interior. At the top of Hosner Mountain, there are views of the Hudson Highlands, Shawangunks, and Catskills. There are also scenic vistas that overlook the Taconic State Parkway and I-84 along with pristine wilderness and countryside within the Hudson River Valley.

Figure 8. View of Hosner Mountain taken from the Appalachian Trail

Little Whaley Lake

Little Whaley Lake is a 45-acre natural lake that lies about 1 mile east of Whaley Lake (252 acres) and about 2 miles south of Route 55 in the Town of Pawling. The property was formerly owned by the Boy Scouts of America, Greater New York Council, but in 2004 was shared by both private and corporate landowners. In the 1990s, the surrounding land use consisted of mixed deciduous-hemlock forest with an understory of mountain laurel representative of a transitional plant community, vernal pools, wooded wetlands, steep slopes and limy bedrock outcroppings (National Audubon Society, 1998). At the northern end of the lake, a perennial stream (class C) flows into Whaley Lake. The elevation of the lake is 917 feet, with it reaching 1,130 feet at the top of the ridge, contributing to the highest elevation in the town of Pawling (Gilbert, 1989). The area is comprised of soils that are highly susceptible to erosion including Charlton-Chatfield complexes and Hollis-Chatfield Rock Outcrops.

The area is characterized as an important bird area (IBA), containing significant habitats for the survival and conservation of bird species. Little Whaley Lake and surrounding lakes (Whaley Lake, Nuclear Lake) and wetlands provide habitat for waterfowl including kingfishers, green herons and great blue herons (Gilbert, 1989). Breeding species include Northern Goshawk, Cooper's Hawk, Osprey, Golden-winged Warbler, Cerulean Warbler, Blackburnian Warbler, Canada Warbler, Swainson's Thrush and Hermit Thrush (National Audubon Society, 1998). Other birds that utilize the lake for breeding habitat include Canada geese, mallard and wood ducks (Gilbert, 1989). The 1982-83 Atlas Breeding Bird Survey indicated the use of the lake by 90 bird species during the nesting season. The lake and its surrounding watershed was designated as a Critical Environmental Area in September 1985 by the Town of Pawling, and a Significant Natural Area by Dutchess County due to its special characteristics, its value as a water resource and its extreme vulnerability. The site is also designated as one of the 123 priority sites in the 1997, New York State Open Space Plan.

Townsend Swamp

Townsend Swamp is a 210-acre, NYSDEC, class 1, regulated wetland (HJ-54) located in the Town of East Fishkill. It is designated as a sensitive site/significant area by New York State due to the presence of a rare animal. It is also designated as a significant natural area by the Dutchess County Environmental Management Council. Ownership of this wetland is entirely private, but was recommended for preservation by the Nature Conservancy (DCDPD and DCEMC, 1985). According to the United States Fish and Wildlife Service National Wetland Inventory, Townsend Swamp contains four different wetland types including palustrine forested, palustrine emergent, palustrine scrub shrub and palustrine unconsolidated bottom, totaling 187 acres. Wiccopee Creek and its subtributaries flow through this wetland providing suitable habitat for fish.

Sharpe Reservation

Sharpe Reservation encompasses 3,000 acres of land in the Towns of Fishkill and East Fishkill in Dutchess County and the Town of Philipstown in Putnam County. It is owned by the Fresh Air Fund and utilized as a recreational camp and environmental education facility. The property contains forests, wetlands and three lakes. In 1995, the Sharpe Reservation contained nineteen wetlands identified in the National Wetlands Inventory. Wetland types included palustrine unconsolidated bottom, palustrine emergent marsh, palustrine forested, palustrine scrub shrub, and lacustrine unconsolidated bottom. Tributaries of the Fishkill Creek on this property include Bloomer Brook and a tributary to Clove Creek, both perennial, class C streams suitable for secondary contact recreation. The property also contains numerous trails, which provide scenic vistas. Sharpe Reservation has historical significance due to the presence of charcoal pits that predate the Revolutionary War (DCDPD and DCEMC, 1985).

Figure 9. Deer Lake at Sharpe Reservation, Fishkill, NY

III. Status of the Fishkill Creek Watershed

Introduction

Water quality of the Fishkill Creek and its major tributaries was assessed between 1973 and 2002 by different scientific research groups including, Neuderfer (1977), Schmidt and Kiviat (1985), Bode et al. (1991), Bode et al. (1999), Stainbrook (2001), and Bode (2004). The primary component of these studies was an analysis of biological communities, including benthic macroinvertebrates and fish. In addition to the biological analysis, water samples were collected and analyzed for chemical and physical parameters. The following summaries provide the rationale for the studied parameters.

Nitrogen

Nitrogen is found in various forms in ecosystems including organic forms, nitrate (NO_3^-), nitrite (NO_2^-) and ammonium (NH_4^+). The majority of nitrogen is in the form of a gas (N_2), which makes up approximately 80% of our air. Nitrogen is converted into organic matter by some types of terrestrial plants (legumes) that have nitrogen-fixing bacteria, lightning and microbes in the water and soil. Nitrate, the most mobile form of nitrogen, can either be assimilated by vegetation to make protein, leach into groundwater or surface water, or be converted to nitrogen gas in the process of denitrification (Welsch et al. 1995). Nitrites (NO_2^-), ammonia (NH_3) and ammonium (NH_4^+) are intermediate forms of nitrogen in aquatic systems and are quickly removed from the system by being converted to another form of nitrogen (NO_3^- or N_2) (Behar, 1996). Ammonium is released into the system during animal or plant decomposition or when animals excrete their wastes. Through the process of nitrification, ammonium is oxidized to nitrates by nitrifying bacteria ($NH_4^+ \rightarrow NO_2^- \rightarrow NO_3^-$). Nitrate concentrations in water can serve as an indicator of sewage or fertilizer in surface or ground water.

Based upon average concentrations found in water samples from 85 sites across the United States, in relatively undeveloped watersheds the median concentrations of nitrate-nitrogen and total nitrogen were .087 and .26 mg/L respectively (Clark et al., 2000). However, due to present and past land uses, the undeveloped watershed concentrations (below .26 mg/L) of total N rarely occur in Dutchess County in 2004. Major sources of nitrate (most mobile form of nitrogen) in streams are municipal and industrial wastewater discharges and agricultural and urban runoff. In addition, deposition from the atmosphere of the nitrogenous material in automobile exhaust and industrial emissions are a source (Smith et al., 1991).

Nitrate in excessive amounts can accelerate eutrophication of surface waters, and can present a human health concern in drinking water. Any water that contains nitrate concentrations of 44 mg/L (equivalent to 10 mg/L nitrate-nitrogen for EPA and NYSDOH standards) or higher has the potential to cause methemoglobinemia, or "blue baby" disease in children, and the excess nitrate can indicate serious residential or agricultural contaminants (McCasland et al., 1998). Although the human health standard for nitrate consumption has little correlation with stream health, high levels of nitrate in both surface and groundwater usually indicate widespread nonpoint source pollution. Figures ten and eleven provide a general idea of total nitrogen and nitrate-nitrogen concentrations in the Fishkill Creek basin during low-flow in the summer of 2001.

Figure 10. Mean total nitrogen and nitrate-nitrogen concentrations (mg/L) from a limited set (4) of Fishkill Creek water samples collected in summer 2001 and 2002 (Stainbrook, 2004). Data are arranged from downstream (river mile 4.1) to upstream (river mile 25.7).

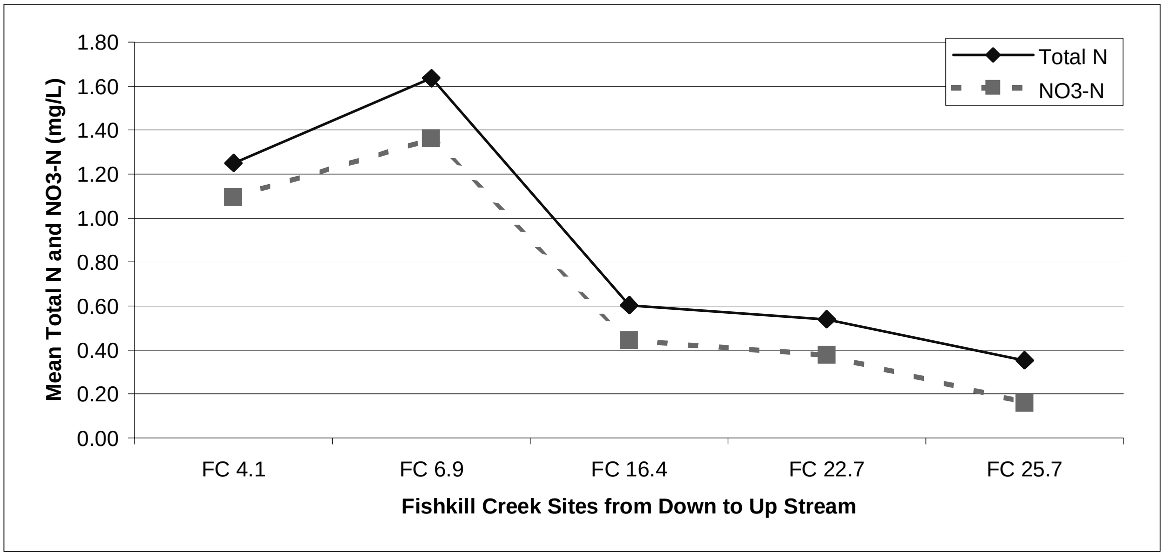
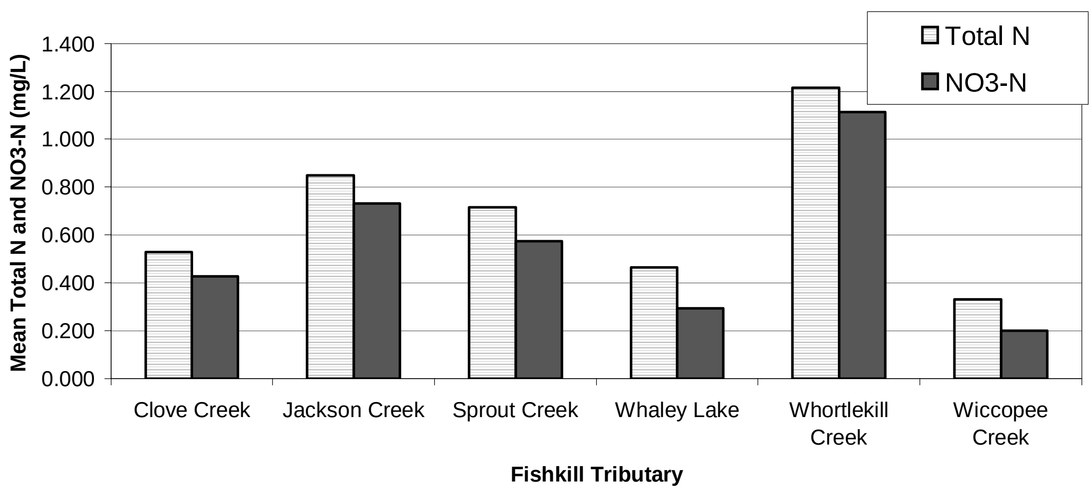


Figure 11. Mean total nitrogen and nitrate-nitrogen concentrations (mg/L) from a limited set (4) of water samples collected close to the confluence of the major tributaries to the Fishkill Creek and the Fishkill Creek proper in the summer of 2001 and 2002 (Stainbrook, 2004).



Phosphorus

Phosphorus is a nutrient essential to plant growth. In aquatic ecosystems phosphorus occurs primarily in the form of organic phosphorus. Organic phosphorus is bound in plant and animal tissue and is unavailable for plant uptake. Phosphate (orthophosphate) is in a form that is available and needed by plants. Plants assimilate orthophosphate from the surrounding water and convert it to organic phosphorus. In freshwater ecosystems phosphate tends to be the nutrient that is least available for plant growth. Consequently, phosphate is the limiting factor, and small additions to surface waters can result in large amounts of plant growth and eutrophication.

Phosphate binds to soil particles, which slows its transport. Often, the soil-attached particles will settle out in standing water (ponds/lakes), which can lead to excessive vegetation growth. The most likely sources of phosphate inputs include animal wastes, human wastes, fertilizer, detergents, disturbed land, road salts (anticaking agent), and stormwater runoff. Based upon the average concentrations found in water samples from 85 sites across the United States in relatively undeveloped watersheds, the median concentrations of total phosphorus and orthophosphate as P were .022 and .010 mg/L respectively (Clark et al., 2000). In general, any concentration over 0.05 mg/L of orthophosphate will likely have an impact on surface waters (Behar, 1996). However, in many streams and lakes concentrations of PO_4 as low as 0.01 mg/L can have a significant impact on water resources by causing a proliferation of aquatic vegetation and phytoplankton. In order to control eutrophication, the USEPA recommended limiting phosphate concentrations to .05 mg/L in waters that drain to lakes and ponds, and .1 mg/L in free flowing rivers and streams (USEPA, 1996). Figures twelve and thirteen provide an idea of low flow summer concentrations of phosphorus, in the year 2001, from the Fishkill Creek basin.

Figure 12. Mean total phosphorus concentrations (mg/L) from a limited set (4) of Fishkill Creek water samples collected in summer 2001 and 2002 (Stainbrook, 2004). Data are arranged from downstream (river mile 4.1) to upstream (river mile 25.7).

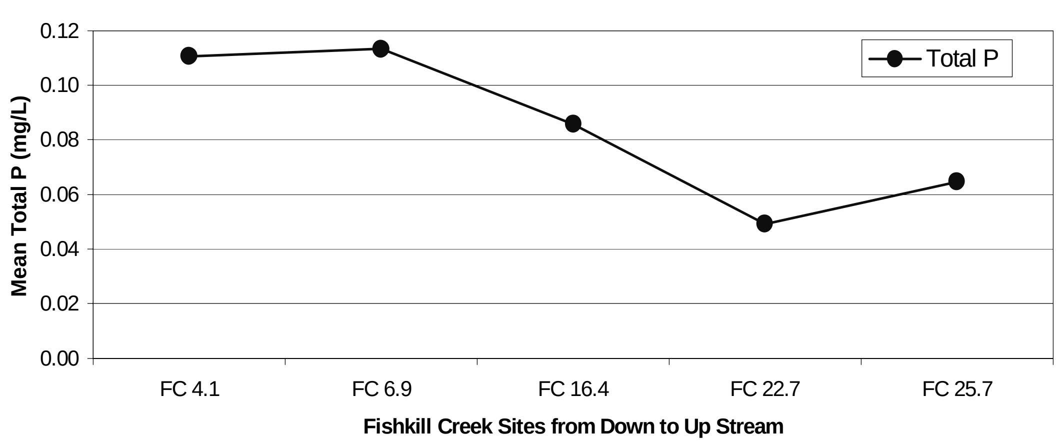
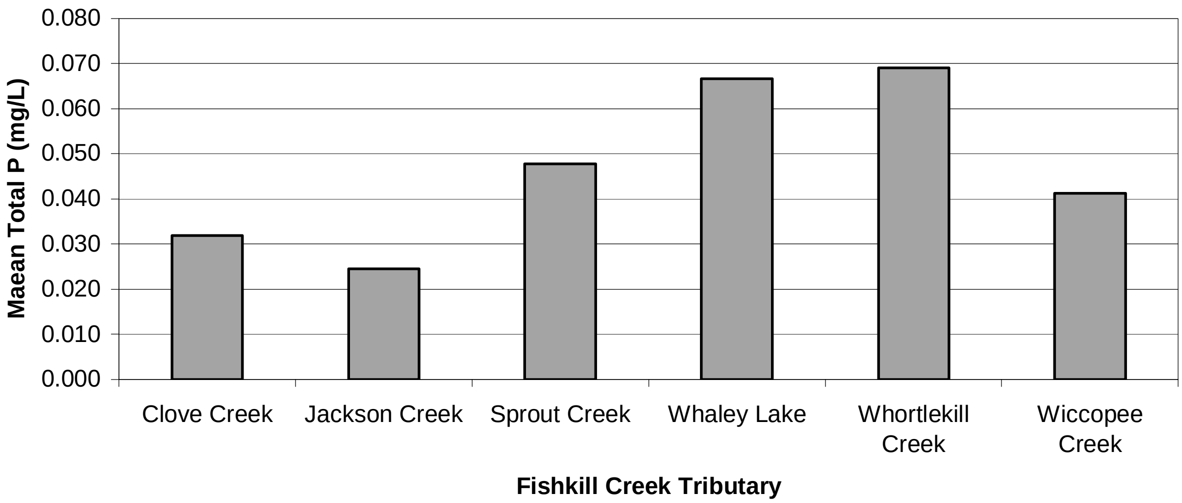


Figure 13. Mean total phosphorus concentrations (mg/L) from a limited set (4) of water samples collected close to the confluence of major tributaries to the Fishkill Creek and the Fishkill Creek proper in the summer of 2001 and 2002 (Stainbrook, 2004).



Other Chemical and Physical Parameters

Dissolved oxygen is the presence of oxygen gas (O_2) molecules in the water. The molecules are naturally consumed and produced in aquatic systems, and necessary for almost all aquatic organisms. If dissolved oxygen levels fall below a certain threshold, biologic integrity will be compromised. For example, on a scale of 0 to 14 mg/L, a concentration of 7 mg/L to 11 mg/L is very good for most stream fish (Behar, 1996). Dissolved oxygen can be measured as the concentration of milligrams O_2 per liter (mg/L) or as percent saturation of O_2. Percent saturation is the amount of oxygen in a liter of water relative to the total amount of oxygen the water can hold at a given temperature. In cold water systems, a percent saturation of 60% to 79% is acceptable for most stream animals (Behar, 1996).

The pH of water is important because most species of aquatic organisms prefer a pH in the range of 6.5 to 8.0, and variance outside of this range can stress or kill organisms. Due to the acidity of rainfall, maintaining this level is of concern in New York State. According to the NYSDEC (2004), the average rainfall acidity in NY ranges in pH from 4.0 to 4.5. However, Dutchess County contains large amounts of calcium carbonate bedrock, which acts to raise the alkalinity and hardness of surface and ground water, and provides a buffer for acidic inputs.

Sulfates (SO4--) can be naturally occurring as a result of the decomposition of leaves that fall into the stream, water passing through rock or soil containing gypsum and other common minerals, or from atmospheric deposition. They also can be indicators of municipal sewer treatment plant discharges, fertilized agricultural runoff, or industrial discharges. The combustion of fossil fuels releases large amounts of sulfur to the atmosphere. Sulfur in the atmosphere is oxidized and eventually deposited by precipitation, or other means, as sulfate. Sulfate is highly mobile and often ends up in our local streams and lakes. Therefore, monitoring levels of sulfate in surface waters may provide a means of tracking impacts of fossil fuel consumption.

Conductivity is the measure of the ability of water to carry an electric current, and is determined primarily by bedrock geology. High conductivity is created by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions or sodium, magnesium, calcium, iron, and aluminum cations. Studies of inland fresh waters indicate that streams supporting good mixed fisheries have a conductivity range of 150 to 500 µmhos/cm (USEPA, 1997).

Macroinvertebrate Sampling Rationale

Benthic macroinvertebrates (BMI) can be simply defined as animals without backbones that are larger than ½ millimeter and live at least a portion of their life cycles in or on the bottom of a body of water (Dates and Byrne, 1996). In freshwater systems these animals may live on rocks, logs, sediment, debris and aquatic plants during their various life stages. A few common examples of BMIs include crustaceans such as crayfish, mollusks such as clams and snails, aquatic worms, and the immature forms of aquatic insects such as stoneflies, caddisflies, mayflies and true flies.

BMIs function at the lower levels of the aquatic food chain, with many feeding on algae, detritus, and bacteria. Some shred and eat leaves and other organic matter that enters the water, and others are predators. Because of their abundance and position in the aquatic food chain, BMIs play a critical role in the natural flow of energy and nutrients through the aquatic system (Covich et al., 1997). For example, Sweeney (1993) demonstrated in a second order stream, that leaf litter and woody debris were primarily consumed in the forested woodlot where the debris originated, rather than being washed downstream. Also, as organisms die, they decay, leaving behind nutrients that are reused by aquatic plants and other animals in the food chain. Insects fill the roles of predators, parasites, herbivores, saprophages, and pollinators, among others, which indicate the pervasive ecological and economic importance of this group of animals in both aquatic and terrestrial ecosystems (Rosenberg et al., 1986).

Biological monitoring appears to be an attractive methodology for documenting water quality for several reasons. First, the community collected at a given site reflects the water quality at that site over several weeks, months, or years. The alternative methodology of grabbing a water sample reflects the water quality at the instant the sample is collected (i.e. a snap shot image). Second, the community-based approach protects the biological integrity of the water body, and doesn’t focus on a limited number of chemical parameters. Third, samples can be preserved in reference libraries for future application; this provides a convenient routine of summer collection and winter analysis. Finally, biological assessments tend to be much more cost effective than chemical analysis. Table 23 lists the rationale for biomonitoring in New York State (Bode et al., 2002).

Biological assessments have been used by many states to evaluate the effectiveness of water quality programs, particularly for nonpoint source impact determinations (USEPA, 2002). For example, biological assessment models have been tested with field data and the results suggested that macroinvertebrate data collected for establishing the degree of water quality impairment can also be used to identify the impairment source with reasonable accuracy (Murray et al., 2002). In addition, it has been suggested that the percentage of chironomids (Diptera larvae) in samples may be a useful index of heavy metal pollution (Winner et al., 1980). Furthermore, the Ohio EPA employs biological response signatures, based on biological, chemical, physical, bioassay, pollution source, and watershed characteristic, that consist of key response components of the biological data that consistently indicate one type of impact over another (Yoder, 1991). In New York State, the first recorded biological monitoring effort dates from 1926-1939, but the regulatory role of stream biological monitoring did not begin in New York until after the passage of the Federal Water Pollution Control Act Amendments of 1972 (Clean Water Act). The primary objective of New York State's program was to evaluate the relative biological health of the state's streams and rivers through the collection and analysis of macroinvertebrate communities (Bode et al., 2002).

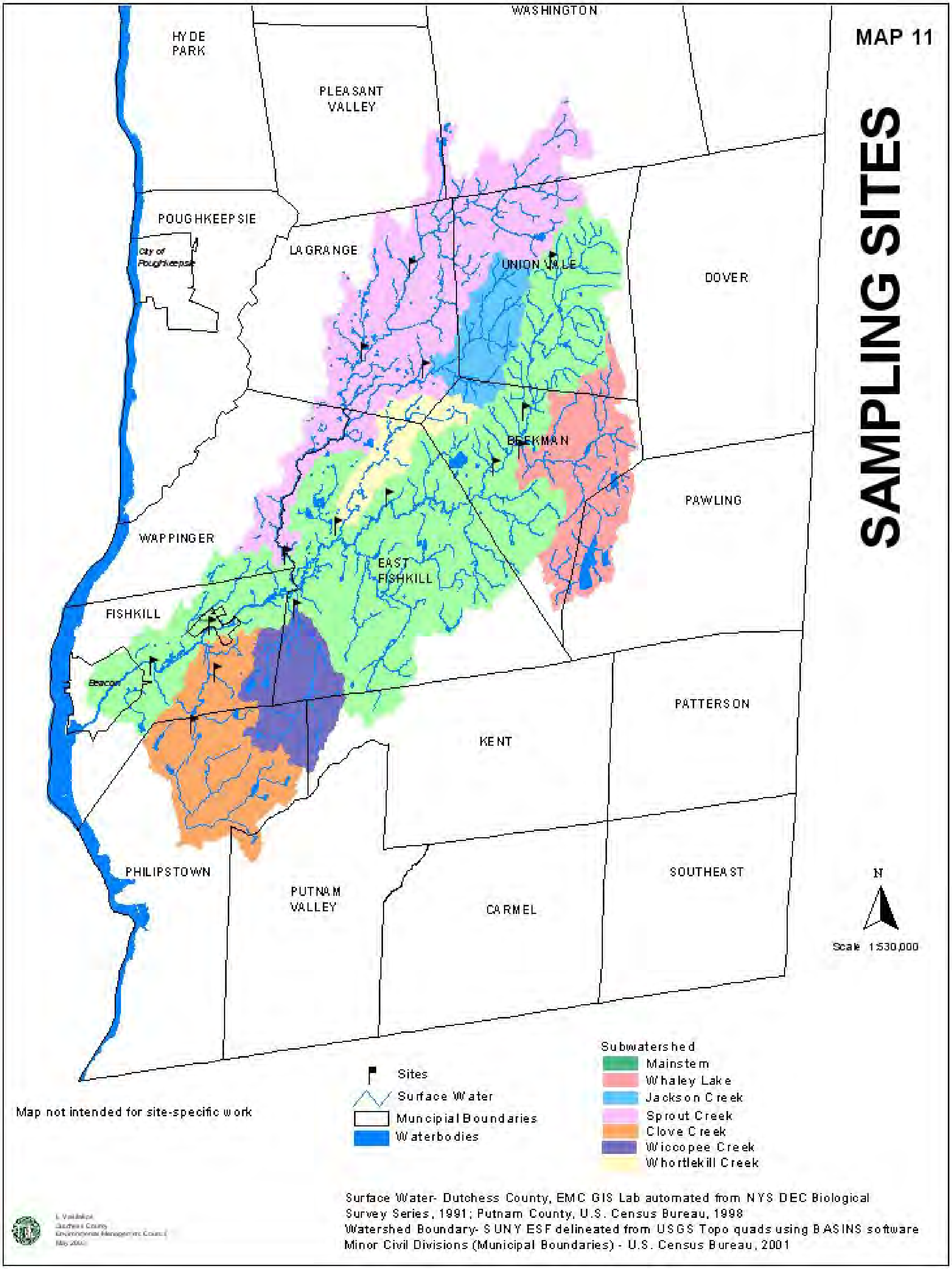
Table 23: Rationale for the analysis of macroinvertebrate communities to determine water quality of streams and rivers in New York State (Bode et. al., 2002).

1. BMIs are sensitive to environmental impacts;
2. BMIs are less mobile than fish, and thus can avoid discharges;
3. They can indicate the effects of spills, intermittent discharges, and lapses in treatment;
4. They are indicators of overall, integrated water quality, including synergistic effects and substances lower than detectable limits;
5. They are abundant in most streams, and are relatively easy and inexpensive to sample;
6. They are able to detect non-chemical impacts to the habitat, such as siltation or thermal change;
7. They are readily perceived by the public as tangible indicators of water quality;
8. They can often provide an on-site estimate of water quality;
9. They bioaccumulate many contaminants to concentrations that analysis of their tissues is a good monitor of toxic substances in the aquatic food chain;
10. They provide a suitable endpoint to water quality objectives.

Standardized protocols for benthic macroinvertebrate monitoring were developed in the mid-1980s due to the need for cost-effective habitat and biological survey techniques (Plafkin et al., 1989). The primary driver of the development was limited economic resources available to states with miles of unassessed streams. It was also recognized that it was crucial to collect, compile, analyze, and interpret environmental data rapidly to facilitate management decisions and resulting actions for control and/or mitigation of impairment. Therefore, the conceptual principles of rapid bioassessment protocols (RBPs) were as follows, cost-effective, yet scientifically valid procedures, provisions for multiple site investigations in a field season, quick turn-around of results for management decisions, easily translated to management and the public, and environmentally benign procedures (Barbour et al. 1999).

Subwatershed Summaries

The following summaries are based on the subwatersheds of the Fishkill Creek watershed. In other words, the entire Fishkill Creek watershed was divided into the seven major tributary watersheds for the following analysis (Map 1). Approximately the same watershed sites were sampled in the Schmidt and Kiviat (1986), Stevens et al. (1994), and Stainbrook (2004) studies (Map 11). Within the subwatershed summaries, assessment site names are based on river mileage from the Fishkill Creek's confluence with the Hudson River, or the tributaries confluence with the Fishkill Creek. The complete New York State Department of Environmental Conservation's stream classification definitions are available in appendix four, and all state pollution discharge elimination system (SPDES) permits issued prior to August 2002 for the Fishkill basin are available in tables 12 and 13 of this document.


MAP 11
SAMPLING SITES
WASHINGTON
HYDE PARK
PLEASANT VALLEY
POUGHKEEPSIE
City of Poughkeepsie
LAGRANGE
UNION VALE
DOVER
BEEKMAN
PAWLING
WAPPINGER
EAST FISHKILL
FISHKILL
Beacon
PATTERSON
KENT
PHILIPSTOWN
PUTNAM VALLEY
CARMEL
SOUTHEAST
N
Scale 1:530,000
Sites
Surface Water
Muncipial Boundaries
Waterbodies
Subwatershed
Mainstem
Whaley Lake
Jackson Creek
Sprout Creek
Clove Creek
Wiccopee Creek
Whortlekill Creek
Map not intended for site-specific work
Surface Water- Dutchess County, EMC GIS Lab automated from NYS DEC Biological Survey Series, 1991; Putnam County, U.S. Census Bureau, 1998
Watershed Boundary- SUNY ESF delineated from USGS Topo quads using BASINS software
Minor Civil Divisions (Municipal Boundaries) - U.S. Census Bureau, 2001

Fishkill Creek Main Stem

Comprising 42% of the Fishkill Creek watershed, the main stem subwatershed encompasses 52,783 acres in the towns of Union Vale, Beekman, East Fishkill, Fishkill and Wappinger (Map 12). The watershed's major stream is the main stem of the Fishkill Creek, originating in the town of Union Vale and flowing southwest until it empties into the Hudson River in the City of Beacon. In 2000, land uses in the main stem watershed consisted of 44.2% forest, 23.9% residential, 10.4% water/wetlands, 9.7% agriculture, 3.5% outdoor recreation, 2.1% transportation, 1.7% commercial, 1.7% public/semipublic, 1.5% inactive, 1.1% industrial and 0.2% extractive (Table 24). The percentage of lake, ponds and wetlands in the main stem subwatershed was the highest in the Fishkill Creek watershed.

Table 24. Fishkill Creek Mainstem Land Use

Land Use Category	Acreage	Percentage (%)
Agriculture	5081.3	9.7
Commercial	891.2	1.7
Extractive	124.1	0.2
Forestland	23037.4	44.2
Industrial	572.5	1.1
Outdoor Recreation	1807.2	3.5
Public/Semipublic	877.2	1.7
Residential	12462.8	23.9
Transportation	1071.2	2.1
Inactive	788.8	1.5
Water/Wetlands	5440.2	10.4
	52153.97	**100.00**

The dominant soil types in this watershed were Hollis-Chatfield-Rock outcrop complex (13.8%), Hoosic gravelly loam (8.6%) and Stockbridge silt loam (8.3%) (Table 25). Hollis-Chatfield-Rock outcrop complex is comprised of 35% Hollis soils, 30% Chatfield soils, 15% folded schist, granite, or gneiss rock outcrop and 20% other soils. Hollis soils are shallow, well drained and somewhat excessively drained loamy soils formed in till underlain by folding schist, granite or gneiss bedrock. Chatfield soils are moderately deep, well drained and somewhat excessively drained loamy soils formed in till underlain by folded schist, granite, or gneiss bedrock. Well-drained soils comprised 64.5% of the watershed, while hydric (wet) soils comprised 11.9%. Soils prime for farmland represented 5.7% of the total, while 3% of soils were designated as farmland of statewide importance.

The New York State Department of Environmental Conservation classified the Fishkill Creek main stem as C from its mouth to its confluence with the Clove Creek (FC 5.9 or 1,690’ upstream of Route 84), C(T) from the confluence with Clove Creek (FC 5.9) upstream to river mile 9.6 (4,752’ upstream of Route 52 crossing near East Fishkill/Beekman town line), B(T) from river mile 9.6 to 1,221’ above the intersection of the main stem and Clove Branch Road in Beekman (FC 16.4), and C(T) from 1,221’ above the intersection of the main stem and Clove Branch Road (FC 16.4) to its source in the Town of Unionvale, where the stream crosses Chestnut Ridge Road (FC 35.1).

The largest bodies of water included Sylvan Lake (116.1 acres), Lake Walton (41.3 acres), Beacon Reservoir (20.2 acres), Christie Pond (11.5 acres), Pray Pond (11.2 acres), McKinney Pond (10.3 acres), Furnace Pond (8.7 acres) and Penneywater Pond (8.3 acres). The Fishkill Creek main stem watershed is comprised of 144 miles of tributaries and subtributaries. Named tributaries that drain into this subwatershed include Gidneytown Brook, Sprout Creek, Whortlekill Creek, Wiccopee Creek, Sylvan Lake Outlet, Ivy Hollow Brook (Frog Hollow Brook), Whaley Lake (Brook or Stream), Dry Brook (Melzingah or Beacon Reservoir), Clove Creek, Clove Valley Creek, Sweezy Creek, Seely Creek, Bloomer Brook, Trout Creek and Gildersleeve Brook. In August of 2002, there were forty-two State Pollution Discharge Elimination System (SPDES) permitted facilities that discharged into surface water (19) or groundwater (23) within the subwatershed.

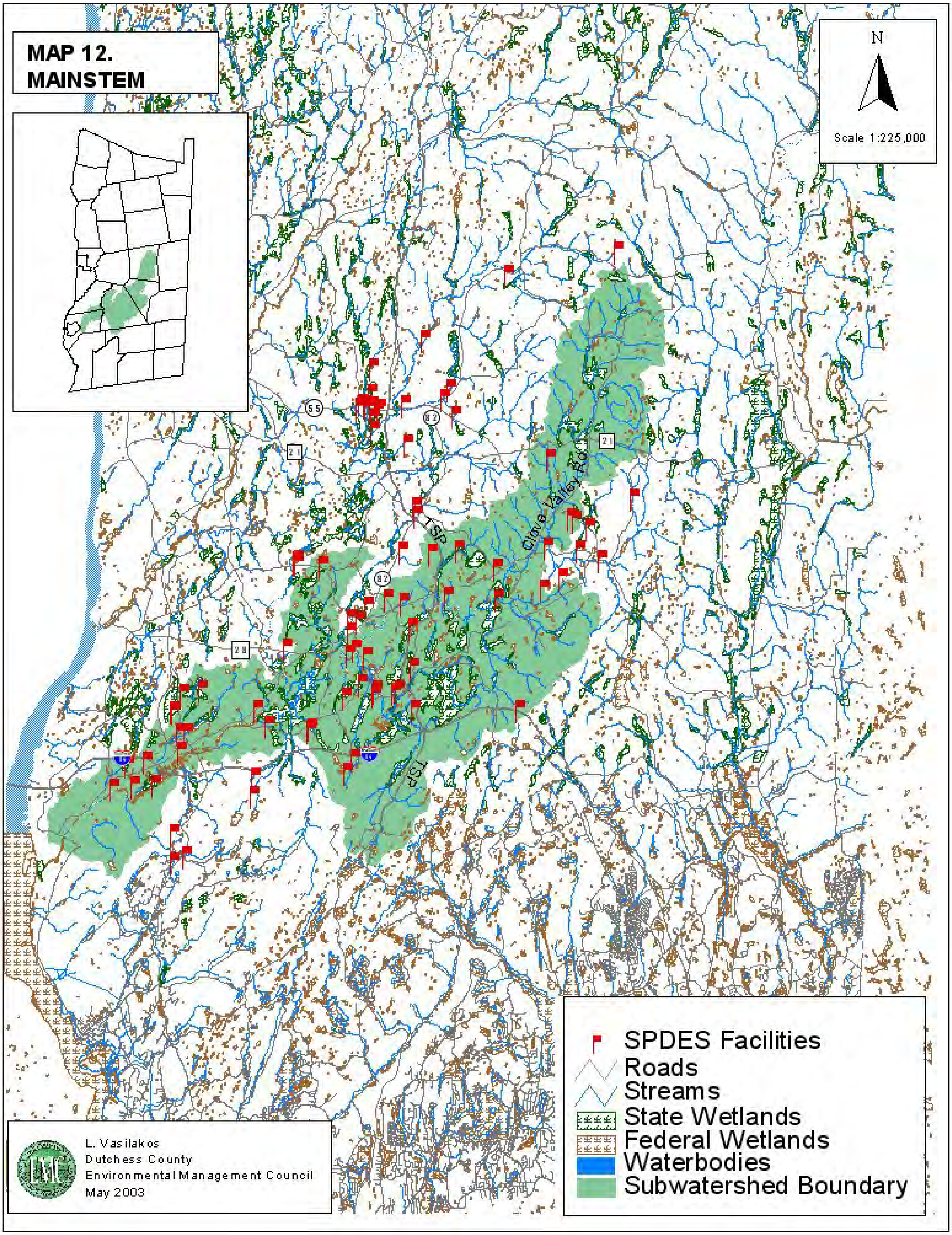

MAP 12.
MAINSTEM
N
Scale 1:225,000
55
82
21
TSP
Clove Valley Rd
28
SPDES Facilities
Roads
Streams
State Wetlands
Federal Wetlands
Waterbodies
Subwatershed Boundary
L. Vasilakos
Dutchess County
Environmental Management Council
May 2003

Table 25. Soils in the Fishkill Creek Mainstem

Soil Name	Percentage (%)	Soil Description
Bernardston silt loam	4.57	0.63% prime farmland, well-drained
		2.96 % farmland of statewide importance
Bernardston-Urban land complex	0.21	well-drained/urban
Canandaigua silt loam	0.90	hydric
Carlisle muck	2.17	hydric
Charlton loam	2.62	well-drained
Charlton-Chatfield complex	2.66	well-drained
Chatfield-Hollis complex	2.40	well-drained/somewhat excessively drained
Copake, gravelly silt loam	2.59	0.89% prime farmland, well-drained
Copake, channery silt loam	0.05	all prime farmland, well-drained
Dutchess silt loam	1.71	well-drained
Dutchess-Cardigan complex	4.20	well-drained
Dutchess-Cardigan-Urban land complex	0.59	well-drained/urban
Farmington-Galway complex	3.19	well-drained
Farmington-Rock Outcrop	0.57	well-drained
Fluvaquents-Udifluvents complex	1.53	hydric/well to excessively drained
Fredon silt loam	1.20	somewhat poorly drained
Galway-Farmington complex	4.96	well-drained
Galway-Farmington- Urban land complex	0.53	well-drained/urban
Georgia silt loam	1.38	well-drained
Halsey mucky silt loam	0.20	hydric, poorly-drained
Haven loam	0.67	prime farmland, well-drained
Hollis-Chatfield-Rock Outcrop complex	13.81	well-drained
Hollis-Rock Outcrop complex	0.21	well-drained
Hoosic gravelly loam	8.56	somewhat excessively drained
Hoosic channery loam	0.75	somewhat excessively drained
Hoosic-Urban land complex	0.50	somewhat excessively drained/urban
Kingsbury and Rhinebeck soils	0.10	somewhat poorly drained
Knickerbocker fine sandy loam	0.50	somewhat excessively drained
Knickerbocker-Urban land complex	0.20	somewhat excessively drained/urban
Leicester loam	0.15	somewhat poorly drained
Linlithgo silt loam	0.21	somewhat poorly drained
Massena silt loam	1.40	somewhat poorly drained
Nassau-Cardigan complex	3.00	somewhat excessively drained/well-drained
Nassau-Rock outcrop complex	1.74	somewhat excessively drained/rock
Palms muck	0.79	hydric, poorly-drained
Pawling silt loam	1.70	well-drained
Paxton fine sandy loam	0.01	well-drained
Pits, gravel	0.24	N/A
Pittstown silt loam	1.44	well-drained
Punsit silt loam	0.60	somewhat poorly drained
Raynham silt loam	0.51	somewhat poorly drained
Scio silt loam	0.02	well-drained
Sun loam	0.03	poorly drained (hydric)
Stockbridge silt loam	8.13	3.2% prime farmland, well-drained
Stockbridge Farmington complex	5.34	well-drained
Stockbridge-Urban land complex	0.35	well-drained/urban
Sun silt loam	2.24	hydric, poorly-drained
Udorthents	2.11	well-drained
Urban land	1.17	N/A
Water	1.00	N/A
Wappinger loam	0.21	prime farmland, well-drained
Wayland silt loam	4.07	hydric, poorly-drained
TOTAL	100	

Biological Community Analysis

Based on recent assessments (1991, 1999, and 2001), the main stem of the Fishkill Creek ranges from non-impacted in its upstream reaches, to slightly impacted towards its confluence with the Hudson River (Map 13) (Table 26). In the following text, assessment site names are based on river mileage from the Fishkill Creeks confluence with the Hudson River (see introduction for biological water quality assessment rationale).

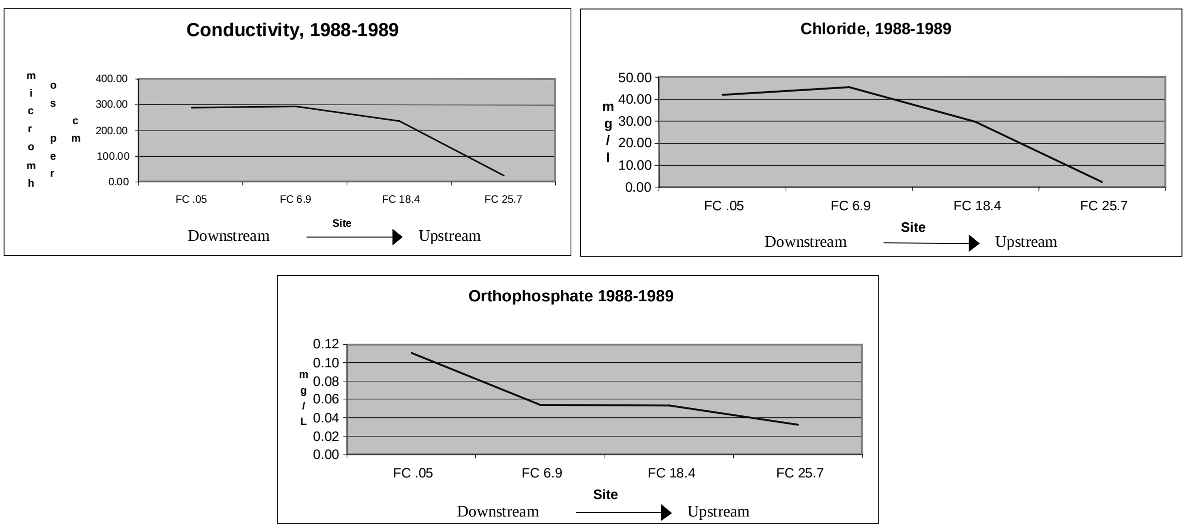
In July of 1973, fifteen stations in the main stem of the Fishkill Creek were assessed (Neuderfer, 1977). Based on the macroinvertebrate community, the water quality of the Fishkill Creek from river mile 23.4 (200' downstream of Greenhaven Rd. bridge) to river mile 12.8 (1000' downstream of the Palon Rd. bridge) was found to be in good condition (non-impacted) (Neuderfer, 1977). River mile 9.7 (end of McGrath Terrace road) through river mile 6.5 (2500' downstream of Route 9 bridge) demonstrated satisfactory (slightly impacted) water quality (Neuderfer, 1977). In this section, nutrient enrichment and the resulting eutrophication were apparent, and drastically altered the biological community towards an unbalanced population (Neuderfer, 1977). Water quality at river mile 3 (250' downstream of Beacon Dye and Texaco Research facility) through river mile 2.7 (30' downstream of Bridge street) appeared to have been grossly degraded (severely impacted) by toxic pollutants (Neuderfer, 1977). However, by river mile 1.8 (300' downstream of the East Main St. bridge in Beacon) water quality appeared to have improved to satisfactory (slightly impacted) (Neuderfer, 1977). Neuderfer (1977) identified several point sources of pollution to the Fishkill Creek including, the Greenhaven State Prison, Dutchess Park and Merrit Brooklands sewer treatment plants, Texaco Research waste treatment effluent, discharges from Beacon and Braendly Dye, and Bobrich Products Company.

In conclusion, based on the 1973 study, the Fishkill Creek main stem was non-to-slightly impacted by siltation and nutrient enrichment in it upper reaches through river mile 6.5. Below river mile 6.5, toxic pollutants were drastically impacting water quality, but the creek's communities seemed to recover by river mile 1.8 (300' downstream of East Main Street bridge in Beacon).

Approximately a decade after the 1973 study, researchers again visited the Fishkill Creek for an overall assessment of stream health. In 1985, Schmidt and Kiviat found the Fishkill Creek system in good health. However, the main stem of the Fishkill Creek, from Hopewell Junction to the confluence with the Hudson River, was slightly-to-moderately impacted from municipal and industrial discharges, dams and channelization (Schmidt and Kiviat, 1986). Additionally, in 1988, a separate research group found the Fishkill Creek in Beacon and downstream of the Route 9 bridge in the Town of Fishkill to contain poor macroinvertebrate community representation (Stevens et al., 1994). The suspected causes for the poor communities varied from industrial and organic (sewage) pollutants in Beacon, to channelization and the resulting degraded habitat that accompanied the construction of the Route 9 bridge (FC 6.9) (Stevens et al. 1994). Communities at Hopewell Junction (~FC 16.4) and upstream of the Route 55 crossing (~FC 25.7), were assessed as moderately impacted (Stevens et al., 1994).

In 1985, the Fishkill Creek, upstream of approximately river mile 10.3 (1.4 miles upstream of Rte. 52 bridge) had healthy fish populations and contained substantial sport fish populations (trout, smallmouth and largemouth bass, and rock bass) (Schmidt and Kiviat, 1986). Near river mile 10.3 and in Beacon, fish populations were dominated by warmwater and pollution tolerant fish species (Schmidt and Kiviat, 1986). Finally, the Fishkill Creek demonstrated a prominent upstream to downstream pollution gradient (Stevens et al., 1994). The analysis of water chemistry further demonstrated the upstream to downstream pollution gradient (Figure 14)(Stevens et al., 1994).

Figure 14. Water chemistry data averaged from monthly samples collected May 1988 through April, 1989 (Stevens et al., 1994). Graphs demonstrate the gradient of ion concentrations in the Fishkill Creek from Beacon (stream mile FC .05) to Clove Valley (stream mile FC 25.7).



The New York State Department of Environmental Conservation's Stream Biomonitoring Unit assessed the Fishkill Creek at four sites in 1991. Sites ranged from approximately river mile 26 (Clove Valley) to river mile 1.4 (Beacon). Based on macroinvertebrate community analysis, FC 26 (Clove Valley), FC 6.9 (Route 9), and FC 1.4 (Beacon) all rated as slightly impacted, and FC 16.9 rated as non-impacted. The FC 26 community was most likely affected by an upstream dam, and did not necessarily indicate degraded water quality (Bode et al., 1991). Communities at FC 6.9 and FC 1.4 showed indications that sewage and heavy metal pollutants may have been negatively affecting the macroinvertebrate community (Bode et al., 1991).

The final study in the Fishkill Creek was conducted in 2001 by researchers from the State University of New York, Environmental School of Forestry and the Dutchess County EMC. Results indicated a similar upstream (non-to-slightly impacted) to downstream (slightly-to-moderately impacted) gradient of stream health that was present since the 1973 study. However, Stainbrook (2004) also suggested that the health of the Fishkill Creek improved slightly from 1988 to 2001.

Conclusion – Status of Fishkill Creek Main Stem

Based on previous studies of the Fishkill Creek (1973 through 2001), it seemed the stream water quality improved slightly in the downstream portions of the stream since 1973. These improvements can most likely be attributed to the passage and implementation of the Clean Water Act in 1972, and the subsequent reduction to point (end-of-pipe) source discharges. Upstream of the route 9 bridge (FC 6.9), the Fishkill Creek remained in good ecological health throughout the period of study (1973 through 2001). In this section, the primary impact to biological communities appeared to be the many dams in the creek, but this does not necessarily translate into water quality degradation. Rather, it may be an indicator of habitat degradation.

From the Route 9 bridge (FC 6.9) to its confluence with the Hudson River, the Fishkill Creek was impacted by various sources of pollution. The Route 9 (FC 6.9) area seemed to have been drastically impacted by stream channelization caused by construction of a new bridge in the early 1980s, but the community recovered somewhat since that time. In 2001, little change from 1991 was detected in the macroinvertebrate communities living in the Fishkill Creek near Sarah Taylor Park in Fishkill (close to Rte. 9 or FC 6.9) (Bode et al., 2001). In addition, little change was noticed at the site approximately 328-feet above the East Main Street bridge in Beacon (FC 1.4) (Bode et al., 2001). Tissue analysis of organisms from these two sites showed elevated levels of polycyclic aromatic hydrocarbons (PAHs), and elevated levels of lead and selenium at the Beacon site (Bode et al., 2001). PAHs result from the incomplete combustion of organic carbon (including wood), municipal and solid waste, and fossil fuels, as well as from natural anthropogenic introduction of uncombusted coal and oil (USGS, 1998). The level of lead in crayfish at the Beacon site was high, and likely attributable to unknown urban sources of pollution (Bode et al., 2001). It is not known whether there are new sources of lead, or the crayfish are being exposed to lead stored in sediments from historical discharges.

Biological communities also demonstrated impacts from sewage inputs. The source of these inputs was most likely sewer overflows following heavy rains and the aging sewage infrastructure in the City of Beacon. There is no doubt, that the many dams from Route 9 south impacted biological communities, both fish and macroinvertebrates, but their associated waterfalls also acted to add dissolved oxygen to the water column. This addition of oxygen may have helped the stream maintain healthy levels of dissolved oxygen through stressful low flow periods. Table 26 offers a decade-based summary of the studies that were completed in the Fishkill Creek.

Table 26. Comparison of Fishkill Creek, Macroinvertebrate-Based, Aquatic Community Health Results 1973, 1985, 1991 and 2001.

	1973 (Neuderfer, 1977)	1985 (Schmidt and Kiviat, 1986)	1991 (Bode et al., 1991)	2001 (Bode et al., 2001)
Clove Valley	Non-to-slightly impacted; EPT present	Slightly-to-Moderately impacted; but mayflies and caddis present	Slightly impacted; EPT present	No Data
Hopewell Junction	Non-to-slightly impacted; EPT present	Slightly-to-Moderately impacted; no mayflies	Non-impacted; dominated by mayflies	No Data
Fishkill	Slightly impacted; caddis and mayflies present	Severely impacted; no mayflies	Slightly impacted; EPT present	Slightly impacted; Elevated levels of PAHs
Beacon	Moderately impacted; dominated by caddisflies	Severely impacted; dominated by caddisflies	Slightly impacted; dominated by caddisflies	Slightly impacted; Elevated levels PAHs, lead, and selenium

New York State Department of Environmental Conservation Biomonitoring Unit's Levels of Water Quality Impacts in Streams (Bode et al., 2001).

Non-Impacted – Indices reflect very good water quality. The macroinvertebrate community is diverse, usually at least 27 species in riffle habitats. Water quality should not be limiting to fish survival or propagation. This level of water quality includes both pristine habitats and those receiving discharges that minimally alter the biota.

Slightly Impacted – Indices reflect good water quality. The macroinvertebrate community is slightly but not significantly altered from the pristine state.

Moderately Impacted – Indices reflect poor water quality. The macroinvertebrate community is altered to a large degree form a pristine state. Water quality is often limiting to fish propagation, but usually not to fish survival.

Severely Impacted – Indices reflect very poor water quality. The macroinvertebrate community is limited to a few tolerant species. The dominant species are almost all tolerant, and are usually midges and worms. Often 1 or 2 species are very abundant. Water quality is often limiting to both fish propagation and survival.

Sprout Creek Watershed

The Sprout Creek watershed encompasses 29,342 acres representing 24 percent of the Fishkill Creek watershed (Map 13). This subwatershed is located within five municipalities including the towns of Washington, Pleasant Valley, Union Vale, La Grange, East Fishkill and Wappinger. In 2000, the dominant land uses in the Sprout Creek watershed were forest (43%), residential (21%) and agriculture (17%). Land uses representing a smaller portion of the watershed area included water/wetlands (9.5%), inactive (2.0%), outdoor recreation (2.0%), transportation (1.9%), extractive (1.4%), public/semipublic (0.98%), urban/commercial (0.8%), and industrial (0.01%)(Table 27). The Sprout Creek watershed ranked second for total acreage of agricultural land, and third for acreage of water/wetlands relative to the other subwatersheds in the Fishkill Creek watershed.

The dominant soil types in this watershed include Dutchess-Cardigan complex (27.6%), Nassau-Cardigan complex (17.8%), Hoosic gravelly loam (11.5%), and Nassau-Rock outcrop complex (7.0%) (Table 28). Well-drained soils comprise 39.7 %, while hydric soils comprise 14.6%. Approximately 35 percent of soils are classified as farmland of statewide importance, while 7 percent are classified as prime farmland.

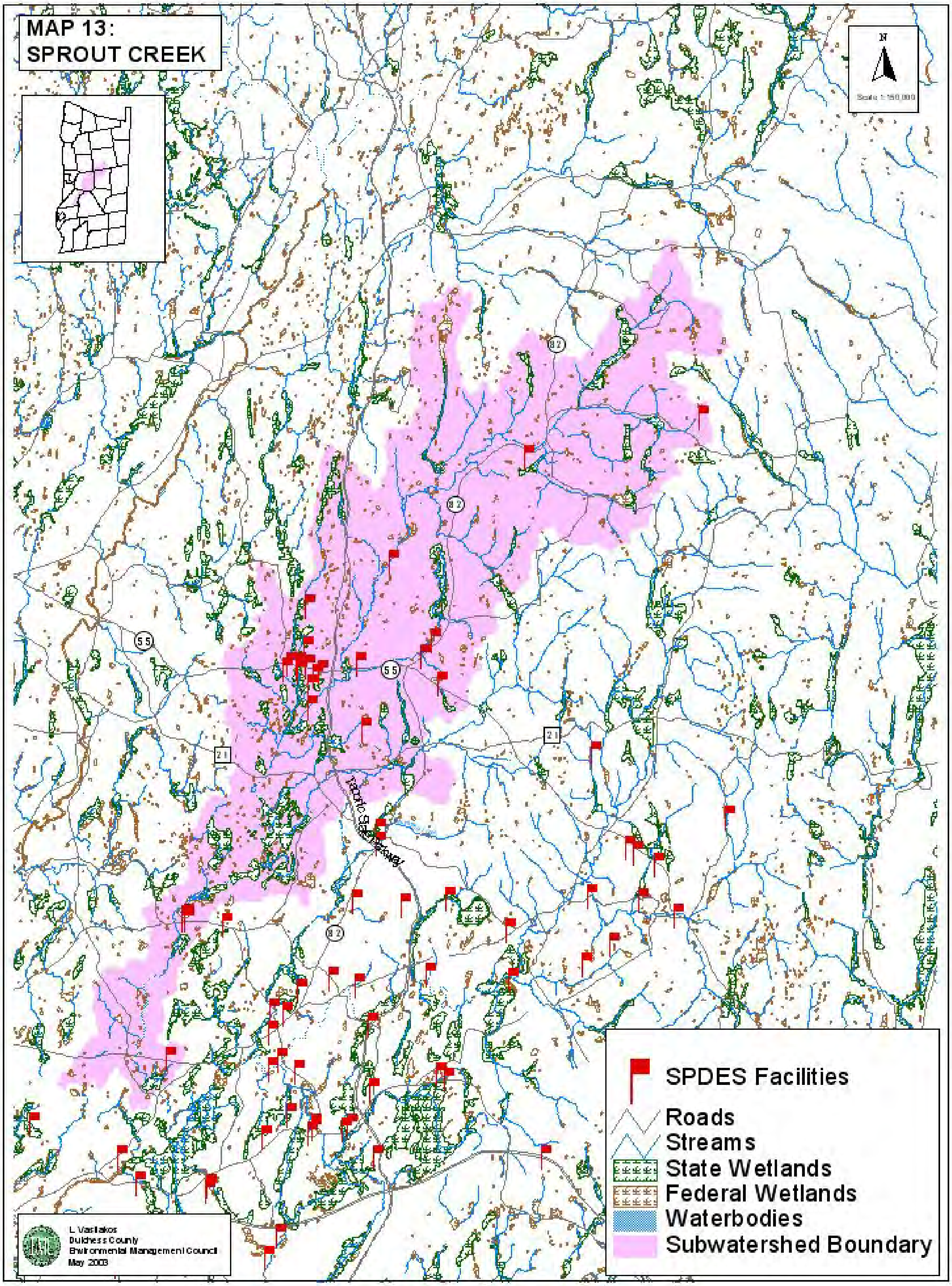
The Sprout Creek watershed contains many tributaries totaling 77 miles in length, with the Sprout Creek itself contributing 18.5 miles of the total. The main stem of the Sprout Creek is classified as a C(T) stream by the New York State Department of Environmental Conservation. This classification means the stream should be suitable for fishing, fish propagation and survival, and primary and secondary contact recreation. The watershed also contained approximately 332 acres of ponds and lakes. The largest lakes were Tyrell Lake (Class C, 49.4 acres) and Hillside Lake (Class B, 26.4 acres). In August of 2002, there were 24 SPDES facilities that discharged into surface water (3) or groundwater (21).

Table 27. Land Use in Sprout Creek Subwatershed

Landuse Category	Acreage	Percentage (%)
Agriculture	4947.97	17.00
Urban/Commercial	236.36	0.81
Extractive	396.62	1.36
Forestland	12562.02	43.17
Industrial	2.69	0.01
Outdoor Recreation	578.84	1.99
Public/Semipublic	284.17	0.98
Residential	6180.08	21.24
Transportation	555.70	1.91
Inactive	586.82	2.02
Water/Wetlands	2768.97	9.52
Total	**29100.24**	**100.00**

Table 28. Soils in the Sprout Creek Watershed

Soil Type	Percentage (%)	Soil Description
Bernardston silt loam	3.78	1.55 % prime farmland, 1.95% farmland of statewide importance, well-drained
Bernardston- Urban land complex	0.07	well-drained/urban
Canandaigua silt loam	0.84	hydric
Carlisle muck	2.37	hydric
Charlton-Chatfield complex	0.34	0.22 % farmland of statewide importance, well-drained
Dutchess silt loam	3.52	1.08 % prime farmland, 1.96 % farmland of statewide importance, well-drained
Dutchess-Cardigan complex	27.58	23.14% farmland of statewide importance, well-drained
Farmington-Galway complex	0.05	well-drained
Fluvaquents-Udifluvents complex	0.80	hydric
Fredon silt loam	1.04	farmland of statewide importance, hydric inclusion
Galway-Farmington complex	0.02	farmland of statewide importance, well-drained
Georgia silt loam	0.67	0.64 % prime farmland, 0.03 farmland of statewide importance well drained
Halsey mucky silt loam	0.40	hydric
Haven loam	0.42	prime farmland, well-drained
Hollis-Chatfield Rock Outcrop complex	0.62	well-drained
Hoosic gravelly loam	11.49	somewhat excessively drained
Hoosic channery loam	0.57	somewhat excessively drained
Hoosic-Urban land complex	0.06	somewhat excessively drained/urban
Linlithgo silt loam	0.39	farmland of statewide importance, hydric inclusion
Massena silt loam	1.00	somewhat poorly drained
Nassau-Cardigan complex	17.81	somewhat excessively drained/well-drained (mix)
Nassau-Rock Outcrop complex	6.98	somewhat excessively drained
Palms muck	0.73	hydric
Pawling silt loam	1.70	well-drained
Pits, gravel	0.34	N/A
Pittstown silt loam	3.47	2.51% prime farmland, 0.96 % farmland of statewide importance well-drained
Punsit silt loam	1.18	farmland of statewide importance, somewhat poorly drained
Stockbridge silt loam	0.23	0.02 % prime farmland, 0.21% farmland of statewide significance well-drained
Stockbridge-Farmington complex	0.01	well-drained
Sun silt loam	3.65	farmland of statewide importance, hydric
Udorthents, smoothed	0.35	well-drained
Urban land	0.00	N/A
Water	0.92	N/A
Wappinger loam	0.84	prime farmland, well-drained
Wayland silt loam	5.77	hydric
TOTAL	100.00	


MAP 13:
SPROUT CREEK
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82
Taconic State Parkway
SPDES Facilities
Roads
Streams
State Wetlands
Federal Wetlands
Waterbodies
Subwatershed Boundary
L Vasilakos
Dutchess County
Environmental Management Council
May 2003

Biological Community Analysis

In July of 1973, two stations in the main stem of the Sprout Creek were assessed. Based on this assessment, water quality appeared to have been very good (non-impacted) at stream mile 3.2 (downstream of George Brown Bridge on Brown Road) with no evidence of recent organic pollution (Neuderfer, 1977). River mile 2.5 (upstream of the Old Hopewell Rd. (Cty Rte. 28) bridge) also appeared to have good water quality (slightly impacted). However, there were indications of a slight amount of nutrient enrichment from the Rockingham Farms sewage treatment plant effluent (Neuderfer, 1977).

In 1985, researchers again visited the Sprout Creek and assessed water quality at river mile 10.6 (Todd Hill Road bridge) and river mile 1.3 (Route 82 bridge). Based on the macroinvertebrate community, the Sprout Creek was assessed as the least affected by pollution of all the Fishkill Creek tributaries (Schmidt and Kiviat, 1986). Another indicator of clean, cold water in the Sprout Creek was the presence of reproducing brown trout, and when compared to historical data it appeared the fish community hadn't changed significantly since 1936 (Schmidt and Kiviat, 1986). Finally, based on chemical and physical parameters, the Sprout Creek appeared healthy (non-to-slightly impacted)(Table 29).

Once again the Sprout Creek was studied in 1988-1989 at the same sites (SC 10.6 and SC 1.3) with more somber results. Researchers found healthy macroinvertebrate populations in the winter, but poor in the remaining seasons, and speculated the closed Town of La Grange landfill and bank modifications may have negatively impacted the system around SC 1.3 (Stevens et al., 1994). In general, water quality at SC 10.6 and SC 1.3 was good (slightly impacted)(Table 29). However, the water at SC 1.3 had high phosphorus and low dissolved oxygen levels in July, possibly due to the Rockingham Farms sewage treatment plant effluent which has since been sent to the Beacon sewer treatment plant (Stevens et al., 1994).

Table 29. Yearly mean water chemistry data from Sprout Creek 10.6 and Sprout Creek 1.3 from 1985, 1989, and 2001. Sample collection in 1985 ranged from January through December, 1989 collection ranged from May 1988 through April 1989, and 2001 data is limited to summer 2001 and 2002 (Schmidt and Kiviat, 1986; Stevens et al., 1994; Stainbrook, 2004).

Sprout Creek 10.6						
			Year			
	1985		**1989**		**2001**	
Parameter						
pH	7.6	s.d. .37, N = 11	7.5	s.d. .47, N = 9	8.01	s.d. .20, N = 4
Dissolved Oxygen (mg/L)	10.8	s.d. .54, N = 11	8.2	s.d. .87, N = 10	9.22	s.d. .99, N = 4
Alkalinity (mg/L)	60	s.d. 16, N = 11	ND		ND	
Temperature C	9	s.d. 7.3, N = 11	10.2	s.d. 7.9, N = 12	19.45	s.d. 6.2, N = 4
Chloride (mg/L)	18.1	s.d. 2.6, N = 10	22.6	s.d. 3.4, N = 12	ND	
PO4-P (mg/L)	ND		0.01	s.d. .007, N = 12	ND	
SO4 (mg/L)	ND		18.2	s.d. 3.5, N = 12	ND	
Conductivity (µmhos/cm)	ND		157	s.d. 47, N = 12	382.5	s.d. 129.4, N = 2
Sprout Creek 1.3						
			Year			
	1985		**1989**		**2001**	
Parameter						
pH	7.4	s.d..22, N = 11	7.5	s.d. .37, N = 9	7.8	s.d. .32, N = 4
Dissolved Oxygen (mg/L)	9.9	s.d. 1.6, N = 11	8.1	s.d. 1.8, N = 10	8.8	s.d. 2.1, N = 4
Alkalinity mg/L)	69	s.d. 10.8, N = 11	ND		ND	
Temperature C	10.8	s.d. 7.7, N = 11	10.7	s.d. 7.9, N = 12	18.25	s.d. 3.4, N = 4
Chloride (mg/L)	23.6	s.d. 3.2, N = 11	30.2	s.d. 5.1, N = 12	ND	
PO4-P (mg/L)	ND		0.04	s.d. .03, N = 12	ND	
SO4 (mg/L)	ND		21.1	s.d. 3.9, N = 12	ND	
Conductivity (µmhos/cm)	ND		205	s.d. 57, N = 12	479	s.d. 66.5, N = 2

Finally, in 2002, the New York State DEC Biomonitoring Unit assessed the Sprout Creek. At similar locations to the previous studies, they found the stream to be slightly impacted from nonpoint source nutrient enrichments.

In conclusion, the Sprout Creek appeared to be in good (non-to slightly-impacted) shape throughout the period of study (1973-2002). However, at various points throughout the period of study there were pollution sources that acted to slightly degrade the stream. The most likely sources of nutrient enrichment were sewer treatment plant effluents, faulty septic systems, and agricultural operations that weren't following best management guidelines. In their 1994 report, Stevens et al. recommended all new increases to nutrient load and/or reduction in dissolved oxygen need to be carefully evaluated. It would be prudent to follow this advice as development occurs throughout the Sprout Creek watershed. Cumulative impacts should be assessed prior to the issuance of permits to discharge to the waters of the Sprout Creek, and in the design of septic systems within 200 feet of the stream. In addition, agricultural operations that aren't following best management practice guidelines should be identified and encouraged to follow the guidelines.

Clove Creek Watershed

Clove Creek watershed encompasses an area of approximately 12,960 acres in the town of Fishkill in Dutchess County, and the towns of Philipstown and Putnam Valley in Putnam County, representing 10 % of the Fishkill Creek watershed (Map 14). The major stream in the watershed is the Clove Creek, which originates in Putnam County on the east side of Route 9 and continues to flow northward to the town of Fishkill. The Clove Creek flows parallel to the Fishkill Ridge on the northern side, and continues west, where it empties into the Fishkill Creek near the intersection of Route 9 and Interstate 84. In 2000, the dominant land use in the watershed was forest totaling 79%, the highest percentage among all Fishkill Creek subwatersheds (Table 30). The remaining Clove Creek watershed land uses were residential (8%), water/wetlands (5%), commercial (1.9%), agricultural (1.6%), extractive (1.6%), public/semipublic (0.7%), outdoor recreation (0.6%), transportation (0.6%), industrial (0.4%), and inactive land (0.3%) (Table 30).

The predominant soils are Charlton-Chatfield soils (17%), Hollis-Chatfield (16.2%), and Charlton Loam (13.4%)(Table 31). Charlton-Chatfield soils are comprised of 50% Charlton soils, 30% Chatfield soils and 20% other soils. Charlton soils are very deep, well-drained loamy soils formed in till. Chatfield soils are moderately deep, well drained to somewhat excessively drained loamy soils formed in till underlain by folded schist, granite, or gneiss bedrock. Charlton-Chatfield soils are recognized as farmland of statewide importance. In addition, soils characterized as prime farmland, or are suitable for farming and/or cultivating crops, represent 4.6 percent of the Clove Creek watersheds' soil area. Soils designated as farmland of statewide importance represent 16.9 percent. Finally, well-drained soils encompass 84.7% of the subwatershed, while hydric soils comprise 6.5% of the subwatershed.

The New York State Department of Environmental Conservation classified the Clove Creek as a C(TS) stream, suitable for trout spawning, from its confluence with the Fishkill Creek to the inlet of an unnamed pond (p345c) in the town of Philipstown. From the unnamed pond to the Fishkill's source the stream it is classified as a C stream. The best usage of Class C(TS) waters is fishing, but they are also suitable for trout propagation and survival. The water quality should also be suitable for primary and secondary contact recreation. A number of water bodies that enter Clove Creek have higher stream classifications. Lake Valhalla, Cargill Reservoir, and the headwaters of Hell Hollow Stream are designated as Class A streams, which are suitable for drinking water. In August of 2002, there were three SPDES facilities that discharged into groundwater within this watershed. Two of these facilities also discharged into Clove Brook and Highland Creek.

Clove Creek aquifer is a significant feature located in the northwest corner of Putnam and southwest corner of Dutchess Counties'. Designated as a critical environmental area by the town of Fishkill, the

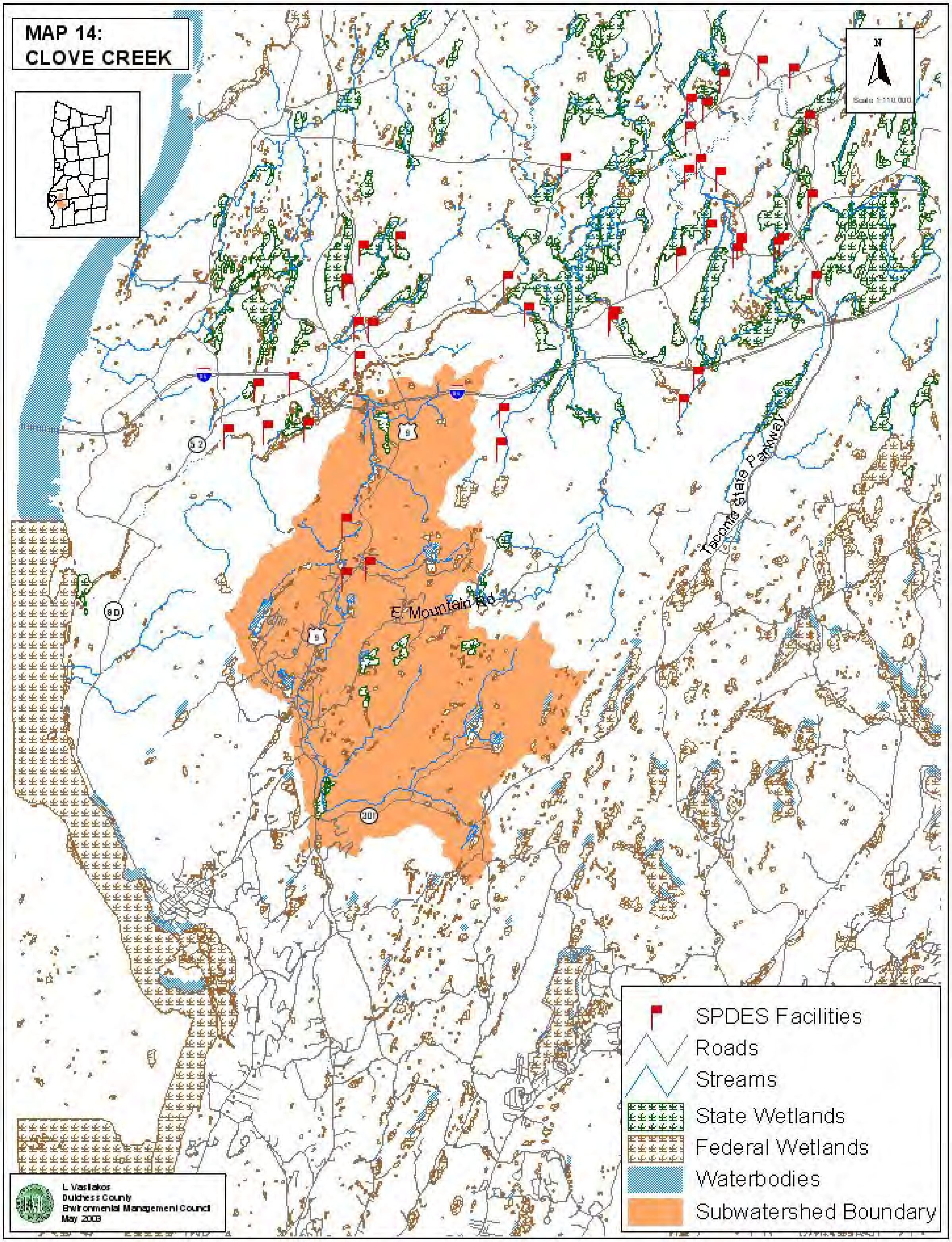
Clove Creek Aquifer is underlain by sand and gravel, and is a very permeable and productive aquifer with wells yielding an average of 189 gallons of water per minute (Snavely, 1980).

Table 30. Clove Creek Land Use

Land Use Category	Acreage	Percentage (%)
Agriculture	209.09	1.61
Commercial	243.56	1.88
Extractive	204.43	1.58
Forest	10230.39	78.93
Industrial	56.99	0.44
Outdoor Recreation	81.44	0.63
Public/Semipublic	95.00	0.73
Residential	1052.64	8.12
Transportation	81.69	0.63
Inactive	44.37	0.34
Water/Wetlands	661.52	5.10
TOTAL	**12961.13**	**100.00**

Table 31. Soils in the Clove Creek Subwatershed

Soil Type	Percentage (%)	Soil Description
Canandaigua	0.01	Hydric
Carlisle Muck	0.54	Hydric
Charlton-Loam	13.38	Well-Drained, 2.71 prime farmland, 2.34 farmland of statewide importance
Charlton-Chatfield (rolling)	16.97	Well-Drained, 11.53 farmland of statewide importance
Chatfield-Hollis (rolling)	10.84	Well-Drained
Copake GR-SIL,hilly	10.43	Well-Drained
Fluvaquents-Udifluvents	1.90	hydric/well-drained
Fredon SIL	0.35	poorly drained, farmland of statewide importance, hydric inclusion
Galway-Farmington	0.25	Well-Drained, farmland of statewide importance
Georgia SIL	0.11	Well-Drained, 0.09 prime farmland, 0.01 farmland of statewide imp.
Haven L, nearly level	0.05	Well-Drained, prime farmland
Hinckley gravelly loamy sand	0.29	excessively drained
Hollis-Chatfield, rolling	16.21	well-drained
Hollis Rock Outcrop, very steep	6.71	well-drained
Hoosic GR-L	0.62	somewhat excessively drained, farmland of statewide importance
Knickerbocker FSL, nearly level	1.18	somewhat excessively drained, 0.84 prime farmland 0.34 farmland of statewide importance
Leicester loam, stony	2.96	poorly drained, drained
Linlithgo SIL	1.16	somewhat poorly drained, farmland of statewide importance
Palms muck	0.41	very poorly drained, hydric
Palms and Carlisle Soils	0.10	very poorly drained, hydric
Paxton fine sandy loam	3.72	well-drained
Pits	1.25	somewhat excessively drained
Pompton silt loam	0.14	well-drained to poorly drained, suitable for farming
Pittstown SIL	0.05	Well-Drained, prime farmland
Raynham SIL	0.09	somewhat poorly drained, farmland of statewide importance
Ridgebury Loam	0.61	poorly drained, hydric, suitable for farming
Riverhead	2.56	well-drained
Sun loam	1.02	poorly drained, hydric
Sun SIL	0.17	poorly drained, hydric inclusion, farmland of statewide importance
Sutton Loam	0.79	well drained
Udorthents	1.53	well drained
Urban land-Charlton complex	0.09	urban/well-drained
Urban land	0.71	impermeable
Water	1.39	n/a
Woodbridge loam	0.89	well-drained
Wappinger	0.13	Well-Drained, prime farmland
Wayland SIL	0.37	poorly drained, hydric
TOTAL	**100.00**	


MAP 14:
CLOVE CREEK
N
E. Mountain Rd
Taconic State Parkway
SPDES Facilities
Roads
Streams
State Wetlands
Federal Wetlands
Waterbodies
Subwatershed Boundary
L Vasilakos
Dutchess County
Environmental Management Council
May 2003

Biological Community Analysis

The Clove Creek was not sampled during the 1973 assessment of Neuderfer. However, Schmidt and Kiviat assessed the Clove Creek in 1985 at approximately river mile CC .75 (behind Route 9 plaza). Macroinvertebrate analysis indicated the Clove Creek was a good (non-to-slightly impacted) quality stream, and fish sampling indicated the fish community of the Clove Creek hadn't changed since a previous sampling in 1936 (Schmidt and Kiviat, 1985). The researchers also found reproducing brown trout populations, which can also be an indicator of good water quality.

In 1988 and 1999, researchers sampled water chemistry, fish, diatom and macroinvertebrate communities at three sites in the Clove Creek watershed. All the sites were located in Putnam County at approximately river miles 3.1, 4.6, and 6.2. The researchers found the Clove Creek contained the best water quality in the entire Fishkill system (Stevens et al., 1994) (Table 32). They also found reproducing brown trout at CC 3.1 and CC 4.6, and pollution sensitive diatoms dominated at various times throughout the year (Stevens et al., 1994). Finally, in 2002 the New York State Department of Environmental Conservation's Stream Biomonitoring Unit assessed the Clove Creek as non-impacted based on the macroinvertebrate assemblage near CC .75 (Bode et al., 2004).

In 1985, Schmidt and Kiviat recommended upgrading the NYSDEC classification of the Clove Creek to B due to the amount of primary contact recreation that occurs in the stream. Recently, the stream was upgraded from class C to class C(TS) in recognition of the trout spawning that occurs in the stream. If the stream is being utilized for primary contact recreation (swimming), as observed by Kiviat and Schmidt, it should be afforded the protections' that accompany a B classification. Also, as pointed out by Stevens et al. (1994), the Clove Creek watershed is under intense residential, commercial, and industrial development pressure. Therefore, land use proposals should be scrutinized with the intention of maintaining the high biotic quality present during the period of study.

Table 32. Yearly mean water chemistry data from Clove Creek at various sampling points from 1985, 1989, and 2001. Sample collection in 1985 ranged from January through December, 1989 collection ranged from May 1988 through April 1989, and 2001 data is limited to summer 2001 and 2002 (Schmidt and Kiviat, 1986; Stevens et al., 1994; Stainbrook, 2004).

Clove Creek								
	Year				**Year**			
	1985				**1989**			
Location	**CC .75**		**CC 3.1**		**CC 4.6**		**CC 6.2**	
Parameter								
pH	7.5	s.d. .34, N = 11	7.6	s.d. .51, N = 8	7.3	s.d. .62, N = 8	7.1	s.d. .69, N = 8
Dissolved Oxygen (mg/L)	10.4	s.d. 1.7, N = 11	9.3	s.d. 1.7, N = 10	9.6	s.d. 1.8, N = 10	8.9	s.d. 2.3, N = 10
Alkalinity (mg/L)	56.5	s.d. 18.6, N = 11	ND	ND	ND	ND	ND	ND
Temperature C	10	s.d. 7.8, N = 11	10.5	s.d. 7.5, N = 12	12	s.d. 9.9, N = 12	11.3	s.d. 8.2, N = 12
Chloride (mg/L)	18.5	s.d. 3.7, N = 10	25.6	s.d. 11, N = 12	21.9	s.d. 12.8, N = 12	17.9	s.d. 10.5, N = 12
PO4-P (mg/L)	ND	ND	0.007	s.d. .0009, N = 12	0.007	s.d. .003, N = 12	0.005	s.d. .003, N = 12
SO4 (mg/L)	ND	ND	14.4	s.d. .58, N = 12	13	s.d. 3.0, N = 12	10.9	s.d. 2.6, N = 12
Conductivity (µmhos/cm)	ND	ND	171.7	s.d. 112, N = 12	114	s.d. 87, N = 12	77	s.d. 36.4, N = 12
			Year					
			2001					
Location			**CC .75**		**CC 6.5**			
Parameter								
pH			7.5	s.d. .24, N = 4	7.9	s.d. .26, N = 4		
Dissolved Oxygen (mg/L)			7.8	s.d. 3.5, N = 4	8.7	s.d. 1.6, N = 4		
Alkalinity (mg/L)			ND	ND	ND	ND		
Temperature C			18.1	s.d. 4.0, N = 4	17.2	s.d. 2.6, N = 4		
Chloride (mg/L)			ND	ND	ND	ND		
PO4-P (mg/L)			ND	ND	ND	ND		
SO4 (mg/L)			ND	ND	ND	ND		
Conductivity (µmhos/cm)			417.5	s.d. 109.6, N = 2	359	s.d. 154.1, N = 2		

Jackson Creek Watershed

Jackson Creek watershed encompasses an area of 5,524 acres in the towns of Union Vale, La Grange and Beekman (Map 15). The watershed encompasses 4 percent of the total area of the Fishkill Creek watershed. In 2000, the dominant land use in the watershed was forest representing 42 percent of the total Jackson Creek watershed land use. Residential and agricultural land uses were the next highest categories representing 27 and 19 percent, respectively. Jackson Creek watershed had the highest percentage of agricultural land relative to all the subwatersheds in the Fishkill Creek basin. Other land uses in the watershed included inactive land (5%), water/wetlands (4%), outdoor recreation (2%), public/semipublic (0.3%), urban/commercial (0.1%) and extractive (0.07%) (Table 33).

The dominant soils in the Jackson Creek watershed are Nassau-Cardigan complex (21%), Dutchess Cardigan complex (20%), and Pittstown silt loam (15 %) (Table 34). Nassau-Cardigan complex is comprised of 40% Nassau soils, 40% Cardigan soils and 20% other soils and rock outcrop. Nassau soils are shallow, somewhat excessively drained loamy soils formed in till underlain by folded shale bedrock. Cardigan soils are moderately deep, well-drained loamy soils formed in till underlain by folded shale bedrock. Sixty-nine percent of watershed soils are well drained, and hydric soils comprise ten percent. Five percent of soils are classified as farmland of statewide importance, while three percent are classified as prime farmland.

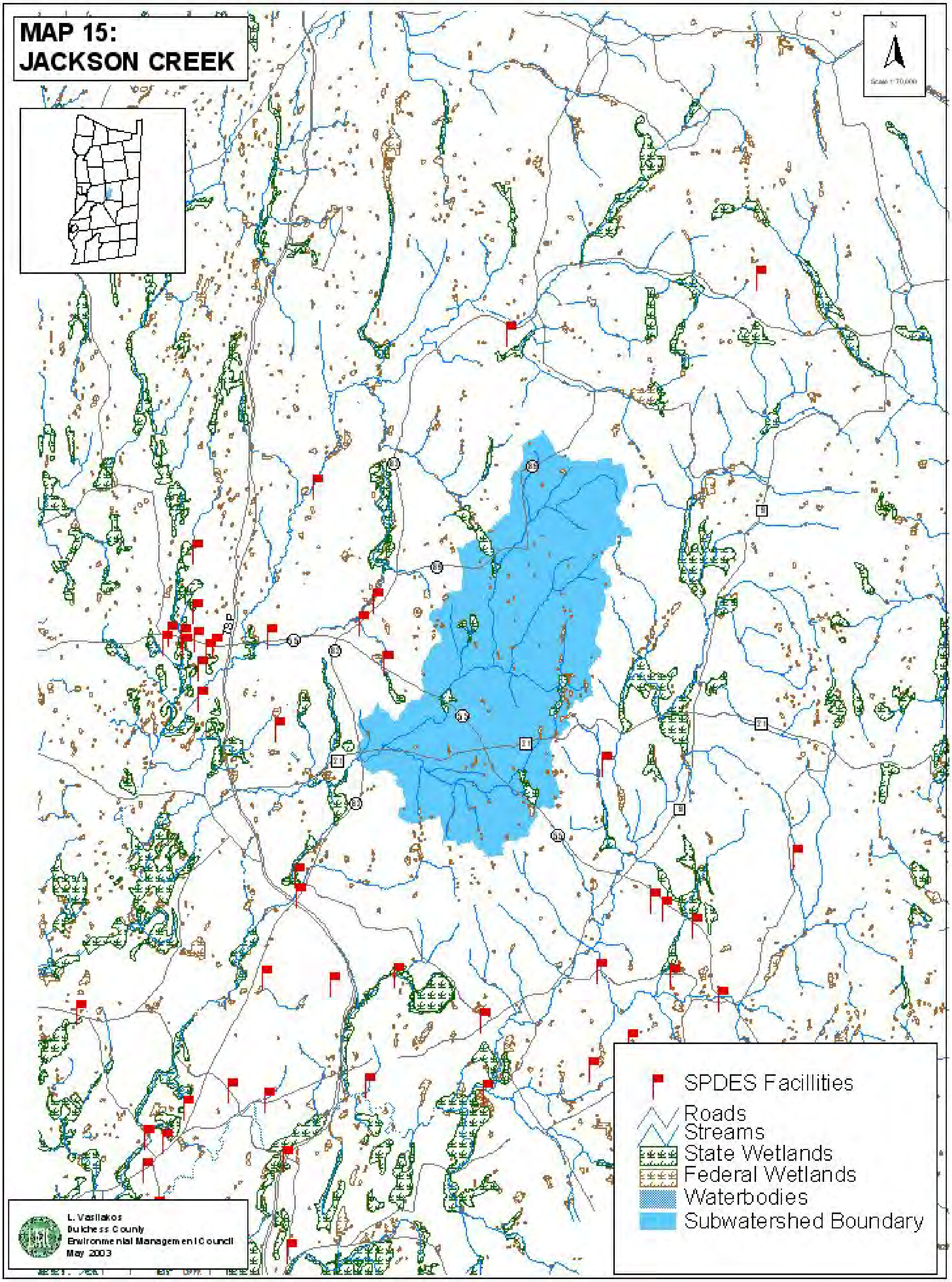
Jackson Creek watershed contains at least 20 lakes and ponds totaling 6 acres. The waterbodies range in size from 0.02 to 1.9 acres, and the watershed contains 24 tributaries totaling 23 miles. Jackson Creek is classified C(TS) from its confluence with the Sprout Creek to river mile 4.5 (317' upstream of East Noxon Rd. crossing), and class C(T) from JC 4.5 to its source. The classification means the stream should be suitable for primary and secondary contact recreation, and it should support trout spawning and survival. Finally, as of August 2002, there were no SPDES facilities present in the watershed.

Table 33. Jackson Creek Subwatershed Landuse

Landuse Category	Acreage	Percentage (%)
Agriculture	1055.50	19.01
Urban/Commercial	6.62	0.12
Extractive	3.74	0.07
Forestland	2340.60	42.15
Outdoor Recreation	119.63	2.15
Public/Semipublic	18.23	0.33
Residential	1498.32	26.98
Inactive	291.89	5.26
Water/Wetlands	218.70	3.94
Total	**5553.23**	**100.00**

Table 34. Soils in the Jackson Creek Subwatershed

Soil Name	Percent (%)	Description
Bernardston silt loam	5.15	1.4% prime farmland, well-drained
		3.1% farmland of statewide importance
Carlisle Muck	0.00	hydric
Dutchess silt loam	3.31	1 % prime farmland, well-drained
		2.3 % farmland of statewide importance
Dutchess-Cardigan complex	20.16	well-drained
Fluvaquents-Udifluvents complex	3.93	hydric/well to excessively drained
Fredon silt loam	0.75	somewhat poorly drained
Georgia silt loam	3.03	well-drained
Halsey mucky silt loam	0.17	hydric, poorly-drained
Hoosic gravelly loam	7.97	somewhat excessively drained
Hoosic channery loam	1.25	somewhat excessively drained
Massena silt loam	4.16	somewhat poorly drained
Nassau-Cardigan complex	20.66	somewhat excessively drained/well-drained
Nassau-Rock outcrop complex	3.23	somewhat excessively drained/rock
Palms muck	0.73	hydric, poorly-drained
Pawling silt loam	0.51	well-drained
Pits, gravel	1.30	N/A
Pittstown silt loam	15.32	well-drained
Punsit silt loam	1.90	somewhat poorly drained
Stockbridge silt loam	0.63	prime farmland, well-drained
Sun silt loam	5.25	hydric, poorly-drained
Udorthents	0.04	well-drained
Water	0.22	N/A
Wayland Silt Loam	0.31	hydric, poorly-drained
TOTAL	100.00	


MAP 15:
JACKSON CREEK
N
SPDES Facillities
Roads
Streams
State Wetlands
Federal Wetlands
Waterbodies
Subwatershed Boundary
L. Vasilakos
Dutchess County
Environmental Management Council
May 2003

Biological Community Analysis

Jackson Creek was not sampled during the 1973 or 1989 assessments because it is a tributary to the Sprout Creek, and not directly to the Fishkill Creek. However, Schmidt and Kiviat (1985) assessed the fish populations of Jackson Creek and found naturally reproducing trout populations. High brook and brown trout populations were also documented in 2001, despite poor physical conditions due to the lack of flow and only pockets of water (Stainbrook, 2004). Water chemistry data were collected in the summers of 2001 and 2002, but it is limited to four dates (Table 35). Finally, in the summer of 2002, Bode et al. (2004) found the Jackson Creek fauna dominated by clean-water mayflies, and based on macroinvertebrate metrics assessed the water quality as non-impacted.

Jackson Creek has been subjected to intense development pressures in the past four years (2000-2004). It is imperative to the health of the biotic communities that water quality and quantity issues be considered during the approval of development proposals. The geomorphic stability of the stream needs to be assessed to determine the impact of an increasing number of stream crossings and land contour changes for development, particularly in the steep sloped areas upstream of the route 55 crossing. Finally, further chemical water quality analysis may be warranted to establish base line chemical parameters for the stream.

Table 35. Yearly mean water chemistry data from Jackson Creek, collected at river mile 4 (720' downstream of Rte 82 crossing). Data is limited to summer 2001 and 2002 (Stainbrook, 2004).

Jackson Creek		
	Year	
	2001	
Location	**JC 4.0**	
Parameter		
pH	7.9	s.d. .21, N = 4
Dissolved Oxygen (mg/L)	9.8	s.d. 1.66, N = 4
Alkalinity (mg/L)	ND	ND
Temperature C	18.75	s.d. 6.25, N = 4
Chloride (mg/L)	ND	ND
PO4-P (mg/L)	ND	ND
SO4 (mg/L)	ND	ND
Conductivity (µmhos/cm)	412.5	s.d. 78.5, N = 2

Whaley Lake Brook Watershed

Whaley Lake Brook watershed encompasses 11,481 acres, accounting for 9 percent of the Fishkill Creek watershed area (Map 16). This watershed is located within three municipalities including the towns of Union Vale, Beekman and Pawling. In 2000, the dominant land uses in the watershed were forest (58%), residential (18%) and water/wetlands (10%) (Table 36). The remaining land uses included agriculture (8.9%), inactive (2.8%), public/semipublic (0.81%), outdoor recreation (0.80%), transportation (0.59%), urban/commercial (0.52%), extractive (0.11%), and industrial (0.08%) (Table 36). Relative to other Fishkill Creek subwatersheds, Whaley Lake Brook watershed ranked second in total area of water/wetlands and third for forestland.

The dominant soil type in Whaley Lake Brook watershed is Hollis Chatfield Rock outcrop complex comprising 36.4% (Table 37). Hollis and Chatfield soils are well drained to somewhat excessively drained loamy soils formed in till which is underlain by folded schist, granite or gneiss bedrock. The major difference between the two soil types is their depth, with Hollis soils characterized as shallow (10 to 20 inches) and Chatfield considered moderately deep (20 to 40 inches). Another portion of this complex is rock outcrop consisting of exposures of folded schist, granite or gneiss bedrock. The second most abundant soil type is Stockbridge silt loam at 14.6%. Stockbridge silt loam is a well-drained loamy soil formed in till which ranges in slope from 3 to 45 percent.

The Whaley Lake Brook watershed contains ~32 miles of streams, and ~393 acres of lakes and ponds. Whaley Lake Brook is approximately 5.6 miles in length from its beginning at the outfall of Whaley Lake, to its confluence with the Fishkill Creek. The brook is classified as a C(T) stream from its confluence with the Fishkill Creek upstream to its confluence with tributary 4 (river mile 4.5), and a C(TS) stream from tributary 4 to the outlet of Whaley Lake. According to the New York State Department of Environmental Conservation, the best usage of Class C (TS) waters is fishing, but they are also suitable for trout propagation and survival. The water quality should also be suitable for primary and secondary contact recreation. Gardner Hollow Brook (tributary H-95-19-3/river mile 4.5) has an A classification for half its length, indicating it could provide a source of drinking water, along with the uses listed above. The remainder of Gardner Hollow Brook is classified C(T). Tributary H-95-19-1 (WL 1.48) and H-95-19-2 (WL 1.5) are classified as C(T), and the remainder of the Whaley tributaries have C designations.

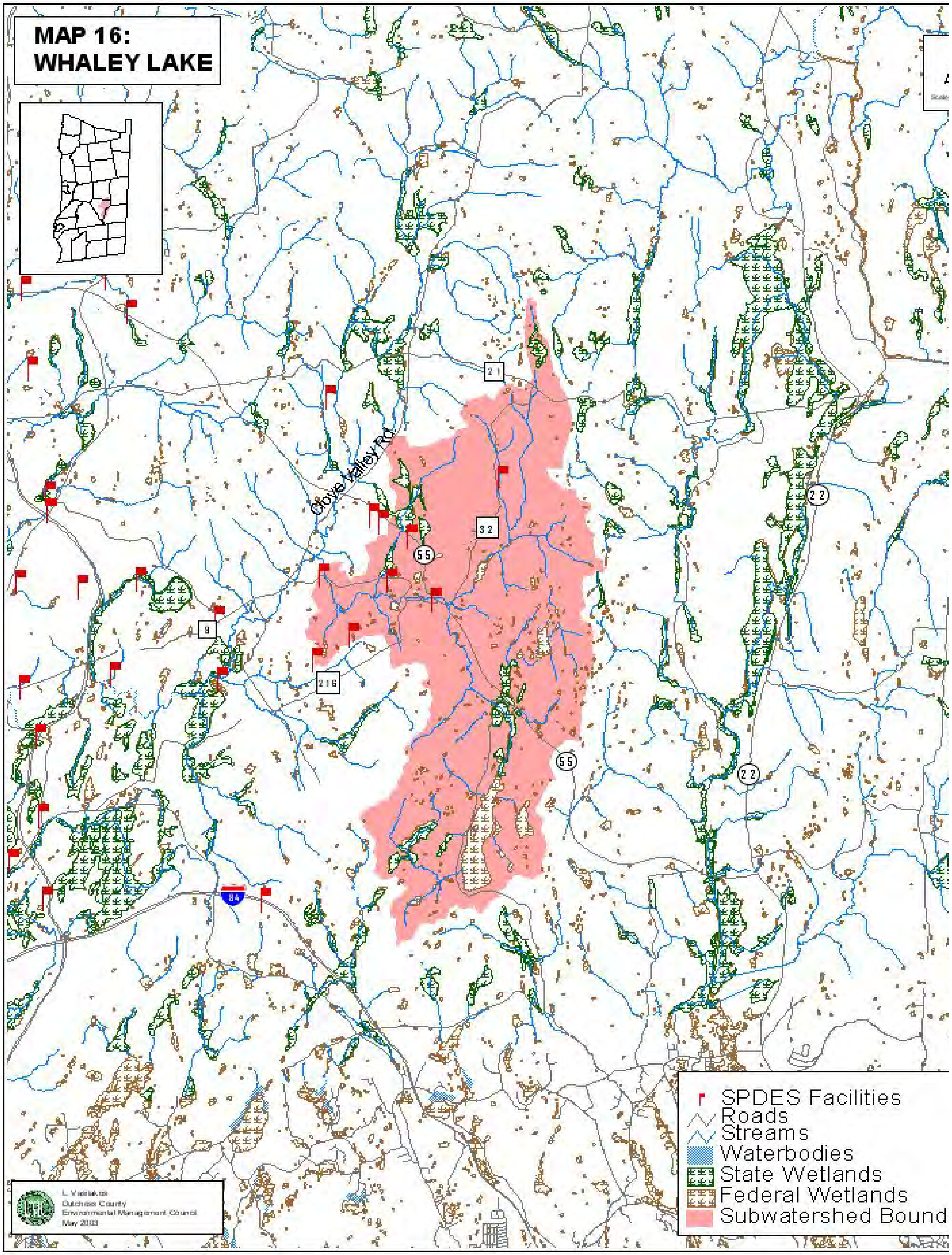
The largest lakes in the watershed are Whaley Lake (252-acres, class B), Little Whaley Lake (44.1 acres, class B), and Nuclear Lake (50 acres, class C). There is more in-depth discussion of these lakes in the Surface Water section of this plan. Finally, as of August of 2002, there were 7 SPDES facilities that discharged to surface water (2) or groundwater (5).

Table 36. Land Use in the Whaley Lake Subwatershed

Land Use Category	SUM_ACRES	Percentage (%)
Agriculture	1008.94	8.86
Urban/Commercial	58.66	0.52
Extractive	12.79	0.11
Forestland	6554.40	57.58
Industrial	8.83	0.08
Outdoor Recreation	91.36	0.80
Public/Semipublic	92.66	0.81
Residential	2014.73	17.70
Transportation	67.13	0.59
Inactive	321.19	2.82
Water/Wetlands	1152.67	10.13
Total	**11383.37**	**100.00**

Table 37. Soils in the Whaley Lake Subwatershed

Soil Name	Percentage (%)	Soil Description
Carlisle Muck	1.35	hydric
Charlton loam	3.76	0.48 prime farmland, 3.04 farmland of statewide importance, well-drained
Charlton-Chatfield complex	8.31	5.45 % farmland of statewide importance well-drained
Chatfield-Hollis complex	11.88	well-drained
Copake gravelly silt loam	4.34	2.92% prime farmland, 1.32 farmland of statewide importance, well-drained
Copake channery silt loam	0.91	0.91 % prime farmland, well-drained
Farmington-Galway complex	0.27	well-drained
Farmington-Rock outcrop	0.03	well-drained/rock (mix)
Fluvaquents-Udifluvents complex	0.20	hydric/well-drained (mix)
Fredon silt loam	0.40	farmland of statewide importance, hydric inclusion
Galway-Farmington complex	0.27	well-drained
Georgia silt loam	2.52	1.93% prime farmland, 0.59 farmland of statewide importance, well-drained
Halsey mucky silt loam	0.15	hydric
Hollis-Chatfield Rock outcrop complex	36.36	well drained and somewhat excessively drained
Hoosic gravelly loam	0.44	0.38 farmland of statewide importance somewhat excessively drained
Hoosic channery loam	0.09	farmland of statewide importance, somewhat excessively drained
Linlithgo silt loam	0.11	farmland of statewide importance, hydric inclusion
Massena silt loam	1.78	farmland of statewide importance, hydric inclusion
Palms muck	1.64	hydric
Pawling silt loam	0.13	prime farmland, well-drained
Pits, gravel	0.49	N/A
Stockbridge silt loam	14.56	3.35 prime farmland, 8.03 farmland of statewide importance well-drained
Stockbridge-Farmington complex	2.05	farmland of statewide importance, well-drained
Sun silt loam	2.77	farmland of statewide importance
Udorthents	0.10	somewhat excessively drained to well-drained
Urban land	0.07	N/A
Water	3.46	N/A
Wappinger loam	0.15	well-drained
Wayland silt loam	1.38	hydric
TOTAL	**100**	


MAP 16:
WHALEY LAKE
Clove Valley Rd
21
32
55
22
9
216
84
SPDES Facilities
Roads
Streams
Waterbodies
State Wetlands
Federal Wetlands
Subwatershed Bound
Dutchess County
Environmental Management Council
May 2003

Biological Community Analysis

Whaley Lake Brook wasn't sampled in Neuderfer's 1973 watershed assessment. The stream was assessed in 1985 at river mile WL 0.4, where Schmidt and Kiviat found that Whaley Lake Brook had a substantial effect on the water quality of the upper Fishkill creek (Schmidt and Kiviat, 1986). Additionally, the researchers documented brown trout holding over throughout the summer, but didn't find evidence that they were successfully reproducing at that time (Schmidt and Kiviat, 1986).

Researchers visited Whaley Lake Brook again in 1988 through 1989 at river mile WL 0.4. According to Stevens et al. (1994), Whaley Lake Brook had substantially higher chloride concentrations than existed in the 1985 analysis (Table 38). Despite the increase in chloride concentrations, Whaley Lake Brook had good water quality (slightly impacted), a substantial fish community, and clean-water diatoms (Stevens et al., 1994). Additionally, spawning brown trout were documented in 1988 and 1989, again indicating good water quality.

Due to the chloride concentrations in Whaley Lake Brook, further chemical examinations may be warranted to track potential sources. In addition, as noted by Stevens et al. (1994), the effects of increased sewage inputs on stream flora and fauna need to be evaluated in order to determine the required level of sewage treatment necessary to minimize impacts for the rapidly developing area.

Table 38. Yearly mean water chemistry data from Whaley Lake Brook 0.4 from 1985, 1989, and 2001. Sample collection in 1985 ranged from January through December, 1989 collection ranged from May 1988 through April 1989, and 2001 data is limited to summer 2001 and 2002 (Schmidt and Kiviat, 1986; Stevens et al., 1994; Stainbrook, 2004).

Whaley Lake Brook						
	Year		**Year**		**Year**	
	1985		**1989**		**2001**	
Location	**WC 0.4**		**WC 0.4**		**WC 0.4**	
Parameter						
pH	7.9	s.d. .28, N = 11	8	s.d. .31, N = 8	8.2	s.d. .24, N = 4
Dissolved Oxygen (mg/L)	10.7	s.d. 1.6, N = 11	9.8	s.d. 2.1, N = 10	9.7	s.d. 1.3, N = 4
Alkalinity (mg/L)	93.2	s.d. 42.2, N = 11	ND	ND	ND	ND
Temperature C	11.2	s.d. 8.8, N = 11	12.7	s.d. 9.3, N = 12	20.2	s.d. 4.8, N = 4
Chloride (mg/L)	25.8	s.d. 9.1, N = 10	35.3	s.d. 16.5, N = 12	ND	ND
PO4-P (mg/L)	ND	ND	0.011	s.d. .005, N = 12	ND	ND
SO4 (mg/L)	ND	ND	15.8	s.d. 2.9, N = 12	ND	ND
Conductivity (µmhos/cm)	ND	ND	239.2	s.d. 114.9, N = 12	444.5	s.d. 201.5, N = 2

Whortlekill Creek Watershed

The Whortlekill Creek watershed encompasses approximately 4,269 acres, accounting for 3 percent of the total Fishkill Creek watershed area (Map17). The Whortlekill watershed is located in three municipalities including the towns of Beekman, La Grange and East Fishkill. In 2000, the dominant land uses in the watershed were residential (42%), forest (31%) and agricultural (9.6%)(Table 39). The remaining land uses included water/wetlands (8%), urban/commercial (3%), outdoor recreation (2%), inactive (2%), transportation (1%), public/semipublic (0.47%), extractive (0.37%), and industrial (0.06%). Developed land (urban/commercial, industrial, residential and public/semipublic land uses) accounted for 45.5% of the land area in the watershed, ranking it the highest relative to all other subwatersheds of the Fishkill Creek.

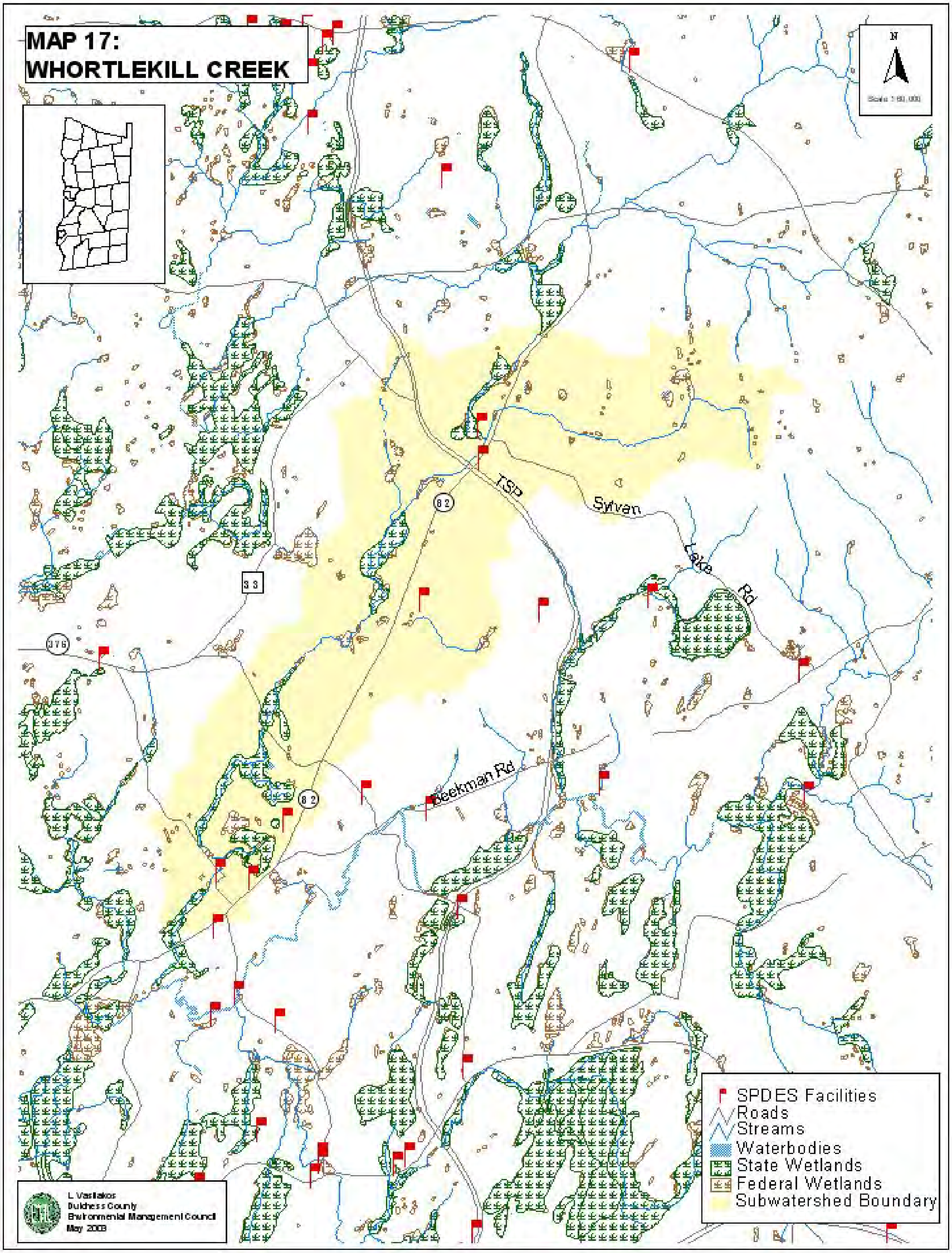
The dominant soil types in the Whortlekill watershed are Hoosic gravelly loam (29.1%) and Dutchess-Cardigan complex (19.1%)(Table 40). Hoosic gravelly loam is very deep and somewhat excessively drained sandy over gravelly soil formed in outwash. Hoosic gravelly loam has a slope ranging from 0 to 45 percent, and a permeability that is rapid to moderately rapid in the surface layer and subsoil and very rapid in the substratum. Dutchess-Cardigan complex consists of about 40 percent Dutchess soils, 30 percent Cardigan soils, and 30 percent other soils and rock outcrop. Dutchess soils are very deep, well-drained loamy soils formed in till with a moderate permeability. Cardigan soils are moderately deep, well-drained loamy soils formed in till underlain by folded shale bedrock with moderate permeability. Well-drained soils comprise 49.5% of soils in the watershed, while hydric soils comprise 8.9%. In 2004, soils characterized as farmland of statewide importance comprised 61.8% while prime farmland comprised 7 percent of the Whortlekill land area.

The Whortlekill Creek watershed contains approximately 52.7 acres of ponds and lakes, and 11.7 miles of streams. The Whortlekill Creek measures approximately 8.3 miles in length. From its confluence with the Fishkill Creek to tributary H-95-12-1a (WK 5.6), the stream is designated a Class C(T) stream. From tributary 1a (WK 5.6) to its source the stream is classified as C(TS). The best usage of the Whortlekill Creek is fishing, while it should also be suitable for fish propagation and survival along with primary and secondary contact recreation. Additionally, the upper portions should support trout reproduction. The remaining tributaries of the Whortlekill Creek are classified as C. As of August 2002, the watershed contained 6 SPDES facilities that discharged to groundwater.

Table 39. Land Use in the Whortlekill Subwatershed		
Land Use Category	**Acreage**	**Percentage (%)**
Agriculture	410.92	9.59
Urban/Commercial	135.79	3.17
Extractive	16.01	0.37
Forestland	1340.03	31.26
Industrial	2.45	0.06
Outdoor Recreation	86.00	2.01
Public/Semipublic	19.94	0.47
Residential	1784.43	41.63
Transportation	48.71	1.14
Inactive	95.81	2.24
Water/Wetlands	346.35	8.08
Total	**4286.43**	**100.00**

Table 40. Soils in the Whortlekill Subwatershed

Soil Name	Percentage (%)	Soil Description
Bernardston silt loam	7.58	1.45 % prime farmland, 5.81 % farmland of statewide importance, well-drained
Carlisle muck	1.05	hydric
Dutchess silt loam	0.22	prime farmland, well-drained
Dutchess-Cardigan complex	19.12	18.53 farmland of statewide importance, well-drained
Fluvaquents-Udifluvents complex	2.38	hydric
Fredon silt loam	2.10	farmland of statewide importance, hydric inclusion
Galway-Farmington complex	0.21	well-drained
Georgia silt loam	0.79	0.20 prime farmland, 0.59 farmland of statewide importance; well-drained
Halsey mucky silt loam	0.17	hydric
Haven loam	0.37	prime farmland, well-drained
Hoosic gravelly loam	29.09	28.56 farmland of statewide importance somewhat excessively drained
Hoosic channery loam	0.75	farmland of statewide importance, somewhat excessively drained
Hoosic-Urban land complex	0.70	somewhat excessively drained/urban
Massena silt loam	2.04	farmland of statewide importance, hydric inclusion
Nassau-Cardigan complex	14.97	well-drained to somewhat excessively drained
Nassau-Rock outcrop complex	1.34	somewhat excessively drained/urban
Palms muck	0.10	hydric
Pits, gravel	0.96	N/A
Pittstown silt loam	4.60	4.5 % prime farmland, 0.09 farmland of statewide importance, well-drained
Punsit silt loam	1.26	farmland of statewide importance, hydric inclusion
Stockbridge silt loam	0.31	0.13 % prime farmland, 0.18 % farmland of statewide importance, well-drained
Stockbridge-Farmington complex	0.28	farmland of statewide importance
Sun silt loam	1.62	farmland of statewide importance, hydric inclusion
Udorthents, smoothed	1.45	0.32 hydric inclusion, somewhat excessively drained to moderately well-drained
Urban land	0.56	N/A
Water	0.67	N/A
Wappinger loam	0.14	prime farmland, well-drained
Wayland silt loam	5.16	hydric
TOTAL	100.00	


MAP 17:
WHORTLEKILL CREEK
N
TSP
Sylvan
Lake
Rd
Beekman Rd
82
33
376
SPDES Facilities
Roads
Streams
Waterbodies
State Wetlands
Federal Wetlands
Subwatershed Boundary
L Vasilakos
Dutchess County
Environmental Management Council
May 2003

Biological Community Analysis

Whortlekill Creek was not sampled in Neuderfer's 1973 or Schmidt and Kiviat's 1985 watershed assessment.

Researchers visited Whortlekill Creek in 1988 through 1989 at river mile WK 0.35. According to Stevens et al. (1994), the stream contained a diatom community that was dominated by pollution sensitive species, especially in the fall and winter. Additionally, the stream contained the best fish community of all the Fishkill Creek sampling stations (Stevens et al., 1994). The researchers found a reproducing population of brook trout, which are very pollution sensitive. Combined, these factors indicated good (non-to slightly-impacted) water quality. However, sulfate and chloride concentrations and conductivity levels were high relative to other subwatersheds (Table 41). In 2001, the brook trout populations were still present despite a large increase in developed land (Stainbrook, 2004).

The high chloride and sulfate concentrations can be considered indications of impacts from urbanizing land uses. Therefore, it would be warranted to conduct further research in order to determine if land use impacts have damaged biological communities.

Table 41. Yearly mean water chemistry data from Whortlekill Creek 0.35 from 1989 and 2001. Sample collection in 1989 ranged from May 1988 through April 1989, and 2001 data is limited to summer 2001 and 2002 (Schmidt and Kiviat, 1986; Stevens et al., 1994; Stainbrook, 2004).

Whortlekill Creek				
	Year		**Year**	
	1989		**2001**	
Location	**WK .35**		**WK .35**	
Parameter				
pH	7.8	s.d. .5, N = 8	8.05	s.d. .29, N = 4
Dissolved Oxygen (mg/L)	8.3	s.d. 1.6, N = 10	9.4	s.d. .90, N = 4
Alkalinity (mg/L)	ND	ND	ND	ND
Temperature C	11.3	s.d. 8, N = 12	19.7	s.d. 4.8, N = 4
Chloride (mg/L)	23.7	s.d. 14, N = 12	ND	ND
PO4-P (mg/L)	0.009	s.d. .007, N = 12	ND	ND
SO4 (mg/L)	14.4	s.d. 3.1, N = 12	ND	ND
Conductivity (µmhos/cm)	188.6	s.d. 68, N = 12	621	s.d. 76.4, N = 2

Wiccopee Creek Watershed

Wiccopee Creek watershed (H-95-8) encompasses 7,267 acres, accounting for 6 percent of the Fishkill Creek watershed area (Map 18). This Fishkill Creek subwatershed is located within four municipalities including the towns of East Fishkill and Fishkill in Dutchess County and the towns of Kent and Philipstown in Putnam County. According to reference materials the Wiccopee is also called Trout Creek. In 2001, the dominant land uses in the Wiccopee Creek watershed were forest (71.2%) and residential (13.4%) (Table 42). The remaining land uses included agriculture (4.8%), water/wetlands (4.5%), outdoor recreation (2.1%), extractive (1.4%), transportation (0.82%), inactive (0.80%), industrial (0.56%), and commercial (0.37%). Wiccopee Creek watershed had the second highest percentage of forested land relative to the other subwatersheds of the Fishkill Creek watershed.

Comprising 27% of watershed soils, Copake gravelly silt loam is the dominant soil type (Table 43). Copake gravelly loam is a very deep, well-drained gravelly loam soil over sand and gravel that is formed in outwash. Copake gravelly loam ranges in slope from 0 to 45%. Eighty-seven percent of watershed soils can be characterized as well drained, and approximately 5% are classified as hydric. In addition, 19.4% of soils are characterized as farmland of statewide importance, while the prime farmland classification characterizes 10.5%.

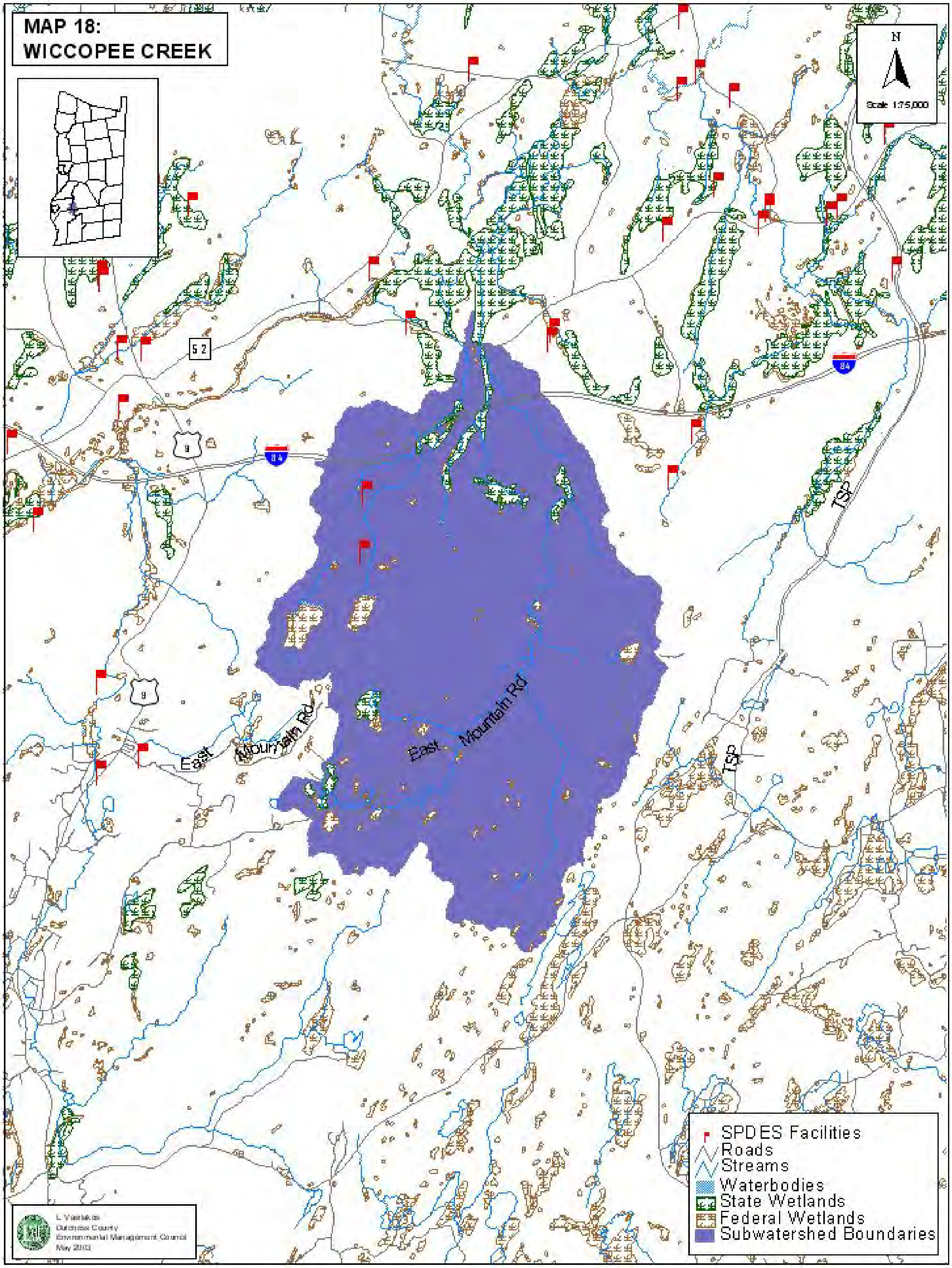
The Wiccopee Creek watershed contains 13.7 miles of streams, and 86 acres of lakes and ponds. In addition, the Wiccopee Creek main stem totals approximately 6 miles, and the majority of lakes and ponds were classified as New York State regulated wetlands. Wiccopee Creek (H 95-8), a Class C(T) stream, should be suitable for trout survival, and it should support primary and secondary contact recreation. Tributary H 95-8-6, which is located in Putnam County, is classified to support trout survival and spawning (C(TS)). The remainder of the perennial tributaries in the watershed have been assigned a C classification. Finally, the Wiccopee Creek watershed contains 2 SPDES facilities that discharged to surface water (1) or ground water (1).

Table 42. Land Use in the Wiccopee Creek Subwatershed

Land Use Category	Acreage	Percentage (%)
Agriculture	347.53	4.78
Commercial	27.20	0.37
Extractive	104.01	1.43
Forestland	5180.18	71.23
Industrial	40.44	0.56
Outdoor Recreation	154.30	2.12
Residential	977.49	13.44
Transportation	59.93	0.82
Inactive	58.23	0.80
Water/Wetlands	323.33	4.45
TOTAL	**7272.66**	**100.00**

Table 43. Soils in the Wiccopee Creek Subwatershed

Soil Type	Percentage (%)	Soil Description
Bernardston silt loam	2.45	0.15 % farmland of statewide importance,well-drained
Carlisle muck	0.34	hydric
Charlton loam	7.49	0.55% prime farmland, well-drained
Charlton-Chatfield complex	12.20	9.03 % farmland of statewide importance, well-drained
Chatfield-Hollis complex	12.31	well drained and somewhat excessively drained
Copake gravelly silt loam	26.58	6.86 % prime farmland, 2.59% farmland of statewide importance, well drained
Farmington-Galway complex	0.95	well drained and somewhat excessively drained
Fredon silt loam	0.64	farmland of statewide importance, hydric inclusion
Galway-Farmington complex	0.80	0.30 % farmland of statewide importance, well drained
Georgia silt loam	0.99	prime farmland, well drained
Halsey mucky silt loam	0.12	hydric
Hollis-Chatfield Rock outcrop complex	12.87	well drained and somewhat excessively drained
Hollis-Rock outcrop complex	3.33	well drained and somewhat excessively drained
Hoosic gravelly loam	0.15	farmland of statewide importance, somewhat excessively drained
Leicester loam	1.63	poorly drained, hydric
Massena silt loam	0.17	farmland of statewide importance, hydric inclusion
Palms muck	0.14	hydric
Pawling silt loam	2.09	prime farmland, moderately drained
Paxton fine sandy silt loam	0.98	well-drained
Pits, gravel	0.82	N/A
Pompton silt loam	0.11	moderately well-drained and somewhat poorly drained
Ridgebury loam	0.03	hydric inclusion
Riverhead loam	0.45	well-drained
Sun loam	0.90	farmland of significant importance, hydric
Stockbridge silt loam	3.07	2.38 % farmland of significant importance, well-drained
Stockbridge-Farmington complex	3.33	2.94 % farmland of significant importance well-drained and somewhat excessively drained
Sutton loam	0.02	well-drained
Udorthents	1.30	somewhat excessively drained to moderately drained
Urban land	0.42	N/A
Water	1.55	N/A
Wappinger loam	0.19	well-drained
Wayland silt loam	1.56	hydric
TOTAL	**100.00**	


MAP 18:
WICCOPEE CREEK
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Scale 1:75,000
52
9
84
East Mountain Rd
East Mountain Rd
TSP
TSP
SPDES Facilities
Roads
Streams
Waterbodies
State Wetlands
Federal Wetlands
Subwatershed Boundaries
Dutchess County
Environmental Management Council
May 2003

Biological Community Analysis

The Wiccopee Creek wasn't sampled in Neuderfer's 1973 watershed assessment. The stream was assessed in 1985 when Schmidt and Kiviat found the Putnam County headwaters contained healthy brown trout and slimy sculpin populations. Slimy sculpins require clean and clear streams for survival, and thus their presence indicated good (non-impacted) water quality in the headwaters of the Wiccopee. The researchers went as far as to compare the headwaters to pristine Catskill streams, particularly due to the cold-water temperatures (Schmidt and Kiviat, 1986). Overall, Wiccopee fish populations appeared not to have changed significantly since a previous fish study in 1936 (Schmidt and Kiviat, 1986).

Researchers visited the Wiccopee Creek again in 1988 through 1989 at river mile WC .82 (Route 52 bridge). They found the macroinvertebrate community indicated high water quality (non-impacted) in the summer, but mediocre (slightly impacted) in other seasons (Stevens et al., 1994). The fish communities were the poorest in the Fishkill basin with only two species collected in 1988, and by 1991 the fish communities hadn't recovered (Stevens et al., 1994). Although the lower portions of the Wiccopee appeared to have been damaged, the headwater portion remained healthy. Despite the poor fish community, the water chemistry parameters measured as good (non-to-slightly impacted)(Table 44).

In 1988 and 1991, Stevens et al. (1989) noted a black substance on the rocks that wasn't present in the 1985 study of Schmidt and Kiviat. The substance tested high in manganese, and the researchers contemplated whether there was a relationship between the substance and the high stream turbidity observed by Schmidt and Kiviat (1986). The 1986 report noted that following a rainstorm the Wiccopee Creek at Route 52 was as "turbid as the Mississippi River", and suggested the high turbidity may have been caused by construction site runoff (Schmidt and Kiviat, 1986). In any case, proper erosion and sediment controls should be required during construction if the healthy fish populations documented in 1985 are to be restored and/or maintained. In addition, other potential impacting land uses, such as gravel mining and orchards, should be investigated for water quality improvement potential (Schmidt and Kiviat, 1986). Finally, the stream should be assessed to determine potential impacts, and a possible source, of the unidentified black substance noted by Stevens et al., (1994)

Table 44. Yearly mean water chemistry data from Wiccopee (Trout) Creek .82 from 1985, 1989, and 2001. Sample collection in 1985 ranged from January through December, 1989 collection ranged from May 1988 through April 1989, and 2001 data is limited to summer 2001 and 2002 (Schmidt and Kiviat, 1986; Stevens et al., 1994; Stainbrook, 2004).

Wiccopee Creek						
	Year		**Year**		**Year**	
	1985		**1989**		**2001**	
Location	**WC .82**		**WC .82**		**WC .82**	
Parameter						
pH	7.6	s.d. .22, N = 11	7.8	s.d. .5, N = 8	7.9	s.d. .27, N = 4
Dissolved Oxygen (mg/L)	10.4	s.d. 1.86, N = 11	8.3	s.d. 1.6, N = 10	9.5	s.d. 1.55, N = 4
Alkalinity (mg/L)	76.8	s.d. 22, N = 11	ND	ND	ND	ND
Temperature C	9.7	s.d. 7.7, N =11	11.3	s.d. 8, N = 12	18.7	s.d. 4.6, N = 4
Chloride (mg/L)	14.4	s.d. 3.7, N = 11	23.7	s.d. 14, N = 12	ND	ND
PO4-P (mg/L)	ND	ND	0.009	s.d. .007, N = 12	ND	ND
SO4 (mg/L)	ND	ND	14.4	s.d. 3.1, N = 12	ND	ND
Conductivity (µmhos/cm)	ND	ND	188.6	s.d. 68, N = 12	355	s.d. 1.4, N = 2

Conclusion

Looking towards the future

To protect the Fishkill Creek watershed for future generations, efforts need to be made to protect the stream corridor through the establishment of effective forested stream buffers. The stream buffers will function to offer some measure of protection against encroaching land uses. Additionally, watershed groundwater withdrawals for the expansion of suburban land uses need to be balanced to protect in-stream flows. In conjunction with this, a watershed-wide approach should be employed to determine the amount of regulated discharges that can be added to the various streams during low-flow periods without causing degradation. Stormwater run-off, from parking lots, roads, and subdivisions, should be treated before reaching the streams. In addition, serious investments should be made into impervious surface alternatives.

Water quality monitoring should continue to be conducted to track changes in biological community structure and water chemistry. Dissolved oxygen, temperature, conductivity, nitrate, phosphate, sulfate and chloride are water quality constituents of particular interest for tracking human-induced changes. Finally, failing and out-of-date sewage systems need to be upgraded to protect water quality and human health.

Following these guidelines should allow the Fishkill Creek to thrive along with the communities it touches. Ignoring the water quality of the Fishkill Creek during this period of extensive expansion will act to erode the health of the Fishkill Creek, and ultimately the surrounding communities. In depth recommendations developed by the Fishkill Creek Watershed Committee are available in Chapter 4.

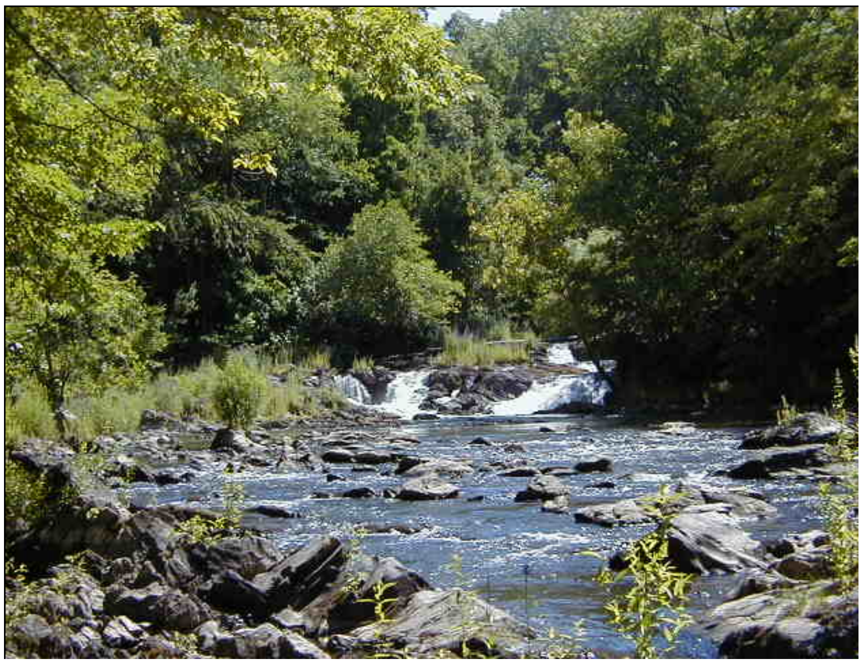


Figure 15. Fishkill Creek rapids near Maddam Brett Park in Beacon, NY.

IV. Management Strategies for Achieving Watershed Conservation Goals and Objectives

Introduction

The previous three chapters outlined many of the natural resources of the Fishkill Creek watershed. Chapter four contains objectives and recommendations that are designed to protect and/or restore the Fishkill Creek watershed. Following these guidelines should allow the Fishkill Creek, and its watershed, to thrive along with the communities it touches.

This chapter is divided into three parts. The first section includes *Watershed Conservation Objectives* that can be applied to the entire watershed. In the second section there are *Subwatershed Specific Recommendations* for the main stem and each subwatershed that include recommendations from previous scientific studies. The third part of this chapter contains *Additional Watershed Protection Measures* identified as important by the Fishkill Creek Watershed Committee. Finally, Chapter five outlines various *Best Management Practices* developed by the New York State Department of Environmental Conservation and other organizations that can be utilized to mitigate for the effects of various development and land use activities on water quality and quantity within a watershed.

Watershed Conservation Objectives

1) The Dutchess County Environmental Management Council and various environmental organizations should collect, organize, evaluate and make public existing data on the Fishkill Creek watershed.

2) Municipalities, government agencies and environmental organizations should continue to monitor water quality and quantity, biodiversity, land use, stream flow regime and other parameters within the watershed with the objective of identifying areas of concern to its integrity. Wherever possible this new data should be incorporated into the database mentioned in objective number one.

3) Municipalities, residents and businesses (i.e. property owners) should work toward remediation of the problems identified through analysis of the database developed through objectives one and two. Environmental groups should assist with the remediation efforts.

4) Businesses, municipalities, environmental groups and residents (the stakeholders) should collaborate to protect the watershed.

5) Environmental organizations, residents, businesses and municipalities should encourage locally based water resource education.

6) All stakeholders should help maintain a good quality– of– life within the watershed by protecting the health of the watershed.

Subwatershed Specific Recommendations

The following recommendations focus on environmental concerns pertaining to the Fishkill Creek watershed and its subwatersheds (major tributaries), as identified in current and previous investigations conducted in the various streams within the watershed.

Entire Fishkill Creek Watershed

Efforts should be made to protect the stream corridor through the establishment of effective forested stream buffers. The stream buffers will offer some measure of protection against encroaching land uses.

Groundwater withdrawals for the expansion of suburban land uses need to be balanced with groundwater recharge to protect in– stream flows. In conjunction with this, a watershed– wide approach should be employed to determine the amount of regulated discharges that can be added to the stream during low–flow periods without causing degradation.

Stormwater run– off, from parking lots, roads, and buildings, should be treated before reaching the stream. This can be accomplished by replacing old infrastructure with modern systems that remove many pollutants (see additional watershed protection measures section).

In addition, serious investments should be made into impervious surface alternatives, and ordinances to limit the amount of impervious surfaces in new developments.

Water quality monitoring should continue to be conducted to track changes in biological community structure and water chemistry. Macroinvertebrate studies should be repeated approximately every 5 years. Dissolved oxygen, temperature, conductivity, nitrate, phosphate, sulfate, and chloride are water quality constituents of particular interest for tracking human– induced as well as natural changes in the drainage.

Mapping of riparian and in–channel habitats should be completed. The remote– sensing based mapping should be updated on a 5 year basis in order to track changes.

Identify streams routinely use for swimming and check to see if NYSDEC classifies them as B (suitable for primary contact recreation). If necessary, request a classification upgrade to class B.

Cumulative impacts should be considered before issuance of state pollution discharge (SPDES) permits.

Best Management Practices (BMPs) issued by the NYSDEC, NYSDOT, USEPA and others should always be followed.

Many of the dams within the watershed are no longer in use. These dams should be systematically evaluated and removed where practical.

Fishkill Creek Main Stem Watershed

Failing and out– of– date sewage systems need to be upgraded to protect water quality and human health.

Sediment in the lower Fishkill Creek should be analyzed to determine the concentration and lateral extent of toxic heavy metal contamination. This should be done before the large dams in the area are breached or deteriorate naturally.

If feasible, remove the many, small (less than 3' high) dams along the Fishkill Creek documented during Streamwalk, 2004.

Sprout Creek Watershed

In their 1994 report, Stevens et al. recommended all new nutrient enhancements and/or reductions in dissolved oxygen need to be carefully evaluated.

Cumulative impacts should be assessed prior to the issuance of permits to discharge to the waters of the Sprout Creek, and in the design of septic systems within 200 feet of the stream.

Agricultural operations that do not follow best management practice guidelines should be identified and encouraged to follow them.

Clove Creek Watershed

In 1985, Schmidt and Kiviat recommended upgrading the NYSDEC classification of Clove Creek to class B due to the amount of primary contact recreation (swimming) that occurs in the stream. Recently, the stream was upgraded from class C to class C(TS) in recognition of the trout spawning that occurs in the stream. If the stream is being utilized for primary contact recreation (swimming), as observed by Kiviat and Schmidt (1985), it should be afforded the protections that accompany a B classification.

As described by Stevens et al. (1994), the Clove Creek watershed is under intense residential, commercial, and industrial development pressure. Therefore, proposals should be scrutinized with the intention of maintaining the high biotic quality present through the period of study (1985 through 2001).

Efforts should be made to protect the highly valuable drinking water available in the Clove Creek aquifer.

Jackson Creek Watershed

Jackson Creek has been subjected to intense development pressures over the last four years (2000– 2004). It is imperative to the health of the biotic communities that water quality and quantity issues be considered during the approval of development projects.

The geomorphic stability of the stream needs to be assessed to determine the impact of an increasing number of stream crossings and land contour changes due to development, particularly in the steep sloped areas upstream of the Route 55 crossing.

Further chemical water quality analysis is warranted to establish base line chemical parameters for Jackson Creek.

Whaley Lake Brook Watershed

Due to relatively high chloride concentrations in Whaley Lake Brook, further chemical studies are warranted to identify potential sources.

Effects of increased sewage inputs on stream flora and fauna need to be evaluated to determine the required level of sewage treatment necessary to minimize impacts from the rapidly developing area (Stevens et al., 1994).

Whortlelkill Watershed

Due to recent rapid watershed development, it would be prudent to conduct further research to determine if land use impacts have damaged biological communities.

Wiccopee Watershed

Proper erosion and sediment controls should be required during construction if the healthy fish populations documented in 1985 are to be restored or maintained.

Other potential impacting land uses, such as gravel mining and orchards, should be investigated to determine their possible effects on in– stream water quality (Schmidt and Kiviat, 1986).

The stream should be assessed chemically and physically to determine potential impacts—specifically, the identity and possible source of the unidentified black substance noted by Stevens et al., (1994).

V. Additional Watershed Protection Measures

Litter/ Solid Waste

The Fishkill Creek Streamwalk of 2004 identified litter as a significant problem along Fishkill Creek (and probably within the entire watershed). A systematic, regularly scheduled effort should be undertaken to address this issue. Annual stream cleanup events should be held in various locations, particularly in the lower Fishkill Creek where the worst of the litter was observed. Regularly scheduled roadside cleanup events should also be done in cooperation with municipalities and NYSDOT. In high litter areas, deterrents such as signage and/or increased police patrols should be employed.

Old or Inadequate Stormwater Runoff Infrastructure

The Fishkill Creek Streamwalk of 2004 documented many discharge pipes emptying directly into the Fishkill Creek. Most of these pipes discharged untreated runoff into the creek, and many of the outfalls created significant erosion features, such as gullies. These old systems should be upgraded to prevent gully formation, and at least partially treat the runoff through the use of the five NYS Stormwater design practices (ponds, wetlands, infiltration, filtering practices and open channels). Additional information can be found in the *Urban/Stormwater Runoff Management Practices* in the Best Management Practices section of this document.

Water Quality Monitoring

The streams, lakes and wetlands within the watershed should be regularly monitored for water quality, water quantity, biodiversity, as well as for physical and habitat changes. Monitoring these changes will help identify which practices or land use changes have significant adverse impacts on the watershed, so these can be avoided in the future.

Water quality monitoring should continue to be conducted to track changes in biological community structure and water chemistry. Macroinvertebrate studies should be repeated approximately every 5 years. Dissolved oxygen, temperature, conductivity, nitrate, phosphate, sulfate, and chloride are water quality constituents of particular interest for tracking human–induced as well as natural changes in water quality. In addition, streamwalk physical assessment surveys, analyses of water quantity and biodiversity studies should be conducted. Finally, mapping of riparian and in– channel habitats should be completed. The mapping should be updated on a 5 year basis in order to track changes.

Regulatory Analysis

A watershed– wide evaluation of regulations, including ordinances and zoning laws, should be undertaken. The evaluation should seek to identify regulatory gaps and determine if the current laws and ordinances adequately protect the watershed. The evaluation should also analyze current municipal zoning regulations for impervious surface/sprawl inducing aspects.

Municipal Studies (Land–Use, Master Plans, etc.)

Various studies commonly conducted by municipalities, such as master plans, land–use studies, and build–out analyses are very useful to watershed protection efforts. An effort should be made to identify which of these studies need to be updated and encourage municipalities to do so.

Evaluation of Projects and Procedures

All projects and procedures undertaken by the Fishkill Creek Watershed Committee should be evaluated to determine whether or not they are effective. Ineffective projects must be modified or abandoned. The Committee should encourage other entities working within the watershed to evaluate their project effectiveness as well.

White–Tailed Deer Management

In recent years deer populations have greatly increased throughout the watershed. Coupled with a decrease in hunters, lack of natural predators and an increase in development the issue of deer overpopulation has grown significantly. Excessive deer browse has damaged forest understories and stream buffer zones, virtually eliminating the next generation of trees. A humane method to control deer populations must be found to reduce the environmental damage caused by overpopulation.

Additional Issues

Important issues such as air and noise pollution are often overlooked when considering the health of a watershed. Air pollution produces acid rain precipitation as well as nitrogen and mercury deposition. Noise pollution adversely affects the quality of life of humans, and can have significant adverse impacts on non– human species. These issues need additional monitoring, and new and creative solutions need to be considered.

Incentive Programs for Watershed Conservation

Tax incentives, cost sharing programs, and award programs can be effective in protecting critical wetlands, watercourses and habitat areas. Tax reductions can be made at the local and county level for deed restrictions, covenants and conservation easements on properties identified for protection. There is also an opportunity for a reduction in income taxes through several donation and gift provisions in the Internal Revenue Code, which can provide attractive incentives for wetland and floodplain protection to landowners (DCEMC, 1999).

Open space assessment programs can be effective where the locality has adopted an open space plan. Within the guidelines of the open space plan or local master plan, assessments supporting local services such as water, sewer, and flood control can be reduced on property that will not be developed in the future.

The following are examples of cost sharing and award programs used both locally and on a national level:

Wetland Reserve Program (WRP)

www.nrcs.usda.gov/programs/wrp

WRP is a U.S. Department of Agriculture (USDA) program designed to help farmers and other landowners take agricultural lands out of production and restore them as wetlands. Technical Assistance is provided by USDA's Natural Resource Conservation Service (NRCS). In exchange for the landowner's agreement to restore and protect the wetland, payments are made for establishing wetland easements on eligible property. In 2004, for permanent easements, 100% of all eligible costs and the appraised agricultural value of the land are paid. For 30– year easements, 100% of all eligible costs and 75% of the appraised value is paid. Wetlands eligible for the program include prior converted cropland, farmed wetlands, farmed wetland pasture, stream corridors, or land substantially altered by flooding. The applicant must own the land for at least 12 months before the end of the sign– up period, and must have a clear title.

Wetland restoration agreements are also available, either in conjunction with an easement or as a stand– alone contract, where the landowner agrees to maintain certain conservation practices for 10 years. Under the restoration program the landowner or another source of funding pays 25% of the cost and USDA– NRCS pays 75%.

Conservation Reserve Program (CRP)

www.fsa.usda.gov/dafp/cepd/crp.htm

CRP encourages farmers to voluntarily plant permanent areas of grass and trees on land that needs protection from erosion, to act as windbreaks, or in places where vegetation can improve water quality or provide food and habitat for wildlife. In 2004, farmers must enter into 10 to 15 year contracts with the United States Department of Agriculture's Commodity Credit Corporation (CCC). In return, they receive annual rental payments, incentive payments for certain activities and cost– share assistance to establish protective vegetation. Eligible land includes cropland that was planted to an agricultural commodity in 4 of the previous 6 most recent crop years, and marginal pastureland that is suitable for use as a riparian buffer to be planted to trees. Landowners who have owned the land for at least one year or operators who have leased the acreage for at least one year are eligible.

Green Power Partnership

http://www.epa.gov/greenpower/index.htm

The Green Power Partnership is a voluntary Partnership between the U.S. Environmental Protection Agency (EPA) and organizations that are interested in buying green power. Through this program, the EPA supports organizations that are buying or planning to buy green power. As a Green Power Partner, an organization pledges to replace a portion of its electricity consumption with green power within a year of joining the Partnership. In 2004, the EPA offered credible benchmarks for green power purchases, market information, and opportunities for recognition and promotion of leading purchasers.

Wildlife Habitat Incentives Program

http://www.nrcs.usda.gov/programs/whip/

The Wildlife Habitat Incentives Program (WHIP) is a voluntary program for people who want to develop and improve wildlife habitat primarily on private land. Through WHIP, USDA's Natural Resources Conservation Service provides both technical assistance and up to 75 percent cost–share assistance to establish and improve fish and wildlife habitat. WHIP agreements between the NRCS and the participant generally last from 5 to 10 years from the date the agreement is signed.

WHIP has proven to be a highly effective and widely accepted program across the country. By targeting wildlife habitat projects on all lands and aquatic areas, WHIP provides assistance to conservation minded landowners who are unable to meet the specific eligibility requirements of other USDA conservation programs.

Education

The Fishkill Creek Watershed Committee has identified education as one of the most important components of a watershed planning strategy. In the past two years the Committee has started a website containing educational information (along with the Dutchess County EMC – FishkillCreekWatershed.org), obtained a Hudson River Estuary Program Grant to create K–12 lesson plans about the watershed (along with the DC Water and Wastewater Authority), helped organize and run the Fishkill Creek Streamwalk Program of 2004 (along with DCEMC and DC Soil and Water Conservation District), participated in the Hudson River Valley Ramble in 2004, organized a Canoe Trip on the Fishkill Creek open to the public (along with DCEMC), operated a booth at East Fishkill Community Day 2004 with displays and free information, and conducted monthly meetings that are open to the public and often have a featured speaker. These efforts should continue annually.

Additional Educational Initiatives (many originating from the Wappinger Creek Watershed Planning Committee) (DCEMC, 2000)

Community Networking

- Develop a centralized source, such as a non– profit group or regional agency, to distribute information and curriculum about the watershed.
- Establish a network among community groups by creating a Fishkill Watershed Resource Partner Book that describes each organization and how to contact them.

Public Education

- Develop routine methods to educate new landowners about water issues. For example, provide realtors with brochures already available from the EMC and SWCD titled, *What is a Wetland?*, *Reducing Nonpoint Source Pollution*, *Streamside Protection for Landowners* and *The Fishkill Creek Watershed*.
- Develop a hands—on display and accompanying presentation that could travel with staff or volunteers to public places such as malls, festivals, community days, teen centers, churches, senior centers or scout meeting places. Include the definition of a watershed, how people affect the watershed in their daily lives, and what they can do to help improve water quality.
- Create a video based on the hands—on display and presentation that could be purchased or loaned out to school and community groups.
- Provide workshops for local officials and landowners about the importance of open space and how it affects the tax base, the importance of agriculture and a healthy forest, and existing NYSDEC regulations.
- Present information on water quality and water quantity to chambers of commerce.
- Have a "Fishkill Creek Watershed Week" in late April or early May with various events planned and corporate sponsors.
- Advertise the benefits and values of the Creek by publishing maps, guides and telephone numbers for stream information in local newspapers and magazines.
- Establish contact with streamside homeowners. Inform them about the importance of vegetated buffers and involve them in community restoration efforts.
- Develop an outreach program to educate homeowners about how their actions can lead to loss of habitat and damage the ecology of our natural systems. Provide economic incentives for homeowners to not only protect habitat, but to restore it.

- Implement neighborhood workshops focusing on integrated pest management, best management practices for lawn care, maintenance of riparian buffers (vegetation along streams), and wetland protection to reduce pollutant loading from pesticides, toxins, sediment and nutrients.

School Programs

- Promote use of a recently developed *Watershed Education for Teachers* booklet developed through the Fishkill Creek Watershed Committee.
- Encourage the use of a watershed curriculum guide developed by Cornell University (Edelstein et al., n.d.).
- Encourage the use of water quality protocols developed by the Hudson Basin River Watch (Behar and Cheo, 2000).
- Develop a Fishkill Creek Watershed training guide for schools based on the data and information in the *Natural Resources Management Plan for the Fishkill Creek Watershed*.
- Provide seminars and workshops for teachers so they are more comfortable with the vast technical information available to them. Use the tools noted above for the workshops. Explore partnering with organizations such as BOCES, Hudson Basin River Watch, NYSDEC Hudson River Estuary Program and IES to cosponsor the programs.
- Send out a teacher survey asking what they currently teach related to watershed protection, and what they would like to have available. Based on the response, recommend the resources noted above or develop additional materials to meet their needs.
- Work at the state level to integrate environmental education into the base curriculum for public schools in a practical and creative way. Encourage or mandate the state board of public education and local school boards to add to programs and provide more time, funding and encouragement for environmental education.
- At the grade school level teach children to educate other children and their parents about environmental protection. Examples include children encouraging their parents to use the town transfer station for recycling and/or high school students mentoring elementary school children on water resource topics.

VI. Best Management Practices

The best management practices listed below were developed as recommendations and required implementation measures by the New York State Department of Environmental Conservation, New York State Department of Transportation, and others. The following practices should be followed to protect the Fishkill Creek watershed.

Agricultural Management Practices

The following is a list of agricultural best management practices. For a detailed description of each practice see the Agricultural Management Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State (NYSDEC, 1992). Additionally, there are other recommendations that can be obtained through the Natural Resources Conservation Service and Soil and Water Conservation District.

Access Road Improvement – Structural and vegetative improvements made to farm roadways.

Barnyard Runoff Management System – An installed system for the interception, collection, and safe disposal of runoff water from a barnyard or concentrated livestock area.

Conservation Tillage – Any tillage and planting system that leaves a minimum of 30% of the soil surface covered with plant residue after the tillage or planting operation. Strip– till, ridge– till and reduced– till are all included under minimum– till definition.

Constructed Wetlands – A constructed, shallow water area, usually a marsh, dominated by cattail, bulrush, rushes or reeds, designed to simulate the water quality improvement function of natural wetlands. Constructed wetlands are usually a component practice in a total system approach to agricultural wastewater and surface agricultural runoff treatment.

Contour Farming – The alignment and operation of all farm tillage, planting and harvesting practices as close to the true contour as possible.

Cover and Green Manure Crop – A crop of close growing grasses, legumes, or small grains grown primarily for temporary, seasonal soil protection and improvement. It is usually grown for 1 year or less. Green manure crops are cover crops, sod crops or intercrops that are plowed under and incorporated into the soil.

Critical Area Protection: Permanent Vegetative Cover – To establish and/or preserve permanent vegetation on highly erodible areas or land vulnerable to nonpoint source pollution.

Critical Area Protection: Structural Slope Protection – The stabilization of erosive slopes with riprap, walls or other non– vegetative materials.

Critical Area Protection: Streambank and Shoreline Protection – The use of vegetation, structures, biotechnology (willow wattles, live cribwalls, brush layering), or management techniques to stabilize and protect streambanks and shorelines.

Critical Area Protection: Mulching – The application of plant residues or other suitable materials to protect permanent vegetative cover or to stabilize soil independently.

Critical Area Protection: Temporary Vegetative Cover – Close– growing grasses or legumes established primarily for temporary, seasonal soil protection and improvement.

Crop Rotation – A planned sequence of annual and/or perennial crops.

Diversion – An earthen drainageway of parabolic or trapezoidal cross– section with a supporting ridge on the lower side.

Fencing – To enclose or divide an area of land with a suitable permanent structure that acts as a barrier to livestock.

Filter Strip – A strip of perennial grasses, legumes or shrubs and trees established or maintained across the slope and managed for pollutant removal by overland flow.

Grassed Waterway – A natural or constructed channel or parabolic or trapezoidal cross– section that is below ground level and is established in suitable vegetation for the stable conveyance of runoff.

Integrated Pest Management – An ecologically– based integrated pest control strategy designed to keep pest populations below economically injurious levels using a variety of control tactics, including: biological controls, cultural practices, resistant crop varieties, scouting, and trap crops.

Irrigation Water Management – A planned system that determines and controls the rate, amount, and timing of irrigation water. May also include "trickle" irrigation systems which deliver water directly to the root zone of plants by means of low volume, low pressure applicators.

Nutrient Management – An integrated system approach to maximizing the efficient use of plant nutrients. Techniques include composting, wise fertilizer management, timed application of manure, analysis of manure nutrients, proper manure storage, and soil testing.

Nutrient/Sediment Control System – A sequential system of structural and vegetative component practices installed down gradient from concentrated operations.

Pasture Management: Short– duration Grazing Systems – A pasture management system using 10 or more paddocks for a grazing season, alternating paddocks every week to allow for forage re– growth.

Pesticide Management – An integrated systems approach to managing the selection, handling, mixing, use, placement, storage and disposal of pesticides used in agricultural crop production. This may include computerized precision application, evaluation of site– specific leaching and surface loss potentials, a permanent structure for pesticide handling, proper equipment calibration, and proper timing and use of pesticides.

Riparian Forest Buffer – An area of trees, shrubs and grasses located adjacent to and up gradient from water bodies.

Strip cropping – Growing annual and perennial crops in a systematic arrangement of strips or bands. When the system is planted on the contour, it is called contour strip cropping. When the system is planted across the general slope, it is called field strip cropping.

Terraces – An earth embankment, a channel, or a combination ridge and channel constructed across the slope.

Construction and Resource Extraction Management Practices

(see also Urban/Stormwater Runoff Management Practices)

Soil erosion from construction and mining in areas where exposed soil is subject to erosion from rainfall events is one of the major causes of sedimentation in the Fishkill Creek Watershed. Even though earth disturbances may take place for a relatively short period of time, the movement of sediment and other pollutants is often severe (NYSDEC, 1992a). In addition, uncontrolled construction site sediment loads have been reported to be on the order of 35 to 45 tons per acre per year (USEPA Office of Water, 1997). Conversely, sediment loadings from undisturbed woodlands are typically less than 1 ton per acre per year (USEPA Office of Water, 1997).

Best Management Practices can be used to prevent erosion from construction and mining sites. The following is a list of best management practices developed by the Construction Management Practices Sub– Committee of the New York State Nonpoint Source Management Practices Task Force. Detailed descriptions of these practices can be found in the Construction Management Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State (NYSDEC, 1992a).

Administrative Control Mechanisms – Erosion and sediment control ordinances, subdivision rules & regulations, site review, zoning regulations and special easements and covenants can be adopted town– wide, countywide, or for special designated areas.

Check Dam – Small, temporary stone dams constructed across a swale or drainageway.

Construction Road Stabilization – The temporary stabilization of access routes, on– site vehicle transportation routes, and parking areas on construction sites.

Construction Waste Management – The proper use or disposal of solid waste materials from construction sites.

Critical Area Protection (See description under *Agricultural Practices*)

Diversions (See description under *Agricultural Practices*)

Dust Control – Application of water, construction of wind barriers, or roughening of soil surface to control the movement of airborne pollutants from land– disturbing activities.

Filter Strip (See description under Agricultural Practices)

Grade Stabilization Structure – A structure for controlling the grade and gully erosion in natural or artificial channels.

Grassed Waterway (See description under Agricultural Practices)

Hazardous Material Management – The proper handling, storage and application of materials defined as hazardous in the Department of Transportation Code of Federal Regulations, Title 49 or in NYS Rules and Regulations, Part 371.

Level Spreader – A non– erosive outlet constructed to disperse concentrated flows uniformly across a slope.

Lined Waterway or Outlet – A channel or outlet permanently protected with rock, concrete or other erosion– resistant material for its entire design depth.

Paved Flume – A small concrete– lined channel used to convey water on a relatively steep slope.

Pipe Slope Drain – A closed drain installed from the top to the bottom of a slope.

Planned Land Grading – Reshaping the land surface to planned erosion– resistant grades as determined by engineering survey and layout.

Riparian Forest Buffer – An area of trees, shrubs and grasses located adjacent to and up gradient from water bodies.

Silt Fence – A temporary barrier of geotextile fabric supported by posts and entrenched in the soil.

Stabilized Construction Entrance – A stable pad of coarse aggregate underlain with filter cloth located at points of construction ingress and egress.

Staged Land Clearing and Grading – Scheduled or phased land disturbances, each phase being limited to what is required for immediate construction activity.

Storm Drain Inlet Protection – A sediment barrier installed around a storm drain inlet.

Straw Bale Dike – A temporary barrier of straw or hay bales that are staked and entrenched in the soil for a depth of at least 4 inches.

Sub– surface Drain – A conduit installed beneath the ground to collect and/or convey drainage water.

Sump Pit – A small basin constructed to collect excess water and sediment from excavation.

Temporary Dike/Swale – A temporary berm and/or excavated channel constructed to direct water to a desired location and stabilized with appropriate materials.

Temporary Sediment Basin – An earthen basin constructed to intercept sediment– laden runoff and to trap and retain the sediment and water– borne debris.

Temporary Sediment Trap – A small ponding area constructed to intercept sediment– laden runoff and retain the sediment.

Temporary Storm Drain Diversion – A re–directed stormwater conveyance that discharges into a sediment– trapping device.

Temporary Watercourse Crossing – A stable structure installed across a watercourse to provide short– term access for construction traffic.

Topsoiling – Conserving and utilizing a specified quality and quantity of topsoil on disturbed areas.

Turbidity Curtain – A flexible barrier used to trap sediment in water bodies.

Waterbar – A ridge, or ridge and channel, constructed across sloping roads, rights– of– way, or other narrow disturbed areas.

Hydrologic and Habitat Modification Management Practices

Hydrologic modification includes stream channelization, dredging, and flow regulation or modification through the use of dams and other structures. Habitat modification occurs when riparian (riverside) vegetation is removed, streambanks are modified and destabilized, and surface water is impounded behind a dam or other structure altering the type of habitat available to plants and animals. Somewhere between 70 and 90 percent of natural riparian ecosystems in the United States have been lost due to human activity (USEPA Office of Water, 1997). These activities can have both short and long– term effects on water quality and quantity in the watershed.

The following practices can be used to lessen the impact of these activities on water resources. Detailed descriptions can be found in *Hydrologic and Habitat Modification Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State* (NYSDEC, 1992b).

- ***Modifying, Operating and Maintaining Flood Control Structures*** – Design modifications, retrofit modifications, and structural or non– structural practices that can be used in addition to or instead of traditional flood control structures, designs or procedures for their operation or upkeep to improve nonpoint pollution control.
- ***Modifying, Operating and Maintaining Reservoirs*** – Operational, vegetative and structural practices that can be used in the maintenance of reservoirs to reduce nonpoint source pollution.
- ***Proper Dam Breaching*** – The partial or total dismantling of a water impounding structure.

Streambank and Shoreline Protection

- ***General*** – The use of vegetation, structures, biotechnology, or management techniques to stabilize and protect streambanks and shorelines.
- ***Biotechnical Methods*** – The use of live dormant stem cuttings or plants in combination with geotextiles or structural devices for erosion control.
- ***Selective Clearing and Snagging*** – Selective removal of trees, log– jams, sediments, and other obstructions from the stream channel in order to re– establish the original hydraulic capacity and gradient of the channel.
- ***Stream Grade Stabilization Structures*** – Selective use of instream flow control structures to control scouring and sedimentation in the stream channel due to both natural and human causes.
- ***Structural Slope Protection*** – The stabilization of steep or erosive slopes with riprap, retaining walls, or other non– vegetative materials either, on the streambank or upslope of the stream channel.

Water Quality and Habitat Protection

Constructed Wetlands (see description in the *Agricultural Practices*)

Improving Instream and Riparian Habitat – Instream and on– bank structures built, or vegetation grown, to improve or create fish habitat in the stream and enhance biodiversity, generally, in the riparian buffer.

Restoring Freshwater Wetlands – Reestablishing the functions and character of a wetland that had been degraded or lost by actions such as filling, excavating, draining, altering hydrology, loss of adequate buffer, or introduction of contaminants. Returning a degraded or former freshwater wetland to a close approximation of pre– disturbance condition.

Restoring Tidal Wetlands – Reestablishing the functions and character of a tidal wetland that has been degraded or lost to a close approximation of pre– disturbance condition.

Riparian Forest Buffer – A corridor of trees, shrubs and grasses of varying width located adjacent to and up gradient from waterbodies.

Stream Corridor Protection Program (Greenbelting) – A program to protect and restore a stream corridor, carried out in cooperation with a unit of government (federal, state or local), the residents of the watershed and other interested conservation organizations.

On–site Wastewater Treatment Systems (septic systems) Management Practices

At least two bodies of water within the watershed (Hillside Lake and Whaley Lake) exhibit elevated levels of nutrients, with on– site septic systems believed to be the primary source (NYSDEC, 1996). In 2004 Whaley Lake suffered a significant, long– term algal bloom, possibly induced by high nutrient levels (*Rick Oestrike, Personal Communication, January 18, 2005*). Impairment of waterways occurs when septic systems fail, when systems are densely located in residential or commercial areas, or when soil types do not allow for filtration of nutrients before they reach groundwater or waterways.

The following techniques can be used by contractors and local governments to reduce the water quality impact of septic systems. For a detailed description of these practices see On–site Wastewater Treatment Management Practices Catalogue for Nonpoint Source Pollution

Prevention and Water Quality Protection in New York State (NYSDEC, 1994). Please note that all wastewater treatment systems must be approved by the Dutchess County Department of Health.

Site and Soils

- ***Soil and Site Analysis*** – Identifying crucial soil, water and other land characteristics that determine site suitability for on– site wastewater treatment systems.
- ***Percolation Tests*** – On–site percolation tests for use in design of appropriate on– site wastewater treatment systems.
- ***Deep Test Holes*** – On– site soil profile evaluation for use in design of appropriate on– site wastewater treatment systems.

Conventional Septic Systems

- ***Septic Tanks and Standard Absorption Fields (Trenches)*** – A large (e.g. 1,000 – 1,750 gallon) buried, watertight chamber for settling wastewater with inlet and outlet baffles to prevent discharge of solids, followed by a distribution box that diverts flow equally to two or more perforated pipes laid in gravel trenches within natural, undisturbed soil.
- ***Aerobic Systems and Standard Absorption Fields*** – A partitioned watertight compartment with a pump, air compressor or other device to inject air into the sewage in the first compartment. The next component is a settling chamber or filtering device. This is followed by solid piping to a distribution box that distributes effluent to perforated pipes in buried gravel trenches or a gravel bed for infiltration into the soil.
- ***Gravelless Absorption Systems*** – A distribution system installed without gravel– filled trenches, where aggregate is not economically available. It receives effluent from the distribution box in the overall wastewater treatment system. Two types of systems commonly used are: (1) Chamber design (2) Geotextile– wrapped corrugated plastic pipe or tubing.
- ***Deep Absorption Trenches*** – A conventional soil absorption system downstream of a septic or aerobic tank. Used in sites where a thick layer of impermeable soil overlies more suitable soil.
- ***Shallow Absorption Trenches*** – A conventional soil absorption system down gradient of a septic or aerobic tank and having additional soil with permeability equal to the original underlying soil used for fill.
- ***Cut and Fill Systems*** – A standard absorption trench system installed on sites where impermeable soil overlays a permeable or usable soil.
- ***Absorption Bed Systems*** – Similar to the absorption trench except that several pressure distribution laterals are installed in a single excavation rather than single laterals in several excavations.
- ***Seepage Pits*** – A covered pit with an open–jointed or perforated lining (either concrete or masonry) through which septic tank effluent infiltrates into the surrounding soil. These devices are sometimes called a leaching pit, leaching pool or dry well and are incorrectly called a cesspool. These are generally discouraged by many local regulatory agencies in favor of trench or bed systems.

Alternative Systems

- ***Raised Systems*** – A conventional absorption trench system constructed in stabilized (in place for at least six months and one freeze/thaw cycle) permeable fill placed above the original ground surface on a building lot. (Note: Granular soils with a percolation rate of 5– 30 min/inch do not require stabilization.)

- ***Elevated Sand Mounds*** – A pressure– dosed absorption system that is elevated above the original soil surface in a sand fill. The system consists of a septic tank (or aerobic tank), dosing chamber and the elevated sand mound.
- ***Intermittent Sand Filters*** – A biological and physical treatment process consisting of a bed of sand receiving periodic doses of wastewater from the septic tank. The liquid passing through the sand filter is then discharged to a mound absorption system. This practice is called a Buried Sand Filter in some literature.

Administration, Operation and Maintenance

- ***Operation and Maintenance for Septic Tanks and Standard Absorption Systems*** – Tasks that the user or a municipal agent must perform to prevent premature failure of a septic system and to assure the longest possible life span and optimum performance. These include annual inspection, providing new homeowners with a septic system location map, discouraging garbage grinders, avoiding disposal of bulky items in the septic system, discouraging use of septic tank additives, limiting discharges from hot tubs, pool backwash, and whirlpool baths to five gallons per minute, keeping swimming pools and heavy equipment away from leach field, keeping roof and cellar drains away from the system, and practicing water conservation.
- ***Inspection and Pumping*** – Periodic (e.g. yearly) septic system inspections and routine pumping (every 1 to 5 years, depending on tank size and number of people in household) of the septic tank.
- ***Administrative Control Measures*** – Regulations, permit processes and other controls available to local units of government for reducing nonpoint source pollution. Examples: Septic surveys, property/home sale contingencies, subdivision rules and regulations, site review and zoning regulations, watershed rules and regulations, wellhead protection measures, and NYS Health Department regulation addendums.

Conservation Measures

- ***High Efficiency Plumbing Fixtures*** – Enforcing the use of high efficiency plumbing devices for new systems, and promoting their use as a contingency for the approval of a replacement or upgraded system.
- ***Graywater Separation*** – Separating toilet water from the wastewater stream and retaining and treating the resulting graywater on–site.

Public Education

- ***Advocating Proper System Design and Construction*** – Preventing future on–site wastewater treatment system failure by promoting professional designer, installer and homeowner education on the design and construction of on– site wastewater treatment systems.
- ***Proper Use and Disposal of Household Hazardous Substances*** – Providing guidelines on the proper use and disposal of household hazardous substances and alternative products that are less hazardous.

Engineered Systems for Nitrate Removal

- ***Anaerobic Upflow Filters (AUF)*** – A component of an on– site wastewater treatment system consisting of a 500– 2,500 gallon tank (or sand filter underdrain system of equal capacity) containing gravel or rock. The unit is continually submerged in septic tank or sand filter effluent to maintain an anaerobic environment.
- ***RUCK System*** – A blackwater/graywater separation and treatment system using two septic tanks, a 3– stage sand filter and a standard or custom– designed soil absorption system.

- ***Recirculating Sand Filters*** – A modified intermittent sand filter in which sand filter effluent is mixed with septic tank effluent and recirculated through the sand filter. A portion of the filtered effluent is discharged to the soil absorption system.
- ***Non–Waterborne Systems*** – Elimination of toilet (blackwater) waste from the soil absorption system by use of a composting toilet, incinerator toilet, chemical toilet, oil recirculating toilet, pit privy, or pumping to a holding tank.
- ***Constructed Wetlands*** – An aquatic plant/microbial filter constructed in a gravel bed or gravel trenches. It may be constructed down gradient from the septic or aerobic tank and followed by an absorption field. It may also be constructed down gradient from an elevated sand mound for effluent polishing. It is a component of a complete wastewater treatment system.

Innovative or Other Systems

- ***Holding Tanks for All Wastewater*** – Temporary underground storage tanks used to retain all wastewater generated by the household, used only when weather conditions, impending sanitary sewers or other conditions make installation of on– site treatment system impossible or impractical.
- ***Rotating Biological Contactors*** – A type of aerobic wastewater treatment system where a module rotates through the stored solids that are used as a biological food source, even in no flow or low flow periods.
- ***Trickling Filter–type Systems*** – A package plant relying on both aerobic and anaerobic bacteria, providing secondary treatment. It receives influent from a septic or aerobic tank and its effluent discharges to a soil absorption system.
- ***Septic and Aerobic Tanks: Septage Disposal Management*** – Determining the most practical economic and publicly acceptable means of disposing of the pumped contents of septic tanks, cesspools (no longer allowed for new facilities in New York State) or other individual sewage treatment facilities that receive domestic sewage wastes.

Leaks, Spills and Accidents Management Practices

The storage and transport of petroleum products is regulated at the federal and state level by the U.S. Environmental Protection Agency and the New York State Department of Environmental Conservation. The following is a list of practices that are required by these agencies, with references for more information contained in the Leaks, Spills and Accidents Management Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State (NYSDEC, 1992c).

- Proper Design of Tanks, Piping Systems and Containment Structures
- Proper Materials Handling and Transfer Operations
- Containing Leaks and Spills
- Detecting Leaks and Spills
- Facility Inspection, Facility Maintenance and Personnel Training Programs
- Temporary and Permanent Closure of Storage Facilities
- Controlling Initial Spills (First Response)
- Upgrading Storage Systems
- Testing and Inspecting Underground Storage Tank Systems
- Inspecting and Maintaining Aboveground Storage Tank Systems
- Record keeping
- Spill Reporting Procedures
- Good Housekeeping Practices

- Materials Compatibility Analysis
- Security Measures
- Risk Identification and Assessment
- Roadway and Right–of–way Maintenance Management Practice

Roadway and Right-of-Way Maintenance Management Practices

State, county and local highway departments have the responsibility of maintaining our roadways in a safe condition. This entails the use of deicing materials (salt and sand), herbicides and asphalt preparations. However, the use and storage of these materials can also cause water quality impairment when activities are located near streams, lakes or storm drains which are often direct connections to local waterways.

The following are management practices that can be used to lessen the impacts of road maintenance activities on water quality. For a detailed description of these practices see the Roadway and Right– of– Way Maintenance Management Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State (NYSDEC, 1994a).

Abrasive and Deicing Material Application and Cleanup – Proper calibration of equipment, spreading and clean– up of abrasive and deicing material based on the storm conditions to avoid excessive accumulation of the material.

Catch Basin Cleaning – Cleaning out the catch basins regularly to maintain their sediment trapping ability.

Control of Bridge Paint Residuals – Methods to avoid the transport to waterbodies of paint chips and dust resulting from surface preparation, grinding, sanding, or washing bridges.

Deicing Material Mixing and Handling – Taking precautions during mixing and transportation of bulk quantities of deicing chemicals to prevent the transport of salt residue and brine from mixing areas, salt delivery trucks or maintenance vehicles directly to waterbodies.

Dust Control – Methods controlling the movement of airborne pollutants and particulate matter from unpaved roads.

Filter Strip – (See description in *Agricultural Practices*)

NYSDOT Highway Maintenance Guidelines, Snow and Ice Control, (NYSDOT, 1993)

- Salt should be applied to roads very early in a storm to be most effective.
- Application rates shall be from 225 lbs of salt per mile, per lane (during light to moderately accumulating snow) to 270 lbs of salt per mile, per lane (during rapidly accumulating dense snow, freezing rain, sleet or pre– existing pack). Follow– up application shall be 115 lbs of salt per mile, per lane.
- Applicators should be calibrated to within 7– ½ % of the target values.
- Spreading patterns and speed should be checked to ensure the spreading pattern of the salt is appropriate.
- Abrasives should generally be used where low traffic volume and/or low temperature will preclude salt from working properly.
- Mixtures of 50:50 salt and abrasive are wasteful and inefficient. For most of NY State, 5% salt mixed with abrasive is sufficient.

- All pure salt shall be stored, covered and housed on an impermeable pad in an acceptable structure.
- The salt storage area selected should not drain directly into a stream, reservoir, well, well aquifer, or adjacent residential property.
  - Herbicide and Vegetation Management
  - Proper Equipment Calibrations
  - Proper Timing of Herbicide Application
  - Read and Follow Herbicide Label Directions
  - Selective Aerial Application

Selective Herbicide Application in Sensitive Areas

- ***Maintenance of Vegetative Cover*** – Maintenance and inspection of vegetative cover in critical areas on a regular basis and re– establishment of vegetation in exposed soils.
- ***Proper Mechanical Control of Vegetation*** – Proper use of mechanical equipment to remove or reduce undesirable vegetation.
- ***Proper Road Ditch Maintenance*** – Techniques for providing stable conditions on roadside ditches during routine sediment removal, clean up, and ditch reshaping operations.
- ***Proper Species Selection for Vegetative Cover*** – Selection of appropriate vegetative species to stabilize the soil and minimize the need for maintenance.
- ***Restoration of Disturbed Areas Within the Right of Way*** – Restoration of the disturbed area to its original condition of slope, soil compaction, ground cover, and hydrologic pattern through appropriate practices.

Salt Storage

- ***Drainage*** – A system used to temporarily store and properly dispose of salt brine solutions collected at salt loading docks, ramps, or other areas associated with a salt storage system where exposure of salt to precipitation is unavoidable.
- ***Foundation/Floor*** – Raising the foundation to an elevation higher than surrounding terrain to prevent run– in; paving the storage area's floor; and providing impermeable padding for the mixing area of the salt storage system.
- ***Shelter/Cover*** – The use of a structure, shed, shelter, or impermeable cover to protect the salt from direct precipitation.
- ***Site Location Selection*** – Selection of salt storage site location considering the protection of water resources.
- ***Street Sweeping/Road Cleanup*** – Use of a mechanical broom sweeper, motorized vacuum sweeper, loaders, or hand tools to clean impervious surfaces.

Silviculture Management Practices

Silviculture management practices are simple, low– cost practices and techniques that can be incorporated into timber harvest to protect water quality, maintain the productivity of the forest, improve public confidence in timber harvesters, and maintain public support for forest management and timber harvesting. Erosion and sedimentation are the primary potential nonpoint source pollution problems associated with forest management activities, especially at stream crossings for forest roads and skid trails (New York State Forestry, 2000). Other associated problems include the removal of overstory vegetation shade that can increase water temperatures, and harvesting operations can greatly increase the amount of organic material (leaves, sticks, etc.) in the waterbody, which can deplete oxygen and alter stream habitats (USEPA Office of Water, 1997).

The following is a list of silvicultural management practices. Detailed descriptions of these practices are available in the *Silviculture Management Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State* (NYSDEC, 1993). Additional guidelines are available in the New York State Forestry – *Best Management Practices for Water Quality: BMP Field Guide* (New York State Forestry, 2000).

Hazardous Material Management – The proper storage, handling and application of materials defined as hazardous in the Department of Transportation Code of Federal Regulations, Title 49 or in NYS Rules and Regulations, part 371.

Planned Access Routes – The proper location and design of logging road/skid trail systems.

Planned Harvest Operations – Harvesting forest products according to a well– developed plan.

Planned Watercourse Crossings – A stable structure installed across a watercourse to provide temporary access for logging equipment.

Riparian Buffer Protection – Preservation of natural vegetation and soil cover adjacent to streams or other waterbodies.

Road Water Management – The control of water on log roads and skid trails.

Sediment Barriers – Temporary structures installed cross– slope to trap sediment before it reaches watercourses.

Vegetation Establishment – Seeding grasses and legumes on exposed forest soils.

Urban/Stormwater Runoff Management Practices

Stormwater causes a significant proportion of water quality impairments in urban areas. Stormwater is usually conveyed to streams through storm sewers, roadside ditches, grassed swales, and ponds. Typically, storms sewers transport runoff rapidly with no pretreatment or filtering before the runoff enters local streams (Westchester County Department of Planning. 1998). One third of the rivers and lakes on the Hudson River basin priority waterbodies list cite urban runoff as the primary source of impairment (NYSDEC, 2000). The primary threat to Hudson Valley drinking water reservoirs is residential/commercial development and the associated urban/suburban runoff of sediment and nutrient loads that promote eutrophication and silt/sediment attributed to stream bank erosion (NYSDEC, 2000).

Pollutants found in urban runoff include heavy metals, toxic organic chemicals, sediment, nutrients, bacteria and protozoa. Also, urban runoff may cause flash flooding because pavement and rooftops prevent rainwater and snowmelt from soaking into the ground.

The following is a list of structures and practices that can be used to filter pollutants or reduce the impact of stormwater on water bodies. For detailed descriptions of these practices see the Urban/Stormwater Runoff Management Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State (NYSDEC, 1994b). Additional practices are outlined in the New York State Stormwater Management Design Manual (NYSDEC, 2001), and the New York Standards and Specifications for Erosion and Sediment Control (NYSDEC, 2005).

Catch Basins – Stormwater runoff inlets equipped with a small sedimentation sump or grit chamber.

Check Dams – Small temporary stone dams constructed across a drainage way.

Collection & Treatment of Stormwater – Physical and chemical operations that provide treatment of urban stormwater runoff but are less involved and costly than treatment plant technology and can be either used independently or interfaced with other best management practices.

Concrete Grid & Modular Pavement – Pavement consisting of strong structural materials having regularly interspersed void areas which are filled with pervious materials, such as sod, gravel, or sand.

Constructed Wetlands – (See description under Agricultural Practices)

Construction Road Stabilization – The stabilization of temporary construction access routes, on–site vehicle transportation routes and construction parking areas.

Critical Area Protection (See description under *Agricultural Practices*)

Debris Basins – Barriers or dams constructed across a waterway or other suitable locations to form a basin for catching and storing sediment and other waterborne debris.

Diversions (See description under *Agricultural Practices*)

Dry Detention Basins – A basin designed to collect and store stormwater runoff in a temporary pool of water for less than 24 hours.

Dust Control – The control of dust resulting from land– disturbing activities.

Earth Dikes – A temporary berm or ridge of compacted soil, located in such a manner as to channel water to a desired location.

Extended Detention Basin – A basin designed to collect and store stormwater runoff in a temporary pool of water for 24 hours or greater.

Filter Strip (See description under *Agricultural Practices*)

Fluidic Flow Regulators – Self– powered flow control devices operating according to a closed–loop signal system, which is responsive to changes in water level and flow characteristics.

Grade Stabilization Structures – Structures to stabilize the grade or to control head cutting in natural or artificial channels.

Grassed Swales – Small vegetated depressions constructed on permeable soils, and designed to convey stormwater runoff from areas less than 1 acre in size.

Grassed Waterways (See description under *Agricultural Practices*)

Implementation of Land Use Planning – Adoption and implementation of comprehensive environmental regulations to govern the development process for the purpose of providing long–term watershed protection.

Infiltration Basins & Pits – An excavated basin (or pit) constructed in permeable soils, for the temporary collection and storage of urban stormwater runoff prior to exfiltration.

Infiltration Trench – A blind sub– surface trench backfilled with gravel for the temporary collection and storage of stormwater runoff prior to exfiltration.

Integrated Pest Management (See description under *Agricultural Practices*)

Irrigation Water Management (See description under *Agricultural Practices*)

Level Spreaders – Non– erosive outlets for concentrated runoff constructed to disperse flow uniformly across the slopes.

Lined Waterways or Outlets – Waterways or outlets with a lining of concrete, stone, or other permanent material. The lined section extends up the side slopes to the designated depth. The earth above the permanent lining may be vegetated or otherwise protected.

Nutrient Management: (See description under *Agricultural Practices*)

Composting Yard and Home Wastes	Fertilizer Management	Soil Testing•

Paved Flumes – Small concrete– lined channels to convey water on a relatively steep slope.

Peat/Sand Filter System – Peat/sand filters are gravity driven, constructed filtration systems designed to reduce nonpoint source pollutant loading from urban watersheds to receiving waterbodies.

Perimeter Dikes/Swales – Temporary ridges of soil excavated from an adjoining swale located along the perimeter of the site or disturbed area.

Pesticide Management – An integrated systems approach to managing the selection, handling, mixing, use, placement, storage and disposal of pesticides used on turf grasses and ornamental plants in urban areas.

Pipe Slope Drains – Temporary structures placed from the top of a slope to the bottom of a slope.

Porous Pavement – Porous pavement is graded aggregate cemented together by asphalt into a coherent mass that has sufficient interconnected voids to provide a high rate of permeability to water.

Portable Sediment Tanks – Sediment tanks are compartmented tank containers through which sediment– laden water is pumped to trap and retain the sediment.

Proper Use and Disposal of Household Hazardous Substances (See description under On–site Wastewater Treatment System Practices)

Public Education – Nonpoint source instructional programs, workshops and information campaign conducted by educational institutions, agencies and organizations for the public.

Reduction of Traffic– generated Pollutants – Pollution prevention measures to lower the amount of pollutants originating from motor vehicle traffic in urban areas.

Retaining Walls – Structural walls constructed and located to prevent soil movement.

Retention Pond (Wet Pond) – An excavated pond designed to store and retain a permanent pool of water for evaporation or partial infiltration.

Riparian Forest Buffer – (see description under Hydrologic and Habitat Modification Management Practices).

Riprap Slope Protection – A layer of stone designed to protect and stabilize areas subject to erosion.

Rock Dams – Rock embankments located to capture sediment.

Rock Outlet Protection – A section of rock protection placed at the outlet end of the culverts, conduits or channels.

Roof Runoff System – A system to handle roof runoff by directing it to down spouts and into trenches prior to infiltration into permeable soil.

Sediment Basins – Temporary barriers or dams constructed across a drainage way or at other suitable locations to intercept sediment– laden runoff and to trap and retain the sediment.

Sediment Traps – Temporary sediment control devices formed by excavation and/or embankment to intercept sediment– laden runoff and to retain the sediment.

Silt Fences – Temporary barriers of geotextile fabric (filter cloth) used to intercept sediment– laden runoff from drainage areas of disturbed soil.

Stabilized Construction Entrances – Stabilized pads of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right– of– way, street, alley, sidewalk or parking area.

Stormwater Conveyance System Storage – Providing storage capability within stormwater conveyance systems for temporary detention and controlled release of urban stormwater during wet weather.

Straw Bale Dikes – Temporary barriers of straw or similar material used to intercept sediment– laden runoff from small drainage areas of disturbed soil.

Stream Corridor Protection Program – (See Hydrologic and Habitat Modification Management Practices section).

Street and Pavement Sweeping – Use of a mechanical broom sweeper or motorized vacuum sweeper to clean impervious surfaces.

Storm Drain Inlet Protection – Permeable barriers installed around inlets in the form of a fence, berm or excavation around an opening, thereby reducing sediment content of sediment laden water.

Structural Streambank Protection – Stabilization of eroding streambanks by the use of designed structural measures.

Subsurface Drains – Conduits, such as tile, pipe or tubing, installed beneath the ground surface that intercept, collect, and/or convey drainage water.

Surface Roughening – Roughening a bare soil surface with horizontal grooves running across the slope, stair– stepping, or tracking with construction equipment.

Sump Pits – Temporary pits which are constructed to trap and filter water for pumping to a suitable discharge area.

Temporary Access Waterway Crossings – A temporary access waterway crossing is a structure placed across a waterway to provide access for construction purposes for a period of less than one year. Temporary access crossings shall not be utilized to maintain traffic for the general public.

Temporary Storm Drain Diversions – The redirection of storm drain lines or outfall channels so that they may temporarily discharge into a sediment– trapping device.

Temporary Swales – Temporary excavated drainage ways.

Turbidity Curtains – Flexible, impenetrable barriers used to trap sediment in water bodies. These curtains are weighted at the bottom to achieve closure while supported at the top through a flotation system.

Urban Forestry (Trees and Shrubs) – Protecting and planting trees and shrubs before, during and after urban site development.

Water Bars – Ridges or ridges and channels constructed diagonally across a sloping road or utility right– of– way that is subject to erosion.

Water Quality Inlet (Oil/Grit Separators) – Water quality inlets (also known as oil/grit separators) are subsurface, multi– chamber inlets installed in parking lots to trap heavy sediment and hydrocarbons from urban stormwater runoff.

Pathogen and Nutrient Management Control

- ***Nuisance Bird Waste Management and Control*** – Activities undertaken by individuals, corporations and units of government to deter nuisance birds that contribute fecal material to urban stormwater runoff and groundwater.
- ***Pet Waste Management and Control*** – Institutional control measures employed by local governments and management measures employed by individuals to prevent nonpoint source pollution by urban canines and felines.
- ***Waterfowl Waste Management and Control*** – Activities undertaken by individuals, corporations and units of government to deter nuisance waterfowl that contribute fecal material to waterbodies and groundwater.

Policy and Programs for Stormwater Control

by Barbara Kendall, Stormwater Outreach Specialist, Hudson River Estuary Program, NYSDEC Region 3

Numerous studies have documented water quality and water quantity impacts from stormwater runoff, as well as the role of impervious surface in a watershed in creating those impacts. But how can we control these impacts when land use decisions take place at the local level? The EPA has recognized that the control of stormwater impacts must be shared by multiple levels of government by promulgating the Phase II Stormwater Regulations under the National Pollutant Discharge Elimination System (NPDES) program. New York State has implemented this program under the State Pollutant Discharge Elimination System with two general permits: The SPDES General Permit for Stormwater Discharges from Construction Activity (GP– 02– 01) and the SPDES General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s) (GP– 02– 02).

Construction Site Runoff

The construction activity general permit was developed by New York State in response to the research that showed that construction sites can be major contributors of sediment to streams, lakes and wetlands. The construction permit also reflects research showing that imperviousness can be quantified, managed and controlled during land development. In effect as of March 2003, GP– 02– 01 requires any owner or operator of construction activities of more than one acre to file with the NYSDEC a Notice of Intent to discharge stormwater and prepare a Stormwater Pollution Prevention Plan (SWPPP) for the site. All activities require a level one SWPPP consisting of an erosion and sediment control plan including such items as silt fences, sediment traps and phasing sequences. In some cases, a level two SWPPP is also required that includes post– construction stormwater controls such as stormwater ponds, stormwater wetlands, filtering and infiltration practices.

Recognizing the impervious area impacts on watershed function, New York State has incorporated impervious area calculations into the formulas that are required under GP– 02– 01 for sizing of stormwater management practices as detailed in the New York State Stormwater Management Design Manual (Design Manual). The Design Manual was written by the Center for Watershed Protection in Maryland, in consultation with the New York State Department of Environmental Conservation. Based on the most recent research, the Design Manual contains a wealth of information, including an entire chapter on the impacts of new development on our waterways. The approved stormwater management practices that are listed in the Design Manual have been proven through research to remove 80% of the total suspended solids and 40% of the total phosphorus from stormwater when installed correctly.

Municipal Stormwater Programs

The General Permit for Stormwater Discharges from MS4s (GP– 02– 02), while sounding like a wastewater permit program, is, in actuality, a community– wide watershed planning program. MS4s, defined as a population center of 50,000 with an associated surrounding area of 1,000 people per square mile or more, must develop a local Stormwater Management Program by 2008 that contains six minimum measures of control: Public Education and Outreach, Public Involvement and Participation, Illicit Discharge Detection and Elimination, Construction Site Runoff Control, Post– Construction Runoff Control, and, finally, Pollution Prevention and Good Housekeeping. The required activities include identification of impaired waterways, mapping of stormwater outfalls, public education on the impacts of stormwater, and adoption of a local law or other regulatory mechanism to control sedimentation from construction sites and stormwater impacts from newly created impervious areas. Optional items include water quality monitoring of streams and stormwater discharges. As one can see, these activities involve multiple levels of involvement by planning, conservation, educational and scientific groups at the local level.

The NYSDEC has developed various tools to assist communities with this program, including a Stormwater Management Guidance Manual for Local Officials that contains a Model Local Law for Stormwater Management, educational materials, and a grant program for MS4s from the Environmental Protection Fund. The Model Local Law is designed to be adopted as amendments to a municipality's zoning, site plan, subdivision and erosion control laws. Through adoption of these amendments, the municipality will then require a Stormwater Pollution Prevention Plan (or equivalent) during subdivision and site plan review that contains stormwater management practices that reflect the most recent research on pollutant controls and stream channel protection. Since New York State is a home rule state, the most effective way to produce change at the local level is to include requirements for stormwater controls during the local review process.

Exciting Enhancements to the Required Program

There are exciting opportunities to build on the requirements of the Stormwater Phase II program and create even better land use projects that will be reflected in more livable communities and even better watershed quality. The concept of Low Impact Development (LID) incorporates infiltration and filtering of stormwater at the individual lot level, while emphasizing use of natural contours and protection of existing riparian buffers. LID also encourages subdivision layouts that reduce street widths, provide sidewalks on one side of the street, and eliminate cul– de– sacs. When combined with the techniques outlined in the Design Manual, LID can reduce impervious cover and reduce the required size of stormwater management practices.

A community should also look beyond the requirements of the Stormwater Phase II program and incorporate protection of wildlife habitat and biodiversity when approving stormwater management practices for a site. While stormwater ponds and wetlands do create wildlife habitat, they may attract certain amphibians that cannot survive in fluctuating water levels. By mapping sensitive habitat areas on a community– wide basis within a watershed planning process, local boards can then recognize areas where infiltration and filtering practices would be a better choice than stormwater ponds and wetlands. In addition, use of certain infrastructure practices such as "Cape Cod Curbs" can facilitate the movement of amphibians in urban and suburban areas. Cape Cod Curbs are designed with a maximum 1:4 slope.

Finally, by incorporating riparian buffer, wetland and watercourse, and steep slope regulations along with a stormwater management law at the local level, communities can provide a suite of natural resource protection laws that provide protection for their waterways and habitats. Other techniques such as conservation subdivisions, overlay districts, and purchase of development rights also provide site– specific tools for managing land use. The Pace Land Use Law Center has developed a series of guides that can assist communities in developing these land use controls (see the Starting Ground Series, 2003, available from the Land Use Law Center, Pace University School of Law and the NYSDEC Hudson River Estuary Program).

The NYSDEC Hudson River Estuary Program is currently providing education and outreach on the Stormwater Phase II program for communities in the Hudson Valley. Please contact Barbara Kendall at 845– 256– 3163 or blkendal@gw.dec.state.ny.us. If you would like to order the Stormwater Management Guidance Manual for Local Officials, other educational materials or would like to schedule a presentation. The Hudson River Estuary Program also provides technical assistance and grants to communities and non– profit organizations on watershed planning, biodiversity and Hudson River education programs.

Vernal Pool Management

Vernal pools, a type of seasonal or temporary wetland, are very important to the survival of many Hudson Valley plants and animals. The rapid wet– dry cycle of vernal pools prevents fish from becoming established, allowing critical breeding and rearing habitat for amphibians, crustaceans, and insects (Biebighauser, 2002). The multitude of organisms supported by these pools are key links within the Hudson Valley's web of life.

The management guidelines below are taken from *Forestry Habitat Management Guidelines for Vernal Pool Wildlife*, MCA Technical Paper Series: No. 6 (Calhoun and deMaynadier, 2004) and *The Best Development Practices, Conserving Pool– Breeding Amphibians in Residential and Commercial Developments in the Northeastern United States*, MCA Technical Paper Series: No. 5 (Calhoun and Klemens, 2002). The management areas include the Vernal Pool Depression itself, the Vernal Pool Envelope (extending 100' outward from the pool edge) and the Critical Terrestrial Habitat (extending from 100' to 750' outward from the pool edge).

- Property owners should be aware of the importance of vernal pools and where on their land the pools are located.
- Develop a strategy for mapping and tracking potential vernal pools either from aerial photography or as discovered in the field.
- Identify highly productive vernal pools suitable for more rigorous protection strategies.
- Maintain the vernal pool basin, associated vegetation and pool water quality in an undisturbed state.
- Within 100' of the pool's edge, maintain an undeveloped forested habitat around the pool, including both canopy and understory. Avoid barriers to amphibian dispersal. Protect and maintain pool hydrology and water quality. Maintain a pesticide– free environment.
- From 100' to 750' of the pool's edge, maintain or restore a minimum of 75% of the zone in contiguous forest with undisturbed ground cover. Maintain or restore forested corridors connecting wetlands or vernal pools. Provide suitable terrestrial habitat for pool– breeding amphibian populations by maintaining or encouraging at least a partially closed– canopy stand that will provide shade, deep litter, and woody debris. Minimize disturbance to the forest floor. Where possible, maintain native understory vegetation.
- Roads and driveways should be excluded from the vernal pool depression and the vernal pool envelope (within 100' of the pool edge).
- Roads and driveways with projected traffic volumes in excess of 5– 10 cars per hour should not be sited within 750' of a vernal pool. The total length of roads within 750' of the pool should be limited to the greatest extent possible.
- Use Cape Cod– style curbing or no– curb alternatives on low capacity roads.
- Use oversize square box culverts (2' wide x 3' high) near wetlands and known amphibian migration routes to facilitate amphibian movement under roads. These should be spaced at 20' intervals and use curbing to deflect amphibians toward the box culverts.

- Use cantilevered roadways (i.e., elevated roads that maximize light and space underneath) to cross low areas, streams, and ravines that may be important amphibian migratory routes.
- Cluster development to reduce the amount of roadway needed and place housing as far from vernal pools as possible.
- During construction, minimize disturbed areas and protect down– gradient buffer areas to the extent practicable.
- Site clearing, grading and construction activities should be excluded from within 100' of a vernal pool.
- Site clearing, grading and construction activities should be limited to less than 25% of the entire area out to 750' from the pool edge.
- Limit the area of clearing, grading and construction by clustering development.
- Minimize erosion by maintaining vegetation cover on steep slopes.
- Avoid creating ruts and other artificial depressions that hold water. If ruts are created, refill to grade before leaving the site.
- Refill percolation test pits to grade.
- Use erosion and sediment control best management practices to reduce erosion.
- Limit forest clearing on individual house lots, within the developed sections less than 750' from the edge of a pool, to no more than 50% of lots that are two or more acres in size. Encourage landscaping with natural woodland, containing native understory and groundlayer vegetation, as opposed to lawn.
- Silt fencing should be used to exclude amphibians from active construction areas. Construction activities should, ideally, occur outside of peak amphibian movement periods (which include early spring breeding and late summer dispersal).
- Vernal pool depressions should never be used, either temporarily or permanently, for stormwater detention or biofiltration.
- Treat stormwater runoff using grassy swales with less than 1:4 sloping edges. If curbing is required, use Cape Cod curbing. Maximize open drainage treatment of stormwater.
- Use hydrodynamic separators only in conjunction with Cape Cod curbing or swales to avoid funneling amphibians into treatment chambers, where they are killed.
- Maintain inputs to the vernal pool watershed at pre– construction levels. Avoid causing increases or decreases in water levels.
- Accessory structures (e.g., outbuildings, swimming pools) should be excluded within 100' of the edge of a vernal pool.
- Belowground swimming pools located within 750' of a vernal pool should be surrounded by some sort of barrier. A fine mesh wire at the base of a picket fence or a one– foot high, 90– degree curb or barrier would deter amphibians from traveling into the pool.
- Alteration of existing conditions within vernal pools and other small wetlands should be avoided.
- Creation of ponds and similar wetlands should be avoided within 750' of a vernal pool.

- Redirect effort from creating low value, generalized wetland to enhancing terrestrial habitat around vernal pools. These enhancements could include reforestation of post–agricultural lands within 750' of a vernal pool, restoration of forest, importing additional cover objects (e.g., logs, stumps) and removal of invasive plants and animals.
- Discourage predators by keeping garbage and other supplemental food sources unavailable.
- Consider keeping cats indoors at all times. This would reduce predation on a wide variety of species, ranging from pool– breeding amphibians to ground– nesting birds. Attaching bells to cat collars does not significantly reduce the ability of cats to prey on small vertebrates.
- Mark the edge of a protected area (within 750' of a vernal pool) with permanent markers. Well– marked boundaries make enforcement of restricted areas clear to both homeowners and the local wetlands enforcement agency.
- Use covenants or deed restrictions to assure that the vernal pool and its envelope are conserved, and that pesticide use, lot clearing and other degrading activities are kept out of associated areas. Assign the homeowner or homeowner's association with responsibility for ensuring that conditions of the covenant or deed restriction are met. Provisions should also be included to allow a third party, such as the town or local land trust, with adequate notice, to enter the property and conduct appropriate management and remediation, charging the homeowner for these services.
- In the case of a homeowner's association or other type of multiple tenant arrangement, a stewardship manual could be prepared that would educate each purchaser, or lessee, as to the unique nature of the property they are purchasing or renting, what their collective obligations to protect the resource entail, and where to obtain additional assistance or information.
- A conservation easement, covering at a minimum to 100' from the vernal pool (and, preferably to 750') could be held by a municipality, land trust or other non– government organization.

References

Allan, B.F., Keesing, F., and Ostfeld, R.S. 2003. Effect of Forest Fragmentation on Lyme Disease Risk. Conservation Biology 17(1): 267-272.

Babbitt, B. 2002. What goes up may come down. BioSci. 52(8): 656-658.

Balk R. 1936. Structural and petrological studies in Dutchess County, New York, Part I. Geologic structure of sedimentary rocks. Geological Society of America Bulletin, 47: 685-774.

Barbour, M.T., Gerritsen, J., Snyder, B.D., Stribling, J.B. 1999. Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

Barth, T. F. W. 1936. Structural and petrological studies in Dutchess County, New York, Part II. Petrology and metamorphism of the Paleozoic rocks. Geological Society of America Bulletin, 47: 775-850.

Bednark, A. 2001. Undaming rivers: a review of the ecological impacts of dam removal. Ecological Management. 27(6): 803-814.

Behar S. and Cheo, C. 2000. Hudson Basin River Watch Guidance Document. Hudson Basin River Watch, 3570 Route 29, East Greenwich, NY.

Behar, Sharon. 1996. Testing the Waters Chemical and Physical Vital Signs of a River. River Watch Network, Montpelier, VT. 147 P.

Biebighauser, T.R. 2002. A Guide to Creating Vernal Pools. USDA Forest Service, 2375 KY Highway 801 South, Morehead, KY.

Bilby, R.E., Reeves, G.H. and Dolloff, C.A. 2003. Sources of variability in aquatic ecosystems: factors controlling biotic production and diversity. Ch. 6 in Strategies for Restoring River Ecosystems: Sources of Variability and Uncertainty in Natural and Managed Systems. Ed R. Wissmar and P.A. Bisson. American Fisheries Society: p. 129-146.

Black, G. and Winne, P. 1998. Recreational Use and Economic Impact of the Wappinger Creek Watershed. Bureau of Economic Research, Marist College, Poughkeepsie, NY.

Bode, R. W., Novak, M.A., and Abele, L.E. 1991. Biological Assessment of the Fishkill Creek. Stream Biomonitoring Unit, Division of Water, NYS Department of Environmental Conservation, 625 Broadway, Albany, NY 12233.

Bode, R. W., Novak, M.A., Abele, L.E., Heitzman, D.L. 2001. Biological Assessment of tributaries of the Lower Hudson River, targeted studies of stressed streams. New York State Department of Environmental Conservation, Division of Water, Albany, N.Y.: 4 p.

Bode, R.W., Novak, M.A., Abele, L.E., Heitzman, D.L., and Smith, A.J. 2002. Quality Assurance Work Plan For Biological Stream Monitoring in New York State. NYS Department of Environmental Conservation, Division of Water, Stream Biomonitoring Unit, Albany, NY.

Bode, R.W., Novak, M.A., Abele, L.E., Heitzman, D.L., and Smith, A.J. 2004. 30-year trends in water quality of rivers and streams in New York State, based on macroinvertebrate data. NYS Department of Environmental Conservation, Technical Report. 384 pages.

Boedeltje, G., Bakker, J.P., Brinke, A.T., Van Groenendeal, J.M. and Soesbergen, M. 2004. Dispersal pheneology of hydrochorous plants in relation to discharge, seed release time and buoyancy of seeds: the flood pulse concept supported. J. of Eco. 92: 786-796.

Bowman, M. 2002. Legal Perspectives on dam removal. BioSci. 52(8): 739-747.

Bunn, S.E. and Davies, P.M. 2000. Biological processes in running waters and their implications for the assessment of ecological integrity. Hydrobiologia. 422/423: 61-70.

Calhoun, A.J.K. and P. deMaynadier. 2004. Forestry habitat management guidelines for vernal pool wildlife. MCA Technical Paper No. 6, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, NY.

Calhoun, A.J.K. and M.W. Klemens. 2002. Best development practices: Conserving pool-breeding amphibians in residential and commercial developments in northeastern United States. MCA Technical Paper # 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, NY.

Clark, G.M., Mueller, D.K., Mast, M.A. August 2000. Nutrient Concentrations and Yields in Undeveloped Stream Basins of the United States. Journal of the American Water Resource Association, Vol 36(4): 849-860.

Clark, S.J., Bruce-Burgess, L. and Wharton, G. 2003. Linking form and function: towards an eco-hydromorphic approach to sustainable river restoration. Aquat. Cons. Mar. and Freshw. Eco. 13: 439-450.

Center for Watershed Protection. 2000. The Practice of Watershed Protection, Techniques for protecting our nation's streams, lakes, rivers, and estuaries. Center for Watershed Protection, Ellicot City, M.D. Article 17, 3(1): 554-565.

Chazen Companies. 2003. County-wide Groundwater Monitoring Program, 2002 Annual Report, Dutchess County. The Chazen Companies, Poughkeepsie, NY.

CLEARS. 1995. LUNR Classification and Inventory Methods. Cornell Laboratory for Environmental Applications of Remote Sensing, Cornell University, Ithaca, NY.

Covich, A.P., Palmer, M.A., and Crowl, T.A. 1997. The role of benthic invertebrate species in freshwater ecosystems, zoobenthic species influence energy flows and nutrient cycles. BioScience 49(2):119-127.

Crook, D.A. and Robertson, A.I. 1999. Relationships between riverine fish and woody debris: implications for lowland rivers. Mar. Freshw. Res. 50:941-953.

Curtis, P. D. (accessed 2004). Can QDM Improve Deer Management in Forested Landscapes?

Department of Natural Resources, Cornell University. Ithaca, NY 14853 http://www.dnr.cornell.edu/ext/forestrypage/pubs/infobroch/by%20topic/quality_deer_management_curtis.htm.

Dates, G. and Byrne, J. 1996. River Watch Network Benthic Macroinvertebrate Monitoring Manual. River Watch Network, Montpelier, Vermont.

DCDPD and DCEMC. 1985. Natural Resources of Dutchess County, NY. Dutchess County Department of Planning and Development and Dutchess County Environmental Management Council. Millbrook, NY.

DCEMC. 1995. Dutchess County GIS Metadata Record: 1020, National Wetlands Inventory, original data from U.S. Fish and Wildlife Service. Dutchess County Environmental Management Council, Millbrook, NY.

DCEMC. 1999. Local Strategies for Wetland and Watercourse Protection, Dutchess County Environmental Management Council, Millbrook, NY.

DCEMC. 2000. Natural Resources Management Plan for the Wappinger Creek Watershed. Dutchess County Environmental Management Council, Millbrook, NY.

DCEMC GIS Laboratory. 2003. Land Use for Natural Resources Analysis of the Fishkill Creek Utilizing 2000 Digital Orthophotos. Dutchess County Environmental Management Council, Millbrook, NY.

D'Ermilio, R. 1985. The Effects of Treated Sewage Effluent of Phosphorus Concentrations in the East Branch of Wappinger's Creek. State University of New York, College at Purchase: 99p.

Dodds, W.K. 2002. Freshwater Ecology: Concepts and Environmental Applications. Academic Press. New York.

Doyle, M.E., Harbor, J. M., and Stanley, E.H. 2003. Towards policies and decision making for dam removal. Env. Manag. 31(4): 453-465.

Dutchess County Environmental Management Council. 1977. Freshwater Wetlands Field Data Sheets, Millbrook, NY.

Edelstein, K., Trautmann, N., and Krasny, M. n.d. Watershed Science for Educators. Cornell University, ISBN # 1-57753-250-3, Ithaca, NY.

Edmonds, R.L., Francis, R.C., Mantua, N.J. and Peterson, D.L. 2003. Sources of climatic variability in river ecosystems. Ch. 2 in Strategies for Restoring River Ecosystems: Sources of Variability and Uncertainty in Natural and Managed Systems. Ed R. Wissmar and P.A. Bisson. American Fisheries Society: p. 11-38.

Evans, R.A. 2002. An Ecosystem Unraveling? Proceedings: Hemlock Woolly Adelgid in the

Eastern United States Symposium, February 5-7, 2002, East Brunswick, New Jersey. http://www.fs.fed.us/na/morgantown/fhp/hwa/pub/proceedings/eco_unravel.pdf, (Accessed February, 2004).

Gilbert, S. 1989. Significant Natural Areas in the Town of Pawling. Little Whaley Lake and Area. Pawling, NY.

Grim, J.S. 1996. Investigation of Light Penetration and Turbidity in Beaver Lake and Deer Lake. Northeastern Biologists, Inc., Rhinebeck, NY: 7 p.

Gwin, S.E., Kentula, M.E., Shaffer, P.W. 1999. Evaluation of wetland regulations through hydrographic classification and landscape profiles. Wetlands 19(3): 477-489.

Haberstock, A.E., Nichols, H.G., DesMeules, M.P., Wright, J., Christensen, J.M. and Hudnut, D.H. 2000. Method to identify effective riparian buffer widths for atlantic salmon habitat protection. J. of the Amer. Wat. Resourc. Assoc. 36(6): 1271-1286.

Hambler, C. 2004. Conservation: strategies in biology. Cambridge University Press. Cambridge.

Hammer, D.A. 1997. Creating Freshwater Wetlands. Lewis Publishers. New York.

Hart, D.D., Johnson, T.E., Bushaw-Newton, K.L., Horawitz, R.J., Bednarek, A.T., Charles, D.F., Kreeger, D.A. and Velinsky, D.J. 2002. Dam removal: challenges and opportunities for ecological research and river restoration. BioSci. 52(8): 669-681.

Hauer, F.R., Dahm, C.N., Lamberti, G.A. and Stanford, J.A. 2003. Landscapes and ecological variability of rivers in North America: factors affecting restoration strategies. Ch. 4 in Strategies for Restoring River Ecosystems: Sources of Variability and Uncertanty in Natural and Managed Systems. Ed R. Wissmar and P.A. Bisson. American Fisheries Society: p. 81-105

Horsley and Witten. 1992. Watershed Management Plan for Dutchess County. Horsley, Witten, Hegemann, Inc., Barnstable, MA: 6.8-6.10.

Johnson, D.H. 2000. Dam Restoration and Rehabilitation Study, Project # 99102, Whaley Lake Dam, Town of Pawling, NY. Zarecki and Associates Co. LLC. Pawling, NY.

Johnson, S.E. and Graber, B.E. 2002. Enlisting the social sciences in decisions about dam removal. BioSci. 52(8): 731-738.

Kelly, V.R., Lovett, G.M., Weathers, K.C., Likens, G.E. 2002. Trends in atmospheric concentration and deposition compared to regional and local pollutant emissions at a rural site in southeastern New York, USA. Atmospheric Environment 36: 1569-1575.

Kishbaugh, S.A. and B.R. Hohenstein. 2000. 1999 Interpretive Summary: New York Citizens Statewide Lake Assessment Program (CSLAP) - Whaley Lake. New York State Department of Environmental Conservation Division of Water, Lake Services Section, Albany, NY: 45 p.

Kiviat, E. 1984. Dutchess County, NY, Natural Resources, Wildlife Section. Dutchess County Department of Planning and the Dutchess County Environmental Management Council. Millbrook, NY.

Kiviat, E. 1984a. Dutchess County, NY, Natural Resources, Vegetation Section. Dutchess County Department of Planning and the Dutchess County Environmental Management Council. Millbrook, NY.

Kyker-Snowman, Thom. 2003. Rotten Logs and Sowbugs: the Role of dead wood. Massachusetts Association of Professional Foresters. http://www.massforesters.org/coarse.htm (Assessed 1/30/04).

Larke, S.J., Bruce-Burgess, L. and Wharton, G. 2003. Linking form and function: towards an eco-hydromorphic approach to sustainable river restoration. Aqut. Cons. Mar. and Freshw. Eco. 13: 439-450.

Lewis, R.R. 1989. Wetland restoration/creation/enhancement terminology: suggestions for standardization. Wetland Creation and Restoration: the status of science, Vol. 2 EPA 600/3/89/038B. U.S. Environmental Protection Agency, Washington, D.C.

Limburg, K.E., Moran, M.A., McDowell, W.H., Buckley. J.M. 1986. The Hudson River Ecosystem. Springer-Verlag, NY.

LoGiudice, K., Ostfeld, R.S., Schmidt, K.A., Keesing, F. 2003. The ecology of infectious disease: Effects of host diversity and community composition on Lyme disease risk. Proceedings of the National Academy of Sciences 100(2): 567-571.

Mackenzie, L. 2001. Weather America, a thirty-year summary of statistical weather data and rankings. Grey House Publishing Inc., Millerton, NY.

[MCA/WCS] Metropolitan Conservation Alliance, Wildlife Conservation Society. 2002. Biological and ecological considerations in the development of the General Electric Motors site, Sleepy Hollow, N.Y. MCA site report no.1. prepared for Scenic Hudson, Inc.

McCasland, M., Trautmann, N. M., Wagenet, R. J., Porter, K.S. 1998. Nitrate: Health Effects in Drinking Water. Natural Resources, Cornell Cooperative Extension, 5123 Comstock Hall

Cornell University, Ithaca, New York. On Internet: http://pmep.cce.cornell.edu/facts-slides-self/facts/nit-heef-grw85.html.

Moffat, S.M. 2003. Dams levees, and river health. Science. 261: 1115-1116.

Montgomery, D.R., and Bolton, S.M. 2003. Hydrogeomorphic variability and river restoration. Ch. 3 in Strategies for Restoring River Ecosystems: Sources of Variability and Uncertainty in Natural and Managed Systems. Ed R. Wissmar and P.A. Bisson. American Fisheries Society: p. 39-80.

Murray, K.R., Bode, R.W., Phillips, P.J., Wall, G.L. 2002. Impact Source Determination with Biomonitoring Data in New York State: Concordance with Environmental Data. Northeastern Naturalist 9(2): 127-162.

National Audubon Society, New York. 1998. Important Bird Areas in New York State. National Audubon Society, Albany, NY. On internet: http://ny.audubon.org/iba/whaley.html.

National Park Service. 1993. Environmental Assessment of Alternatives for Nuclear Lake Site, Dutchess County, NY. U.S. Department of the Interior, National Park Service, Appalachian National Scenic Trail, Harpers Ferry, WV.

Neuderfer, G.N. 1973. A Macroinvertebrate Study of Fishkill Creek. Division of Fish and Wildlife, New York State Department of Environmental Conservation, Albany, NY.

New York Natural Heritage Program. 2003. Animal Species Actively Inventoried in the Biological and Conservation Data System. New York Natural Heritage Program, Albany, NY.

New York Natural Heritage Program. 2004. Rare Plant Species List. New York Natural Heritage Program, Albany, NY.

New York State Forestry (2000) Best Management Practices for Water Quality: BMP Field Guide. Prepared by Empire State Forest Products, NYSDEC, and the Watershed Agricultural Council, Walton, NY.

New York State Museum. 1991. Geology of New York- A Simplified Account, Educational Leaflet No. 28, New York State Museum/Geological Survey, The State Education Department, University of State of NY. Albany and Auburn, NY (respectively).

Nieder, W.C. 1994. Identification of Nonpoint Source pollution in a Multiple Land Use Watershed (Unpublished Data): Sawkill, Dutchess County, NY. Hudson River National Estuarine Research Reserve, Annandale, NY: 12p.

Nilsson, C., Jansson, R. and Zinko, U. 1997. Long-term responses of river-margin vegetation to water level regulation. Science. 276: 798-800.

NOAA. 1985. Climatography of the United States No. 20, Climatic summaries for selected sites, 1951-80: New York. National Oceanic and Atmospheric Administration, National Climatic Data Center, Asheville, NC.

Nuclear Lake Management Site Clearance Subcommittee. 1982. Nuclear Lake, A Resource in Question. Dutchess County, NY. 132 p.

NYSDEC. 1992. Agriculture Management Practices Catelogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State. New York State Department of Environmental Conservation, Division of Water, Bureau of Water Quality Management, Albany, NY.

NYSDEC. 1992a. Construction Management Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State. NYS Department of Environmental Conservation, Division of Water, Bureau of Water Quality Management, Albany, NY.

NYSDEC. 1992b. Hydrologic and Habitat Modification Management Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State. NYS Department of Environmental Conservation, Division of Water, Bureau of Water Quality Management, Albany, NY.

NYSDEC. 1992c. Leaks, Spills and Accidents Management Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State. NYS Department of Environmental Conservation, Division of Water, Bureau of Water Quality Management, Albany, NY.

NYSDEC. 1993. Silviculture Management Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State. NYS Department of Environmental Conservation, Division of Water, Bureau of Water Quality Management, Albany, NY.

NYSDEC. 1994. On-site Wastewater Treatment Management Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State. NYS Department of Environmental Conservation, Division of Water, Bureau of Water Quality Management, Albany, NY.

NYSDEC. 1994a. Roadway and Right-of-Way Maintenance Management Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State. NYS Department of Environmental Conservation, Division of Water, Bureau of Water Quality Management, Albany, NY.

NYSDEC. 1994b. Urban/Stormwater Runoff Management Practices Catalogue for Nonpoint Source Pollution Prevention and Water Quality Protection in New York State. NYS Department of Environmental Conservation, Division of Water, Bureau of Water Quality Management, Albany, NY.

NYSDEC. 1996. New York State Water Quality 1996. New York State Department of Environmental Conservation Division of Water, Albany, N.Y.: 2 p.

NYSDEC. 1999. The 1999 Lower Hudson River Basin Waterbody Inventory and Priority Waterbodies List. New York State Department of Environmental Conservation, Division of Water, Albany, N.Y.: 115p.

NYSDEC. 2000. The 1999 Lower Hudson River Basin Waterbody Inventory and

Priority Waterbodies List. New York State Department of Environmental Conservation, Division of Water, Albany, N.Y.: 12p.

NYSDEC. 2001. New York State Stormwater Management Design Manual. NYS Department of Environmental Conservation, Division of Water, Bureau of Water Quality Management, Albany, NY.

NYSDEC. 2004. Some Questions and Answers on Acid Rain. New York State Department of Environmental Conservation, 625 Broadway, Albany, NY. http://www.dec.state.ny.us/website/dar/ood/acidrain.html (Accessed October 8, 2004).

NYSDEC. 2005. New York Standards and Specifications for Erosion and Sediment Control. NYS Department of Environmental Conservation, Division of Water, Bureau of Water Quality Management and the Empire State Chapter of the New York State Soil and Water Conservation Society, Albany, NY.

NYSDOT. 1993. NYSDOT Highway Maintenance Guidelines, Snow and Ice Control. New York State Department of Transportation, Albany, NY.

Omernik, J.M. 1976. The Influence of Land Uses on Stream Nutrient Levels. United States Environmental Protection Agency, Corvallis Environmental Research Laboratory, Corballis, OR. EPA-600/3-76-014.

Ormerod, S.J. 2004. A golden age of river restoration science. Aquatic Conserv: Mar. Freshw. Ecosyst. 14: 543-549.

Orwig, D.A. 2002. Stand Dynamics Associated with Chronic Hemlock Wooly Adelgid Infestations in Southern New England. Proceedings: Hemlock Woolly Adelgid in the

Eastern United States Symposium, February 5-7, 2002, East Brunswick, New Jersey. http://www.fs.fed.us/na/morgantown/fhp/hwa/pub/proceedings/dynamics.pdf (Accessed February, 2004).

Pejcher, L. and Warner, K. 2001. A river might run through it again: criteria for consideration of dam removal and instream lessons from California. Env. Manag. 26(5): 561-575.

Pimentel, D., Wilson, C., McCullum, C., Huang, R., Dwen, P., Flack, J., Tran, Q., Saltman, T., Cliff, B. 1997. Economic and Environmental Benefits of Biodiversity. BioScience 47(11): 747-756.

Pizzuto, J. 2002. Effects of dam removal on river form and process. BioSci. 52(8): 683-691.

Plafkin, J.L., Barbour M.T., Porter K.D., Gross S.K. & Hughes R.M. 1989. Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates & Fish. US Environmental Protection Agency Assessment and Watershed Protection Division, EPA/440/4-89/001,Washington.

Poff, L. N., Hart, D. D. 2002. How dams vary and why it matters for the emerging science of dam removal. Bioscience. 52(8): 659-668.

Reschke, C. 1990. Ecological Communities of New York State. New York Natural Heritage Program, New York State Department of Environmental Conservation, Latham, NY.

Rosenberg, D.M., Danks, H.V. and Lehmkuhl, D.M. 1986. Importance of Insects in Environmental Impact Assessment. Environmental Management 10(6): 773-783.

Schmidt, R.E. and Kiviat, E. 1986. Environmental Quality of the Fishkill Creek Drainage, A Hudson River Tributary. Hudsonia Ltd., Bard College, Annandale, NY.

Schmidt, R.E. and Limburg, K. 1989. Fishes Spawning in Non-tidal Portions of Hudson River Tributaries. Final Report to the Hudson River Foundation, Grant #005/87R/012, New York: 74p.

Shafroth, P.B., Friedman, J.M., Auble, G.T., Scott, M.L. and Braatne, J.H. 2002. Potential responses of riparian vegetation to dam removal. BioSci. 52(8): 703-712.

Shields, F.D., Copland, R.R., Kilngeman, P.C., Doyal, M.W., and Simon, A. 2003. Design for stream restoration. J. of Hydraulic Engineering. 129(8): 575-584.

Shuman, R. 1995. Environmental considerations for assessing dam removal alternatives for river restoration. Regulated Rivers; Research and Management. 11: 249-261.

Smith, R.A., Alexander R.B., and Lanfear, K. J. 1991. Stream Water Quality in the Conterminous United States -- Status and Trends of Selected Indicators During the 1980's. National Water Summary 1990-91 -- Stream Water Quality, U.S. Geological Survey Water-Supply Paper 2400. U.S. Geological Survey, 410 National Center, Reston, VA.

Snyder, C.D., Young, J.A., Smith, D., Lemarie, D.P., and Smith, D.R. 2002. Influence of eastern hemlock (*Tsuga canadensis*) forests on aquatic invertebrate assemblages in headwater streams. Canadian Journal of Fisheries and Aquatic Sciences 59(2): 262-275.

Stainbrook, K. 2004. Using Ecological Indicators to Detect Environmental Change in Urbanizing Watersheds: Case Study in Dutchess County, NY. State University of NY, College of Environmental Science and Forestry, Syracuse, NY.

Stanley, E.H. and Doyle, M.W. 2002. A geomorphic prospective on nutrient retention following dam removal. BioSci. 52(8): 693-701.

Stanley, E.H. and Doyle, M.W. 2003. Trading off: the ecological effects of dam removal. Frontiers in Eco and Enviro. 1(1): 15-22.

Stanley, E.H., Luebxe, M., Doyle, M.W. and Marshall, D.W. 2002. Short-term changes in channel form and macroinvertebrate communities following low head dam removal. J. N. Amer. Benthol. Soc. 21(1): 72-187.

Stevens, G., Schmidt, R.E., Roeder, D.R., Tashiro, J.S., and Kiviat, E. 1994. Baseline Assessment of Tributaries to the Hudson (BATH): Water quality, Fishes, Macroinvertebrates, and Diatoms in Fishkill Creek, Quassic Creek, and Moodna Creek. Volume 1. Hudsonia Ltd, Annandale, NY: 13 p.

Suren, A.M., Biggs, J.M., Duncan, M.J., Bergey, L., and Lambert, P. 2003a. Benthic community dynamics during summer low-flows in two rivers of contrasting enrichment 2. invertebrates. New Zeland J. Mar. Freshw Research. 37:71-83.

Suren, A., Biggs, B. and Kilroy, C. and Burgey, L. 2003b. Benthic community dynamics during summer low-flows in two rivers of contrasting enrichment 1. periphton. New Zealand J Mar. Freshw Research. 37:53-70.

Sweeney, B.W. 1993. Effects of streamside vegetation on macroinvertebrate communities in White Clay Creek in Eastern North America. Proceedings of the Academy of Natural Sciences of Philadelphia 144: 291-340.

Tung, C.P., and Haith, D.A. 1995. Global-Warming Effects on New York Streamflows. Journal of Water Resources Planning and Management. Vol. 121, No. 2, March/April: 216-225.

U.S. Census Bureau. 2001. U.S. Census Population, 1990-2000. Compiled by the Dutchess County Department of Planning and Development. Available: http://www.co.dutchess.ny.us/countygov/departments/Planning/PLcensus.htm (Accessed 10/31/03).

USEPA. 1996. Environmental Indicators of Water Quality in the United States: United States EPA Report # EPA 841-R-96-002: 25 p.

USEPA. 1997. Volunteer Stream Monitoring: A Methods Manual. EPA 841-B-97-003. United States Environmental Protection Agency Office of Water, Washington, DC. 173 P.

USEPA Office of Water. 1997. Monitoring Guidance for Determining the Effectiveness of Nonpoint Source Controls. EPA-841-B-96-004. United States Environmental Protection Agency. Washington, D.C.: 1-10 P.

USEPA. 2002. Summary of biological assessment programs and biocriteria development for states, tribes, territories, and interstate commissions: Streams and wadeable rivers. EPA-822-R-02-048. U.S. Environmental Protection Agency Office of Water, Washington, D.C.

USGS. 1998. Water Quality in the Hudson River Basin, New York and Adjacent States, 1992-95. U.S. Geological Survey Circular 1165, USGS, Troy, N.Y.: 31 p.
USGS. 2003. Real Time Data for the Fishkill Creek at Beacon, NY, Station # 01373500. Available: http://nwis.waterdata.usgs.gov/ny/nwis/discharge/?site_no=01373500 (Accessed 10/31/03).

Welsch, David J., Smart, David L., Boyer, James N., Minkin, Paul, Smith, Howard C., and McCandless, Tamara L. 1995. Forested Wetlands, Functions, Benefits, and the Use of Best Management Practices. United States Department of Agriculture Forest Service, Radnor, PA: 30-31 P.

Westchester County Department of Planning. 1998. Controlling Nonpoint Source Pollution in Long Island Sound. Westchester County Planning Department, White Plains, NY.

Whitelaw, E. and MacMullan, E. 2002. A framework for enlisting the costs and benefites of dam removal. BioSci. 52(8): 724-738.

Winner, R.W., Boesel, M.W., Farrell, M.P. 1980. Insect Community Structure as an index of heavy-metal pollution in lotic ecosystems. Can. J. Fish. Aquat. Sci. 37: 647-655.

Wissmar, R.C., Braatne, J.H., Beschta, R.L., and Rood, S.B. 2003. Variability of riparian ecosystems: implications for restoration. Ch.5 in Strategies for Restoring River Ecosystems: Sources of Variability and Uncertainty in Natural and Managed Systems. Ed R. Wissmar and P.A. Bisson. American Fisheries Society: p. 107-128.

Yoder, C.O. 1991. The integrated biosurvey as a tool for evaluation of aquatic life use attainment and impairment in Ohio surface waters. In: Biological Criteria: Research and Regulation. U.S. Environmental Protection Agency, Office of Science and Technology, Washington, D.C.: 110-122.

Appendices

Appendix 1.
Acronyms

avg. = average
cc. = cubic centimeter
cm. = centimeter
cfs = cubic feet per second
deg. = degree
gm. = gram
gpm = gallons per minute
gpd = gallons per day
gph = gallons per hour
hr. = hour
L = liter(s)
ml = milliliter(s)
mg/L = milligrams per liter
ppb = parts per billion
ppm = parts per million

AEM = Agricultural Environmental Management Program
AU = Animal Unit (1 AU = 1000 lbs. Animal)
BMP = Best Management Practice
CAFO = Concentrated Animal Feedlot Operation
CCE = Cornell Cooperative Extension
CEA = Critical Environmental Area
CRP = Conservation Reserve Program
CSLAP = Citizens Statewide Lake Assessment Program
CWA = Clean Water Act
CWQCC = County Water Quality Coordinating Committee
DCEMC = Environmental Management Council DEC = Department of Environmental Conservation
DOH = Department of Health
DOS = Department of State
EAF = Environmental Assessment Form
ECL = Environmental Conservation Law
EIS = Environmental Impact Statement
EPA = Environmental Protection Agency
EPF = Environmental Protection Fund
EPT = Ephemeroptera, Plecoptera and Trichoptera
EQIP = Environmental Quality Incentives Program
FCWC = Fishkill Creek Watershed Committee
FEMA = Federal Emergency Management Administration
FIP = Forestry Incentives Program
FIRM = Flood Insurance Rate Maps
FLPP = Farm Land Protection Program
FSA = Farm Service Agency
GIS = Geographic Information System
HVRC = Hudson Valley Regional Council
IBA = Important Bird Area
IES = Institute of Ecosystem Studies
LID = Low Impact Development
LUNR = Land Use and Natural Resources Inventory
MTBE = Methyl tertiarybutyl ether
NPS = Nonpoint Source
NRCS = National Resources Conservation Service
NYSDEC = New York State Department of Environmental Conservation
NYSDOT = New York State Department of Transportation
PAH = Polycyclic aromatic hydrocarbons
PCE = Perchlororthylene
PWL = Priority Waterbody List of the NYSDEC
RIBS = NYSDEC Rotating Intensive Basin Study
RBP = Rapid Bioassessment Protocols
SEQR = State Environmental Quality Review
SEQRA = State Environmental quality Review Act
SPDES = State Pollution Discharge Elimination System
SWCC = Soil and Water Conservation Committee
SWCD = Soil and Water Conservation District
TCA = Trichloroethylene
TCE = Trichloroethylene
USDA = United States Department of Agriculture
USGS = United States Geological Survey
WCWPC = Wappinger Creek Watershed Planning Committee
WFP = Whole Farming Program
WSP = Water Supply Protection
WHIP = Wildlife Habitat Incentives Program
WRP = Wetlands Reserve Program

Appendix 2.
Watershed Environmental Resource Directory
Names, Addresses, Phone Numbers, Email, Websites
(12/23/04)

Watershed Groups, and Other Interested Parties

Catskill Center for Conservation and Development
Tom Alworth, Executive Director
Aaron Bennett, Watershed Coordinator
P.O. Box 504, Route 28
Arkville, NY 12406
(845) 586-2611
(845) 586-3044 (fax)
Email: abennett@catskill.net
Website: www.catskillcenter.org

Fishkill Creek Watershed Committee
Website: FishkillCreekWatershed.org
Online Discussion:
groups.yahoo.com/group/Fishkillwatershed

Onesquethaw Coeyman's Watershed/ NYS Council, Trout Unlimited
Roy Lamberton
PO Box 90
East Berne, NY 12059
(518) 872-2217
Email: roymcl@aol.com

Onesquethaw-Coeymans Watershed Council
Fred Realbuto
46 Rarick Road
Selkirk, NY 12158
(518) 767-9051 x 15

PlanPutnam
Jeff Green
145 Miller Hill Road
Kent Cliffs, NY 10512
Email: jeff@planputnam.org
Website: www.planputnam.org

Protect the Plattekill Creek & Watershed
Sandra Thorpe, Coordinator
290 Fish Creek Rd.
Saugerties, NY 12477
(845) 246-7174
Email: rthorpe@hvc.rr.com

Quassaick Creek Coalition
Bob Ewald
261 Van Keuren Ave.
Pine Bush, NY 12566
(845) 361-5069
Email: rbewald@citlink.net
Website: www.qcreek.org

Quassaick Creek Coalition
Jean Wort
PO Box 988
Ft. Montgomery, NY 10922
(845) 446-5831
Email: jeanwort@aol.com

Saugerties Watershed Council
Joe Damrath
(845) 657-6069

Sawkill Watershed Alliance
Mary McNamera
PO Box 241
Woodstock, NY 12498
(845) 679-7664
Email: mmcnamara@parnassussquare.com

Saw Mill River Coalition (a program of Groundwork Yonkers)
Carol Capobianco
6 Wells Avenue
Yonkers, NY 10701
(914) 375-2151
Email: carol@groundworkyonkers.org

Sparkill Watershed Conservancy
Greg Mercurio
PO Box 771
Ft. Montgomery, NY 10922
(845) 446-5885
Email: pikaiafish@aol.com

Sparkill Watershed Conservancy
Larry Vail
389 King's Highway
Tappan, NY 10983
(845) 365-1159
Email: Ldvail@optonline.net

Wallkill River Task Force
Martha Cheo
115 Springtown Road
New Paltz, NY 12561
(845) 256-9316

Wallkill River Task Force/Orange County Land Trust
Ann Botshon
350 Burlingham Road
Pine Bush, NY 12566
(845) 361-1322
Fax. (845) 361-1322
Email: botshon@warwick.net

Wappinger Creek Watershed Planning Committee
Bruce Donagan, Chair
Dutchess County Environmental Management Council
2715 Route 44, Suite 2
Millbrook, NY 12545
(845) 677-5253

Local and Regional Environmental and Conservation Organizations

Dutchess Land Conservancy
Becky Thornton
Executive Director
2908 Route 44
Millbrook, NY 12545
(845) 677-3002
Website: www.dutchessland.org

Environmental Advocates of New York
Website: www.eany.org

Hudson Basin River Watch
Website: www.hudsonbasin.org

Hudson River Valley Greenway Conservancy
Carmella R. Mantello, Executive Director (acting)
Capitol Building, Capital Station, Room 254
Albany, NY 12224
(518) 473-3835
Email: hrvg@hudsongreenway.state.ny.us
Website: www.hudsongreenway.state.ny.us

Hudsonia Limited, Inc.
Executive Director
Bard College Field Station
Annandale, NY 12504
(845) 758-7273
Website: www.hudsonia.org

Hudson River Sloop Clearwater
Andy Mele, Executive Director
Manna Jo Greene, Environmental Director
112 Little Market Street
Poughkeepsie, NY 12601
(845) 454-7673
Website: www.clearwater.org

Hudson River Environmental Society
Stephen O. Wilson, Executive Director
6626 Stitt Road
Altamont, NY 12009
(518) 861-8020
Website: www.hres.org

Institute of Ecosystem Studies
Alan Berkowitz, Director of Education
Box R
Millbrook, NY 12545
(845) 677-5359
Website: www.ecostudies.org

Local Government Environmental Assistance Network (LGEAN)
www.lgean.org

NY City Dept. of Environmental Protection (DEP)
www.nyc.gov/dep

NY Public Interest Research Group
www.nypirg.org

Pictures along Dutchess Co. Rd. 29 (Fishkill Creek) in East Fishkill
dutchess29.org/protect_pages/Protect_East_Fishkill_Resources_Page_1.html

Rivers & Estuaries Center on the Hudson
199 Main Street
Beacon, NY 12508
(845) 838-1600
Email: Info@riversandestuaries.org
Website: www.riversandestuaries.org

Riverkeeper
PO Box 130
Garrison, NY 10524
800-217-4837
Email: info@riverkeeper.org
Website: www.riverkeeper.org

Scenic Hudson
Ned Sullivan, Executive Director
9 Vassar Street
Poughkeepsie, NY 12601
(845) 473-4440
Website: www.scenichudson.org

The Nature Conservancy, Lower Hudson Chapter
Kathleen Moser, Executive Director
19 North Moger
Mt. Kisco, NY 10549
(845) 244-3271
Website: (New York Chapter)
www.nature.org/wherewework/northamerica/states/newyork

County and State Government Offices

Cornell Cooperative Extension of Dutchess County (CCEDC)
Farm and Home Center
2715 Route 44, Suite 1
Millbrook, NY 12545
(845) 677-8223
Website: www.cce.cornell.edu/~dutchess/splash.htm

Dutchess County Department of Health (DOH)-(Main Office)
Dr. Michael Caldwell, Commissioner
387 Main Street
Poughkeepsie, NY 12601
(845) 486-3404
Email: healthinfo@co.dutchess.ny.us
Website:
www.co.dutchess.ny.us/CountyGov/Departments/Health/HDIndex.htm

Dutchess County Department of Planning and Development
Roger Akeley, Commissioner
27 High Street
Poughkeepsie, NY 12601
(845) 486-3610
Email: plandev@co.dutchess.ny.us
Website:
www.dutchessny.gov/CountyGov/Departments/Planning/PLIndex.htm

Dutchess County Resource Recovery Agency
96 Sand Dock Road
Poughkeepsie, NY 12601
(845) 462-6090
Email: agency@dcrra.org
Website: www.dcrra.org

Dutchess County Soil and Water Conservation District
Website: dutchess.ny.nacdnet.org

Dutchess County Water and Wastewater Authority
27 High Street
Poughkeepsie, NY 12601
(845) 486-3601
Email: dcwwa@co.dutchess.ny.us
Website:
www.dutchessny.gov/CountyGov/Departments/WaterandWaste/WRIndex.htm

Dutchess County Department of Public Works
Michael Murphy, Commissioner
22 Market St.
Poughkeepsie, NY 12601
(845) 486-2121
Email: dpwadmin@co.dutchess.ny.us
Website:
www.dutchessny.gov/CountyGov/Departments/PublicWorks/PWIndex.htm

Dutchess County Legislature
Bradford Kendall, Chairman
22 Market St.
Poughkeepsie, NY 12601
(845) 486-2100
Email: countylegislature@co.dutchess.ny.us
Website:
www.dutchessny.gov/CountyGov/Departments/Legislature/CLindex.htm

New York State Department of Environmental Conservation (DEC)

DEC Central Office, Division of Water
625 Broadway
Albany, NY 12233
(518) 402-8233
Website: www.dec.state.ny.us/website/dow

DEC Region 3
Marc Moran, Regional Director
21 South Putt Corners Rd
New Paltz, NY 12561
(845) 256-3000
Website: www.dec.state.ny.us/website/reg3

DEC Region 4
1150 North Westcott Rd.
Schnectady, NY 12306
(518) 357-2234
Website: www.dec.state.ny.us/website/reg4

DEC - Environmental Notice Bulletin (weekly)
Website: www.dec.state.ny.us/website/enb

DEC - Stony Kill Farm Environmental Education Center
79 Farmstead Lane
Wappingers Falls, NY 12590
(845) 831-8780
Website:
www.dec.state.ny.us/website/education/stonykil.html

DEC - The NYS Hudson River Homepage
Website:
www.dec.state.ny.us/website/hudson

DEC - Hudson River Estuary Program
Scott Cuppett, Watershed Program Manager
21 South Putt Corners Rd
New Paltz, NY 12561
(845) 256-3029
Email: swcuppet@gw.dec.state.ny.us
Website:
www.dec.state.ny.us/website/hudson/hrep.html

NY State Environmental Facilities Corporation
Website: www.nysefc.org

Environmental Management Councils

New York State Association of Environmental Management Councils
Website: www.nysaemc.org

Dutchess County EMC
Farm and Home Center
2715 Route 44, Suite 2
Millbrook, NY 12545
Website: dutchessemc.org

Putnam County EMC
Barbara Scuccimarra Chairperson
Putnam County EMC
37 Highridge Road
Garrison NY 10524
(845) 265-2601
bscucc@aol.com

Rockland County EMC
Diane Gruskin
50 Sanitorium Road, Building P
Pomona, NY 10970
(845) 364-2669
GruskinD@co.rockland.ny.us

Ulster County EMC
Marian Strouse, Staff Coordinator
PO Box 557
Stone Ridge, NY 12484
(845) 687-0267
Mstrouse@hvi.net

Westchester County EMC
Kay L. Eisenman, Staff Coordinator
148 Martine Avenue
432 Michaelian Office Building
White Plains, NY 10601
(914) 995-4424/4422
kle1@westchestergov.com

Soil and Water Conservation Districts - www.nacdnet.org

Hudson Valley Region

Albany County Soil and Water Conservation District
Box 497, Martin Rd.
Voorheesville, NY 12186
(518) 765-7923

Columbia County Soil and Water Conservation District
1024 Rt. 66
Ghent, NY 12075
(518) 828-4386

Delaware County Soil and Water Conservation District
44 West St
Suite 1
Walton, NY 13856
(607) 865-7161

Dutchess County Soil and Water Conservation District
Farm and Home Center
2715 Route 44, Suite 1
Millbrook, NY 12545
(845) 677-8011
Website: www.dutchess.ny.nacdnet.org
Email: dutchess@ny.nacdnet.org

Greene County Soil and Water Conservation District
11C # 3 Box 907
Cairo, NY 12413
(518) 622-3620
Website: www.gcswcd.com

Lower Hudson Coalition of Conservation Districts
4433 Route 81
Greenville, NY 12083
Website: www.lhccd.org

Orange County Soil and Water Conservation District
225 Dolson Ave., Suite 103
Middletown, NY 10940
(845) 343-1873

Putnam County Soil and Water Conservation District
841 Fair Street
Carmel, NY 10512
(845) 878-7918

Rensselaer County Soil and Water Conservation District
Ag and Life Science Building
61 State Street
Troy, NY 12180
(518) 271-1740

Rockland County Soil and Water Conservation District
50 Sanitorium Rd
Pomona, NY 10970
(845) 364-2667

Saratoga County Soil and Water Conservation District
50 West High Street, Building 5
Ballston Spa, NY 12020
(518) 885-6900

Sullivan County Soil and Water Conservation District
69 Ferndale-Loomis Rd
Liberty, NY 12754
(914) 292-6552

Ulster County Soil and Water Conservation District
Times Square Office Park
652 Route 299
Highland, NY 12528
(845) 883-7162

Westchester County Soil and Water Conservation District
432 Michaelain Building
148 Martine Avenue
White Plains, NY 10601
(914) 285-4422

Federal Agencies

United States Environmental Protection Agency (EPA), Region 2
290 Broadway
New York, NY 10007
(212) 637-3000
Website: www.epa.gov/region2

EPA Environmental Response Team
Website: www.ertresponse.com

EPA Superfund Program
Website: www.epa.gov/superfund

United States Geological Survey
425 Jordan Road
Troy, NY 12180
(518) 285-5600
Website, general: www.usgs.gov
Website, Waters in NY:
water.usgs.gov/wid/html/ny.html

National Wildlife Federation
Website: www.nwf.org

US Army Corps of Engineers (USACE)
New York District , Jacob K. Javits Federal Building
26 Federal Plaza
NY, NY 10278-0090
(212) 264-0100
George Nieves, Chief of Operations
(212) 264-9020
John Cavolaro, Deputy Chief of Operations
Ella Snell, Chief Supervisor
(212) 264-0238
Mark Roth - Western Permits
James Cronin - Dutchess County Project Manager
Mr. Bryon Orzel
Website (NY): www.nan.usace.army.mil
Website (US): www.usace.army.mil

Additional USACE Websites

USACE Headquarters, Regulatory Branch
www.usace.army.mil/inet/functions/cw/cecwo/reg

USACE New York District, Nationwide Permits and Regional Conditions
www.nan.usace.army.mil/business/buslinks/regulat/permits

USACE's Waterways Experiment Station (WES)
www.wes.army.mil

USACE's Wetlands Regulatory Assistance Program (WRAP)
www.wes.army.mil/el/wrap

USACE Wetland Management Handbook
el.erdc.usace.army.mil/wrap/pdf/srel00-16.pdf

Recent Corps Regulatory Announcements & Decisions
www.usace.army.mil/inet/functions/cw/cecwo/reg/citizen.htm

Guidance on Compensatory Mitigation Projects, Regulatory Guidance Letter 02-2
www.usace.army.mil/inet/functions/cw/hot_topics/RGL_02-2.pdf

Summary of 2002 Nationwide Permits (PDF format)
www.usace.army.mil/inet/functions/cw/cecwo/reg/Summary_table.pdf

Nationwide Permit Summaries
www.spk.usace.army.mil/pub/outgoing/co/reg/nwp

Current Decision Documents (Environmental Assessments), Nationwide Permits
www.usace.army.mil/inet/functions/cw/cecwo/reg/nw2002dd

USACE's Aquatic Resources News
www.usace.army.mil/inet/functions/cw/cecwo/reg/aqua_ltr.htm

Joint Application for Permit Form
http://www.nan.usace.army.mil/business/buslinks/regulat/formdocs/jtperm.pdf

USACE's Public Notice Distribution List Request Sheet
http://www.nan.usace.army.mil/business/buslinks/regulat/formdocs/pnmail2.pdf

USDA - Stream Corridor Restoration
Website: www.nrcs.usda.gov/technical/stream_restoration

Watershed Websites

American Rivers - provides directory to rivers and river groups, river issues including landuse and urban sprawl, water quality, floodplains and wetlands, fish and wildlife and wild and scenic rivers,
(www.americanrivers.org)

American Heritage Rivers - provides recent information on President Clinton's American Heritage Rivers (AHR) initiative to support community-led efforts,
(www.epa.gov/rivers)

Association of State Wetland Managers - provides information on wetland and watershed management consisting of a guidebook that makes recommendations for integrating wetlands into broad watershed management efforts. It also includes information on specific water programs including floodplain management, stormwater management, source water protection, point source pollution control, and nonpoint source pollution control programs,
(www.aswm.org)

Bonneville Power Administration, Fish and Wildlife - provides information on their Watershed Management Environmental Program and provides examples of watershed projects,
(www.efw.bpa.gov)

Center for Watershed Protection - provides tools and resources for watershed protection,
(www.cwp.org)

Stormwater Manager's Resource Center ,
(www.stormwatercenter.net)

Clean Water Network - provides water quality standards, and nutrient guidance document for rivers and streams,
(www.cwn.org)

Conservation Technology Information Center - contains Know Your Watershed guides, and information on Building Local Partnerships and Putting Together a Watershed Management Plan,
(www.ctic.purdue.edu/CTIC/CTIC.html)

League of Woman Voters of Westchester - provides information about stormwater pollution and the government's role, also contains information on WestchesterCounty watersheds including the Croton Watershed, Hudson River Watershed, Long Island Sound Watershed and Bronx River Watershed.,
(www.watpa.org/lwv)

International Year of Freshwater 2003 - The United Nations has designated 2003 as the International Year of Freshwater,
(www.wateryear2003.org)

National Institute for Water Resources - contains information about the NIWR program which conducts research to solve water problems in specific areas and contains links to water resource information,
(http://niwr.montana.edu/)

National Marine Fisheries Service - provides information on essential fish habitat and recreational fisheries,
(www.nmfs.noaa.gov)

Natural Resource Conservation Service - contains downloadable version of National Watershed Manual and "Aging Watershed Infrastructure" documents and provides information on Watershed Protection and Flood Control Operations, Watershed Surveys and Planning, Wetlands Conservation Compliance, Wetlands Reserve

Program and Wildlife Habitat Incentives Program,
(www.nrcs.usda.gov)

Natural Resources Defense Council - contains information on various subjects including clean air and energy, global warming, clean water & oceans, wildlife & fish, parks, forests & wetlands, toxic chemicals & health, cities & green living, and environmental legislation,
(www.nrdc.org)

New England Interstate Water Pollution Control Commission (NEIWPCC) - provides information on water quality issues including total maximum daily loads (TMDL's), nonpoint source pollution, surface water management, and stormwater along with downloadable technical documents and newsletters (Water Connection),
(www.neiwpcc.org)

New York Sea Grant - provides information on water quality, aquatic invaders, seafood safety , education, coastal resources, fisheries, new initiatives and coastal businesses,
(www.seagrant.sunysb.edu)

New York State Department of Environmental Conservation, Division of Water,
(www.dec.state.ny.us/website/dow)

New York State Water Resource Institute - provides information and technical assistance relating to the state's water resources,
(wri.eas.cornell.edu)

Nonpoint Education for Municipal Officials - provides information on non-point source pollution and watershed protection measures,
(www.nemo.uconn.edu)

Office of the Attorney General - provides publications and studies prepared by the environmental's bureau lawyers and scientists, provides a link to the report on phosphorous loads in NYC watershed reservoirs,
(www.oag.state.ny.us/environment/environment.html)

The River Network - contains a resource library with information on watershed protection and restoration, links to major environmental organizations, state government agencies, federal agencies and U.S. Congress River and Watershed organizations, and the annual River Rally conference that offers workshops on river protection and restoration,
(www.rivernetwork.org)

Tennessee Valley Authority - provides water quality information in the Tennessee River System,
(www.tva.gov/environment/water)

Terrene Institute - contains factsheets on delineating watersheds, integrated stream management and how to reduce impacts to aquatic habitats. Reasonably-priced books available,
(terrene.org)

Trout Unlimited - describes Embrace a Stream Program and stream protection,
(www.tu.org)

United States Environmental Protection Agency, Office of Wetlands, Oceans and Watersheds,

Index of Watershed Indicators	www.epa.gov/watershed/waacademy	Protecting and Restoring America's Watersheds	www.epa.gov/owow/protecting
Lessons Learned	www.epa.gov/owow/lessons	Online Watershed Management Training	www.epa.gov/watertrain
Model Ordinances	www.epa.gov/owow/nps/ordinance	Watershed Restoration	www.epa.gov/owow/restore
Surf your watershed	www.epa.gov/owow/watershed		

United States Geological Survey, National Water Quality Assessment Program - details the NAWQA program, which is conducted in more than 50 major river basins; includes data about water chemistry, hydrology, land use, habitat and aquatic life,
(water.usgs.gov/nawqa)

United States Department of Interior, Bureau of Land Management, Riparian Recovery Initiative - provides general information on riparian areas and provides downloadable flyers on the protection and restoration of riparian areas,
(www.blm.gov/riparian)

Water Forum - offers a forum for the discussion of surface and groundwater issues, including drinking water, fisheries and wildlife use, wetlands, contamination and related topics,
(www.egroups.com/group/waterforum)

Watershed Information Network - provides information on federal water resource protection programs and facts about many watersheds,
(www.epa.gov/win)

The Watershed Report Card - provides a step by step process to help you learn about what keeps a watershed functioning,
(www.watershedreportcard.org)

America's Clean Water Foundation (ACWF),
(www.acwf.org)

Association of State & Interstate Water Pollution Control Administrators (ASIWPCA)
(www.asiwpca.org)

Cornell Center for the Environment,
(environment.cornell.edu)

The Foundation Center - Help for Grant Seekers,
(fdncenter.org)

Cornell Pesticide Management Education Program,
(pmep.cce.cornell.edu)

List of Local Representatives - Pok Journal,
(www.poughkeepsiejournal.com/news/extras/lawmakers.htm)

Local Media

Our Environment - Poughkeepsie Journal
www.poughkeepsiejournal.com/sections/environment

Valley Water Under Siege - Poughkeepsie Journal
www.poughkeepsiejournal.com/projects/water/index.shtml

River & Estuaries Center - Poughkeepsie Journal
www.poughkeepsiejournal.com/projects/institute

Environmental Protection Rights - Poughkeepsie Journal
www.poughkeepsiejournal.com/projects/environment

Links to Local Papers - from Dutchess Co. Government
dutchessny.gov/QuickLinks/Newspapers.htm

RNN - TV
RNN Kingston Studio
721 Broadway
Kingston, NY 12401
(845) 339-6200
fax: (845) 339-6210
Diane Lee - covers Shenandoah Superfund site
Email: dlee@rnn.com
Website : www.rnntv.com

Poughkeepsie Journal
85 Civic Center Plaza
PO Box 1231
Poughkeepsie, NY 12602
NEWSROOM: (845) 437-4800, (800) 765-1120
Fax: (845) 437-4921
Email: newsroom@poughkee.gannett.com
Website: www.poughkeepsiejournal.com
Dan Shapley, Environment Writer & Editor
Email: dshapley@poughkee.gannett.com
(845) 437-4814

Mid_Hudson Valley Fact Book (Annual) - Poughkeepsie Journal
www.poughkeepsiejournal.com/projects/factbook

Mid-Hudson News Network
midhudsonnews.com

Southern Dutchess News
84 East Main Street
Wappingers Falls, NY 12590
(845) 297-3723
(845) 297-6810 (fax)
Email: newsplace@aol.com

LEGAL NOTICES - Poughkeepsie Journal
http://vh80259.vh8.infi.net/osform/MVCCService?osform_template=/standard/query.oft&publication=pojo&displayCount=10&category=Legal

Local Municipalities

City of Beacon - www.cityofbeacon.org

Town of Beekman - www.townofbeekman.com

Town of Fishkill - www.fishkill-ny.gov

Village of Fishkill - www.vofishkill.com

Town of East Fishkill
370 Route 376
Hopewell Junction, NY 12533
(845) 221-9191
Planning Board (845) 221-2428
Peter Idema, Town Supervisor 221-4303
Town Clerk - Dottie McKeel 221-9191
Website: www.eastfishkillny.org

Town of East Fishkill Conservation Advisory Council (CAC)
Brent Feldweg, Chairman
(845) 226-4553
Fax:(845) 221-1924
227-1449 (H?)
Email: efcac@nysnet.net
Website: www.eastfishkillny.org/cac.html

Town of Kent - www.townofkent.org

Town of La Grange - www.lagrangeny.org

Town of Pleasant Valley - www.ci.pleasant-valley.ny.us

City of Poughkeepsie -
www.cityofpoughkeepsie.com

Town of Poughkeepsie -
www.townofpoughkeepsie.com

Town of Union Vale -
www.marist.edu/unionvale

Town of Unionvale Conservation Advisory Council (CAC) -
www.marist.edu/unionvale/HdCAC.htm

Town of Wappinger -
www.townofwappinger.us

Publications and Laws

A Citizen's Guide to Environmental Information in New York State (PDF file)
www.oag.state.ny.us/environment/citizens_guide_to_envir_info.pdf

EPA Watershed Outreach Documents
www.epa.gov/owow/watershed/outreach/documents/

NY State Constitution
assembly.state.ny.us/leg/?co=0

NY State Legislature Resources
www.nysl.nysed.gov/ils/legislature/legis.html

NY State Laws - NY State Assembly
assembly.state.ny.us/leg/?sl=0

NY State Environmental Law
www.nyenvlaw.com

Land Use Law Center - Pace University
www.law.pace.edu/landuse

State Environmental Quality Review Act (SEQR)
www.dec.state.ny.us/website/dcs/seqr

Legal Publications - including Land Use Technical Series - NY State Dept. of State, Div. of Local Govt.
www.dos.state.ny.us/lgss/list9.html

See the Watershed Environmental Resource Directory for updates:
http://FishkillCreekWatershed.org/pubs/Resource_Directory.html

Appendix 3.
Geographic Information System (GIS) Data Sources for Maps

Dutchess County EMC GIS Lab,
Stacy Hoppen, GIS Coordinator
shoppen@co.dutchess.ny.us

Dutchess County GeoAccess
www.dutchessny.gov/GeoAccess.htm

EPA's EnviroMapper
www.epa.gov/enviro/html/em

NY Public Interest Research Group (NYPIRG) Community Mapping Assistance Project (CMAP)
www.nonprofitmaps.org

NY State DEC's Environmental Navigator
www.dec.state.ny.us/website/imsmaps/navigator

NY State Political District Maps
latfor.state.ny.us/maps

NY State GIS Maps
www.nysgis.state.ny.us

Appendix 4.
NYSDEC and National Wetland Inventory Wetland Classifications

National Wetland Inventory Classifications:

QUICK CROSS REFERENCE OF MAP CODES TO COMMON WETLAND TYPES (Using System, Subsystem and Class)

MAP CODE	COMMON NAME or WETLAND TYPE
PFO	FORESTED OR WOODED SWAMP OR BOG
PSS	SHRUB SWAMP OR BOG
PEM	EMERGENT MARSH, FEN, OR WET MEADOW
PUB	POND
PUS	POND SHORELINE
PAB	POND WITH FLOATING OR SUBMERGED AQUATIC VEGETATION
R1UB	FRESHWATER TIDAL RIVER
R2UB	SLOW MOVING RIVER WITH FLOODPLAIN
R2AB	RIVER WITH AQUATIC VEGETATION (PICKERELWEED)
R3US	BANK OR SHORELINE OF FAST FLOWING RIVER
R4SB	INTERMITTENT STREAM CHANNEL
R5UB	RIVER SHOWING CHARACTERISTICS OF BOTH UPPER AND LOWER PERENNIAL RIVERS
M1UB	OPEN OCEAN WITH UNCONSOLIDATED BOTTOM
M2AB	INTERTIDAL SEAWEED BED IN OCEAN
M2RF	INTERTIDAL OYSTER AND MUSSEL REEFS IN OCEAN
E2EM	SALT OR BRACKISH TIDAL MARSH
E2SS	ESTUARINE SHRUB SWAMP
E2US	ESTUARINE FLATS, BEACH, OR SAND BARS
E1UB	OPEN WATER ESTUARY
L1UB	DEEPWATER ZONE OR LAKE
L2US	LAKE SHORE OR SHALLOW WATER ZONE OF LAKE
L2AB	AQUATIC VEGETATION IN LAKE
L2UB	SHALLOW WATER ZONE OF LAKE

DEC Wetland Classifications:

664.5 Classification System

Not all wetlands supply equally the benefits explained in section 664.3 (b). The degree to which wetlands supply benefits depends upon many factors, including: their vegetative cover, their ecological associations, their special features, their hydrological and pollution control features, and their distribution and location; and these may vary considerably from wetland to wetland.

Because of this variation, the act requires the commissioner to classify wetlands in a way that recognizes that not all wetlands are of equal value. This section establishes four ranked regulatory classes of wetlands, depending upon the degree of benefits supplied. The benefits cited in section 24-0105 (7) of the act are translated into discernable wetland characteristics, and these characteristics are used to classify wetlands. Section 664.6 describes each characteristic in some detail and discusses the benefits supplied by a wetland when it contains that characteristic.

(a) Class I wetlands.

A wetland shall be a Class I wetland if it has any of the following seven enumerated characteristics:

664.5 (a)

Ecological associations

(1) it is a classic kettlehole bog (664.6 (b) (2));*

Special features

(2) it is resident habitat of an endangered or threatened animal species (664.6 (c) (2) and (4));

(3) it contains an endangered or threatened plant species (664.6 (c) (4));

(4) it supports an animal species in abundance or diversity unusual for the state or for the major region of the state in which it is found (664.6 (c)(1) and (6));

Hydrological and pollution control features

(5) it is tributary to a body of water which could subject a substantially developed area to significant damage from flooding or from additional flooding should the wetland be modified, filled, or drained (664.6 (d) (1));

(6) it is adjacent or contiguous to a reservoir or other body of water that is used primarily for public water supply, or it is hydraulically connected to an aquifer which is used for public water supply (664.6 (d) (2), (3), and (4)); or

Other

(7) it contains four or more of the enumerated Class II characteristics. This department may, however, determine that some of the characteristics are duplicative of each other, therefore do not indicate enhanced benefits, and so do not warrant Class I classification. Each species to which paragraphs 664.5 (b) *(6) through (8) apply shall be considered a separate Class II characteristic for this purpose.*

664.5 (b)

Class II wetlands.

A wetland shall be a Class II wetland if it has any of the following seventeen enumerated characteristics:

Covertype

(1) it is an emergent marsh in which purple loosestrife and/or reed (phragmites) constitutes less than two-thirds of the covertype (664.6 (a) (2));*

Ecological association

(1) it contains two or more wetland structural groups (664.6 (b) (1));

(2) it is contiguous to a tidal wetland (664.6 (b) (3));

(3) it is associated with permanent open water outside the wetland (664.6 (b) (4));

(4) it is adjacent or contiguous to streams classified C(t) or higher under article 15 of the environmental conservation law (664.6 (b) (5));

Special features

(1) it is traditional migration habitat of an endangered or threatened animal species (664.6 (c) (3) and (4));

(2) it is resident habitat of an animal species vulnerable in the state (664.6 (c) (2) and (5));

(3) it contains a plant species vulnerable in the state (664.6 (c) (5));*

(4) it supports an animal species in abundance or diversity unusual for the county in which it is found (664.6 (c) (7));

(5) it has demonstrable archaeological or paleontological significance as a wetland (664.6 (c) (8));

(6) it contains, is part of, owes its existence to, or is ecologically associated with, an unusual geological feature which is an excellent representation of its type (664.6 (c) (9));

664.5 (b)

Hydrological and pollution control features

(1) it is tributary to a body of water which could subject a lightly developed area, an area used for growing crops for harvest, or an area planned for development by a local planning authority, to significant damage from flooding or from additional flooding should the wetland be modified, filled or drained (664.6 (d) (1));

(2) it is hydraulically connected to an aquifer which has been identified by a government agency as a potentially useful water supply (664.6 (d) (4));

(3) it acts in a tertiary treatment capacity for a sewage disposal system (664.6 (d) (3);

Distribution and location

(1) it is within an urbanized area (664.6 (e) (1));

(2) it is one of the three largest wetlands within a city, town, or New York City borough (664.6 (e) (3));*

(3) it is within a publicly owned recreation area (664.6 (e) (4)).

664.5 (c)

Class III wetlands.

A wetland shall be a Class III wetland if it has any of the following fifteen enumerated characteristics:

Covertypes

(1) it is an emergent marsh in which purple loosestrife and/or reed (phragmites) constitutes two-thirds or more of the covertype (664.6 (a) (2));

(2) it is a deciduous swamp (664.6 (a) (3));

(3) it is a shrub swamp (664.6 (a) (5));

(4) it consists of floating and/or submergent vegetation (664.6 (a) (6));

(5) it consists of wetland open water (664.6 (a) (5));

Ecological associations

(1) it contains an island with an area or height above the wetland adequate to provide one or more of the benefits described in section 664.6 (b) (6);

Special features

(1) it has a total alkalinity of at least 50 parts per million (664.6 (c)(10));

(2) it is adjacent to fertile upland (664.6 (c) (11));*

(3) it is resident habitat of an animal species vulnerable in the major region of the state or in the major region of the state in which it is found, or it is traditional migration habitat of an animal species vulnerable in the state or in the major region of the state in which it is found (664.6 (c) (1), (2), (3), and (5));

(4) it contains a plant species vulnerable in the major region of the state in which it is found (664.6 (c) (1) and (5));

664.5 (c)

Hydrological and pollution control features

(1) it is part of a surface water system with permanent open water and it receives significant pollution of a type amenable to amelioration by wetlands (664.6 (d) (3));

Distribution and location

(1) it is visible from an interstate highway, a parkway, a designated scenic highway, or a passenger railroad and serves a valuable aesthetic or open space function (664.6 (e) (2));

(2) it is one of the three largest wetlands of the same covertype within a town (664.6 (e) (3));

(3) it is in a town in which wetland acreage is less than one percent of the total acreage (664.6 (e) (3)); or

(4) it is on publicly owned land that is open to the public (664.6 (e) (5)).

664.6 (a)

Class IV Wetlands

A wetland shall be a Class IV wetland if it does not have any of the characteristics listed as criteria for Class I, II, or III wetlands. Class IV wetlands will include wet meadows (664.6 (a) (1))* and coniferous swamps (664.6 (a) (4)) which lack other characteristics justifying a higher classification.

The reference in parentheses after each characteristic is to the description of that characteristic and its associated benefits in section 664.6.

Appendix 5.
New York State Department of Environmental Conservation's stream classification
(From: 6 NYCRR Part 701)

FRESH SURFACE WATERS

§701.2 Class N fresh surface waters

(a) The best usages of Class N waters are the enjoyment of water in its natural condition and, where compatible, as a source of water for drinking or culinary purposes, bathing, fishing, fish propagation, and recreation.

(b) There shall be no discharge of sewage, industrial wastes, or other wastes, waste effluents or any sewage effluents not having had filtration resulting from at least 200 feet of lateral travel through unconsolidated earth. A greater distance may be required if inspection shows that, due to peculiar geologic conditions, this distance is inadequate to protect the water from pollution.

(c) These waters shall contain no deleterious substances, hydrocarbons or substances that would contribute to eutrophication, nor shall they receive surface runoff containing any such substance.

§701.3 Class AA-Special (AA-S) fresh surface waters

(a) The best usages of Class AA-S waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish propagation and survival.

(b) These waters shall contain no floating solids, settleable solids, oil, sludge deposits, toxic wastes, deleterious substances, colored or other wastes or heated liquids attributable to sewage, industrial wastes or other wastes.

(c) There shall be no discharge or disposal of sewage, industrial wastes or other wastes into these waters.

(d) These waters shall contain no phosphorus and nitrogen in amounts that will result in growths of algae, weeds and slimes that will impair the waters for their best usages.

§701.4 Class A-Special (A-S) fresh surface waters

(a) The best usages of Class A-S waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish propagation and survival.

(b) This classification may be given to those international boundary waters that, if subjected to approved treatment, equal to coagulation, sedimentation, filtration and disinfection with additional treatment, if necessary, to reduce naturally present impurities, meet or will meet New York State Department of Health drinking water standards and are or will be considered safe and satisfactory for drinking water purposes.

§701.5 Class AA fresh surface waters

(a) The best usages of Class AA waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish propagation and survival.

(b) This classification may be given to those waters that, if subjected to approved disinfection treatment, with additional treatment if necessary to remove naturally present impurities, meet or will meet New York State Department of Health drinking water standards and are or will be considered safe and satisfactory for drinking water purposes.

§701.6 Class A fresh surface waters

(a) The best usages of Class A waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish propagation and survival.

(b)This classification may be given to those waters that, if subjected to approved treatment equal to coagulation, sedimentation, filtration and disinfection, with additional treatment if necessary to reduce naturally present impurities, meet or will meet New York State Department of Health drinking water standards and are or will be considered safe and satisfactory for drinking water purposes.

§701.7 Class B fresh surface waters

The best usages of Class B waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

§701.8 Class C fresh surface waters

The best usage of Class C waters is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

§701.9 Class D fresh surface waters

The best usage of Class D waters is fishing. Due to such natural conditions as intermittency of flow, water conditions not conducive to propagation of game fishery, or stream bed conditions, the waters will not support fish propagation. These waters shall be suitable for fish survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

Historical Note

Sec. filed July 3, 1985; repealed, new filed Aug. 2, 1991 eff. 30 days after filing.

Cover Description	Source Citation
State Pollution Discharge Elimination Systems (SPDES) Facilities	DCEMC GIS Lab automated, 1998
Road and Road Labels	New York State Department of Transportation, 1995
Streams	Originated by Dutchess County Environmental Management Council based on the New York State Department of Conservation Biological Survey Maps, published in 1991, edited in 1999
Surficial Water	Originated by Dutchess County Environmental Management Council based on the New York State Department of Conservation Biological Survey Maps, published in 1991, edited in 1999
State Wetland	Department of Environmental Conservation, Division of Fish and Wildlife, Habitat Inventory Unit created in 1994
Federal Wetland	US Fish and Wildlife Service, Digital Line Graph files, October 1995
Sub-watershed Boundary	SUNY ESF delineated boundaries using USGS 10-meter DEM and BASINS software, 2003

Appendix 6.
Fishkill Creek Streamwalk Program, 2004
by Rick Oestrike, Chair, Fishkill Creek Watershed Committee

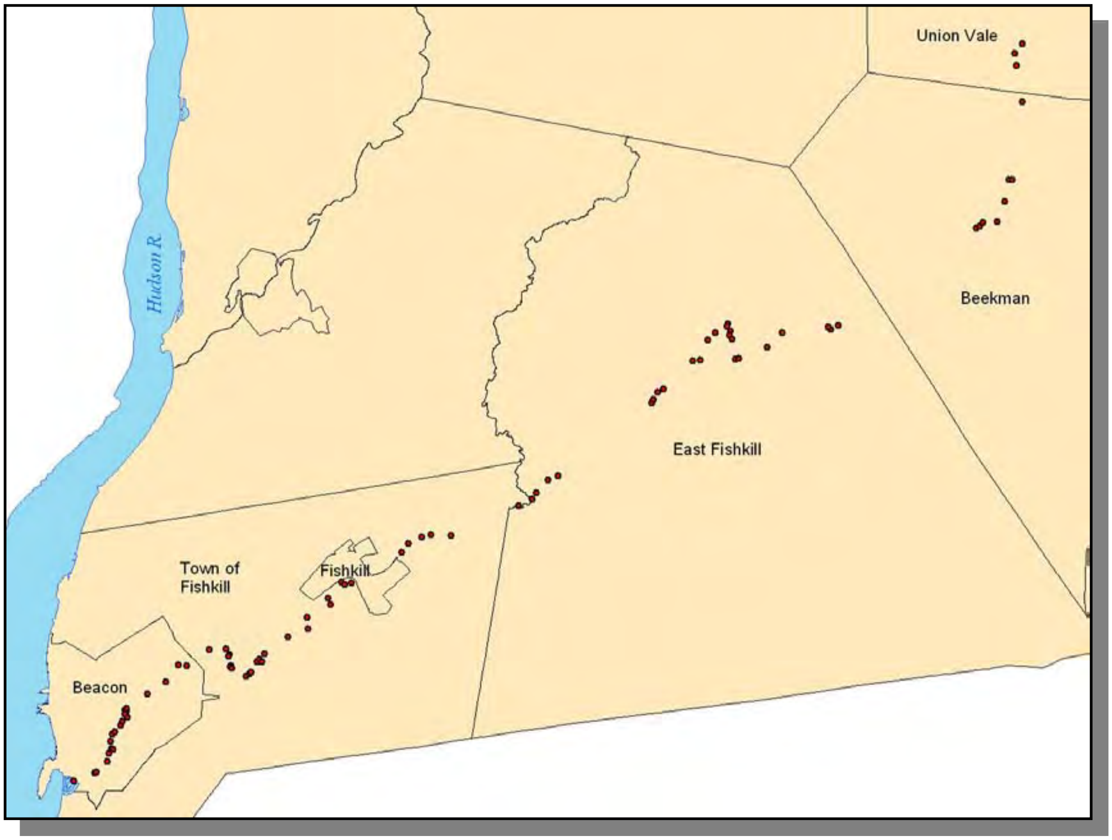
Streamwalk, a volunteer assessment program was conducted between May and August of 2004 along the main stem of the Fishkill Creek. This program was designed by the Natural Resources Conservation Service and implemented by the Lower Hudson Coalition of Soil and Water Conservation Districts and the Dutchess County Environmental Management Council. Sixteen stream segments, or approximately 16 miles, were studied along the main stem of the Fishkill Creek. Fifty-five impaired sites were surveyed, with a total of 104 impairments. Over 700 digital photographs were taken of the stream and surrounding areas, and over 90 global positioning system (GPS) coordinates were taken of features of interest including bridges, dams, outlet pipes, areas of erosion, etc. The participating volunteers donated 477 hours of their time to complete the project.

The main stem of the Fishkill Creek was subdivided into 26 segments, from FC-01 (near the confluence with the Hudson River), to FC-26 (near the headwaters). Ideally, each segment was one-mile long and had a recognizable landmark at each end. Since landmarks are not spaced equally, the actual segments varied from about half a mile to one and a half miles in length. In 2004, 16 of the 26 segments were studied. Of the segments studied, none received a score of excellent, seven received a score of good, four received a score of fair and five received a score of poor. When these scores were considered geographically, a clear trend became apparent. The downstream portion of the creek rated low and the upstream portions rated much higher. All of the segments that rated as poor were located in the lower portion of the creek in the Town of Fishkill and City of Beacon. In the upper portion of the creek in the Towns of Unionvale and Beekman, all of the segments rated as good.

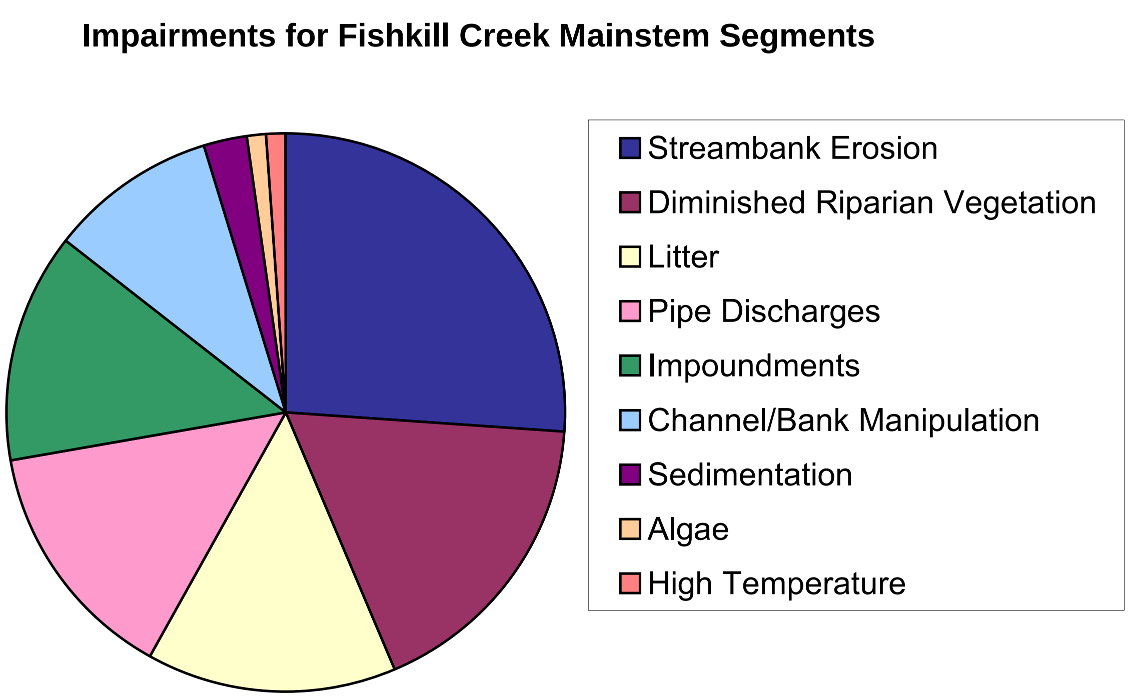
On average, there are 3.4 impaired sites per mile studied, and many of these sites had more than one impairment. The most common impairment observed was streambank erosion, which was present at 49% of all impaired sites. The second most common impairment was diminished riparian vegetation, which occurred at 44% of impaired sites. Both litter and pipe discharges occurred at 27% of impaired sites. The term litter implies significant piles of trash or large manmade objects, such as shopping carts, lawn tractors, washing machines, etc. Impoundments, including dams, occurred at 25% of impaired sites. Channel or bank manipulation occurred at 18% of impaired sites. Finally, both excess algae and high water temperatures occurred at 2% of the impaired sites.

Some types of impairments displayed geographic trends. For example, extensive litter was fairly common in the lower portion of the creek, but uncommon in the middle and upper reaches. Diminished riparian vegetation was uncommon in the lower Fishkill Creek, but commonplace in the middle and upper portions of the creek. Streambank erosion was most abundant in the middle portions of the creek in the Town of East Fishkill. Impoundments were uncommon in the middle portion, but common in the lower and upper sections of the creek.

Other information recorded during the Streamwalk program included water temperature, pH, stream depth and width, local land uses, water appearance, fish and macroinvertebrate habitats and substrate embeddedness. Impaired site reports included any unusual smells, type of streambank vegetation, stream bottom composition, presence/absence of waterfowl and observed human activates near the creek.



Impaired Sites in the Fishkill Creek Main stem identified by Streamwalk, 2004.



Streamwalk Segment Scores for the City of Beacon, Town of Fishkill, Town of East Fishkill, Town of Beekman and Town of Union Vale

Impairments	Percentage (%)
Streambank Erosion	49
Diminished Riparian Vegetation	33
Litter	27
Pipe Discharges	27
Impoundments	25
Channel/Bank Manipulation	18
Sedimentation	5
Algae	2
High Temperature	2

Percentages related to chart from previous page

City of Beacon/Town of Fishkill

Section No.	Area	Condition
FC-01	Fishkill Creek mouth to Wolcott Ave. Bridge- Rte 9D:	POOR
FC-02	Wolcott Ave. Bridge to East Main St. Bridge:	POOR
FC-03	East Main St. Bridge to Front St.:	GOOD
FC-04	Front St. to railroad bridge upstream of Maple St.:	POOR
FC-05	Maple St. to Greenwood Dr. near mid-section adjacent to creek:	FAIR
FC-06	Greenwood Drive to I-84	POOR
FC-07	I-84 to Rte. 9	FAIR
FC-08	Fishkill Glen Dr. adjacent to railroad tracks:	NO DATA
FC-09	Fishkill Glen Dr. to Rte. 52 Bridge	POOR
FC-10	Rte. 52 Bridge to East Fishkill Town Line	NO DATA

Town of East Fishkill

Section No.	Area	Condition
FC-11	East Fishkill Town Line to substation near intersection of Rt. 82 & Lake Walton Rd (Helin Rd.)	GOOD
FC-12	Helin Rd. to Rte. 376 (South of firehouse):	NO DATA
FC-13	Rte. 376 to Carol Drive	GOOD
FC-14	Carol Drive crossing to near Carpenter Rd. (North end of creek meander at intersection of Rt. 9 & Augusta Rd.)	FAIR
FC-15	Augusta Rd. to dam (former Greenburg property, now Behr	FAIR
FC-16	dam to Stormville Rd. bridge near Taconic State Parkway	GOOD
FC-17	Stormville Rd. to Phillips Rd	GOOD
FC-18	Phillips Rd. to East Fishkill/Beekman Town Line (end of Moonlight Drive	NO DATA

Town of Beekman		
Section No.	Area	Condition
FC-19	Town of East Fishkill Boundary to Williams Dr.	NO DATA
FC-20	Williams Dr. to Greenhaven Rd.	NO DATA
FC-21	Greenhaven Rd. to Beekman-Poughquag Rd	NO DATA
FC-22	Beekman-Poughquag Rd. to Limbach Rd	GOOD
FC-23	Limbach Rd. to Dorn Rd.	NO DATA
FC-24	Dorn Rd. to Bruzgul Rd. (portion in towns of Beekman and Union Vale)	GOOD

Town of Union Vale		
Section No.	Area	Condition
FC-25	Bruzgul Rd. to Bruzgul Rd. (goes through Tymor Lake and loops around to Bruzgul Rd.)	NO DATA
FC-26	Bruzgul Rd. to confluence near Clove Rd.	NO DATA

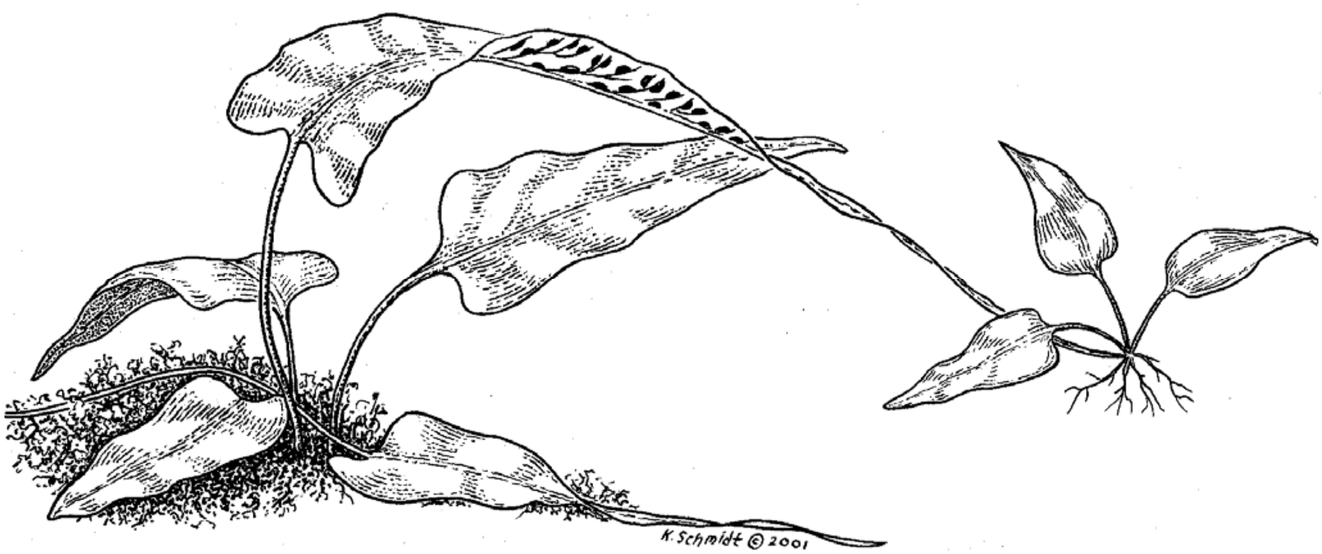
SIGNIFICANT HABITATS

IN THE

FISHKILL AND SPROUT CREEK CORRIDORS,

TOWNS OF BEEKMAN, LAGRANGE, AND FISHKILL,

DUTCHESS COUNTY, NEW YORK



Report to
the New York State Department of Environmental Conservation, the Town of Beekman, the Town of LaGrange, the Town of Fishkill, and the City of Beacon

NYSDEC Contract No. C302187

By
John Sullivan and Gretchen Stevens

December 2005

Hudsonia Ltd.
PO Box 5000
Annandale, NY 12504

Environmental Research and Education
Science for Conservation

CONTENTS

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CONTENTS (cont.)

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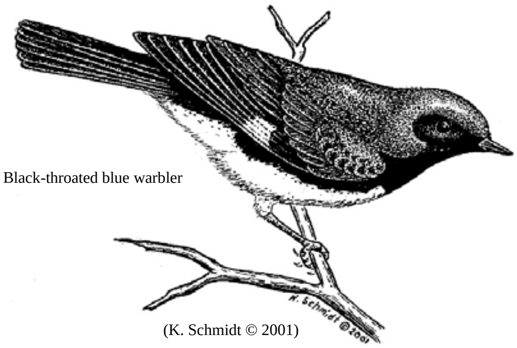
Contents (cont.)

TABLES



Black-throated blue warbler

(K. Schmidt © 2001)

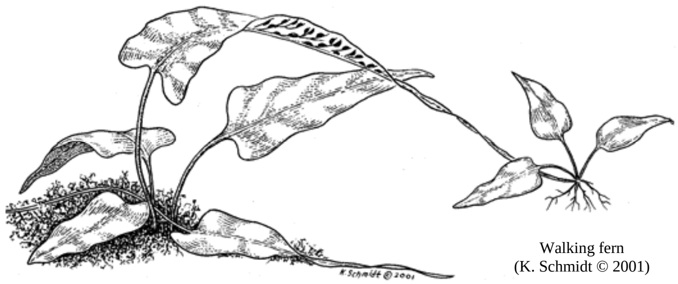
EXECUTIVE SUMMARY

Hudsonia Ltd. identified and mapped ecologically significant habitats in a 2,000 meter (6560 feet) wide corridor along Fishkill Creek and Sprout Creek in the towns of Beekman, LaGrange, and Fishkill between October 2003 and October 2005. The project was funded by the Hudson River Estuary Program of the New York State Department of Environmental Conservation as part of their Fishkill Creek watershed planning initiative.

Using map analysis, aerial photograph interpretation, and field observations, we created a series of large-format maps showing the location and configuration of ecologically significant habitats in the study area. These included widespread, common habitats, such as upland hardwood forest, upland meadow, and hardwood, as well as more unusual habitats such as fen, kettle shrub pool, and oak-heath barren. Some of these habitats are rare or declining in the region, while others are good quality examples of common habitats and habitat complexes. In total, we identified 33 different kinds of habitats in the corridor that we consider to be of potential ecological importance. In this report we describe some of the ecological attributes of each habitat, and discuss some conservation measures that can help to protect the habitats and the species of conservation concern they may support.

This is the third in a series of large habitat mapping projects conducted by Hudsonia in the Hudson Valley. The maps are intended to serve as tools for land use and conservation planning. This report and the accompanying habitat maps can help towns identify areas of greatest ecological significance, develop conservation goals, and establish conservation policies and practices that will help to protect biodiversity resources while serving the social, cultural, and economic needs of the human community.

INTRODUCTION



Walking fern
(K. Schmidt © 2001)

Background

Rural landscapes in the Hudson Valley are undergoing rapid change as farms and forests are converted to residential and commercial uses. The consequences of rapid land development include widespread habitat loss and degradation, habitat fragmentation, and the loss of native biodiversity. Although many land use decisions in the region are necessarily made on a site-by-site basis, the long-term viability of biological communities, habitats, and ecosystems requires consideration of whole landscapes. If general biodiversity information is available for large areas, such as whole towns, watersheds, or counties, then landowners, developers, and municipal planners will be better able to incorporate biodiversity protection into day-to-day decision-making.

To address this need, Hudsonia Ltd., a nonprofit scientific research and education institute based in Annandale, New York, initiated a series of large habitat mapping projects in Dutchess County in 2001. These projects demonstrate how Hudsonia's *Biodiversity Assessment Manual for the Hudson River Estuary Corridor* (Kiviat and Stevens 2001) can be used to identify important biological resources and inform local communities about biodiversity conservation.

Hudsonia has completed town-wide habitat maps for the towns of East Fishkill (Stevens and Broadbent 2002) and Washington (Tollefson and Stevens 2004), and will complete the habitat map for Stanford (Bell et al. in prep.) in December 2005. We are also nearing completion of a map of potential habitats of the Blanding's turtle, a New York State Threatened species, in six towns in southern Dutchess County (Hartwig et al. in prep.).

The Hudson River Estuary Program of the New York State Department of Environmental Conservation, recognizing the inseparability of watersheds and stream quality, has been supporting watershed planning initiatives for Hudson River tributaries. The Estuary Program provided the funding for the present mapping project so that biodiversity could be considered along with other planning concerns in the Fishkill Creek and Sprout Creek corridors. This report discusses the scope and findings of that project, and is accompanied by three large-format (wall-sized) habitat maps, one for each of the three towns in the study area.

John Sullivan (Biologist) and Gretchen Stevens (Director, Biodiversity Resources Center) conducted the work on this project from October 2003 through October 2005. Using map analysis, aerial photograph interpretation, and field observations, we created maps of ecologically significant habitats in a 6560-foot (2000-meter) wide corridor centered along Fishkill Creek in the towns of Beekman and Fishkill, and along Sprout Creek in the town of LaGrange. Some of these habitats are rare or declining in the region, while others are high quality examples of common habitats. The emphasis of this project was on identifying and mapping general habitat types, and not on conducting species-level inventories or mapping the known locations of rare species.

This is the third in a series of large habitat mapping projects conducted by Hudsonia. We will soon be completing similar projects in several more towns in Dutchess County, and hope to extend the program to other parts of the county and region. To facilitate intermunicipal planning, we strive for consistency between towns in the ways that we define and identify habitats and present the information for town use, but we also expect to improve our methods and products as the program evolves. Many passages in this report relating to general conservation concepts and other information applicable to the region as a whole are taken directly from the East Fishkill (Stevens and Broadbent 2002) and the Town of Washington (Tollefson and Stevens 2004) reports without specific attribution. We have adapted the report, however, to encompass our findings and recommendations for the Fishkill Creek and Sprout Creek corridors. We intend that each of these projects will build on the previous ones, and believe that the expanding body of biodiversity information will be a valuable resource for site-specific, town-wide, and region-wide conservation efforts.

What is Biodiversity?

The concept of biological diversity, or biodiversity, encompasses all of life and its processes. It includes ecosystems, biological communities, species, and their genes, as well as their interactions with each other and with the non-biological components of their environment, such as soil, water, air, and sunlight. Many ecologists agree that protecting native biodiversity is essential to maintaining healthy, functioning ecosystems that sustain the human community and the living world around us. Healthy ecosystems make the earth habitable by moderating the climate, producing oxygen, purifying water and air, producing and decomposing organic matter, and providing many other essential services. They also help to produce and sustain extractable and harvestable resources on which human economies are based.

The decline or disappearance of native species can warn us of environmental deterioration, and may be part of collapses in other parts of the ecosystem. While we do not fully understand the role of most organisms in the ecosystem and cannot fully predict the consequences of the extinction of any particular species, we do know that even some inconspicuous organisms, such as fungi or insect pollinators, can play critical roles in the maintenance of certain biological communities. Maintaining the full complement of native species in a region can allow an ecosystem to respond to stresses and adapt to changing environmental conditions.

What are Ecologically Significant Habitats?

For purposes of this project, a "habitat" is simply the place where an organism or population lives or where a biological community occurs, and is defined according to its biological and non-biological components. Individual species will be protected for the long term only if their habitats are maintained intact. The local or regional disappearance of a habitat can lead to the local or regional extinction of species that depend on the habitat. For these reasons, and because habitats are a manageable unit for planning and conservation, the focus of this project is on identifying and mapping ecologically significant habitats. Habitats that we consider to be "ecologically significant" include:

1. Habitats that are rare or declining in the region.
2. Habitats that support rare species and other species of conservation concern.

3. High-quality examples of common habitats (e.g. those that are especially large, isolated from human activities, old, lacking harmful alien species, or those that provide connections between other important habitat units).
4. Complexes of connected habitats that, by virtue of their size, composition, or configuration, have significant biodiversity value.

Because most wildlife species need to travel among different habitats to satisfy their basic needs, landscape patterns can have a profound influence on wildlife populations. The size, connectivity, and juxtaposition of both common and uncommon habitats in the landscape all have important implications for biodiversity. By illustrating the location and configuration of ecologically significant habitats throughout the Fishkill and Sprout Creek corridor, the habitat maps produced for this project can serve as a valuable source of ecological information that can be incorporated into local land use planning and decision making.

Study Areas

We mapped ecologically significant habitats in a 6560 ft (2000 m) wide corridor centered along Fishkill Creek in the towns of Beekman and Fishkill, and along Sprout Creek in the Town of LaGrange. The variability in geology, topography, and land use history of these three towns resulted in marked differences in the type and quality of habitats found in each. A brief description of the study area in each town is given below.

TOWN OF BEEKMAN:

The Town of Beekman has a residential and agricultural character with some large tracts of undeveloped land. Most development and agricultural land use occurs in the lowlands, which generally parallel Fishkill Creek through the center of the town. The town encompasses an area of approximately 30 square miles (78 square kilometers). As of the 2000 Census, Beekman had a population of 13,655 (including a correctional institution with a population of 2,303), a population density of 455 people per square mile (175 people per square kilometer), and approximately 115 mi (185 km) of roads.

Most of the town is drained by Fishkill Creek, a major tributary of the Hudson River. Elevations range from 310 ft (95 m) in the farmland south of Sylvan Lake to 1336 ft (407 m) at the southern tip of the town, south of Pepper Hill Rd. The eastern and southern parts of town are characterized by high hills; about half of the acreage is in large parcels of land owned by New York State, the National Park Service, and private landowners. The northwestern section of town is characterized by lowlands and smaller hills (elevations up to 860 ft [262 m]). The bedrock geology of Beekman is primarily granitic gneiss in the southeastern highlands and limestone, dolostone, and shale in the Fishkill Creek valley (Fisher et al. 1970). Phyllite, schist, and meta-graywacke dominate the hills in the northern part of town. A narrow band of quartzite conglomerate and gneiss with amphibolite and calcsilicate rock separates the granitic gneiss from the calcareous bedrock of the valley. Surficial geology is primarily glacial till along the Fishkill Creek valley with several small kame deposits throughout (Cadwell 1989). Outcrops of bedrock are common in the higher elevations on either side of the valley.

The study area in Beekman encompassed about 3,900 acres (1578 hectares) or 20 percent of the town. Soils in this corridor are strongly influenced by the underlying limestone bedrock (Figure 1). Several large wetland complexes occur along the floodplain of Fishkill Creek in the southern portion of the corridor.

TOWN OF LAGRANGE:

The Town of LaGrange is characterized by residential and commercial development mixed with agricultural land uses. LaGrange encompasses approximately 40 mi^2 (104 km^2) and, as the 2000 Census had a population of 14,928 people, a population density of 373 people per square mile (144 people per square kilometer), and contains 174 mi (280 km) of roads. A little over half of the town drains into Sprout Creek, a major tributary of the Fishkill Creek. The eastern half of the town drains into Wappinger Creek, another major tributary of the Hudson River. LaGrange's topography is much less rugged than Beekman and Fishkill's; elevations range from 110 ft (34 m) along the Wappinger Creek to 810 ft (247 m) in the northeastern hills.

The bedrock geology of LaGrange is varied. Along the Sprout Creek and Fly Sprout corridors, much of the bedrock is composed of shale, argillite, and siltstone (Fisher et al. 1970). East of Sprout Creek is mostly schist, with minor meta-graywacke lenses. Other bedrock in the town includes amphibolite, limestone, conglomerate, and quartzite. Surficial geology is composed of glacial till with glacial outwash deposits along Jackson Creek, Sprout Creek, Fly Sprout, and Wappinger Creek and its tributaries (Cadwell 1989). Shale outcrops occur throughout much of the town, especially in the northern hills.

The study area in LaGrange encompassed nearly 6,262 ac (2,534 ha) or 24 percent of the town. Soils in the more elevated portions of the corridor are strongly influenced by the underlying shale bedrock (Figure 1), while broad areas along the lower Sprout Creek valley contain extensive glacial outwash soils (Faber 2002). A number of large wetland complexes occur along the floodplain of Sprout Creek and in the adjacent glacial outwash plain.

TOWN OF FISHKILL:

The Town of Fishkill is highly suburbanized with at least one major population center, the Village of Fishkill. The southern part of the town has steep, rugged hills, and the northern part has less rugged terrain with extensive wetlands. The southern ridges of Fishkill are mostly undeveloped; large tracts of land are owned by New York State, Scenic Hudson Land Trust, Inc., and the Fresh Air Fund. Fishkill, including the Village of Fishkill, encompasses approximately 32 mi^2 (83 km^2). As of the 2000 Census, these two municipalities had a total population of about 19,256 people and a population density of 602 people per square mile (232 people per square kilometer). The town has approximately 130 mi (209 km) of roads. Most of Fishkill is drained by the Fishkill Creek. Areas along the western border drain directly into the Hudson River. Elevations in Fishkill range from 0 ft (0 m) on the Hudson River shore to 1610 ft (491 m) at South Beacon Mountain.

The bedrock varies considerably, with granite and gneiss common in the southern hills and a mixture of graywacke, shale, argillite, chert, and some limestone and dolostone in the low-lying terrain to the north (Fisher et al. 1970). The surficial material is mostly glacial till, but some glacial lake deposits occur in the southwest (Cadwell 1989). Glacial outwash deposits are scattered along the Fishkill Creek valley and the valleys of its tributaries, including Clove Creek and Bloomer Brook (Faber 2002). Extensive areas of exposed granite and gneiss occur in the southern hills.

The study area in Fishkill encompassed nearly 5,802 ac (2,348 ha) or 28 percent of the town. Soils along the steep ridges are notably shallow and strongly influenced by the acidic granite and gneiss bedrock (Figure 1). The low-lying terrain contains a mix of soils derived from glacial till and soils that have been significantly altered by urban land use. A few moderate sized wetland complexes occur along the corridor, particularly at the mouth of Fishkill Creek and on several undeveloped floodplain terraces.

CITY OF BEACON:

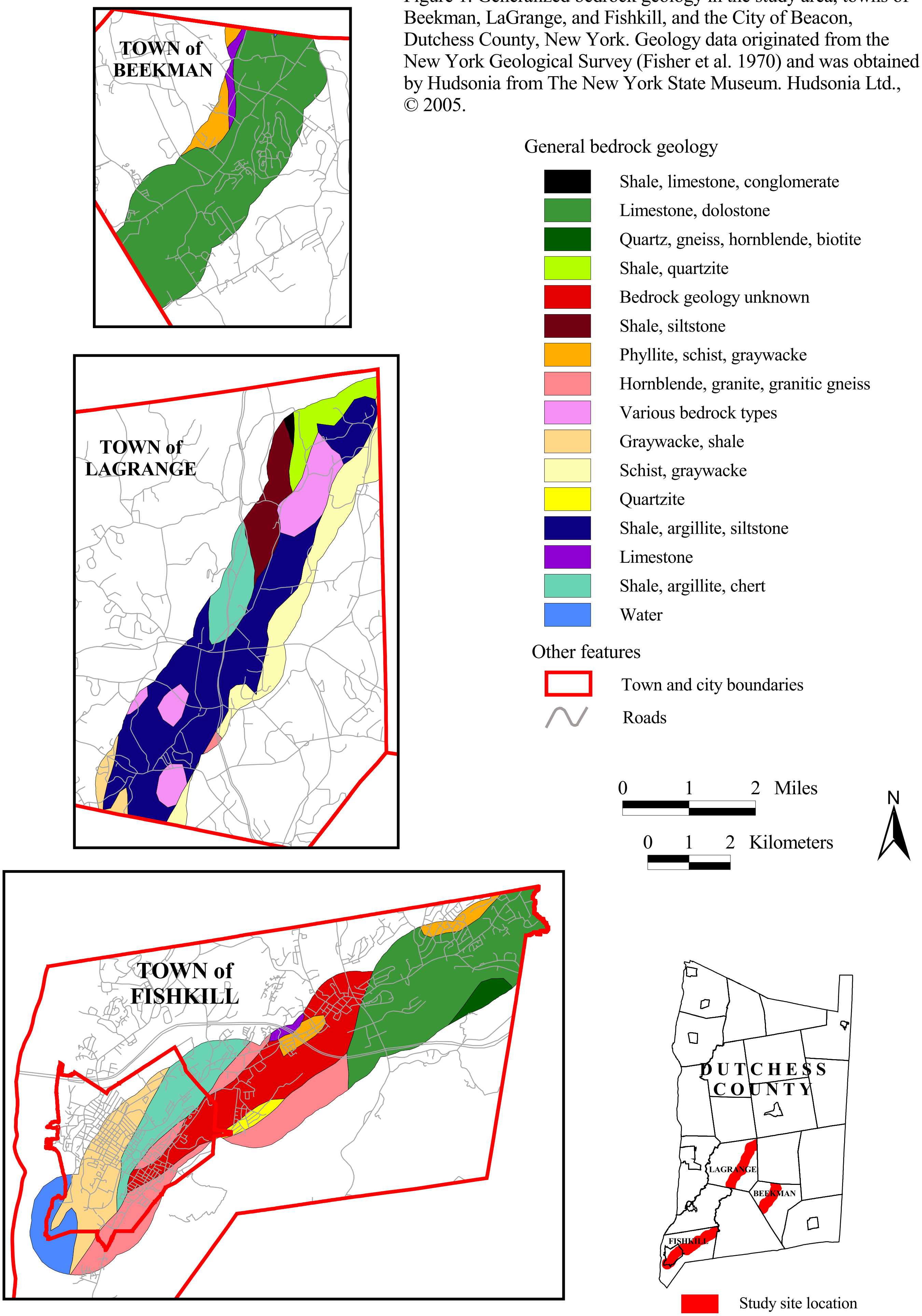
The City of Beacon is intensively developed, but contains some undeveloped land along its perimeter. The Fishkill Correctional facility owns a large area of undeveloped land in the northeast corner, including some working farmland. The City of Beacon encompasses nearly 5 mi^2 (13 km^2), and had a population of 14,810 people and a population density of 2,962 people per square mile (1139 people per square kilometer) as of the 2000 Census. The city has approximately 62 mi (100 km) of roads.

The City of Beacon drains into the Hudson River directly and via the Fishkill Creek. The southeast section of city is in the foothills of the Hudson Highlands and the topography is quite steep. The rest of the city is characterized by small hills and lowlands. Bedrock geology is highly variable, and includes graywacke, shale, argillite, chert, and granitic gneiss (Fisher et al. 1970). Surficial materials are mostly glacial till, but there are outwash and lacustrine deposits near the mouth of the Fishkill Creek and in the northern part of the city (Cadwell 1989).

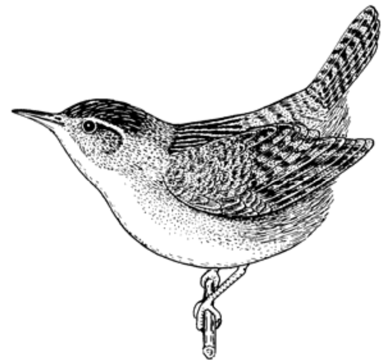
The study area in the City of Beacon encompassed nearly 2,285 ac (925 ha) or 73 percent of the city. Most soils in the low-lying portion of the corridor have been significantly altered from urban land use. An intertidal wetland complex occurred at the mouth of the Fishkill Creek.

For simplicity, the Town of Fishkill, Village of Fishkill, and the City of Beacon are hereafter referred to as the “Fishkill” portion of the study area, and the total area of the Fishkill corridor (i.e. 8,087 ac [3,272 ha]) is used in all calculations.

Figure 1. Generalized bedrock geology in the study area, towns of Beekman, LaGrange, and Fishkill, and the City of Beacon, Dutchess County, New York. Geology data originated from the New York Geological Survey (Fisher et al. 1970) and was obtained by Hudsonia from The New York State Museum. Hudsonia Ltd., © 2005.



METHODS



Sedge wren
(K. Schmidt © 2001)

Hudsonia employs a combination of map analysis, aerial photo interpretation, and field observation in the habitat identification and mapping process. Below, we describe each phase in the Fishkill Creek and Sprout Creek corridor habitat mapping project.

Study Area Identification

We identified and mapped significant habitats in a corridor extending 3280 ft (1000 m) in both directions from the center of Fishkill Creek in the towns of Beekman and Fishkill, and from the center of Sprout Creek (a major tributary of Fishkill Creek) in the town of LaGrange. Thus the total width of the corridor was 6560 ft (2000 m) in each town. We delineated the corridor on-screen using ArcView 3.2 Geographic Information System (GIS) software and digital orthophotos (described below). Generally, only habitats lying within this corridor were identified, mapped, and field checked. At two locations the corridor boundaries were expanded slightly to include highly significant habitats (e.g. intermittent woodland pool and fen) that were just beyond the 3280 ft (1000 m) limit.

Gathering Information and Predicting Habitats

Over many years of habitat studies in the Hudson Valley, Hudsonia has found that, with careful analysis of map data and aerial photographs, we can accurately predict the occurrence of many habitats. First we assemble all relevant maps, GIS data, and existing published and unpublished information from biologists who have worked in the area. We then use combinations of map features (e.g. bedrock chemistry, soil depth and drainage, slopes) and features visible on aerial photographs (e.g. exposed bedrock, vegetation cover types) to predict the location and extent of ecologically significant habitats. In addition to previous studies conducted by Hudsonia biologists and biological data provided by the New York Natural Heritage Program, we also used the following resources for this project:

- *1:40,000 scale color infrared aerial photograph prints from the National Aerial Photography Program series taken in the spring of 1994 and 1995, obtained from the U.S. Geological Survey.* Viewed in pairs, stereoscopic aerial photograph prints provide a three-dimensional view of the landscape and are extremely useful for identifying vegetation cover types, wetlands, streams, and cultural landscape features. For interpretation of aerial photograph prints, we used a Geoscope mirror stereoscope with 3x eyepiece (obtained from Forestry Suppliers, Inc.).

- *High resolution (1 pixel = 7.5 in [19 cm]) true color digital orthophotos (NY State Plane, NAD 83, units of feet) taken in spring 2000 and obtained from the Dutchess County Office of Real Property Tax*. We used digital orthophotos as a base layer in GIS for the onscreen mapping of habitats.

- *U.S. Geological Survey topographic maps (Hopewell Junction, Pleasant Valley, Poughquag, Verbank, Wappingers Falls, and West Point 7.5 minute quadrangles).* Topographic maps contain extensive information about landscape features such as elevation, landscape contours, surface water features and some wetlands, significant cultural features, and general land cover. Contour lines on topographic maps can be used to predict the occurrence of such habitats as cliffs, intermittent woodland pools, intermittent streams, and seeps.

- *Bedrock and surficial geology maps (Lower Hudson Sheets) produced by the New York Geological Survey (Fisher et al. 1970, Cadwell 1989).* Surficial and bedrock geology strongly influence the development of particular soil properties and aspects of groundwater and surface water chemistry, and thus have important implications for the plant and animal communities that become established on any site.

- *Soil Survey of Dutchess County, New York* (*Faber* 2002*).* Specific attributes of soils, such as depth, drainage, texture, and pH, can tell us a great deal about the types of habitats that are likely to occur in an area. Shallow soils in steep terrain, for example, may indicate the location of crest, ledge, and talus habitats. Poorly and very poorly drained soils usually indicate wetland habitats, such as swamps, marshes, and wet meadows. The location of alkaline soils can be used to predict the occurrence of calcareous ledges, fens, and calcareous wet meadows.

- *GIS data*. GIS enables us to overlay multiple map layers on the computer screen, greatly enhancing the efficiency and accuracy with which we can predict a variety of habitats that are closely linked to local topography, geology, hydrology, and soil conditions. We obtained most of our GIS data layers from the Dutchess County Environmental Management Council (EMC), including roads, streams, soils, bedrock geology, surficial geology, state regulated wetlands, and National Wetland Inventory data prepared by the U.S. Fish and Wildlife Service. We also obtained 10-ft (3-m) contour data for the towns of Beekman, LaGrange, and Fishkill from the Dutchess Land Conservancy, and tax parcel data for the three towns from the Dutchess County Office of Real Property Tax. Additional GIS data layers were obtained from the New York State GIS Clearinghouse website (www.nysgis.state.ny.us) including medium resolution (3.25 ft [1 m] horizontal accuracy) infrared digital orthophotos taken in spring 1994 and USGS digital topographic quadrangles (DRGs) for each town. We re-projected GIS layers into New York State Plane NAD 1983, units of feet.

Preliminary Habitat Mapping and Field Verification

We prepared a preliminary map of predicted habitats based on map analysis and stereo interpretation of aerial photographs. We digitized the predicted habitats onscreen over the spring 2000 digital orthophoto images using ArcView 3.2 mapping software on a Dell Latitude D600 computer.

Before going into the field, we contacted individual property owners for permission to enter their land. We prioritized sites for field visits based both on opportunity (e.g. willing landowners) and on our need to answer questions regarding habitat identification or extent that could not be answered remotely. There are several habitat distinctions, for example, that can only be made in the field such as wet meadow vs. calcareous wet meadow, wet meadow vs. fen, and calcareous crest vs. acidic crest. We brought our draft habitat maps with us into the field, where we visited as many of the mapped habitat units as possible to verify their presence and extent. In addition to conducting field work on public and private land, we also viewed habitats visible from public roads and other public access areas.

We estimate that we field checked part or all of 75 percent of the mapped habitat units. Inaccessible areas that could not be field-checked were mapped entirely by remote sensing. We assume that the mapped areas that were field checked are generally more accurate than those we did not visit in the field. Once we have conducted field work in one area, however, we are able to extrapolate our findings to adjacent parcels and similar settings. Because the timeline of this project prevented us from conducting intensive field verification on every parcel in the study area, this strategy increased our efficiency while maintaining a high standard of accuracy.

Refining the Habitat Map

We corrected and refined the preliminary map on the basis of our field observations to produce the final habitat map. We established certain mapping conventions to simplify our work and to improve the consistency of the final habitat map:

- *Developed areas*. Developed areas (including structures, roads, and other impervious surfaces, as well as immediately surrounding areas) were excluded from the habitat map. Areas that have been developed since 2000 (the orthophoto date) were identified as such only if we observed them in the field. For this reason, it is likely that we underestimated the areas of developed land in the study area. Typically, we mapped habitats surrounded by or intruding into developed land only if their dimensions exceeded 165 ft (50 m) in all directions, or if they seemed to provide important connections to other large habitat areas. We did, however, map wetlands within developed areas if they were identifiable on the aerial photographs. These wetland habitats can serve as important drought refuges for rare species and other species of conservation concern.

- *"Cultural" areas.* Intensively managed areas such as golf courses, cemeteries, and large manicured lawns were mapped as "cultural" habitats. We mapped these areas not for their current habitat value, which is often negligible, but for their potential value should they cease to be managed.

- *Upland hardwood forests.* Although these forests are extremely variable in terms of their species composition, size and age of trees, vegetation structure, soil drainage and texture, and other factors, we decided to map upland hardwood forests as a single habitat type for practical reasons. Different forest ages and types are not easily distinguished on aerial photographs, and using remote sensing we could not consistently and accurately separate forests according to dominant tree species or size of overstory trees. Our "upland hardwood forest" type therefore includes non-wetland deciduous forests of all ages, at all elevations, and of all species mixtures. Coniferous-deciduous mixed forests and conifer forests were mapped separately.
- *Upland meadow and upland shrubland.* Pastures, agricultural fields, equestrian fields, and abandoned fields were all mapped as "upland meadow." We mapped upland meadows divided by fences, hedgerows, and unpaved roads as separate polygons, to the extent that these features were visible on the aerial photographs. Because upland meadows often have a substantial shrub component, the distinction between upland meadows and upland shrubland habitats is somewhat arbitrary. In general, we defined upland shrubland habitats as those with widely distributed shrubs that accounted for greater than 20% cover.
- *Crest, ledge, and talus habitats.* Because crest, ledge, and talus habitats are usually embedded within other habitat types (most commonly upland forest), they are depicted as an overlay on the base habitat map. Except for the most exposed ledges, these habitats do not have distinct signatures on aerial photographs and are therefore mapped based on a combination of field observations and locations of potential bedrock exposures inferred from the location of shallow soils (<20 inches [50 cm]) on steep (>15%) slopes. The final overlay of crest, ledge, and talus habitat is therefore an approximation, and we expect that there are additional bedrock exposures outside the mapped areas. The precise locations and boundaries of crest, ledge, and talus habitats should be determined in the field on a site-by-site basis. The distinction between

calcareous and non-calcareous crest, ledge, and talus habitats can only be made in the field. The areas mapped as calcareous crest, ledge and talus, therefore, are extrapolated from the locations of calcareous outcrops observed in the field. Most other areas of exposed bedrock (both non-calcareous and unknown bedrock) were mapped as crest, ledge, and talus. The "oak-heath barren" is an uncommon type of crest and ledge habitat with a distinctive plant community. We mapped this separately because of its special biodiversity potential.

- *Wetlands.* We predicted and mapped wetlands remotely using topographic maps, soils data, and aerial photographs. In the field, we identified wetlands primarily by the predominance of hydrophytic (wetland) vegetation and easily visible indicators of surface hydrology (Environmental Laboratory 1987). We did not ordinarily examine soil profiles for the presence of hydric (wetland) soil indicators. Along some stream corridors and in other low-lying areas with somewhat poorly-drained soils it was often difficult to distinguish between upland forest and hardwood swamp without the benefit of onsite soil data. In the field, these areas were characterized by moist, fine-textured soils with common upland trees in the canopy and, often, dense thickets of vines and shrubs (e.g. Japanese barberry, Eurasian honeysuckle) in the understory. In most cases, we mapped these areas as upland forest. The locations of wetland boundaries (and all other habitat boundaries) on the habitat map should be treated as approximations, and should not be used for jurisdictional determinations. Wherever the actual locations of wetland boundaries are needed to determine jurisdictional limits, the boundaries must be identified in the field by a wetland scientist and mapped by a land surveyor.

- *Intermittent woodland pools.* Intermittent woodland pools are best identified in the spring, when the pools are generally full of water and occupied by invertebrates and breeding amphibians. The presence of fairy shrimp is often a good indicator that the standing water is intermittent. Intermittent woodland pools visited in late summer and fall were identified based on physical features of the habitat (e.g. shallow basin with dark-stained leaves). The pools we did not visit in the field were mapped using remote sensing techniques. Many intermittent woodland pools have a distinct aerial photograph signature, and are readily visible within areas of deciduous forest on photographs taken during leaf-off seasons. Intermittent woodland pools located within areas of conifer forest, however, are not easily identified on aerial photographs, and it is likely that we missed some during our mapping. A small number of intermittent pools located within drier wetland habitats (but still isolated from water bodies and streams with fish) were mapped as intermittent woodland pools. All intermittent woodland pools should be verified in the field on a site-by-site basis.

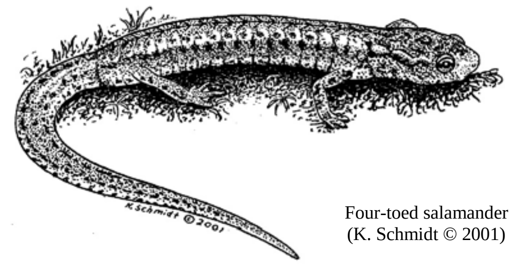
- *Springs & seeps.* Springs and seeps are difficult to identify by remote sensing, so we mapped only the few we happened to see in the field. We expect there are many more springs and seeps along the Fishkill Creek corridor that we did not map. The precise locations and boundaries of seeps and springs should be determined in the field on a site-by-site basis. In one instance, we mapped a broad area with numerous individual seeps using a special seep polygon overlay on the base habitat map.

- *Streams.* A digital stream layer was created by the Dutchess County EMC based on the New York State Department of Environmental Conservation (NYSDEC) 1:24,000 Biological Survey Series Maps created in 1991. Because these data were incomplete for the study area, however, we digitized a new stream coverage in ArcView GIS based on these original data, field observations, and interpretation of topographic maps and aerial photographs. We added numerous perennial and intermittent streams to the coverage and connected the sections of stream that had been depicted as discontinuous where they flowed through ponds, impoundments, or large wetlands. We expect there are additional intermittent streams that we missed, and we recommend these be added to the database as information becomes available. Because it was often difficult to distinguish between perennial and intermittent streams based on aerial photograph and map interpretation, these distinctions were made using our best judgment.

The final large-format paper maps of the study areas in each of the three towns were printed at a scale of 1:10,000 on a Hewlett Packard DesignJet 800PS plotter. The GIS database that accompanies the map includes additional information about many of the mapped habitats, such as the dates of field visits and plant and animal species observed in the field. The habitat map, the GIS database, and this report have been conveyed to the New York State Department of Environmental Conservation, the Town of Beekman, the Town of LaGrange, the Town of Fishkill, the City of Beacon, and the Dutchess County EMC for use in conservation and land use planning and decision making. We request that any maps printed from this database for public viewing be printed at scales no larger than 1:10,000, and that the habitat map data be attributed to Hudsonia Ltd. Although the habitat map was carefully prepared and extensively field-checked, there are inevitable inaccuracies in the final map. Because of this, we request that the following caveat be printed prominently on all maps:

> *"This map is suitable for general land use planning, but is unsuitable for detailed planning and site design or for jurisdictional determinations. Boundaries of wetlands and other habitats depicted here are approximate."*

RESULTS



Four-toed salamander
(K. Schmidt © 2001)

Overview

The large-format habitat maps for the study area illustrate the diversity of habitats in this corridor and the complexity of their configuration on the landscape. Reductions of those maps are shown in Figures 2, 3, and 4. In total, we identified 33 different kinds of habitats (Table 1) that we consider to be of potential ecological importance in the study area. Some of the more unusual or rare habitats we documented include acidic bog, fen, kettle shrub pool, intertidal marsh, oak-heath barren, clay bluff, and clay ravine. These habitats have special potential to support certain rare species and are therefore considered to be particularly important for maintaining overall biodiversity within the Fishkill Creek and Sprout Creek corridors.

Table 1. Ecologically significant habitats identified in the Fishkill and Sprout creek corridors, towns of Beekman, LaGrange, and Fishkill, and City of Beacon, Dutchess County, New York, 2003-2005.

Upland Habitats	Nontidal Wetland & Stream Habitats	Tidal & Supratidal Habitats
upland hardwood forest	hardwood and shrub swamp	estuarine rocky shore
upland conifer forest	conifer swamp	supratidal railroad causeway
upland mixed forest	marsh	intertidal marsh
red cedar woodland	wet meadow	intertidal mudflat
upland shrubland	calcareous wet meadow	intertidal swamp
upland meadow	wet clay meadow	tidal tributary mouth
oak-heath barren	fen	
crest/ledge/talus	acidic bog	
calcareous crest/ledge/talus	intermittent woodland pool	
clay bluff & ravine	kettle shrub pool	
orchard/plantation	open water	
cultural	constructed pond	
waste ground	spring/seep	
	intermittent & perennial stream	

The study area varied considerably in character and extent of land uses in the three towns. For example, only 55% of the Fishkill portion of the study area was undeveloped (i.e. without structures, paved roads, etc.), while nearly 70% of the Town of Beekman portion of the corridor and 82% of the Town of LaGrange portion of the corridor were undeveloped. Table 2 provides a comparison of the total corridor area within each town that was either forested, upland meadow and upland shrubland, or wetland and other aquatic habitats.

Table 2. Percent and total area (acres) of the study area occupied by three general habitat types.

Habitat Type	Town of Beekman	Town of Fishkill[1]	Town of LaGrange
Upland Forested	27% (1056 ac)	28% (2227 ac)	46% (2900 ac)
Upland Meadow & Shrubland	24% (951 ac)	5% (426 ac)	16% (985ac)
Wetland & Other Aquatic	14% (530 ac)	15% (1,236 ac)	15% (940 ac)

[1] Includes the Village of Fishkill and the City of Beacon portions of the study area.

All mapped habitat areas, while still considered to be ecologically significant, have been altered to varying degrees by past and present human activities. Most areas of upland forest, for example, have been logged more than once in the past 250 years, and many forested areas lack the structural complexity of old forests. Many of the wetlands have been extensively altered by human activities (e.g. dredging, damming, removal of buffers, nutrient loading). Although we have documented the location and extent of important habitats within the study area, we have not assessed the quality and condition of most habitat units.

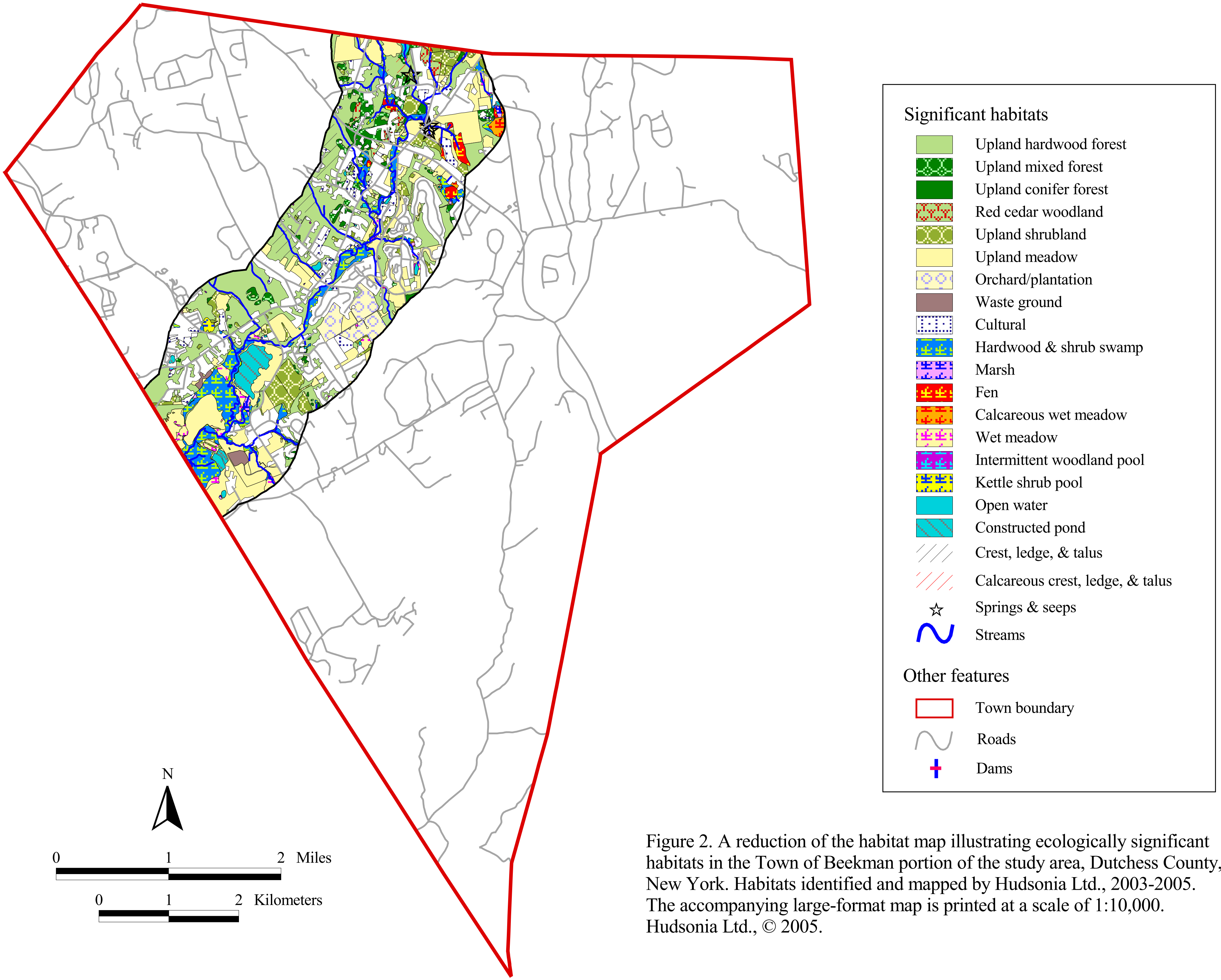


Figure 2. A reduction of the habitat map illustrating ecologically significant habitats in the Town of Beekman portion of the study area, Dutchess County, New York. Habitats identified and mapped by Hudsonia Ltd., 2003-2005. The accompanying large-format map is printed at a scale of 1:10,000. Hudsonia Ltd., © 2005.

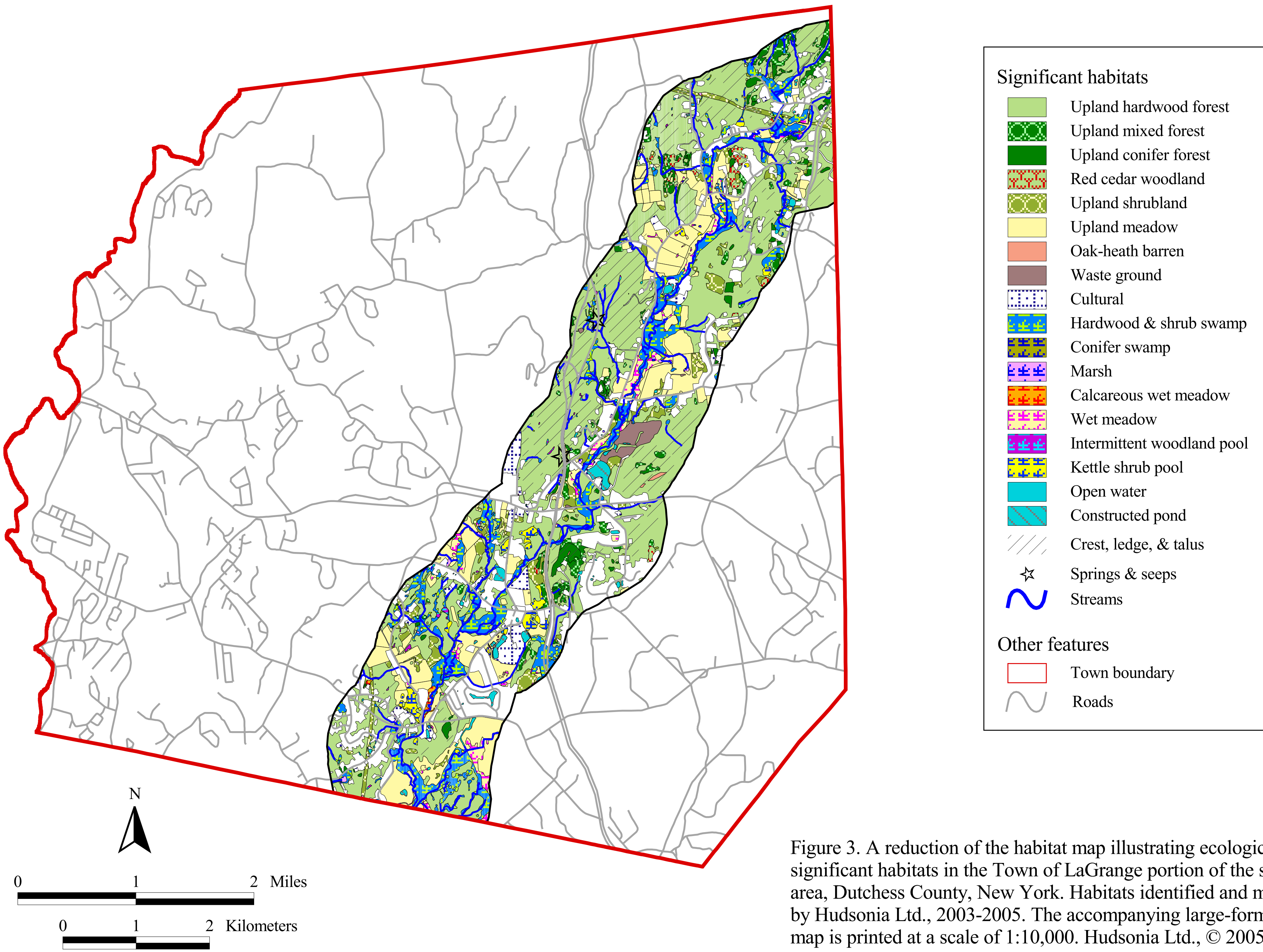


Figure 3. A reduction of the habitat map illustrating ecologically significant habitats in the Town of LaGrange portion of the study area, Dutchess County, New York. Habitats identified and mapped by Hudsonia Ltd., 2003-2005. The accompanying large-format map is printed at a scale of 1:10,000. Hudsonia Ltd., © 2005.

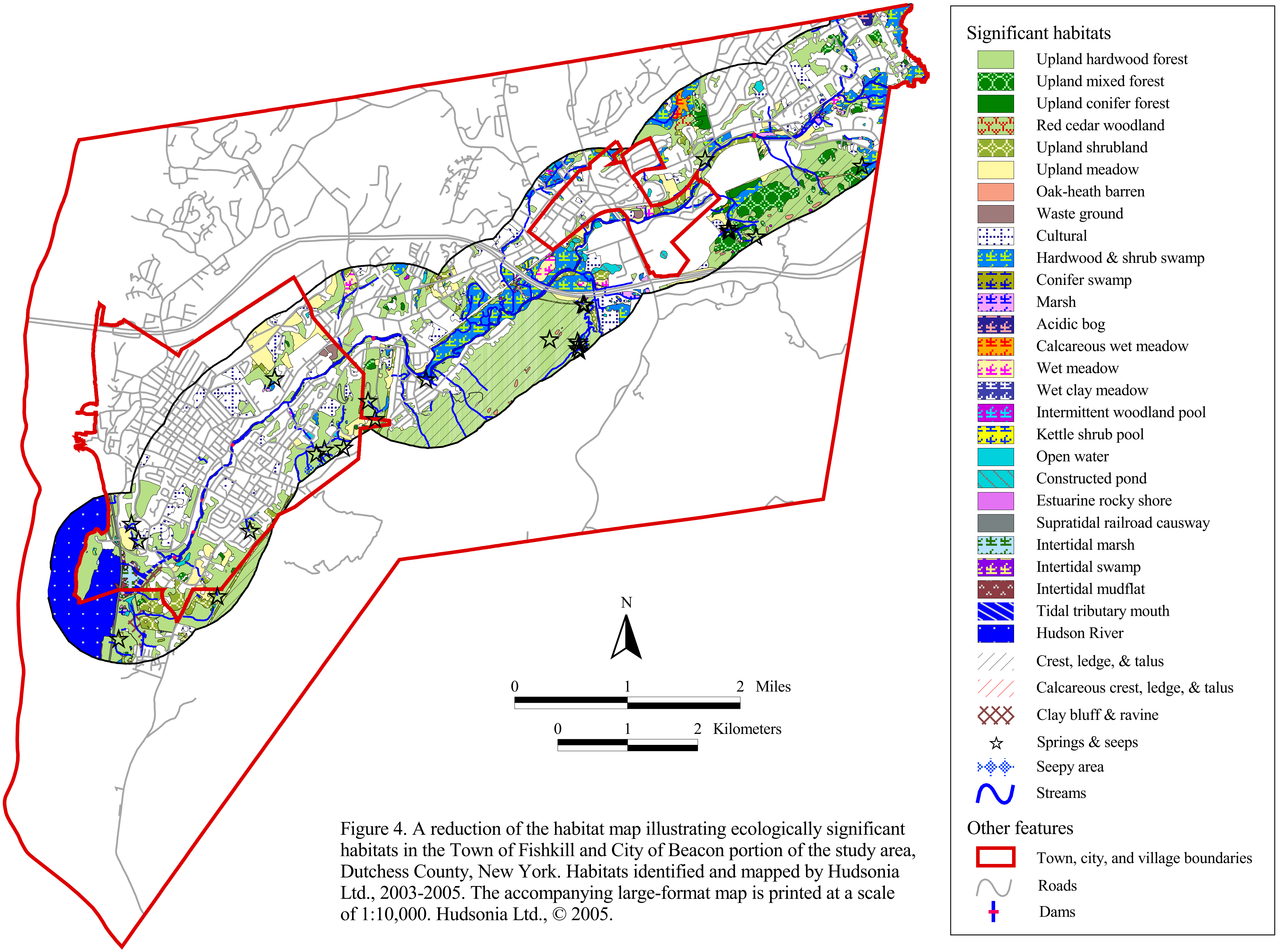


Figure 4. A reduction of the habitat map illustrating ecologically significant habitats in the Town of Fishkill and City of Beacon portion of the study area, Dutchess County, New York. Habitats identified and mapped by Hudsonia Ltd., 2003-2005. The accompanying large-format map is printed at a scale of 1:10,000. Hudsonia Ltd., © 2005.

HABITAT DESCRIPTIONS

Introduction

In the following pages we broadly describe the habitats identified in the study area, and discuss some conservation measures that can help to protect those habitats and the species of conservation concern they may support. All of the species we mention in the habitat descriptions occur in the Hudson Valley and have the potential to occur in the study area. We assigned a code to each habitat type (e.g. upland conifer forest = ucf; marsh = ma) that corresponds to the codes appearing on the large-format habitat maps. Species of particular conservation concern mentioned in the text are indicated by an asterisk (*) following the species name. Appendix A provides a more extensive list of rare species associated with each habitat, including their statewide and regional conservation status. The rarity ranks given in Appendix A are explained in Appendix B. Appendix C gives the common and scientific names of all plants mentioned in this report. Many of the wetlands discussed in this report also appear on the New York State Freshwater Wetlands maps. For these wetlands, the New York State wetland names (e.g. “NYS wetland PV-53”) are given in parentheses in the text.

UPLAND HABITATS

UPLAND FORESTS

Ecological Attributes

We identified three general types of upland forest habitat in the study area: upland hardwood forest, upland conifer forest, and upland mixed forest.

<u>Upland Hardwood Forest (uhf)</u>

Many hardwood forests in the study area, particularly those at lower elevations, appeared to be highly disturbed by current and past human activity. These forests were dominated by early successional or non-native tree species such as black locust, black cherry, and eastern cottonwood. White ash and sugar maple were also common. The shrub layer was typically dense with Eurasian honeysuckle, multiflora rose, Japanese barberry, tree-of-heaven, and gray dogwood. Other weedy species such as garlic-mustard, poison-ivy, Virginia creeper, and Oriental bittersweet were common in the ground layer.

Upland hardwood forests that were less disturbed, often due to steep topography or remote location, were characterized by a more mature forest community, with variable mixtures of hardwoods including sugar maple, pignut hickory, shagbark hickory, mockernut hickory, red oak, white ash, American beech, black birch, and tulip tree among the co-dominants. The shrub layer was also variable and patchy in distribution, with maple-leaf viburnum, flowering dogwood, saplings of various maples, oaks, and hickories, witch-hazel, and spicebush among the common species.

The mid- to upper slopes of steep, rocky ridges (e.g. Fishkill Ridge and Honness Mountain in the Fishkill portion of the corridor) supported high quality oak-hickory forest communities, typically dominated by combinations of red oak, black oak, white oak, hickories, and sugar maple. As the elevation increased, total canopy cover decreased from about 90 percent to 65 percent—presumably due to the shallower soils and drier conditions near the ridge top. The shrub layer, which was often sparse, included maple-leaf viburnum and downy arrowwood. The ground layer in these forests was diverse, with common hairgrass, Pennsylvania sedge, and Christmas fern among the typical species.

Ridge summits and other rugged terrain underlain by shale bedrock (e.g. in the northern portion of the LaGrange study area) contained high quality chestnut oak forest communities. Chestnut oak and red oak were the co-dominant species; scarlet oak, black oak, and white oak were less common. The shrub layer was frequently dominated by deciduous heath species, including pale blueberry, lowbush blueberry, and black huckleberry. A few locations also supported mountain laurel, although total cover was low. Ground layer diversity was less than that of the oak-hickory forest, with Pennsylvania sedge and other grasses and sedges among the common species. Exposed bedrock was extensive throughout the chestnut oak forests.

Upland Conifer Forest (ucf)

This habitat includes both naturally-occurring conifer forests and conifer plantations with greater than 75 percent cover of conifer trees. Natural upland conifer forests in the study area were composed of moderately dense stands of white pine, eastern hemlock, or red cedar—typically in the range of 5-8 in (12-20 cm) diameter-at-breast-height (dbh). Old conifer plantations within the study area were frequently dominated by spruce. The shrub and ground layers in these heavily shaded stands were notably sparse and low in overall diversity.

Several small limestone knolls had conifer forests with stands of 4 in (10 cm) dbh eastern red cedar. Although total canopy cover of the cedar was as high as 85 percent, the ground layer was extensive and included a diverse array of shade-tolerant forbs and grasses. Calcicoles (calcium associated species) such as ebony spleenwort were also relatively abundant.

Upland Mixed Forest (umf)

We use the term "upland mixed forest" for upland forests dominated by a mixture of coniferous and deciduous trees, but where neither represents greater than 75 percent of the canopy. Mixed forests in the study area had various deciduous species mentioned above and at least one of the following conifers: white pine, eastern hemlock, red pine, spruces, eastern red cedar, and in one case pitch pine (likely planted). Although these areas were slightly more shaded than pure deciduous forests, they still tended to support a moderately diverse array of understory species.

Upland mixed forests located on steep slopes and hilltops were usually embedded within oak-hickory or chestnut oak forest communities. These high quality mixed forests were dominated by eastern hemlock, chestnut oak, red oak, white oak, sugar maple, hickories, and black birch. Although these forests tended to be cooler and more shaded, they often supported a shrub and herb community similar to that of the neighboring chestnut oak or oak-hickory forest.

Occurrence in the Study Area

Upland Hardwood Forest (uhf)

Upland hardwood forest occurred in all three parts of the study area, although the extent and quality of the forests varied considerably. In the LaGrange portion of the corridor, approximately 42 percent of the landscape was upland hardwood forest. Most of this habitat was concentrated in the hilly terrain north of Route 55, including the largest block of hardwood forest mapped in LaGrange (250 ac [100 ha]) and at least six other blocks each over 100 ac (40 ha). Many of these were high quality chestnut oak forests and several extended beyond the corridor boundary

Upland hardwood forest occupied about 25 percent of the Fishkill portion of the corridor. The single largest block of hardwood forest in the entire study area was located in Fishkill. This 600 ac (243 ha) forest was associated with the northern arm of Fishkill Ridge, just south of Greenwood Drive. The total size of this forest, which extended beyond the corridor, was more than 6,000 ac (2,428 ha). The second largest block of hardwood forest in the Fishkill portion of the corridor was about 145 ac (60 ha) and located along Honness Mountain, just north of Interstate 84. We consider these two large blocks of high quality oak-hickory and chestnut oak forest to be of particular ecological importance.

Upland hardwood forest occupied only 24 percent of the total land area in the Beekman portion of the study area. The two largest blocks of hardwood forest (150 ac and 116 ac [61 and 47 ha]) occurred in the hilly terrain along the western edge of the corridor, just northeast of Sylvan Lake. Both of these were part of larger forest blocks that extend beyond the corridor boundary.

Upland Conifer Forest (ucf)

Although upland conifer forest was documented in all three portions of the study area, it was far less common than other types of forest habitat and individual occurrences were typically small—about 2 ac [0.8 ha] on average. We mapped about 65 ac (26 ha) of conifer forest in the LaGrange portion of the study area and about 25 ac (10 ha) each in the Fishkill and Beekman portions had

Upland Mixed Forest (umf)

We mapped upland mixed forest in the Beekman, LaGrange, and Fishkill portions of the corridor. The study area in LaGrange contained the most upland mixed forest (194 ac [79 ha]), but many individual occurrences were less than 3 ac (1 ha). The largest patch of mixed forest (20 ac [8 ha]) was located within a high quality chestnut oak complex in the extreme northern tip of the corridor.

The Fishkill portion of the corridor supported a total of 185 ac (75 ha) of mixed forest. The average size of individual occurrences was slightly larger at 5 ac (2 ha). Nearly 58 percent of this habitat, including a 62 ac (25 ha) block, was located along the mid and upper slopes of Honness Mountain, just north of Interstate 84. These patches of mixed forest were part of a high quality forest complex.

Mixed forest occupied a smaller fraction of the Beekman study area. Here, we mapped less than 100 ac (40 ha) of upland mixed forest with most occurrences less than 2 ac (0.8 ha). Sixty percent of this habitat was concentrated in the northwest corner of the corridor.

Conservation Considerations

Forests of all types provide important shelter, foraging, and breeding habitat for wildlife. Extensive forested areas that are unfragmented by roads, utility corridors, or developed lots are especially important for certain species that require large blocks of continuous habitat for their survival. Such unfragmented forests are becoming increasingly rare in the region as new roads and residential and commercial development divide extensive forests into smaller and more isolated patches.

Fragmentation of forests can have many negative ecological effects that extend far from the road, residence, or other fragmenting feature. The adverse impacts of a new road through a forest, for example, can extend several hundred meters from the road and affect soil fauna, birds, amphibians, reptiles, mammals, and plant communities (Forman and Deblinger 2000, Trombulak and Fissell 2000, Haskell 2000). These negative impacts include the reduction in size of animal territories, the intrusion of invasive plants and human-adapted predators such as raccoon and striped skunk, the disruption of migration routes of reptiles, amphibians and large mammals, a decrease in abundance and diversity of soil fauna, and an increase in road mortality for many wildlife species in their ordinary daily and seasonal movements.

The loss of extensive forests has been implicated in the declines of numerous species of migratory songbirds (Robbins 1980, Ambuel and Temple 1983, Wilcove 1985, Hill and Hagan 1991), raptors (Bednarz and Dinsmore 1982, Billings 1990, Crocoll 1994), and large mammals (Godin 1977, Merritt 1987). Many birds and mammals of conservation concern are dependent upon large tracts of upland forest, including Cooper’s hawk,* red-shouldered hawk,*eastern wood-pewee,* Acadian flycatcher,* wood thrush,* cerulean warbler,* ovenbird,* bobcat,* and fisher* to name just a few.

Some general guidelines for forest conservation include:

1. Protect large, contiguous forested areas wherever possible.
2. Protect areas of mature and old-growth forest.
3. Protect natural conifer stands.
4. Avoid development or other disturbance in forest interiors.
5. Maintain the forest canopy and understory vegetation intact.
6. Maintain standing dead wood, downed wood, and organic debris, and prevent disturbance or compaction of the forest floor.
7. Protect smaller forest patches in strategic locations (e.g. those that provide a connection between larger forest patches, have smaller, unusual habitats embedded in them, or are known to support rare species).
8. Maintain or restore corridors of intact habitat between large forested areas (including connections across roads).

RED CEDAR WOODLAND (rcw)

Ecological Attributes

A red cedar woodland is a former oldfield habitat where eastern red cedar has become prominent in the overstory. Individuals of eastern red cedar are generally small (2–4 in [5-10 cm] dbh) and comprise no more than 65 percent cover. Cedar is often one of the first woody plants to invade abandoned pastures on mildly acidic to alkaline soils in this region. Woodlands on recently abandoned pastures or hayfields tend to have a greater cover of open meadow with young, widely spaced cedar, while those on long-abandoned fields have denser stands of older cedar. The composition of the plant community, especially within the open meadow areas, varies considerably depending on the underlying geology, soil chemistry and moisture, and disturbance history.

In portions of the study area that had Wappinger Group bedrock (e.g. the northeastern end of the Fishkill corridor and most of the Beekman corridor), red cedar woodlands were closely associated with limestone knolls. These areas were often recently abandoned pastures that had reverted to an open woodland community. Networks of grassy openings and small limestone rock outcrops were abundant throughout these habitats. Characteristic species included little bluestem grass, poverty grass, gray goldenrod, tall hairy goldenrod, Canada goldenrod, aster, mountain-mints, selfheal, spotted knapweed, white sweet clover, cinquefoils, spiked lobelia, and field pussytoes, among many others. Calcicole ferns such as ebony spleenwort and purple-stemmed cliffbrake occurred on and near limestone outcrops. Shrubs such as gray dogwood, common buckthorn, Eurasian honeysuckle, and autumn olive were locally abundant in a few of these red cedar woodlands.

Red cedar woodlands on shale bedrock (e.g. in the LaGrange portion of the corridor) had a different plant community and habitat structure than those described above. Below the red cedar canopy was a conspicuous subcanopy or tall-shrub layer composed of red oak, white pine, and black birch, usually comprising no more than 20 percent total cover. The meadow-like openings supported small, dense patches of pale blueberry and lowbush blueberry on the relatively deeper soils along the meadow edge, and little bluestem, Pennsylvania sedge, and various other grasses on shallower soils. Exposed shale bedrock was often covered by a thick carpet of moss.

Occurrence in the Study Area

We documented red cedar woodland in all three portions of the study area. The LaGrange portion had a total of 16 red cedar woodlands ranging in size from less than 1 ac (0.4 ha) to 7 ac (2.8 ha). Seventy-two percent of this habitat was concentrated in several distinct complexes along the east and west sides of Gidley Road in the far northern end of the corridor. Many of the ‘mildly acidic’ red cedar woodlands (see above) were located in this region. We considered these habitats to be of high quality due to their distinctive plant community and biodiversity potential.

We mapped a total of 11 red cedar woodlands in the Beekman portion of the corridor, ranging from less than 1 ac to nearly 14 ac (0.4 - 5.7 ha). All were confined to the far northwestern end of the Beekman corridor in an area strongly influenced by the underlying limestone

The Fishkill portion of the study area contained a single 9 ac (3.6 ha) cedar woodland located north of Deer Crossing Road in an area underlain by limestone.

Conservation Considerations

Although relatively little is known about the ecology of red cedar woodlands, they are distinct from other wooded habitats in the region and may provide habitat for an unusual suite of species. Red cedar woodlands may provide roosting habitat for several raptors of conservation concern, including northern harrier,* short-eared owl,* and northern saw-whet owl.* Red cedar fruit is a food source for eastern bluebird, cedar waxwing, evening grosbeak, and other birds. Many songbirds also use red cedar for nesting and roosting, and insectivorous birds such as black-capped chickadee and golden-crowned kinglet forage in red cedar. The olive hairstreak,* a regionally rare butterfly, uses red cedar as its primary larval host.

Red cedar woodlands with exposed gravelly or sandy soils may be important nesting habitat for several reptile species of conservation concern, including Blanding’s turtle,* wood turtle,* spotted turtle,* eastern box turtle,* and eastern hognose snake.* These reptiles may travel considerable distances overland from their primary wetland or forest habitats to reach the nesting grounds. The eastern hognose snake may also use these habitats for basking, foraging, and overwintering. Cedar woodlands on limestone knolls may contain open “sand pits” that could potentially support rare tiger beetles, land snails, and plants such as Carolina whitlow-grass,* yellow wildflax,* Bicknell’s sedge,* and large twayblade.*

Extensive occurrences of red cedar woodlands are limited in Dutchess County, and some of the high-quality examples in the study area are worthy of protection. Cedar woodlands on abandoned agricultural lands are often considered prime development sites, and thus are particularly vulnerable to direct habitat loss or degradation. Woodlands on steep slopes with fine sandy soils may be especially susceptible to erosion from ATV traffic and other human uses. Such disturbances may also facilitate the invasion of non-native forbs and shrubs that tend to diminish habitat quality by forming dense stands that displace native plant species. Wherever possible, measures should be taken to prevent the direct loss or degradation of these habitats and to maintain unfragmented connections with nearby wetlands, forests, and other important habitats.

UPLAND SHRUBLAND (us)

Ecological Attributes

Upland shrubland is a term we use for many kinds of shrub-dominated upland habitats. In most cases, these lands are transitional between upland meadow and young forest habitat, but they also occur along utility corridors maintained by cutting or herbicide application and in recently cleared areas. Shrub cover is generally greater than 20 percent. Most of the upland shrublands in the study area occurred on former agricultural land or along infrequently maintained power line rights-of-way. The vegetation of these habitats was highly variable in species composition, height, and density depending on the disturbance history, soil conditions, and other factors.

Some shrublands contained dense thickets of mostly non-native shrubs such as Eurasian honeysuckle and multiflora rose. Others were dominated by a mixture of native and non-native shrubs and young trees including eastern red cedar, gray dogwood, black cherry, gray birch, and eastern cottonwood. The ground layer of shrublands varied considerably in species composition, but Canada goldenrod, tall hairy goldenrod, and several grasses were among the common species.

Occurrence in Study Area

Upland shrubland habitat occurred in all three sections of the study area. In the LaGrange portion of the corridor, shrubland habitat encompassed a total of 233 ac (94 ha), with individual occurrences ranging from less than 1 ac to 13 ac (<0.4 - 5.3 ha).

We mapped nearly 200 ac (81 ha) of upland shrubland in the Beekman portion of the corridor, ranging from less than 1 ac to 32 ac (<0.4 - 13 ha). We identified two large shrubland complexes. The northern complex, located just west of Clove Valley Road, was composed of nine mid-sized shrubland patches that totaled more than 31 ac (12.5 ha). The southern complex, located just south of the junction of Green Haven Road and Lime Ridge Road, consisted of three shrubland patches that totaled nearly 68 ac (27.5 ha). We believe these complexes have higher habitat value than others in the study area due to their collective size.

The Fishkill portion of the study area had about 181 ac (73 ha) of upland shrubland, with individual occurrences ranging from less than 1 ac to nearly 23 ac (<0.4 - 9 ha). A 64 ac (26 ha) complex composed of four mid-sized and several smaller shrubland patches occurred near Slocum Road and Route 9D in the far southern end of the corridor.

Conservation Considerations

Many bird species of conservation concern nest in upland shrubland and adjacent upland meadow habitats, including northern harrier,* golden-winged warbler,* yellow-breasted chat,* vesper sparrow,* grasshopper sparrow,* blue-winged warbler,* and clay-colored sparrow.* Extensive upland shrublands and those that form large complexes with meadow habitats may be particularly important for these breeding birds. Several species of hawks and falcons use upland shrublands and adjacent meadows for hunting. Rare butterflies such as Aphrodite fritillary,* dusted skipper,* Leonard’s skipper,* and, at higher elevations, cobweb skipper* may occur where their host plants are present. Shrublands and other non-forested upland habitats with loose gravelly soils may be used for nesting by Blanding's turtle,* wood turtle,* box turtle,* spotted turtle,* painted turtle, and snapping turtle. A few species of rare plants are known from calcareous shrublands in the region, such as stiff-leaf goldenrod* and shrubby St. Johnswort.*

While some upland shrublands have reverted to forest habitat, many others have been converted to residential or commercial uses. High quality occurrences that could potentially support rare breeding birds, rare butterflies, or rare plants should be protected from development and other types of human disturbance. For shrublands maintained by brush-hogging or mowing, timing these activities to coincide with the post-fledging season for most birds (e.g. September and later) and only cutting every few years (instead of annually) would reduce the impacts on birds that breed in these habitats.

UPLAND MEADOW (um)

Ecological Attributes

We use the term "upland meadow" very broadly to include hayfields, pastures, and abandoned fields, as well as active cropland (e.g. cornfield) that is tilled and harvested regularly. Upland meadows are typically dominated by grasses and forbs; cover by shrubs is generally less than 20 percent. We include cropland with upland meadow not so much for its current habitat value, but for its potential value. If left uncultivated, cropland areas tend to quickly revert to meadow environments with a much higher habitat value.

Many of the larger upland meadows in the study area were either cattle and horse pasture, and thus highly disturbed, or active cropland with corn as the principal species. The vegetation of other upland meadows varied considerably; some were dominated almost exclusively by tall grasses while others had a mixture of grasses and forbs such as Canada and rough-stemmed goldenrod, several species of aster, Queen Anne's lace, common burdock, daisy fleabane, and numerous others.

Occurrence in the Study Area

Upland meadow occurred in all three segments of the study area, but was most extensive in portions that had active or recently abandoned agriculture. Here, meadows were located in close proximity to one another, often forming large meadow complexes.

We mapped a total of 656 ac (265 ha) of upland meadow in the Beekman portion of the corridor, which accounted for about 17 percent of the Beekman study area. These meadows ranged from less than 1 ac to nearly 54 ac (<0.4 - 22 ha), with an average of 5.6 ac (2.3 ha). A large meadow complex occurred on and in the vicinity of the Green Haven Prison Farm in the southern end of the corridor. This complex was composed of 11 active pastures and cornfields and totaled nearly 206 ac (83 ha). A second complex of moderately sized but somewhat more dispersed upland meadows occurred on recently abandoned or less intensively used agricultural lands north of Route 55.

The LaGrange portion of the corridor had a total of 750 ac (300 ha) of meadow habitat, which accounted for about 12 percent of the LaGrange study area. These meadows ranged from less than 1 ac to 61 ac (<0.4 - 25 ha), with an average of 5.6 ac (2.3 ha). A long, semi-continuous band of pasture and open fields extended northward from Barmore Road to an area just below the junction of Downing Road and Gidley Road. This linear meadow complex contained 348 ac (141 ha) of upland meadow. A second, more widely dispersed complex occurred in the agricultural lands south of Route 55, encompassing 372 ac (151 ha).

The Fishkill portion of the study area contained only 246 ac (100 ha) of upland meadow. These meadows were generally smaller (< 1 ac to 17 ac [<0.4 - 7 ha]; average of 3.4 ac [1.4 ha]) and widely distributed throughout the corridor. A small concentration of meadow occurred on the grounds of the Fishkill Correctional Facility south of Interstate 84.

Conservation Considerations

Upland meadow is a biologically important habitat type that appears to be disappearing at a faster rate than many other habitats in the region. While some upland meadows have simply been abandoned and have reverted to forest, many others have been converted to residential or commercial uses.

Although there can be important habitat value (e.g. for invertebrates and small mammals) in small patches of upland meadow, large patches have especially significant habitat value for grassland breeding birds of conservation concern such as northern harrier,* upland sandpiper,* Henslow's sparrow,* grasshopper sparrow,* vesper sparrow,* eastern meadowlark,* and bobolink.* These species require extensive meadow habitats for successful nesting and foraging. The pronounced decline of grassland-breeding birds in the Northeast has been attributed to the loss of suitable upland meadow habitat (Askins 1993, Vickery 1994, Jones and Vickery 1995). Birds nesting in meadows surrounded by developed land uses are also more vulnerable to a variety of disturbances, including increased nest predation by human-subsidized predators such as raccoon and striped skunk.

Upland meadows with loose soil may be used for nesting by Blanding's turtle,* wood turtle,* spotted turtle,* box turtle*, painted turtle, and snapping turtle. These turtles may travel long distances from their primary wetland or upland habitats to nest in meadows and other open habitats. Several species of rare butterflies, such as dusted skipper,* Leonard's skipper,* swarthy skipper,* and Aphrodite fritillary* depend on upland meadows that support their particular host plants.

Threats to upland meadow habitats include soil compaction and erosion by ATVs, other vehicles, and equipment, which can reduce the habitat values for invertebrates, small mammals, nesting birds, and nesting turtles. Destruction of vegetation can reduce viable habitat for butterflies and rare plants, and mowing of upland meadows during the bird nesting season can cause mortality of nestlings and fledglings. Timing mowing activities to coincide with the post-fledging season for most birds (e.g. September and later) would reduce these negative impacts. The application of pesticides may greatly reduce the capacity of meadows to support biodiversity.

Protecting upland meadow habitats from these and other human disturbances will help to protect sensitive species of conservation concern. Beyond their ecological values, there are many other compelling reasons to conserve active farmland and land with agricultural potential. From a cultural and economic standpoint, maintaining our ability to produce food locally has obvious advantages in the face of unstable and unpredictable energy supplies. Active farms also contribute to the local economy and to the scenic beauty of the town landscape.

OAK-HEATH BARREN (ohb)

Ecological Attributes

The oak-heath barren is an uncommon habitat type typically found on ridge tops, summits, and steep upper slopes where exposed bedrock covers more than 60 percent of the ground surface. The bedrock is hard and acidic, with schist, gneiss, granite, and quartzite among the common types. The soils are extremely thin, excessively well drained, and very nutrient poor. These droughty and infertile conditions have a strong influence on the composition and structure of the plant community. Trees, for example, comprise less than 25 percent cover and are notably stunted, with a dbh of 4 - 8 in (10 - 15 cm) and heights around 6 - 15 ft (2 - 4.5 m). Shrub cover varies depending on the amount of exposed bedrock, but is usually greater than 30 percent and is dominated by scrub oak and heath species. Some oak-heath barrens support a low grassland community characterized by a mixture of drought tolerant grasses, sedges, mosses, lichens, and open rock pavement.

Due to the open canopy, oak-heath barrens tend to have a much warmer microclimate than the surrounding forested habitat, especially in the spring and fall. The exposed nature of these habitats also makes them particularly susceptible to wind, ice, and, at least historically, fire disturbance. Periodic fire in this habitat appears to be an important ecological process that helps control the encroachment of overstory trees and allows for regeneration of characteristic oak-heath barren species. In the absence of fire and other natural disturbance, many oak-heath barrens eventually become ordinary wooded crests.

Chestnut oak, scarlet oak, and red oak were the co-dominant trees in barrens within the study area; other species such as hickories and eastern red cedar were uncommon or localized. A few barrens had pitch pine, a fire dependant tree that was presumably more abundant in this habitat prior to modern forest fire suppression efforts. The tall shrub layer was typically patchy with scrub oak, young red oak, downy arrowwood, red maple, young black birch, and black cherry among the common species. Mountain laurel was a rare component of the shrub layer in a few oak-heath barrens. Lowbush blueberry, pale blueberry, and black huckleberry dominated the lower shrub layer, often forming small thickets in areas with slightly deeper soil. Small grassland openings supported little bluestem, poverty grass, common hairgrass, Indian grass, panic grass, Pennsylvania sedge, white-tinge sedge, downy goldenrod, silverrod, and field chickweed. Mosses, smooth rock tripe, and other lichens often formed thick carpets on portions of the bedrock surface. Ferns such as rock polypody were locally abundant in rock crevices.

Occurrence in the Study Area

Oak-heath barren habitat was confined to the Fishkill and LaGrange portions of the study area. Most barrens were considerably smaller than 1 ac (0.4 ha). We mapped 18 oak-heath barrens in the Fishkill portion of the study area with a total area of 12 ac (5 ha). Half the occurrences were dispersed along the upper ridge line of Fishkill Ridge, just south of Interstate 84. The remaining 9 barrens were found on knolls and summits on Honness Mountain, just north of Interstate 84. The largest oak-heath barren (nearly 3 ac [1.2 ha]) occurred along a power line corridor on Honness Mountain. We considered all of these barrens to have significant habitat value.

The LaGrange portion of the study area contained 7 oak-heath barrens with a total area of more than 3 ac (1.2 ha). The largest barren (2.3 ac [0.9 ha]) spanned the upper slope and crest of a hill just north of Route 55 and east of the Taconic State Parkway. Most of the remaining barrens occurred on lower crests just to the east and west of the Taconic State Parkway. Oak-heath barren habitat in the LaGrange study area had a slightly greater tree cover. However, all barrens still contained at least some high quality grassland and shrub openings with exposed rock outcrops.

Conservation Considerations

Although oak-heath barrens appear quite inhospitable to plants and animals, they often support a number of rare species that are adapted to the dry, exposed conditions or require specialized habitat features associated with rocky outcrops.

Oak-heath barrens can have significant habitat value for several rare snake species, specifically the timber rattlesnake* and the northern copperhead.* Deep rock fissures can provide crucial shelter habitat for these species and the exposed ledges provide basking and breeding habitat in the spring and early summer. Other animals of high conservation concern, such as the northern fence lizard* and five-lined skink,* are dependent on oak-heath barrens and other crest, ledge, and talus habitats (see below) for hibernation, basking, breeding, and foraging. Five-lined skink was observed during this study in an oak-heath barren on Fishkill Ridge in the Fishkill portion of the study area.

A number of rare butterflies that use scrub oak, little bluestem, lowbush blueberry, or pitch pine as their primary food-plant tend to concentrate in barren habitats, including northern hairstreak,* Edward's hairstreak,* Horace's duskywing,* cobweb skipper,* dusted skipper,* Leonard's skipper,* brown elfin,* and eastern pine elfin.* Oak-heath barrens also appear to be refuges for a number of rare oak-dependent moths. Rare plants of oak-heath barrens include reflexed sedge,* clustered sedge,* mountain spleenwort,* and dittany.*

Oak-heath barren habitats are often used by humans as scenic overlooks and some of the more disturbed areas contain campsites, foot paths, ATV trails, and garbage. Trampling, soil compaction, and soil erosion can damage or eliminate rare plants, can discourage use by rare animals, and can encourage invasions of non-native plants. Barrens on ridge tops and summits can be disturbed or destroyed by the construction and maintenance of communication towers. Construction of roads and houses in the valleys between oak-heath barrens can fragment important migration corridors for snakes, lizards, and butterflies, thereby isolating neighboring populations and decreasing their long-term viability. Because rare snakes tend to congregate on oak-heath barrens at certain times of the year, they are also highly susceptible to killing or collecting by poachers. To protect fragile oak-heath barrens and the sensitive species associated with them, activities in the vicinity should be designed to minimize fragmentation, trampling, soil erosion, and direct and indirect disturbance to wildlife.

CREST, LEDGE, and TALUS

Ecological Attributes

Crests and ledges are areas of exposed bedrock, often occurring on hillsides and ridge tops but also found at low elevations. Talus is the mass of rock fragments, blocks, or boulders that often accumulate at the base of steep ledges and cliffs. Crest, ledge, and talus habitats often (but not always) occur together, so are described together here. These habitats are similar to and often occur in close association with the oak-heath barren habitat described above. However, crest, ledge, and talus habitats sometimes have a lower cover of exposed bedrock, a taller plant community with more than 25 percent tree cover, and fewer (if any) scrub oaks and heaths in the shrub layer. The exact composition of the plant community is often quite variable and appears to be determined by factors such as the bedrock type and extent of exposure, soil depth, moisture, aspect, slope, and disturbance history.

In the study area, the more extensive occurrences of crest, ledge, and talus supported a distinct plant community. The upper canopy usually ranged from 40 to 75 percent total cover, and included red oak, chestnut oak, red maple, sugar maple, pignut hickory, and eastern hemlock. Tall shrubs included scrub oak, small stems of other oaks, shadbush, and spicebush, while low blueberry and pale blueberry occupied the low shrub layer. The ground layer was highly variable, but Pennsylvania sedge, little bluestem, common hair grass, poverty grass, downy goldenrod, and white wood aster were among the common species. Smooth rock tripe and other lichens frequently covered 25 percent or more of the rock surface. We observed pink lady's slipper in several crest habitats on shale bedrock.

Occurrence in Study Area

Crest, ledge, and talus habitats occurred in variable amounts in all three parts of the study area. The Fishkill portion of the corridor contained the greatest amount, with more than 1000 ac (405 ha) concentrated in the steep granite and gneiss terrain of Fishkill Ridge and Honness Mountain. We consider these rocky summits and talus slopes to have exceptional habitat value due to their extent, condition, and location within large forested areas. An area along the northeast slope of Fishkill Ridge was particularly noteworthy due to its near vertical cliff face and extensive talus slope.

Crest, ledge, and talus in the LaGrange portion of the corridor occurred primarily along the shale and schist ridges that flank Sprout Creek. Most was north of Route 55, particularly along the western edge of the corridor. These habitats, which consisted largely of small to mid-sized rock outcrop with little talus, were frequently associated with high quality chestnut oak forests. Rock outcrop/chestnut oak associations may have a unique biodiversity value not found elsewhere in the study area.

The Beekman portion of the study area contained only a few small patches of crest, ledge, and talus located along the western edge of the corridor between Route 55 and Martin Road.

Conservation Considerations

Crest, ledge, and talus provide key habitat for a number of vulnerable plants and animals. Potential rare plants of these habitats include reflexed sedge,* mountain spleenwort*, clustered sedge,* slender knotweed,* and eastern prickly-pear.* The regionally rare slimy salamander* occurs in wooded talus, and northern hairstreak* (butterfly) occurs with oak species, its larval hosts. Breeding birds of acidic crest habitats include cerulean warbler,* worm-eating warbler, and blackburnian warbler.* The timber rattlesnake,* northern copperhead,* fence lizard,* five-lined skink,* and black racer* use crest, ledge, and talus for foraging and shelter habitat. Bobcat and fisher are two vulnerable species that use high-elevation crests and ledges for travel, hunting, and cover. Bobcat also uses talus habitats for denning.

Crest, ledge, and talus habitats often occur in locations that are valued by humans for scenic vistas and house sites. Construction of roads and houses destroys crest, ledge, and talus habitats directly, and causes fragmentation of these habitats and the forested areas of which they are a part. Rare plants of crests are vulnerable to trampling and collecting and rare breeding birds of these habitats can be easily disturbed by human activities nearby. Rare snakes are vulnerable to killing or collecting, to the loss of denning and breeding habitats, and to disruption of their foraging areas and movement corridors. The shallow soils of these habitats are especially susceptible to erosion from construction and logging activities, and from foot and ATV trails. To protect fragile crest, ledge, and talus habitats and the sensitive species associated with them, activities in the vicinity should be designed to minimize fragmentation, soil erosion, and direct and indirect disturbance to wildlife.

CALCAREOUS CREST, LEDGE, and TALUS

Ecological Attributes

Calcareous crest, ledge, and talus habitats are similar to the previous habitat type except that the exposed bedrock is calcareous, typically limestone in this study area. The soils surrounding these outcrops are highly calcareous and tend to be very shallow and well drained. Areas mapped as calcareous crest, ledge, and talus consisted mostly of small limestone outcrops, exposed limestone pavement, and a few small limestone ledges. Only one area south of Furnace Pond in the Beekman portion of the corridor contained an appreciable amount of calcareous talus; this talus appears to be the result of historic limestone mining for a former iron furnace.

The limestone bedrock had a strong influence on the plant community of these areas. Some of the more conspicuous areas were associated with the red cedar woodland habitat described above. Other occurrences were associated with forest and meadow habitats. Ebony spleenwort, maidenhair spleenwort, purple cliffbrake, herb-Robert, wild columbine, and other calcicoles were abundant on and near higher quality outcrops, while more disturbed areas were dominated by non-native species such as garlic-mustard and Japanese barberry.

Occurrence in the Study Area

We documented calcareous crest, ledge, and talus in the Beekman and Fishkill portions of the study area. Most of these occurrences were very small, often encompassing just a few rock outcrops on a knoll or hillside feature in the low-lying portions of the landscape. The greatest extent of calcareous crest, ledge, and talus (about 25 ac [10 ha]) occurred in the vicinity of Furnace Pond in the northern end of the Beekman corridor.

Although we did not document calcareous crest, ledge, and talus in the LaGrange portion of the corridor, some of the shale crests and ledges that we did not observe in the field might be somewhat calcareous. A more detailed site-by-site assessment of these areas should be conducted where needed.

Conservation Considerations

Calcareous crest, ledge, and talus habitats frequently support a collection of habitat-specialized and increasingly rare species. Ferns such as smooth cliffbrake* and walking fern* are associated with crevices in the rock face, while other rare plants such as northern blazing-star,* small-flowered crowfoot,* yellow harlequin*, and Carolina whitlow-grass* may occur in openings adjacent to the rock outcrops. The larger fissures, cavities and exposed ledges may provide shelter, den, and basking habitat for eastern hognose snake,* northern copperhead,* worm snake,* and five-line skink.* Rare butterflies such as olive hairstreak* are largely restricted to crests that support their particular host plants. These habitats may also support a diverse land snail community.

Calcareous crest, ledge, and talus habitats often occur in the valley regions of the county, typically associated with the fertile farmland. These areas are under particularly strong development pressure and many of these habitats have been significantly altered. Construction of roads and houses may destroy calcareous crest, ledge, and talus habitats directly, and cause fragmentation of these habitats and the forested areas of which they are a part. The shallow soils of these habitats are especially susceptible to erosion from construction activities. To protect fragile calcareous crest, ledge, and talus habitats and the sensitive species associated with them, activities in the vicinity should be designed to minimize fragmentation, soil erosion, and direct and indirect disturbance to wildlife, and to maintain habitat connections between crest occurrences.

CLAY BLUFF and RAVINE (cbr)

Ecological Attributes

Clay bluff and ravine habitats occur on clayey soils near the Hudson River and are characterized by steep-sided ravines cut by small streams, and steep bluffs fronting the river. The silty clay loam soils typically belong to the Hudson-Vergennes soil series and are deep and somewhat calcareous. These ravines and bluffs are often eroded or otherwise unstable with areas of slumping or sliding of the surface soil layers. Slumping may produce step or terrace-like features, while sliding may produce smooth, sparsely vegetated scars with soil accumulations at their bases. Clay bluffs and ravines support a variety of other upland habitat types such as hardwood or mixed forest and upland shrubland.

Clay bluff and ravine habitats in the study area were forested, with sugar maple, red oak, white oak, mockernut hickory, shagbark hickory, eastern cottonwood, and American elm among the co-dominant species. A few weedy areas contained abundant Eurasian honeysuckle and Oriental bittersweet.

Occurrence in the Study Area

Clay bluff and ravine habitat was confined to the Fishkill portion of the study area. We mapped a single 9 ac (3.6 ha), clay bluff habitat along the bank of Fishkill Creek, just west of South Avenue. A 21-acre (8.5 ha) clay ravine was located just north of Victoria Lane.

Conservation Considerations

Leatherwood* and goldenseal* have been found in Dutchess County clay ravines. Northern white cedar is nearly restricted in this region to clay bluffs, rocky shores, and shoreline ledges, and wetlands of the Hudson River. Extensive areas of forested clay bluffs and ravines or those with large trees may support breeding Cooper's hawk,* barred owl,* fish crow,* black-throated green warbler,* black-throated blue warbler,* cerulean warbler,* or winter wren.* Trees of clay bluffs that front on the Hudson River or on large bays of the river are used by bald eagle, osprey, and fish crow for hunting perches.

The soils of clay bluff and ravine habitats are very prone to erosion, slumping, and sliding, especially where natural or artificial disturbance has occurred, such as blowdowns, clearing of forest vegetation, ATV use, or foot trail or bike trail construction and use. Areas of disturbed clayey soils are also vulnerable to invasive plant incursions. Maintaining a forested canopy and an undisturbed forest floor will help to protect the biodiversity potential of these habitats.

ORCHARD/PLANTATION (or/pl)

This habitat includes actively maintained or recently abandoned fruit orchards, Christmas tree farms, and other young conifer or hardwood plantations. Conifer plantations with larger, more mature trees were mapped as "upland conifer forest." In the study area, we mapped a single complex of orchard/plantation habitat just south of Apple Tree Lane in Beekman. This complex consisted of three fields totaling 96 ac (39 ha) with apple and other fruit trees. We mapped this as an ecologically significant habitat type more for its future ecological value after abandonment than its current values, which are often compromised by frequent mowing, application of pesticides, and other human activity. These habitats have some of the vegetation structure and ecological values of upland meadows and upland shrublands, and will ordinarily develop into young forests if left alone after abandonment. Cavities in old fruit trees may be used by certain birds, bats, and other animals.

CULTURAL (c)

We define cultural habitats as areas that are significantly altered and intensively managed (e.g. mowed), but are not otherwise developed with pavement or structures. Cultural areas in the study area included several town recreational facilities and parks, school playgrounds, and large lawns. Even though the current ecological value of these areas is reduced by frequent mowing, application of pesticides and fertilizers, and other types of management, they hold potential habitat value if abandoned. Many cultural areas are valuable for open space and provide ecological services such as buffering areas of natural habitat from developed areas and linking patches of undeveloped habitat together. Because they are already significantly altered, however, it may be preferable to site new development in these areas instead of in relatively undisturbed habitats.

WASTE GROUND (wg)

Waste ground is our term for land that has been severely altered by previous or current human activity, but lacks pavement or structures. These areas have been stripped of vegetation and topsoil or have been filled with soil or debris but remain largely unvegetated. We applied this term to several areas that had excavated gravel pits or mounds of bare soil and discarded asphalt. The most extensive waste ground was associated with an active gravel mine just north of Route 55 in LaGrange.

Although waste ground often has low habitat value, there are notable exceptions. Several snake and turtle species of conservation concern, including eastern hognose snake,* Blanding's turtle,* and wood turtle,* may use the open, gravelly areas of waste grounds for burrowing, foraging, or nesting habitat. Several rare plant species are also known to inhabit waste ground environments, including rattlebox* slender pinweed,* and slender knotweed.* Rare lichens may potentially occur in some waste ground habitats. The biodiversity value of waste ground will often increase over time as it reverts to a higher quality habitat.

NONTIDAL WETLAND and STREAM HABITATS

HARDWOOD & SHRUB SWAMP (hs)

Ecological Attributes

A swamp is a wetland community dominated by woody vegetation—trees or shrubs. We combined forested hardwood and shrub swamps into a single habitat type because the two often occurred together and were often difficult to separate using remote sensing. We mapped conifer swamps as a separate habitat type, however, because they were easily distinguished from hardwood swamps on aerial photographs. Hardwood and shrub swamp habitats in the study area varied considerably in their physical and biological characteristics depending on their location in the landscape, hydrology, soil type, intensity and frequency of disturbance (both natural and human disturbance), and other factors.

Large tracts of hardwood and shrub swamp occurred along the broad floodplains adjacent to Fishkill Creek and Sprout Creek. The plant community of these swamps was moderately diverse due, in part, to differences in local flood regime. Green ash, red maple, silver maple, and American elm were among the dominant tree species; swamp white oak, pin oak, eastern cottonwood, and sycamore were less common or localized. Several floodplain swamps had mature trees with diameters greater than 20 in (50.8 cm). Shrub cover varied from less than 25 percent in the more frequently flooded areas to nearly 75 percent in the more elevated portions of the floodplain. Typical species included spicebush, saplings of green ash and American elm, speckled alder, silky dogwood, northern arrowwood, willows, and winterberry. The ground layer was diverse and variable with ostrich fern, skunk-cabbage, and false hellebore among the dominant herbs in the more flood prone areas. Other ground layer taxa included tussock sedge, spotted touch-me-not, false-nettle, sedges, asters, sensitive fern, cinnamon fern, and royal fern. Debris dams, scour lines, deposits of fine alluvial material, and other signs of overland flow were extensive in these swamps.

Outside the floodplains, several shrub swamps supported a plant community not found in the floodplain swamps. These were dominated by highbush blueberry, swamp azalea, swamp rose, young red maple, and extensive carpets and hummocks of *Sphagnum*. Hardwood and shrub swamps influenced by calcareous groundwater were characterized by abundant calcicoles including spreading goldenrod, yellow sedge, golden ragwort, and poison sumac. Disturbed swamps contained non-native shrubs and herbs such as Eurasian honeysuckle, multiflora rose, Japanese barberry, and garlic-mustard.

Occurrence in the Study Area

Hardwood and shrub swamps were the most extensive wetland habitat type in all three portions of the study area. Some swamps were contiguous with marsh and wet meadow habitat and often formed large wetland complexes in low lying portions of the corridor. Smaller swamps were spread throughout the corridor along drainageways and in small depressions.

We mapped a total of 286 ac (116 ha) of hardwood and shrub swamp in the Beekman portion of the corridor, with individual occurrences ranging from smaller than 1 ac (0.4 ha) to nearly 72 ac (29 ha). Approximately 75 percent of this habitat was directly associated with the floodplain of Fishkill Creek, with most located in the southern end of the corridor near the Green Haven Prison Farm. The two largest swamps (NYS wetland PQ-8 and PQ-47) were located on the Green Haven farm property.

The LaGrange portion of the study area contained 651 ac (263.5 ha) of hardwood and shrub swamp, with individual occurrences ranging from less than 1 ac to 97 ac (<0.4 -39 ha). Over 60 percent of this habitat was directly associated with the Sprout Creek floodplain, including the largest occurrence (NYS wetland PV-53) located east of Robinson Lane in the southern end of the corridor. The boundary of this wetland is particularly complex and is only approximated on the habitat map.

We documented nearly 528 ac (214 ha) of hardwood and shrub swamp in the Fishkill portion of the corridor, with individual occurrences ranging from smaller than 1ac to 94 ac (<0.4 - 38 ha). About 57 percent of this habitat was directly associated with the undeveloped portions of the Fishkill Creek and Sprout Creek floodplains. The largest occurrence (NYS wetland WF-23) was located along the Fishkill Creek floodplain just north and south of Interstate 84.

Conservation Considerations

Hardwood and shrub swamps are important habitats for a wide variety of species, especially when the swamp is contiguous with other wetland types or embedded within large areas of upland forest. Rare or declining birds such as the red-shouldered hawk,* barred owl,* great blue heron,* wood duck,* prothonotary warbler,* Canada warbler,* and white-eyed vireo* are potential nesters in large hardwood swamps. Pools within swamps are used for breeding by a variety of amphibian species, including the blue-spotted salamander.* Four-toed salamander,* believed to be regionally rare, breeds in swamps with abundant moss-covered logs and hummocks. Hardwood and shrub swamps along the floodplain of clear, low-gradient streams can be an important habitat component for wood turtle.* Several wood turtles were observed in floodplain swamps in LaGrange and Beekman during this study. Other turtles such as Blanding's turtle,* spotted turtle,* and box turtle* frequently use swamps for summer foraging and winter hibernation. Swamps in low-lying valleys are often heavily used as travel corridors by these turtles as they move between upland nesting areas, drought refuge pools, summer foraging wetlands, and overwintering wetlands.

Swamp cottonwood* is a very rare tree of hardwood swamps and is known from at least one location in the LaGrange portion of the study area. Some of the other rare plants associated with swamp habitats include dwarf huckleberry,* southern dodder*, and ostrich fern.* Ostrich fern is also the primary host of the rare ostrich fern borer moth.*

Many of the small swamps in the study area are embedded in larger areas of upland forest. Most of the larger swamps, however, are located in low-elevation areas where human land uses are also concentrated. Many are surrounded by open agricultural areas or bordered by roads and development. Maintaining the water quality, quantity, and flow patterns in swamps is important to the plants and animals of swamp habitats. For those swamps surrounded by agricultural land, it is important that runoff contaminated with agricultural nutrients and chemicals does not enter the swamps. This can degrade the water quality, affecting both the ecological condition of the swamp and associated streams, and the quality of drinking water if the swamp is connected to a public water supply.

Maintaining connectivity between swamp habitats and adjacent upland and wetland habitats is essential to amphibians that breed in swamps and to other resident and transient wildlife of swamps. Direct disturbance, such as construction activity, creation of ponds, and logging can damage soil structure, plant communities, and microhabitats, and provide access for invasive plants.

CONIFER SWAMP (cs)

Ecological Attributes

Conifer swamp is a special type of forested swamp habitat (see above) where conifer species occupy 75 percent or more of the upper tree canopy. The dense canopy has a strong influence on the plant community and habitat structure of these swamps. The shrub and herbaceous layers, for example, are typically sparse and low in species diversity due to the heavy shading. Shading also creates a cooler microclimate, thereby allowing snow and ice to persist longer into the early spring growing season. Conifers growing in wetlands frequently have very shallow root systems and are therefore prone to windthrow. The resulting tip-up mounds, root pits, and coarse woody debris all contribute to the habitat's complex structure and microtopography.

Eastern red cedar was the dominant species in conifer swamps in the study area. Deciduous trees such as green ash, American elm, and red maple were present, but less abundant. The shrub and herbaceous layers were similar in species composition to those of hardwood and shrub swamps, but the overall cover was considerably lower.

Occurrence in the Study Area

We documented a few conifer swamps in the Fishkill and LaGrange portions of the study area. The Fishkill portion contained a total of 4.5 ac (1.8 ha) of conifer swamp, with individual occurrences ranging from less than 1 ac to 2 ac (<0.4 - 0.8 ha). These occurred in two different wetland complexes in the east-central portion of the corridor. In the LaGrange study area, we mapped only two small occurrence of conifer swamp (totaling 0.3 ac [0.1 ha]) along the Sprout Creek floodplain in the northern half of the corridor.

Conservation Considerations

Conifer swamps are uncommon in the Hudson Valley, and may support rare plants, insects, birds, and other biota. Tamarack swamps are often near fens or fen-like habitats, and may support some of the rare species of fens. Barred owl is known to nest in conifer swamps that are part of a larger forest matrix. These habitats share many of the sensitivities of hardwood swamps, and are easily damaged by logging and other intrusive activities that damage soil structure, vegetation, and microhabitats.

MARSH (ma)

Ecological Attributes

A marsh is a wetland dominated by herbaceous (non-woody) vegetation that typically has standing water for most or all of the growing season. Water depths can range from a few inches to 3 ft (1 m) or more. The composition of the plant community varies with depth and duration of standing water, nutrient availability, and other factors. There is often a layer of well decomposed organic muck over a mineral soil. Marshes often occur at the fringes of deeper water bodies (e.g. lakes and ponds), streams, or within and adjacent to other wetland habitats such as hardwood swamps. The edges of marshes, where standing water is less permanent, often grade into wet meadows.

Many marshes in the study area were associated with dredged or artificially impounded wetlands. Several marshes were apparently created to serve as stormwater treatment basins. These were typically dominated by non-native species such as purple loosestrife and common reed. Less disturbed marshes contained a somewhat more diverse plant community with cattail, water plantain, small forget-me-not, beggar-ticks, bulrushes, rice-cutgrass, tussock sedge, marsh fern, and spotted joe-pye-weed among the common taxa. Marshes in the study area were relatively shallow, with spring and mid-summer water depths of 4-12 in (10-30 cm).

Occurrence in the Study Area

Marsh habitat was uncommon in the study area. We mapped less than 50 ac (20 ha) of marsh, with most occurrences smaller than 1 ac (0.4 ha). Most marshes were highly disturbed and dominated by dense stands of non-native species.

The Fishkill portion of the study area contained the most marsh with a total of 26 ac (10.5 ha). The LaGrange and Beekman portions of the corridor had nearly 12 ac (5 ha) and 10 ac (4 ha), respectively. These habitat units generally ranged from less than 1 ac to nearly 5 ac (<0.4 - 2 ha).

We considered one marsh in the Beekman portion of the corridor to have especially high habitat value. This 2.8 ac (1 ha) marsh was part of an extensive, high quality wetland complex composed of calcareous wet meadow and fen located just west of the junction of Hynes Road and Beach Road. Unlike many other marshes in the study area, this marsh was dominated by an array of native species and had a well-developed habitat structure.

Conservation Considerations

High quality marsh is uncommon in the region. These habitats often support a diverse array of common and rare species. For example, marshes provide crucial nesting or nursery habitats for marsh birds and waterfowl such as Virginia rail,* sora,* king rail,* least bittern,* American bittern,*, marsh wren,* American black duck,* and wood duck.* Many raptor, wading bird, and mammal species use marshes for foraging. Marshes are also important habitats for reptiles and amphibians, including spotted turtle,* northern leopard frog, northern water snake, eastern painted turtle, and snapping turtle. Blanding's turtle* uses marshes for summer foraging, drought refuge, and rehydration during nesting migrations.

Several rare plant species are known from emergent marshes in the region, including buttonbush dodder* and spiny coontail.* Marshes may also support a diverse dragonfly and damselfly community including rare species such as New England bluet.*

Marshes are sensitive to various stresses from offsite (upgradient) sources. Nutrient pollution, contaminated stormwater runoff, and sedimentation can lead to changes in the plant and animal communities of marshes, including the invasion of non-native plants such as purple loosestrife and common reed. Noise and direct disturbance from human activities can discourage breeding activities of marsh birds. Because many animal species of marshes depend equally on surrounding upland habitats for their life history needs, protection of the ecological functions of marshes must include protection of surrounding habitats.

FEN (f)

Ecological Attributes

A fen is an open herbaceous and low shrub wetland that is fed by calcareous groundwater seepage. Fens are characterized by a distinctive plant community dominated by calcicoles, low and sometimes sparse vegetation, a tussocky ground surface, and shallow rivulets and pools. Fens in this region are concentrated in areas underlain by marble or limestone bedrock and are frequently adjacent to upland soils derived from calcareous glacial till. Fens are a rare habitat type because the distribution of calcareous bedrock, soils, and groundwater seepage is limited, and because of historic alteration of wetlands.

Fens in the study area had not been recently grazed or mowed and many contained dense tall-shrub thickets. All fens, however, still contained high quality openings with diverse herbaceous plant communities. Common forbs included marsh fern, grass-of-parnassus, small flowered agrimony,* spotted joe-pye-weed, hog-peanut, tall meadow rue, skunk-cabbage, spreading goldenrod, bog goldenrod, purple-stemmed aster, and golden ragwort among numerous other species. Sedges and grasses were diverse and quite abundant in most fens. Common species included porcupine sedge, yellow sedge, interior sedge, bristly-stalked sedge, woolly-fruit sedge, lakeside sedge, rice-cutgrass, and blue-joint grass.

Shrubby cinquefoil and northern gooseberry were the dominant species in the low shrub layer with most individuals less than 3 ft (1 m) in height. The tall shrub layer (shrubs between 5-10 ft [1.5 - 3 m] in height) included speckled alder, poison sumac, red cedar, silky dogwood, silky willow, and saplings of red maple. At least one fen also contained a moderate number of swamp birch* in the tall shrub layer. Young red maple and American elm, 3-5 in (7.6 - 12.7 cm) dbh, were widely scattered throughout several fens, but their total cover was generally 5 percent or less. Cover by invasive plants such as purple loosestrife and common reed was low.

Occurrence in the Study Area

We documented fen habitat only in the Beekman portion of the study area. All 10 of these fens were concentrated in the northern tip of the Beekman corridor, extending from just south of Route 55 northward to the town boundary. This region, which was strongly influenced by the underlying Wappinger Group limestone, also contained clusters of other important habitats such as calcareous wet meadows and calcareous crest, ledge, and talus. While most fens were smaller than 7 ac (3 ha), the largest fen encompassed nearly 14 ac (5.6 ha). Despite the advanced successional stage of these fens, we considered all to be high quality habitat due to their especially diverse plant communities, low invasive species cover, close proximity to one another, and high potential for successful long-term management.

Conservation Considerations

Fens are one of the most biologically diverse habitats in the Hudson Valley, but they are also one of the most imperiled due to their overall rarity and their sensitivity to disturbance. Because of their unusual chemistry, hydrology, and structure, fens provide habitat to an array of highly specialized species. Many of these species are restricted to fens and so may be quite vulnerable to extirpation.

Fens are the core habitat for the endangered bog turtle* in southeastern New York. The exposed tussocks provide critical basking and nesting microhabitats for this turtle in spring and early summer, and the deep, soft substrate is used for estivation and hibernation at other times of the year. Adjacent marshes, wet meadows, and swamps also provide important summer refuge and winter hibernation habitat, and are considered essential parts of the bog turtle habitat complex.

Fens are also used by other reptiles of conservation concern such as the spotted turtle* and ribbon snake.* The rare sedge wren* nests almost exclusively in shallow, sedge dominated wetlands like fens. Large open fens, especially those associated with extensive meadow complexes, can also be important hunting areas for the northern harrier.* Rare butterflies such as Dion skipper* and black dash,* as well as rare dragonflies such as forcipate emerald* and Kennedy's emerald,* are largely restricted to fen habitats.

More than 12 different plants of conservation concern are found almost exclusively in fen habitats, including bog valerian,* scarlet Indian paintbrush,* handsome sedge,* Schweinitz's sedge,* ovate spikerush,* spreading globeflower,* and swamp birch.* A population of swamp birch was observed in a fen in Beekman during this study.

Fens are highly vulnerable to degradation from activities in nearby upland areas. Nutrient pollution from septic systems, fertilizers, or road runoff, disruption of groundwater flow from wells or excavation, sedimentation from construction activity, or direct physical disturbance can lead to changes in the character of the habitat, including a significant decline in overall plant diversity and invasion by non-native species and tall shrubs (Aerts and Berendse 1988, Panno et al. 1999, Richburg et al. 2001, Drexler and Bedford 2002). Such changes can render the habitat unsuitable for the bog turtle and other fen animals and plants that require the special structural, chemical, or hydrological environment of an intact fen.

Fens that are known to harbor the bog turtle or may serve as potential habitat for the turtle require special protective measures. The US Fish and Wildlife Service (Klemens 2001) recommended not only protecting the actual wetland complex, but also prohibiting development (e.g. roads, driveways, residences, sewer lines, storm water basins, and other structures), mining, herbicide, pesticide, or fertilizer application, and delineation of lot lines within a 300 ft (91 m) distance from the wetland boundary. This buffer may be crucial to safeguarding the wetland habitat quality, hydrology, and turtle travel corridors. We believe that maintaining safe travel corridors between suitable fen habitats is important for population dispersal and to accommodate turtles displaced from degraded habitats. Measures aimed at protecting the bog turtle and its habitat would also help protect the numerous other rare species associated with fens.

WET MEADOW (wm)

Ecological Attributes

A wet meadow is a wetland characterized by a herbaceous (non-woody) plant community and a hydroperiod (duration of flooding) intermediate between that of an upland meadow and a marsh. Wet meadows generally lack standing water for most of the year and frequently become quite dry by mid-summer. The surface soils are saturated long enough, however, to promote the establishment of wetland forbs and graminoids. Wet meadows typically occur along the drier edges of swamps and marshes, or in shallow depressions in upland meadow habitats.

Wet meadows in the study area were generally located near intensive human activity (e.g. agricultural or recreational use) and therefore tended to be more chronically disturbed than other wetlands in the study area. Many had dense stands of one or more invasive species such as reed canary grass, common reed, or purple loosestrife. Less disturbed areas contained native species such as sensitive fern, tussock sedge, fox sedge, other sedges, soft rush, various grasses, arrow-leaved tearthumb, skunk-cabbage, late goldenrod, Canada goldenrod, lance-leaved goldenrod, and asters. Ostrich fern was abundant in a few wet meadows along the Sprout Creek floodplain. Low to mid-sized shrubs were generally patchy (never more than 50 percent cover) and included willows, red maple, elms, and silky dogwood.

Occurrence in the Study Area

We documented wet meadow habitat in all three portions of the study area. The LaGrange portion contained the most wet meadow with a total of nearly 135 ac (55 ha). Individual occurrences ranged from less than 1 ac to more than 21 ac (<0.4 - 8.5 ha). More than 50 percent of the wet meadow habitat occurred within the immediate floodplain of Sprout Creek. These floodplain wet meadows often formed large complexes with hardwood swamp, especially north of Route 55. Many wet meadows in the Sprout Creek floodplain supported a moderately diverse plant community with a low cover of invasive species.

The Fishkill portion of the study area had nearly 68 ac (27.5 ha) of wet meadow, with individual meadows ranging from less than 1 ac to 15 ac (<0.4 - 6 ha). Over 60 percent of this habitat was associated with the immediate floodplain of Fishkill Creek. Despite the highly disturbed condition of the surrounding landscape, some of these floodplain meadows were of good quality with a low cover of invasive species.

We mapped nearly 71 ac (29 ha) of wet meadow in the Beekman portion of the study area, ranging from less than 1 ac to nearly 7 ac (<0.4 - 2.8 ha). Most wet meadows were scattered throughout the active agricultural region in the southern end of the corridor, near the Green Haven Prison Farm. All were dominated by dense stands of invasive species.

Conservation Considerations

Wet meadows share many of the habitat values of upland meadows (see above). Wet meadows can provide nesting and foraging habitat for songbirds such as sedge wren,* wading birds such as American bittern,* and raptors such as northern harrier.* Wet meadows that are part of extensive meadow areas (both upland and wetland) may be especially important to species of grassland breeding birds that have suffered from loss of habitat throughout the Northeast. Wet meadows with diverse plant communities may have rich invertebrate faunas. Blue flag and certain sedges and grasses of wet meadows are larval food plants for a number of regionally-rare butterflies, including mulberry wing,* black dash,* two-spotted skipper,* and meadow fritillary.* Large and small mammals, including the regionally rare southern bog lemming,* use wet meadows and a variety of other habitats for foraging.

Wet meadows are often part of larger complexes of meadows and upland shrubland habitats that are prime sites for development, but they are often omitted from state, federal, and site-specific wetland maps and are frequently overlooked in the environmental reviews of development projects. Wet meadows should be accurately delineated and mapped, and they should be regarded as potentially important habitats during the environmental review process.

CALCAREOUS WET MEADOW (cwm)

Ecological Attributes

A calcareous wet meadow is a special type of wet meadow habitat (see above) that is strongly influenced by calcareous groundwater and soils. These conditions favor the establishment of a calcicolous plant community. Calcareous wet meadows are often associated with the dryer margins of calcareous swamps and fens or are located in close proximity to these habitats.

Calcareous wet meadows in the study area supported a diverse plant community composed of calcicoles such as spreading goldenrod, small flowered agrimony,* drooping bulrush, yellow sedge, porcupine sedge, woolly-fruit sedge, and Bush's sedge.* Several were dominated by dense stands of lakeside sedge and sweetflag. Shrubs indicative of highly calcareous conditions, such as shrubby cinquefoil and beaked willow, occurred at a very low density in a few of these habitats. Other common species included field horsetail, marsh fern, sensitive fern, tussock sedge, fox sedge, meadow sedge, pointed broom sedge, hop sedge, spotted touch-me-not, false-foxglove, dodders, spotted joe-pye-weed, and late goldenrod. Little standing water was observed during spring field visits, but the soils were saturated.

Occurrence in the Study Area

We documented calcareous wet meadow in variable amounts in all three segments of the study area. Calcareous wet meadows cannot be distinguished from an ordinary wet meadow by remote sensing and so must be confirmed in the field. It is possible, therefore, that some of the "wet meadows" we mapped but did not field check were calcareous.

The Beekman portion of the study area contained the most calcareous wet meadow with a total of approximately 18 ac (7.3 ha). Individual meadows ranged from less than 1 ac to 11.4 ac (<0.4 - 4.6 ha). Most calcareous wet meadows were concentrated in the northeastern end of the Beekman corridor. Many were contiguous with or closely associated with other calcareous habitats such as fens. We considered these calcareous wet meadows, especially the largest one, to be high quality habitat with high biodiversity potential.

We documented a total of 8 ac (3.2 ha) of calcareous wet meadow in the LaGrange portion of the study area, with individual occurrences ranging from less than 1 ac to 5.5 ac (<0.4 - 2.2 ha). Nearly 79 percent of this habitat was concentrated in a single area along Sprout Creek, just north of Noxon Road. This large calcareous wet meadow complex was considered to be of high quality due to its extent and condition.

The Fishkill portion of the study area contained a single, 14.5 ac (6 ha) occurrence of calcareous wet meadow, located just north of Deer Crossing Road in the eastern half of the corridor. The potential biodiversity value of this habitat was diminished somewhat by dense stands of purple loosestrife.

Conservation Considerations

Calcareous wet meadows that are part of larger meadow complexes share many of the habitat values of large upland meadows (see above). High quality calcareous wet meadows with diverse native plant communities may support some of the rare plants of fens, such as Schweinitz's sedge* and scarlet Indian paintbrush,* and several rare butterflies if their host plants are present. Ribbon snake* and spotted turtle* are also known to use calcareous wet meadows for basking, foraging, and nesting.

Bog turtles* use calcareous wet meadows that are adjacent to fens for summer foraging and even nesting habitat. Therefore, we recommend that calcareous wet meadows near suitable fens be treated as potential bog turtle habitat and given the same level of protection as fens, including a 300 ft (91 m) buffer zone (see discussion in the "Fen" section).

Calcareous wet meadows share with fens many of the same sensitivities to disturbance. They are particularly vulnerable to nutrient enrichment and siltation, which often facilitate the spread of invasive species. In addition, because calcareous wet meadows tend to be on the drier end of the wetland continuum, they are often omitted from state, federal, and site-specific wetland maps and are frequently overlooked in the environmental reviews of development projects. Calcareous wet meadows should be accurately delineated and mapped, and should be regarded as potentially significant habitats during the environmental review process.

WET CLAY MEADOW (wcm)

Ecological Attributes

A wet clay meadow is a special type of wet meadow habitat (see above) that occurs on level terrain with deep silty clay loam and clay loam soils of glaciolacustrine (glacial lake) origin. The clayey soils are generally calcareous and low in organic matter, and have low permeability. Like other wet meadows, wet clay meadows tend to dry up by mid- to late summer. The soils of some wet clay meadows may experience regular swelling and shrinkage at their surface as they become saturated in the spring and then dry out in summer. The wetland plant community is often similar to that of other wet meadows, but usually includes other species such as false foxglove, small flowered agrimony, meadow sedge, and Bush's sedge.

Wet clay meadow habitat in the study area had open graminoid and forb communities with smaller patches of shrubs and young trees. The ground layer was particularly diverse, and included an array of sedges, goldenrods, and other herbs. Calcicoles such as small-flowered agrimony* were locally abundant in the open areas. Silky dogwood, eastern cottonwood, American elm, and willows comprised the shrub layer. The microtopography was complex with numerous sedge tussocks and small hollows that held standing water during early spring.

Occurrence in the Study Area

We documented a single occurrence of wet clay meadow habitat in the Fishkill portion of the study area. This meadow was less than 1 ac (0.4 ha) and located in the far southwestern end of the corridor, just west of Victoria Lane.

Conservation Considerations

We have found many plants of regional or statewide significance in wet clay meadows, such as Frank's sedge,* Bush's sedge,* buttonbush dodder,* downy ground-cherry,* small skullcap,* winged loosestrife,* and ragged fringed orchid.* The Baltimore* (butterfly) has been found in wet clay meadows, and other rare butterflies are likely if their host plants are present. Because wet clay meadows resemble oldfield and shrubland habitats, they share some of the same biodiversity values of those habitats. For example, wet clay meadows are used for courtship displays by American woodcock, and those that are part of larger meadow or shrubland complexes may support grassland breeding birds.

Wet clay meadows, like other oldfield habitats, are often subject to ATV use and similar uses that can disturb nesting birds, cause erosion, soil compaction, and soil loss, and invite invasive plant species. Purple loosestrife has taken over some wet clay meadows in the region. Mowing or brush-hogging could help to control loosestrife and maintain an open habitat, but could also harm rare plants or disturb nesting birds. Wet clay meadows are often attractive sites for residential, industrial, or commercial developments that may destroy, fragment, or otherwise degrade the meadow habitat.

ACIDIC BOG (ab)

Ecological Attributes

An acidic bog is a rare wetland habitat that is perennially wet, very nutrient poor, and dominated by shrubs of the heath family and extensive carpets or floating mats of peat moss (*Sphagnum*). Bog soils consist of deep, partially decomposed peat moss and other organic matter that isolates the bog from ground water influence. Acidic bogs, therefore, are fed primarily by precipitation and by surface runoff from the immediate watershed. The thick peat moss also helps insulate the underlying ice into late spring or early summer, thereby maintaining a cool microclimate that supports a boreal relict plant community.

The acidic bog habitat in the study area was characterized by an extensive carpet of thick S*phagnum*. Several species of sphagnum covered large hummocks throughout the bog mat; many hummocks were more than 3 ft (1m) in diameter and 1.6 ft (0.5 m) tall. Insectivorous species such as pitcher-plant and round-leaved sundew were abundant in the low-lying areas and along the bases of hummocks. Leatherleaf, small cranberry, sheep laurel, and small individuals of highbush blueberry were co-dominant species in the low shrub layer, which represented 30 - 50 percent overall cover. The tall shrub layer was generally confined to the elevated hummocks and the outer edge of the bog mat. Typical tall shrub species included swamp azalea, highbush blueberry, gray birch, and red maple. Small white pine and red maple trees formed small to mid-sized clumps throughout the bog, especially along the outer edge of the bog mat. A narrow band of hardwood and shrub swamp occurred between the acidic bog and the surrounding upland forest habitat.

A small pool within the acidic bog had a rather distinctive plant community and physical appearance. We believe this pool may be at least weakly influenced by mineral rich ground water. The pool contained a mix of shallow open water areas and exposed mud flats, all over a deep, fine silty muck substrate. Some portions of the pool were dominated by water-willow. A narrow band of high tussocks surrounded the pool, and supported several sedges, marsh fern, royal fern, cinnamon fern, pitcher-plant, and leatherleaf. Poison sumac was the dominant tall shrub in the vicinity of the pool, often forming dense thickets.

Occurrence in the Study Area

We documented a single acidic bog in the Fishkill portion of the study area. This 9 ac (3.6 ha) bog was located in the far eastern end of the corridor, just northeast of the junction of Lake Road and Route 82. Although it was surrounded by development, we considered this bog to be an ecologically significant habitat due to its rarity, large size, and high habitat quality.

Conservation Considerations

Acidic bog is a rare habitat in the Hudson Valley, and many of the characteristic species of acidic bogs are rare or uncommon in the region; for example, Virginia chain fern,* white beakrush,* cottongrasses,* pitcher-plant,* round-leaved sundew,* leatherleaf,* and cranberries.* Four-toed salamander* may occur in bogs and similar wetlands with deep mats of sphagnum and other mosses on rocks, logs, and woody hummocks. Breeding birds of acidic bogs in the region include Nashville warbler,* golden-winged warbler,* northern waterthrush,* and eastern bluebird. Southern bog lemming* could occur in bogs and adjacent forests.

Bog soils and vegetation are easily damaged by foot traffic and similar disturbance. Because bog ecology seems to depend on a cool microclimate and low nutrient availability, bogs are probably sensitive to removal of forest in surrounding areas and to nutrient pollution.

Protection of large forested buffer zones around bogs would help to maintain the water quality essential to bog ecology, and to insulate the bog community from other aspects of human disturbance.

INTERMITTENT WOODLAND POOL (iwp)

Ecological Attributes

An intermittent woodland pool is a small wetland habitat that has standing water during the winter and spring, but typically drying out by mid- to late summer. Intermittent woodland pools are surrounded partially or entirely by forest and are a subset of the “vernal pool” habitat (which may or may not be surrounded by forest). The hydroperiod, or duration of standing water, varies from year to year depending mainly on the timing and intensity of precipitation. Intermittent woodland pools have no perennial inlet or outlet stream and are generally isolated from other wetland and stream systems. Some, however, are drained by shallow intermittent streams that flow only briefly when pool water levels are at their maximum.

Despite the small size of intermittent woodland pools, those that hold water through early summer can support amphibian diversity equal to or greater than that of much larger wetlands (Semlitsch and Brodie 1998, Semlitsch 2000). The seasonal drying and isolated nature of these pools help exclude fish, which are major predators on amphibian eggs and larvae. Because of this, these pools provide critical breeding and nursery habitat for numerous salamander and frog species. The surrounding forest provides essential habitat for adult and juvenile amphibians during the non-breeding season.

Several amphibian species and at least one group of invertebrates are considered obligate intermittent woodland pool species because they are entirely dependant on the predator free conditions of this habitat to successfully complete their life cycle. Breeding activity by obligate species is frequently used as an indicator for this habitat. Tadpoles, egg masses, or individuals of wood frog, spotted salamander, and fairy shrimp were observed in a number of intermittent woodland pools in the study area during spring field visits.

Most of the intermittent woodland pools in the corridor occurred in upland hardwood forest habitat, but we mapped a few pools in drier hardwood swamps if they appeared to be suitable amphibian breeding habitat and we believed fish were absent. Most of the woodland pools had water depths of 10 - 18 in (25.4 - 45.7 cm) during our early spring visits. In some the water was strongly tea-colored.

Vegetation tends to be sparse in intermittent woodland pools, but several common species were present in most occurrences in the study area. Trees such as red maple, pin oak, and American elm grew along the edge and on large hummocks (woody root crowns) in the pool. Various shrubs such as winterberry, highbush blueberry, buttonbush, and silky dogwood were also common on these hummocks.

Occurrence in the Study Area

We documented intermittent woodland pools in all three towns of the study area. The LaGrange portion of the corridor contained a total of 31 pools, Fishkill had 29, and Beekman had 5. Most were less than 0.5 ac (0.2 ha). The biodiversity potential of these pools varied considerably throughout the corridor, some especially high quality examples occurred in the LaGrange portion of the corridor in the forested hills bordering the Taconic State Parkway north of Route 55. Several high quality woodland pools also occurred on Honness Mountain in the Fishkill portion of the corridor. All of these examples were located within large blocks of contiguous forest, and we observed breeding obligate woodland pool species in many.

Conservation Considerations

Intermittent woodland pools are an imperiled habitat in the Hudson Valley region, in part because they have been frequently overlooked in environmental reviews of proposed developments and have been drained, filled, or dumped in by landowners and developers. Even when the pools themselves are spared in a development plan, the surrounding forests so essential to the ecological functions of the pools are frequently destroyed. Intermittent woodland pools are often excluded from federal and state wetland protection due to their small size, their temporary surface water, and their isolation from other wetland habitats. It is these very characteristics of size, isolation, and intermittency however, that make woodland pools uniquely suited to species that do not reproduce or compete successfully in larger wetland or pond systems.

Intermittent pools provide critical breeding and nursery habitat for an array of rare amphibian species, including the Jefferson salamander,* marbled salamander,* spotted salamander,* and wood frog.* The spotted turtle* uses intermittent woodland pools for foraging, rehydrating, and shelter. Wood duck* and American black duck* use intermittent woodland pools for nesting, brood-rearing, and foraging. The invertebrate communities of these pools can be rich, providing abundant food for songbirds such as yellow warbler, common yellowthroat, and northern waterthrush. Springtime physa, a regionally rare snail, is also associated with intermittent woodland pools. At least two rare plants, featherfoil* and false hop sedge,* occur in intermittent woodland pools in the lower Hudson Valley.

The mole salamanders (including Jefferson, marbled, and spotted salamander) breed in intermittent woodland pools, but spend most of their juvenile and adult lives in the soils and organic litter of surrounding upland forests. These salamanders are known to migrate seasonally up to 650 ft (198 m) from their breeding pools into surrounding forests (Downs 1989, Semlitsch 1998). A wood frog juvenile may travel as far as 1,550 ft (472 m) from a breeding pool into the surrounding upland forests (Calhoun and Klemens 2002). Both salamanders and frogs are highly vulnerable to vehicle mortality where roads or driveways cross their travel routes between intermittent woodland pool and upland forest habitats. The loss of individual pools or the forested connections between them can cause local extinctions of species.

Intermittent woodland pools produce mosquitoes and are sometimes targeted with pesticides or biocontrols to kill mosquitoes. However, the mosquito believed to be most important in transmitting West Nile Virus to humans, *Culex pipiens*, does not typically breed in intermittent woodland pools unless the pools are polluted with sewage, manure, or other organic materials.

Important conservation measures for intermittent woodland pools include protecting pools from filling, draining, dumping, dredging, logging, pollution, siltation, or compaction; protecting large areas of surrounding forests; and preserving overland connections between pools. Calhoun and Klemens (2002) recommended protecting a 750 ft (228 m) forested radius around each intermittent woodland pool, an area representing the critical habitat zone for obligate pool-breeding amphibians.

KETTLE SHRUB POOL (ksp)

Ecological Attributes

A kettle shrub pool is a seasonally or permanently flooded, shrub-dominated wetland located in a glacial kettle—a depression formed by the melting of a stranded block of glacial ice. These pools are adjacent to soils formed in glacial outwash (e.g. Hoosic gravelly loam). Standing water is typically 1 - 3 ft (0.3 - 1 m) or more deep and is often stained a dark tea color. These habitats have a thick organic (muck) substrate, usually with a surface layer of undecomposed leaf litter and woody debris. Kettle shrub pools typically have no stream inlet or outlet, although some may have a small intermittent stream outlet. Often, a shrub thicket in the middle of the pool is entirely or partly surrounded by an open water moat.

Most kettle shrub pools in the study area were dominated by buttonbush, an aquatic shrub. Buttonbush often formed dense stands throughout most pools, sometimes covering 75 percent or more of the pool surface. Other kettle shrub pools contained a somewhat more diverse shrub community composed of highbush blueberry, swamp azalea, winterberry, alder, silky dogwood, pussy willow and young stems of red maple, green ash, and swamp white oak. Duckweeds, coontails, and liverworts, along with other living and dead plant material, formed floating mats on the pool surface. Cover by emergent herbaceous species was generally low or patchy, and included purple loosestrife, tussock sedge, bur-reed, beggarticks, water-plantain, and arrowhead. Trees such as red maple and American elm were sparse in the pool interior. Many pools had a ring of mature hardwoods around all or most of the perimeter.

Occurrence in the Study Area

We found kettle shrub pools in all three segments of the study area, but the LaGrange portion contained the greatest number. The 18 pools mapped in LaGrange ranged from less than 0.5 ac

(0.2 ha) to nearly 13 ac (5.2 ha). Thirteen of these were concentrated in the broad glacial outwash plain south of Route 55. The remaining pools were scattered along narrow bands or small inclusions of outwash in the northern half of the corridor. We considered all of these shrub pools to have high ecological value due to their habitat structure and (for most) proximity to one another.

Just two kettle shrub pools were mapped in the Fishkill portion of the corridor. Both were small (< 1 ac [0.4 ha]) and located in an intensively developed area west of the Route 9 - Interstate 84 interchange. The habitat value of these pools was lower due to the disturbed condition of the surrounding landscape.

The Beekman portion of the corridor had only one kettle shrub pool. This 6.3 ac (2.5 ha) pool was located just north of Sylvan Lake Road in an area of mixed land use. Although the habitat structure was quite good, its overall habitat value may be diminished by the apparent isolation of this pool from other kettle shrub pools.

Conservation Considerations

A kettle shrub pool or similar wetland is an essential part of the core habitat of the threatened Blanding’s turtle.* The Blanding’s turtle uses kettle shrub pools during two crucial phases of its life cycle, winter hibernation and spring basking. In late spring and early summer, adult females move overland to upland nesting sites, and, during the spring and summer, adult males and females use kettle shrub pools and a variety of other wetlands for foraging, resting, and drought refuge.

Most Blanding’s turtle seasonal movements occur within a 3,300 ft (1,000 m) radius of their winter and spring wetland habitat. In the Northeast and elsewhere in their range, however, movements of 6,500 feet (2,000 m) or more have been documented on numerous occasions (Joyal et al. 2000, Fowle 2001, Joyal et al. 2001). To delineate the potential extent of the habitat complex used by a Blanding’s turtle population, we draw a 1,000 m and a 2,000 m radius around their winter and spring wetland habitat (i.e. kettle shrub pools). We consider 1,000 m to be the zone of primary concern, and 2,000 m to be the zone of secondary concern

(Hartwig et al. in prep). The 1000 m zone encompasses the wetlands that the turtles use regularly, most of the nesting areas, and most of the travel corridors. One can expect turtles regularly in this zone throughout the active season (April through October). The 2000 m zone encompasses the landscape within which the Blanding's turtle travels to explore new wetlands, and sometimes to nest. One can expect a few turtles from a particular core wetland in this zone each year. Within these zones, potential Blanding's turtle habitats include both wetlands and upland nesting habitats, as well as the travel corridors between them. Nesting habitats are typically non-forested, unshaded habitats with loose, coarse-textured, well drained soil (often gardens, agricultural fields, utility rights-of-way, soil mines, etc.).

At least two state-listed rare plants (spiny coontail* and buttonbush dodder*) and three regionally-rare plants (the moss *Helodium paludosum**, short-awn foxtail*, and pale alkali-grass*) have been found in kettle shrub pools. Kettle shrub pools are used by spotted turtle*, wood duck*, mallard, American black duck,* and many other wildlife species.

By identifying kettle shrub pools, we have identified some of the key winter and spring habitats that may be used by Blanding's turtles in normal years. Proposed development near a Blanding's turtle habitat complex, especially within the 1,000 m zone of primary concern, should be carefully planned and executed to prevent loss or degradation of wetlands, and to maintain important travelways between wetlands and upland nesting habitats.

OPEN WATER (ow)

Ecological Attributes

Open water habitats include natural ponds and lakes, large open water areas within marshes, and ponds that may have originally been constructed but have since reverted to a more natural state (e.g. surrounded by unmanaged vegetation; no longer maintained as ornamental or livestock ponds, etc.). Most of the open water habitats in the study area appeared to be constructed ponds (see below) that are no longer managed and have been allowed to revert to a more natural condition. Open water habitats were usually buffered from developed areas by a ring of natural upland vegetation. The interior of these habitats was often free of vegetation, but in a few cases submerged and floating leaved aquatic vegetation such as duckweed, coontail, and yellow water-crowfoot formed a thin mat at the water surface.

Occurrence in the Study Area

Natural open water was an uncommon habitat type in the study area, although all three sections of the corridor contained at least a few occurrences. The Fishkill portion of the corridor had a total of 8 open water areas, most of which were smaller than 1 ac (0.4 ha). We documented a total of 7 open water ponds in the Beekman portion of the study area, including one that was nearly 3 ac (1.2 ha). The LaGrange portion of the corridor had only two of these habitats; both were 0.5 ac (0.2 ha) or less.

Conservation Considerations

Open water habitats are used by many common species of invertebrates, fishes, frogs, turtles, waterfowl, and mammals. American bittern,* osprey,* bald eagle,* and great blue heron* may use open water areas as foraging habitat. Blanding's turtle* and spotted turtle* use ponds and lakes during non-drought periods and as refuges during drought periods. Wood turtle* may overwinter and mate in open water areas. Northern cricket frog* may occur in circumneutral ponds, and spiny coontail* is known from several calcareous open water ponds. Open water areas sometimes support submerged aquatic vegetation that can provide important habitat for aquatic invertebrates and fish.

The habitat value of natural open water areas can be greater than that of constructed ponds if they are less intensively managed, less disturbed by human activities, and located within a mosaic of undeveloped habitat. These habitats are, however, vulnerable to human impacts, such as use of motorized watercraft, shoreline development, aquatic weed control, and runoff from roads, lawns, and agricultural areas. Aquatic weed control, which may include use of herbicides, grass carp, harvesting, and biocontrol, is an especially important concern in open water habitats, and the potential negative impacts should be assessed carefully before any such activities are undertaken. To protect water quality and habitat values, broad zones of undisturbed vegetation and soils should be maintained around undeveloped ponds and lakes. If part of a pond or lake must be kept open for ornamental or other reasons, it is desirable to avoid dredging and to allow other parts of the pond to develop abundant vegetation.

CONSTRUCTED POND (cp)

Ecological Attributes

Constructed ponds include water bodies that have been excavated or dammed by humans, either in existing wetlands or in upland terrain, for such purposes as aesthetics, recreation, watering livestock, irrigation, or drinking water (e.g. reservoirs). They also include water bodies created during mining operations. Most of these habitats are intensively managed (e.g. shoreline mowing, herbicide application) or subject to disturbance from the surrounding landscape (e.g. contaminated runoff from agriculture and private yards) and lack of natural vegetated buffers. If left unmanaged, however, constructed ponds often revert to open water or wetland habitat with a much higher habitat value.

Occurrence in the Study Area

We mapped a total of 160 constructed ponds in the study area. Most of these ponds were smaller than 1 ac (0.4 ha). The LaGrange portion of the study area had 90. The largest (nearly 17 ac [6.9 ha]) was in an active gravel mine just north of Velie Road. This pond was not seen in its entirety and may be considerably larger than mapped.

We documented a total of 36 constructed ponds in the Beekman portion of the corridor, with the largest (53 ac [21.5 ha]) located in a recently abandoned gravel mine along Green Haven Road. We also mapped two mid-sized sewage treatment ponds on the Green Haven Prison property as “constructed pond.”

The Fishkill portion of the study area contained a total of 35 constructed ponds. The largest of these (9.5 ac [3.8 ha]) was part of a stormwater detention basin system in a development just west of Route 9. Many of the constructed ponds in the Fishkill Creek corridor were located within landscaped areas near residences and other developments. Some, however, were associated with active or recently abandoned agricultural lands—especially in the Beekman portion of the corridor.

Conservation Considerations

The habitat values of constructed ponds vary depending on the landscape context and the extent of human disturbance. If constructed ponds are not intensively disturbed by human activities, they can be important habitats for many of the common and rare species that are associated with natural open water habitats (see above). In general, the habitat value increases when the ponds have undeveloped shorelines, are relatively undisturbed by human activities, and are embedded within a mosaic of intact habitat. Because many constructed ponds are not buffered by natural vegetation, they are vulnerable to the adverse impacts of agricultural runoff, septic leachate, and pesticide/fertilizer runoff from lawns and gardens. We expect that many of those maintained as ornamental ponds are treated with herbicides and perhaps other toxins. Since constructed ponds serve as potential habitat for a variety of common and rare species, care should be taken to minimize these impacts.

The habitat values of constructed ponds, especially intensively managed ornamental ponds, do not ordinarily justify altering streams or destroying natural wetland or upland habitats to create those ponds. In most cases, the loss of ecological functions of natural habitats far outweighs any habitat value gained in the new artificial environments.

SPRINGS & SEEPS

Ecological Attributes

Springs and seeps are places where groundwater discharges to the ground surface, either at a single point (a spring) or diffusely (a seep). Although springs often discharge into ponds, streams, or wetlands such as fens, we mapped only springs and seeps that discharged conspicuously into upland locations. These aquatic features often emerge at the base of a ledge or slope, or just upgradient of a wetland or stream. Springs and seeps originating from deep groundwater sources flow more or less continuously while those from shallower sources flow intermittently. Because groundwater discharge in our region has a fairly constant temperature of about 50-55^{o} F (10-13^{o} C), springs and seeps are warmer than their surroundings in winter and cooler in summer. The habitats created at springs and seeps are determined in part by the hydroperiod and the chemistry of the soils and bedrock through which the groundwater flows before emerging. In the study area, a few seeps with calcareous groundwater discharge supported yellow sedge, shrubby cinquefoil, and other calcicoles.

Occurrence in the Study Area

We observed springs and seeps in all three portions of the study area. The Fishkill portion had at least 25 individual occurrences of springs and seeps; most were located at various points along the base of Fishkill Ridge and Honness Mountain. One hillside just north of Mountain Lane contained so many seeps that instead of mapping them individually, we used a polygon overlay to map this 16 ac (6.5 ha) seep complex. We observed far fewer springs and seeps in the Beekman and LaGrange portions of the corridor, which had 3 and 2 occurrences respectively. Because the occurrence of springs and seeps is difficult to predict by remote sensing, we mapped only the very few we happened to see in the field. We expect there are many more springs and seeps in the study area that we did not map. More detailed inventories of springs and seeps should be conducted as needed on a site-by-site basis.

Conservation Considerations

Very little is known, or at least published, on the ecology of seeps in the Northeast. Springs and seeps provide important water sources for many organisms during droughts, and during winter when some of these habitats may remain free of ice. Because springs and seeps tend to be warmer than surrounding habitats in winter and cooler than surrounding habitats in summer, they sometimes support certain organisms that occur rarely or not at all in other habitats in the region. Golden saxifrage is a plant restricted to springs and groundwater-fed streams and wetlands. A few rare invertebrates are restricted to springs in the region; for example, gray petaltail* and tiger spiketail* are two rare dragonflies of seeps. Springs emanating from calcareous bedrock or calcium-rich surficial deposits sometimes support an abundant and diverse snail fauna. Northern dusky salamander* and northern two-lined salamander are typically associated with springs and cold streams.

Springs are easily disrupted by disturbance to upgradient land or groundwater, altered patterns of surface water infiltration, or pollution of infiltering waters. Many springs have been modified for water supply, and some have had spring houses constructed over excavated basins. In many areas, groundwater has been polluted, or drawn-down by pumping for human or livestock water supply, affecting the quality or quantity of water issuing from seeps and springs.

PERENNIAL & INTERMITTENT STREAMS

Ecological Attributes

Perennial streams flow continuously during years with normal precipitation, but some smaller perennial streams may dry up during droughts. Intermittent streams flow only during certain times of year or after rains and snowmelt. They are the headwaters of many perennial streams, and are significant water sources for lakes, ponds, and wetlands of all kinds. The condition of intermittent streams therefore influences the water quality and quantity of those larger water bodies and wetlands. Factors such as underlying and nearby geology and land uses in the watershed have a strong influence on the physical, chemical, and biological character of these aquatic systems, including the type of the substrate (e.g. clay, sand, gravel, cobbles, or bedrock), water quality, and the composition of plant and animal communities.

We mapped larger low-gradient streams, such as Fishkill Creek and Sprout Creek, and the numerous smaller perennial and intermittent streams found throughout the landscape as a single habitat type. We did distinguish between perennial and intermittent streams, however, in the accompanying GIS attribute table for this habitat. The habitat structure and quality of these streams varied considerably depending on the type and intensity of the surrounding land use and the local environmental conditions. Portions of streams influenced by tidal water from the Hudson River were mapped as a separate habitat type.

Occurrence in the Study Area

Perennial streams were distributed throughout the Beekman, LaGrange, and Fishkill portions of the study area, while intermittent streams were most common in the hilly terrain. We expect that there are additional intermittent streams that we have missed.

Conservation Considerations

Streams and their associated riparian zones tend to have high species diversity and high biological productivity. Most fish and wildlife depend upon riparian habitats in some way for their survival (Hubbard 1977, McCormick 1978). Perennial streams and riparian zones provide nesting and foraging habitat for many species of birds, such as spotted sandpiper, belted kingfisher, tree swallow, bank swallow, Louisiana waterthrush, great blue heron* and green heron. Red-shouldered hawk,* willow flycatcher, prothonotary warbler, and cerulean warbler* nest in areas with extensive riparian forests, especially those with mature trees. Bats use perennial stream corridors for foraging. Wood turtle* uses perennial streams with pools and recumbent logs, undercut banks, and muskrat or beaver burrows. The fish and aquatic invertebrate communities of perennial streams may be diverse, especially in clean-water streams with unsilted bottoms. Brook trout* and slimy sculpin* are two native fish species that require clear, cool streams for successful spawning and nursery habitats. Wild brook trout, however, are now confined largely to small headwater streams in the region, due to degraded water quality and competition from brown trout, a non-native species stocked by the state and by private groups. Muskrat, beaver, mink, and river otter,* are some of the mammals that use riparian corridors regularly. We know of many rare plants of riparian zones, such as cattail sedge,* Davis' sedge,* and diarrhena* (a grass).

Intermittent streams can be important local water sources for wildlife, and their disappearance in a portion of the landscape can affect the presence and behavior of wildlife populations over a large area. Although intermittent streams have been little studied by biologists, they have nonetheless been found to support rich aquatic invertebrate communities, including regionally rare and state-listed rare mollusks (Gremaud 1977) and dragonflies. Both perennial and intermittent streams provide breeding, larval, and adult habitat for northern dusky salamander,* and northern two-lined salamander. The forests and sometimes the meadows adjacent to streams provide foraging habitats for adults and juveniles of these species.

Removal of trees or other shade-producing vegetation along streams can lead to elevated stream temperatures that can adversely affect aquatic invertebrate and fish communities. Clearing of floodplain vegetation can reduce the important exchange of nutrients and organic materials between the stream and the floodplain, and can diminish the floodplain's capacity for floodwater attenuation, leading to increased flooding downstream, scouring and bank erosion, and sedimentation of downstream reaches. Any alteration of flooding regimes, stream water volumes, timing of runoff, and water quality can profoundly affect the habitats and species of streams and riparian zones. Hardening of the streambanks with concrete, riprap, gabions, or other materials reduces the biological and physical interactions between the stream and floodplain, and tends to be harmful both to stream and floodplain habitats. Removal of snags from the streambed degrades habitat for fishes, turtles, snakes, birds, muskrats, and their food organisms.

Effective protection of stream habitats, therefore, requires attention not only to the stream channel, but to land uses in the riparian corridor and throughout the watershed. Applications of fertilizers and pesticides to agricultural fields, golf courses, lawns, and gardens in or near the riparian zone can degrade the water quality and alter the biological communities of streams. Construction, paving, logging, soil mining, clearing of vistas, creating lawns, and other disruptive activities in and near riparian zones can eliminate riparian functions and adversely affect the species that depend on streams, riparian zones, and nearby upland habitats. Because one of the most important means of protecting stream quality is to protect the riparian zones from disturbance, we recommend maintaining (or restoring, if necessary) natural riparian habitats wherever possible. Activities in the watershed that cause soil erosion, increased surface water runoff, reduced groundwater infiltration, or contamination of surface water or groundwater are likely to affect stream habitats adversely. For example, an increase in impervious surfaces (roads, parking lots, roofs) may elevate runoff volumes, leading to erosion of stream banks and siltation of stream bottoms and degrading the habitat for invertebrates, fish, and other animals. Road runoff often carries contaminants such as petroleum hydrocarbons, heavy metals, road salt, sand, and silt into streams.

TIDAL and SUPRATIDAL HABITATS

ESTUARINE ROCKY SHORE (ers)

Ecological Attributes

This habitat type includes beaches of gravel, cobble, and natural rock rubble, as well as rock outcrops, ledges, and cliffs in and above the intertidal zone of the Hudson River. Estuarine rocky shores are subjected to regular tidal inundation or wetting by wave splash and wind spray. These habitats also experience rapid heating and cooling, ice scouring in winter, and intermittent wind and wave disturbance. The plant community is usually sparse in the intertidal zone, but may be moderately dense in the splash zone above the high water mark. In the study area, most estuarine rocky shores were narrow beaches of unconsolidated gravel and cobble with small patches of mid-sized rock material. No intertidal rock outcrops, ledges, or cliffs were observed within the study area.

Occurrence in the Study Area

We documented estuarine rocky shore only in the Town of Fishkill and the City of Beacon. About 5,164 linear feet (1,574 linear meters) of rocky shore habitat was observed in various locations along the eastern bank of the Hudson River and the west shore of Denning Point. Except for a few remote areas, much of this habitat was disturbed by human activity (e.g. fishing, garbage).

Conservation Considerations

We know little about the ecology of rocky shore environments on the Hudson River. Rare plants of the upper intertidal zone of freshwater reaches of the Hudson include estuary beggar-ticks,* heartleaf plantain,* and terrestrial starwort.* Eastern prickly-pear* has been found on a rocky shore in Rockland County, and river birch* on a rocky peninsula in Dutchess County. Northern white cedar* occurs on cliffs and rocky shores in Dutchess and Columbia counties. Map turtle* basks and nests on Hudson River rocky shores, and harbor seal* sometimes hauls

out onto rocky shores in locations isolated from human activities. Mallard and American black duck* are known to nest on rocks above the mean high water elevation.
The biological communities of Hudson River rocky shores seem to be well-adapted to disturbances caused by wind, waves, and ice, but can be damaged or destroyed by excessive human foot traffic or by use of wheeled or tracked vehicles. Human intrusions are likely to discourage use of rocky shore sites by nesting waterfowl or by harbor seals. For these reasons, developed features including walking trails should be located away from these and other shoreline habitats wherever possible.

SUPRATIDAL RAILROAD CAUSEWAY (src)

We use the term supratidal railroad causeway to describe the elevated railroad tracks that run along the shores of the Hudson River. These railroads rest on a foundation of fill material composed of coal cinder and crushed stone over larger blocks of rock. The railroad beds are contaminated with toxic elements and organic compounds from coal and petroleum use, and are repeatedly sprayed with herbicides to prevent vegetation from overgrowing the tracks. Discarded railroad ties and a variety of other railroad-generated refuse litter large areas of the habitat. The vegetation is typically dominated by non-native species and can range from nearly bare to a moderate cover of herbs and grasses. A narrow band of shrubs and young trees often occurs along the base of the railroad bed. A supratidal railroad causeway runs along the eastern shore of the Hudson River in the Fishkill portion of the study area.

Despite its highly disturbed nature, this habitat does have some potential biodiversity value worth noting. Several rare plants, including Drummond’s rock-cress,* slender knotweed,* and kidneyleaf mud-plantain,* are known from supratidal railroads in the Hudson Valley. These railroads are also used intensively for nesting by snapping and eastern painted turtles. Wood turtle* and spotted turtle* may also use the cinders and exposed gravel found along the railroad for nesting, and this habitat is sometimes used by snakes for basking.

TIDAL TRIBUTARY MOUTH (ttm)

Ecological Attributes

The term “tidal tributary mouth” refers to the tidal reaches of Hudson River tributary streams. This habitat occurs no higher (farther upstream) than the first topographic contour line (10-20 ft [3-6 m] elevation) or the first dam, whichever is lower. This portion of the stream is strongly influenced by the mixing of nontidal and tidal waters. The substrate and water chemistry of these habitats are often very different from those found in the adjoining tributary or in the Hudson River. Salinity values can fluctuate considerably depending on the season, stream volume and the tide. In winter there is often intense ice scouring of the stream bed and shore line. The plant and animal communities are composed mainly of freshwater species able to tolerate tidal fluctuations and seasonally brackish waters.

The tidal mouth habitat of Fishkill Creek had a fine sand and mucky silt substrate with a moderate cover of submerged aquatic vegetation dominated by non-native species such as water chestnut, Eurasian water milfoil, and curly pondweed. A smaller portion of this habitat near the upstream limit of tidal influence had a small to mid-sized rock, gravel, and coarse sand substrate with little aquatic vegetation.

Occurrence in the Study Area

The only occurrence of tidal tributary mouth habitat in the study area was at the mouth of Fishkill Creek in the City of Beacon. We considered the dam just east of South Avenue (approximately 3280 ft [1000 m] upstream from the Hudson River) to be the upper limit of tidal influence and thus the upper limit of this habitat. The lower reach of the tidal tributary mouth split into two separate stream channels with a broad expanse of high quality intertidal marsh and mudflat between.

Conservation Considerations

Tidal tributary mouths tend to be sites of concentrated biological activity. Macroinvertebrates may be abundant and diverse in these habitats, which also serve as spawning sites for fishes, and foraging sites for wading birds, waterfowl, and raptors. Several rare or uncommon plants such as lizard's tail,* estuary beggar-ticks,* smooth bur-marigold,* and goldenclub,* and at least one rare snail, *Pomatiopsis lapidaria*, have been found in tidal tributary mouths of the Hudson.

Noise, pollution, and mechanical disturbance from boat traffic can cause extreme disturbance to the plant and animal communities of tidal tributary mouths. Foot traffic on tributary banks can damage vegetation and increase susceptibility to bank erosion. Poor water quality in the tributary streams will reduce the habitat quality of the tidal stream mouths. Dams impede fish spawning runs, and the installation of fish ladders or dam by-passes would do much to support the populations of river herring (alewife & blueback herring) and many other fish species that spawn in non-tidal portions of Hudson River tributaries.

INTERTIDAL MARSH (im)

Ecological Attributes

An intertidal marsh is a non-forested wetland that occurs in the shallow bays and tributary mouths along the tidal portion of the Hudson River, in the elevation zone between mean high water and mean low water. The substrate is regularly exposed at low tide and flooded twice daily by high tide. In the study area, the tidal water can vary in salinity from fresh to slightly brackish, and is usually less than 6 ft (2 m) deep at high tide. Intertidal marshes at tributary mouths also receive water and sediment from the associated freshwater stream. The plant community is composed of emergent herbaceous species, including common freshwater marsh plants and other species tolerant of tidal fluctuations and brackish water. Low elevation areas bordering mudflats (see below) or open water are usually dominated by low broad-leaf emergents and submerged aquatics. More elevated portions of the marsh are frequently dominated by tall, narrow-leaf emergents.

This zonation of the plant community was observed in many intertidal marshes in the study area, especially in the larger marshes. The low elevation zones were dominated by spatterdock, arrow arum, pickerelweed, strap-leaf arrowhead, and broadleaf arrowhead. Narrow-leaf cattail, sweetflag, and blue flag formed dense stands in the higher elevation zones. Invasive species such as common reed and purple loosestrife were sparse or confined to small patches. Eurasian watermilfoil and water chestnut (two non-native aquatics) were extensive in the deepest intertidal areas.

Occurrence in the Study Area

Intertidal marsh was confined to the Fishkill Creek mouth and associated bay in the Fishkill portion of the study area. We mapped a total of 15.5 ac (6.3 ha) of intertidal marsh, with individual occurrences ranging from less than 1 ac (0.4 ha) to 13 ac (5.3 ha). We consider all of these marshes to be ecologically significant, but the largest marsh was particularly noteworthy due to its size, complex habitat structure, dominance by native species, and high biodiversity potential.

Conservation Considerations

The fishes and birds of freshwater and brackish tidal marshes can be diverse and abundant. Least bittern,* American bittern,* sora, Virginia rail, and common moorhen* are known to breed in Hudson River tidal marshes, and osprey and northern harrier forage in these habitats. Many rare plants have been reported from these habitats, including Fernald's sedge,* Long's bittercress,* spongy arrowhead,* goldenclub,* American waterwort,* and heartleaf plantain.*

Soil compaction and trampling or clearing of vegetation in tidal marshes can damage microhabitats and can promote the spread of invasive plants such as common reed or purple loosestrife. Motorized boat traffic can cause water pollution and mechanical destruction of plants, and can disturb breeding and foraging birds and other animals of these habitats. Any alteration of wave stresses or deposition regimes could alter the extent or quality of the tidal marsh habitats at the mouth of Fishkill Creek.

INTERTIDAL MUDFLAT (imf)

Ecological Attributes

An intertidal mudflat is a sparsely vegetated wetland that occurs in the shallow bays, tributary mouths, and other shallow zones in the tidal portion of the Hudson River. These habitats are restricted to the lowest portion of the intertidal zone, usually between intertidal marsh and permanent open water. Intertidal mudflats experience the deepest flooding at high tide and are exposed for the shortest period of time at low tide. The sparse plant community typically is low-growing, rosette-leaved aquatics that are completely submerged at high tide.

In the study area, greater than 75 percent of the mudflat was bare at low tide during late spring visits. Species such as strap-leaf arrowhead, arrowhead, and tapegrass were sparse or occurred in small patches across the mudflats.

Occurrence in the Study Area

We documented intertidal mudflat only in the mouth of Fishkill Creek in the Town of Fishkill and the City of Beacon. Six high quality mudflat areas totaled 7.5 ac (3 ha), with individual occurrences ranging from less than 1 ac to 2.5 ac (<0.4 - 1 ha).

Conservation Considerations

Wading birds, waterfowl, and raptors forage on mudflats at lower tide levels. Some rare plants of Hudson River tidal mudflats include strapleaf arrowhead,* spongy arrowhead,* mudwort,* and false-pimpernel.* These habitats are sensitive to the same kinds of mechanical, pollution, and noise disturbances described for tidal marshes. Any alteration of wave stresses or deposition regimes could alter the extent or quality of the mudflat habitats at the mouth of Fishkill Creek.

INTERTIDAL SWAMP (is)

Ecological Attributes

Intertidal swamp is a forested or shrub-dominated wetland that occurs in the upper intertidal zone of the Hudson River, along the mainland, on islands, or in the elevated portions of intertidal marshes. Intertidal swamps may grade gently into supratidal or non-tidal hardwood and shrub swamps. The substrate is continuously wet and is subjected to twice daily flooding by tidal water, which in the study area can vary from fresh to slightly brackish. The plant community is similar to that of non-tidal swamps in the region. Areas that are more strongly influenced by the tide may have many dead or damaged trees.

Intertidal swamps in the study area were dominated by eastern cottonwood, American elm, and red maple. The shrub layer ranged from sparse to very dense and included silky dogwood, alder, willows, northern arrowwood, and multiflora rose. Sensitive fern was a common component of the herbaceous layer.

Occurrence in the Study Area

We mapped three areas of intertidal swamp near the mouth of Fishkill Creek totaling less than 3 ac (1 ha), and located at the fringes of intertidal marsh.

Conservation Considerations

Hudson River tidal swamps are biologically rich, but their ecology has been little studied. Nine species of rare mosses and two rare liverworts have been found in Dutchess County tidal swamps. Swamp lousewort,* Fernald's sedge,* and winged monkey-flower occur in several tidal swamps in the region, and goldenclub* and heartleaf plantain* have been found at swamp edges. Wood turtle,* beaver, mink, and river otter* are known to use Hudson River tidal swamps, and osprey and bald eagle sometimes perch in large trees near swamp edges.

Tidal swamps should be protected from logging and other activities that would destroy important wildlife habitat or damage the swamp floor. As with other tidal habitats, alterations to wave stresses, tidal unundation patterns, or deposition regimes could alter the extent or quality of the swamp habitats at the mouth of Fishkill Creek.

PLANNING FOR BIODIVERSITY


Goldenclub
(K. Schmidt © 2001)

Overview

Most local land use decisions in the Hudson Valley are made on a site-by-site basis without the benefit of good ecological information about the site or the surrounding lands. Al-though the incremental loss of biological resources from any single development site may seem trivial, the cumulative impacts of site-by-site decision making have included the disappearance of certain habitats from whole segments of the landscape, the fragmentation and degradation of many other habitats, the local extinction of species, and the depletion of overall biodiversity in the region.

The size of habitats, the degree of connectivity between habitats, and the juxtaposition of habitats in the landscape all have important implications for regional biodiversity. While some species and habitats may be adequately protected at a relatively small scale, many wide-ranging species with large spatial requirements, such as black bear, barred owl, and red-shouldered hawk require large, interconnected blocks of unbroken habitat. Many species, such as Blanding's turtle, timber rattlesnake, and Jefferson salamander, need to travel among different habitats to satisfy their basic needs for food, water, cover, nesting and nursery areas, and population dispersal. Landscapes that are fragmented by roads, railroads, utility corridors, and developed land limit the movements of and interactions between animals, and can disrupt patterns of dispersal, reproduction, competition, and predation. According to Wilcove et al. (1986), habitat fragmentation may be "the principal threat to most species in the temperate zone." Habitat patches surrounded by human development function as islands, and species unable to move between habitats are vulnerable to genetic isolation and local extirpation over the long term (Davies et al. 2001). Landscapes with larger areas of unfragmented habitat, on the other hand, are more likely to support a broad diversity of native species and the ecological processes and disturbance regimes that maintain those habitats and species.

Because habitats, biological communities, and ecosystems extend beyond property boundaries, the best approach to biodiversity conservation is from the perspective of whole landscapes.

The habitat maps for the study area facilitate this approach by illustrating the location and configuration of ecologically significant habitats throughout the Fishkill Creek and Sprout Creek corridors. This spatial ecological information together with the information included in this report can be applied directly to land use and conservation planning and decision-making at multiple scales:

1. *Large-scale conservation and land use planning*

   The three habitat maps and this report are practical tools that can help the towns establish conservation goals, priorities, and strategies. The maps provide a landscape perspective on the Fishkill Creek and Sprout Creek corridors that can help users prioritize areas for protection and identify sites for new development where the ecological impact will be minimized. The landscape approach is much more likely to yield sound conservation decisions than the typical parcel-by-parcel approach.

2. *Reviewing development proposals and other land use proposals*

   The habitat maps and this report can help landowners, developers, and town officials understand the ecologically significant habitats on a site and the ecological connections between habitats when considering development proposals. With this information, new developments can be sited and designed to minimize impacts to important habitats.

In the following pages, we outline recommendations for: 1) developing general conservation strategies at the landscape level; and 2) using the maps as a resource for reviewing site-specific land use proposals. In the next section, we suggest specific conservation goals and priorities for each of the three towns within the study area.

General Strategies for Biodiversity Conservation

A variety of regulatory and non-regulatory means can be employed by a municipality to achieve its conservation goals, including volunteer conservation efforts, master planning, zoning ordinances, tax incentives, land stewardship incentives, permit conditions, land acquisition, and conservation easements. Section 4 in the *Biodiversity Assessment Manual* (Kiviat and Stevens 2001) provides additional information about these and other conservation tools. Several recent publications of the Metropolitan Conservation Alliance, the Pace University Land Use Law Center, and the Environmental Law Institute describe some of the tools and techniques available to municipalities for conservation planning. *Conservation Thresholds for Land-Use Planners* (Environmental Law Institute 2003), for example, synthesizes information from the scientific literature to provide guidance to land use planners interested in establishing regulatory setbacks from sensitive habitats. A recent publication from the Metropolitan Conservation Alliance (2002) offers guidance for delineating a conservation overlay district that can be integrated into a municipal master plan and zoning ordinance.

In addition to establishing regulations and incentives designed to protect specific types of habitat, the three towns can also apply some general practices on a town-wide basis to foster biodiversity conservation. The list below is adapted from the *Biodiversity Assessment Manual* (Kiviat and Stevens 2001).

- Protect large, contiguous, unaltered tracts wherever possible.
- Preserve links, and create new links, between natural habitats on adjacent properties.
- Preserve natural disturbance processes, such as fires, floods, seasonal drawdowns, landslides, and wind exposures wherever possible.
- Restore and maintain broad buffer zones of natural vegetation along streams, along shores of other water bodies and wetlands, and around the perimeters of other sensitive habitats.
- Direct human uses toward the least sensitive areas, and minimize alteration of natural features, including vegetation, soils, bedrock, and waterways.

- Encourage development of altered land instead of unaltered land. Promote redevelopment of brownfields and previously altered sites, “infill” development, and re-use of existing structures wherever possible.
- Encourage and provide incentives for developers to consider environmental concerns early in the planning process, and incorporate biodiversity conservation principles into their choice of development sites, their site design, and their construction practices.
- Concentrate development along existing roads; discourage construction of new roads in undeveloped areas. Promote clustered and pedestrian-centered development wherever possible to maximize extent of unaltered land and minimize expanded vehicle use.
- Minimize the area of impervious surfaces (roads, parking lots, sidewalks, driveways, roof surfaces) and maximize onsite runoff retention and infiltration to help protect groundwater recharge and surface water quality and flows.
- Preserve farmland potential wherever possible.
- Plan landscapes with the broadest possible connections between open space patches. When considering protection for a particular species or group of species, design the open space networks according to the particular needs of the species of concern.
- Restore degraded habitats wherever possible, but do not use restoration projects as a license to destroy existing habitats.

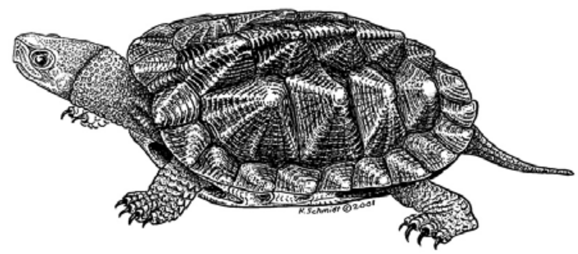
Using the Habitat Maps to Review Site-Specific Land Use Proposals

In addition to corridor-wide land use and conservation planning, the habitat maps and report can also be used for reviewing site-specific development and other land use proposals. The habitat map provides ecological information about a proposed development site, as well as a portion of the surrounding areas that might be affected, and thus can help planning and regulatory agencies consider the ecological relationships among habitats when making land use decisions. We recommend that reviewers take the following steps when considering the impact of the proposed land use change on the habitats on and near the site:

1. Consult the habitat map to see which ecologically significant habitats, if any, are located on and near the site in question.
2. Read the habitat descriptions in this report, and note the conservation recommendations for each.
3. Consider whether the proposed development project can be designed or modified to ensure that the habitats of greatest ecological concern, as well as the ecological connections between them, are maintained intact. Design modifications may include (but are not limited to):
   - Minimizing intrusions into large forest or meadow habitats.
   - Minimizing intrusions into forested areas that are within 750 ft (230 m) of an intermittent woodland pool.
   - Avoiding disturbances that would disrupt the groundwater quantity or quality available to onsite or offsite fens and other wetlands.
   - Channeling stormwater runoff from paved areas or fertilized turf into detention basins instead of directly into streams, ponds, or wetlands.
   - Locating human activity areas as far as possible from the most sensitive habitats.
   - Locating developed features such that the broadest possible corridors of undeveloped land are maintained between habitats.

Because the habitat maps have not been 100 percent ground-truthed, we emphasize that they be used strictly as a general guide for land use planning and decision making. Onsite delineations and assessments by qualified professionals should be an integral part of the review process for any proposed land use change.

CONSERVATION PRIORITIES AND RECOMMENDATIONS



Wood turtle
(K. Schmidt © 2001)

Overview

Habitat loss and fragmentation caused by roads and developed land uses have severely strained biological resources in southern Dutchess County. There are, however, still areas of undeveloped land in the study area that contain high quality examples of significant habitats. By employing a proactive approach to land use and conservation planning, the towns of Beekman, LaGrange, and Fishkill have the opportunity to protect the integrity of their remaining biological resources for the long term.

With limited financial resources to devote to conservation purposes, local government agencies must decide how best to direct those resources to achieve the greatest conservation results. While it may be impossible to protect all significant habitats, there are reasonable ways to prioritize conservation efforts using the best available scientific information. Below we highlight some areas that we consider "priority conservation zones." While we hope this information will help the towns think strategically about future land-use planning, this is not an exhaustive list of important conservation areas. Furthermore, our assessment of habitat quality and conservation priority is inherently limited by our lack of information from outside the corridor. Habitats not considered to be a conservation priority within the Fishkill and Sprout creek corridors may in fact be important in the context of the larger landscape. (To expand the biodiversity information for local planning, we encourage users to consult Hudsonia's East Fishkill map and report [Stevens and Broadbent 2002] and Blanding's turtle habitat maps and report [Hartwig et al., in prep] for six southwestern Dutchess County towns.) The priority zones outlined below should be reviewed and revised periodically to accommodate landscape changes and additional ecological information.

Delineation of Priority Conservation Zones

We used the requirements of a selected group of species to help identify some of the areas where conservation efforts might yield the greatest return for biological diversity. We chose several species or groups of species that have large home ranges, specialized habitat needs, or acute sensitivity to disturbance. Many of these are rare or declining in the region or statewide.

Localized conservation efforts that focus on protecting individual habitat units but ignore essential interactions with surrounding areas often fail to protect either the habitats themselves or the species of concern. Many habitats and species depend on regular physical or biological exchange with the larger landscape, and certain mobile and wide-ranging species require extensive habitat complexes to meet their basic needs. For these reasons, we focused on the larger landscape to safeguard the long-term viability of species and habitats of conservation concern. We have designed priority conservation areas that encompass the habitat needs of particular rare and vulnerable species, and that provide a “protective umbrella” for an array of other rare and common species that co-occur in the same habitats.

We selected species of concern (see Table 3) that are known to occur in or near the study area. Each of these species or groups requires a particular habitat type for a crucial stage in its life cycle (e.g. hibernation, breeding). These “special habitats” (see Table 3) typically form the hub of the animal’s habitat complex. The various other habitats required during other life cycle stages are typically located within a specified distance of the core habitat. This distance defines the extent of the species’ habitat complex and, therefore, the minimum area that needs to be protected or managed in order to conserve the species. We refer to this area as the “priority conservation zone.” In most cases, the extent of the priority conservation zone corresponds to the typical distance traveled by an animal from its “special habitat” to the outer edge of its habitat complex. In the case of breeding birds of marshes, the priority zone represents a protective buffer from human activity. We utilized home-range and average travel distance data reported in the scientific literature to estimate the priority conservation zone widths for the species of concern. The results of this assessment are presented in Table 3.

We also identified several other priority conservation zones associated with highly sensitive habitats (e.g. streams, acidic bog) that are of great importance to regional biodiversity. All of these special habitats are vulnerable to disturbance from human activity and some, such as the acidic bog, are also quite rare within the Hudson Valley. The priority conservation zone widths (see Table 3) are designed to help maintain the integrity of the habitats by providing a protective buffer. We reviewed the scientific literature to determine the buffer zone widths needed to effectively filter sediments, nutrients, and other contaminants from runoff, stabilize stream banks, prevent channel erosion, regulate habitat temperature and microclimate, and protect important ecosystem process.

In many cases, the priority zone for a particular habitat partially overlapped the priority zones for other habitats. We merged the individual priority zones together to make the final presentation easier to interpret. It is important to remember, however, that the priority zone and accompanying conservation recommendations for a given habitat apply to the entire extent of that habitat, even areas that extend into or are encompassed by the priority zone of another habitat.

Priority Conservation Zones

The nine priority conservation zones that we identified in the study area are depicted in figures 5-11. Many of these zones occur in two or all three towns within the study area, but a few occur in just one town. The priority conservation zones within each municipality are:

- Town of Beekman: Priority zones 1, 2, 3, 4, 8, and 9
- Town of LaGrange: Priority zones 2, 3, 4, 5, 8, and 9
- Town of Fishkill: Priority zones 1, 3, 4, 5, 6, 7, 8, and 9
- City of Beacon: Priority zones 4, 7, 8, and 9

Table 3. Special habitats, species of concern, and associated priority conservation zones identified by Hudsonia in the Fishkill and Sprout Creek corridors, towns of Beekman, LaGrange, and Fishkill, and the City of Beacon, Dutchess County, New York.

Special Habitat	Associated Species of Concern	Priority Conservation Zone Width	Rationale	References
oak-heath barren	northern copperhead *	1000 meters	Encompasses most of the summer foraging habitat.	Fitch 1960
kettle shrub pool	Blanding's turtle*	1000 meters	Encompasses most of the essential habitat complex including nesting areas, summer foraging wetlands, drought refuge pools and overland travel corridors.	Kiviat 1997, Hartwig et al. in prep.
fen & calcareous wet meadow	bog turtle*	750 meters	Represents the reported overland distance traveled between wetlands within a habitat complex. Also encompasses the recommended "Bog turtle Conservation Zone" aimed at protecting habitat integrity.	Eckler et al. 1990 Klemens 2001
Fishkill & Sprout creeks & riparian zone	wood turtle*	200 meters	Encompasses most of the core habitat including nesting areas, spring basking sites, foraging habitat, and overland travel corridors	Carroll and Ehrenfeld 1978, Harding and Bloomer 1979, Buech et al. 1997, Foscarini and Brooks 1997
intermittent woodland pool	pool breeding amphibians*	230 meters	Encompasses non-breeding season foraging and refuge habitats and most dispersal routes between pools.	Downs 1989, Madison 1997, Semlitsch 1998, Calhoun and Klemens 2002
intertidal marsh & mudflat	breeding marsh birds*	200 meters	Minimizes human-induced flushing and habitat avoidance.	Selected values reviewed in Rodgers and Smith 1997
acidic bog	----	200 meters	Provides a protective buffer for filtering sediment, nutrients, and contaminants, and attenuating surface water runoff.	Priority zone designed based on bog's sensitivity (e.g. Wilcox 1986)
streams	----	50 meters	Provides a protective buffer for filtering sediment, nutrients, and contaminants from runoff, stabilizing stream banks, preventing channel erosion, regulating microclimate, and protecting ecosystem processes.	Young et al. 1980, Hewlett and Fortson 1982, Steinblums et al. 1984, Lynch et al. 1985, McDade et al. 1990, Spence et al. 1996.
* Species of conservation concern. See Appendix A.				

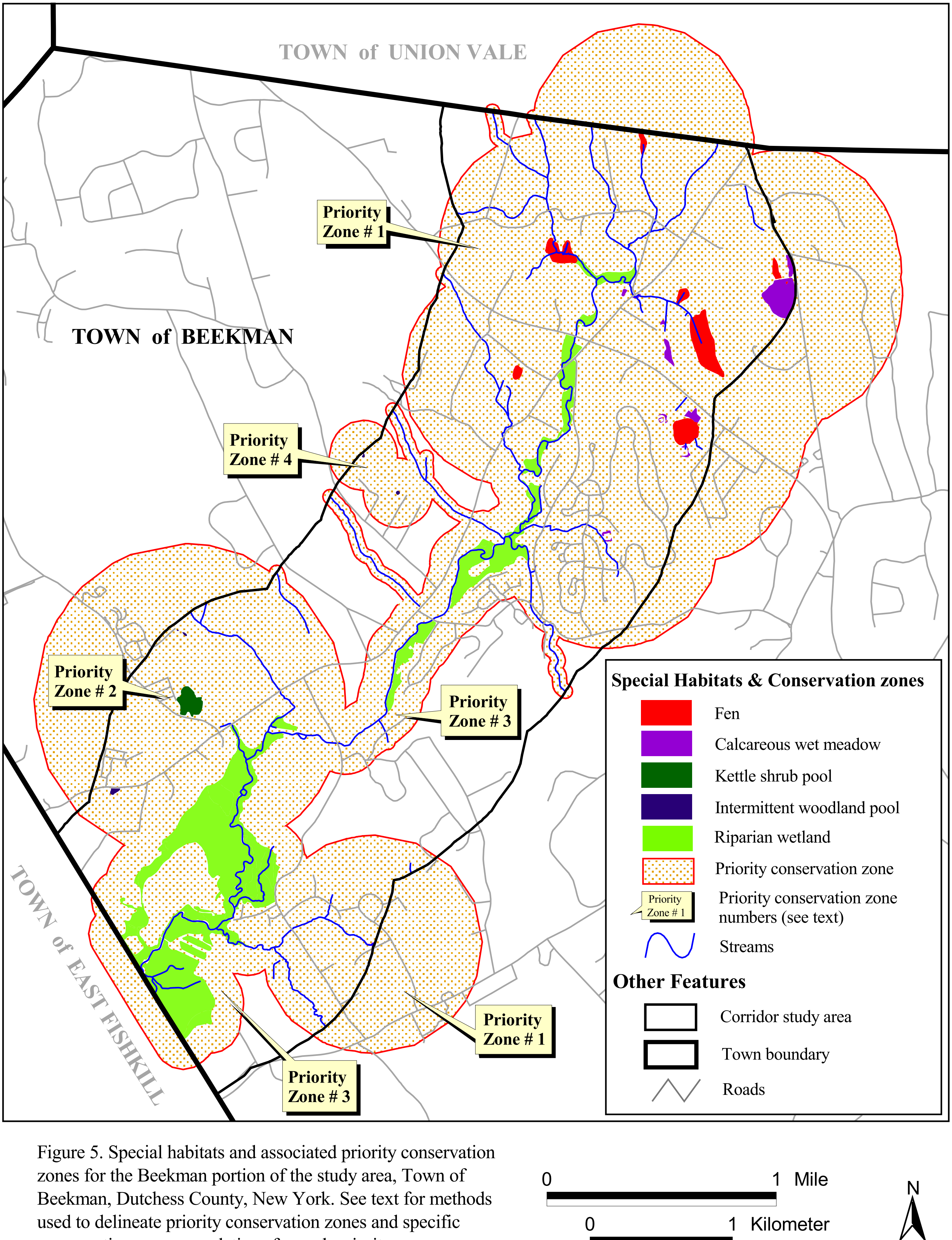


Figure 5. Special habitats and associated priority conservation zones for the Beekman portion of the study area, Town of Beekman, Dutchess County, New York. See text for methods used to delineate priority conservation zones and specific conservation recommendations for each priority zone. Hudsonis Ltd., © 2005

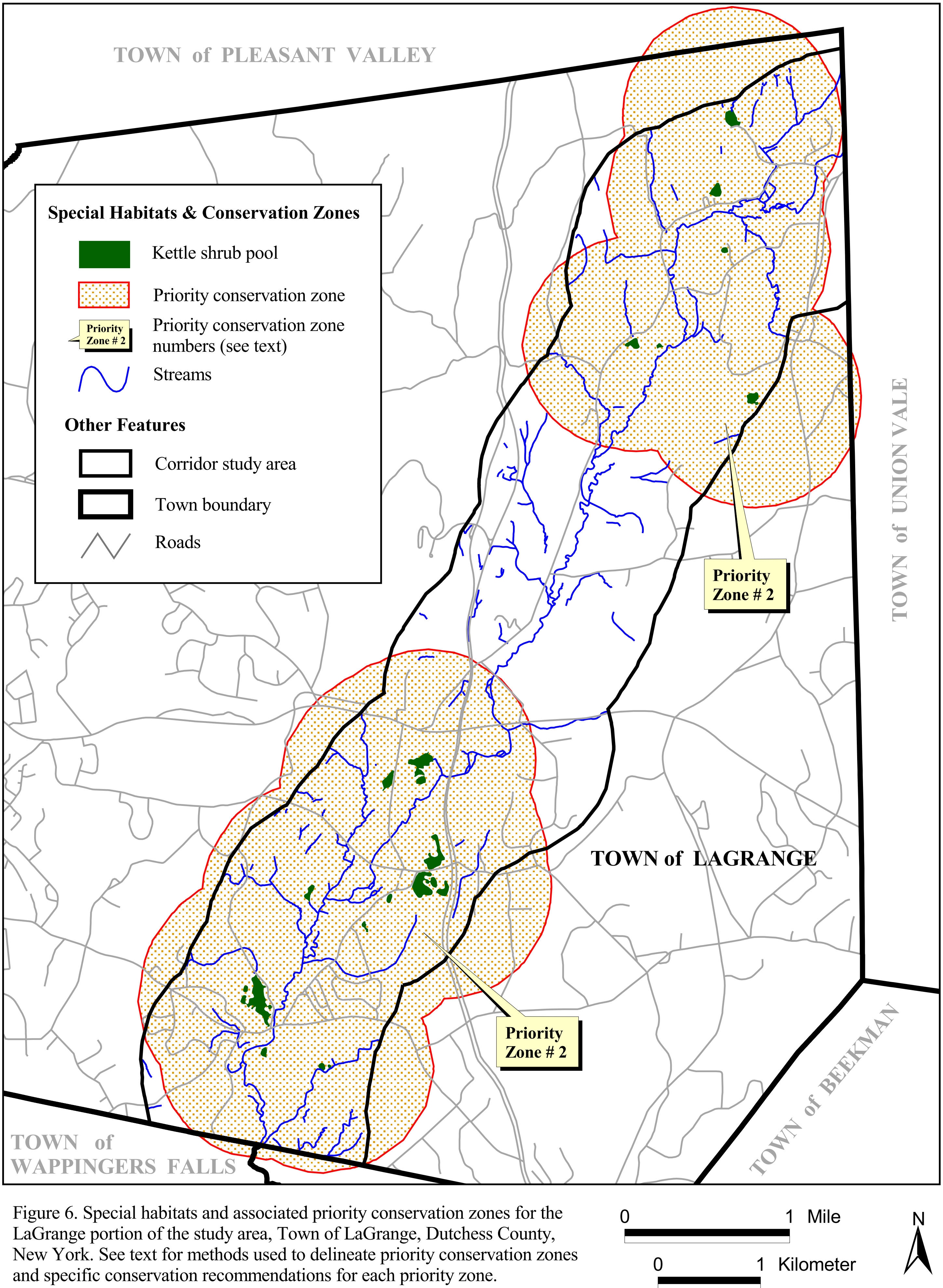


Figure 6. Special habitats and associated priority conservation zones for the LaGrange portion of the study area, Town of LaGrange, Dutchess County, New York. See text for methods used to delineate priority conservation zones and specific conservation recommendations for each priority zone.
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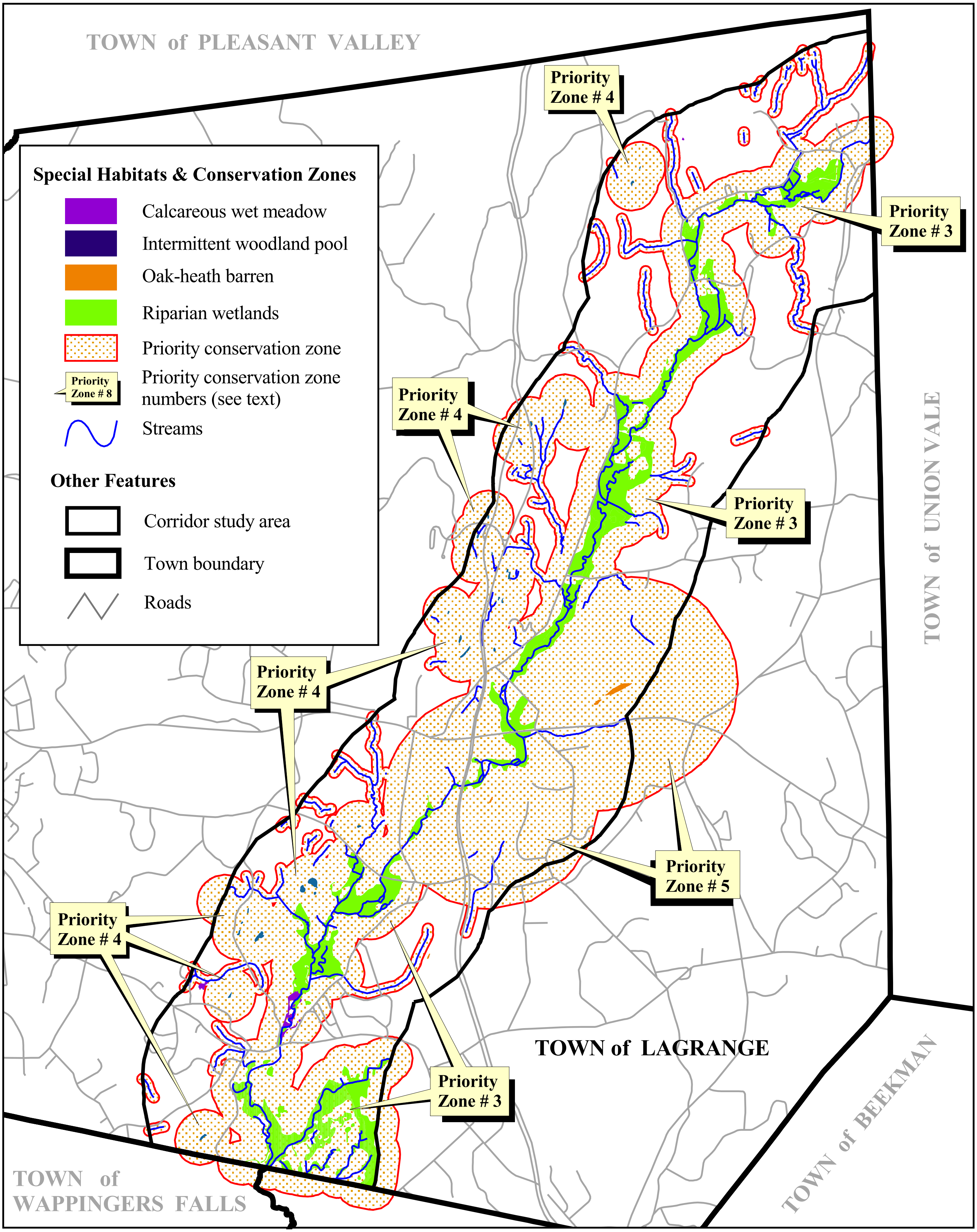


Figure 7. Special habitats and associated priority conservation zones for the LaGrange portion of the study area, Town of LaGrange, Dutchess County, New York. See text for methods used to delineate priority conservation zones and specific conservation recommendations for each priority zone. Hudsonia Ltd., © 2005

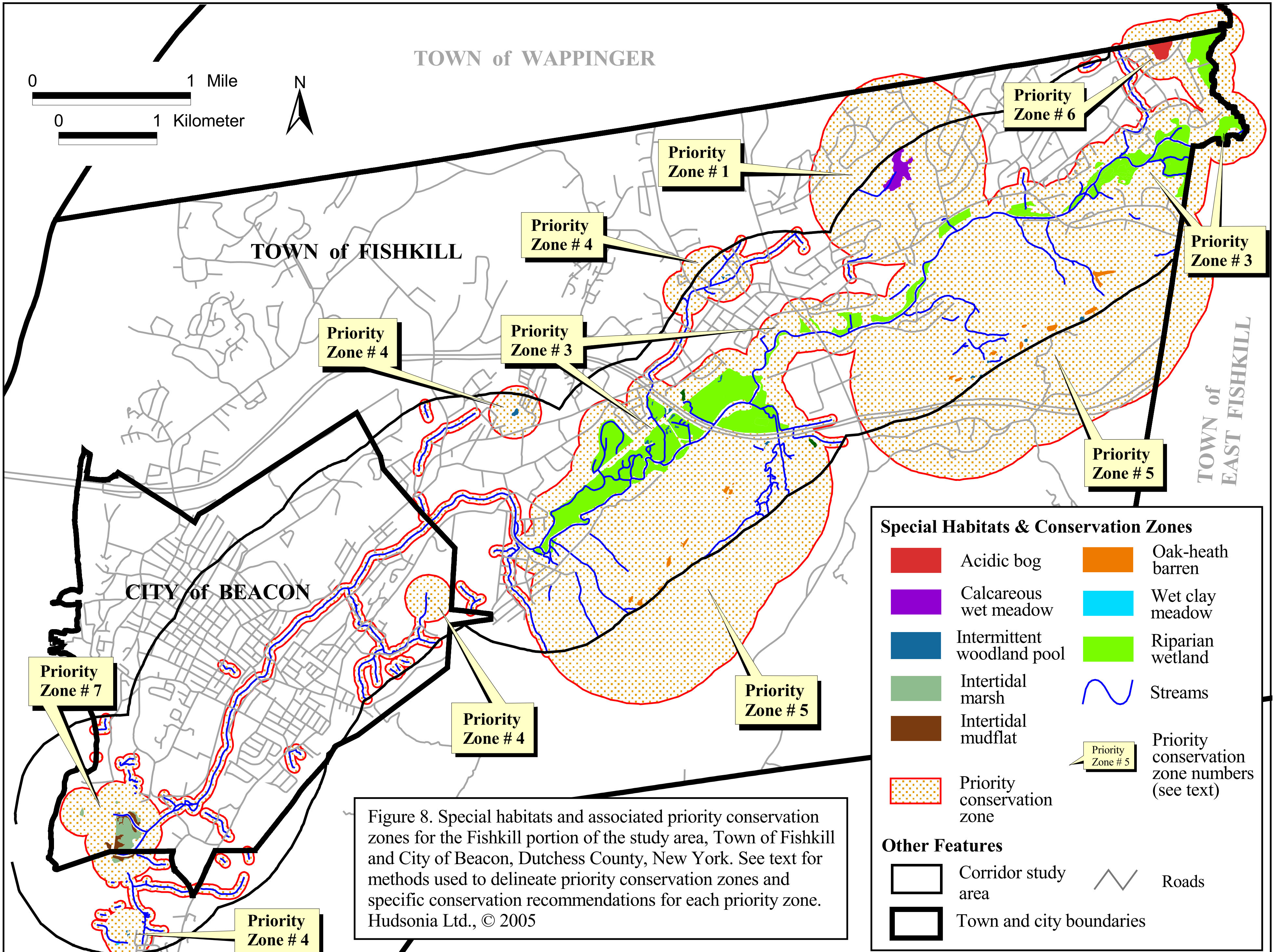


Figure 8. Special habitats and associated priority conservation zones for the Fishkill portion of the study area, Town of Fishkill and City of Beacon, Dutchess County, New York. See text for methods used to delineate priority conservation zones and specific conservation recommendations for each priority zone. Hudsonia Ltd., © 2005

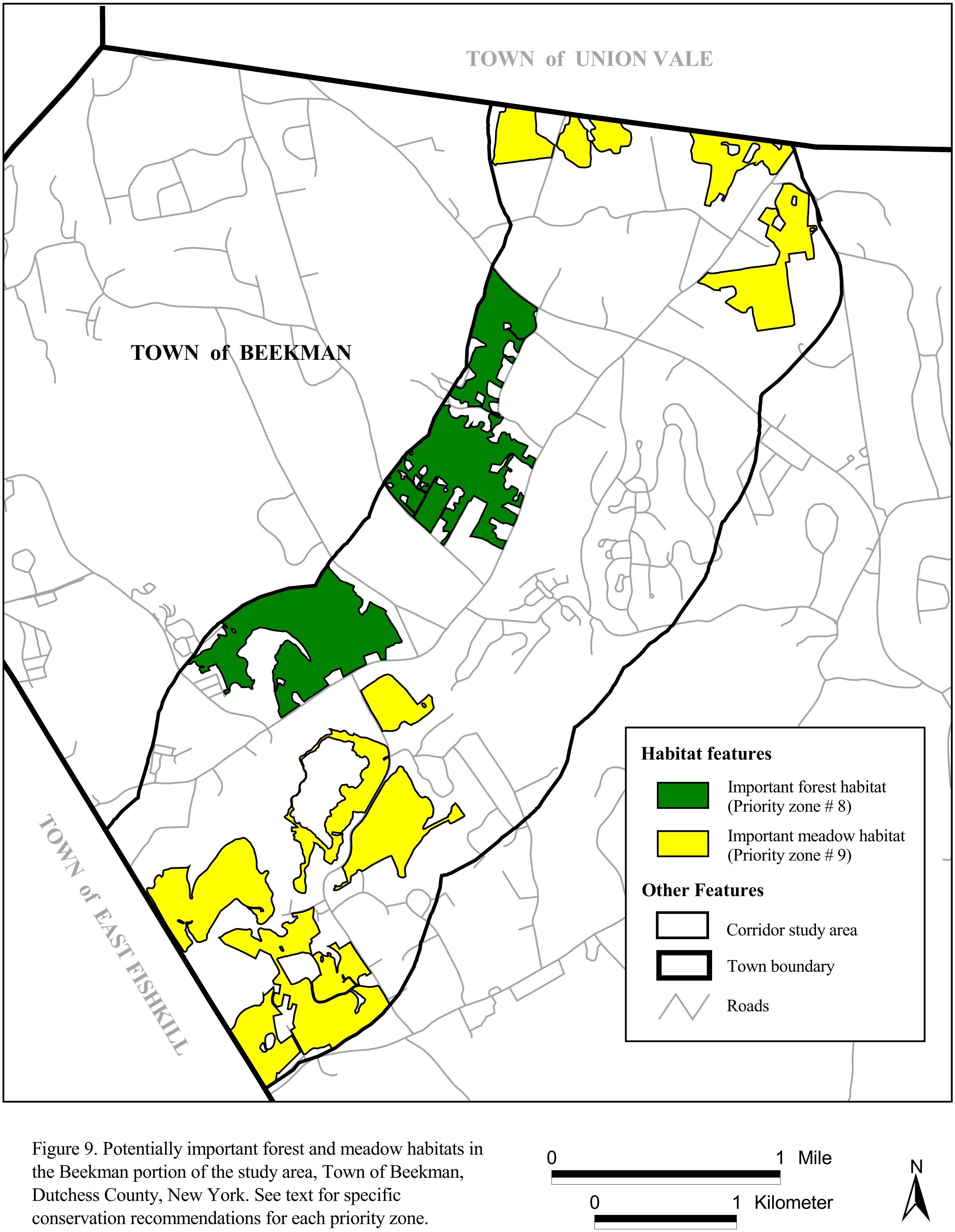


Figure 9. Potentially important forest and meadow habitats in the Beekman portion of the study area, Town of Beekman, Dutchess County, New York. See text for specific conservation recommendations for each priority zone. Hudsonis Ltd., © 2005

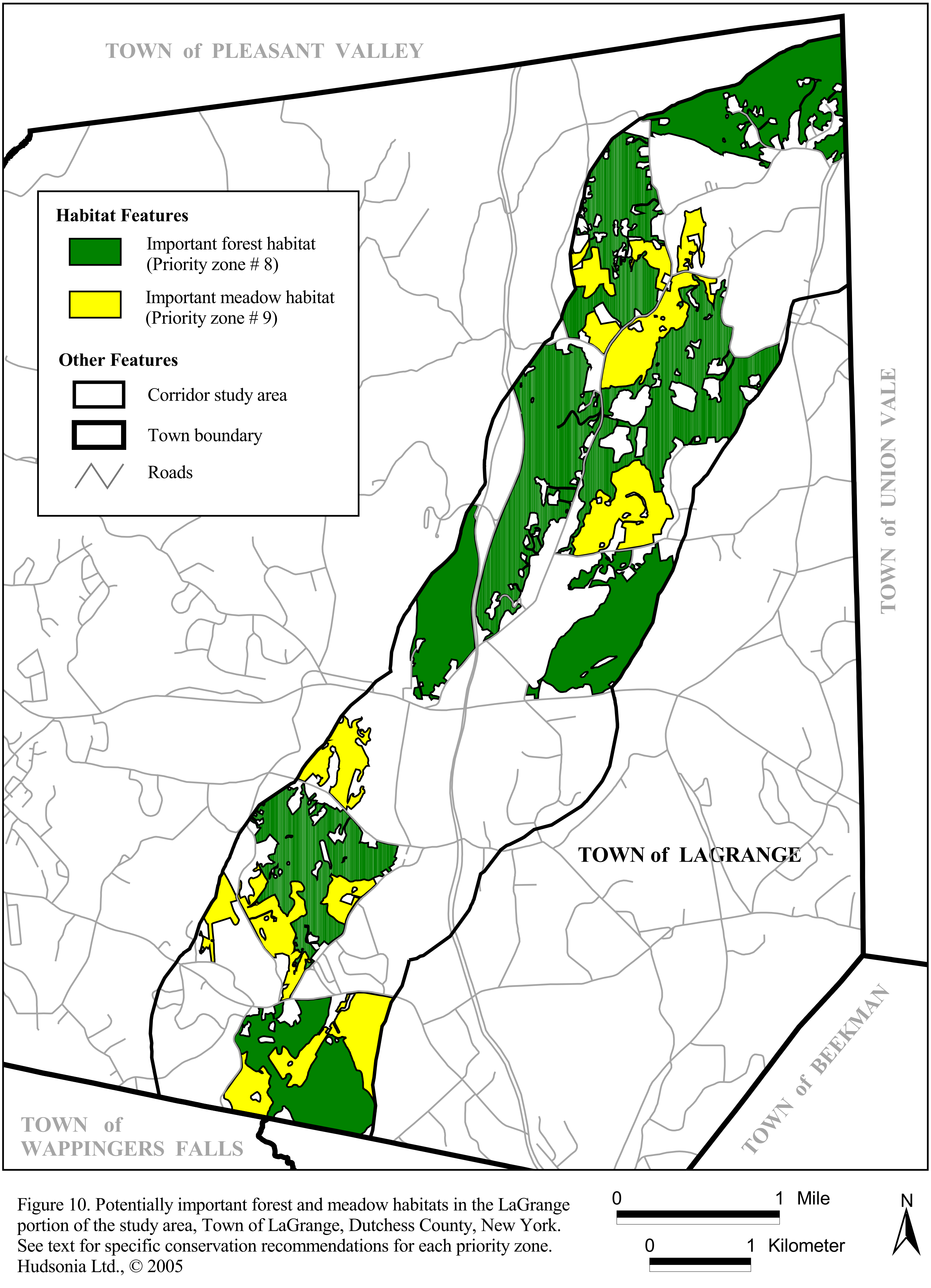


Figure 10. Potentially important forest and meadow habitats in the LaGrange portion of the study area, Town of LaGrange, Dutchess County, New York. See text for specific conservation recommendations for each priority zone. Hudsonia Ltd., © 2005

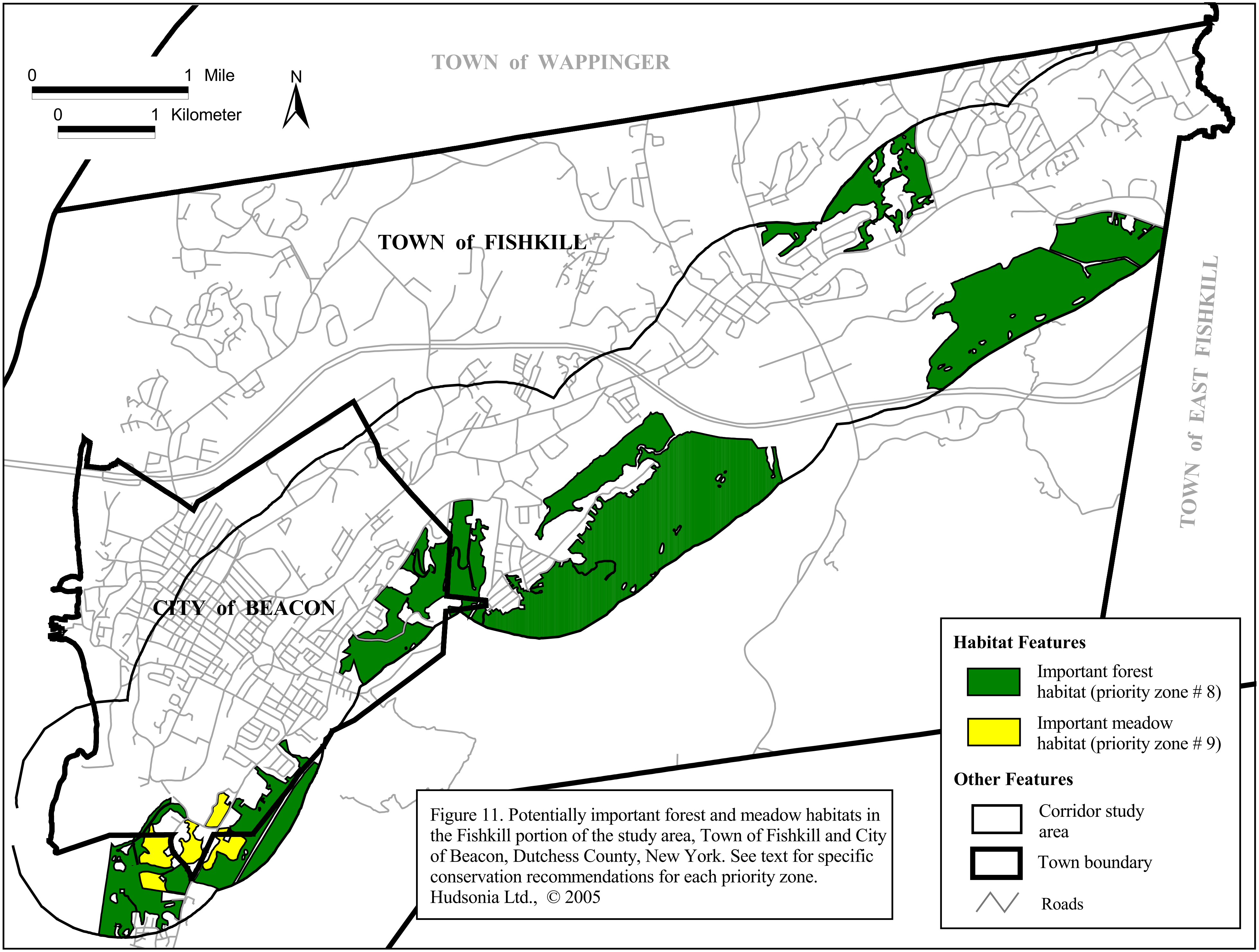


Figure 11. Potentially important forest and meadow habitats in the Fishkill portion of the study area, Town of Fishkill and City of Beacon, Dutchess County, New York. See text for specific conservation recommendations for each priority zone. Hudsonia Ltd., © 2005

The target habitats, conservation issues and specific recommended actions for each priority zone are summarized below.

- ### *Priority Zone 1: Fens and Calcareous Wet Meadows*

Target Habitats: This zone encompasses 10 fens and 11 calcareous wet meadows in the Beekman portion of the study area, one calcareous wet meadow in the Fishkill portion of the study area, and all upland and wetlands habitats within 2,500 ft (750 m) of those fens and wet meadows.

Conservation Issues: Fens and calcareous wet meadows are uncommon in the Hudson Valley and many provide important habitat to a number of plant and animal species of conservation concern (see Appendix A). We believe the fens and calcareous wet meadows in priority zone 1 have a high potential for supporting rare species due to their low invasive species cover and intact habitat structure. We discovered a population of swamp birch (NYS Threatened) in one of these fens during our field work for this project.

One of the most imperiled species associated with fens in Dutchess County is the bog turtle, listed as Endangered in New York and Threatened on the federal list. Suitable habitat for this species was observed in all of the mapped fens. We recommend, therefore, that the fens and calcareous wet meadows in priority zone 1 be considered potential bog turtle habitat and that the special protective measures discussed below be implemented to safeguard the integrity of these sensitive habitats.

Recommendations: Fens are maintained by calcareous groundwater seepage. Alterations to the quality or quantity of groundwater or surface water feeding the fen can alter the vegetation structure or plant community composition, and can render the habitats unsuitable for the bog turtle and other species of conservation concern. Thus, even if the fen footprint is not disturbed, activities in areas surrounding a fen can affect the fen habitat. Furthermore, although bog turtles spend most of their lives in fens and associated wetlands, they also require safe travel corridors between fens for dispersal and other long-term migrations.

To help protect the integrity of these habitats and the long-term viability of the bog turtle, the US Fish and Wildlife Service recommends the following (excerpted from Klemens [2001]):

1) *Protect wetland habitat*. The entire wetland, not just those portions that have been identified as, or appear to be, optimal for nesting, basking, or hibernating, should be protected from direct destruction and degradation. The following activities (not an inclusive list) should be avoided within the wetland:

   - Development of roads, residences, driveways, parking lots, sewer lines, utility lines, stormwater or sedimentation basins, and other structures.
   - Wetland draining, ditching, tiling, filling, excavation, stream diversion, and construction of impoundments.
   - Herbicide, pesticide, or fertilizer application (except as part of approved bog turtle management plan)
   - Mowing or cutting of vegetation (except as part of approved bog turtle management plan)
   - Delineation of lot lines for development, even if the proposed building or structure will not be in the wetland.

2) *Establish 300 ft buffer zone*. A 300 ft (91 m) wide protective "buffer" should be established around known or potential bog turtle wetlands to help prevent or minimize the effects of land-use activities. Activities in this zone could indirectly destroy or degrade the habitat over the short or long term and should be thoroughly evaluated in consultation with the US Fish and Wildlife Service and the New York State Department of Environmental Conservation. Activities in this zone that may adversely impact bog turtles and their habitats include, but are not limited to, the following:

   - Development of roads, residences, driveways, parking lots, sewer lines, utility lines, stormwater or sedimentation basins, and other structures.
   - Mining.
   - Herbicide, pesticide, or fertilizer application.
   - Farming (with the exception of light to moderate grazing).
   - Stream bank stabilization (e.g. rip-rapping).
   - Delineation of lot lines for development, even if the proposed building or structure will not be in the wetland.

3) *Assess potential impacts at least one-half mile beyond buffer zone.* Despite the distance, development activities occurring within the drainage basin of the fen or at least one-half mile from the boundary of the buffer zone may adversely affect bog turtles and their habitat. Activities such as the construction of roads and other impervious surfaces, groundwater extraction (e.g. wells), septic/sewer facilities, and mining have a high potential to alter the hydrology and chemistry of the fen habitat. Development within this area may also sever important travel corridors between wetlands occupied or likely to be occupied by bog turtles, thereby isolating populations and increasing the likelihood of road mortality as turtles attempt to disperse.

In New York, bog turtles may travel overland 2,500 ft (750 m), or nearly one-half mile, between individual wetlands within a habitat complex (Eckler et al. 1990). Maintaining connections to other wetland habitats within a one-half mile radius of a known or potential bog turtle habitat may be crucial to sustaining the long-term genetic viability of bog turtle populations and the ability of individuals to relocate as habitat quality changes. We believe the construction of new roads and bridges should be avoided within this radius. Existing roads with medium to high volume traffic may be ideal candidates for "turtle underpasses" that may provide safer travel passageways for this species.

Priority conservation zone 1 (see figures 5 and 8) encompasses a 2,500 ft (750 m) wide area around the mapped fens and calcareous wet meadows representing the minimum extent of the potential bog turtle habitat complex. We strongly recommend that all activity proposed within this zone be thoroughly reviewed in consultation with the Endangered Species Unit of the New York State Department of Environmental Conservation using the most up-to-date scientific information on this species and its sensitive habitat.

➢ *Priority Zone 2: Kettle Shrub Pools*

Target Habitats: This zone encompasses 19 kettle shrub pools in the LaGrange portion of the study area, a single kettle shrub pool in the Beekman portion of the study area, and all upland and wetland habitats within 3,300 ft (1,000 m) of the pools' boundaries.

Conservation Issues: Kettle shrub pools are an essential part of the core habitat of the Blanding's turtle (NYS Threatened). This turtle uses kettle shrub pools for winter hibernation and spring basking. During other times of the year, Blanding's turtles use kettle shrub pools and a variety of other wetlands in the surrounding landscape for foraging, shelter, and drought refuge. Females also migrate long distances from their core wetlands to nest in open (non-wooded) upland areas with loose, coarse-textured soils and sparse vegetation.

Suitable habitat for the Blanding's turtle was observed in all of the kettle shrub pools within priority zone 2. We recommend, therefore, that the special protective measures discussed below be implemented in priority zone 2 to safeguard the integrity of this species and its habitat.

Recommendations: Maintaining a Blanding's turtle population requires protecting not only the core wetland habitats (e.g. kettle shrub pools), but also the associated foraging and drought refuge wetlands, the upland nesting areas, and the upland areas between these habitats. The Blanding's turtle habitat complex can encompass the wetland and upland habitats within 3,300 ft (1000 m) or more of a kettle shrub pool (Kiviat 1997, Hartwig et al. in prep.). Development activity within this habitat complex can have significant adverse effects on the turtles and their habitats, including the direct loss of wetland habitat (especially small, unregulated wetlands), degraded water quality from pesticides, fertilizers, and toxic compounds, altered wetland hydroperiod and water depth from groundwater extraction, habitat fragmentation from roads and developed land uses, increased nest predation by human-subsidized predators, and greater road mortality of nesting females and other individuals migrating between habitats.

To help protect Blanding's turtles and the habitat complex they require, we recommend the following measures within priority zone 2 (adapted from Hartwig et al., in prep.):

1) *Protect wetland habitats*. All wetland habitats within a minimum of 3,300 ft (1,000 m) of a known or potential Blanding's turtle wetland should be protected from filling, dumping, drainage, incursion of construction equipment, siltation, polluted runoff, and hydrological alterations.

2) *Establish 660 ft buffer around core habitat*. Blanding's turtles regularly use upland areas within 660 ft (200 m) of a kettle shrub pool habitat for basking, estivation (rest during periods of hot dry weather), and short-distance travel. A 200 m wide buffer of natural vegetation and soil will minimize direct impacts to these individuals, help maintain wetland

hydrology and water temperature, and filter runoff containing silt and other pollutants. We recommend that no buildings, pavement, roads, or other structures be constructed within this protective buffer zone.

3) *Minimize impacts from new and existing roads*. Road mortality of nesting females and individuals migrating between wetlands or dispersing to new habitats is one of the greatest threats to Blanding's turtle populations. To help minimize the adverse affects of roads on this species, we recommend the following actions be undertaken within this 1,000 m wide priority conservation zone:

   - Prohibit the building of new roads crossing or adjoining Blanding's turtle habitat complexes. This applies to public and private roads of all kinds including driveways.
   - Keep vehicle speeds low on new and existing roads by installing speed bumps, low speed limit signs, and wildlife crossing signs.
   - Medium and heavy volume roads within the priority zone should be considered as candidates for turtle underpasses. Adult Blanding's turtles have been observed using culverts to pass under highways; however, no drift fence or underpass system has ever been specifically constructed for Blanding's turtles and proven to function successfully. Given this uncertainty, we recommend that underpass systems be considered as a last resort if construction of new roads or increased traffic cannot be avoided.

4) *Maintain broad corridors between habitats and habitat complexes.* Blanding's turtles travel overland on a day-to-day or seasonal basis to reach important foraging areas, nesting sites, overwintering areas, and refuge habitats within the surrounding landscape. These regular movements can encompass an area up to 3,300 ft (1000 m) from a core wetland habitat. Long distance dispersal greater than 3,300 ft from a core wetland occur on a less-than-annual basis, but are equally important to the long term viability of Blanding's turtle populations within a landscape. These long distance dispersals enable turtles to select alternative habitats as habitat quality or social dynamics change, and to breed with populations from neighboring habitat complexes. Broad, naturally vegetated travel corridors should be maintained between individual habitats within a complex (e.g. between kettle shrub pools, foraging wetlands, drought refuge ponds, and nesting areas) and between neighboring habitat complexes.

5) *Protect nesting areas.* Blanding's turtles traditionally nest in upland meadow or open shrublands, habitats that also tend to be prime targets for development. Construction of roads, houses, and other structures on potential nesting habitats could severely limit the reproductive success of females over the long term. The loss of "traditional" nesting grounds might also force females to travel farther to find suitable nesting sites. This, in turn, can expose them to increased road mortality or collecting as they cross roads and developed areas. We recommend that large areas of potential nesting habitat within priority zone 2 (e.g. upland meadows, upland shrublands, waste grounds with exposed gravelly soils) be permanently protected from development and other disturbance. These areas, however, may need to be managed as part of an approved management plan to maintain suitable nesting conditions.

In addition to the recommendations discussed above, local and state agencies should require the following of any proposed development project within priority conservation zone 2:

1) Potential pitfall hazards such as window wells, storm drains, catch basins, swimming pools, and silt fencing should be designed or modified to prevent the entrapment of turtles. For example:

   - Window wells should have either permanent grates (maximum 1 in [2.5 cm] mesh size) or lips at least 10 in (25 cm) high so Blanding's turtles of carapace length up to 10 inches cannot climb over and become trapped.

- Fences or other barriers should be constructed around in-ground swimming pools to keep turtles of any size out of the pools. Barriers must exclude turtles as small as 1 in (2.5 cm) carapace length, and must be at least 10 in (25 cm) high to exclude turtles up to 10 inches carapace length.

- Storm drains should be designed or retrofitted so that turtles, including hatchlings of carapace length 1 in (2.5 cm), cannot fall in.

- Coarse-mesh backing on filter fabric silt fencing (e.g. 0.8-1.2 in [2-3 cm] square mesh size) can trap turtles and snakes and should not be used on construction sites within this zone. Erosion control fabrics, geotextiles, or landscaping fabrics should be selected as to not present an entanglement hazard to turtles.

- Immediate (same day) backfilling of any excavations (e.g. soil test pits, foundation holes, utility ditches) should be established, or else gently sloping (e.g. 30^{o} or less from horizontal) earthen or wooden ramps should be installed to allow turtles to climb out.

2) Potential barriers to turtle movement either on land or in the water should be designed with spaces or openings to allow safe turtle passage. Such potential barriers include stone walls, chain-link fences, and curbs. Spaces must be no less than 4 in (10 cm) high and no more than 82 ft (25 m) apart to allow turtles to move freely across the landscape (fences around swimming pools and other pit fall hazards discussed above are excluded).

3) Construction crews and eventual residents should be educated on how to look for and safely move turtles under cars, construction equipment, or mowing machines before operating or driving.

4) Under certain circumstances (to be determined on a case-by-case basis by the New York State Department of Environmental Conservation or a Blanding's turtle specialist), temporary exclusion fencing should be erected around a construction site to keep Blanding's turtles out of the work area. This pertains especially to construction areas that are within 660 ft (200 m) of a Blanding's turtle wetland, or construction areas that may be situated between wetlands and nesting areas if construction is to occur between 25 May and 10 July (the nesting season). Temporary exclusion fencing should consist of small-mesh filter fabric with the bottom buried 8 in (20 cm) deep in the soil. These fences should be regularly maintained so that turtles of all sizes are unable to pass through or climb over.

Priority conservation zone 2 (see figures 5 and 6) represents the minimum extent of the potential Blanding's turtle habitat complex. We strongly recommend that all activity proposed within this zone be thoroughly reviewed in consultation with the Endangered Species Unit of the New York State Department of Environmental Conservation using the most up-to-date scientific information on this species and its habitat requirements.

Priority Zone 3: Fishkill Creek and Sprout Creeks

Target Habitats: This zone encompasses Fishkill Creek in the Town of Beekman, Sprout Creek in the Town of LaGrange, and the eastern half of Fishkill Creek in the Town of Fishkill, all associated riparian wetlands, and all upland habitats within 660 ft (200 m) of these stream channels and wetlands. The portion of Fishkill Creek flowing through highly developed areas in the City of Beacon was excluded from this priority zone.

Conservation Issues: Low gradient, perennial streams can be essential core habitat for the wood turtle, a Species of Special Concern in New York State. Wood turtles require streams with undercut banks, muskrat burrows, or other underwater shelter for winter hibernation. In early spring, wood turtles use overhanging tree limbs and stream banks for basking. In late spring and summer, however, wood turtles (especially females) move into the surrounding riparian zone to bask and forage in a variety of wetland and upland habitats, and females travel long distances from their core stream habitat to find open, sparsely vegetated upland nesting habitats.

We observed four female wood turtles along Fishkill Creek and Sprout Creek during our field work for this project and observed suitable habitat for this species along most parts of these streams. We recommend, therefore, that the portions of Fishkill Creek and Sprout Creek included in priority zone 3 be considered core wood turtle habitat and that the special protective measures discussed below be implemented to safeguard the integrity of these habitats.

Recommendations: Conserving wood turtles requires protecting not only their core habitat (e.g. perennial streams), but also their riparian wetland and upland foraging habitats, the upland nesting areas, and the upland migration corridors between these habitats. The wood turtle habitat complex can encompass the wetland and upland habitats within 660 ft (200 m) or more of a core stream habitat. Development activity within this habitat complex can have significant adverse affects on wood turtles and their habitats, including habitat degradation from stream alteration;

habitat fragmentation from culverts, bridges, roads, and other structures; the direct loss of wetland habitat, degraded water quality from siltation, pesticides, fertilizers, and toxic compounds; increased nest predation by human-subsidized predators; disturbance from human recreational activities; and higher road mortality of nesting females and other individuals migrating between habitats.

To help protect wood turtles and the habitat complex they require, we recommend that the following measures be employed within priority zone 3:

1) *Protect integrity of stream habitats*. Wood turtles are particularly sensitive to disturbance or change in their core stream habitats. Engineering practices that alter the physical structure of the stream channel (e.g. stream channelization, bank stabilization) can destroy key hibernation and basking habitat. These activities may also alter the complex hydrological and stream channel dynamics that help maintain wood turtle habitat over the long-term. To help protect the core stream habitats within this priority zone, we advise the following:

    - Activities such as stream channelization, artificial stream bank stabilization (e.g. rip-rap, concrete), construction of dams or artificial weirs, vehicle crossing (e.g. from construction or logging equipment, ATVs), and the clearing of natural stream bank vegetation should be prohibited within streams in this zone.

    - Direct discharge of stormwater runoff, chlorine-treated wastewater, agricultural by-products, and other potential pollutants should be avoided or minimized to the greatest extent possible.

    - A minimum 160 ft (50 m) wide protective buffer zone should be established on all streams in the watershed, including perennial and intermittent tributary streams, regardless of whether or not they are used by wood turtles. Such a buffer zone will help stabilize stream banks, prevent channel erosion, filter sediments, nutrients, and other contaminants from runoff before it enters the stream, regulate stream temperature and microclimate, and provide important woody debris and leaf litter to the stream ecosystem. This, in turn, would help maintain or improve the quality of wood turtle, trout, and other wildlife habitat in streams within priority zone 3. Buffer zones should remain naturally vegetated to provide the greatest benefit possible. Disturbance within the buffer zone should be avoided, including construction of any kind, conversion to impervious surfaces, agriculture and livestock use, pesticide and fertilizer application, and installation of septic leachfields or other waste disposal facilities.

2) *Protect riparian wetland and upland habitats.* All riparian wetlands adjacent to known or potential wood turtle streams should be protected from filling, dumping, drainage, incursion of construction equipment, siltation, polluted runoff, and hydrological alterations. In addition, large, contiguous blocks of upland habitats (e.g. forests, meadows, shrublands) within 660 ft (200 m) of a core wood turtle stream should be preserved to the greatest extent possible to provide important foraging, basking, and nesting habitat for this species.

   Special efforts may need to be taken to protect particularly vulnerable components of the habitat complex such as wet meadows. Wet meadows are often sought after by wood turtles, especially females, for spring basking and foraging (Kaufmann 1992). These wetlands, however, are often omitted from state, federal, and site-specific wetland maps and are frequently overlooked in the environmental reviews of development proposals. We strongly recommend that wet meadows and other wetlands within priority zone 3 be accurately delineated, and their potential for wood turtle habitat be fully considered during environmental reviews of development projects.

3) *Minimize impacts from new and existing stream crossings.* Stream crossings, particularly undersized bridges and narrow culverts, may be significant barriers to wood turtle movement along their core stream habitats. Wood turtles may shy away from entering such structures and choose an overland route to reach their destination. Typically, this overland route involves crossing a road or other developed area—often resulting in road mortality. If a stream crossing completely blocks the passage of turtles, individuals can be cut off from important foraging or nesting habitats, or be unable to interbreed with neighboring wood turtle populations. Such barriers could significantly diminish the long-term viability of these populations.

We recommend that no new stream crossings (roads) be constructed within priority zone #3. If new crossings cannot be avoided, or if old bridges and culverts are scheduled to be upgraded, we suggest that they be specifically designed to accommodate the passage of turtles and other wildlife. We believe the following specifications, although not specifically designed for wood turtles, may be an important first step to improving the connectiveness of stream corridors (adapted from Singler and Graber 2005):

- Use bridges and open-bottomed arches instead of culverts.
- Use structures that span at least 1.2 times the bank-full width of the stream so that one or both banks remain in a semi-natural state beneath the structure. This may promote the overland passage of turtles and other wildlife.
- The structure should be a minimum of 4 ft (1.2 m) in height and have an openness ratio of at least 0.5 (openness ratio = the cross-sectional area of the structure divided by its length, measured in meters). Higher openness ratio values mean that more light is able to penetrate into the interior of the crossing. Brighter conditions beneath a crossing may be more favorable for the passage of animals including wood turtles.
- The substrate within the structure should be composed of natural materials and match the texture and composition of upstream and downstream substrates. If possible, crossings should be installed in a manner that does not disturb the natural substrate of the stream bed.
- If the stream bed must be disturbed during construction, the final elevation and gradient of the structure bottom should be designed so as to maintain water depth and velocities at low flow that are comparable to those found in natural stream segments just upstream and downstream of the structure. Sharp drops in elevation at the inlet or outlet of the structure can be a physical barrier to wood turtle passage.

4) *Minimize impacts from new and existing roads*. Road mortality of nesting females and individuals dispersing to new habitats is one of the greatest threats to wood turtle populations. To help minimize the adverse affects of roads on this species, we recommend the following actions be undertaken within this 200 m wide priority conservation zone:

- Prohibit the building of new roads crossing or adjoining wood turtle habitat complexes. This applies to public and private roads of all kinds including driveways.

- Keep vehicle speeds low on new and existing roads by installing speed bumps, low speed limit signs, and wildlife crossing signs.

5) *Maintain broad corridors between habitats and habitat complexes.* Wood turtles travel overland on a day-to-day or seasonal basis to reach important foraging grounds, nesting sites, over-wintering areas, and refuge habitats within the surrounding landscape. These regular movements can encompass an area extending 660 ft (200 m) or more from the core stream habitat. Long distance dispersal greater than 660 ft from a core stream occur less frequently, but are equally important to the long term viability of wood turtle populations within a landscape. These long distance dispersals enable turtles to select alternative habitats as habitat quality or social dynamics change, and to breed with populations from neighboring habitat complexes. Broad, naturally vegetated travel corridors should be maintained between individual habitats within a complex (e.g. between core stream habitats, foraging wetlands, and nesting areas) and between neighboring habitat complexes.

6) *Protect nesting areas.* Wood turtles typically nest in upland meadow or open shrublands, habitats that also tend to be prime areas for development. Construction of roads, houses, and other structures on potential nesting habitats could severely limit the reproductive success of females over the long term. The loss of "traditional" nesting grounds might also force females to travel farther to find suitable nesting sites. This, in turn, could expose them to increased road mortality or collecting as they cross roads and developed areas. We recommend that large areas of potential nesting habitat within priority zone 3 (e.g. upland meadows, upland shrublands, waste ground with exposed gravelly soils) be permanently protected from development and other disturbance.

In addition to the recommendations discussed above, local and state agencies should require the following of any proposed development project within priority conservation zone 3:

1) Potential pitfall hazards such as window wells, storm drains, catch basins, swimming pools, and silt fencing should be designed or modified to prevent the entrapment of turtles. For example:

   - Window wells should have either permanent grates (maximum 1 in [2.5 cm] mesh size) or lips at least 10 in (25 cm) high so wood turtles of carapace length up to 10 inches cannot climb over and become trapped.

   - Fences or other barriers should be constructed around in-ground swimming pools to keep turtles of any size out of the pools. Barriers must exclude turtles as small as 1 in (2.5 cm) carapace length and must be at least 10 in (25 cm) high to exclude turtles up to 10 inches carapace length.

   - Storm drains should be designed or retrofitted so that turtles, including hatchlings of carapace length 1 in (2.5 cm) cannot fall in.

   - Coarse-mesh backing on silt fencing (e.g. 0.8-1.2 in [2-3 cm] square mesh size) can trap turtles and snakes and should not be used on construction sites within this zone. Erosion control fabrics, geotextiles, or landscaping fabrics should be selected as to not present an entanglement hazard to turtles.

   - Immediate (same day) backfilling of any excavations (e.g. soil test pits, foundation holes, utility ditches) should be established, or else gently sloping (e.g. 30^{o} or less from horizontal) earthen or wooden ramps should be installed to allow turtles to climb out.

2) Potential barriers to turtle movement either on land or in the water should be designed with spaces or openings to allow safe turtle passage. Such potential barriers include stone walls, chain-link fences, and curbs. Spaces must be no less than 4 in (10 cm) high and no more than 82 ft (25 m) apart to allow turtles to move freely across the landscape (exceptions are barrier fences around swimming pools and other pit fall hazards discussed above).

3) Construction crews and eventual residents should be educated on how to look for and safely move turtles found under or in front of cars, construction equipment, or mowing machines before operating or driving.

4) Under certain circumstances (to be determined on a case-by-case basis by the New York State Department of Environmental Conservation or a turtle specialist), temporary exclusion fencing should be erected around a construction site to keep wood turtles out of the work area. This pertains especially to construction areas that are within 660 ft (200 m) of a wood turtle stream, or construction areas that may be situated between riparian systems and nesting areas if construction is to occur between 25 May and 10 July (the nesting season). Temporary exclusion fencing should consist of filter fabric with the bottom buried 8 in (20 cm) deep in the soil. These fences should be regularly maintained so that turtles of all sizes are unable to pass through.

Priority conservation zone 3 (see figures 5, 7, and 8) represents the minimum extent of the potential wood turtle habitat complex within the study area. It is important to note that we did not assess the habitat suitability of the many tributaries to Fishkill Creek and Sprout Creek, and that some of these tributaries may also provide core habitat for the wood turtle. We strongly recommend that all activity proposed within priority zone 3 be thoroughly reviewed in consultation with the Endangered Species Unit of the New York State Department of Environmental Conservation using the most up-to-date scientific information on this species and its habitat requirements.

➢ *Priority Zone 4: Intermittent Woodland Pools*

Target Habitats: This zone encompasses all intermittent woodland pools mapped within the study area (31 pools in LaGrange, 29 in Fishkill, and 5 in Beekman) and all upland forest habitat within 750 ft (230 m) of the pools' boundaries.

Conservation Issues: Intermittent woodland pools provide crucial breeding and nursery habitat for several amphibian species that cannot successfully reproduce in other wetlands. Two of these amphibians, Jefferson salamander and marbled salamander, are listed as Species of Special Concern in New York State. We consider the spotted salamander and wood frog to be regionally vulnerable due to the loss of woodland pool and upland forest habitats. During the non-breeding season, these amphibians are exclusively terrestrial and require the deep shade, thick leaf litter, uncompacted soil and coarse woody debris of the surrounding upland forest for foraging and shelter. Thus, both the intermittent woodland pool and the surrounding forest are essential for these species to complete their life cycle.

We observed wood frog tadpoles and egg masses of spotted salamander and Jefferson/blue-spotted salamander in intermittent woodland pools in the study area. Other woodland pools visited during the non-breeding season appeared to contain suitable breeding habitats for these amphibians. We recommend, therefore, that the intermittent woodland pools in priority zone 4 be considered important amphibian breeding habitat and that the special protective measures discussed below be implemented to safeguard these species and their habitats.

<u>Recommendations:</u> Protecting the salamander and frog species associated with intermittent woodland pools requires protecting not only their core breeding habitat (i.e. the intermittent woodland pool), but also their key foraging and wintering habitats in the surrounding upland forests, and the forested migration corridors between individual pools and pool complexes. The upland habitat of pool breeding amphibians can encompass an area 750 ft (230 m) or more from the edge of the woodland pool. Disturbance of vegetation or soils within this area can have significant adverse effects on the amphibians, including the direct loss of pool and forest habitats, alteration of the pool hydroperiod, degradation of pool water quality, degradation of forest floor microhabitats, isolation of woodland pools from other pools and habitats, and increased road mortality of animals migrating among pools and between pools and upland habitats.

To help protect pool breeding amphibians and the habitat complex they require, we recommend that the following protective measures be taken within priority zone 4 (adapted from Calhoun and Klemens 2002, Calhoun and deMaynadier 2004):

1) *Protect the intermittent woodland pool depression*. Intermittent woodland pools are often overlooked during environmental reviews of proposed development projects and are frequently drained, filled, or dumped in. Some that are not directly destroyed may be excavated by future homeowners to create an ornamental pond. These activities severely diminish the reproductive success of intermittent woodland pool breeding amphibians and threaten the long-term viability of these populations within the larger landscape.

   We advise that intermittent woodland pools be permanently protected from development and disturbance of any kind including the construction of houses, roads, lawns, and ponds within the pool depression. This zone of protection should include the pool basin up to the spring high water mark and all associated vegetation. The soil in and surrounding the pool should not be compacted in any manner and the vegetation within the pool should not be removed.

2) *Protect all upland forest within 100 ft of the intermittent woodland pool.* Maintaining the integrity of the forest habitats within 100 ft (30 m) of a woodland pool is crucial to sustaining the pool's ecological and biodiversity potential. This zone provides important shelter for high densities of adult and recently emerged salamanders and frogs during the spring and early summer. The forest in this zone also helps shade the pool, maintains pool water quality, and provides important leaf litter and woody debris to the pool system. This organic debris constitutes the base of the pool food web and serves as attachment sites for amphibian egg masses.

   To further safeguard intermittent woodland pool habitats and their associated pool breeding amphibians, we recommend that all upland forest habitats within 100 ft (30m) of the pool's spring high water mark be protected in their entirety from development and disturbance of any kind including, but not limited to, clearing, excavation, site grading, and the construction of houses, roads, stormwater detention basins, and other structures. The forest habitat around a pool should remain undisturbed, including the canopy and understory vegetation, the leaf litter and woody debris layer, and the soil.

3) *Maintain critical terrestrial habitat within 750 ft of the pool*. The upland forests within 750 ft (230 m) or more of a woodland pool are critical foraging and shelter habitats for pool breeding amphibians during the non-breeding season. Roads, development, logging, ATV use, and other activities within this critical terrestrial habitat can crush a large number of amphibians and destroy the forest floor microhabitats that provide shelter and invertebrate food to the amphibians. Development within this zone can also prevent dispersal and genetic exchange between neighboring pools, thereby making local extinction more likely. It is important, therefore, that the critical terrestrial habitat be preserved to the greatest extent possible.

   We recommend that no more than 25 percent of the total critical terrestrial habitat (i.e. the area 750 ft from pool's seasonal high water mark) be developed or otherwise disturbed. A minimum of 75 percent of this zone should remain in contiguous (unfragmented) forest with an undisturbed forest floor. Wherever possible, forested connections between individual pools should be identified and maintained to provide overland dispersal corridors.

We also recommend the following guidelines for all development activity proposed within the critical terrestrial habitat zone of an intermittent woodland pool:

1) Avoid or minimize the potential adverse affects of roads to the greatest extent possible. Pool breeding salamanders and frogs are especially susceptible to road mortality from vehicular traffic, predation, and desiccation. Curbs and other structures associated with roads frequently intercept and funnel migrating amphibians into stormwater drains where they may be killed. To minimize these potential adverse impacts:

- Roads and driveways with projected traffic volumes in excess of 5-10 vehicles per hour should not be sited within 750 ft (230 m) of the pool.

- Regardless of traffic volumes, the total length of roads within 750 ft of a woodland pool should be limited to the greatest extent possible. This can be achieved, among other ways, by clustering development to reduce the amount of needed roadway.

- "Cape Cod" style curbs or no-curb alternatives should be used to reduce barriers to amphibian movement.

- Over-sized square box culverts (2 ft wide by 3 ft high) should be used near wetlands and known amphibian migration routes to facilitate amphibian movements under roads. These culverts should be spaced at 20 ft (6 m) intervals. Special "curbing" should also be used along the adjacent roadway to deflect amphibians into the box culverts.

2) Maintain woodland pool water quality and quantity at pre-disturbance levels. Development within a woodland pool's drainage basin can degrade pool water quality by increasing sediment, nutrient, and pollutant loading to the pool. Even slight increases in sediment or pollution can stress and kill amphibian eggs and larvae and may have adverse long-term affects on the adults. Activities such as groundwater extraction (e.g. wells) or the redirection of natural surface water flows can decrease the pool hydroperiod below the threshold required for successful egg and larval development. Increasing impervious surfaces or channeling stormwater runoff toward pools can increase pool hydroperiod, which can also adversely affect the ability of amphibians to reproduce successfully in woodland pools. Changes to pool water quality and flood regime should be avoided to the greatest extent possible. Some protective measures that would help achieve this are listed below:

- Do not use intermittent woodland pools for storm water detention, either temporarily or permanently.

- Aggressively treat stormwater using methods that allow for the maximum infiltration and filtration of runoff, including grassy swales, filter strips, and oil-water separators in paved parking lots.

- Avoid or minimize the use of pesticides, herbicides, and fertilizers within the woodland pool's drainage basin to the greatest extent possible.

- Maintain both surface water runoff and groundwater inputs to intermittent woodland pools at pre-construction levels. Avoid changes (either increases or decreases) in pool depth, volume, and hydroperiod.

- Minimize impervious surfaces including roads, parking lots, and buildings to reduce runoff problems and resulting stormwater management needs.

3) Avoid creating stormwater detention basins and other artificial depressions that intermittently hold water (e.g. vehicle ruts) within 750 ft (230 m) of an intermittent woodland pool or in areas that might serve as overland migration routes between pools. These "decoy wetlands" can attract large numbers of pool breeding amphibians, but the eggs laid in these water features rarely survive due to the high sediment and pollutant loads and short hydroperiod.

4) Design or modify potential pitfall hazards to prevent the entrapment and death of migrating amphibians. For example:

   - In-ground swimming pools located within the critical terrestrial habitat of a woodland pool should be surrounded by a protective barrier such as a fine mesh wire at the base of a picket fence or a 1 ft (0.3 m) high curb. These barriers must be continuously maintained for the life of the swimming pool.

   - Excavations such as soil test pits, foundation holes, and utility ditches should be immediately backfilled as soon as the test is complete or the need for the excavation is fulfilled.

5) Schedule construction activities to occur outside peak amphibian movement periods in spring and early summer. If construction activity during this time period cannot be avoided, temporary exclusion fencing should be installed around the entire site (in consultation with the New York State Department of Environmental Conservation) to keep amphibians out of the active construction areas. Temporary exclusion fencing should consist of woven filter fabric (without coarse-mesh backing) with the bottom buried 8 in (20 cm) deep in the

soil. These fences should be regularly maintained so that amphibians are unable to pass through or get entangled in the barrier.

Priority zone 4 (see figures 5, 7, and 8) represents the minimum extent of the potential pool breeding amphibian habitat complex within the study area. We strongly recommend that all activity proposed within this zone be thoroughly reviewed in consultation with the Endangered Species Unit of the New York State Department of Environmental Conservation using the most up-to-date scientific information on woodland pool breeding amphibians and their habitat requirements.

- ### *Priority Zone 5: Oak-Heath Barrens*

Target Habitats: This zone encompasses all oak-heath barren habitats mapped within the study area (18 barrens in Fishkill and 7 in LaGrange,) and all upland and wetland habitats within 3,300 ft (1,000 m) of the barrens.

Conservation Issues: Oak-heath barrens are uncommon in the Hudson Valley and may provide core habitat for several rare reptiles that require rocky outcrops and exposed conditions at crucial stages in their life cycle. These reptiles include northern copperhead, five-lined skink (both regionally vulnerable), and at least along portions of Fishkill Ridge outside the study corridor, timber rattlesnake and eastern fence lizard (both NYS Threatened). The five-lined skink and eastern fence lizard typically use oak-heath barrens and associated crest, ledge, and talus habitats throughout the year for basking, foraging, and shelter. Snakes, on the other hand, may only use these open rocky habitats at key times of the year, including for spring basking and breeding. During late spring and summer the copperhead, for example, may travel 3,300 ft (1,000 m) or more from these habitats to forage in the surrounding forests, wetlands, and fields. These species also occasionally disperse to nearby barrens to interbreed with neighboring populations (thereby maintaining the genetic health of the populations) or to colonize new habitats as habitat quality changes. Thus, both the oak-heath barrens and the surrounding habitat matrix are important to the long-term viability of these species.

We believe the oak-heath barrens in the study area have good habitat quality and high biodiversity potential. We observed five-lined skink in one barren in the Fishkill portion of the study area and found suitable habitat for other rare species in most other barrens we visited. We recommend that these oak-heath barrens be considered potentially important habitats for biodiversity and that the following recommendations be implemented to safeguard their integrity.

<u>Recommendations:</u> Individual oak-heath barrens are not usually threatened by development because the steep rocky terrain makes the construction of houses, roads, and other structures expensive. Barrens occurring along hill summits and ridge tops, however, may be viewed as prime sites for communication (cell) towers. These barrens are also frequented by people seeking the scenic views, and thus are often subjected to ATV and foot traffic. All of these disturbances can severely degrade oak-heath barren habitat and expose the rare reptiles to fatal human encounters. Although the barrens themselves may not be developed, the surrounding habitats frequently are. Such development can destroy vital snake foraging habitat and sever the important travel corridors between interbreeding populations.
To help protect oak-heath barren habitats and their associated rare species, we recommend the following measures within priority zone 5:

1) *Protect oak-heath barren habitats.* All oak-heath barrens and their closely associated crest, ledge, and talus habitats should be protected from disturbances of any kind including, but not limited to, the construction of communication towers, mining, housing and road construction, and high intensity human recreation. We believe the landscapes that encompass oak-heath barrens may be ideal targets for long-term land preservation efforts. Wherever possible, we recommend that special effort be taken to minimize or prevent the adverse

effects associated with human activity in these areas. Posting cautionary signs that warn of the fragile nature of the habitat may be an important first step.

2) *Protect critical adjoining habitats*. As discussed above, the various upland and wetland habitats surrounding oak-heath barrens can provide important summer foraging habitat and travel corridors for rare reptiles. We advise that habitats within at least 3,300 ft (1,000 m) of an oak-heath barren be considered critical components of the barren habitat "complex." New development of any kind should be avoided within this 3,300 ft zone. If development cannot be avoided, it should be concentrated in a manner that maximizes the amount and connectivity of undisturbed habitat. Special measures may also need to be taken (in consultation with the New York State Department of Environmental Conservation) to restrict the potential movement of rare snakes into the newly developed areas, thereby minimizing the likelihood of human-snake encounters (which are often fatal for the snake) and road mortality. Protecting large areas of contiguous habitat surrounding oak-heath barrens will not only protect the potential foraging habitats and travel corridors, it may also help support the ecological and natural disturbance processes (e.g. fire) that help sustain these barrens habitats.

3) *Maintain corridors between oak-heath barren habitat complexes*. Perhaps one of the greatest threats to the long-term viability of the rare animals associated with oak-heath barrens is the fragmentation of habitat complexes from one another. The low-lying valley areas typically found between ridge-top barren complexes are often seen as prime development sites. The construction of houses, roads, and other structures in these areas can isolate habitat complexes and the animal populations they support by preventing dispersal and genetic exchange. This, in turn, can limit the ability of these populations to adapt to changing climatic or environmental conditions and makes them more prone to local extinction. It is important, therefore, that the intervening areas between habitat complexes remain intact to provide important long-distance migration

corridors for these species. We believe special efforts should be taken to identify and protect the potential travel corridors between oak-heath barren complexes within priority Zone 5.

Priority conservation zone 5 (see figures 7 and 8) may be the minimum area needed to protect some of rare reptile species commonly associates with barren habitats. Some species, however, require much larger areas of habitat to meet their foraging needs. We strongly recommend that all activity proposed in the vicinity of an oak-heath barren be thoroughly reviewed in consultation with the Endangered Species Unit of the New York State Department of Environmental Conservation.

- *Priority Zone 6: Acidic Bog*

Target Habitats: This zone encompasses a single acidic bog in the Fishkill portion of the study area and the area within 660 ft (200 m) of the bog.

Conservation Issues: Acidic bogs are a rare habitat type in the Hudson Valley and many of the indicator species of bogs are scarce in the region, including pitcher-plant, sundews, and cranberries. Acidic bogs can also support several species of conservation concern including golden-winged warbler, northern waterthrush, four-toed salamander, and pod-grass, among others (see Appendix A).

We consider the one mapped acidic bog to be an ecologically significant habitat due to its rarity, relatively large size, high habitat quality, and potential to support rare species. We recommend, therefore, that the special protective measures discussed below be implemented within priority zone 6 to safeguard the integrity of this sensitive habitat.

Recommendations: Acidic bogs are maintained largely by nutrient poor precipitation. Activities that alter the quality and quantity of water entering the bog have the potential to change the composition of the plant community over the long-term. Sphagnum moss, for example, appears to be particularly sensitive to pollutants such as chloride from road salt and other sources (Wilcox 1986). Acidic bogs are also sensitive to removal of the surrounding forest habitat. The loss of a forested "buffer" can result in warming of the bog mat, increased sediment and pollutant loading, and greater stormwater runoff entering the bog.

To help protect the sensitive acidic bog habitat, we recommend the following protective measures within priority zone 6:

1) *Protect acidic bog habitat.* The acidic bog habitat should be protected from disturbances of any kind including development, dredging, use as a stormwater detention basin, and intense human recreation. We believe the acidic bog and surrounding landscape may be an ideal target for long-term land preservation efforts. If the site is acquired for public access (e.g. as part of a nature preserve), we recommend that special effort be taken to minimize or prevent the adverse effects associated with human activity in this habitat. Boardwalks or viewing platforms should be limited to carefully selected discreet locations at the bog perimeter only, and should be constructed to protect soils, water quality, and vegetation, and to minimize visual or noise disturbance of the bog community. Cautionary signs that warn of the fragile nature of the habitat should also be posted.

2) *Maintain a forested buffer within 660 ft of the bog.* Forest habitats within 660 ft (200 m) of the bog provide an important buffer that helps maintain a cool microclimate in the bog, filter nutrients and other contaminants from runoff, and prevent surface waters from flooding the bog. We recommend that the forested habitats surrounding the bog be protected to the greatest extent possible. The undisturbed habitats surrounding the bog may also be ideal targets for long-term land preservation efforts. Activities such as land clearing and the construction of new houses and roads should be avoided within 660 ft of the bog.

3) *Maintain surface water quality*. Acidic bogs are adversely affected by changes in both the amount and quality of surface water that they receive. Impervious surfaces such as roads and buildings can increase surface water runoff to a bog, thereby altering the hydrology of these habitats. This runoff is often contaminated with nutrients and other pollutants such as road salts, hydrocarbons, minerals, sediment, pesticides, and herbicides. These contaminants can alter the vegetation structure or plant community composition, and can render the habitats unsuitable for the species of conservation concern. Changes to bog water quality and hydrology should be avoided to the greatest extent possible. Some protective measures that would help achieve this are listed below:

- Do not use acidic bogs for stormwater detention, either temporarily or permanently.
- Aggressively treat stormwater in the vicinity of the bog using methods that allow for the maximum infiltration and filtration of runoff, including grassy swales and filter strips.
- Avoid or minimize the use of pesticides, herbicides, and fertilizers within the bog's drainage basin to the greatest extent possible.
- Maintain surface water runoff inputs to acidic bogs at pre-construction levels. Avoid changes (either increases or decreases) in bog hydrology.
- Minimize impervious surfaces including roads, parking lots, and buildings to reduce runoff problems and resulting stormwater management needs.

➢ *Priority Zone 7: Tidal Habitats*

Target Habitats: This zone encompasses all intertidal marsh and mudflat habitats mapped in the Fishkill portion of the study area and a protective zone extending 660 ft (200 m) from these habitats.

Conservation Issues: Intertidal marshes and mudflats are uncommon in the Hudson Valley and many provide important habitat to a number of plant and animal species of conservation concern (see Appendix A). Birds such as least bittern, king rail, northern harrier (all NYS Threatened), American bittern (NYS Special Concern), Virginia rail, sora, common moorhen, and marsh wren (all regionally rare) depend on marshes for nesting and foraging. These birds are often easily disturbed by most types of human activity in or near the marsh, especially during the nesting season.

We observed suitable nesting habitat for marsh breeding birds in all of the intertidal marshes in the study area. We recommend, therefore, that the marshes and mudflats in priority zone 7 be considered potential habitat for marsh breeding birds and that the special protective measures discussed below be implemented to protect these species.

<u>Recommendations:</u> Human activity near a marsh, such as hiking (e.g. on a boardwalk), using motorized watercraft, and ATV riding in the surrounding uplands, can flush marsh birds from their nests and foraging areas. Such disturbances can diminish nesting success by making the eggs and fledglings more susceptible to predation. Chronic disturbance may also discourage these birds from even attempting to nest in the marsh habitat. Physical disturbance to the soils and the plant community may encourage the invasion of plant species such as common reed and purple loosestrife, which can render these habitats unsuitable for many marsh breeding birds and other species of conservation concern.

To protect marsh breeding birds and the habitats they require, we recommend the following protective measures be taken within priority zone 7:

1) *Protect the intertidal marsh/mudflat complex.* The intertidal marshes and mudflats within this priority zone should be protected from disturbances of any kind including dredging, channelization of the tidal tributary mouth and associated tidal channels, removal of vegetation, alteration of tidal hydrology, and intensive human recreational use. We believe this intertidal marsh/mudflat complex may be an ideal target for long-term land preservation efforts. If the

site and bordering uplands are acquired for public access (e.g. as part of a nature preserve), we recommend that special effort be taken to minimize or prevent the adverse effects associated with human recreation in these habitats, including minimizing human activity during the nesting and fledgling season of marsh birds.

2) *Maintain an undisturbed buffer within 660 ft of the marsh/mudflat complex.* Broad areas of undisturbed habitats, especially forests, can help mitigate noise disturbance from nearby land uses by deflecting or muffling the noise before it reaches the marsh. Such a buffer can help minimize disturbance to marsh breeding birds and other wildlife. We recommend that all habitats within 660 ft (200 m) of the marshes and mudflats be protected to the greatest extent possible to serve as a noise and visual buffer. If development within this buffer cannot be avoided, it should be designed to minimize potential adverse impacts to marsh breeding birds. Measures that could help minimize impacts to these species include timing construction activities to coincide with the end of the nesting and fledgling season, using the greatest possible setback distance from the marsh, and minimizing disturbance or clearing of densely vegetated areas between the marsh and the development.

   Other activities that could potentially disturb marsh birds should also be avoided within this protective buffer zone, including but not limited to the use of motorized watercraft, intensive human recreation, and ATV riding. If the site is made accessible to the public, any boardwalks or observation decks constructed near the marsh should be located at the most distant and discreet vantage points and trails should not follow the wetland-upland boundary to minimize human contact with marsh birds and other species of conservation concern.

➢ *Priority Zone 8: Large Forests*

Target Habitats: This zone includes certain hardwood, mixed, and conifer forests (both upland and wetland) that we believe may be especially important for maintaining local biodiversity. In general, these forests were greater than 100 ac (40 ha). In a few instances, we also selected smaller forests that could potentially serve as wildlife travel corridors or "stepping stones" between nearby habitats.

In most cases, these forested areas extended beyond the corridor boundary to encompass a much larger area. For example, each of these forests in the Beekman portion of the study area (see figure 9) was approximately 500 ac (200 ha) in total when the unmapped forest outside the corridor was considered. Several of the important forests in the LaGrange portion of the study area (see figure 10) also extended beyond the corridor boundary to encompass a total of 400-600 ac (160-240 ha) or more, including the forested swamp at the southern end of the corridor, the forested hill northeast of Velie Road, and the forest south of Sunset Hill Road. The most extensive forest in the LaGrange study area occurred at the very northern end of the corridor. This forest, which extended into the Town of Pleasant Valley, may encompass a total of several thousand acres. Two important forests in the Fishkill portion of the study area (see figure 11) were also quite extensive. Forest along Honness Mountain just north of Interstate 84 totaled nearly 700 ac (280 ha) when the contiguous forest beyond the corridor was included. The most extensive forest habitat however, occurred on Fishkill Ridge just south of Interstate 84 and encompassed an estimated 8,000 ac (3,240 ha) beyond the study area corridor.

Conservation Issues: Large blocks of unfragmented forest are increasingly uncommon in rapidly developing areas of southern Dutchess County. Large forests provide crucial habitat for numerous "area-sensitive" species that require many hundreds or thousands of acres of contiguous forest to survive and successfully reproduce in the long-term. Large forests, particularly those that are more round and less linear, also support "forest interior" species that are highly sensitive to disturbance and predation along forest edges. Most of these area-sensitive and forest interior species are rare or declining due to the loss of large forest habitats.

Although many of the forests identified as important within the study area may be too small to support the successful reproduction of the most sensitive species (with the exception of the forest along Fishkill Ridge in Fishkill), they may nonetheless be vital for maintaining local biodiversity and supporting other rare or vulnerable species. Some area-sensitive forest birds that appear to be at least moderately successful in forest patches between 100-700 ac (40-280 ha), such as wood thrush, ovenbird, barred owl, and red-shouldered hawk, (all species of conservation concern, see Appendix A), may in fact use the larger forests within priority zone 8. Other species such as the regionally vulnerable bobcat may use the larger forests within the study area for foraging, denning, and travel. We expect that box turtle (NYS Special Concern) may be locally common within many forests in the study area. For these and other reasons, the large forest patches identified within priority zone 8 are potentially significant to biodiversity and should be protected.

Recommendations: Forest habitats are particularly susceptible to loss and disturbance from development and other human activity. Development along the edges of a forest can "chip-away" at the available habitat over time, while development that extends into the forest interior can fragment the habitat into smaller and more isolated patches. This, in turn, can have significant adverse affects on area-sensitive and forest interior species, as well as on local biodiversity and ecosystem dynamics in general.

We recommend that the remaining blocks of large forest within the study area be considered priority areas for conservation, and that efforts be taken to fully protect these habitats wherever possible. If new development cannot be avoided, it should be concentrated near forest edges and near existing development so that as much forest area as possible is preserved. New roads or even driveways should not extend into the interior of the forest and should not divide the habitat into smaller isolated patches.

- *Priority Zone 9: Large Meadows and Shrublands*

Target Habitats: This zone includes certain upland meadow, upland shrubland, and wet meadow habitats that we believe may be especially important to local biodiversity. In general, these meadows were greater than 25 ac (10 ha) with the largest occurrences around 100 ac (40 ha). In a few cases we also selected smaller meadows that could potentially serve as wildlife travel corridors or "stepping stones" between nearby habitats.

As with the important forest habitats discussed above, several of these meadows extended beyond the corridor boundary to encompass a much larger area. In the Beekman portion of the study area, a meadow complex just west of Clove Valley Road in the north end of the corridor totaled more than 300 ac (120 ha) when contiguous meadow habitat in the Town of Union Vale was included. In the LaGrange portion of the study area, a meadow that extended beyond the corridor boundary just west of Lauer Road totaled nearly 100 ac (40 ha), while an abandoned hayfield just south of Noxon Road was approximately 200 ac (80 ha) when contiguous meadow to the east was included.

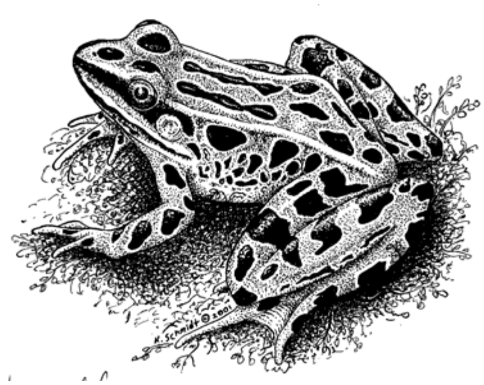
Conservation Issues: Meadows are disappearing from the landscape at a faster rate then most other habitat types. Not only are meadows an important scenic resource in the study area, they are also an important ecological resource. In particular, larger blocks of meadow (especially those unfragmented by hedgerows and fences) are potential breeding habitat for several species of rare or declining grassland birds. Most of these grassland breeding birds require meadow patches many hundreds of acres in size in order to successfully reproduce. The pronounced decline in grassland breeding bird populations in the Northeast has been attributed to the loss of large meadow habitats (Askins 1993, Vickery 1994, Jones and Vickery 1995).

Grassland breeding bird species that have particularly large habitat area requirements may not be successful in the important meadow habitats identified in priority area # 9. Some grassland birds that appear to be at least moderately successful in meadow patches greater than 25 ac (10 ha), such as savannah sparrow, vesper sparrow, bobolink, eastern meadowlark (all species of conservation concern, see Appendix A), may in fact use the larger meadows within priority zone 9. Some of the meadows within the study area may also be prime nesting habitat for Blanding's turtle (NYS Threatened) and wood turtle (NYS Special Concern). We recommend, therefore, that efforts be made to protect the meadows within priority zone # 9.

Recommendations: Meadows are among the habitats most vulnerable to future development. In agricultural areas, for example, development is often an attractive alternative to the economic challenges faced by small farmers. Even when development does not destroy the entire meadow habitat, the remaining fragments are usually small and of much lower biodiversity value. Meadows and the rare species they support are also highly susceptible to other human activities such as mowing, conversion to crop agriculture, pesticides, and ATV traffic. Development around meadows can also promote increased predation on grassland breeding bird nests by human-subsidized predators such as raccoon.

We believe large meadows and meadow complexes should be priority areas for long-term preservation. If development of meadows cannot be avoided, every effort should be made to concentrate any new development in one area near existing roads at meadow edges so that as much meadow habitat as possible remains intact. Wherever possible, new roads and driveways should not divide individual meadows into smaller patches or fragment meadow complexes. If meadows must be mowed, we recommend that it be timed to coincide with the post-fledging season for most birds (e.g. September and later) wherever possible.

CONCLUSION



Northern leopard frog
(K. Schmidt © 2001)

In the suburban and rural landscapes of southern Dutchess County, including in the study area, there are still significant opportunities for biodiversity conservation. Development pressure is on the rise, however, and strategic land use and conservation planning is needed to ensure that species, communities, and ecosystems are protected for the long term. Through our habitat mapping work, Hudsonia hopes to equip town agencies, landowners, and others with information about local habitats of ecological significance so they can take steps to protect the resources of greatest importance to them.

The "habitat approach" to conservation, however, is quite different from the traditional parcel-by-parcel approach to land use decision making. It requires examining the landscape beyond the boundaries of any particular land parcel, and considering the size and juxtaposition of habitats in the landscape, the kinds of biological communities and species they support, and the ecological processes that help to maintain those habitats and species. After conveying the completed habitat map, database, and report to the towns of Beekman, LaGrange, and Fishkill and the City of Beacon, Hudsonia hopes to assist town and city officials, local landowners, and other interested individuals and groups in interpreting the map, understanding what ecological resources exist within the town, and devising ways to integrate this new information into land-use planning and decision making.

We believe that the habitat maps are an invaluable tool for land use and conservation planning. An understanding of the significant ecological resources in the town will enable local decision makers to focus limited conservation resources where they will have the greatest impact. The maps provides a bird's-eye view of the Fishkill Creek and Sprout Creek corridors, illustrating the location and configuration of ecologically significant habitats. At the printed scale of 1:10,000, many important ecological and land-use patterns emerge, such as the location and extent of remaining unfragmented forest blocks, the areas where fens or other rare habitats are concentrated, and the patterns of habitat fragmentation caused by roads and private residential development. This kind of general information can help the three towns think about where future development should be concentrated and where future conservation efforts should be targeted.

At the site-specific scale, we hope the map will be used as a resource during routine deliberations over development proposals and other proposed land use changes within the study area. The map and report bring an independent body of information to site design and environmental reviews, and will help users raise questions about important biological resources that might otherwise be overlooked. We strongly emphasize, however, that the maps have not been exhaustively field-checked and should therefore be used only as a source of general information. In an area proposed for development, for example, the habitat maps and this report can provide basic ecological information about the site and the surrounding lands. The maps, however, should never be considered a substitute for site visits by qualified professionals. During site visits, the presence and boundaries of important habitats can be verified, and the site can be assessed for additional ecological values, such as rare species occurrences. This detailed, up-to-date information is essential to making informed decisions about specific development proposals. Because the natural landscape and patterns of human land use are dynamic, it is important for the towns to consider refining and/or updating the habitat map over time.

Conservation of habitats is one of the best ways to protect biological resources. We hope that the information contained in the habitat maps and in this report will help town decision-makers plan wisely for future development while taking steps to protect biological resources of greatest importance. Incorporating this approach into planning and decision making will help to minimize the adverse effects of human activities, to integrate the needs of the human community with those of the natural landscape, and to protect the ecological patterns and processes that support the human community and the rest of the living world.

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REFERENCES CITED

Aerts, R. and F. Berendse. 1988. The effect of increased nutrient availability on vegetation dynamics in wet heathlands. Vegetatio 76:63-69.

Ambuel, G. and S.A. Temple. 1983. Songbird populations in southern Wisconsin forests: 1954 and 1979. Journal of Field Ornithology 53:149-158.

Askins, R.A. 1993. Population trends in grassland, shrubland, and forest birds in Eastern North America. Current Ornithology 11:1-34.

Bednarz, J.C. and J.J. Dinsmore. 1982. Nest sites and habitat of red-shouldered and red-tailed hawks in Iowa. Wilson Bulletin 94(1):31-45.

Billings, G. 1990. Birds of prey in Connecticut. Rainbow Press, Torrington, CT. 461 p.

Buech, R., L.G. Hanson, and M.D. Nelson. 1997. Identification of wood turtle nesting areas for protection and management. In J. Van Abbema ed. Proceedings: Donservation, Restoration, and Management of Tortoises and Turtles- An International Conference. New York Turtle and Tortoise Society and the WCS Turtle Recovery Program, New York.

Cadwell, D.H. 1989. Surficial geologic map of New York (Lower Hudson sheet). Map and Chart Series 40, 1:250,000, 100 ft. contour. New York State Museum, Albany.

Calhoun, A.J.K. and M.W. Klemens. 2002. Best development practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States. MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.

Calhoun, A.J.K. and P. deMaynadier. 2004. Forestry habitat management guidelines for vernal pool wildlife. MCA Technical Paper No. 6, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York.

Carroll, T.E. and D.H. Ehrenfeld. 1978. Intermediate-range homing in the wood turtle, *Clemmys insculpta*. Copia 978:117-126.

Crocoll, S.T. 1994. Red-shouldered hawk (*Buteo lineatus*). In A. Poole and F. Gill, eds. The Birds of North America, No. 107. Academy of Natural Sciences, Philadelphia, and American Ornithologists' Union, Washington, DC.

Davies, K.F., C. Gascon, and C.R. Margules. 2001. Habitat fragmentation: Consequences, management, and future research priorities. P. 81-97 in M.E. Soule, and G.H. Orians eds., Conservation Biology: Research Priorities of the Next Decade. Society of Conservation Biology, Washington, DC.

Drexler, J.Z. and B.L. Bedford. 2002. Pathways of nutrient loading and impacts on plant diversity in a New York peatland. Wetlands. 22:263-281.

Downs, F.L. 1989. Family Ambystomatidae. P. 87-172 in R.A. Pfingsten and F.L. Downs, eds., Salamanders of Ohio. Ohio Biological Survey Bulletin. New Series 7(2).

Eckler, J.T. and A.R. Breisch. 1990. Radio telemetry techniques applied to the Bog Turtle (*Clemmys muhlenbergii* Schoepff 1801). In R.S. Mitchell, C. J. Sheviak, and D. J. Leopold, eds. Ecosystem management: rare species and significant habitats. New York State Museum Bulletin No. 471. Albany, New York. p70.

Environmental Laboratory. 1987. Corps of Engineers wetland delineation manual. Waterways Experiment Station, Corps of Engineers, Vicksburg, MS. 100 p. + appendices.

Environmental Law Institute. 2003. Conservation thresholds for land use planners. Environmental Law Institute, Washington, D.C. 55 p.

Faber, M. 2002. Soil survey of Dutchess County, New York. Natural Resources Conservation Service National Cooperative Soil Survey, US Department of Agriculture. 356 p. + maps.

Fisher, D.W., Y.W. Isachsen, and L.V. Rickard. 1970. Geologic map of New York (Lower Hudson Sheet). Map and Chart Series 15. 1:250,000, 100 ft. contour. New York State Museum and Science Service, Albany.

Fitch, H.S. 1960. Autecology of the copperhead. University of Kansas publication. Museum of Natural History 13:85-288.

Forman, R.T.T. and R.D. Deblinger. 2000. The ecological road-effect zone of a Massachusetts (U.S.A.) suburban highway. Conservation Biology 14(1):36-46.

Foscarini, D.A. and R.J. Brooks. 1997. A proposal to standardize data collection and implications for management of the wood turtle, *Clemmys insculpta*, and other freshwater turtles in Ontario, Canada. In J. Van Abbema ed. Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles- An International Conference. New York Turtle and Tortoise Society and the WCS Turtle Recovery Program, New York.

Fowle, S.C. 2001. Priority sites and proposed reserve boundaries for protection of rare herpetofauna in Massachusetts. Report to the Massachusetts Department of Environmental Protection. 107 p.

Godin, A.J. 1977. Wild mammals of New England. Johns Hopkins University Press, Baltimore. 304 p.

Hardling, J.H. and T.J. Bloomer. 1979. The wood turtle (*Clemmys insculpta*): A natural history. Bulletin of the New York Herpetological Society 15(1):9-26.

Hartwig, T., G. Stevens, J. Sullivan, and E. Kiviat. In prep. Blanding's turtle habitats in southern Dutchess County. Report to the Marilyn Milton Simpson Charitable Trusts. Hudsonia Ltd., Annandale, New York.

Haskell, D.G. 2000. Effects of forest roads on macroinvertebrate soil fauna of the southern Appalachian Mountains. Conservation Biology 14(1):57-63.

Hewlett, J., and J. Fortson. 1982. Stream temperature under an inadequate buffer strip in the southeast Piedmont. Water Resources Bulletin 18:983-988.

Hill, N.P. and J.M. Hagan. 1991. Population trends of some northeastern North American landbirds: A half-century of data. Wilson Bulletin 103(2):165-182.

Jones, A.L. and P.D. Vickery. 1995. Distribution and population status of grassland birds in Massachusetts. Bird Observer 23(2):89-96.

Joyal, L.A., M. McCollough, and M.L. Hunter, Jr. 2000. Population structure and reproductive ecology of Blanding's turtle (*Emydoidea blandingii)* in Maine, near the northeastern edge of its range. Chelonian Conservation and Biology 3:580-588.

Joyal, L.A., M. McCollough, and M.L. Hunter, Jr. 2001. Landscape ecology approaches to wetland species conservation: A case study of two turtle species in southern Maine. Conservation Biology 15:1755-1762.

Kaufmann, J.H. 1992. Habitat use by wood turtles in central Pennsylvania. Journal of Herpetology. 26(3):315-321.

Kiviat, E. 1997. Blanding's turtle habitat requirements and implications for conservation in Dutchess County, New York. P. 377-382 in J. van Abbema, ed., Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles--An International Conference. New York Turtle and Tortoise Society, New York.

Kiviat, E. and G. Stevens. 2001. Biodiversity assessment manual for the Hudson River estuary corridor. New York State Department of Environmental Conservation, Albany. 508 p.

Klemens, M.W. 2001. Bog turtle conservation zones. Appendix A in Bog Turtle (*Clemmys muhlenbergii*), Northern Population, Recovery Plan. U.S. Fish and Wildlife Service. Hadley, Massachusetts. 103 p.

Lynch, J., E. Corbett, and K. Mussallem. 1985. Best management practices for controlling nonpoint-source pollution on forested watersheds. Journal of Soil and Water Conservation 40:164-167.

Madison, D.M. 1997. The emigration of radio-implanted spotted salamanders, *Ambystoma maculatum*. Journal of Herpetology 31:542-552

McDade, J., F. Swanson, W. McKee, J. Franklin, and J. Van Sickle. 1990. Source distances for course woody debris entering small streams in western Oregon and Washington. Canada Journal of Forest Research 20:326-330.

Metropolitan Conservation Alliance. 2002. Conservation overlay district: A model local law. Technical Paper Series, No. 3. Bronx, NY. 46 p.

Mitchell, R.S. and G. C. Tucker. 1997. Revised checklist of New York State plants. Bulletin No. 490, New York State Museum, Albany. 400 p.

Panno, S.V., V.A. Nuzzo, K. Cartwright, B.R. Hensel, and I.G. Krapac. 1999. Impact of urban development on the chemical composition of ground water in a fen-wetland complex. Wetlands. 19: 236-245.

Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S. Butcher, D.W. Demarest, E.H. Dunn, W.C. Hunter, E.E. Inigo-Elias, J.A. Kennedy, A.M. Martell, A.O. Panjabi, D.N. Pashley, K.V. Rosenberg, C.M. Rustay, J.S. Wendt, T.C. Will. 2004. Partners in Flight North American landbird conservation plan. Cornell Laboratory of Ornithology. Ithaca, New York.

Richburg, J.A., W.A. Patterson III, and F. Lowenstein. 2001. Effects of road salt and *Phragmites australis* invasion on the vegetation of a western Massachusetts calcareous lake-basin fen. Wetlands. 21:247-255.

Robbins, C.S. 1980. Effect of forest fragmentation on breeding bird populations in the Piedmont of the Mid-Atlantic region. Atlantic Naturalist 33:31-36.

Rodgers, J.A. and H.T. Smith. 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. Wildlife Society Bulletin 25(1):139-145.

Semlitsch, R.D. 1998. Biological delineation of terrestrial buffer zones for pond-breeding salamanders. Conservation Biology 12: 1112-1119.

Semlitsch, R.D. 2000. Size does matter: The value of small isolated wetlands. National Wetlands Newsletter 22(1):5-6,13.

Semlitsch, R.D. and J.R. Brodie. 1998. Are small, isolated wetlands expendable? Conservation Biology 12: 1129-1133.

Singler, A. and B. Graber, eds. 2005. Massachusetts stream crossings handbook. Massachusetts Riverways Program, Massachusetts Department of Fish and Game. 11 p. (Available from www.streamcontinuity.org).

Spence, B., G. Lomnicky, R. Hughes, and R. Novitzki. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. ManTech Environmental Research Services Corporation. Corvallis, Oregon.

Steinblums, I., H. Froechlich, and J. Lyons. 1984. Designing stable buffer strips for stream protection. Journal of Forestry 82:49-52.

Stevens, G. and E. Broadbent. 2002. Significant habitats of the Town of East Fishkill, Dutchess County, New York. Report to the Marilyn Milton Simpson Charitable Trusts, and the Town of East Fishkill. Hudsonia Ltd., Annandale, NY. 56 p.

Tollefson, J. and G. Stevens. 2004. Significant habitats in the Town of Washington, Dutchess County, New York. Report to the Millbrook Tribute Garden, the Dyson Foundation, the Town of Washington, and the Dutchess County Land Conservancy. Hudsonia Ltd., Annandale, NY. 89 p.

Trombulak, S.C. and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. Conservation Biology. 14(1):18-30.

Vickery, P.D. 1994. Birds of the grasslands. Sanctuary 33(5):26-27.

Wilcove, D.S. 1985. Nest predation in forest tracts and the decline of migratory songbirds. Ecology 66(4):1211-1214.

Wilcove, D.S., C.H. McLellan, and A.P. Dobson. 1986. Habitat fragmentation in the temperate zone. P. 309-329 in M.E. Soule, ed., Conservation Biology. Sinacur Associates, Sunderland, MA.

Wilcox, D.A. 1986. The effects of deicing salts on vegetation in Pinhook Bog, Indiana. Canadian Journal of Botany 64:865-874.

Young, R., T. Huntrods, and W. Anderson. 1980. Effectiveness of vegetated buffer strips in controlling pollution from feedlot runoff. Journal of Environmental Quality 9:483-497.

Appendix A. Some species of conservation concern potentially associated with habitats in the towns of Beekman, Fishkill, and LaGrange, and the City of Beacon. These are not comprehensive lists, but are merely a sample of the species of conservation concern known to use these habitats in the region. The two-letter codes given with each species name denote conservation status. Codes include **NYS ranks** (E, T, R, SC), **NY Natural Heritage Program ranks** (S1, S2, S3), and **regional ranks** (RG). For birds, we also indicate those species listed by Partners in Flight as high conservation priorities at the continental (PIF1) and regional (PIF2) level. This ranking system is explained in Appendix B.

UPLAND DECIDUOUS FOREST		
Plants	***Vertebrates (cont.)***	***Vertebrates (cont.)***
silvery spleenwort (RG)	Jefferson salamander (SC, S3)	eastern wood-pewee (RG, PIF2)
American ginseng (RG)	blue-spotted salamander (SC, S3)	Acadian flycatcher (S3)
red baneberry (RG)	marbled salamander (SC, S3)	wood thrush (RG, PIF1)
blue cohosh (RG)	northern goshawk (SC, S3N)	cerulean warbler (SC, PIF1)
leatherwood (RG)	red-shouldered hawk (SC)	black-throated blue warbler (RG)
hackberry (RG)	Cooper's hawk (SC)	black-throated green warbler (RG)
sweet-gum (RG)	sharp-shinned hawk (SC)	ovenbird (RG)
Vertebrates	broad-winged hawk (RG)	southern bog lemming (RG)
wood frog (RG)	American woodcock (RG, PIF1)	bobcat (RG)
spotted salamander (RG)	barred owl (RG)	fisher (RG)

UPLAND CONIFER FOREST		
Vertebrates	***Vertebrates (cont.)***	***Vertebrates (cont.)***
blue-spotted salamander (SC, S3)	long-eared owl (S3)	blackburnian warbler (RG, PIF2)
Cooper's hawk (SC)	short-eared owl (E, S2, PIF1)	pine siskin (RG)
sharp-shinned hawk (SC)	barred owl (RG)	red-breasted nuthatch (RG)
American woodcock (RG, PIF1)	black-throated green warbler (RG)	evening grosbeak (RG)

RED CEDAR WOODLAND		
Plants	***Vertebrates***	***Vertebrates (cont).***
large twayblade (E, S1)	eastern hognose snake (SC, S3S4)	northern harrier (T, S3B, S3N)
yellow wildflax (T, S2)	Blanding's turtle (T, S2S3)	northern saw-whet owl (S3)
Carolina whitlow-grass (T, S2)	spotted turtle (SC, S3)	long-eared owl (S3)
Bicknell's sedge (T, S3)	wood turtle (SC, S3)	short-eared owl (E, S2, PIF1)
Invertebrates	eastern box turtle (SC, S3)	
olive hairstreak (butterfly) (RG)	eastern bluebird (RG)	

UPLAND SHRUBLAND		
Plants	***Vertebrates***	***Vertebrates (cont.)***
stiff-leaf goldenrod (T, S2)	wood frog (RG)	golden-winged warbler (SC, PIF1)
small-flowered agrimony (S3)	Blanding's turtle (T, S2S3)	prairie warbler (PIF1)
shrubby St. Johnswort (T, S2)	spotted turtle (SC)	yellow-breasted chat (SC, S3)
devil's-bit (T, S1S2)	eastern box turtle (SC)	clay-colored sparrow (P, S2)
butterfly weed (RG)	wood turtle (RG)	vesper sparrow (SC)
Invertebrates	northern harrier (T, S3B, S3N)	grasshopper sparrow (SC, PIF2)
Aphrodite fritillary (butterfly) (RG)	short-eared owl (E, S2, PIF1)	Henslow's sparrow (T, S3B, PIF1)
dusted skipper (butterfly) (S3)	northern saw-whet owl (S3)	
Leonard's skipper (butterfly) (RG)	loggerhead shrike (E, S1B)	
cobweb skipper (butterfly) (RG)	blue-winged warbler (PIF1)	

UPLAND MEADOW		
Plants	***Vertebrates***	***Vertebrates (cont.)***
Bush's sedge (S3)	Blanding's turtle (T, S2S3)	eastern bluebird (RG)
Invertebrates	spotted turtle (SC, S3)	vesper sparrow (SC)
Aphrodite fritillary (butterfly) (RG)	eastern box turtle (SC, S3)	grasshopper sparrow (SC, PIF2)
dusted skipper (butterfly) (S3)	wood turtle (SC, S3)	Henslow's sparrow (T, S3B, PIF1)
Leonard's skipper (butterfly) (RG)	northern harrier (T, S3B, S3N)	bobolink (RG)
swarthy skipper (butterfly) (RG)	upland sandpiper (T, S3B, PIF1)	eastern meadowlark (RG)
	sedge wren (T, S3B, PIF2)	

OAK-HEATH BARREN and NON-CALCAREOUS CREST, LEDGE, & TALUS		
Plants	***Invertebrates***	***Vertebrates (cont.)***
mountain spleenwort (T, S2S3)	Edward's hairstreak (butterfly) (S3S4)	eastern box turtle (SC, S3)
Bicknell's sedge (T, S3)	striped hairstreak (butterfly) (RG)	five-lined skink (S3)
bronze sedge (RG)	brown elfin (butterfly) (RG)	black rat snake (RG)
clustered sedge (T, S2S3)	olive hairstreak (butterfly) (RG)	turkey vulture (RG)
reflexed sedge (E, S2S3)	northern hairstreak (butterfly) (S1S3)	golden eagle (E, S1N)
whorled milkweed (RG)	gray hairstreak (butterfly) (RG)	whip-poor-will (SC, PIF2)
blunt-leaf milkweed (RG)	Horace's duskywing (butterfly) (RG)	common raven (RG)
eastern prickly-pear (RG)	swarthy skipper (butterfly) (RG)	winter wren (RG)
whorled milkwort (RG)	Leonard's skipper (butterfly) (RG)	eastern bluebird (RG)
rock sandwort (RG)	cobweb skipper (butterfly) (RG)	hermit thrush (RG)
downy arrowwood (RG)	dusted skipper (butterfly) (S3)	blackburnian warbler (RG, PIF2)
goat's-rue (RG)	***Vertebrates***	cerulean warbler (SC, PIF1)
slender knotweed (R, S3)	slimy salamander (RG)	worm-eating warbler (RG, PIF1)
dittany (RG)	marbled salamander (SC, S3)	small-footed bat (SC, S2)
Torrey's mountain-mint (E, S1)	Fowler's toad (RG)	boreal redback vole (RG)
allegheny-vine (RG)	northern copperhead (S3)	porcupine (RG)
bearberry (RG)	eastern hognose snake (SC, S3S4)	fisher (RG)
three-toothed cinquefoil (RG)	worm snake (SC, S3S4)	bobcat (RG)
stiff-leaf aster (RG)	timber rattlesnake (T, S3)	

CALCAREOUS CREST, LEDGE, & TALUS		
Plants	***Plants (cont.)***	***Invertebrates (cont.)***
side-oats grama (E, S1)	Emmons' sedge (S3)	Leonard's skipper (butterfly) (RG)
Torrey's mountain-mint (E, S1)	yellow harlequin (S3)	swarthy skipper (butterfly) (RG)
large twayblade (E, S1)	Dutchman's breeches (RG)	anise millipede (RG)
green milkweed (T, S2)	pellitory (RG)	***Vertebrates***
yellow wild flax (T, S2)	roundleaf dogwood (RG)	five-lined skink (S3)
Carolina whitlow-grass (T, S2)	hairy rock-cress (RG)	eastern hognose snake (SC, S3S4)
devil's-bit (T, S1S2)	walking fern (RG)	northern black racer (RG)
smooth cliffbrake (T, S2)	purple cliffbrake (RG)	black rat snake (RG)
Bicknell's sedge (T, S3)	***Invertebrates***	northern copperhead (S3)
small-flowered crowfoot (T, S3)	olive hairstreak (butterfly) (RG)	
northern blazing-star (T, S2)	dusted skipper (butterfly) (S3)	

CLAY BLUFF & RAVINE		
Plants	***Vertebrates***	***Vertebrates (cont.)***
goldenseal (T, S2)	eastern box turtle (SC, S3)	black-throated blue warbler (RG)
leatherwood (RG)	bald eagle (T, S2S3B, S2N)	black-throated green warbler (RG)
closed gentian (RG)	osprey (SC, S4B)	
stiff gentian (RG)	Cooper's hawk (SC, S4)	
northern white cedar (RG)	cerulean warbler (SC, S4B)	

WASTE GROUND		
Plants	***Plants (cont.)***	***Vertebrates (cont.)***
hair-rush (RG)	slender knotweed (R, S3)	northern copperhead (S3)
toad rush (RG)	river birch (S3)	American black duck (RG, PIF1)
orangeweed (RG)	***Vertebrates***	common raven (RG)
field dodder (S3)	Fowler's toad (RG)	grasshopper sparrow (SC, PIF2)
slender pinweed (T, S2)	Blanding's turtle (T, S2S3)	Henslow's sparrow (T, S3B, PIF1)
rattlebox (E, S1)	wood turtle (SC, S3)	bank swallow (RG)
blunt mountain-mint (T, S2S3)	eastern hognose snake (SC, S3S4)	

HARDWOOD & SHRUB SWAMP and CONIFER SWAMP		
Plants	***Vertebrates (cont.)***	***Vertebrates (cont.)***
ostrich fern (RG)	blue-spotted salamander (SC, S3)	wood duck (RG, PIF2)
wood horsetail (RG)	four-toed salamander (RG)	red-shouldered hawk (SC)
swamp cottonwood (T, S2)	northern leopard frog (RG)	American woodcock (RG, PIF1)
southern dodder (E, S1)	Blanding's turtle (T, S2S3)	barred owl (RG)
dwarf huckleberry (E, S1S2)	eastern box turtle (SC, S3)	white-eyed vireo (RG)
Invertebrates	spotted turtle (SC, S3)	eastern bluebird (RG)
ostrich fern borer (S1?)	wood turtle (SC, S3)	prothonotary warbler (P, S2, PIF1*)
	great blue heron (RG)	Canada warbler (RG, PIF1)

MARSH		
Plants	***Vertebrates (cont.)***	***Vertebrates (cont.)***
winged monkey-flower (R, S3)	spotted turtle (SC, S3)	northern harrier (T, S3B, S3N)
buttonbush dodder (E, S1)	pied-billed grebe (T, S3B, S1N)	king rail (T, S1B, PIF1)
spiny coontail (T, S3)	American bittern (SC, S4)	Virginia rail (RG)
Vertebrates	least bittern (T, S3B, S1N)	sora (RG)
northern leopard frog (RG)	wood duck (RG, PIF2)	common moorhen (RG)
Blanding's turtle (T, S2S3)	American black duck (RG, PIF1)	marsh wren (RG)

WET MEADOW		
Invertebrates	***Invertebrates (cont.)***	***Vertebrates (cont.)***
mulberry wing (butterfly) (RG)	Milbert's tortoiseshell (butterfly) (RG)	Virginia rail (RG)
black dash (butterfly) (RG)	phantom cranefly (RG)	American woodcock (RG, PIF1)
two-spotted skipper (butterfly) (RG)	***Vertebrates***	sedge wren (T, S3B, PIF2)
meadow fritillary (butterfly) (RG)	spotted turtle (SC, S3)	Henslow's sparrow (T, S3B, PIF1)
Baltimore (butterfly) (RG)	ribbon snake (RG)	vesper sparrow (SC)
bronze copper (butterfly) (RG)	American bittern (SC)	grasshopper sparrow (SC, PIF2)
eyed brown (butterfly) (RG)	northern harrier (T, S3B, S3N)	southern bog lemming (RG)

FEN and CALCAREOUS WET MEADOW		
Plants	***Plants (cont.)***	***Invertebrates (cont.)***
wood horsetail (RG)	bog valerian (E, S1S2)	mulberry wing (butterfly) (RG)
slender lady's tresses (RG)	alder-leaf buckthorn (RG)	phantom cranefly (RG)
showy ladyslipper (RG)	***Invertebrates***	***Vertebrates***
rose pogonia (RG)	*Gammarus pseudolimnaeus* (amphipod) (RG)	northern leopard frog (RG)
Schweinitz's sedge (T, S2S3)	forcipate emerald (dragonfly) (S1)	bog turtle (E, S2)
handsome sedge (T, S2S3)	Kennedy's emerald (dragonfly) (SNA)	spotted turtle (SC, S3)
ovate spikerush (E, S1S2)	*Pomatiopsis lapidaria* (snail) (RG)	eastern box turtle (SC)
small-flowered agrimony (S3)	eyed brown (butterfly) (RG)	ribbon snake (RG)
spreading globeflower (R, S3)	two-spotted skipper (butterfly) (RG)	sedge wren (T, S3B, PIF2)
swamp birch (T, S2)	black dash (butterfly) (RG)	
scarlet Indian paintbrush (E, S1)	Dion skipper (butterfly) (S3)	

WET CLAY MEADOW		
Plants	***Plants (cont.)***	***Vertebrates (cont.)***
ragged fringed orchid (RG)	winged monkey-flower (R, S3)	eastern box turtle (SC, S3)
slender lady's-tresses (RG)	small skullcap (S3)	wood turtle (SC, S3)
nodding lady's-tresses (RG)	slender gerardia (RG)	Virginia rail (RG)
small-flowered agrimony (S3)	winged loosestrife (RG)	American woodcock (RG)
downy-ground-cherry (E, S1)	fringed gentian (RG)	sedge wren (T, S3B, PIF2)
Frank's sedge (E, S1)	***Vertebrates***	Henslow's sparrow (T, S3B, PIF1)
Bush's sedge (S3)	spotted salamander (RG)	vesper sparrow (SC)
buttonbush dodder (E, S1)	spotted turtle (SC, S3)	grasshopper sparrow (SC, PIF2)

ACIDIC BOG		
Plants	***Plants (cont.)***	***Vertebrates (cont.)***
pod-grass (R, S3)	small cranberry (RG)	golden-winged warbler (SC, PIF1)
cottongrass (RG)	large cranberry (RG)	Nashville warbler (RG)
pitcher-plant (RG)	bog rosemary (RG)	northern waterthrush (RG)
roundleaf sundew (RG)	***Vertebrates***	southern bog lemming (RG)
dragonmouth orchid (RG)	four-toed salamander (RG)	
Virginia chain fern (RG)	eastern bluebird (RG)	

INTERMITTENT WOODLAND POOL		
Plants	***Vertebrates***	***Vertebrates (cont.)***
featherfoil (T, S2)	four-toed salamander (RG)	spotted turtle (SC, S3)
false hop sedge (R, S2)	Jefferson salamander (SC, S3)	wood turtle (SC, S3)
Invertebrates	marbled salamander (SC, S3)	wood duck (RG, PIF2)
black dash (butterfly) (RG)	blue-spotted salamander (RG, S3)	American black duck (RG, PIF1)
mulberry wing (butterfly) (RG)	wood frog (RG)	northern waterthrush (RG)
springtime physa (snail) (RG)	Blanding's turtle (T, S2S3)	

KETTLE SHRUB POOL		
Plants	***Vertebrates***	***Vertebrates (cont.)***
pale alkali-grass (RG)	blue-spotted salamander (SC, S3)	wood duck (RG, PIF2)
short-awn foxtail (RG)	spotted turtle (SC, S3)	American black duck (RG, PIF1)
spiny coontail (T, S3)	ribbon snake (RG)	
buttonbush dodder (E, S1)	Blanding's turtle (T, S2S3)	

OPEN WATER and CONSTRUCTED POND		
Plants	***Vertebrates (cont.)***	***Vertebrates (cont.)***
spiny coontail (T, S3)	wood turtle (SC, S3)	osprey (SC)
Vertebrates	spotted turtle (SC, S3)	bald eagle (T, S2S3B)
northern cricket frog (E, S1)	American bittern (SC)	
Blanding's turtle (T, S2S3)	great blue heron (RG)	

SPRINGS and SEEPS		
Invertebrates	***Vertebrates***	
Piedmont groundwater amphipod (RG)	northern dusky salamander (RG)	
gray petaltail (dragonfly) (SC, S2)	spring salamander (RG)	
tiger spiketail (dragonfly) (S1)		

PERENNIAL & INTERMITTENT STREAM		
Plants	***Invertebrates (cont.)***	***Vertebrates (cont.)***
winged monkey-flower (R, S3)	*Pisidium adamsi* (fingernail clam) (RG)	slimy sculpin (fish) (RG)
riverweed (T, S2)	brook floater (mussel) (T, S1)	wood turtle (SC, S3)
spiny coontail (T, S3)	***Vertebrates***	northern dusky salamander (RG)
goldenseal (T, S2)	tadpole madtom (fish) (S3)	spring salamander (RG)
Invertebrates	creek chubsucker (fish) (RG)	wood duck (RG, PIF2)
sable clubtail (dragonfly) (S1)	longnose sucker (fish) (S3)	American black duck (RG, PIF1)
arrowhead spiketail (dragonfly) (S2S3)	bridle shiner (fish) (RG)	bank swallow (RG)
mocha emerald (dragonfly) (S2S3)	brook trout (fish) (RG)	great blue heron (RG)
Marstonia decepta (snail) (RG)	mud sunfish (fish) (T, SH)	

RIPARIAN CORRIDOR		
Plants	***Plants (cont.)***	***Vertebrates***
ostrich fern (RG)	goldenseal (T, S2)	wood turtle (SC, S3)
cattail sedge (T, S2)	false-mermaid (RG)	wood duck (RG, PIF2)
Davis' sedge (T, S2)	swamp rose-mallow (RG)	red-shouldered hawk (SC)
winged monkey-flower (R, S3)	***Invertebrates***	American woodcock (RG, PIF1)
river birch (S3)	ostrich fern borer (S1?)	cerulean warbler (SC, PIF1)
small-flowered agrimony (S3)		river otter (RG)

ESTUARINE ROCKY SHORE		
Plants	***Plants (cont.)***	***Vertebrates***
river quillwort (E, S1)	eastern prickly-pear (RG)	map turtle (RG)
estuary beggarticks (R, S3)	***Invertebrates***	American black duck (PIF1)
heartleaf plantain (T, S3)	falcate orange tip (S3S4)	harbor seal (S3)
terrestrial starwort (T, S2S3)	hackberry butterfly (S3S4)	
northern white cedar (RG)		

SUPRATIDAL RAILROAD CAUSEWAY		
Plants	***Plants (cont.)***	***Vertebrates***
Canada lily (RG)	kidneyleaf mud-plantain (T, S3)	spotted turtle (SC, S3)
Frank's sedge (E, S1)	Drummond's rock-cress (E, S2)	wood turtle (SC, S3)
Davis' sedge (T, S2)	green-headed coneflower (RG)	diamondback terrapin (S3)
hair-rush (RG)	slender knotweed (R, S3)	map turtle (RG)
swamp lousewort (T, S2)		

TIDAL TRIBUTARY MOUTH

Plants	***Invertebrates***	***Vertebrates (cont.)***
river quillwort (E, S1)	*Pteronarcys* (stonefly) (RG)	American bittern (SC, S4)
goldenclub (T, S2)	*Pomatiopsis lapidaria* (snail) (RG)	bald eagle (T, S2S3B, S2N)
estuary beggar ticks (R, S3)	***Vertebrates***	osprey (SC, S4B)
smooth bur-marigold (T, S2)	American brook lamprey (S3)	
winged monkey-flower (R, S3)	northern hog sucker (RG)	
lizard's tail (RG)	rainbow smelt (RG)	

INTERTIDAL MARSH

Plants	***Invertebrates***	***Vertebrates (cont.)***
smooth bur-marigold (T, S2)	coastal broad-winged skipper (RG)	king rail (T, S1B, PIF1)
heartleaf plantain (T, S3)	***Vertebrates***	black rail (E, S1B)
estuary beggar ticks (R, S3)	least bittern (T, S3B, S1N)	Virginia rail (RG)
American waterwort (E, S1)	American bittern (SC, S4)	sora (RG)
winged monkey-flower (R, S3)	osprey (SC, S4B)	common moorhen (RG)
swamp rose-mallow (RG)	northern harrier (T, S3B, S3N)	marsh wren (RG)
closed gentian (RG)	bald eagle (T, S2S3B, S2N)	blue-winged teal (RG)

INTERTIDAL MUDFLAT

Plants	***Vertebrates***	***Vertebrates (cont.)***
river quillwort (E, S1)	shortnose sturgeon (E, S1)	ruddy duck (S1)
heartleaf plantain (T, S3)	American brook lamprey (S3)	redhead (RG)
kidneyleaf mud-plantain (S3)	northern hog sucker (RG)	oldsquaw (RG)
Hudson River water-nymph (E, S1)	diamondback terrapin (S3)	red-breasted merganser (RG)
Invertebrates	map turtle (RG)	osprey (SC, S4B)
alewife floater (mussel) (S1S2)	least bittern (T, S3B, S1N)	bald eagle (T, S2S3B, S2N)
yellow lampmussel (mussel) (S3)	American bittern (SC, S4)	
tidewater mucket (mussel) (S1)		

INTERTIDAL SWAMP

Plants		***Vertebrates (cont.)***
goldenclub (T,S2)	swamp lousewort (T, S2)	bald eagle (T, S2S3B, S2N)
small purple fringed orchid (RG)	spring cress (RG)	osprey (SC, S4B)
Plants (cont.)	***Invertebrates***	barred owl (RG)
Sprengel's sedge (RG)	coastal broad-winged skipper (RG)	red-headed woodpecker (SC,S4)
winged monkey-flower (R, S3)	***Vertebrates***	white-eyed vireo (RG)
green dragon (RG)	northern leopard frog (RG)	
vetchling (RG)	wood turtle (SC, S3)	

Appendix B. Explanation of ranks of species of conservation concern listed in Appendix A. Explanations of New York State ranks and New York Natural Heritage Program ranks are from the New York Natural Heritage Program website, updated May 2003.

New York State Ranks

The following categories are defined in regulation 6NYCRR part 193.3 and apply to New York State Environmental Conservation Law section 9-1503.

E **Endangered Species**. Any species which meets one of the following criteria: species with 5 or fewer extant sites or fewer than 1,000 individuals; species restricted to fewer than 4 USGS 7 ½ minute topographical maps; or species listed as endangered by the U.S. Department of the Interior, as enumerated in the Code of Federal Regulations 50 CFR 17.11.

T **Threatened Species**. Any species which meets one of the following criteria: species with 6 to 20 extant sites or 1,000-3,000 individuals; species restricted to not less than 4 or more than 7 USGS 7 ½ minute topographical maps; or species listed as Threatened by the United States Department of the Interior, as enumerated in the Code of Federal Regulations 50 CFR 17.11.

R **Rare Species (plants only)**. Species with 20-35 extant sites or 3,000-5,000 individuals statewide.

SC **Special Concern Species**. Those species which are not yet recognized as endangered or threatened, but for which documented concern exists for their continued welfare in New York. Unlike the first two categories, species of special concern receive no additional legal protection under Environmental Conservation Law section 9-1503.

P **Protected Wildlife**. Wild game, protected wild birds, and endangered species of wildlife, defined in Environmental Conservation Law section 11-0535.

New York Natural Heritage Program Ranks (Statewide)

S1 Critically imperiled in NY State because of extreme rarity (5 or fewer sites or very few remaining individuals) or extremely vulnerable to extirpation from NY State due to biological factors.

S2 Imperiled in NY State because of rarity (6-20 sites or few remaining individuals) or highly vulnerable to extirpation in NY State due to biological factors.

S3 Rare in NY State (usually 21-100 extant sites).

SH Historical. No extant sites known in New York State but it may be rediscovered.

B, N These modifiers indicate when the breeding status of a migratory species is considered separately from individuals passing through or not breeding within New York State. B indicates the breeding status, N indicates the non-breeding status.

? Indicates that a question exists about the species' rank.

Regional Status (Hudson Valley)

RG Hudsonia has compiled lists of native plants and animals that are rare in the Hudson Valley but do not appear on statewide or federal lists of rarities (Kiviat and Stevens 2001). We use ranking criteria similar to those used by the NYNHP, but we apply those criteria to the Hudson Valley below the Troy Dam. Our regional lists are based on the extensive field experience of biologists associated with Hudsonia and communications with other biologists working in the Hudson Valley. These lists are subject to change as we gather more information about species occurrences in the region. In this report, we denote all regional ranks (rare, scarce, declining, vulnerable) with a single code (RG). Species with New York State or New York Natural Heritage Program ranks are presumed to be regionally rare also, but are not assigned an 'RG' rank.

Partners in Flight Priority Species Lists

Based on August 2003 lists for physiographic areas # 17 (Northern Ridge and Valley) and # 9 (Southern New England).

PIF1 High continental priority (Tier IA and IB species)
PIF2 High regional priority (Tier IIA, IIB, and IIC species)
PIF1* Two species were not included in the watch lists for this region; however, they are listed as "High Continental Priority" in PIF's national North American Landbird Conservation Plan (Rich et al. 2004).

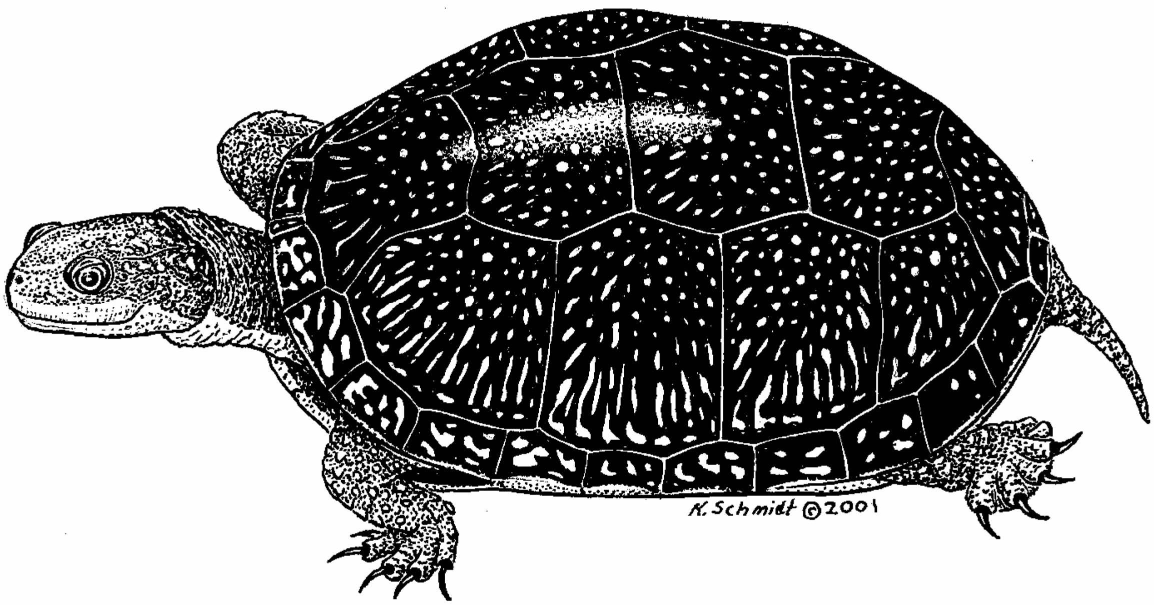
Appendix C. Common and scientific names of plants mentioned in this report. Scientific names follow the nomenclature of Mitchell and Tucker (1997).

Common Name	Scientific Name	Common Name	Scientific Name
agrimony, small flowered	*Agrimonia parviflora*	clover, white sweet-	*Melilotus alba*
alder, speckled	*Alnus incana* spp. *rugosa*	cohosh, blue	*Caulophyllum thalictroides*
Allegheny-vine	*Adlumia fungosa*	columbine, wild	*Aquilegia canadensis*
arrow-arum	*Peltandra virginica*	coneflower, green-headed	*Rudbeckia laciniata*
arrowhead	*Sagittaria*	coontail	*Ceratophyllum*
arrowhead, broadleaf	*Sagittaria latifolia*	coontail, spiny	*Ceratophyllum echinatum*
arrowhead, strapleaf	*Sagittaria subulata*	cottonwood, eastern	*Populus deltoides*
arrowwood, downy	*Viburnum rafinesquianum*	cottonwood, swamp	*Populus heterophylla*
arrowwood, northern	*Viburnum dentatum* v. *lucidum*	cranberry, large	*Vaccinium macrocarpon*
ash, green	*Fraxinus pensylvanica*	cranberry, small	*Vaccinium oxycoccos*
ash, white	*Fraxinus americana*	cress, spring	*Cardamine bulbosa*
aster	*Aster*	crowfoot, small-flowered	*Ranunculus micranthus*
aster, purple stem	*Aster puniceus*	crowfoot, yellow water	*Ranunculus flabellaris*
aster, stiff-leaved	*Aster linariifolius*	cut-grass, rice	*Leersia oryzoides*
aster, white wood	*Aster divaricatus*	devil's-bit	*Chamaelirium luteum*
azalea, swamp	*Rhododendron viscosum*	dittany	*Cunila origanoides*
baneberry, red	*Actaea spicata* ssp. *rubra*	dodder, buttonbush	*Cuscuta cephalanthi*
barberry, Japanese	*Berberis vulgaris*	dodder, field	*Cuscuta pentagona*
bearberry	*Arctostaphylos uva-ursi*	dodder, southern	*Cuscuta obtusiflora* v. *glandulosa*
beech, American	*Fagus grandifolia*	dogwood, flowering	*Cornus florida*
beggar-ticks	*Bidens*	dogwood, gray	*Cornus foemina* ssp. *racemosa*
begger-ticks, estuary	*Bidens bidentoides*		
birch, black	*Betula lenta*	dogwood, silky	*Cornus amomum*
birch, gray	*Betula populifolia*	dragon, green	*Arisaema dracontium*
birch, river	*Betula nigra*	duckweed	*Lemna*
birch, swamp	*Betula pumila*	elm	*Ulmus*
bittersweet, Oriental	*Celastrus orbiculata*	elm, American	*Ulmus americana*
blazing-star, northern	*Liatris scariosa* v. *novae-angliae*	false-mermaid	*Floerkea proserpinacoides*
blueberry, highbush	*Vaccinium corymbosum*	featherfoil	*Hottonia inflata*
blueberry, lowbush	*Vaccinium angustifolium*	fern, Christmas	*Polystichum acrostichoides*
blueberry, pale	*Vaccinium pallidum*	fern, cinnamon	*Osmunda cinnamomea*
buckthorn, alder-leaf	*Rhamnus alnifolia*	fern, marsh	*Thelypteris palustris*
buckthorn, common	*Rhamnus cathartica*	fern, ostrich	*Matteuccia struthiopteris*
bulrush	*Scirpus*	fern, royal	*Osmunda regalis*
bulrush, drooping	*Scirpus pendulus*	fern, sensitive	*Onoclea sensibilis*
bur-marigold, smooth	*Bidens laevis*	fern, Virginia chain	*Woodwardia virginica*
bur-reed	*Sparganium*	fern, walking	*Asplenium rhizophyllum*
butterflyweed	*Asclepias tuberosa*	flag, blue	*Iris versicolor*
buttonbush	*Cephalanthus occidentalis*	forget-me-not, small	*Myosotis laxa*
canary-grass, reed	*Phalaris arundinacea*	gentian, closed	*Gentiana andrewsii*
cattail	*Typha*	gentian, fringed	*Gentianopsis crinita*
cattail, narrow-leaf	*Typha angustifolia*	gentian, stiff	*Gentiana quinquefolia*
cedar, eastern red	*Juniperus virginiana*	gerardia, slender	*Agalinis tenuifolia*
cedar, northern white	*Thuja occidentalis*	ginseng, American	*Panax quinquefolius*
cherry, black	*Prunus serotina*	globeflower, spreading	*Trollius laxus*
chickweed, field	*Cerastium arvense*	goat's-rue	*Tephrosia virginiana*
cinquefoil	*Potentilla*	goldenclub	*Orontium aquaticum*
cinquefoil, dwarf	*Potentilla canadensis*	goldenrod, bog	*Solidago uliginosa*
cinquefoil, shrubby	*Potentilla fruticosa*	goldenrod, Canada	*Solidago canadensis*
cinquefoil, three-toothed	*Potentilla tridentata*	goldenrod, downy	*Solidago puberula*
clearweed	*Pilea pumila*	goldenrod, gray	*Solidago nemoralis*
cliffbrake, purple	*Pellaea atropurpurea*	goldenrod, lance-leaved	*Euthamia graminifolia*
cliffbrake, smooth	*Pellaea glabella*	goldenrod, late	*Solidago gigantea*

Common Name	Scientific Name	Common Name	Scientific Name
goldenrod, spreading	*Solidago patula*	(moss)	*Helodium paludosum*
goldenrod, stiff-leaf	*Solidago rigida*	moss, peat	*Sphagnum*
goldenrod, tall hairy	*Solidago rugosa*	mountain-mint	*Pycnanthemum*
goldenseal	*Hydrastis canadensis*	mountain-mint, blunt	*Pycnanthemum muticum*
gooseberry, northern	*Ribes hirtellum*	mountain-mint, Torrey's	*Pycnanthemum torrei*
grama, side-oats	*Bouteloua curtipendula*	mud-plantain, kidneyleaf	*Heteranthera reniformis*
grass-of-Parnassus	*Parnassia glauca*	mustard, garlic	*Alliaria petiolata*
grass, blue-joint	*Calamagrostis canadensis*	nettle, false	*Boehmeria cylindrica*
grass, Indian	*Sorghastrum nutans*	oak, black	*Quercus velutina*
grass, little-bluestem	*Schizachyrium scoparium*	oak, chestnut	*Quercus montana*
grass, pale alkali-	*Torreyochloa pallida* v. *pallida*	oak, pin	*Quercus palustris*
grass, panic	*Panicum*	oak, red	*Quercus rubra*
grass, poverty	*Danthonia spicata*	oak, scarlet	*Quercus coccinea*
ground-cherry, downy	*Physalis pubescens* v. *integrifolia*	oak, scrub	*Quercus ilicifolia*
hackberry	*Celtis occidentalis*	oak, swamp white	*Quercus bicolor*
hairgrass	*Deschampsia flexuosa*	oak, white	*Quercus alba*
hair-rush	*Bulbostylis capillaris*	olive, autumn	*Elaeagnus umbellata*
harlequin, yellow	*Corydalis flavula*	orangeweed	*Hypericum gentianoides*
hellebore, false	*Veratrum viride*	orchid, ragged fringed	*Platanthera lacera*
hemlock, eastern	*Tsuga canadensis*	orchid, small purple fringed	*Platanthera psycodes*
herb-Robert	*Geranium robertianum*	paintbrush, scarlet Indian	*Castilleja coccinea*
hickory	*Carya*	pickerelweed	*Pontederia cordata*
hickory, mockernut	*Carya tomentosa*	pine, pitch	*Pinus rigida*
hickory, pignut	*Carya glabra*	pine, red	*Pinus resinosa*
hickory, shagbark	*Carya ovata*	pine, white	*Pinus strobus*
honeysuckle, Bell's	*Lonicera* x *bella*	pinweed, slender	*Lechea tenuifolia*
horsetail, field	*Equisetum arvense*	pitcher-plant	*Sarracenia purpurea*
hog-peanut	*Amphicarpaea bracteata*	plantain, heartleaf	*Plantago cordata*
huckleberry, black	*Gaylussacia baccata*	pod-grass	*Scheuchzeria palustris*
huckleberry, dwarf	*Gaylussacia dumosa*	poison-ivy	*Toxicodendron radicans*
joe-pye-weed, spotted	*Eupatorium maculatum*	pondweed	*Potamogeton crispus*
knapweed, spotted	*Centaurea maculosa*	prickly-pear, eastern	*Opuntia humifusa*
knotweed, Japanese	*Polygonum cuspidatum*	pussytoes, field	*Antennaria neglecta*
knotweed, slender	*Polygonum tenue*	quillwort, river	*Isoetes riparia*
ladyslipper, pink	*Cypripedium acaule*	ragwort, golden	*Senecio aureus*
lady's-tresses, nodding	*Spiranthes cernua*	rattlebox	*Crotalaria sagittalis*
lady's-tresses, slender	*Spiranthes lacera*	red cedar, eastern	*Juniperus virginiana*
laurel, mountain	*Kalmia latifolia*	reed, common	*Phragmites australis*
leatherleaf	*Chamaedaphne calyculata*	riverweed	*Podostemum ceratophyllum*
leatherwood	*Dirca palustris*	rock-cress, Drummond's	*Arabis drummondii*
lily, Canada	*Lilium canadense*	rock-cress, hairy	*Arabis hirsuta* v. *pycnocarpa*
liverwort	*Riccia fluitans*	rose-mallow, swamp	*Hibiscus moscheutos*
lizard's-tail	*Saururus cernuus*	rose, multiflora	*Rosa multiflora*
lobelia, spiked	*Lobelia spicata*	rose, swamp	*Rosa palustris*
locust, black	*Robinia pseudo-acacia*	rush, Dudley's	*Juncus dudleyi*
loosestrife, purple	*Lythrum salicaria*	rush, soft	*Juncus effusus*
loosestrife, winged	*Lythrum alatum*	rush, toad	*Juncus bufonius*
lousewort, swamp	*Pedicularis lanceolata*	sandwort, rock	*Minuartia michauxii*
maple, red	*Acer rubrum*	sedge	*Carex*
maple, silver	*Acer saccharinum*	sedge, Bicknell's	*Carex bicknellii*
maple, sugar	*Acer saccharum*	sedge, bristly-stalked	*Carex leptalea*
meadow-rue, tall	*Thalictrum pubescens*	sedge, bronze	*Carex aenea*
milkweed, blunt-leaf	*Asclepias amplexicaulis*	sedge, Bush's	*Carex bushii*
milkweed, green	*Asclepias viridiflora*	sedge, cattail	*Carex typhina*
milkweed, whorled	*Asclepias verticillata*	sedge, clustered	*Carex cumulata*
milkwort, whorled	*Polygala verticillata*	sedge, Davis'	*Carex davisii*
mint	*Mentha*	sedge, Emmons'	*Carex albicans* v. *emmonsii*
monkey-flower, winged	*Mimulus alatus*	sedge, false hop	*Carex lupuliformis*

Common Name	Scientific Name	Common Name	Scientific Name
sedge, fescue	*Carex festucacea*	whitlow-grass, Carolina	*Draba reptans*
sedge, fox	*Carex vulpinoidea*	wildflax, yellow	*Linum sulcatum*
sedge, Frank's	*Carex frankii*	willow	*Salix*
sedge, handsome	*Carex formosa*	willow, autumn	*Salix serissima*
sedge, hop	*Carex lupulina*	willow, beaked	*Salix bebbiana*
sedge, interior	*Carex interior*	willow, pussy	*Salix discolor*
sedge, lakeside	*Carex lacustris*	willow, silky	*Salix sericea*
sedge, meadow	*Carex granularis*	winterberry	*Ilex verticillata*
sedge, Pennsylvania	*Carex pensylvanica*	witch-hazel	*Hamamelis virginiana*
sedge, porcupine	*Carex hystericina*		
sedge, prairie	*Carex prairea*		
sedge, reflexed	*Carex retroflexa*		
sedge, Schweinitz's	*Carex schweinitzii*		
sedge, Sprengel's	*Carex sprengelii*		
sedge, sterile	*Carex sterilis*		
sedge, tussock	*Carex stricta*		
Sedge, white tinge	*Carex albicans* v. *albicans*		
sedge, woolly-fruit	*Carex lasiocarpa*		
sedge, yellow	*Carex flava*		
selfheal	*Prunella vulgaris*		
shadbush	*Amelanchier*		
sheep-laurel	*Kalmia angustifolia*		
silver-rod	*Solidago bicolor*		
skullcap, small	*Scutellaria parvula* v. *parvula*		
skunk-cabbage	*Symplocarpus foetidus*		
spatterdock	*Nuphar advena*		
spicebush	*Lindera benzoin*		
spikemoss, rock	*Selaginella rupestris*		
spikerush, olivaceous	*Eleocharis flavescens*		
spikerush, ovate	*Eleocharis obtusa* v. *ovata*		
spleenwort, ebony	*Asplenium platyneuron*		
spleenwort, maidenhair	*Asplenium trichomanes*		
spleenwort, mountain	*Asplenium montanum*		
spleenwort, silvery	*Deparia acrostichoides*		
spruce	*Picea*		
St. Johnswort, shrubby	*Hypericum prolificum*		
starwort, terrestrial	*Callitriche terrestris*		
sumac, poison	*Toxicodendron vernix*		
sundew, roundleaf	*Drosera rotundifolia*		
sweetflag	*Acorus*		
sweet-gum	*Liquidambar styraciflua*		
sycamore	*Platanus occidentalis*		
tearthumb, arrow-leaf	*Polygonum sagittatum*		
touch-me-not, spotted	*Impatiens capensis*		
tree-of-heaven	*Ailanthus altissima*		
tree, tulip	*Liriodendron tulipifera*		
tripe, rock (lichen)	*Umbilicaria*		
twayblade, large	*Liparis lilifolia*		
valerian, bog	*Valeriana uliginosa*		
vetchling	*Lathyrus palustris*		
viburnum, maple-leaf	*Viburnum acerifolium*		
violet	*Viola*		
wall-rue	*Asplenium ruta-muraria*		
water-chestnut	*Trapa natans*		
watermilfoil, Eurasian	*Myriophyllum spicatum*		
water-nymph, Hudson River	*Najas guadalupensis* v. *muenscheri*		
waterwort, American	*Elatine americana*		
water-willow	*Decodon verticillata*		

BLANDING'S TURTLE HABITATS IN SOUTHERN DUTCHESS COUNTY



Report to the
Marilyn Milton Simpson Charitable Trusts
and New York State Department of Environmental Conservation
Hudson River Estuary Program

By Tanessa Hartwig, Gretchen Stevens,
John Sullivan, and Erik Kiviat

March 2009

Environmental Research and Education
Science for Conservation

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EXECUTIVE SUMMARY

Hudsonia Ltd. identified and mapped known and potential habitats for the Blanding's turtle, a New York State Threatened Species, in six towns in southern Dutchess County. This work was funded with grants from the Marilyn Milton Simpson Charitable Trusts and the New York State Environmental Protection Fund through the Hudson River Estuary Program of the New York State Department of Environmental Conservation (DEC), and with programmatic support from the Educational Foundation of America.

Blanding's turtles are rare throughout their range (centered on the Great Lakes region in the United States and Canada), and occur only in isolated populations in the Northeast. Isolated populations and their habitats are important to a species' viability, providing genetic diversity and potential refugia as climate changes. Blanding's turtles use a diverse array of wetland and upland habitats in a large area, and provide an important ecological link between wetlands and the surrounding uplands. We consider the Blanding's turtle an "umbrella species," in that protecting land for the Blanding's turtle also protects habitats for many other rare and common wildlife species. Rare species in general, and in particular those that use large and diverse areas, act as "canaries in a coal mine" that indicate the quality of the environment for humans. The glacial outwash deposits of Blanding's turtle landscapes, in particular, are important groundwater aquifers in Dutchess County, and the organic soils of the core (regularly used) wetlands store carbon and may be important in mitigating climate change.

Through map analysis, aerial photograph interpretation, and field observations, we mapped locations and configurations of potential Blanding's turtle habitat complexes throughout Beekman, Fishkill, LaGrange, Poughkeepsie, Union Vale, and Wappinger. Altogether, we identified 173 potential core wetlands and 3926 associated (irregularly used) wetlands as well as many potential nesting areas. The "Blanding's Turtle Zone," which contains a 2000 meter-wide area around each core wetland, is continuous in the six towns. In this report, we describe potential habitats in each town and discuss conservation measures that can help protect these habitats and the turtle populations, including landscape-level measures for protecting habitat complexes, on-site mitigation at construction sites, and backyard practices for residences and businesses. We also recommend procedures for review of development proposals within Blanding's turtle habitat zones and discuss a short list of the highest quality habitat areas that we think deserve special attention.

We produced a large-format habitat map for each town; those maps and this report are intended as tools for conservation planning and decision-making. The maps provide town agencies, the DEC, and others information on areas that are potentially of concern, and those that are not of concern, for Blanding's turtle conservation. The maps can help landowners and developers choose sites for development that will be the least detrimental to Blanding's turtles, and thus incur less time and expense in the environmental review process. The habitat information may be particularly useful in the State Environmental Quality Review (SEQR) process, which balances the needs of wild species with socioeconomic factors in making land use decisions. The maps and report can help practitioners identify areas of greatest ecological significance, develop conservation goals, and establish conservation policies and practices that will help to protect Blanding's turtles while serving the social, cultural, and economic needs of the human community.

INTRODUCTION

Purpose of this Study

The Blanding's turtle (*Emys [Emydoidea] blandingii*) is a Threatened species in New York State and is of conservation concern throughout most of its range in the United States and Canada. Although Threatened animal species are provided some legal protection by New York State, turtle populations in Dutchess County continue to be harmed by damage to their habitats and to the turtles themselves. The Blanding's turtle is a mobile species that uses a variety of wetland and upland habitats in a large area to meet its foraging, basking, nesting, drought refuge, and overwintering needs, and it provides an important ecological link between wetlands and the surrounding uplands. Traveling between these habitats increases the turtles' vulnerability to human-related hazards such as busy roads, intensely developed areas, agricultural or mowing equipment, and collection by humans.

There are approximately 12 known Blanding's turtle populations in the county, but incidental data indicate the presence of other undocumented populations. Local populations of Blanding's turtles are frequently harmed when their habitats are not identified in advance of land development or road-building. In fact, habitat loss is considered a major threat to the Blanding's turtle and appears to be a key factor in population declines throughout its range (Kofron and Schreiber 1985; Congdon and Gibbons 1996; Kiviat 1997; Piepgras and Lang 2000; Standing et al. 2000; Blanding's Turtle Recovery Team 2003). Hudsonia biologists have created a map of potential Blanding's turtle habitat in six towns in southern Dutchess County—Beekman, Fishkill, LaGrange, Poughkeepsie, Union Vale, and Wappinger—using map analysis, aerial photograph interpretation, and field observations. We hope these maps will help local, county, and state agencies, as well as landowners, developers, and residents, incorporate Blanding's turtle habitat protection into their planning and conservation efforts. This project was

funded with grants from the Marilyn Milton Simpson Charitable Trusts and the New York State Environmental Protection Fund through the Hudson River Estuary Program of the New York State DEC, and with programmatic support from the Educational Foundation of America.

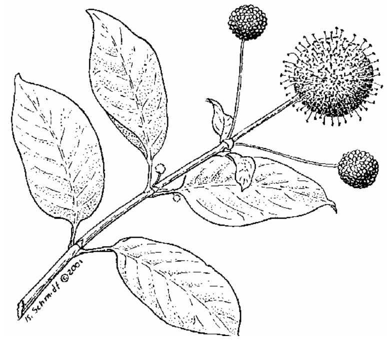
Introduction to the Blanding's Turtle

Blanding's turtle (*Emys blandingii*)

Natural History and Conservation Threats The Blanding's turtle is a medium-sized turtle with a dark, helmet-shaped carapace (shell) up to 25 cm (10 in) long and a bright, solid yellow chin and throat. It is listed as Threatened or Endangered in most of the states and provinces within its range and has been extirpated from several states (Hartwig 2004). The Blanding's turtle range is centered on the Great Lakes region in North America (Ernst et al. 1994), but isolated populations exist in New York, eastern Massachusetts, southern New Hampshire, southern Maine, and southern Nova Scotia (Ernst et al. 1994). In New York, the turtles occur in Dutchess County, Saratoga County (one known population), the eastern Ontario Lake Plain (one known population), Cattaraugus County (western New York), and the St. Lawrence River Valley (A. Breisch, *pers. comm.*).

Blanding's turtles use a variety of special habitats, many of which are damaged by human activities in our rapidly suburbanizing region. Blanding's turtles in Dutchess County use habitat complexes composed of "core wetlands," "associated wetlands," upland nesting areas, and other upland areas used for basking or refuge from unfavorable water temperatures.

We define "core wetlands" for the Blanding's turtle as the regularly used wetlands typically occupied during the winter, spring, early summer, and fall. They are deep enough to normally remain unfrozen at their bottoms and contain abundant aquatic vegetation. Core wetlands function as overwintering, foraging, and thermoregulation habitat. In Dutchess County, core wetlands are typically, but not always, kettle shrub pools. A kettle shrub pool is a seasonally or permanently flooded shrub-dominated pool located in a glacial kettle—a depression formed by the melting of a stranded block of glacial ice within glacial outwash materials. Soils such as Hoosic gravelly loam, derived from glacial outwash, are usually adjacent to or near the pools. Buttonbush, an aquatic shrub, is often the dominant plant, but other shrubs such as highbush blueberry and swamp azalea may also be abundant and buttonbush may be absent. Often, a shrub thicket is entirely or partly surrounded by an open water moat. The kettle shrub pool is usually ringed with mature hardwood trees and may have some small trees such as red maple or green ash in the pool interior, but typically lacks a forest canopy.



Buttonbush (*Cephalanthus occidentalis*)

Kettle shrub pool

Kettle shrub pools characteristically have no stream inlet or outlet, although some may have a small, intermittent inlet or outlet. In some cases the inlet or outlet is a ditch or channelized stream. Kettle shrub pools appear to be primarily fed by groundwater. Standing water is normally present in winter and spring but may disappear by late summer, or remain only in isolated puddles. Surface sediments in kettle shrub pools are normally organic although mineral sediments may be present due to surrounding land use. Hudsonia has found two state-listed rare plants (spiny coontail and buttonbush dodder) and three regionally-rare plants (the moss *Helodium paludosum*, short-awn foxtail, and pale alkali-grass) in kettle shrub pools in Dutchess County. Kettle shrub pools are also used by spotted turtle, wood duck, mallard, American black duck, and many other wildlife species.

We use the term "associated wetland" to describe other wetland habitats that are used by Blanding's turtles from late winter through late summer. Associated wetlands contain some standing water for at least part of the growing season, and include deep ponds or lakes, acidic bogs, marshes, forested wetlands, slow-moving streams and riparian wetlands, ditches, and woodland pools. They apparently provide food during times of scarcity in core wetlands or peak productivity of food resources in associated wetlands, reduced competition, refuge from undesirable water temperatures or water depths, shelter and rehydration for females during nesting migrations, and shelter for other traveling turtles. Certain associated wetlands may also supply year-round habitat for juvenile Blanding's turtles, which apparently prefer shallower, more densely vegetated areas than the adults (Hartwig 2004).

Blanding's turtles engage in two different types of movement: annual home range movement and long distance travels (Kiviat 1997; Hartwig 2004). Annual home range movement includes movements that occur regularly on a day-to-day or seasonal basis, such as travel within and between wetlands and nesting migrations by females. These movements are related to seasonal selection of habitats—such as finding suitable water temperatures or depths, foraging areas, nesting sites, and overwintering sites, seeking mates, and possibly seeking refuge from competition—and can include long distance movements, particularly by females during nesting season. Movements exceeding 1000 m (3300 ft) were common in a Massachusetts population (Butler 1997), and have also been observed in Dutchess County (Hudsonia Ltd., unpublished data).

Long distance journeys other than nesting migrations occur on a less-than-annual basis, are typically greater than 1000 m (3300 ft), and appear to be associated with individual turtles' habitat requirements or preferences. Long distance travel enables Blanding's turtles to select alternate habitats within a landscape as habitats or social dynamics change. While long distance movements by females are common during the nesting season, both male and female Blanding's turtles travel long distances unrelated to nesting activity (Table 1). These turtles establish residency in new wetlands (Rowe and Moll 1991; Power et al. 1994; Butler 1995; Hall and Cuthbert 2000; Hudsonia Ltd., unpublished data), mate (Joyal et al. 2000), or eventually return to their previous home ranges (Rowe and Moll 1991). It should be noted that, although we have distinguished between these two movement patterns for ease of discussion, a population of turtles typically exhibits a continuum of movement patterns from normal annual movement to long distance movements.

Table 1. Long distance movements by Blanding's turtles not related to nesting

Location	Distance (m)	Sex	Date	Reference
Illinois	895 – 1400	Female, male	Late May to July	Rowe and Moll 1991*
Illinois	722 – 1000	Female, male	--	Rubin et al. 2001
Maine	1330	Female	June or July	Joyal 2000
Massachusetts	1000 – 1600	Female, male	--	Butler 1995
Minnesota	2200	Male	July	Hall and Cuthbert 2000*
Minnesota, Weaver Dunes	5632	Male	Mid-May	Lang 2001*
Nebraska, Sandhills	~3200	Male	Late April to early June	Farrar 2003*
New York, Dutchess County	2600	Female	--	Hudsonia Ltd., unpublished data
Nova Scotia	5000 – 11,500	Male	--	Power et al. 1994
Wisconsin	900, 1240	Male	July	Wilder 2003*

*Data for these turtles were available for only one year, or the duration of the study was unknown; so we cannot be certain these were not annual movements.

Blanding's turtles in Dutchess County usually spend the winter in core wetlands below the ice in 30–60 cm (12-24 in) of water (Hudsonia Ltd., unpublished data). They survive the cold temperatures and low oxygen levels by greatly reducing their metabolic activity—to the point that, even though turtles are air-breathing animals, they receive the oxygen they need to survive through their digestive system. In late March or April, the turtles become more active and venture out to find food and warmer water temperatures or basking areas. Often, they leave their overwintering wetland to take advantage of abundant food or warm water in associated wetlands, such as woodland pools or marshes. Basking areas tend to be plentiful in Blanding's turtle habitat, but their composition varies. Blanding's turtles bask on logs, tussocks, woody hummocks, muskrat lodges, and even partially submerged in neuston—the floating layer of living and dead plant material on the water's surface (Kiviat 1993; Ernst et al. 1994). Blanding's turtles may also spend time on land, often under leaf litter or vegetation, to escape cool waters (Rowe and Moll 1991; Joyal et al. 2001; Lang 2001). They are sometimes found resting in upland forested areas over 100 m (328 ft) from the nearest wetland (Lang 2001).

By late summer when surface water is shallow or absent in many wetlands, many turtles move to deeper water bodies, which serve as "drought refuges." Drought refuges are usually springfed ponds, lakes, or deep water wetlands and can be 250-900 m (820-2950 ft) from the nearest core wetland (Kiviat 1997). Throughout the warm months Blanding's turtles also move among a variety of wetlands searching for food (Ross and Anderson 1990). During very warm periods, the turtles often estivate, becoming inactive for an extended period of time. Dutchess County Blanding's turtles have estivated in saturated muck in wetlands, in a small isolated pool in a stream bed, under shrubs in dry wetlands, and under shrubs, leaves, or dead branches in upland areas (Hudsonia Ltd., unpublished data).

The females are particularly vulnerable to travel-related hazards from late May through early July, when they travel long distances to find suitable nesting sites. In Dutchess County, females have been documented traveling less than 20 m (66 ft) to more than 1500 m (0.9 mi; Hudsonia Ltd., unpublished data). Throughout their range, Blanding's turtles have traveled from 100 m (328 ft) to 2900 m (1.8 mi) to lay their eggs (Linck et al. 1989; Ross and Anderson 1990; Rowe and Moll 1991; Herman et al. 1994; Butler 1997; Kiviat 1997; Joyal et al. 2000; Piepgras and Lang 2000; McNeil 2002; Farrar 2003). They often make use of upland areas, wetlands, or other water bodies to rest after laying their eggs and during their journey from or back to their core wetland. Nesting females rest in dense vegetation, brush piles, or leaf litter on land, intermittent woodland pools, wooded swamps, shallow marshes, deep marshes, ornamental ponds, and open water areas before and after nesting (Eckler and Breisch 1988; Rowe and Moll 1991; Kiviat 1997; Sajwaj et al. 1998; Standing et al. 1999; Congdon et al. 2000; Piepgras and Lang 2000; McNeil 2002; Kiviat et al. 2000).

The females take great care in choosing a nest site, often spending a week or longer in their search. Nest sites are usually in open, well-drained areas such as agricultural fields, lawns, and gravelly road shoulders (Petokas 1986; Kiviat 1997; Linck et al. 1989; Standing et al. 1999; Lang 2001; Blanding's Turtle Recovery Team 2003; Lang 2003). Nests may also be in small pockets of soil on rock outcrops, in ornamental plantings in house yards, in powerline rights-of-way, and in cut-and-fill soils of construction sites. Once she has found an acceptable site, the female spends many hours (3 – 7 or more) digging a hole, laying her clutch of 8 to 16 eggs, and then covering it—all under the shelter of night (Hudsonia Ltd., unpublished data). She then returns to the water. Blanding's turtles do not exhibit parental care for the eggs or the hatchlings.

Many eggs and hatchlings are lost to predators, including skunks, raccoons, foxes, and opossums (Power 1989; Mitchell and Klemens 2000). These animals thrive in suburban areas, adding to the pressures on the young turtles (Mitchell and Klemens 2000). After their first or second year, however, the turtles are larger and develop a hard shell which protects them from most predators. Barring interference from human-related hazards such as habitat loss and encounters with vehicles, most Blanding's turtles that survive to two years live a long, productive life, reaching reproductive maturity at about 15 years and breeding until they die, at about 70 years. The oldest known Blanding's turtle was 80.

Status of the Blanding's Turtle in Dutchess County

During the past 20 years, Blanding's turtle populations have been documented at a dozen locations in the western three-fourths of Dutchess County. There are a few dozen additional locations where single turtles have been found (mostly crossing roads) or where the turtles formerly occurred but have not been confirmed recently. Some of these locations are near potential core habitat and may well support populations. In other cases, potential core habitat exists between known populations. Thus there may be local populations of Blanding's turtle that have not been documented. Local populations tend to occur like beads on a necklace, following the county's gravelly outwash plains along stream corridors. In some areas, there are a few, well-defined "beads" in clearly-identifiable habitat complexes, whereas in other areas (such as a large part of the Town of Hyde Park), there appears to be a very widespread and sparse population occupying numerous small wetlands not all of which are on outwash.

This information may suggest that Dutchess has plenty of Blanding's turtles, and perhaps we should not be so concerned about their future. Most of the documented populations, however, appear to be small, comprising perhaps 5-15 adults. Furthermore, all the known populations, and virtually all (if not all) the potential habitat we have identified on the maps, are under a high level of threat from land use change, road mortality, and other human-caused problems. Even the populations on a nature reserve and a park are not fully protected, because the turtles range off the protected areas to nest or forage. An examination of the wetlands within a portion of the area we mapped indicated that perhaps half of the core wetland habitat had been destroyed (e.g. filled) historically (E. Kiviat, pers. obs.). And although we know that Dutchess Blanding's turtles lay eggs which produce hatchlings, we do not know how many young turtles recruit to the adult segments of the populations and how effectively adults lost to old age, road mortality, or collecting are replaced.

Current scientific knowledge of turtle population dynamics shows clearly that turtles depend on a very high rate of survival of adults from year to year to maintain a population. Eggs and perhaps hatchlings are relatively "cheap" and populations can sustain high rates of loss from predation on nests, but a small amount of additional adult mortality can cause populations to decline. This unnatural loss of adults can occur when they are hit by cars or other machinery, taken into captivity, or trapped in "pitfalls" such as swimming pools or storm drains. Although improving the survival of eggs and young is important, reducing the loss of adults is even more important to maintaining viable populations.

Legal Protection

The Blanding's turtle is listed as a Threatened species in New York State. A Threatened species is any that meets one of the following criteria: species with 6 to 20 extant sites or 1000-3000 individuals; species restricted to fewer than four USGS 7 ½ minute map quadrangles; or species listed as Threatened by the United States Department of the Interior, as enumerated in the Code of Federal Regulations 50 CFR 17.11 (Regulation 6NYCRR part 193.3; New York State Environmental Conservation Law Section 9-1503). According to New York State

Department of Environmental Conservation Regulation Part 182, no person may, except under permit from the DEC,

> "take, import, transport, possess or sell any endangered or threatened species of fish or wildlife, or any hide or part thereof, or sell or possess with intent to sell any article made in whole or in part from the skin, hide or other part of such species unless such species, hide or part thereof was in the possession of such person on or before the date such species was designated as endangered or threatened by the Secretary of the Interior or the department, and such possession must be evidenced by such legal proof as may be required by the commissioner."

"Take" is defined broadly, and includes harassing, harming, killing, trapping, capturing, and collecting (Percival et al. 1996).

In addition, the New York State Freshwater Wetlands Act (Article 24 of the Environmental Conservation Law) classifies any wetland that is resident habitat for a Threatened or Endangered species as a Class 1 wetland (part 664.5), bringing it under New York State jurisdiction as a regulated wetland whether or not it meets the standard minimum size requirement of 5 ha (12.4 acres). The Freshwater Wetlands Act prohibits filling, draining, clearcutting, construction, and pesticide application in any regulated wetland without a permit.

STUDY AREA

The study area for this project consists of six towns (Beekman, Fishkill, LaGrange, Poughkeepsie, Union Vale, and Wappinger) and two cities (Poughkeepsie and Beacon) in southern Dutchess County (Figure 1).

Throughout most of Dutchess County, the bedrock is covered by glacial till deposits, mineral material that was carried by glaciers and deposited directly as the glaciers advanced or retreated. Till is made up of a mixture of particle sizes, from clay, silt and sand to cobbles and large boulders. There are also areas of

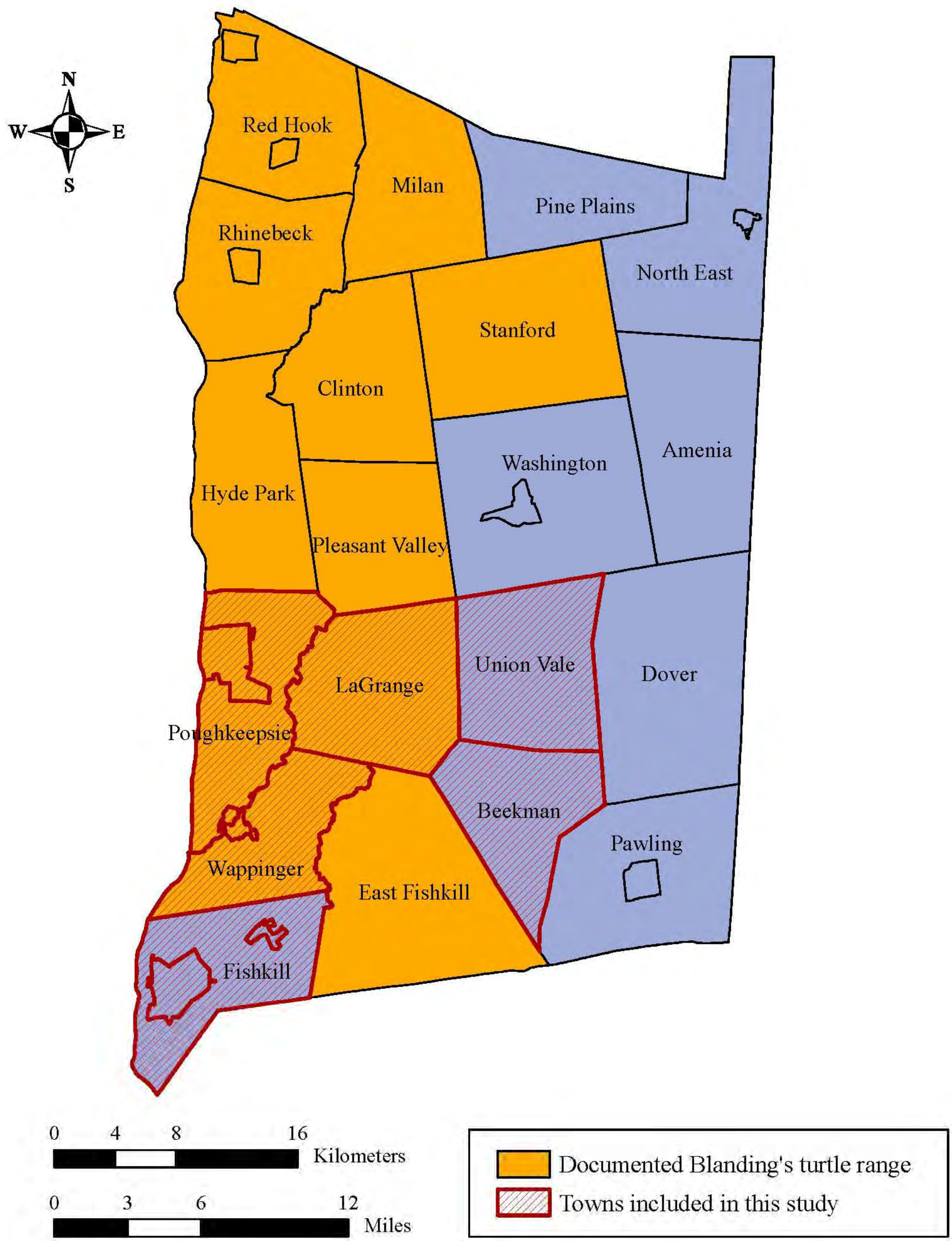


Figure 1. Towns in Dutchess County, NY with documented Blanding's turtle populations, and towns included in our six-town study of potential Blanding's turtle habitats. Hudsonia Ltd., 2009.

glacial outwash—gravelly and sandy material deposited by glacial meltwater streams. Outwash plains contain kettle shrub pools, the typical core habitat of the Blanding's turtle, and soils formed in outwash material provide prime nesting areas for the turtles.

Below we briefly describe the landscape and other characteristics of each town in the study area. Population figures and land areas given below are from the 2000 federal census (obtained from www.dutchessny.gov).

Beekman Much of the Town of Beekman is in rural residential and agricultural uses, but large areas in the eastern and southern parts of town are hilly, forested, and sparsely settled. The town still retains large tracts of undeveloped land. Most residential and commercial development and agricultural land uses occur in the lowlands, which generally parallel the Fishkill Creek through the center of the town in a northeast-southwest trend, and in the low hills in the northwest part of town. The town encompasses 78 km^2 (30 mi^2). In 2000 it had a population of 13,655 (including a correctional institution with a population of 2303) and an overall population density of 175 people per km^2 (455 people per mi^2). Beekman contains 180 km (112 mi) of roads—2.3 km of road per km^2 (1.4 mi/mi^2).

Most of the town is drained by Fishkill Creek, a major tributary of the Hudson River. A small section in the northeast part of town drains into the Tenmile River, a tributary of the Housatonic River, and a small part in the south section drains to the Croton River watershed. Elevations range from 95 m (310 ft) in the farmland south of Sylvan Lake to 407 m (1336 ft) at the southern tip of the town, south of Pepper Hill Rd. The eastern and southern parts of town are hilly, and about half of this area is made up of large land parcels owned by New York State, the National Park Service, and private landowners. The northwestern section of town is characterized by lowlands and low hills (elevations up to 260 m [850 ft]).

The eastern and southern hills are part of the Hudson Highlands physiographic region and include Depot Hill. Fisher et al. (1970) described the bedrock of the Hudson Highlands as composed of various types of gneiss and the soils are mostly derived from glacial till (Faber 2002). A narrow band of quartzite conglomerate and gneiss with amphibolite and calcsilicate rock separates the granitic gneiss from the floodplain material of the Fishkill Creek valley. The bedrock geology in the valley consists of limestone, dolostone, and shale, which influence the chemistry of the valley soils. Phyllite, schist, and meta-graywacke dominate the hills in the north part of town. Surficial geology in this area is primarily glacial till (Cadwell et al. 1989). Approximately 672 ha (1661 acres) of outwash soils exist along the various streams that drain the town, including Gardner Hollow Brook, Whaley Lake Stream, Fishkill Creek, Frog Hollow Brook, and Whortlekill Creek (calculated from Faber 2002).

Fishkill & Beacon The Town of Fishkill contains the Village of Fishkill and surrounds the City of Beacon. The northern part of town is highly suburbanized, but the southern hills are mostly undeveloped; large tracts are owned by New York State, Scenic Hudson Land Trust, and the Fresh Air Fund (an organization that operates camps for inner-city children). The Town of Fishkill encompasses 69 km^2 (27 mi^2). In 2000 it had a population of 17,521 and a population density of 254 people per km^2 (650 people per mi^2). The Village of Fishkill encompasses 2.3 km^2 (0.9 mi^2) and had a population of 1735. The town and village contain 206 km (128 mi) of roads—3 km per km^2 (1.9 mi/mi^2).

Most of Fishkill is drained by the Fishkill Creek. A few areas along the western border drain directly into the Hudson River. Elevations in Fishkill range from

0 m on the Hudson River shore to 491 m (1610 ft) on South Beacon Mountain. The southern hills are part of the Hudson Highlands, and include South Beacon Mountain, Sugarloaf Mountain, and Beacon Hill. Fishkill's northern half is characterized by less rugged terrain and, in less developed areas, extensive wetlands. The bedrock in Fishkill is composed mostly of graywacke, shale, argillite, and chert, with some limestone and dolostone in the eastern part of town (Fisher et al. 1970), and surficial material is mostly glacial till (Cadwell et al. 1989). Some glacial lake deposits occur in the southwest end of town in the lowlands north of the Hudson Highlands. Soils formed in glacial outwash are scattered along the Fishkill Creek valley and the valleys of its tributaries, including Clove Creek and Bloomer Brook. A pocket of outwash soils also exists in the northwest corner of town. Fishkill contains 716 ha (1770 acres) of outwash-derived soils (calculated from Faber 2002).

The City of Beacon is intensively developed, but contains undeveloped land along most of its perimeter. The Fishkill Correctional facility owns a large area of undeveloped land in the northeast corner, including some working farmland. The City of Beacon encompasses 12.4 km^2 (4.8 mi^2), and in 2000 had a population of 14,810 and a population density of 1194 people per km^2 (3085 people per mi^2).

The City of Beacon drains into the Hudson River directly and through the Fishkill Creek. The southeast section is in the foothills of the Hudson Highlands and the topography is quite steep. The rest of the city is characterized by small hills and lowlands. Bedrock geology is highly variable, and includes graywacke, shale, argillite, chert, and granitic gneiss (Fisher et al. 1970). Surficial materials are derived mostly from glacial till, but there are outwash deposits near the mouth of the Fishkill Creek and in the north part of the city (Cadwell et al. 1989). Outwash-derived soils comprise 275 ha (680 acres) in Beacon (calculated from Faber 2002).

LaGrange The Town of LaGrange is characterized by suburban and rural residential uses, commercial development, and agricultural land uses. It encompasses 103 km^2 (40 mi^2), and in 2000 had a population of 14,928 and a population density of 145 people per km^2 (373 people per mi^2). LaGrange contains 277 km (172 mi) of roads—2.7 km per km^2 (1.7 mi/mi^2). New York State owns 239 ha (590 acres) of relatively undeveloped land (James Baird State Park) in the center of town, and there are several other fairly large parcels of undeveloped land owned by private individuals.

A little over half of the town drains into the Fishkill Creek, almost entirely through Sprout Creek. The western half of the town drains into Wappinger Creek, another major tributary of the Hudson River. LaGrange's topography is much less rugged than that of Beekman and Fishkill; elevations range from 34 m (110 ft) along the Wappinger Creek to 247 m (810 ft) in the hilly northeastern part of the town. LaGrange's bedrock geology is varied. According to Fisher et al. (1970), much of the bedrock is composed of shale, argillite, and siltstone along the Sprout Creek and Fly Sprout (a tributary of Sprout Creek) corridors. The section of town east of the Fishkill Creek is mostly underlain by schist with minor meta-graywacke lenses. Other bedrock in the town includes amphibolite, limestone, conglomerate, and quartzite. Surficial material is mostly composed of glacial till, but there are outwash deposits along Jackson Creek, Sprout Creek, Fly Sprout, and Wappinger Creek and its tributaries (Cadwell et al. 1989). LaGrange contains 1433 ha (3540 acres) of outwash-derived soils (calculated from Faber 2002). Shale outcrops are common throughout the town.

Poughkeepsie The Town of Poughkeepsie is intensively developed, but still retains a few large areas of undeveloped land owned by various entities, including Vassar College, Dutchess Golf Club, IBM, Dutchess County, private landowners, and private development corporations. The Town of Poughkeepsie encompasses 75 km^2 (29 mi^2), and in 2000 had a population of 41,800 and a population density of 560 people per km^2 (1441 people per mi^2). The town contains part of the Village of Wappingers Falls and partially envelops the City of Poughkeepsie. Wappingers Falls straddles the Towns of Poughkeepsie and Wappinger. The part of the Village of Wappingers Falls that is within the Town of Poughkeepsie encompasses 1 km^2 (0.4 mi^2) and has a population of 977 people. The Town of Poughkeepsie contains 325.5 km (202.3 mi) of roads; 4.4 km per km^2 (7.1 mi/mi^2).

The eastern third of the town drains into the Wappinger Creek. The rest of the town drains directly into the Hudson River through smaller tributaries, including the Fall Kill and Casper Creek. Poughkeepsie's terrain is gently rolling, with elevations ranging from 0 m (along the Hudson River) to 146 m (480 ft) in the northeast part of town. According to Fisher et al. (1970), the bedrock is mostly graywacke and shale in the northwest and southeast parts of town, with shale, argillite, and siltstone running southwest to northeast through the center of town. A prong of limestone, dolostone, and shale extends from just north of Casper Creek up to the southeast end of the City of Poughkeepsie. Surficial material in the Town of Poughkeepsie is mostly glacial till, with outwash deposits occurring along Wappinger Creek, Casper Creek, the Fall Kill, in central Poughkeepsie about 800 m [2624 ft] east of the Hudson River shore, and north of an unnamed Hudson River tributary in the northwest corner of town (Cadwell et al. 1989). In the southern part of town, north of the Wappinger Creek corridor, soils are influenced by underlying limestone (Faber 2002). Poughkeepsie contains 1126 ha (2782 acres) of outwash-derived soils (calculated from Faber 2002).

The City of Poughkeepsie is very intensively developed, although it contains two pockets of undeveloped land in the northeast and southeast corners, owned by the city and Vassar College, respectively. The City of Poughkeepsie encompasses 13.2 km^2 (5.1 mi^2), and in 2000 had a population of 29,871 and a population density of 2263 people per km^2 (5857 people per mi^2).

The City of Poughkeepsie drains into the Hudson River directly and through the Fallkill and Casper Creeks. Topography is nearly level, except for two small hills in the northeast and southeast corners. Bedrock geology is dominated by graywacke and shale and surficial materials are mostly glacial till (Fisher et al. 1970, Cadwell et al. 1989). Outwash-derived soils occur in the southeast corner of the city and comprise 116 ha (287 acres; calculated from Faber 2002).

Union Vale The Town of Union Vale has a rural character, and is composed of low-density residential areas and farmland concentrated in the valleys and low elevation hills. Union Vale encompasses 97.6 km^2 (37.7 mi^2) and in 2000 had a population of 4546 and a population density of 47 people per km^2 (121 people per mi^2). The town contains 137 km (85 mi) of roads—1.4 km per km^2 (0.9 mi per mi^2).

Most of Union Vale drains into the Fishkill Creek. A small section of the town's eastern side drains into the Tenmile River. Union Vale is quite rugged, with elevations ranging from 122 m (400 ft) along the Sprout Creek in the northwestern part of town to 424 m (1390 ft) at Clove Mountain; approximately half of the town is more than 245 m (800 ft) above sea level. There are extensive wetlands associated with the Clove Valley in the central part of town. Bedrock geology is composed mostly of phyllite, schist, and meta-graywacke, with limestone, dolostone, and shale along the Fishkill and Clove Valley Creek (the same as Clove Brook) corridors (Fisher et al. 1970). Surficial geology in Union Vale is primarily glacial till, with numerous bedrock outcrops (Cadwell et al. 1989). Glacial outwash occurs mostly along the Clove Valley Creek, Sprout Creek, Jackson Creek, and Willow Brook. Clove and Fishkill valley soils contain limestone from the bedrock (Faber 2002). Union Vale contains 311 ha (678 acres) of outwash soils (calculated from Faber 2002).

Wappinger Much of the Town of Wappinger is intensively developed, but some active farmland remains. The few remaining large forests are mostly owned by development corporations. New York State owns 115 ha (285 acres; Stony Kill Farm) of partially undeveloped land in southern Wappinger. Wappinger encompasses 69 km^2 (27 mi^2), and in 2000 had a population of 26,274 and a population density of 381 people per km^2 (973 people per mi^2). The Town of Wappinger encompasses part of the Village of Wappingers Falls, which straddles the towns of Wappinger and Poughkeepsie. Within Wappinger, Wappingers Falls encompasses 2.1 km^2 (0.8 mi^2) and had a population of 3952. The Town of Wappinger contains 254 km (158 mi) of roads—3.7 km per km^2 (2.3 mi/mi^2).

Approximately one-third of the town drains into the Sprout Creek, a tributary of the Fishkill Creek. Most of the rest of the town drains into Wappinger Creek, except for a small section along the Hudson River that drains directly into the river through a small tributary. Wappinger's topography is gently rolling, ranging from 0 m along the Hudson River to 165 m (540 ft) in the southeast part of town. According to Fisher et al. (1970), most of Wappinger's bedrock is composed of graywacke and shale, particularly the western and northern parts of town. Other bedrock includes schist, amphibolite, phyllite, argillite, and siltstone. Surficial materials are mostly glacial till, but there are outwash deposits along the Sprout Creek and the Wappinger Creek and its tributaries (Cadwell et al. 1989). Soils formed in outwash comprise 550 ha (1359 acres) of the Town of Wappinger (calculated from Faber 2002).

METHODS

Hudsonia employs a combination of laboratory and field methods in the habitat identification and mapping process, including map and aerial photo analysis to predict the occurrence of habitats; field observations to verify, correct, and refine those predictions; and digital preparation of the final habitat map.

Hudsonia biologists have studied Blanding's turtles by means of live-trapping and radiotelemetry for 13 years at the Arlington High School and James Baird State Park in the Town of LaGrange, as well as conducting short-term trapping or telemetry surveys at a number of other sites in the county, and we have analyzed vegetation, soils, and water levels in Blanding's turtle habitats. These studies have given us an understanding of habitat use and habitat requirements that allows us to predict the likelihood of Blanding's turtles occurring in complexes of wetlands where turtle surveys have not been conducted (Hartwig and Kiviat 2007, Kiviat 1993 and 1997, Kiviat and Stevens 2003, Kiviat et al. 2000 and 2004). Blanding's turtles are in some respects rather flexible in their abilities to use habitats, whereas in other ways they have stringent habitat requirements. The conceptualization of the core wetland – associated habitat system captures the habitat affinities of this species in a way that is useful for environmental planning and conservation. Below, we describe each phase in this project.

Gathering Information and Predicting Habitats

Over many years of habitat studies in the Hudson Valley, Hudsonia has found that, with careful analysis of existing maps and aerial photographs, we can accurately predict the occurrence of many habitats. We then use combinations of map features (e.g. soil texture and drainage, topography) and aerial photo signatures to predict the locations and extent of ecologically significant habitats—in this case core and associated Blanding's turtle habitats. In addition to published and unpublished information from our own archives and from other biologists who have worked in the area, citizen reports of Blanding's turtle sightings, and data provided by the New York Natural Heritage Program, we used the following resources for this project:

- *1:40,000 scale color infrared aerial photograph prints* from the National Aerial Photography Program series taken in the spring of 1994 and 1995, obtained from the U.S. Geological Survey. Viewed in pairs, stereoscopic aerial photograph prints provide a three-dimensional view of the landscape and are extremely useful for identifying vegetation cover types, wetland and upland habitats, streams, and cultural landscape features. For interpretation of aerial photograph prints, we used a Luminos Photo stereoscope, model PS-4a.
- For onscreen mapping, we used *high resolution (1 pixel = 7.5 inches [19 cm]) true color digital orthophotos* taken in spring 2000 and obtained from the Dutchess County Office of Real Property Tax and *panchromatic digital orthophotos (1 pixel = 24 inches [61 cm])* taken in spring 2004, obtained from the NYS GIS Clearinghouse (http://www.nysgis.state.ny.us). These digital aerial photos were used for on-screen digitizing of habitat boundaries.
- *U.S. Geological Survey topographic maps* (Hopewell Junction, Oscawana Lake, Pleasant Valley, Poughkeepsie, Poughquag, Verbank, Wappingers Falls, and West Point 7.5 minute quadrangles). Topographic maps contain information such as elevation, contours, surface water features, and significant cultural features. Elevation contours on topographic maps can be used to predict the occurrence of such habitats as intermittent woodland pools, other wetlands, intermittent streams, and seeps.
- *Soil Survey of Dutchess County, New York* (Faber 2002). Specific attributes of soils, such as depth, drainage, texture, and pH, can tell us a great deal about the types of habitats that are likely to occur in an area. Poorly and very poorly drained soils, for example, often indicate the location of wetland habitats, such as swamps, marshes, and wet meadows. Outwash

soils, such as Hoosic and Knickerbocker soils, can be an indication of Blanding's turtle habitat.

- *GIS data layers.* GIS enables us to overlay multiple data layers on the computer screen, greatly enhancing the efficiency and accuracy with which we can predict a variety of habitats that are closely linked to local topography, geology, hydrology, and soil conditions. GIS also enables us to create detailed, spatially accurate maps. We obtained most of our GIS data layers from the Dutchess County Environmental Management Council (EMC), the Dutchess County/Cornell Cooperative Extension GIS laboratory, and the New York State GIS Clearinghouse (http://www.nysgis.state.ny.us), including coverages for roads, streams, soils, bedrock geology, surficial geology, and wetlands (National Wetlands Inventory data prepared by the U.S. Fish and Wildlife Service). We also obtained 10 ft contour data from the Dutchess Land Conservancy, and tax parcels from the Dutchess County Real Property Tax office. We re-projected all GIS layers into New York State Plane NAD 1983.

Preliminary Habitat Mapping & Field Verification

Hudsonia biologists Tanessa Hartwig and John Sullivan prepared a preliminary habitat map based on analysis of maps, aerial photos, and published data. Our general approach was to first identify potential core habitat; then identify wetlands and nesting areas associated with the core habitats, and finally map these areas. We digitized the predicted habitats onscreen over the 2000 orthophoto images using ArcView 3.2 mapping software (Environmental Systems Research Institute, Inc.). Hartwig, Gretchen Stevens, or Sullivan then visited as many of the mapped core wetlands as possible to verify their presence and extent.

Preliminary mapping At the preliminary mapping stage, we used the following criteria to remotely identify potential core wetland habitat for Blanding's turtles using aerial prints viewed stereoscopically and GIS map layers:

- below 245 m (800 ft) in elevation
- outwash-derived soils (Hoosic or Knickerbocker) within 1 km (0.6 mi)
- shrubby appearance
- open canopy
- moats, pools, or deep water
- tree fringe surrounding wetland
- no significant inlet or outlet
- proximate to other wetlands; part of a complex of wetlands

Because core wetlands can be quite variable, we did not require that a wetland meet all of these criteria to be considered for preliminary mapping. Based on Hudsonia biologists' experience, certain qualities (e.g. shrubby vegetation structure and a moat or pool areas) were given greater consideration than other qualities. For instance, if a wetland near outwash soils appeared to be shrubby and contained a discernible moat, but lacked a tree fringe, we would map it as potential core habitat.

Before going into the field, we contacted many individual property owners for permission to access their land. We identified landowners using tax parcel data obtained from the Dutchess County Real Property Tax office. In addition to conducting field work on private land, we also viewed habitats from public roads, from other public properties, and from adjacent lands.

Field methods We viewed as many mapped habitats as possible in the field to verify their potential as core habitats. We also looked for certain qualities that could not be assessed remotely. Following are characteristics that indicated core Blanding's turtle habitat in the field (Kiviat 1993 and 1997, Hartwig and Kiviat 2007):

- shrubby wetlands, particularly wetlands containing buttonbush
- deep organic sediments
- open canopy or canopy cover less than 50%
- no flowing water; preferably no inlet or outlet with significant flow
- abundant neuston (living or dead material floating on the surface of the wetland), particularly duckweeds (*Lemna minor*) and floating liverworts (*Riccia fluitans* and *Ricciocarpus natans*)
- tree fringe surrounding wetland
- water ≥ 30 cm (11.8 in) deep in spring and early summer
- open water, moats, or moat-like areas

As in the preliminary mapping, we used these characteristics as guidelines, rather than requirements for individual wetlands. Therefore, a wetland that was dominated by purple loosestrife—a plant that is intermediate between an herb and a shrub—but had most of the other characteristics would still be mapped as potential core habitat. We also used our knowledge of Blanding's turtle occurrence in Dutchess County wetlands to determine potential core habitats, depending partially on a wetland's overall structure.

Due to access limitations (e.g. unwilling landowners), not all core habitats were field checked. Ultimately we visited 144 of the 173 potential core habitat units that we mapped. We expect that areas of the habitat map that were field checked are generally more accurate than areas we did not visit in the field. However, as we viewed more wetlands in the field, we were able to extrapolate our findings to determine the potential of wetlands we were unable to gain access to.

Mapping Once a potential core habitat was verified in the field, Hartwig and Sullivan digitized the information in ArcView 3.2 and ArcMap 9.2 software (Environmental Systems Research Institute, Inc.). We then identified and mapped all wetlands within a 1 km (0.6 mi) radius from the perimeter of each core wetland; these are the "associated" wetlands that may be used by the turtles in spring, summer, and fall. Inasmuch as we were unable to field check many of the associated wetlands, we have not assessed the probability that Blanding's use a particular wetland. Some of these wetlands are highly suitable for Blanding's turtle use and others may be unsuitable. In certain towns, we found wetland types that are rare in the region, and marked these on the large-format wall maps. In addition, we identified and mapped areas of open fields or disturbed lands larger than 25 m (82 ft) wide as potential nesting habitat for the turtles. It is important to understand, however, that Blanding's turtles have been known to nest in any disturbed area within 2.9 km (1.8 mi) of their habitat complex. This includes gardens, dirt piles, and yards. We only mapped those areas with greater potential for conservation, so that agencies and landowners can direct their conservation efforts and resources accordingly.

We delimited 200 m (660 ft), 1000 m (3300 ft) and 2000 m (6600 ft) radius zones around the perimeter of each core habitat to illustrate the Blanding's turtle Priority Zone, Conservation Zone, and Area of Concern, respectively (Figure 2). These zones are based on Hudsonia's experience with Blanding's turtles in Dutchess County and on a review of Blanding's turtle habitat use in other areas (Kiviat 1993; Kiviat 1997; Hartwig 2004; also see natural history section of this report). Each zone represents an area that Blanding's turtles use in different ways, and with variable frequency, and requires attention from the perspective of Blanding's turtle conservation. Blanding's turtle zones were delimited on a coarse scale. Therefore, the conservation zones may include areas not likely to support Blanding's turtles, such as areas with pavement or buildings, elevations greater than 245 m (800 ft), and intensively developed areas. However, it should be noted that Blanding's turtles may also occasionally be found traveling in these areas. Width of zones begins at the wetland boundary of the core wetland(s), not in the center of the wetland.

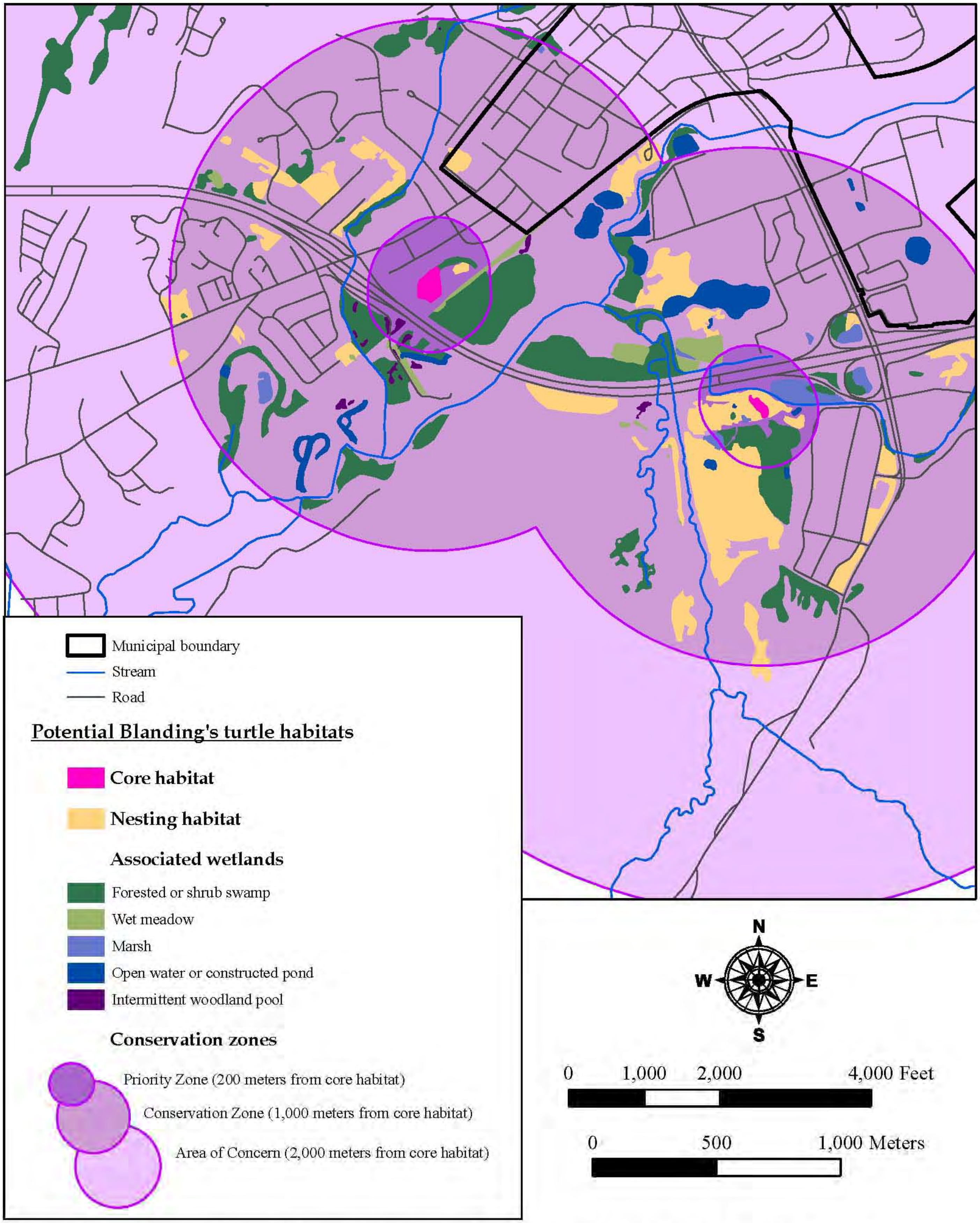


Figure 2. Sample area of Blanding's turtle habitat map, depicting potential core wetlands, nesting habitat, and associated wetlands, as well as zones important for Blanding's turtle conservation. Hudsonia Ltd., 2009.

Below is a description of each zone:

- The 200 m **Priority Zone** is the area immediately surrounding the core wetland. This upland area is often used by the turtles to bask or to escape cool or warm waters; the turtles may stay here for a week or longer at a time (Hartwig 2004) during the warmer months of the year (April through October). Nesting areas may also occur in this zone.

- The 1000 m **Conservation Zone** is the area that encompasses the wetlands that the turtles use regularly on a seasonal basis, most of the nesting areas, and most of the travel corridors. One can expect turtles regularly in this zone throughout the active season (April through October).

- The 2000 m **Area of Concern** encompasses the Priority Zone and the Conservation Zone, and also includes the landscape within which the Blanding's turtle travels to explore new wetlands, and sometimes to nest. One can expect a few turtles from a particular core wetland in this zone each year.

RESULTS

Within the study area, we identified 173 core wetlands and 3926 associated wetlands. The "**Blanding's Turtle Zone**," which includes the entire contiguous area encompassed by all of the Areas of Concern, extends from the northern and eastern portion of Poughkeepsie through LaGrange to the western quarter of Union Vale, south to northwest Beekman, through Wappinger and the north half of Fishkill, and then west to the Hudson River (Figure 3). Most of LaGrange and Wappinger are within this region of potential Blanding's turtle occurrence.

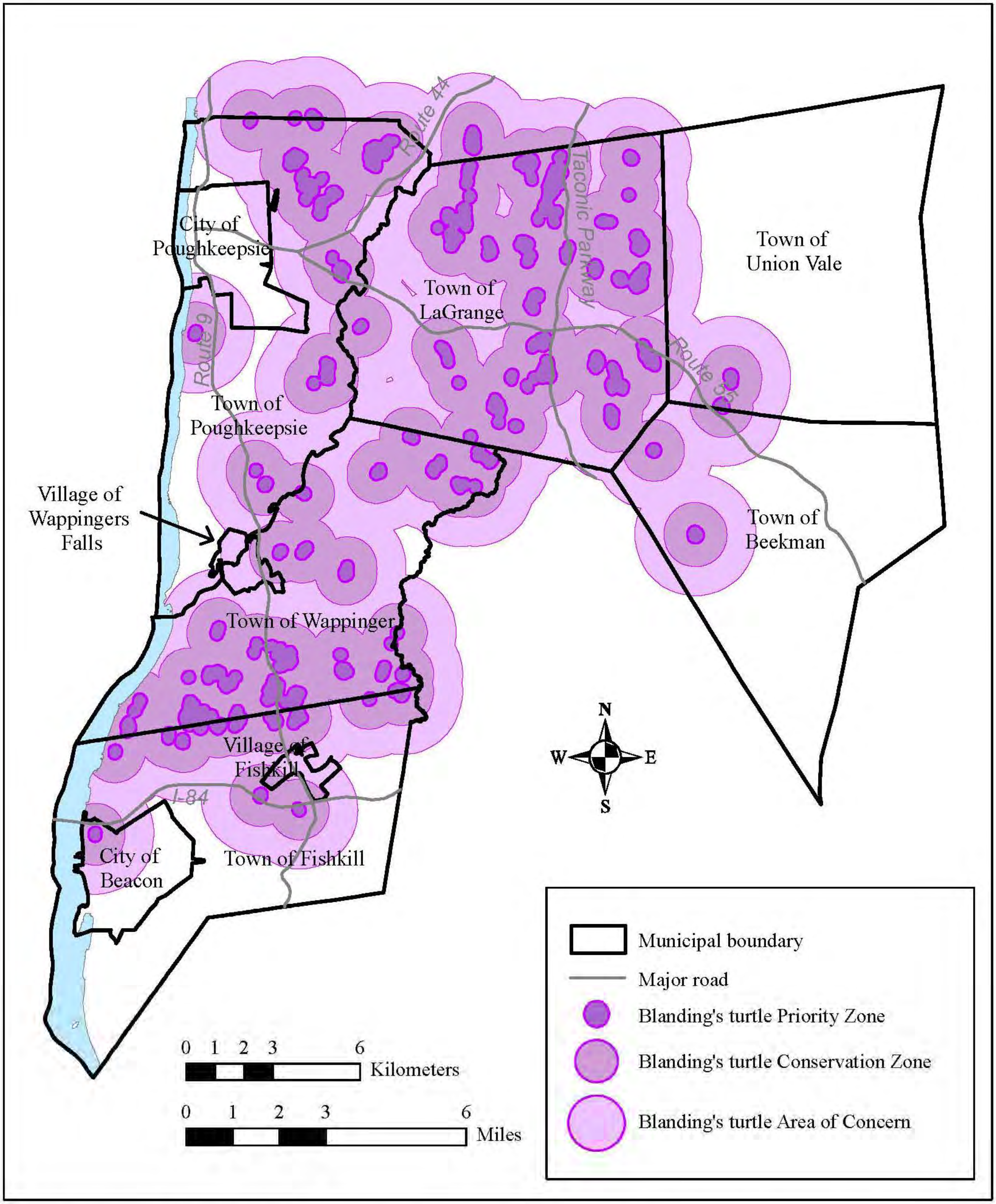


Figure 3. Blanding's turtle Priority Zones (within 200 meters of core habitat), Conservation Zones (within 1,000 m of core habitat), and Areas of Concern (within 2,000 m of core habitat) in six towns in southern Dutchess County, NY. Hudsonia Ltd., 2009.

Common associated wetlands were: constructed ponds, hardwood & shrub swamps (deciduous forested and shrub swamps), intermittent woodland pools (small ephemeral pools in forested settings, well-known to support large numbers of amphibians and other wildlife), marshes (inundated wetlands dominated by herbaceous vegetation), open water areas (naturally formed ponds, lakes, and large pools lacking emergent vegetation), and wet meadows (wetlands dominated by herbaceous vegetation and lacking standing water most of the growing season). Although wet meadows can be important for other fauna and flora, they are not often used by adult Blanding's turtles; we do not know if they are habitat for juvenile Blanding's turtles. Whether or not they are used by the turtles now, these wetlands may become suitable habitat in the future. All associated wetlands, and core wetlands, need to be assessed on a site-specific basis for their potential importance to Blanding's turtles. See Kiviat and Stevens (2001), Stevens and Broadbent (2002), and Tabak and Stevens (2008) for detailed descriptions of wetland habitats in the region. Below is a summary of our findings for each town.

Beekman The northwestern section of the Town of Beekman, characterized by lowlands and low hills (elevations up to 262 m [860 ft]), contains a few potential Blanding's turtle habitat complexes (Figure 4). We identified two potential core wetlands, one just east of Sylvan Lake and one in the northwest corner of town, just north of Whortlekill Creek and south of Clapp Hill Road. In addition, a Blanding's turtle Conservation Zone associated with core habitat in Union Vale overlaps the northwest corner of Beekman. Within the town, we mapped 130 associated wetlands near the core habitats in Beekman, including 31 constructed ponds (several of which are rather large and may serve as good drought refuges), 5 open water habitats, 11 intermittent woodland pools, 4 marshes, and 22 wet meadows. Hardwood & shrub swamps were the most

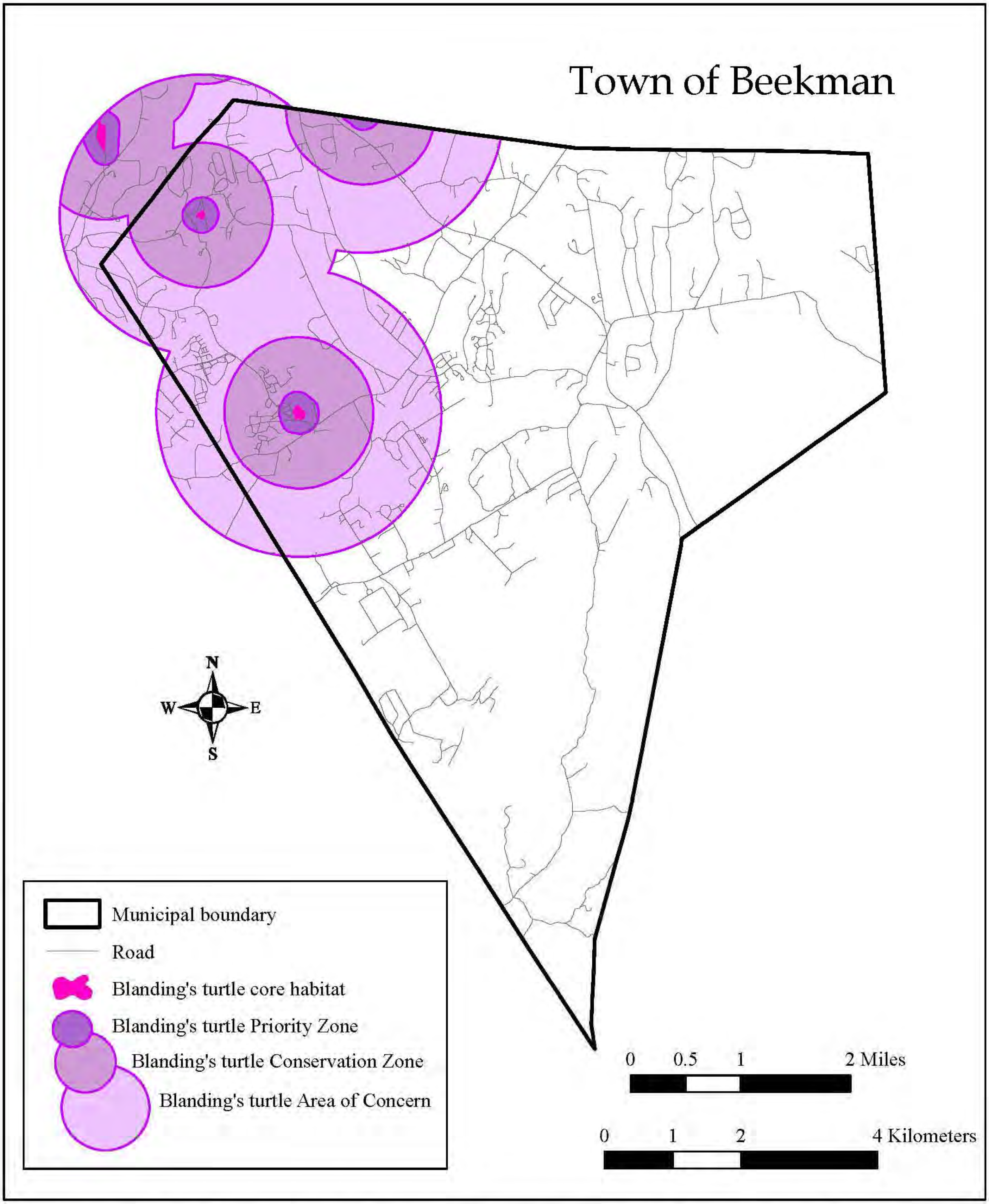


Figure 4. Blanding's turtle potential core habitat, Priority Zones (within 200 meters of core habitat), Conservation Zones (within 1,000 m of core habitat), and Areas of Concern (within 2,000 m of core habitat) in the Town of Beekman, Dutchess County, NY. Hudsonia Ltd., 2009.

common wetland or water body; we mapped 57 swamps in the Conservation Zones.

Land uses within the Conservation Zones include medium-density residential development, agricultural fields, orchards, and forested areas. There are a few areas of high-density residential development, particularly around Sylvan Lake. NYS Rt 55, a heavy-duty highway, intersects one of the Conservation Zones. In addition, there are several medium-duty roads within the Conservation Zones: Beekman Rd, Clapp Hill Rd, Green Haven Rd, and Sylvan Lake Rd. Clapp Hill Rd and Sylvan Lake Rd pass within 20 m (66 ft) of potential core wetlands. We found no potential Blanding's turtle habitat in the eastern and southern parts of town, which are characterized by high hills.

Fishkill & Beacon Most of Fishkill's potential Blanding's turtle habitat is concentrated along the northern border (Figure 5), where wetlands are more numerous and the terrain less rugged than in the south. There are also two potential core wetlands in the lowlands south of the Village of Fishkill—just north and south of Interstate Rt 84—and one potential habitat complex in central Fishkill about 500 m (1640 ft) from the Hudson River—just south of I-84. We identified 16 core wetlands and 304 associated wetlands in Fishkill; the latter comprised 1 calcareous (calcium-rich) wet meadow, 54 constructed ponds, 10 open water areas, 145 hardwood & shrub swamps, 1 conifer swamp, 29 intermittent woodland pools, 22 marshes, 36 wet meadows, 2 tidal marshes, and 4 tidal swamps. To date there are no reports of Blanding's turtles using tidal wetlands, but they have been reported in riparian habitats.

Land uses within the Conservation Zones include: intensive and moderate residential and commercial development, golf courses, agricultural fields, and forested land. Within the Conservation Zones, 300 ha (742 acres) are owned by the Scenic Hudson Land Trust and by the New York State DEC. Several heavy-

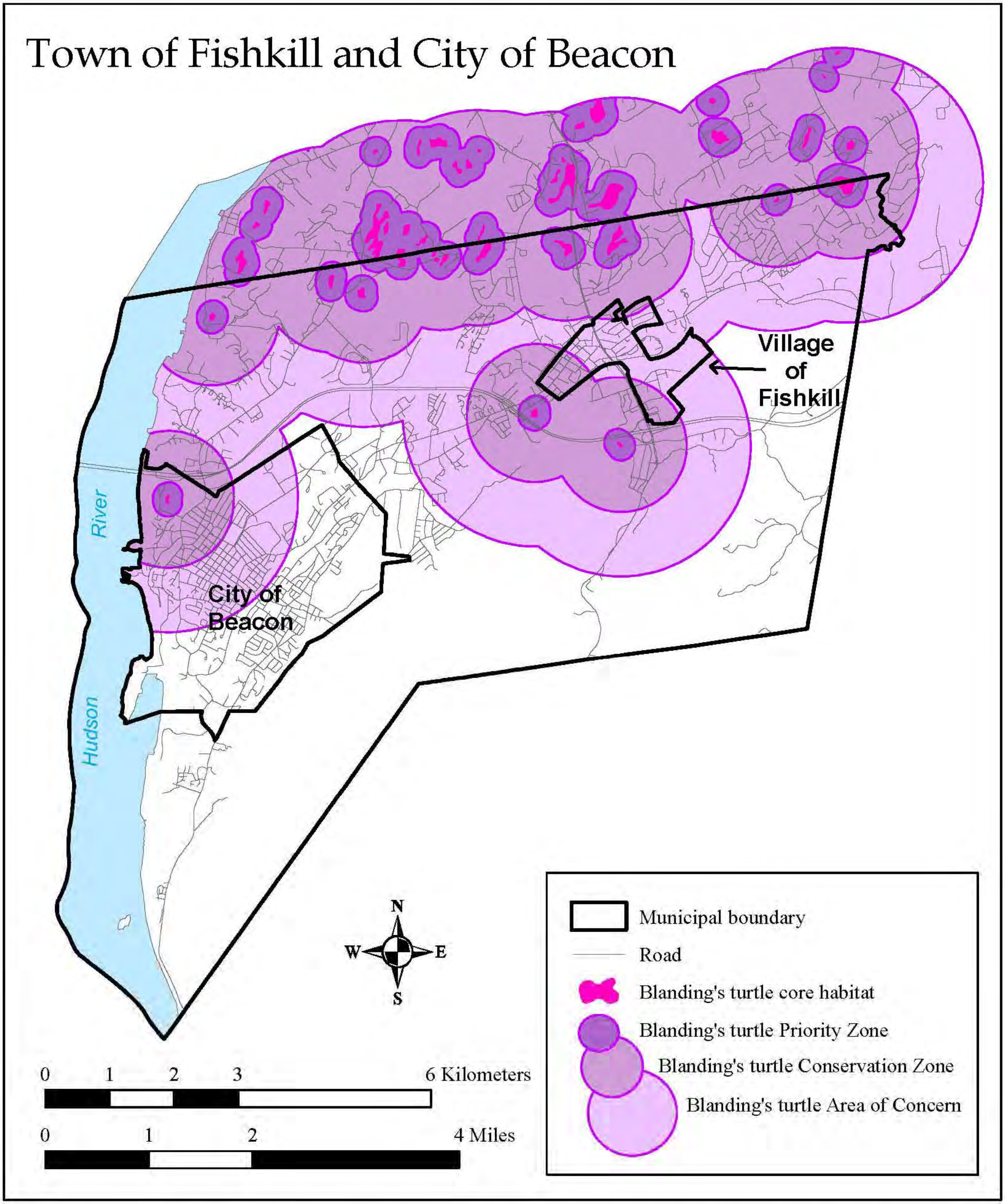


Figure 5. Blanding's turtle potential core habitat, Priority Zones (within 200 meters of core habitat), Conservation Zones (within 1,000 m of core habitat), and Areas of Concern (within 2,000 m of core habitat) in the Town of Fishkill and City of Beacon, Dutchess County, NY. Hudsonia Ltd., 2009.

duty roads pass through the Conservation Zones, including NYS Rts 9, 9D, 52, and 82, and I-84. Medium-duty roads include Baxtertown Rd and Osborne Hill Rd. Several Conservation Zones contain high-density developed areas, including portions of the City of Beacon and the Village of Fishkill, and hence many roads. In fact, one potential core habitat is almost completely surrounded, up to its shoreline, by residential housing. Baxtertown Rd, NYS 9, NYS 9D, and I-84 all pass within 50 m (164 ft) of potential core habitats. No potential Blanding's turtle habitat was found in the southern part of the town.

The City of Beacon contained one potential Blanding's turtle core wetland in its northwest part (Figure 5). We mapped 8 associated wetlands in Beacon, including 1 constructed pond, 1 hardwood & shrub swamp, 2 tidal marshes, and 4 tidal swamps. Land uses within the Conservation Zone include high-density residential areas, forested land, and a golf course. Heavy-duty roads include I-84 and NYS 9D. Many light-duty residential roads are within the Conservation Zone.

LaGrange We found potential Blanding's turtle habitat throughout the Town of LaGrange (Figure 6). We mapped 69 potential and known core habitats and 1560 associated wetlands, which included 9 calcareous wet meadows, 3 conifer swamps, 298 constructed ponds, 39 open water habitats, 755 hardwood & shrub swamps, 2 mixed forest swamps (forested wetland containing a mix of deciduous and conifer species), 117 intermittent woodland pools, 70 marshes, and 264 wet meadows. We also mapped 3 kettle shrub pools which, in these particular cases, we consider associated habitat but not core habitat. We made this decision based on ongoing long-term studies at Hudsonia; it takes many years of study to confirm that turtles aren't using a kettle shrub pool as core habitat. Kettle shrub pools are, however, rare in the region, and often support

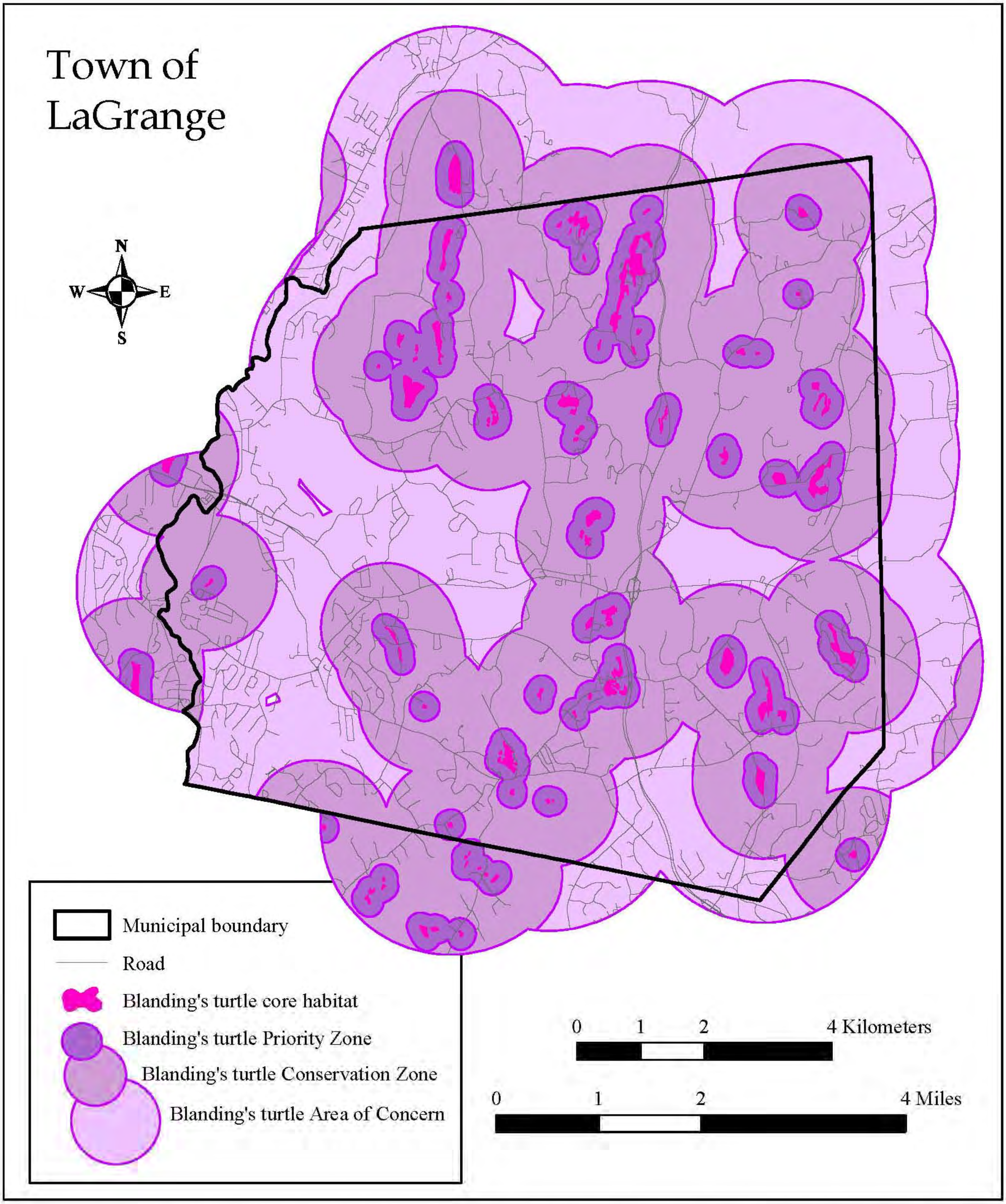


Figure 6. Blanding's turtle potential core habitat, Priority Zones (within 200 meters of core habitat), Conservation Zones (within 1,000 m of core habitat), and Areas of Concern (within 2,000 m of core habitat) in the Town of LaGrange, Dutchess County, NY. Hudsonia Ltd., 2009.

other rare species (Kiviat and Stevens 2001). Therefore, they still deserve special attention when planning for development and conservation.

Land uses within the Conservation Zones include: agricultural fields, medium-density residential and commercial development, forested land, athletic fields, orchards, a golf course, and soil mines. Most of the core wetlands in LaGrange have roads within their 200 m (660 ft) Priority Zone—many of these roads pass within 120 m (394 ft) and in several cases within 50 m (164 ft) of core wetlands. Medium-duty roads that bisect Conservation Zones include Arthursburg Rd, Emans Rd, Freedom Plains or Freedom Rd, Noxon Rd, Overlook Rd, Pleasant Valley Rd, Stringham Rd, and Titusville Rd. In addition, many light-duty or residential roads are within Conservation Zones.

It is evident from Figure 6 that most of the town is within the Blanding's Turtle Zone, so it may seem that the protection of Blanding's turtles while allowing for new development in the town is impractical. We are not recommending, however, that the Blanding's Turtle Zone be completely protected, but rather that, to varying degrees—depending on which zone is under consideration—Blanding's turtles be considered in the planning process. See the recommendations below (starting with "Landscape Recommendations") for ideas on bringing Blanding's turtle conservation into land use planning and decision-making.

Poughkeepsie Most of Poughkeepsie's potential habitat complexes are in the north section of town, where large undeveloped land areas remain (Figure 7). There are also a few complexes in the southeast and central parts of town. In all, we mapped 26 potential and known core habitats and 671 associated wetlands in Poughkeepsie. Associated wetlands included 85 constructed ponds, 26 open water areas, 270 hardwood & shrub swamps, 3 buttonbush pools, 31 intermittent

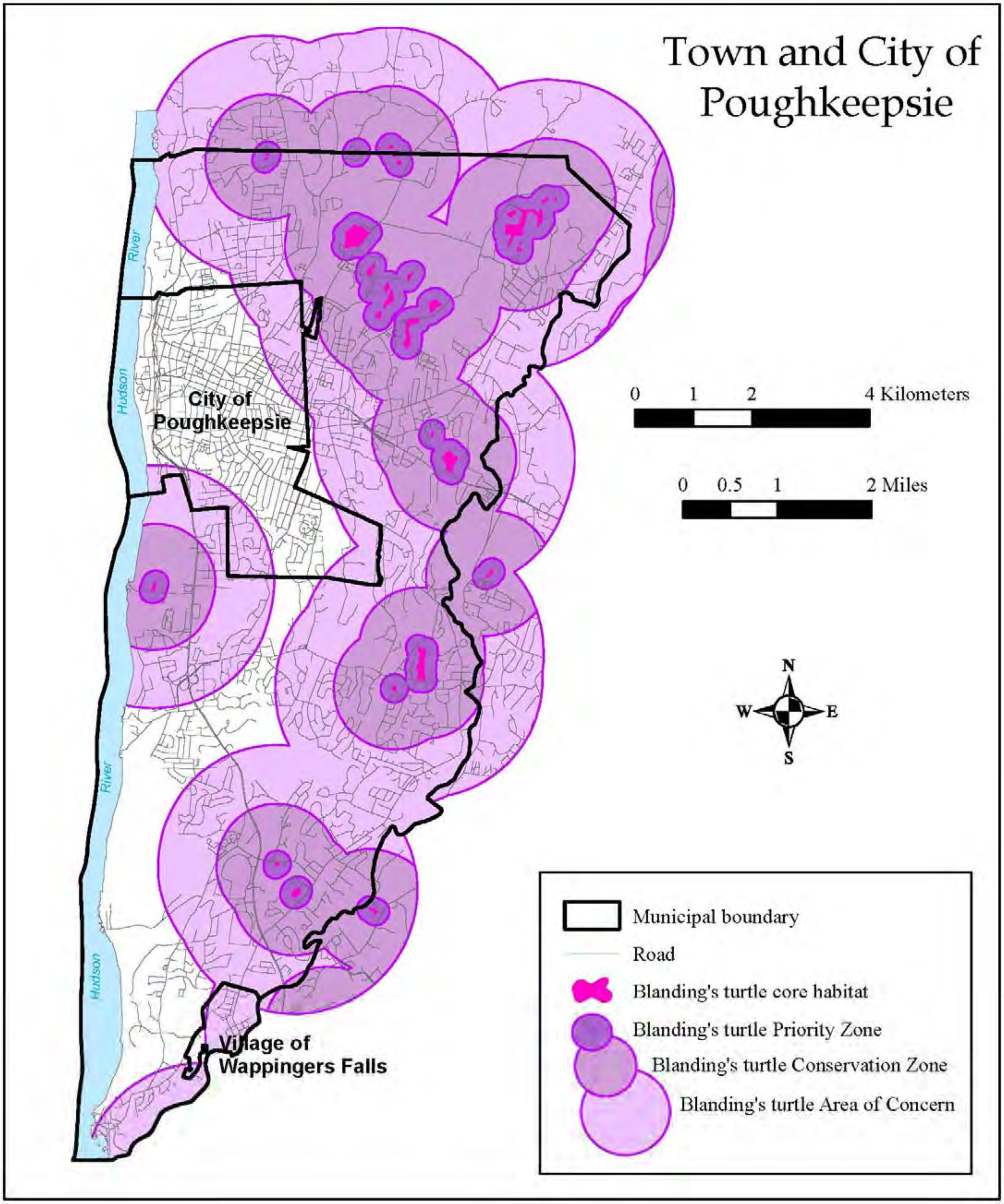


Figure 7. Blanding's turtle potential core habitat, Priority Zones (within 200 meters of core habitat), Conservation Zones (within 1,000 m of core habitat), and Areas of Concern (within 2,000 m of core habitat) in the Town and City of Poughkeepsie, Dutchess County, NY. Hudsonia Ltd., 2009.

woodland pools, 46 marshes, 198 wet meadows, 11 calcareous wet meadows, and 1 tidal marsh. Blanding's turtles have not been reported using tidal wetlands, but have been reported in riparian habitats. Buttonbush pools are shrub swamps dominated by buttonbush but not situated in the vicinity of glacial outwash soils, which differentiates them from kettle shrub pools dominated by buttonbush. Buttonbush pools are uncommon in the region and have not been studied much, but we believe they may have unique biodiversity values. We have identified most buttonbush pools as potential core habitat for Blanding's turtles, but even those not identified as such may deserve special attention during planning for development and conservation.

Land uses within the Blanding's Turtle Zone include agricultural fields in the north part of town, medium- to high-density residential and commercial areas, a capped landfill, and athletic fields. All of the core wetlands in Poughkeepsie contain roads within their 200 m (660 ft) Priority Zone. Heavy duty roads that pass through the 1000 m (3300 ft) Conservation Zones include NYS Rts 9, 9D, 9G, 44, 55, and 376. NYS 55 passes within 20 m (66 ft) of a core wetland. Medium-duty roads that pass through Conservation Zones include Bedell Rd, Boardman Rd, Bower Rd, Cedar Valley Rd, Channingville Rd, Cottage Rd, Creek Rd, Jackson Rd, Old Post Rd, Overocker Rd, Peach Rd, Salt Point Turnpike, Spackenkill Rd, Spring Rd, Underhill Rd, and Van Wagner Rd. Old Post Rd, Salt Point Turnpike, Spackenkill Rd, Underhill Rd, and Van Wagner Rd are all within 30 m (98 ft) of core wetlands. In addition, many light-duty roads are within the 1000 m (3300 ft) Conservation Zone.

The City of Poughkeepsie contains no potential Blanding's turtle core wetlands and is within the Conservation Zone of no core wetlands (Figure 7). It is, however, within the Area of Concern of at least 4 core wetlands in the adjacent town. Land uses within the Areas of Concern include high-density residential and commercial, a golf course, fields, and forested land.

Union Vale Union Vale contains two potential core wetlands in the southwest section of town, both in the headwaters of a tributary to Jackson Creek (Figure 8). In addition, several Blanding's turtle Conservation Zones and Areas of Concern in LaGrange extend beyond its eastern border into Union Vale. There are extensive wetlands associated with the Clove Valley in the central part of town, but none were deemed potential Blanding's turtle habitat. We also found no core wetlands in the northern and eastern parts of town, which are quite rugged. We mapped 84 associated wetlands in Union Vale, including 22 constructed ponds, 1 open water habitat, 35 hardwood & shrub swamps, 5 intermittent woodland pools, 3 marshes, and 18 wet meadows.

Land uses within the Conservation Zones include light residential, forested land, agricultural fields, orchards, and an airport runway. NYS 55, a heavy-duty road, passes through two Conservation Zones. Several medium-duty roads pass through Conservation Zones, including Clapp Hill Rd and Noxon Rd. Noxon Rd is within 25 m (82 ft) of a core wetland.

Wappinger Potential Blanding's turtle habitat is found throughout the Town of Wappinger, with core habitats concentrated in the northeast and southwest sections (Figure 9). We mapped 59 potential and known core wetlands and 921 associated wetlands in the Town of Wappinger. Associated wetlands included 1 circumneutral bog, 128 constructed ponds, 22 open water habitats, 560 hardwood & shrub swamps, 1 mixed forest swamp, 63 intermittent woodland pools, 24 marshes, 120 wet meadows, 1 tidal marsh, and 1 tidal swamp. Blanding's turtles have not been reported using tidal wetlands, but have been reported in riparian habitats.

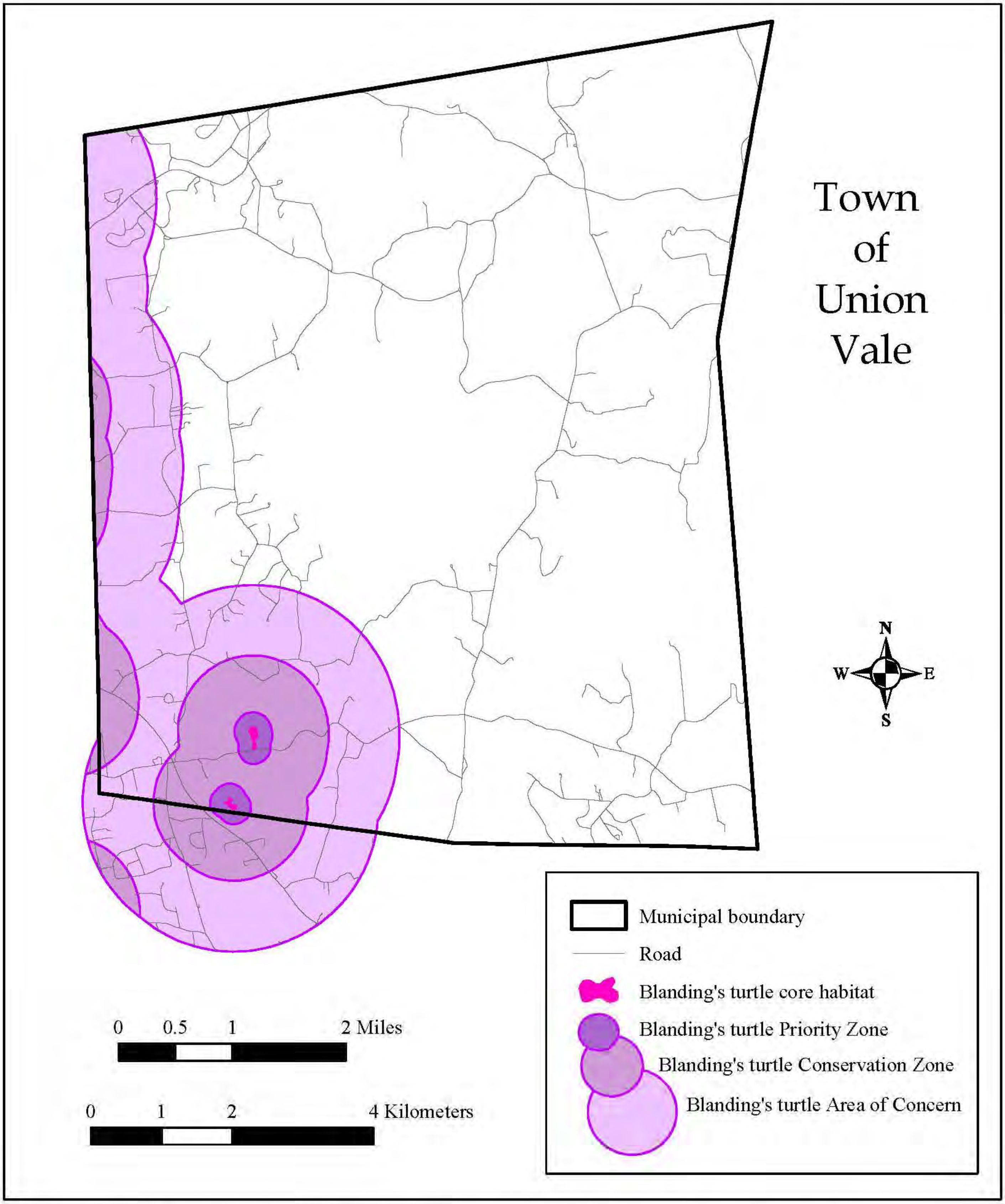


Figure 8. Blanding's turtle potential core habitat, Priority Zones (within 200 meters of core habitat), Conservation Zones (within 1,000 m of core habitat), and Areas of Concern (within 2,000 m of core habitat) in the Town of Union Vale, Dutchess County, NY. Hudsonia Ltd., 2009.

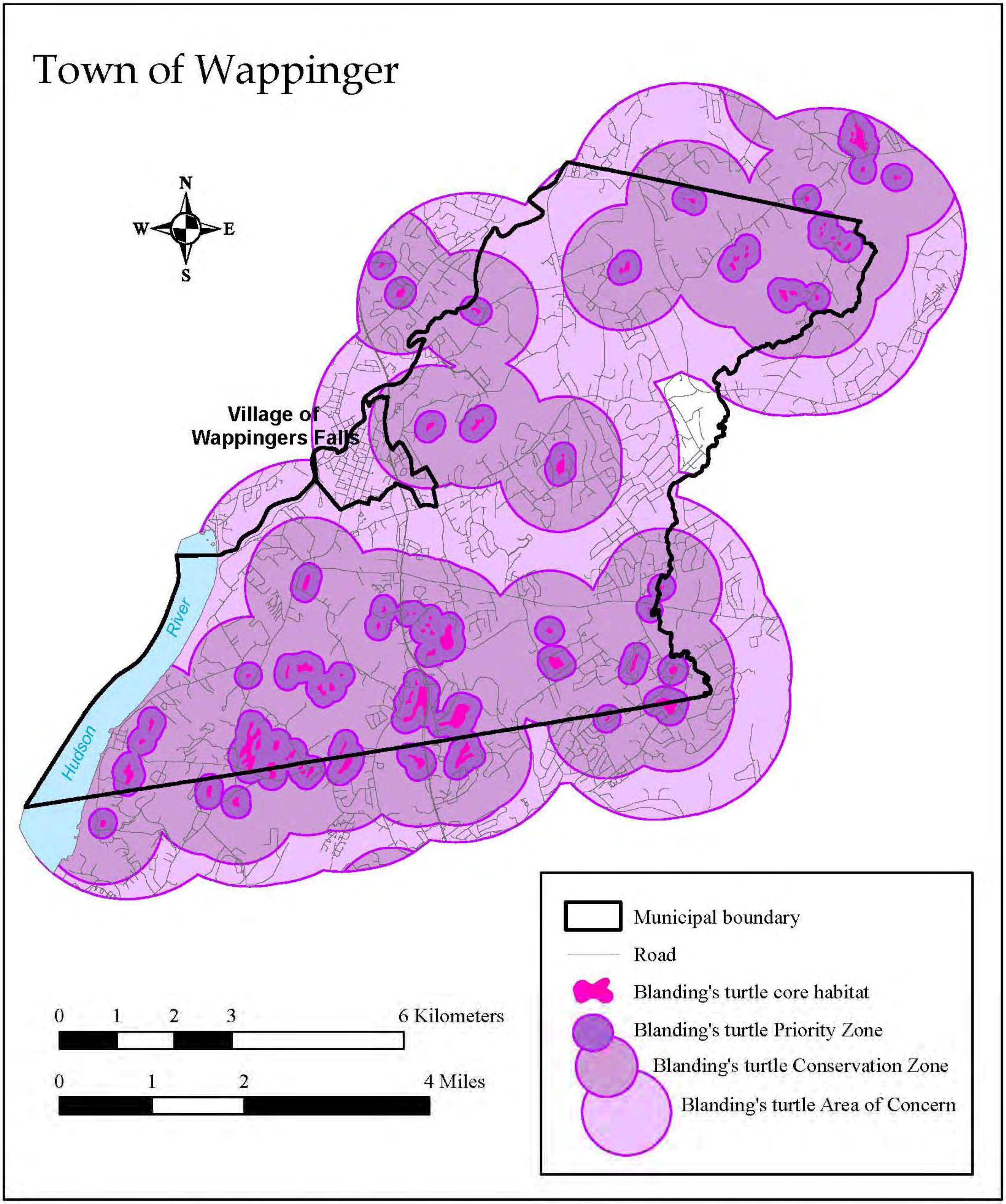


Figure 9. Blanding's turtle potential core habitat, Priority Zones (within 200 meters of core habitat), Conservation Zones (within 1,000 m of core habitat), and Areas of Concern (within 2,000 m of core habitat) in the Town of Wappinger, Dutchess County, NY. Hudsonia Ltd., 2009.

Circumneutral bogs are wetlands that support vegetation of both acidic bogs and calcareous wetlands. They often contain a mosaic of shrubby and herbaceous vegetation, and usually have floating peat mats. Circumneutral bogs are similar to the circumneutral bog lakes described in Kiviat and Stevens (2001), but have less open water. These wetlands are very rare in the region, and usually support rare plants and animals. The circumneutral bog in Wappinger should be given special conservation attention during environmental reviews of activities in nearby areas.

Land uses within the Conservation Zones include medium- to high-density residential and commercial development, athletic fields, agricultural fields, forested land, an airport, and orchard. Heavy-duty roads include NYS 9, 9D, 82, and 376. NYS 9 and NYS 9D pass within 75 m (246 ft) of core wetlands. Medium-duty roads include All Angels Rd, Chelsea Rd, Diddell Rd, Hopewell Rd, Kent Rd, Ketchamtown Rd, Myers Corners Rd, New Hackensack Rd, New Hamburg Rd, Old State Rd, Osborne Hill Rd, Robinson Lane, Rives Rd, Wheeler Hill Rd, and Widmer Rd. All Angels Hill Rd, Chelsea Rd, Ketchamtown Rd, New Hackensack Rd, Old State Rd, Osborne Hill Rd, and Robinson Lane all pass within the 200 m (660 ft) Priority Zone of core wetlands—often within 50 m (164 ft). In addition, many light-duty roads are within the 1000 m (3300 ft) Conservation Zone.

As in LaGrange, it appears from Figure 9 that most of the town is within the Blanding's Turtle Zone, so it may seem that the protection of Blanding's turtles while allowing for new development in the town is impractical. We are not recommending, however, that the Blanding's Turtle Zone be completely protected, but rather that, to varying degrees—depending on which zone is under consideration—Blanding's turtles be considered in the planning process. See the recommendations below (starting with "Landscape Recommendations") for ideas on bringing Blanding's turtle conservation into land use planning and decision-making.

DISCUSSION AND RECOMMENDATIONS

Ecological and Cultural Significance of Blanding's Turtles

The decline or disappearance of a rare native species, particularly one that uses a variety of wetland and upland habitats, can indicate collapses in other parts of the local ecosystem which supports not only many other species of plants and animals but humans as well. Intact ecosystems make the earth habitable by providing such basic services as climate moderation, oxygen production, soil formation, nutrient transformation, and production and decomposition of organic matter. Protecting native biodiversity is a means to the larger end of preserving the integrity and resilience of ecosystems. Although we cannot predict the effects of losing any particular species, we know that each organism, including inconspicuous organisms such as fungi, insects, mice, and turtles, plays a unique role in the maintenance of biological communities.

Blanding's turtles are rare throughout their range, and occur only in isolated populations in the Northeast. Isolated populations and their habitats are important to a species' viability, providing genetic diversity and potential refugia as climate changes. Rare species in general, and especially those that use large and diverse areas, act as "canaries in a coal mine" that indicate the quality of the environment for humans. The glacial outwash deposits of Blanding's turtle landscapes, in particular, are important groundwater aquifers in Dutchess County, and the organic soils of the core wetlands and certain associated wetlands store carbon and may be important in mitigating climate change. Maintaining the full complement of native species in a region is thought to allow an ecosystem to withstand or rebound from stresses and adapt to changing environmental conditions. For these reasons we believe that the wisest course is to use the best information available to maintain native biological diversity wherever possible.

Because of its sensitivity to changes in the environment, its large home range, and its use of a whole complex of habitats, we consider the Blanding's turtle an "umbrella species;" habitat protected for Blanding's turtles protects many other species that co-occur in those habitats. Several of those species are of conservation concern or of cultural importance in New York State, including the pied-billed grebe, wood duck, American black duck, spotted turtle, wood turtle, ribbon snake, mole salamanders, and several rare plants.

In addition, Blanding's turtles have proven useful in medical and biological research. After reaching sexual maturity at about 15 years, the Blanding's turtle is able to reproduce throughout its long life. Study of this phenomenon may help researchers understand the aging process in humans. Also, the isolated populations in the Northeast, such as those in Dutchess County, are genetically different from populations in the Great Lakes region (S. Mockford, *pers. comm.*). This has important implications for the species' conservation in Dutchess County and their potential value to both medical and evolutionary research.

The Blanding's turtle habitat maps offer the opportunity to protect existing Blanding's turtle habitat complexes despite the advancing suburbanization of Dutchess County, through planning new development—such as restricting new road construction and locating new buildings away from Blanding's turtle wetlands and nesting areas—before expensive habitat restoration becomes necessary. The maps provide town agencies, the DEC, and others information on areas that are potentially of concern, and those that are not of concern, for Blanding's turtle conservation. The maps can help landowners and developers choose sites for development that will be the least detrimental to Blanding's turtles, and thus incur less time and expense in the environmental review process. The habitat information may be particularly useful in the State Environmental Quality Review (SEQR) process, which balances the needs of wild species with socioeconomic factors in making land use decisions.

With limited financial resources to devote to conservation purposes, towns and other entities must decide how best to direct those resources to achieve the greatest conservation results. While it may be impossible to implement all of the measures listed below, we hope this information will help towns think strategically about land-use planning and conservation, and that towns will consider implementing these measures as best as they are able. Any such practices will contribute to the viability of the Blanding's turtle in Dutchess County.

Below we describe landscape conservation measures that town agencies, state agencies, land trusts, and others can use to protect Blanding's turtle habitat, and highlight some areas of particular conservation significance within the six towns. We also suggest specific measures that can be taken by town or state agencies when reviewing development applications or assessing habitat on a proposed development site, measures that can be taken by developers for on-site planning and design, and measures that can be adopted by individual landowners. The latter are formatted so that they can be photocopied and given to individuals, such as Planning Board or Conservation Advisory Council members, developers, landowners, or interested residents separately from the rest of this report. We ask that material distributed in this fashion be clearly credited to Hudsonia Ltd.

Areas of Highest Conservation Significance

Although all areas mapped in Figures 4-9 may be important to the Blanding's turtle, the habitat complexes described below are those that we consider particularly important to protect due to their proximity to known Blanding's turtle habitats or the overall quality of the habitats in the Conservation Zone. Beekman and Union Vale have only a few core wetlands each, so should probably consider all of their potential habitats to be significant. While all mapped habitats should be considered for protection, we felt that highlighting a few specific high quality areas may help towns to prioritize limited resources in the near term. If appropriately protected, the Areas of Highest Conservation Significance in key portions of our study area should form corridors that allow Blanding's turtles (and other wildlife) to move from one core wetland to another.

Fishkill (Figure 10)

- The 2 core wetlands east and west of NYS 9D (on DEC property) and associated habitats.
- The core wetland (on DEC property) just north of Baxtertown Rd where it intersects with Baxtertown Rd Extension, and associated habitats.
- The core wetland east of NYS 9 and associated habitats.

LaGrange (Figure 11)

- The 3 core wetlands between NYS 55 and Todd Hill Rd, east and west of Stringham Rd, and the 4 core wetlands south of Todd Hill Rd and east of Stringham Rd and their associated habitats.
- The 7 core wetlands between Mountain Rd and NYS 55, just west of the Taconic Parkway, and their associated habitats. Much of this land is part of James Baird State Park.
- The core wetland north of Carter Rd and west of McDonnell Rd and associated wetlands.
- The 8 core wetlands north of Overlook Rd and south of the town border and associated habitats. Currently, the Nature Conservancy owns 55 ha (135 acres) around the southernmost wetland.
- The northernmost core wetland east of Skidmore Rd and associated habitats.

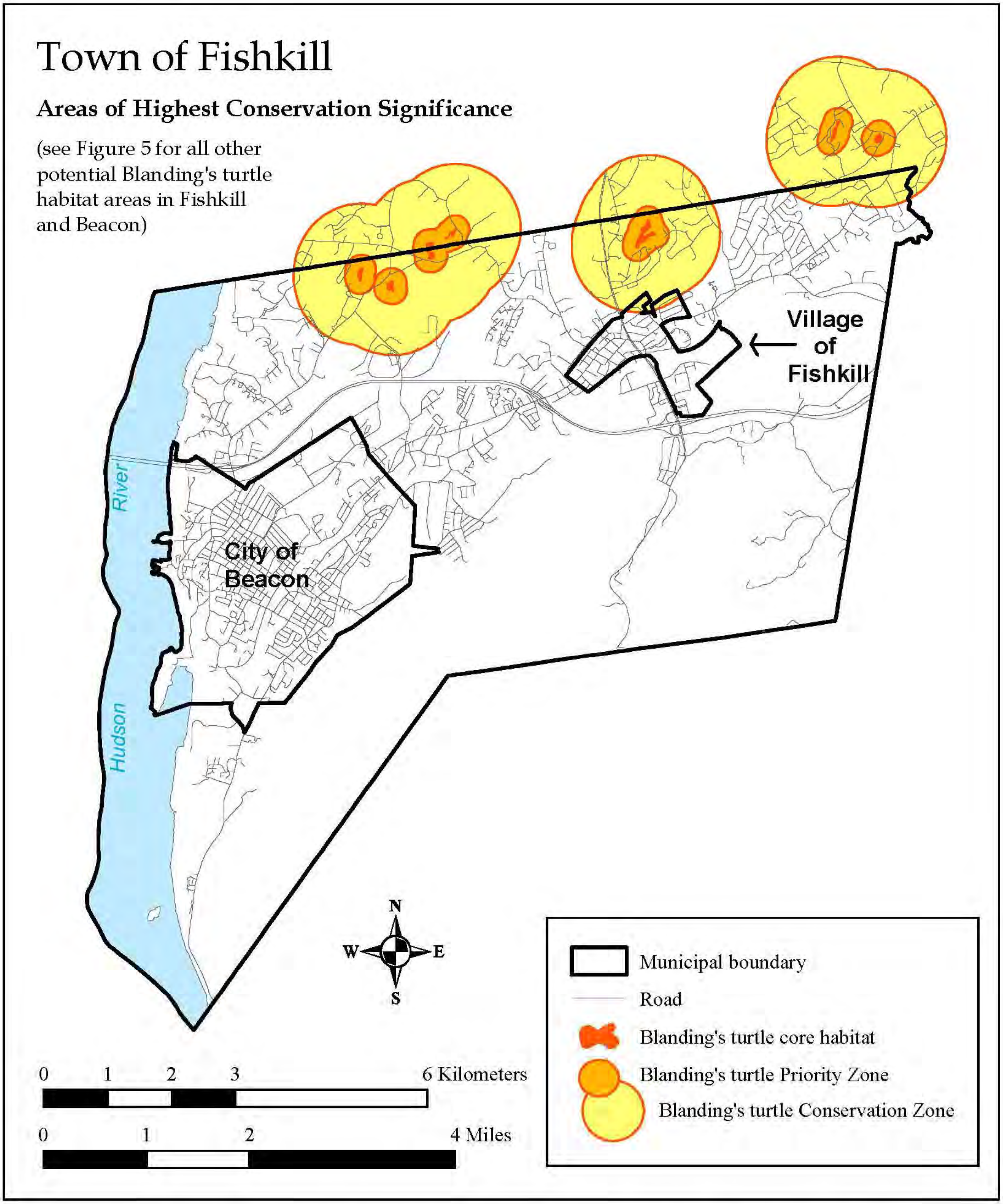


Figure 10. Blanding's turtle habitats of highest conservation significance: core habitats, Priority Zones (within 200 meters of core habitat), and Conservation Zones (within 1,000 m of core habitat) in the Town of Fishkill and City of Beacon, Dutchess County, NY. Hudsonia Ltd., 2009.

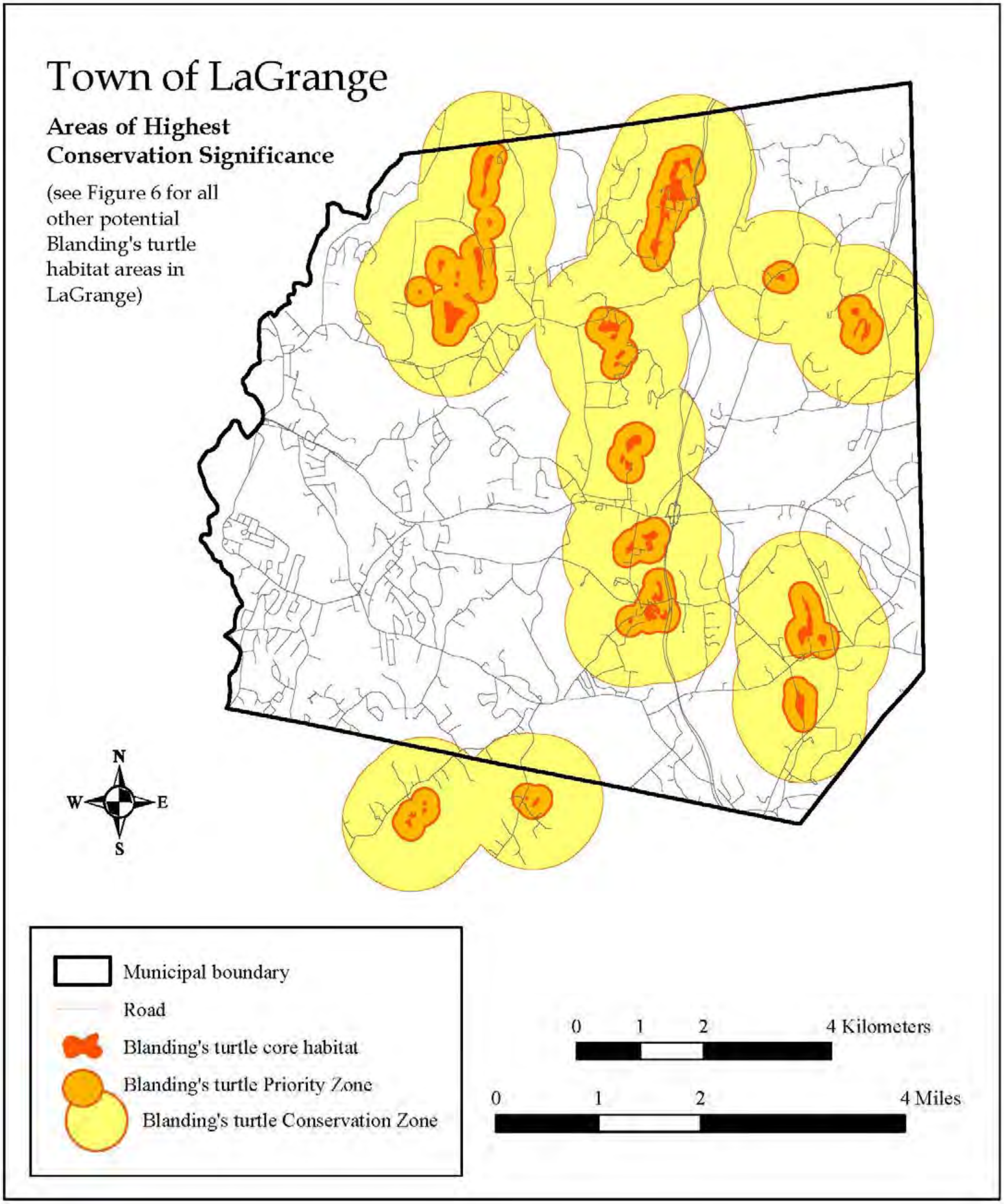


Figure 11. Blanding's turtle habitats of highest conservation significance: core habitats, Priority Zones (within 200 meters of core habitat), and Conservation Zones (within 1,000 m of core habitat) in the Town of LaGrange, Dutchess County, NY. Hudsonia Ltd., 2009.

- The 2 core wetlands west of NYS 82, just north of the junction of NYS 82 and Barmore Rd, and associated habitats.
- The 3 core wetlands north and south of Noxon Rd, and associated habitats.

Poughkeepsie (Figure 12)

- The 4 core wetlands between Salt Point Turnpike and Van Wagner Rd, plus the 2 core wetlands just north of Salt Point Turnpike and south of Van Wagner Rd and their associated habitats.
- The 6 core wetlands east of Van Wagner Rd and south of Bower Rd, and associated habitats.

Wappinger (Figure 13)

- The core wetland at the intersection of All Angels Rd and Park Hill Dr and its associated habitats.
- The core wetland just west of the above wetland, south of Pine Ridge Dr, and its associated habitats.
- The 6 core wetlands east of NYS 9 and south of McFarland Rd, and associated habitats.
- The 3 core wetlands east of Robinson Lane, and associated habitats.
- The 4 core wetlands south of Diddell Rd, along the powerline right-of-way, and associated habitats.
- The 2 larger core wetlands west of Ketchamtown Rd and south of Marc Ridge Lane. Portions of these wetlands are owned by the DEC.
- The core wetland west of Stonykill Rd (the second wetland north of Baxtertown Rd) and associated habitats. This wetland is on DEC property.

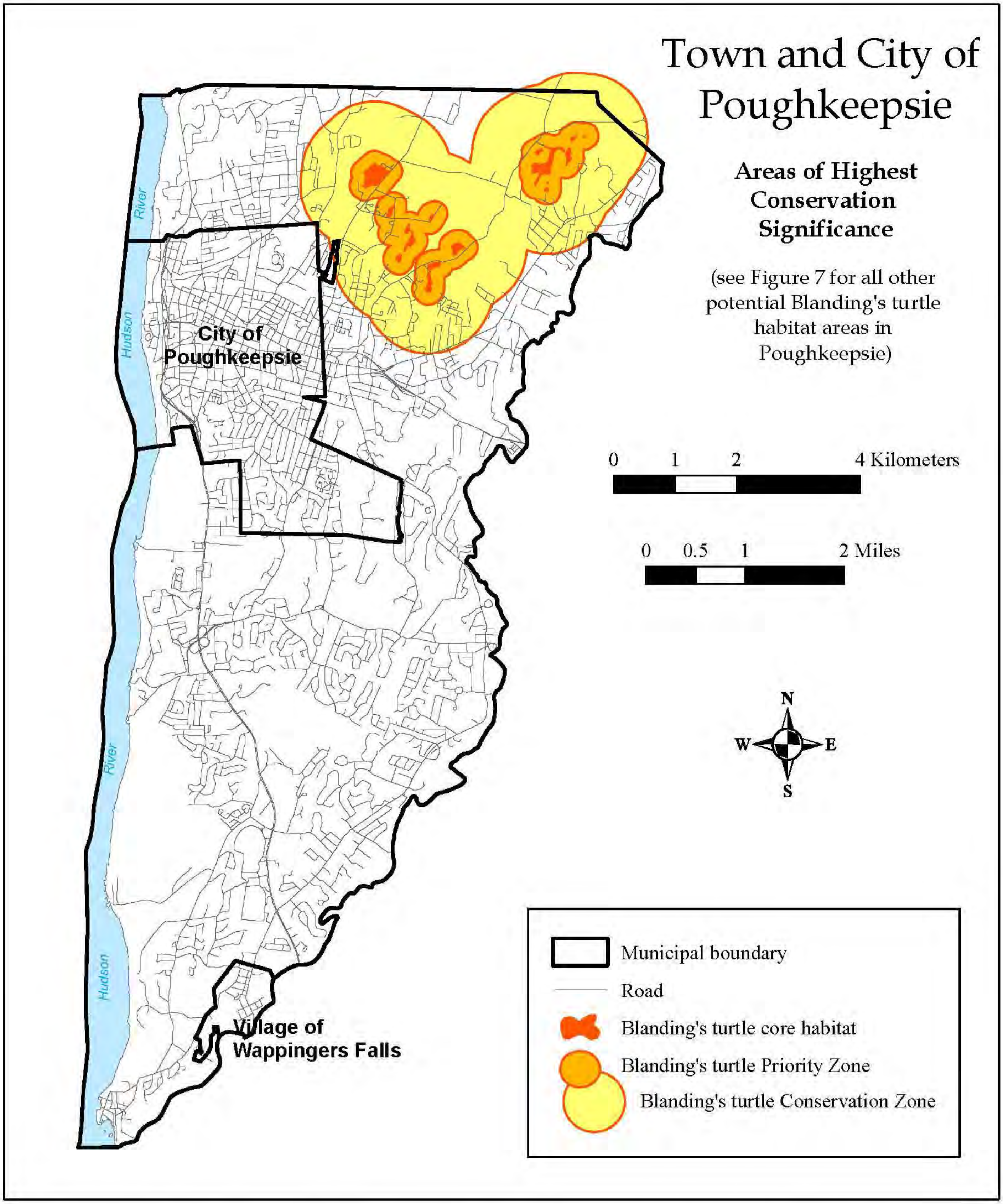


Figure 12. Blanding's turtle habitats of highest conservation significance: core habitats, Priority Zones (within 200 meters of core habitat), and Conservation Zones (within 1,000 m of core habitat) in the Town and City of Poughkeepsie, Dutchess County, NY. Hudsonia Ltd., 2009.

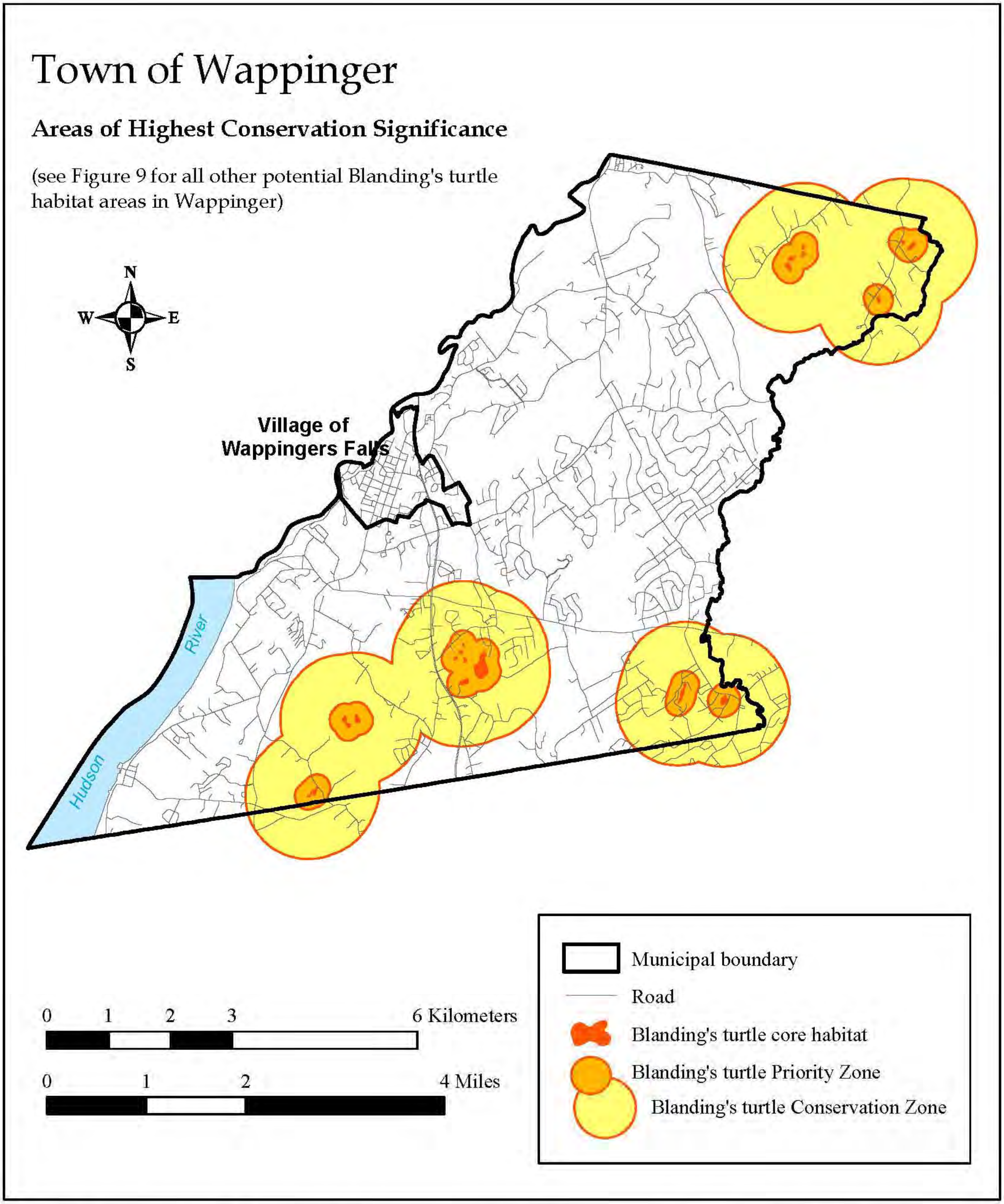


Figure 13. Blanding's turtle habitats of highest conservation significance: core habitats, Priority Zones (within 200 meters of core habitat), and Conservation Zones (within 1,000 m of core habitat) in the Town of Wappinger, Dutchess County, NY. Hudsonia Ltd., 2009.

Landscape Recommendations (for state, county, and town agencies and land trusts)

Because biological communities, habitats, and ecosystems do not coincide with property or municipal boundaries, the best approach to biodiversity conservation is from the perspective of whole landscapes. These recommendations are designed to assist local and state agencies and land trusts in conservation planning at the landscape scale.

The Blanding's turtle requires large areas of undeveloped or minimally developed landscapes in order to maintain populations that are viable in the long term. In order to effectively conserve the species, these landscapes and the habitat complexes they contain must be protected from changes to hydrology, soils, vegetation, and land uses that would reduce survival rates in the population or the health of individual turtles. Areas that have already been altered by development should be evaluated for potential mitigation measures.

As a New York State-listed Threatened species, the Blanding's turtle should be fully considered in municipal planning in all of Dutchess County *except* the towns of North East, Amenia, Dover, and Pawling, which are outside the known or potential range of the species. Blanding's turtle assessments (e.g. habitat assessments, trapping surveys, and conservation planning) must be carried out or advised by a qualified biologist familiar with Blanding's turtles and their habitats in Dutchess County.

In the other 12 towns, natural resource inventories, master plans (comprehensive plans), and zoning ordinances should address the conservation of Blanding's turtle habitat complexes to the extent possible. Planning for Blanding's turtle conservation can not only help avoid destruction and degradation of the habitats of a Threatened species and mortality of individual turtles, but can also prevent costly delays and other problems for landowners and developers, highway departments, and other entities.

Below are some general guidelines for the conservation of Blanding's turtles in Dutchess County.

THE BLANDING'S TURTLE AREA OF CONCERN: THE 2000-METER ZONE

Although the turtles occasionally travel farther, most Blanding's turtle activities occur within 2000 meters (6600 ft) of a core Blanding's turtle wetland. The Area of Concern encompasses this area, including the Conservation Zone and Priority Zone discussed below. If followed, these general measures, and the more specific measures following, will go a long way toward protecting the turtles and their habitats.

Protect wetland habitats from filling, dumping, drainage, incursion of wheeled or tracked equipment, siltation, polluted runoff, groundwater contamination, and alterations to surface or groundwater hydrology.

Maintain the spatial and temporal patterns of surface water and groundwater entering and leaving wetlands.

Maintain broad corridors of undeveloped land within the Area of Concern between all 1000 m (3300 ft) Conservation Zones.

Minimize the extent of new roads through undeveloped land.

Maintain broad buffer zones (e.g. at least 30 m [100 ft] width) of natural soil and vegetation around all wetlands, including unregulated wetlands.

Minimize or eliminate pesticide use on lawns, gardens, and agricultural fields, and prevent movement of soil and nutrients into wetlands.

Educate landowners about the Blanding's turtle and its conservation. Educational materials such as the "Backyard Turtle Conservation" section below and "The Blanding's Turtle" brochure (Hartwig et al. 2006) can be given to residents within the Area of Concern. If priorities need to be established, landowner education should start within the Priority Zones, then the Conservation Zones, and, lastly, the entire Area of Concern.

Consider a variety of regulatory and non-regulatory means to achieve conservation goals, including volunteer conservation efforts, master planning, zoning ordinances, tax incentives, land stewardship incentives, permit conditions, land acquisition, and conservation easements. For example, local conservation organizations can consider establishing a contest for the best "backyard turtle habitat." Section 4 in the *Biodiversity Assessment Manual* (Kiviat and Stevens 2001) provides information on general conservation strategies. A publication from the Metropolitan Conservation Alliance (2002) offers a model local ordinance to delineate a conservation overlay district that can be integrated into a municipal master plan and adapted to the local zoning ordinance.

THE BLANDING'S TURTLE <u>CONSERVATION ZONE</u>:
THE FIRST 1000 METERS

The area within 1000 meters (3300 ft) of a core Blanding's turtle wetland is where the turtles are likely to be traveling frequently between wetlands and ponds of all kinds during the active season and traveling to and from upland nesting areas. In addition to the general measures listed above for the Area of Concern, the measures below are especially designed for this zone of more intensive turtle activity.

In reviews of all applications for **Freshwater Wetlands permits, Stormwater Management permits, and Mined Lands permits**, consider the impacts to Blanding's turtle habitat complexes. Stormwater management permits and mining permits should be written to ensure that sediment from work areas (including suspended clay and silt) does not enter core or associated wetland habitats. Typical silt fence and hay bale structures for siltation control are inadequate for this purpose. Instead, stormwater should be diverted from Blanding's turtle habitats, and stormwater basins should be constructed to remove sediment and ensure maximum onsite infiltration of stormwater runoff. Petroleum hydrocarbons, de-icing salts, and other pollutants, however, may not be effectively removed by stormwater basins.

When siting domestic or municipal **water supply wells**, consider the impacts of water table drawdowns to Blanding's turtle core and associated wetlands.

When siting **septic systems and other sewage treatment systems**, assess the impacts of the movement of nitrogen and phosphorus compounds into Blanding's turtle wetlands. Most important Blanding's turtle wetlands occur on or near glacial outwash deposits, which are very permeable to the movement of groundwater and septic leachate.

Use the Conservation Zone to help **identify high-priority areas** for special protection; e.g. for acquisition of conservation land by public or private entities, or for designing conservation easements on privately-owned land. Keep in mind that the turtles need broad corridors in the Area of Concern to move between Conservation Zones and to move among habitats within the Area of Concern.

Foster municipality-wide and intermunicipal cooperation in planning to preserve habitat complexes and minimize hazards to turtles. Where large development projects or multiple adjoining development projects can be planned simultaneously, design contiguous greenways or other types of open space reserves to protect Blanding's turtle habitat complexes. (An example of a multi-development and intermunicipal greenway created to protect habitat for species other than Blanding's turtle was described by Kiviat [2003].)

BLANDING'S TURTLE PRIORITY ZONE: THE FIRST 200 METERS

Blanding's turtles regularly use the upland areas within 200 m (660 ft) of a core wetland to bask and estivate (rest during periods of hot weather), as well as to nest. Special measures should be taken in this zone to prevent harm to the turtles and to protect the important wetland and upland habitat features. A 200 m-wide buffer of natural vegetation and undisturbed soils around a core wetland will help maintain hydrology and water temperatures, prevent pollution from toxic chemicals or silt, and provide food resources for the turtles (Blanding's turtles eat a variety of aquatic invertebrates, many of which are thought to depend on leaf litter as a food resource).

In addition to the recommendations for the Conservation Zone and the Area of Concern, the following measures will help to protect the turtles near their core wetlands.

Within the Blanding's turtle Priority Zone, we recommend **no new buildings, pavement, lawns, roads, or other structures** unless there are no feasible alternatives.

Keep vehicle speeds low on internal subdivision and other roads by means of posted speed limits, wildlife crossing signs, and speed bumps.

Consider constructing **turtle underpasses** for medium- and heavy-duty roads within the Priority Zone. Although Blanding's turtles are known to use culverts occasionally, little is known about mitigating the impacts of roads on wildlife by building underpasses. Therefore, any underpasses should be carefully designed, constructed, and monitored to determine their actual usefulness to the turtles. Highway agencies may be able to install underpasses in connection with other improvements to roads, culverts, or storm drains.

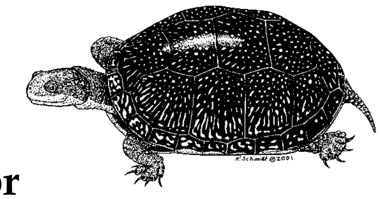
Consider **retrofitting** any structures currently within the Priority Zone using the following guidelines:

> **--Build fences or other barriers** around in-ground swimming pools to keep turtles of any size out of the pools. Fencing mesh must be less than 2.5 cm (1 in) wide to exclude turtles as small as 2.5 cm carapace length; barriers must be at least 25 cm (10 in) high to exclude turtles up to 25 cm carapace length.
>
> **--Require spaces beneath potential barriers** to turtle movement either on land or in the water, including stone walls, chain-link fences, and curbs. Spaces must be no less than 10 cm (4 in) high and no more than 25 m (82 ft) apart, to allow turtles free movement across the landscape.

--Retrofit storm drain grates so that turtles (including hatchlings of carapace length 2.5 cm [1 in]) cannot fall in, or design catch basins such that turtles and other small animals can readily exit if they do fall through the grate.

--Retrofit window wells with either permanent grates (maximum 2 cm [0.8 in] mesh size), or lips at least 25 cm high (that adult Blanding's turtles of carapace length up to 25 cm cannot climb over).

--Maintain or restore a "tree fringe" (a belt at least two trees deep, preferably with most trees greater than 30 cm dbh [12 in caliper]) encircling each core wetland.



Recommendations for

Review of Development Proposals

(for state, county, and town agencies)

These procedures are recommended for review of any land development project within the 1000 m (3300 ft) Conservation Zone of a known or potential Blanding's turtle core wetland.

In most cases, trapping surveys to determine the presence or absence of Blanding's turtles are not recommended, for two reasons:

1. A trapping survey will not establish the absence of Blanding's turtles in a particular wetland.
2. Blanding's turtle populations require a network of habitats across the landscape. Certain wetlands are used in the winter and spring, and others are used spring through fall or during droughts or other extreme conditions. Any of these may be critical to the survival of the Blanding's turtle population, but any one of them may be unoccupied at the time of the trapping survey. Furthermore, the turtles must be able to move from one habitat complex to another so that they can adapt to changing wetlands, population pressures, and competition. A wetland not currently used by Blanding's turtles may be used by them in the future. Patterns of habitat use may vary from year to year.

However, if there is a need to discover movement patterns, such as travel to potential nesting areas or travel corridors between wetlands, we recommend trapping and subsequent radio-tracking with the caveat that at least two years of data (preferably more), including a drier-than-average and wetter-than-average year, are needed to even partially understand the turtles' movement patterns.

For any proposed development project:

1. When a development proposal is submitted for a site within the Conservation Zone notify the New York State Department of Environmental Conservation.

2. Require that the applicant submit an onsite Blanding's turtle habitat assessment (see Recommendations for Habitat Assessments, below) with their draft development proposal. A worthwhile habitat assessment must be conducted by a qualified biologist with specialized knowledge and

experience with the Blanding's turtle in Dutchess County, and must include assessment of all core and associated wetlands, potential upland nesting habitats, and potential upland, wetland, and stream travel corridors between habitats. The evaluation must also include assessment of offsite areas to the extent possible (e.g. using field observations, analysis of aerial photographs, analysis of other maps, etc.).

3. Compare the results of the habitat assessment to the Blanding's Turtle Habitat Map, and have a third party (e.g. Conservation Advisory Council or Planning Board representative, or independent biologist) visit the site to resolve unexplained discrepancies.

4. If suitable wetland or upland habitats, or unobstructed corridors connecting those habitats, are not found on or near the site, then simply design permit conditions to follow the general recommendations for the Area of Concern and the Conservation Zone, outlined in the Landscape Recommendations in Hartwig et al. 2009.

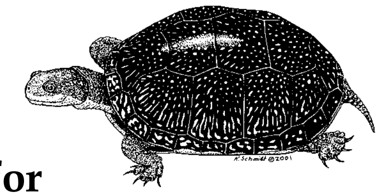
5. If suitable wetland or upland habitats or corridors are found on the proposed development site, require the following:

    a. The potential Blanding's turtle habitats must be clearly mapped and labeled on the site plan.
    b. The site plan and description must show the following:
    --no direct disturbance of the potential upland or wetland Blanding's turtle habitats on the site, including ample corridors between them; core wetlands should be surrounded by 200 m (660 ft) of undisturbed land. Buffer zones should be designed to protect associated wetlands in consideration of their ecological functions and values;
    --no disturbance of corridors between onsite and offsite habitats;
    --no potential contamination of surface waters by sediments, nutrients, or toxic pollutants;
    --no potential contamination of groundwater from septic leachate or other sources;
    --no potential alteration of groundwater elevation or flows in the vicinity of known or potential Blanding's turtle wetlands;
    --no paving of or other disturbance to potential nesting sites, except if alterations are specifically designed (in consultation with a Blanding's turtle specialist) to enhance the quality of the nesting habitat.
    c. The site plan must show the limits of clearing, the locations and extent of all roads, driveways, structures, other hardened or impervious surfaces, septic leachfields, and stormwater

infrastructure, including drains, swales, and detention/retention basins.

d. New driveways should be as short as possible, and located so that likely travel corridors between known or potential Blanding's turtle wetland and upland habitats are avoided.
e. Any window wells, walls, curbs, fences, pitfall hazards, storm drains, culverts, and catch basins must be especially designed to accommodate safe turtle passage:
--Require low barriers or fencing around in-ground swimming pools to keep turtles of any size out of the pools. Fencing must exclude turtles as small as 2.5 cm (1 in) carapace length; barriers must be at least 25 cm (10 in) high to exclude turtles up to 25 cm carapace length.
--Require spaces beneath other potential barriers to turtle movement either on land or in the water, including stone walls, chain-link fences, and curbs. Spaces must be no less than 10 cm (4 in) high and no more than 25 m (82 ft) apart, to allow turtles free movement across the landscape.
--Design storm drain grates so that turtles (including hatchlings of carapace length 2.5 cm) cannot fall in, or design catch basins such that turtles and other small animals can readily exit if they do fall through the grate.
--Design window wells with either permanent grates (maximum 2 cm (0.8 in) mesh size), or lips at least 25 cm high (that adult Blanding's turtles of carapace length up to 25 cm cannot climb over).
--Use "Cape Cod" curb design to allow turtles to navigate curbs.
f. Wherever possible, roads should be equipped with speed bumps, posted low speed limits, and wildlife crossing signs.
g. Any new driveways exceeding 100 m (328 ft) should be equipped with speed bumps.
h. Construction crews and eventual residents must be educated to look for turtles under cars, construction equipment, or mowing machines before operating or driving.

For more information, see: Hartwig, T., G. Stevens, J. Sullivan, and E. Kiviat. 2009. Blanding's turtle habitats in southern Dutchess County. Report to the Marilyn Milton Simpson Charitable Trusts and NYS DEC Hudson River Estuary Program. Hudsonia Ltd., Annandale, NY.



Recommendations for

Habitat Assessments

(for state agencies, town agencies, and consultants)

A Blanding's turtle habitat assessment should be required for any development proposal within the 1000 m (3300 ft) Conservation Zone of a known or potential Blanding's turtle core wetland. Because habitats change over time, and because Hudsonia biologists were not able to check every area in the field during our habitat mapping project (Hartwig et al. 2009), a habitat assessment is required to confirm mapped habitats. This assessment must be conducted by a qualified biologist with specialized knowledge of and experience with Dutchess County Blanding's turtles. All wetlands on the site and selected wetlands nearby should be assessed for their potential as either core or associated habitat, and potential nesting habitats and travelways should be evaluated. Below are guidelines for determining core wetland, associated wetland, and nesting habitat suitability for Blanding's turtles.

Core wetlands

Following are characteristics that may indicate core Blanding's turtle habitat:

- shrubby wetlands, particularly those containing buttonbush, highbush blueberry, and swamp azalea
- deep organic soil layer
- open canopy or canopy cover less than 50%
- little or no flowing water; preferably no inlet or outlet with high flow
- abundant neuston (living or dead material floating on the surface of the wetland), particularly duckweeds and floating liverworts, during the growing season
- tree fringe or forest surrounding wetland
- water ≥ 30 cm (11.8 in) deep for most of the year
- open water, moats, or moat-like areas

These characteristics should be considered guidelines rather than requirements for individual wetlands. Therefore, a wetland with mostly purple loosestrife—a plant with properties intermediate between a shrub and herb—but few shrubs and most of the other characteristics may still be considered core habitat. Assessors must use existing literature and their own knowledge of Blanding's turtle wetlands in Dutchess County to determine potential habitats, depending partially on a wetland's overall structure.

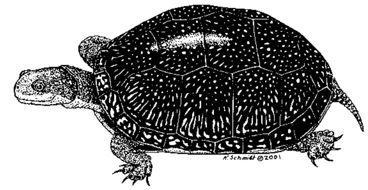
Associated Wetlands
Associated wetlands used by Blanding's turtles are quite variable in structure, vegetation, and hydroperiod. They provide refuge from warm or cold water temperatures or from drying wetlands, supplemental food supply, shelter for traveling turtles, and year-round habitat for hatchlings and juveniles. Blanding's turtle habitat complexes include, but are not limited to, forested swamps, shrub swamps, bogs, marshes, wet meadows, intermittent woodland pools, ponds, and lakes. Human-made as well as natural wetlands or ponds may be used. Wetland size varies; Blanding's turtles have been known to use wetlands from about 0.05 ha to 327 ha (0.1 to 808 acres; Hartwig 2004 and unpublished observations). Blanding's turtle habitat assessors should identify wetlands within 1000 m (3300 ft) of a potential core habitat with standing water during part of the year as an associated wetland for Blanding's turtles, and describe the wetland characteristics so that the configuration and quality of the wetland complex can be evaluated and on-site mitigation measures can be applied as needed.

Nesting Habitat
All potential nesting habitat should be investigated and mapped. Investigators should look for open (non-forested) upland areas with well-drained, loose, gravelly-loam soils. The best nesting habitats receive plenty of sunlight, have plenty of bare or sparsely vegetated, uncompacted soils, and flat to gentle slopes. Exposed soils on road shoulders or banks, idle areas of soil gravel mines, cultivated gardens, house yards, utility corridors, pockets of soil on rock outcrops, and fields have all been used in Dutchess County. Usually 20 cm (8 inches) or more of the surface soil is loose (friable). It should be noted, however, that whereas most Blanding's turtles nest in habitats similar to those described above, an occasional turtle nests in an unusual spot such as hard-packed turf or a steeply sloping dirt pile. Any unshaded, and unpaved, area in the Conservation Zone may provide nesting habitat; however, areas similar to the habitats described above should be conserved as such wherever possible.

Habitat Assessment Map
Once core, associated, and nesting habitats have been identified, they should be clearly mapped. In addition, broad upland areas between wetlands and between wetlands and nesting sites should be mapped as potential corridors. Any perennial or intermittent streams in the Conservation Zone should also be mapped as potential corridors, and a 200 m (660 ft)-wide Priority Zone should be drawn around all known and potential core wetlands.

Hartwig, T.S. 2004. Habitat selection of Blanding's turtle (*Emydoidea blandingii*): a range-wide review and microhabitat study. M.S. Thesis, Bard College, Annandale, NY.

For more information, see: Hartwig, T., G. Stevens, J. Sullivan, and E. Kiviat. 2009. Blanding's turtle habitats in southern Dutchess County. Report to the Marilyn Milton Simpson Charitable Trusts and NYS DEC Hudson River Estuary Program. Hudsonia Ltd., Annandale, NY.



Recommendations for
On-Site Mitigation of Development Projects
(for state and town agencies, and developers)

Require the following for any development project within the 1000 m (3300 ft) Conservation Zone of a known or potential Blanding's turtle core wetland:

Maintain the groundwater table. Decreased groundwater elevations will reduce wetland hydroperiod and water depths in most or all core wetlands and some associated wetlands, altering turtle habitats. Assess individual and cumulative impacts of existing and proposed land uses, including impervious surfaces, stormwater management, and groundwater withdrawals for their effects on the groundwater table, groundwater flows, and impacts to nearby wetlands.

Maintain quality of surface and ground waters. There is evidence that reptiles are susceptible to poisoning by heavy metals, PCBs, and certain pesticides. The Blanding's turtle is likely to be sensitive to a variety of toxic substances potentially emanating from past, present, and proposed dumps, industrial sites, automobile garages and junkyards, golf courses, farms, septic systems, lawns, highways, and other sources. Furthermore, Blanding's turtle core wetlands and many associated wetland habitats are normally relatively low in the plant nutrients phosphorus and nitrogen. Groundwater and surface water discharging into Blanding's turtle wetlands should be protected from nutrient inputs from the sources listed above as well as other potential sources. In addition, core wetland habitats have deep organic sediments that we believe are important to the Blanding's turtles; therefore movement of mineral sediments into wetlands from roads, driveways, farms, residential lots, construction sites, mines, and other sources should be prevented. Use of de-icing salts should also be prohibited in the vicinity of core and higher quality associated wetlands, as many of the potential prey species of Blanding's turtle are sensitive to chloride.

Tightly cluster new houses and other development features to preserve the maximum amount of unfragmented open space and reduce impacts on Blanding's turtle habitat complexes. Spatial distribution of buildings, infrastructure, and open space on development sites and in neighborhoods should be designed in consultation with a Blanding's turtle specialist.

Minimize motor vehicle traffic on roads crossing or adjoining Blanding's turtle habitat complexes. Road mortality is one of the greatest threats to Blanding's turtle populations. Adult Blanding's turtles have been observed using culverts in experimental studies (Lang 2000) and passing under highways (unpublished data, Hudsonia Ltd.); however, no drift fence and underpass system has ever been specifically constructed for Blanding's turtles and proven to function successfully. This level of uncertainty forces us to recommend that:

1. The length and width of roads, driveways, and other paved areas within the Conservation Zone be minimized to the greatest extent possible.
2. If construction of new roads or increased traffic on existing roads cannot be avoided, underpass systems be considered as a last resort in development situations.
3. Blanding's turtle underpasses be constructed and then turtle use carefully monitored wherever road improvements or maintenance coincide with a Blanding's turtle habitat complex.

Prohibit the building of new roads crossing or adjoining Blanding's turtle habitats within the 1000 m (3300 ft) Conservation Zone of a core wetland or within 200 m (660 ft) of any core wetland. This applies to public and private roads of all kinds including driveways.

Keep vehicle speeds low on entrances and internal subdivision roads by means of posted speed limits, wildlife crossing signs, and speed bumps.

Construct fences or other barriers around in-ground swimming pools to keep turtles of any size out of the pools. Fencing must exclude turtles as small as 2.5 cm (1 in) carapace length; barriers must be at least 25 cm (10 in) high to exclude turtles up to 25 cm carapace length.

Construct spaces beneath other potential barriers to turtle movement either on land or in the water, including stone walls, chain-link fences, and curbs. Spaces must be no less than 10 cm (4 in) high and no more than 25 m (82 ft) apart, to allow turtles free movement across the landscape. (See exceptions below for temporary exclusion fencing.)

Design storm drain grates such that turtles (including hatchlings of carapace length 2.5 cm [1 in]) cannot fall in, and design catch basins and storm sewers such that animals that fall through gratings can easily escape.

Install temporary exclusion fences. Under certain circumstances (to be determined by the New York State Department of Environmental Conservation or a Blanding's turtle specialist) temporary exclusion fencing should be erected around a construction site to keep Blanding's turtles out of the work area immediately preceding and during construction. This pertains especially to construction areas that are within 200 m (660 ft) of core and associated Blanding's turtle wetlands or construction areas that may be situated between wetlands and nesting areas if construction is to occur between 25 May and 10 July (inclusive dates) but may pertain to other areas as well. Temporary exclusion fencing should consist of filter fabric with the bottom buried 20 cm (8 in) deep in the soil. Gate(s) for passage of people and equipment should be designed and maintained such that turtles of all sizes are unable to pass through. Gates must be kept tightly closed at all times except when in active use.

Avoid coarse mesh backing on filter fabric silt fencing used for soil management or temporary exclusion fencing. These meshes (e.g. 2-3 cm [0.8-1.2 in] square mesh size) can trap turtles and snakes. Erosion control fabrics, geotextiles, or landscaping fabrics should be selected and installed such that they do not present an entanglement hazard to turtles.

Construct no window wells unless they are fitted either with permanent grates (maximum 2 cm [0.8 in] mesh size), or vertical lips at least 25 cm high (that adult Blanding's turtles of carapace length up to 25 cm cannot climb over).

Enforce immediate (same day) backfilling of any excavations (soil test pits, foundation holes, utility ditches, etc.), or else install gently-sloping (e.g. 30^{o} or less from horizontal) earthen or wooden ramps to allow turtles and other animals to climb out.

Train equipment operators and comparable personnel to watch for Blanding's turtles and move them safely out of the way to reduce the risks of injury or death to the turtles from construction equipment, mowing machinery of all kinds, automobiles, and farm equipment. This is especially important during the nesting season (25 May through 10 July) and the period of hatchling emergence (15 August through 27 September).

Protect and restore the "tree fringe" around the margins of core and associated wetlands.

Instruct workers and residents to look for turtles under cars, construction equipment, or mowing machines before operating or driving. Blanding's turtles often rest beneath vehicles, especially during the nesting season. Blanding's turtles may rest beneath parked cars in driveways, enter open garages, hide beneath wood piles or brush piles, or rest concealed or partially covered in leaf litter or grass clippings, beneath shrubs, or next to logs.

Provide educational materials on the Blanding's turtle to construction workers and residents. Suitable materials include the color-illustrated pamphlet "Blanding's turtle" (Hartwig et al. 2006) and the article "Tale of Two Turtles" (Kiviat 1993), available from Hudsonia.

Hartwig, T.S., G. Stevens, and E. Kiviat. 2006. The Blanding's turtle. New York State Office of Parks, Recreation, and Historic Preservation, Albany, NY. Brochure.

Kiviat, E. 1993. A tale of two turtles; Conservation of the Blanding's turtle and bog turtle. News from Hudsonia 9(3):1-6.

Lang, J.W. 2000. Blanding's turtles, roads, and culverts at Weaver Dunes. Unpublished report to the Minnesota Department of Natural Resources, Contract No. A09492. 30 p.

For more information, see: Hartwig, T., G. Stevens, J. Sullivan, and E. Kiviat. 2009. Blanding's turtle habitats in southern Dutchess County. Report to the Marilyn Milton Simpson Charitable Trusts and NYS DEC Hudson River Estuary Program. Hudsonia Ltd., Annandale, NY.

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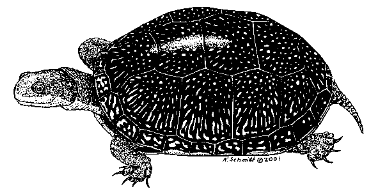

Backyard Turtle Conservation:
Recommendations for Landowners

The conservation of Blanding's turtles in Dutchess County will require long-term protection of wetland and upland habitat complexes that can accommodate the various needs of the turtles. These complexes must include different kinds of wetlands for overwintering, foraging, and refuge from drought, as well as suitable upland nesting sites and safe corridors for travel between habitats.

Anyone living within the range of Blanding's turtles in Dutchess County, or who is concerned about all species of turtles, can take steps in their everyday life to help protect turtles. Many of these steps will also protect other wildlife, including other species of reptiles and amphibians, small mammals, and birds, which face many of the same threats as the Blanding’s turtle.

- During the active season (April-October), check for turtles underneath your parked car before driving.

- Drive carefully to avoid accidents with turtles and other wildlife. If you see a “rock” in the road, slow down—it may be a turtle! When you encounter a turtle on the road, stop and move it off the road in the direction it was heading. Do not take it home or move it more than 90 m (300 ft). Be careful not to endanger yourself in traffic.

- Watch for turtles when mowing or using motorized equipment, especially during the June nesting season when Blanding's turtles may be traveling long distances overland.

- Eliminate pitfall hazards such as abandoned swimming pools, open excavations, unscreened window wells, ditches, and unscreened storm drains which can trap turtles and other small animals. In-ground swimming pools that are in use should have fencing with spaces less than 2.5 cm (1 in) apart to keep small turtles and other animals out.

- Alter vertical barriers such as stone walls, stockade fences, or chain-link fences so that turtles can pass under them. Spaces should be no less than 10 cm (4 in) high and no more than 25 m (82 ft) apart, to allow turtles and other wildlife free movement across the landscape.

- ♦ Create no new lawn areas. Consider natural landscaping, such as shrub thickets, sparse wildflower/grass gardens, and brush piles to replace parts of your current lawn.

- ♦ If you have a dirt pile or other areas of loose, exposed soil, refrain from digging in it between May 26 and September 30. If you have a garden, consider fencing it. Otherwise, you may accidentally dig up turtle eggs!

- ♦ Keep cats indoors during the active season (April to October) or supervise them when they are outdoors. Supervise dogs when they are outdoors. Cats and dogs may harass or injure small and adult turtles and are known to kill hatchlings of many species of turtles (Mitchell and Klemens 2000). Keeping cats indoors and supervising dogs outdoors not only contributes to the safety of your pet and Blanding's turtles, but also protects many other wildlife species; see www.abcbirds.org/abcprograms/policy/cats/index.html or www.audubon.org/bird/at_home/SafeCats.html for more information on the contribution of domestic animals towards the decline of wildlife species and on turning your outdoor cat into a happy, safe indoor cat.

- ♦ Refrain from using pesticides, herbicides, and other toxic substances on your lawn or garden; instead use the many natural alternatives now available.

- ♦ Dump no toxic substances, such as used motor oil, antifreeze, or cleaning products, outside. These are toxic to turtles and other wildlife, and could potentially contaminate your drinking water. Dispose of them properly, according to the manufacturer's instructions.

- ♦ Keep garbage lidded and compost piles contained and feed pets indoors to discourage predators of turtle eggs and hatchlings, such as raccoons, skunks, and opossums.

- ♦ Do not collect turtles. Protect turtles from collectors, and help to educate would-be turtle collectors. The New York Environmental Conservation Law imposes a fine of up to $1000 per occurrence for collecting without a permit, harassing, or killing a Blanding's turtle.

- ♦ Protect wetlands, streams, and upland areas from drainage, channelization, filling, dumping, pollution, and other damage. According to state law, it is illegal to modify any wetland known to be used by Blanding's turtles.

- ♦ Encourage your Planning Board and Conservation Advisory Council to incorporate Blanding's turtle habitat protection measures into their planning and decision-making.

♦ Contact Hudsonia if you would like more information on designing land use changes on your property to accommodate Blanding's turtles.

If you find a Blanding's turtle, please do the following:
1. Make a written note of the exact location, date, and number if it is tagged. If possible, take a photograph or make a sketch of the turtle for verification purposes.
2. As soon as possible, report this information to Hudsonia (845-758-0600).
3. If the turtle is in an area of high risk, move it a short distance out of harm's way but do not take it away with you.

Mitchell, J.C. and M.W. Klemens. 2000. Primary and secondary effects of habitat alteration. P. 5-32 in: M.W. Klemens, ed. Turtle Conservation. Smithsonian Institution Press, Washington, DC.

For more information, see: Hartwig, T., G. Stevens, J. Sullivan, and E. Kiviat. 2009. Blanding's turtle habitats in southern Dutchess County. Report to the Marilyn Milton Simpson Charitable Trusts and NYS DEC Hudson River Estuary Program. Hudsonia Ltd., Annandale, NY.

CONCLUSIONS

In the suburban and rural landscapes of southern Dutchess County there are still significant opportunities for Blanding's turtle conservation. Although land development has disturbed and fragmented many habitats, strategic land use and conservation planning can mitigate past damages, prevent future damage, and ensure that Blanding's turtles and their ecosystems are protected for the long term. Through our habitat mapping work, Hudsonia hopes to equip town agencies, state agencies, local residents, and others with baseline information about local Blanding's turtle habitats so they can take steps to protect these resources.

The "habitat approach" to conservation, however, is quite different from the traditional parcel-by-parcel approach to land use decision-making. It requires examining the landscape beyond the boundaries of any particular land parcel, and considering the size and juxtaposition of habitats in the landscape, the kinds of biological communities and species they support, and the ecological processes that help to maintain those species. After conveying the completed Blanding's turtle habitat map, GIS database, and report to the six towns of the study area, Hudsonia hopes to have the opportunity to assist town officials, local landowners, and other interested individuals and groups in interpreting the map, understanding how Blanding's turtle habitats relate to the landscape, and devising ways to integrate this new information into land-use planning and decision making.

We believe that the town-wide habitat map is an invaluable tool for land use and conservation planning. The map provides a bird's-eye view of the landscape, illustrating the location and configuration of Blanding's turtle habitats in relation to other habitats and cultural features. At the printed scale of 1:10,000, many interesting ecological and land-use patterns emerge, such as the location and extent of nesting sites, the areas where core habitats are concentrated, and the patterns of habitat fragmentation caused by roads and residential development. This kind of general information can help the town think about where future development should be concentrated and where future conservation efforts for the Blanding's turtle should be targeted.

At the site-specific scale, we hope the map will be used as a resource for routine deliberations over development proposals and other proposed land use changes. The map and report bring an independent body of information to environmental reviews, and will help users raise questions about important biological resources that might otherwise be overlooked. We strongly emphasize, however, that the map has not been exhaustively field-checked and should therefore be used only for general planning purposes. In an area proposed for development, for example, the habitat map can illustrate the general locations of potential Blanding's turtle habitats. The map, however, should never be considered a substitute for a site visit by a qualified Blanding's turtle biologist. During site visits, the presence and boundaries of important habitats can be verified and the site can be assessed for habitat quality and additional ecological values. This detailed, up-to-date information is essential to making informed decisions about specific development proposals. Because the natural landscape and patterns of human land use are dynamic, it is important for the town to consider refining and/or updating the habitat map over time.

Conservation of habitats is one of the best ways to protect biological resources. Incorporating this approach into planning and decision making will help to minimize the adverse effects of human activities, to integrate the needs of the human community with those of the natural landscape, and to protect the ecological patterns and processes that support the human community and the rest of the living world.

ACKNOWLEDGEMENTS

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REFERENCES CITED

Blanding's Turtle Recovery Team. 2003. National recovery plan for the Blanding's turtle (*Emydoidea blandingii*) Nova Scotia population. Final draft. Nova Scotia, Canada. 54 p.

Butler, B.O. 1995. Report of Blanding's turtle study, 1992-1994. Fort Devens Tactical Training Area, Lancaster, Massachusetts. Final Report to Natural Resources Office, Fort Devens, Massachusetts; Massachusetts Natural Heritage Program and the Nature Conservancy. Oxbow Wetlands Associates, Lunenburg, MA. 34 p.

Butler, B.O. 1997. Blanding's turtles at Fort Devens, Massachusetts, USA: a case of "mutualism" between turtles and tanks. P. 59-60 in: J. van Abbema, ed. Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles—An International Conference. New York Turtle and Tortoise Society, New York City.

Cadwell, D.H, G.G. Connally, R.J. Dineen, P.J. Fleisher, M.L. Fuller, L. Sirkin, and G.C. Wiles. 1989. Surficial geologic map of New York (Lower Hudson sheet). Map and Chart Series 40, 1:250,000, 100 ft. contour. New York State Museum, Albany.

Congdon, J.D., and J.W. Gibbons. 1996. Structure and dynamics of a turtle community over two decades. P. 137-159 in: M.L. Cody and J.A. Smallwood, eds. Long-Term Studies of Vertebrate Communities. Academic Press, San Diego.

Congdon, J.D., R.D. Nagle, O.M. Kinney, M. Osentoski, H.W. Avery, R.C. van Loben Sels, and D.W. Tinkle. 2000. Nesting ecology and embryo mortality: Implications for hatchling success and demography of Blanding's turtles (*Emydoidea blandingii*). Chelonian Conservation and Biology 3(4):569-579.

Eckler, J. and A. Breisch. 1988. The Blanding's turtle (*Emydoidea blandingii*) in a Dutchess County Nature Conservancy preserve. Unpublished report to the New York Field Office of the Nature Conservancy. 12 p.

Ernst, C.H., J.E. Lovich, and R.W. Barbour. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington, DC. 578 p.

Faber, M. 2002. Soil survey of Dutchess County, New York. USDA, Natural Resources Conservation Service, in cooperation with Cornell University Agricultural Experiment Station. 356 p. + maps.

Farrar, J. 2003. Last stand for Blanding's turtles? Nebraskaland 81(6):28-35.

Fisher, D.W., Y.W. Isachsen, and L.V. Rickard. 1970. Geologic map of New York (Lower Hudson Sheet). Map and Chart Series 15. 1:250,000, 100 ft. contour. New York State Museum and Science Service, Albany.

Hall, C. and F.J. Cuthbert. 2000. Impacts of a controlled wetland drawdown on Blanding's turtles in east-central Minnesota. Chelonian Conservation and Biology 3(4):643-649.

Hartwig, T.S. 2004. Habitat selection of Blanding's turtle (*Emydoidea blandingii*): a range-wide review and microhabitat study. M.S. Thesis, Bard College, Annandale, NY.

Hartwig, T.S., and E. Kiviat. 2007. Microhabitat association of Blanding's turtles in natural and constructed wetlands in southeastern New York. Journal of Wildlife Management 71(2):576-582.

Hartwig, T.S., G. Stevens, and E. Kiviat. 2006. The Blanding's turtle. New York State Office of Parks, Recreation, and Historic Preservation, Albany, NY. Brochure.

Herman, T.B., T. D. Power, and B.R. Eaton. 1994. Status of Blanding's turtles, *Emydoidea blandingii*, in Nova Scotia, Canada. The Canadian Field-Naturalist 108:182-191.

Joyal, L.A., M. McCollough, and M.L. Hunter, Jr. 2000. Population structure and reproductive ecology of Blanding's turtle (*Emydoidea blandingii*) in Maine, near the northeastern edge of its range. Chelonian Conservation and Biology 3(4):580-588.

Joyal, L.A., M. McCollough, and M.L. Hunter, Jr., 2001. Landscape ecology approaches to wetland species conservation: A case study of two turtle species in southern Maine. Conservation Biology 15(6):1755-1762.

Kiviat, E. 1993. A tale of two turtles: Conservation of the Blanding's turtle and bog turtle. News from Hudsonia 9(3):1-6.

Kiviat, E. 1997. Blanding's turtle habitat requirements and implications for conservation in Dutchess County, New York. P. 377-382 in: J. van Abbema, ed. Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles—An International Conference. New York Turtle and Tortoise Society, New York City.

Kiviat, E. 2003. Wetland Assessment of the proposed Mill Brook Greenway, Village and Town of New Paltz, Ulster County, New York. Report to the Village of New Paltz and the Town of New Paltz, New Paltz, New York. Hudsonia Ltd., Annandale, NY. 19 p.

Kiviat, E. and G. Stevens. 2001. Biodiversity assessment manual for the Hudson River estuary corridor. New York State Department of Environmental Conservation, Albany, NY. 508 p.

Kiviat, E. and G. Stevens. 2003. Environmental deterioration of the outwash plains: necropsy of a landscape. News from Hudsonia 18(1):1,3-5.

Kiviat, E., G. Stevens, R. Brauman, S. Hoeger, P.J. Petokas & G.G. Hollands. 2000. Restoration of wetland and upland habitat for Blanding's turtle. Chelonian Conservation and Biology 3(4):650-657.

Kiviat, E, G. Stevens, K.L. Munger, L.T. Heady, S. Hoeger, P.J. Petokas, and R. Brauman. 2004. Blanding's turtle response to wetland and upland habitat construction. Conservation and Ecology of Turtles of the Mid-Atlantic Region: A Symposium. Patuxent Wildlife Refuge, Laurel, MD. Oct. 1999. Salt Lake City, UT.

Kofron, C.P. and A.A. Schreiber. 1985. Ecology of two endangered aquatic turtles in Missouri: *Kinosternon flavescens* and *Emydoidea blandingii*. Journal of Herpetology 19(1):27-40.

Lang, J.W. 2000. Blanding's turtles, roads, and culverts at Weaver Dunes. Unpublished report to the Minnesota Department of Natural Resources, Contract No. A09492. 30 p.

Lang, J.W. 2001. Why do turtles cross the road? Minnesota Conservation Volunteer 64(376):38-47.

Lang, J.W. 2003. Blanding's turtle studies in southwestern Minnesota in 2002-2003. Unpublished report to the Minnesota Department of Natural Resources, Contract No. A344698. 7 p.

Levine, E. (ed.). 1998. Bull's birds of New York State. Comstock Publishing Associates, Ithaca. 622 p.

Linck, M.H., J.A. DePari, B.O. Butler, and T.E. Graham. 1989. Nesting behavior of the turtle, *Emydoidea blandingii*, in Massachusetts. Journal of Herpetology 23(4):442-444.

McNeil, J.A. 2002. Distribution, movements, morphology and reproduction in a population of Blanding's turtle (*Emydoida blandingii*) in an unprotected landscape in southwestern Nova Scotia. M.S. Thesis, Acadia University, Wolfville, Nova Scotia.

Metropolitan Conservation Alliance. 2002. Conservation overlay district: A model local law. Technical Paper Series, No. 3. Wildlife Conservation Society, Bronx, NY. 46 p.

Mitchell, J.C. and M.W. Klemens. 2000. Primary and secondary effects of habitat alteration. P. 5-32 in: M.W. Klemens, ed. Turtle Conservation. Smithsonian Institution Press, Washington, DC.

Mitchell, R.S. and G. C. Tucker. 1997. Revised checklist of New York State plants. Bulletin No. 490, New York State Museum, Albany, NY. 400 p.

Percival, R.V., A.S. Miller, C.H. Schroeder, and J.P. Leape. 1996. Environmental regulation: law, science, and policy. 2nd edition. Aspen Law & Business, Aspen Publishers, Inc., New York.

Petokas, P.J. 1986. Patterns of reproduction and growth in the freshwater turtle *Emydoidea blandingii*. Ph.D. Thesis, State University of New York, Binghamton.

Piepgras, S.A. and J.W. Lang. 2000. Spatial ecology of Blanding's turtle in central Minnesota. Chelonian Conservation and Biology 3(4):589-601.

Power, T.D. 1989. Seasonal movements and nesting ecology of a relict population of Blanding's turtle (*Emydoidea blandingii* (Holbrook)) in Nova Scotia. M.S. Thesis, Acadia University, Wolfville, Nova Scotia.

Power, T.D., T.B. Herman, and J. Kerekes. 1994. Water colour as a predictor of local distribution of Blanding's turtles, *Emydoidea blandingii*, in Nova Scotia. The Canadian Field-Naturalist 108:17-21.

Ross, D.A. and R.K. Anderson. 1990. Habitat use, movements, and nesting of *Emydoidea blandingii* in central Wisconsin. Journal of Herpetology 24(1):6-12.

Rowe, J.W. and E.O. Moll. 1991. A radiotelemetric study of activity and movements of the Blanding's turtle (*Emydoidea blandingii*) in northeastern Illinois. Journal of Herpetology 25(2):178-185.

Rubin, C.S., Warner, R.E., and Ludwig, D.R. 2001. Habitat use and movements of radiotagged Blanding's turtles (*Emydoidea blandingii*) in a suburban landscape. Chelonian Conservation and Biology 4(1):136-141.

Sajwaj, T., S.A. Piepgras, and J.W. Lang. 1998. Blanding's turtle (*Emydoidea blandingii*) at Camp Ripley: Critical habitats, population status, and management guidelines. Final Report to the Nongame Wildlife Office, Minnesota Department of Natural Resources, Brainerd, MN. 59 p.

Standing, K.L., T.B. Herman, and I.P. Morrison. 1999. Nesting ecology of Blanding's turtle (*Emydoidea blandingii*) in Nova Scotia, the northeastern limit of the species' range. Canadian Journal of Zoology 77:1609-1614.

Standing, K.L., T.B. Herman, M. Shallow, T. Power, and I.P. Morrison. 2000. Results of the nest protection program for Blanding's turtle in Kejimkujik National Park, Canada: 1987-1997. Chelonian Conservation and Biology 3(4): 637-642.

Stevens, G. and E. Broadbent. 2002. Significant habitats in the Town of East Fishkill, Dutchess County, New York. Report to the Marilyn Milton Simpson Charitable Trusts. Hudsonia Ltd., Annandale, NY. 61 p.

Tabak, N., K. Bell, and G. Stevens. 2006. Significant habitats in the Town of Amenia, Dutchess County, New York. Report to the Town of Amenia, the Millbrook Tribute Garden, the Dyson Foundation, and the Dutchess Land Conservancy. Hudsonia Ltd., Annandale, NY. 133 p.

Tollefson, J. and G. Stevens. 2004. Significant habitats in the Town of Washington, Dutchess County, New York. Report to the Town of Washington, the Millbrook Tribute Garden, the Dyson Foundation, and the Dutchess Land Conservancy. Hudsonia Ltd, Annandale, NY. 89 p.

Wilder, T.T. 2003. Summary of Blanding's and wood turtle surveys and monitoring on Fort McCoy, Wisconsin. Biological and Cultural Resources Section, Fort McCoy, WI. 46 p.

Appendix A

Common and scientific names of plants and animals mentioned in this report. Scientific plant names follow the nomenclature of Mitchell and Tucker (1997) and scientific bird names follow Levine (1998).

Common Name	Scientific Name
Plants	
ash, green	*Fraxinus pensylvanica*
azalea, swamp	*Rhododendron viscosum*
blueberry, highbush	*Vaccinium corymbosum*
buttonbush	*Cephalanthus occidentalis*
coontail, spiny	*Ceratophyllum echinatum*
dodder, buttonbush	*Cuscuta cephalanthi*
duckweed, greater	*Spirodela polyrhiza*
duckweed, lesser	*Lemna minor*
foxtail, short-awn	*Alopecurus aequalis*
grass, pale alkali-	*Torreyochloa pallida* v. *pallida*
loosestrife, purple	*Lythrum salicaria*
(a liverwort, floating)	*Riccia fluitans*
(a liverwort, floating)	*Ricciocarpus natans*
maple, red	*Acer rubrum*
(a moss)	*Helodium paludosum*
Animals	
duck, American black	*Aix rubripes*
duck, wood	*Aix sponsa*
fox, red and gray	*Vulpes vulpes, Urocyon cinereoargenteus*
mallard	*Aix platyrhynchos*
opossum	*Didelphis virginiana*
raccoon	*Procyon lotor*
salamanders, mole	*Ambystoma* spp.
skunk, striped	*Mephitis mephitis*
turtle, spotted	*Clemmys guttata*

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

DECinfo Locator

Base Map: Topographical

Help

Search

Tools

DEC Information Layers

Environmental Quality | Outdoor Activity

Permits and Registrations

Environmental Cleanup

Environmental Monitoring

Information

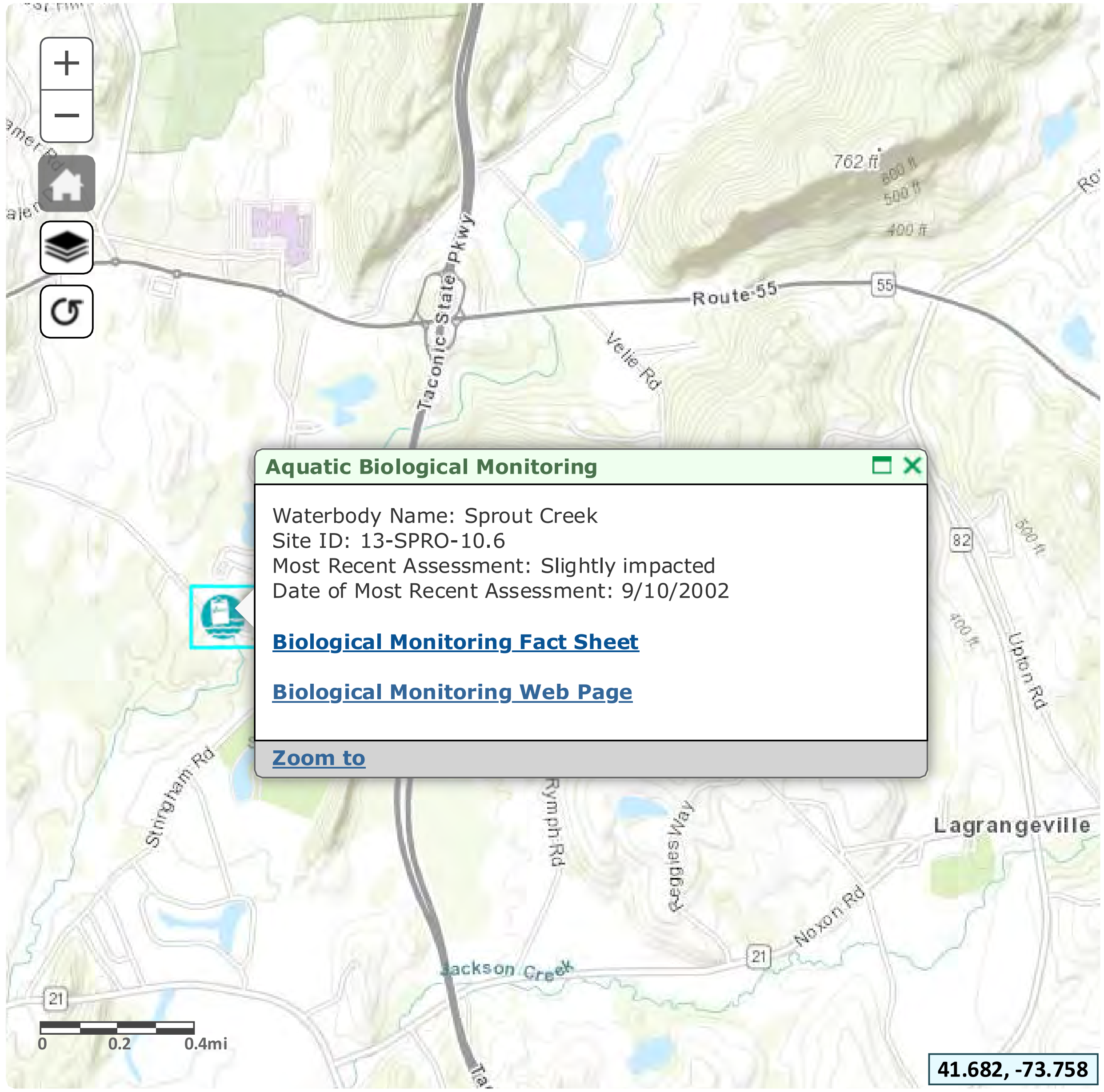
- [ ] **Lakes and Reservoirs**
- [ ] **Estuaries**
- [ ] **Rivers and Streams**
- [ ] **Shorelines**
- [ ] **Air Quality Monitoring Sites**
- [x] **Aquatic Biological Monitoring**
- [ ] **Aquatic Toxicity Monitoring**

Public Involvement

Environmentally Sensitive Areas

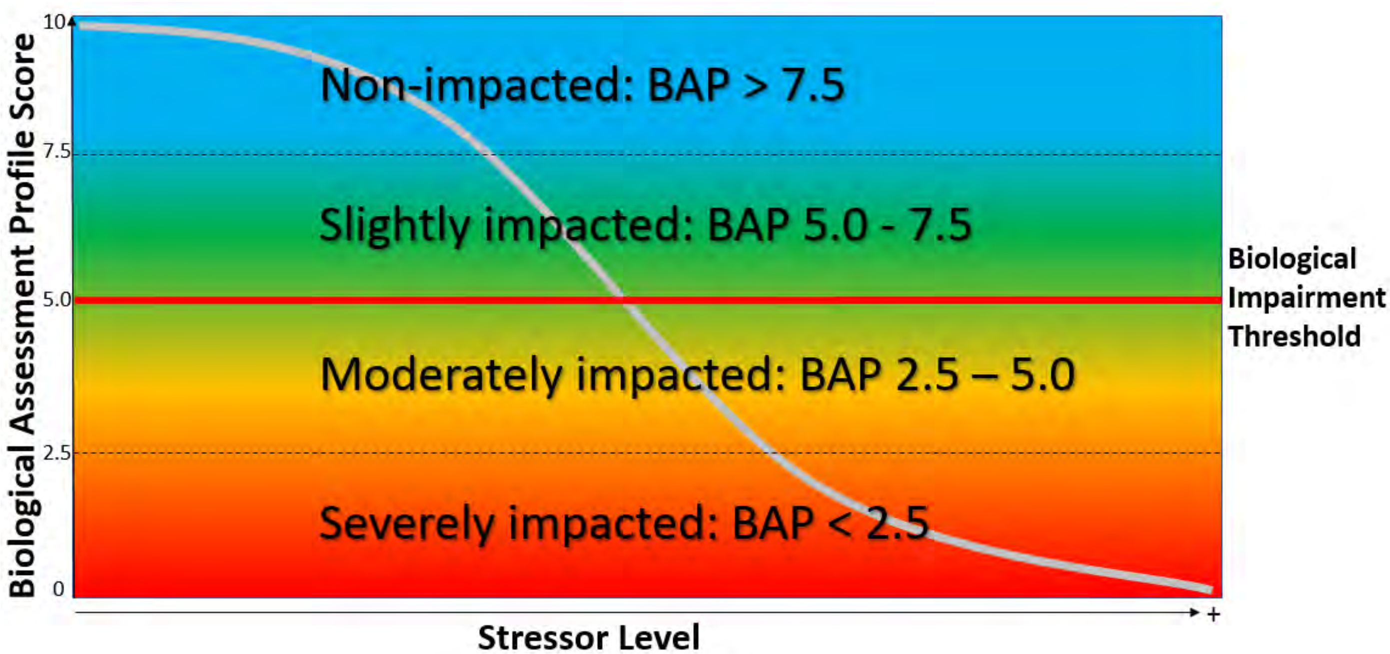
Legal Information

Reference Layers



Fact Sheet on Assessment of Water Quality Impact in Streams and Rivers

The assessment of stream and river water quality uses a four-tiered system of impact categorization based on the macroinvertebrate community. Macroinvertebrates provide an accurate means of water quality assessment by integrating the overall effects of multiple stressors to the community. Level of impact is assessed by first evaluating individual community metrics on a common 10-scale and the averaging them to yield a determination known as the Biological Assessment Profile (BAP) score. A BAP score of 5 or better is indicative of non or slightly impacted conditions and a value below 5 indicates moderate or severely impacted conditions and suggests biological impairment. The figure below illustrates as stressor levels increase, BAP scores decrease.



Various combinations of individual metrics are used to calculate the BAP score and are dependent upon the type of surface water and the method of sample collection. These metrics include: species richness, EPT richness, Hilsenhoff's biotic index, percent model affinity, nutrient biotic index, species diversity, and non-Chironomidae and Oligochaeta richness (See Glossary). Because metrics measure different aspects of the macroinvertebrate community, they do not necessarily form a consensus. A summary of impact categories in included below but for detailed information on New York State's biological monitoring program, including collection and assessment methods, see Standard Operating Procedure: Biological Monitoring of Surface Waters in New York State SOP #208-16, available for download from DEC's website. Glossary available on page 6.

Non-Impacted Category (BAP ≥ 7.5)

Metrics reflect very good water quality. The biological community is diverse, and virtually unaffected by human disturbance. Water quality should not be limiting to fish, shellfish, and wildlife propagation or survival. This level of water quality includes both pristine habitats and those receiving discharges which minimally alter the biota.

Riffle Habitats:

- Species Richness is ≥ 26
- Hilsenhoff Biotic Index is ≤ 4.5
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is ≥ 15
- Percent Model Affinity is ≥ 64
- Nutrient Biotic Index is ≤ 5.0

Multiplate Samples from Navigable Waters:

- Species Richness is ≥ 21
- Hilsenhoff Biotic Index is ≤ 7.0
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is ≥ 5
- Species Diversity is ≥ 3.0

Multiplate Samples from Non-Navigable Waters

- Species Richness is ≥ 26
- Hilsenhoff Biotic Index is ≤ 4.5
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is ≥ 10
- Species Diversity is ≥ 4.0

Low Gradient Streams:

- Species Richness is ≥ 21
- Hilsenhoff Biotic Index is ≤ 5.5
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is ≥ 5
- Non-Chironomidae and Oligochaeta Richness is ≥ 10

Slightly-Impacted Category

Metrics reflect good water quality. The biological community is slightly, but significantly altered from the pristine state. Water quality is usually not limiting to fish, shellfish, and wildlife survival, but may be limiting to fish propagation, especially sensitive coldwater fish taxa.

Riffle Habitats:

- Species Richness is 18 - 25
- Hilsenhoff Biotic Index is 4.4 - 6.5
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is 10 - 14
- Percent Model Affinity is 49 - 63
- Nutrient Biotic Index is 5.1 – 6.0

Multiplate Samples from Navigable Waters:

- Species Richness is 16 - 20
- Hilsenhoff Biotic Index is 7.1 – 8.0
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is 3 - 4
- Species Diversity is 2.5 – 2.9

Multiplate Samples from Non-Navigable Waters

- Species Richness is 18 - 25
- Hilsenhoff Biotic Index is 4.6 – 6.5
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is 5 - 9
- Species Diversity is 3.9 – 3.0

Low Gradient Streams:

- Species Richness is 16 - 20
- Hilsenhoff Biotic Index is 5.6 – 7.0
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is 3 - 4
- Non-Chironomidae and Oligochaeta Richness is 5 - 9

Moderately Impacted Category

Metrics reflect poor water quality. The biological community is altered to a large degree from the pristine state. Water quality often is limiting to fish, shellfish, and wildlife propagation, but usually not to survival.

Riffle Habitats:

- Species Richness is 10 - 17
- Hilsenhoff Biotic Index is 6.4 – 8.5
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is 5 - 9
- Percent Model Affinity is 34 - 48
- Nutrient Biotic Index is 6.1 – 7.0

Multiplate Samples from Navigable Waters:

- Species Richness is 11 - 15
- Hilsenhoff Biotic Index is 8.1 – 9.0
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is 1 - 3
- Species Diversity is 2.0 – 2.4

Multiplate Samples from Non-Navigable Waters

- Species Richness is 10 - 17
- Hilsenhoff Biotic Index is 6.6 – 8.0
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is 1 - 4
- Species Diversity is 2.0 – 2.9

Low Gradient Streams:

- Species Richness is 11 - 15
- Hilsenhoff Biotic Index is 7.1 – 8.5
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is 1 - 2
- Non-Chironomidae and Oligochaeta Richness is 1 - 4

Severely Impacted Category

Metrics reflect very poor water quality. The biological community is limited to a few tolerant species. The dominant species are almost all tolerant. Often 1-2 species are very abundant. Water quality is often limiting to both fish, shellfish, and wildlife propagation and survival.

Riffle Habitats:

- Species Richness is ≤ 10
- Hilsenhoff Biotic Index is ≥ 8.5
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is ≤ 5
- Percent Model Affinity is ≤ 34
- Nutrient Biotic Index is ≥ 7.0

Multiplate Samples from Navigable Waters:

- Species Richness is ≤ 11
- Hilsenhoff Biotic Index is ≥ 9.0
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is ≤ 1
- Species Diversity is ≤ 2.0

Multiplate Samples from Non-Navigable Waters

- Species Richness is ≤ 10
- Hilsenhoff Biotic Index is ≥ 8.0
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is ≤ 1
- Species Diversity is ≤ 2.0

Low Gradient Streams:

- Species Richness is ≤ 11
- Hilsenhoff Biotic Index is ≥ 8.5
- EPT (Ephemeroptera, Plecoptera and Trichoptera) Richness is ≤ 1
- Non-Chironomidae and Oligochaeta Richness is ≤ 1

Glossary

Assessment: Diagnosis or evaluation of water quality

Biological Assessment Profile (BAP): a multimetric index of biological integrity used in NYS to translate macroinvertebrate community data into numerical water quality score between 0 (poor) and 10 (very high).

Hilsenhoff's Biotic Index: A measure of the condition of a biological community representing the degree of environmental disturbance on that community. Biotic indices are often used to determine the impact of water pollution on aquatic life based on various characteristics of the community present.

Community: Group of populations of organisms interacting in a habitat

Discharge: Stream and river discharge is a measure of the volume of water passing a specific location over a specified unit of time. Discharge is therefore the product of stream velocity times stream depth times stream width.

EPT richness: Number of taxa of mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) in a sample or subsample

Impact: Change in the physical, chemical or biological condition of a waterbody

Impairment: Detrimental effect caused by an impact

Index (pl. 'indices'): Number, metric or parameter derived from sample data used as a measure of water quality

Macroinvertebrate: Larger-than-microscopic invertebrate animal that lives at least part of its life in aquatic habitats

Metric: an attribute of a biological community that is sensitive to changes in water quality

Multiplate: Multiple-plate sampler, a type of artificial substrate sampler of aquatic macroinvertebrates

Non-Chironomidae and Oligochaeta: number of taxa in the sample excluding those in the Chironomidae family and Oligochaeta subclass

Nutrient Biotic Index: A measure of the macroinvertebrate community response to phosphorus developed specifically for use in NYS streams and rivers.

Organism: Living individual

Percent Model Affinity: Is a measure of similarity to a model non-impacted benthic macroinvertebrate community based on percent abundance in 7 major groups. This measure is described in detail in Novak, M.A. and R.W. Bode. 1992. Percent model affinity, a new measure of macroinvertebrate community composition. J. North American Benthological Society 11(1):80-85.

Pristine: Condition with the same physical, chemical, and biological characteristics as found in habitats free of measurable effects of human activity.

Riffle: Wadeable stretch of stream, usually with a rubble bottom and sufficient current to break the water surface by the flow; rapids

Species richness: Number of macroinvertebrate taxa in a sample or subsample

Species Diversity: Shannon diversity index, a metric accounting for both abundance and evenness of species present

Tolerant: Ability to survive poor water quality

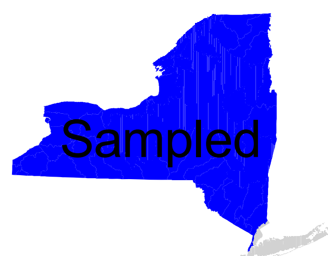
New York State Groundwater Assessment

Each day, ground water directly touches the lives of approximately six million New York State residents, or about one-third of the state's population, as their source of residential drinking water using an estimated average 110 gallons per day each. This and an untold number of additional state and non-state residents also incorporate New York's ground water into their daily activities, while away from home, to an extent that is often unseen. This may include use at work, school, recreation, or leisure activities, and amounts associated with the manufacture or production of goods and services.[1]

New York's population dependence on ground water is considerable (Figure 1). Of New York State's 62 counties a total of 27 (44%) are more than half dependent on ground water for their combined public and self-supplied domestic water needs. Even more telling, seven counties (Cortland, Nassau, Queens, Suffolk, Schenectady, Chenango, and Tioga) representing a population of 5.3 million people, are more than 95% dependent on ground water.

New York State's considerable dependence on ground water points out the critical need to protect the quality of this vital resource. The following sections focus on potential sources of contamination that commonly threaten ground water and the programs or activities New York State has established to minimize the effects these potential sources will have on the state's ground water resource. Table 1 lists major sources of ground water contamination indicating the top 10 considered to be of highest concern. Table 2 provides a listing of superfund registry and non-registry remediation sites providing an indication of the extent of ground water contamination in NYS.

New York continues to make progress in assessing ambient ground water quality across the state through the establishment of a basin approach to ground water sampling. As with the surface water program, ground water sampling is planned for each of NY's 8-digit Hydrologic Unit Code (HUC) basins over a five year period. The studies are being conducted jointly with USGS. As of the start of 2010, New York has conducted ambient ground water quality monitoring in 46 of the state's 51 8-digit HUCs representing 96% of the state. A summary of individual studies for the 2003-2007 sampling efforts is included at the end of this chapter. Final reports for the 2008 studies are expected in the near future with 2009 study reports due out next year.



[1] Estimated Use of Water in the United States in 2000; USGS CIR 1268; 2004

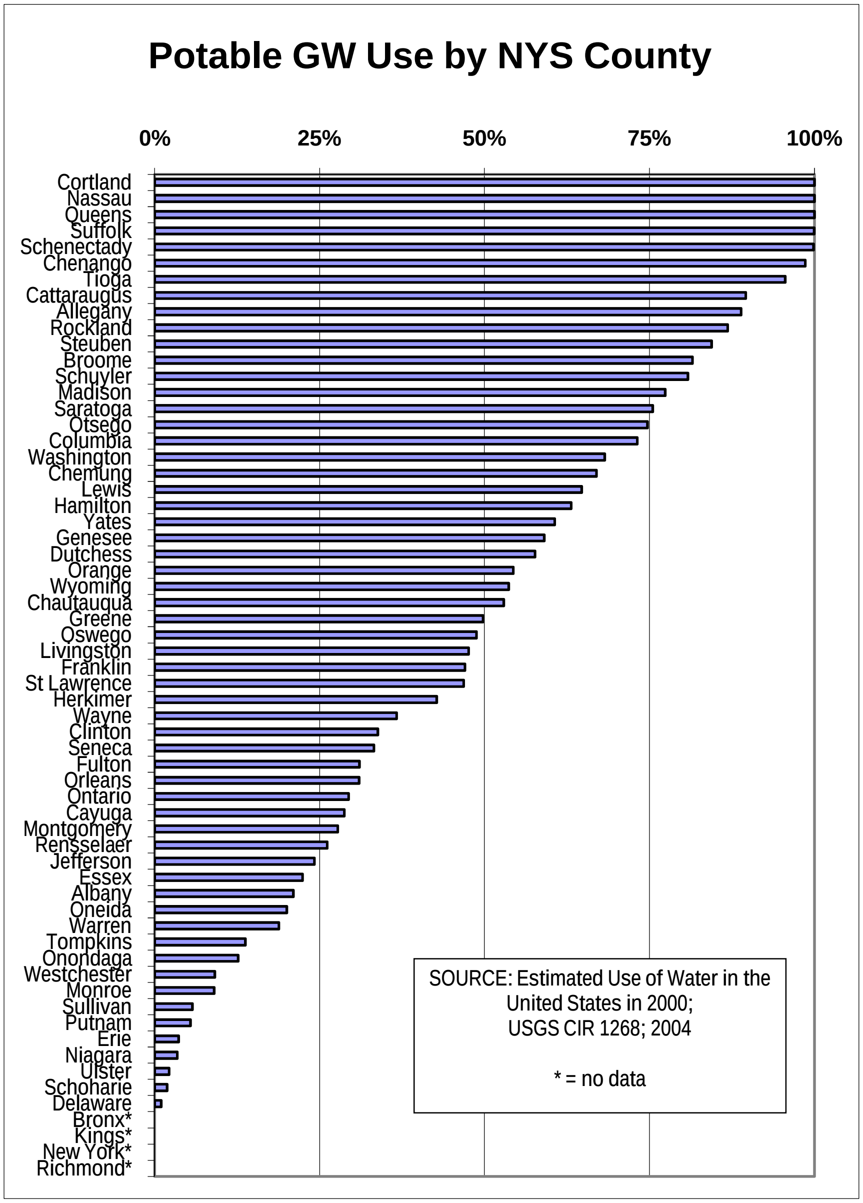

Potable GW Use by NYS County
0%
25%
50%
75%
100%
Cortland
Nassau
Queens
Suffolk
Schenectady
Chenango
Tioga
Cattaraugus
Allegany
Rockland
Steuben
Broome
Schuyler
Madison
Saratoga
Otsego
Columbia
Washington
Chemung
Lewis
Hamilton
Yates
Genesee
Dutchess
Orange
Wyoming
Chautauqua
Greene
Oswego
Livingston
Franklin
St Lawrence
Herkimer
Wayne
Clinton
Seneca
Fulton
Orleans
Ontario
Cayuga
Montgomery
Rensselaer
Jefferson
Essex
Albany
Oneida
Warren
Tompkins
Onondaga
Westchester
Monroe
Sullivan
Putnam
Erie
Niagara
Ulster
Schoharie
Delaware
Bronx*
Kings*
New York*
Richmond*
SOURCE: Estimated Use of Water in the United States in 2000; USGS CIR 1268; 2004
* = no data

Figure 1

Overview of Ground Water Contamination Sources

Table 1: Major Sources of Ground Water Contamination

Contaminant Source	Ten Highest-Priority Sources (√)[1]	Factors Considered in Selecting a Contaminant Source[2]	Contaminants [3]
Agricultural Activities			
Agricultural chemical facilities			
Animal feedlots			
Drainage wells			
Fertilizer applications			
Irrigation practices			
Pesticide applications	√	A, B, E, H	A, B
On-farm agricultural mixing and			
Land application of manure			
Storage and Treatment Activities			
Land appl. (Regulated/ Permitted)			
Material stockpiles			
Storage tanks (above ground)			
Storage tanks (underground)	√	A, H	A, B, C, D
Surface impoundments			
Waste piles/ Waste tailings			
Disposal Activities			
Deep injection wells			
Landfills	√	A, E	C, D, H
Septic systems	√	A, B, H	E, J, L, C
Shallow injection wells			
Other			
Hazardous waste generators	√	A, H	C, D, H
Hazardous waste sites	√	A, E	C, D, H
Large industrial facilities			
Material transfer operations			
Mining and mine drainage			
Pipelines and sewer lines			
Salt storage and road salting			
Salt water intrusion			
Spills	√	A, H	A, B, C, D
Transportation of materials			
Urban runoff			
Small-scale manuf. / repair shops	√	A, H	C, D, H
Other sources (state added)			
Abandoned Oil & Gas Wells	√	A, E	D
Radon	√	A, B, F	I

Notes for Table 1

1. A check (**√**) indicates up to ten contaminant sources identified as highest priority in New York State. Ranking is not indicated.

2. Factor(s) used to select each of the contaminant sources, denoted by corresponding letter (A through I) and listed in order of importance. Additional or special factors of importance within New York State are described in accompanying narrative.

   A. Human health / environmental risk (toxicity)
   B. Size of the population at risk
   C. Location of the sources relative to drinking water sources
   D. Number / size of contaminant sources
   E. Hydrogeologic sensitivity
   F. State findings, other findings
   G. Documented from mandatory reporting
   H. Geographic distribution / occurrence
   I. Other criteria (Described in the narrative)

3. Contaminants/classes of contaminants considered associated with each of the sources checked. Contaminants/contaminant classes are selected based on data indicating that certain chemicals or classes of chemicals may be originating from an identified source. Contaminants/classes of contaminants denoted by corresponding letter below (A through M).

   A. Inorganic pesticides
   B. Organic pesticides
   C. Halogenated solvents
   D. Petroleum compounds
   E. Nitrate
   F. Fluoride
   G. Salinity/brine
   H. Metals
   I. Radio-nuclides
   J. Bacteria
   K. Protozoa
   L. Viruses
   M. Other (Described in narrative)

Discussion of Ground Water Contamination Sources

AGRICULTURAL ACTIVITIES

AGRICULTURAL CHEMICAL FACILITIES

- EPA defines agricultural chemical facilities as those having a Standard Industrial Classification (SIC) code of 3253 under the new North American Industrial Classification System (NAICS). This code refers to the manufacturing and production of fertilizers, pesticides and other miscellaneous agricultural chemicals. The latest Economic Census (2002) from the U.S. Census Bureau (www.census.gov/econ/census02) shows 26 facilities in New York. This is further broken down to: two fertilizer manufacturing facilities, 18 fertilizer mixing only facilities, and six pesticide & other agricultural chemical manufacturing facilities.

o Level of Concern – Low

o Scope of Concern - Regional

ANIMAL FEEDLOTS

- CONCENTRATED ANIMAL FEEDING OPERATION (CAFO) – Since 1999, NYS law has required Animal Feeding Operations (AFO) with animal numbers above designated values (e.g. 200 mature dairy cows, 300 beef cattle or heifers) to apply for a pollution discharge general permit from DEC. Each permit requires a Comprehensive Nutrient Management Plan (CNMP) prepared by a NRCS certified planner. Those AFOs not required to obtain a discharge permit are encouraged to participate in a voluntary assessment program and also implement a voluntary CNMP. This activity remains a concern due to the number of facilities exempt from CAFO requirements.

o Level of Concern – Intermediate

o Scope of Concern - Regional

DRAINAGE WELLS

- Drainage well is one example of a Class V injection well as designated by EPA's Underground Injection Control (UIC) program. Drainage wells include agricultural, storm water, or other special types of drainage wells. These wells are typically used to inject (dispose of) excess untreated surface and subsurface water. Such waters often contain contaminants that exceed New York State's water quality discharge standards. Primacy for the UIC program in NYS remains with USEPA. Storm water drainage wells are "authorized by rule," which means they may be operated without an individual permit so long as the injection does not endanger an aquifer.

o Level of Concern – Intermediate

o Scope of Concern – Regional

FERTILIZER APPLICATIONS

- Much of NYS remains in use for agricultural purposes. Impacts to groundwater from the use of agricultural fertilizers remains a concern largely due to their widespread use. Increasingly, there is also concern for residential lawn fertilizing whether by the homeowner or by a lawn care service. Results from DEC's ambient groundwater monitoring program, beginning in 2002, have found relatively low detectable levels of nitrate in wells sampled (see table below). With one exception, all results were below the current MCL of 10 mg/L. (These results may not exclusively represent contributions from fertilizers).

Study Year	Study Basin (HUCs)	Wells Sampled	Nitrate > 10 mg/L*	Nitrite > 1 mg/L*	Nitrite plus Nitrate > 10 mg/L*	Nitrite plus Nitrate > 1 mg/L
2002	Mohawk R. (02020004)	23	0	0	0	8
2003	Chemung R. (02050105)	37	0	0	0	11
2004	Lake Champlain (02010001, 02010004, 02010006) U. Susquehanna R. (02050101, 02050102, 02050103)	22 33	0 1	0 0	0 1	4 16
2005	Delaware R. (02040101, 02040102, 02040104) St. Lawrence R. (04150301 through 04150307) Genesee R. (04130002, 04130003)	19 25 22	0 0 0	0 0 0	0 0 0	6 2 5
2006	Mohawk R. & Schoharie Ck. (02020004, 02020005) Allegheny R. (05010001, 05010002) Lk. Erie, W. Lk. Ontario & Niagara R. (04120101 – 04120104, 04130001)	27 33	0 0	0 0	0 0	4 7
2007	Upper Hudson (02020001 – 02020003) Finger Lks., Lk. Ontario (04140201 - 04140202, 04140101, 04140102)	25 35	2 0	0 0	2 0	6 8

* The MCL for Nitrate is 10 mg/L, for Nitrite is 1 mg/L, for Nitrite plus Nitrate is 10 mg/L

- Level of Concern – Low
- Scope of Concern – Regional

IRRIGATION PRACTICES

- Concerns for ground water contamination related to irrigation practices potentially involve induced capture of pesticides or nutrients applied to farmlands. A combination of high ground water pumping rates in areas immediately adjacent to farmlands and excessive watering may serve to pull contaminants deeper into aquifers than would otherwise happen. The latest available USGS water use data (2000) ranks NYS 35th in the nation (including several US territories) in terms of groundwater use for irrigation. USGS estimates 23.3 mgd of groundwater is used for irrigation in NYS compared with 11,600 mgd of groundwater for the highest irrigation use state. Overall, this activity is not believed to be a significant concern.

- o Level of Concern – Low
- o Scope of Concern – Regional

PESTICIDE APPLICATIONS

- Pesticides, including insecticides, fungicides, herbicides, and other subcategories, remain in widespread use in agricultural, commercial, residential and other parts of society. Results from DEC's ambient groundwater monitoring program, beginning in 2002, have found detectable levels of pesticides or degradates on average in nearly one of every two wells sampled (see table below). Regionally, northern NY is below this average while the Chemung & Upper Susquehanna basins are above. All results were below current state & federal drinking water MCLs however their prevalence is worth noting. There is continuing high concern for the overuse or misuse of pesticides and the potential for groundwater contamination.

Study Basin (HUCs)	Study Year	Wells Sampled	Wells With Detectable Pesticide Levels
Mohawk R. (02020004)	2002	23	12
Chemung R. (02050105)	2003	27	16
Lake Champlain (02010001, 02010004, 02010006) U. Susquehanna R. (02050101, 02050102, 02050103)	2004	22 33	7 20
Delaware R. (02040101, 02040102, 02040104) St. Lawrence R. (04150301 through 04150307) Genesee R. (04130002, 04130003)	2005	19 25 22	10 4 12
Mohawk R. & Schoharie Ck. (02020004, 02020005) Allegheny R. (05010001, 05010002) Lk. Erie, W. Lk. Ontario & Niagara R. (04120101 – 04120104, 04130001)	2006	27 33	6 14
Upper Hudson (02020001 – 02020003) Finger Lks., Lk. Ontario (04140201 - 04140202, 04140101, 04140102)	2007	25 35	11 17

- o Level of Concern – **High**
- o Scope of Concern - Statewide

ON-FARM AGRICULTURAL MIXING AND LOADING PROCEDURES

- NYS's Agricultural Environmental Management (AEM) Program was enacted through state legislation in August of 2000, under the State Soil and Water Conservation Committee, to assist farmers in identifying and correcting environmental risks associated with farming. As part of the AEM program a guidance worksheet was developed in 2001 specifically dealing with Pesticide Storage, Mixing & Loading. The guidance references and incorporates standards developed by NRCS for agri-chemical mixing facilities. This information is disseminated through 58 County Soil and Water Conservation Districts representing all of NYS. This activity remains of moderate concern.

  - Level of Concern – Intermediate
  - Scope of Concern – Statewide

LAND APPLICATION OF MANURE (UNREGULATED)

- Land application facilities for animal manure and associated bedding material are exempt from NYS solid waste regulations. Facilities of sufficient size to be regulated as Concentrated Animal Feeding Operations (CAFOs) would however require an Agricultural Waste Management Plan (AWMP) prepared by an NRCS certified planner.

- Other wastes, not considered manure, which are also exempt from land application regulations include: food processing wastes that are visually recognizable as a part of a plant or vegetable, aquatic plants or a combination of such wastes, and leaves and/or grass. This exemption contains numerous requirements including minimizing impacts to ground water.

- Concern remains for facilities not regulated as CAFO's and possibly non-manure land application of materials containing pesticides or nutrients.

  - Level of Concern – Intermediate
  - Scope of Concern - Regional

STORAGE AND TREATMENT ACTIVITIES

LAND APPLICATION (REGULATED OR PERMITTED)

- Land application and associated facilities for disposal of septage, nonrecognizable food processing wastes or fish hatchery waste is regulated by NYS through DECs solid waste program.

  - Level of Concern – Low
  - Scope of Concern - Regional

MATERIAL STOCKPILES

- Salt storage stockpiles are dealt with as a concern elsewhere in this section.

- Mined products stockpiles are regulated by DEC. Each mining permit application requires consideration for the potential of ground water contamination from stockpiles.

- Stockpiles that may be of concern for ground water contamination include treated woods. Although the use of CCA is no longer allowed, continuous stockpiling of other unprotected treated woods may be a concern especially at wood treatment facilities. New York's Inactive Hazardous Waste Registry currently includes a former lumber pressure treatment facility (NY Id 401046) with a hazard classification of 02, which indicates a significant threat.

- Level of Concern – Intermediate
- Scope of Concern – Statewide

STORAGE TANKS (ABOVE GROUND)

- PETROLEUM TANK REGISTRATION – Since 1986, NYS law has required owners of petroleum tanks with a combined storage capacity of more than 1,100 gallons to register as petroleum storage facilities with DEC. This law applies to both aboveground and underground tanks. Facilities must re-register every five years. Owners are subject to construction, operation, and maintenance requirements. Concern remains for aboveground tanks currently exempt from regulation.

- CHEMICAL TANK REGISTRATION – Since 1989, NYS law has required owners of any underground tank of any size or aboveground stationary storage tanks equal to or greater than 185 gallons capacity, that store a defined hazardous substance, to register each with DEC. Concern remains for aboveground tanks currently exempt from regulation.

- Level of Concern – **High**
- Scope of Concern - Statewide

STORAGE TANKS (UNDERGROUND)

- PETROLEUM TANK REGISTRATION – See PETROLEUM TANK REGISTRATION under 'STORAGE TANKS (ABOVE GROUND)'. Concern remains for underground tanks currently exempt from regulation.

- CHEMICAL TANK REGISTRATION – See CHEMICAL TANK REGISTRATION under 'STORAGE TANKS (ABOVE GROUND)'. Concern remains for underground tanks currently exempt from regulation.

- Level of Concern – **High**
- Scope of Concern - Statewide

SURFACE IMPOUNDMENTS

- DEC regulations allow water impoundments to be constructed and used during mining activities however any discharge of water to either surface or subsurface waters must meet NYS water quality standards.

- DEC regulations allow the use of surface impoundments at facilities that treat, store or dispose of hazardous waste provided they are designed, constructed and installed to prevent any migration of wastes.

- DEC regulations allow the use of surface impoundments for treatment of solid waste provided they are located, designed, and operated so as to assure that there will be no migration of any hazardous constituent into ground water or surface water at any future time.

- DEC regulations allow the use of surface impoundments for treatment of municipal wastewater as outlined in Recommended Standards For Wastewater Facilities[2]. Construction standards include the sealing of cells to prevent seepage loss. Standards also require assessment of industrial wastes for possible pretreatment prior to this method of treatment.

- DOH regulations do not allow the use of surface impoundments for individual wastewater treatment systems.

  This activity is of low concern due to the amount of regulatory oversight.

  - Level of Concern – Low
  - Scope of Concern – Statewide

WASTE PILES

- Regulations require piles of material classified as hazardous waste must be covered and bottom lined to prevent the migration of hazardous constituents.
- WASTE TIRES – Although waste tires do not pose a direct significant threat to ground water, there is increasing concern for waste tire fires and the associated toxic materials released to the environment, including ground water, during such an event. Since 1989 there have been at least 17 major waste tire fires in NYS consuming over 3 million tires. Waste tires have been regulated in NYS, as solid waste, since 1988 however there remains a concern for waste tire stockpiles.
  - Level of Concern – Intermediate
  - Scope of Concern - Statewide

WASTE TAILINGS

- Since at least 1991 NYS regulations have required mining applications to include, among other things, the proposed location(s) and size of mineral and spoil storage areas along with existing or proposed drainage and water control features. Each application must also include proposed methods of pollution prevention. Due to the regulatory requirements involved in this activity, concern for ground water contamination is low for newer activities and high for activities that predate 1991.
  - Level of Concern – Low / **High**
  - Scope of Concern – Regional

DISPOSAL ACTIVITIES

DEEP INJECTION WELLS

- Currently there are six brine disposal wells, greater than 500 feet deep, permitted for use in five western or central NY counties (Genesee, Cayuga, Livingston, Steuben, and Allegany). Of those, four are associated with oil & gas production, two with gas storage operations, and the last with cavern construction. Rigorous

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[2] Recommended Standards For Wastewater Facilities, Great Lakes - Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers, 1997

construction, operation, and closure regulations are in place for brine disposal wells. Wells less than 500 feet are not permitted for use in brine disposal.

- There are no other deep wells in NYS where a permit has been approved for disposal of untreated waste.
  - Level of Concern – Low
  - Scope of Concern - Regional

LANDFILLS

- Landfills, including Construction & Demolition (C&D) Debris Landfills, have extensive NYS siting, design, operating and monitoring requirements. The last unlined landfill operating in New York State was closed in 2001. New, unlined landfills have not been issued permits to operate in NYS since 1988. Landfills constructed since then therefore do not pose the same threat to ground water as previous unlined facilities. Numerous older, closed landfills continue however to pose a threat to ground water. Currently, 121 former landfill sites are listed in the State Superfund Program.
  - Level of Concern – **High**
  - Scope of Concern - Statewide

SEPTIC SYSTEMS

- Septic systems must be properly sited, designed, constructed, maintained and used in order to prevent ground water contamination. Procedures are in place at state and local levels to address the first three issues. Maintenance and use of Onsite Wastewater Treatment Systems (OWTS) usually falls to the discretion of each owner. Neglect, careless or intentional misuse of an OWTS remains a concern throughout the state.
  - Level of Concern – **High**
  - Scope of Concern - Statewide

SHALLOW INJECTION WELLS

- Some geothermal well systems employ an 'open loop' design that involves return of water by way of a shallow injection well. This activity is reviewed by DEC to determine if a discharge permit is required. Where it can be demonstrated that the initial water quality meets discharge standards and nothing will be substantially added during use, the system is not required to obtain a discharge permit. The system owner is however advised of and referred to EPA's Underground Injection Control (UIC) program. All other types of shallow injection wells are likewise referred to EPA's UIC program.
  - Level of Concern – Low
  - Scope of Concern – Statewide

OTHER ACTIVITIES

HAZARDOUS WASTE GENERATORS

- DEC has established three categories of hazardous waste generators: New York State Conditionally Exempt Small Quantity Generators (NYCESQGs), Small Quantity Generators (SQGs), and Large Quantity Generators (LQGs). Hazardous waste generation is categorized by DEC as either aqueous, or non-aqueous hazardous waste. In 2000 an estimated 72.0 million tons of aqueous hazardous waste was generated in NYS. In the same year, 836.8 thousand tons of non-aqueous hazardous waste was generated in NYS. Although 2% of LQGs accounted for 90% of this total, a significant amount of hazardous waste is generated by the remaining regulated community as well as those not subject to regulations. Concern remains high for this activity due to the widespread occurrence of generators and the human health risks of the wastes generated.

o Level of Concern – **High**

o Scope of Concern - Statewide

HAZARDOUS WASTE SITES

- New York State currently has (as of July 14, 2010) a list of Inactive Hazardous Waste Sites (IHWS) totaling 884. Sites are ranked from Class 1, (posing imminent danger) to Class 5 (completely remediated). DEC's website database of inactive hazardous waste sites has a breakdown as follows: Class 1 sites = 0; Class 2 sites = 523; Class 3 sites = 70; Class 4 sites = 275; Class 5 sites = 16. Class 5 sites are eventually delisted from the site registry and noted as a class C. This total includes 86 federal NPL sites.

- MANUFACTURED GAS PLANT (MGP) SITES – Currently approximately 200 sites have been identified as former MGP sites needing action. At this time it is estimated there is a total of roughly 300 former MGP sites in NYS. Manufactured gas plants operated in many cities and towns across New York, primarily during the 1850s to 1950s. The plants converted coal, or a combination of coal, oil and water, into a gas product used for lighting and heating. The potential wastes and substances of concern at former MGP sites may include coal, ash, cinders, coal tars, coal tar-related liquids and sludges, and gas purification wastes. Such materials may contain various organic and/or inorganic chemicals that are classified as hazardous substances or potentially regulated solid waste under State and Federal laws.

o Level of Concern – **High**

o Scope of Concern - Statewide

LARGE INDUSTRIAL FACILITIES

- Large industrial facilities can pose a threat to ground water in numerous ways. Often however they involve activities for which they are regulated in some manner whether it is storage, treatment, disposal, or generation of materials and wastes. For this reason these facilities are not a high concern.

o Level of Concern – Intermediate

o Scope of Concern - Statewide

MATERIAL TRANSFER OPERATIONS

- Concerns associated with this activity center on spills, see section on *SPILLS* for discussion of concerns.

  - Level of Concern – **High**

  - Scope of Concern - Statewide

MINING AND MINE DRAINAGE

- NYS regulations require discharges from mining operations must meet established water quality requirements including ground water. Due to existing regulatory programs, this activity is of lower concern for ground water contamination.

  - Level of Concern – Low

  - Scope of Concern - Statewide

PIPELINES AND SEWER LINES

- PIPELINES - Individual product pipelines that traverse large portions of NYS generally carry natural, propane or similar gas products. One major petroleum pipeline serves the NYC/NY-NJ Harbor area (details are no longer publicly available). Due to the types of products handled or the low occurrence of petroleum pipelines traversing the state, this activity is not a significant ground water contamination concern.

- SEWER LINES – Sewer lines are found in NYS communities of all sizes. Systems are commonly operated by gravity feed or at relatively low pressure. Forced mains are also used in some areas or from collection points to treatment plants. The frequency of ground water contamination from sewer lines is believed to be low in NYS however this is difficult to confirm. The potential for contamination is higher for forced mains however any such occurrence is usually detected and corrected quickly. Generally, sewered areas are also served by public water. This greatly reduces the potential of private well contamination.

  - Level of Concern – Low

  - Scope of Concern - Statewide

SALT STORAGE AND ROAD SALTING

- A 1991 report from the National Research Council[3] suggests NYS may lead the nation in the total amount of salt used for roadway deicing with 450,000 tons used annually. A comparison of usage per road mile was not provided. To lessen the impacts of road salt the State Department of Transportation (DOT) has established recommended storage and handling procedures for its facilities including covered storage structures and, when needed, the use of temporary covering measures. Concern remains for this activity due to the amount used and its continuing impact on aquifers and at times, drinking water supplies.

  - Level of Concern – Intermediate

  - Scope of Concern – Statewide

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[3] Special Report 235; Highway Deicing, Comparing Salt and Calcium Magnesium Acetate; Transportation Research Board, National Research Council; 1991

SALT WATER INTRUSION

- Salt water intrusion has long been recognized as an important issue in the coastal New York counties of Nassau, Suffolk, Kings (Brooklyn) and Queens which are heavily dependent on ground water. Some additional concerns exist in isolated areas of the state where ground water encounters salt deposits at relatively shallow depths.

  - Level of Concern – Intermediate

  - Scope of Concern - Regional

SPILLS

- There were 14,639 spills reported to DEC during 2009. This compares to 15,337; 15,085; 16,784; 16,084, 15,713; 15,522; 14,915; 14,564; and 16,522 for the years 2008 - 2000 respectively. These totals reflect a wide range of volumes and materials spilled as well as the manner of spills and the resulting response. Although many spills were small, contained, or quickly cleaned up, the overall number, volume, materials involved, and their possible effect on ground water, remain a high concern.

  - Level of Concern – **High**

  - Scope of Concern - Statewide

TRANSPORTATION OF MATERIALS

- Risks to ground water associated with the transportation of materials are discussed in several other sections. See sections regarding *SPILLS, PIPELINES AND SEWER LINES,* and *MATERIAL TRANSFER OPERATIONS.*

  - Level of Concern – **High**

  - Scope of Concern - Statewide

URBAN RUNOFF

- Urban runoff is generated from nonporous surfaces like roads, bridges, parking lots, and buildings. Examples of urban runoff contaminants of concern include: oil; grease; toxic chemicals; nutrients; pesticides; pathogens; road salts; and heavy metals. This activity is already recognized as a significant concern to surface water quality. With increasing use of designed infiltration areas, storm water collection basins, or constructed wetlands there is concern that these vegetated areas will not be able to sufficiently treat or store runoff contaminants allowing their passage to ground water. There is additional concern for ground water contamination where natural or constructed infiltration areas are not vegetated, properly maintained, or the vegetation has been degraded from excessive pollutant loads.

  - Level of Concern – Intermediate

  - Scope of Concern - Statewide

SMALL-SCALE MANUFACTURING AND REPAIR SHOPS

- Small-scale manufacturing and repair shops, like large industrial facilities, can pose a threat to ground water in numerous ways. Small-scale facilities however may not be subject to the same level of regulatory oversight. They are also less likely to have dedicated staff, programs, or advanced methods and training in the prevention of ground water pollution. There is a higher concern for this activity for these reasons as well as their higher geographic occurrence throughout the state.

- Level of Concern – **High**
- Scope of Concern - Statewide

OTHER SOURCES

ABANDONED OIL & GAS WELLS

- Drilling for oil & gas in NYS has occurred since the early periods of exploration in the U.S. During much of that time proper well abandonment was not performed once wells were no longer in use. This has resulted in the improper abandonment of potentially tens of thousands of oil & gas wells from the western most regions of NYS to the eastern areas of Lake Ontario. Concern for ground water contamination involves the uncontrolled vertical migration of hydrocarbons & other associated contaminants by way of the abandoned bore hole.

  - Level of Concern – **High**
  - Scope of Concern – Regional

Overview of State Ground Water Protection Programs

Table 2: Summary of State Ground Water Protection Programs

Programs or Activities	Check (√)[1]	Implementation Status[2]	Responsible State Agency[3]
Active SARA Title III Program	√	Fully established	NYSEMO*, NYSDEC
Ambient ground water monitoring system	√	Continuing efforts	NYSDEC, USGS
Aquifer vulnerability assessment	√	Continuing efforts	NYSDEC
Aquifer mapping	√	Continuing efforts	USGS, NYSDEC
Aquifer characterization	√	Continuing efforts	USGS, NYSDEC
Comprehensive data management system	√	Continuing efforts	NYSDEC
Ground water discharge permits	√	Fully established	NYSDEC
Ground water Best Management Practices	√	Continuing efforts	NYSDEC
Ground water legislation	√	Continuing efforts	Various agencies
Ground water classification	√	Fully established	NYSDEC
Ground water quality standards	√	Fully established	NYSDEC
Interagency coordination for ground water protection initiatives	√	Continuing efforts	NYSDEC
Nonpoint source controls	√	Continuing efforts	NYSDEC* NYSAGMKT
Pesticide State Management Program	√	Fully established	NYSDEC
Pollution Prevention Program	√	Fully established	NYSDEC
Resource Conservation and Recovery Act(RCRA) Primacy	√	Fully established	NYSDEC
Source Water Assessment Program	√	Fully established	NYSDOH*, NYSDEC
State Superfund	√	Fully established	NYSDEC
State RCRA Program incorporating more stringent requirements than RCRA Primacy	√	Fully established	NYSDEC
State septic system regulations	√	Fully established	NYSDOH*, NYSDEC

Underground storage tank installation Requirements	√	Fully established	NYSDEC
Underground Storage Tank Remediation Fund	√	Fully established	NYSOSC*, NYSDEC NYSOAG
Underground Storage Tank Permit Program	√	Fully established	NYSDEC
Underground Injection Control Program	√	Fully established	USEPA
Vulnerability assessment for drinking water/wellhead protection	√	Continuing efforts	NYSDOH*, NYSDEC
Well abandonment regulations	√	Continuing efforts	NYSDOH*, NYSDEC
Wellhead Protection Program (EPA- approved)	√	Fully established	NYSDOH*, NYSDEC
Well installation regulations	√	Fully established	NYSDOH
OTHER NYS PROGRAMS OR ACTIVITIES			
Freshwater Wetlands Program	√	Fully established	NYSDEC, USACE
Drinking Water State Revolving Fund (SRF)	√	Continuing efforts	NYSEFC*, NYSDOH
Clean Water State Revolving Fund (SRF)	√	Continuing efforts	NYSEFC*, NYSDEC
Clean Water/Clean Air Bond Act	√	Continuing efforts	NYSDEC

NYSDEC - New York State Department of Environmental Conservation	NYSEFC - New York State Environmental Facilities Corporation
NYSDOH – New York State Department of Health	NYSTAX – New York State Department of Taxation and Finance
NYSAGMKT - New York State Department of Agricultural & Markets	NYSGOSC - New York State Governor's Office for Small Cities
NYSEMO - New York State Emergency Management Office	USACE - United States Army Corp of Engineers
NYSOSC – New York State Office of the State Comptroller	USEPA – United States Environmental Protection Agency
NYSOAG – New York State Office of Attorney General	USGS - United States Geological Survey

Notes for Table 2

1. A check (√) after a program or activity in Table 20 indicates existing applicable State program or activity.

2. Implementation status for each of the programs. Terms used to describe implementation status include "not applicable", "under development", "under revision", "fully established", "pending", or "continuing efforts". Implementation status of special programs or activities and the terms used are discussed in the accompanying narrative.

3. State agency, bureau, or department responsible for implementation and enforcement of the program or activity. The lead agency is indicated by an asterisk (*) where multiple agencies are involved in the implementation and enforcement of a program or activity.

Discussion of State Ground Water Protection Programs

ACTIVE SARA TITLE III PROGRAM - SARA Title III, also known as the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) was passed as part of the 1986 federal Superfund Amendments and Reauthorization Act (SARA). This act has four major provisions: Emergency planning; Emergency release notification; Hazardous chemical storage reporting requirements; and Toxic chemical release inventory. The NYS Emergency Management Office is the lead agency for New York's EPCRA program. One portion of SARA Title III, the TRI program, is handled by DEC. The state EPCRA requirements are fully established and active. [For further information, go to: www.semo.state.ny.us/programs/serc , www.dec.ny.gov/chemical/8434.html]

AMBIENT GROUND WATER MONITORING SYSTEM - In 2001 DEC's Division of Water initiated a pilot ambient ground water monitoring program with the goal of establishing a continuing yearly sampling program based on the Division's Rotating Intensive Basin Study (RIBS) surface water monitoring program schedule. The pilot focused on the Mohawk River basin and was conducted as a cooperative effort with the U.S. Geological Survey (USGS). Sampling by USGS personnel occurred in 2002. The following is a chronology of activity since:

- In 2003 a similar limited effort was conducted in the Chemung River basin. A data report for the study was first developed and published.
- In 2004, a more extensive effort was conducted in the Lake Champlain and Upper Susquehanna River basins. Data reports for each area were again developed and published.
- In 2005, groundwater studies were conducted in the St. Lawrence, Delaware, and Genesee River basins. Data reports are also available from USGS for these study efforts.
- In 2006 studies were conducted in the Allegheny River, Lake Erie, Western Lake Ontario, and Mohawk River basins with data reports available through USGS.
- In 2007 studies were conducted in the Central NY - Finger Lakes and Upper Hudson River basins. Data reports have been finalized and published by USGS.
- In 2008 studies were conducted in the Lower Hudson River, Black River, and the Chemung River basins. This year's efforts completed the first full rotation of ground water sampling studies for NYS excluding Long Island. Data reports for these three basins are expected to be published in late 2010.
- In 2009 studies were again focused on the eastern Susquehanna River and Lake Champlain basins. Data and data reports are expected in 2011.
- In 2010 studies are underway for the St. Lawrence, Delaware, and Genesee River basins.

Analytical results and data reports are generally available through USGS approximately 1-2 years following completion of respective studies. Analytical results for each of these studies are available online through the USGS National Water Information System (NWIS). The Division of Water expects to continue its ambient ground water monitoring program with plans to conduct ground water sampling efforts in two or three major basins each year with the goal of fully assessing the state every five years. [For further information, go to: www.dec.ny.gov/lands/36117.html , nwis.waterdata.usgs.gov/ny/nwis/qwdata]

AQUIFER VULNERABILITY ASSESSMENT - Aquifer vulnerability assessment is required as part of New York's State Environmental Quality Review Act (SEQR) which became effective in November of 1978. This law requires all state and local government agencies to consider environmental impacts whenever they must approve or fund a privately or publicly sponsored action. It also applies whenever an agency directly undertakes an action. [For further information, go to: www.dec.ny.gov/permits/357.html]

AQUIFER MAPPING - DEC's aquifer mapping and ground water resource evaluation cooperative effort with USGS dates back to the Department's predecessor, the NYS Water Resources Commission. This effort is expected to continue with approximately one mapping effort undertaken every two years. Consideration is given to population served, resource magnitude, and growth pressures when choosing subsequent mapping efforts. [For further information, go to: www.dec.ny.gov/lands/36118.html]

AQUIFER CHARACTERIZATION - Aquifer characterization is accomplished in conjunction with DEC's cooperative aquifer mapping effort with USGS (see AQUIFER MAPPING section above). Typical information includes material type (i.e. sand & gravel, lacustrine, etc), potential yields, aquifer thickness, and cross sections. Aquifer characterization is expected to continue with mapping efforts of approximately one every two years.

COMPREHENSIVE DATA MANAGEMENT SYSTEM - Ground water data management is a challenging issue due to the numerous programs involved in groundwater data collection and use. DEC has been working both internally and with outside agencies to create a dedicated data system incorporating remedial program data, public water supply and water well reporting data along with other appropriate data. One example of this effort is the current or planned establishment of network nodes at DEC and DOH.

GROUND WATER DISCHARGE PERMITS - DEC has had an approved NPDES pollutant discharge permit program since 1975 and an approved General Permit program since 1992. Although the NPDES program does not require NPDES permits for discharges to ground water, DEC maintains stringent requirements as part of its permitting process for discharges greater than 1,000 gpd to ground water. Discharges to ground water of less than 1,000 gpd are generally residential systems, which are handled through state & local health departments. [For further information, go to: www.dec.ny.gov/permits/6054.html, http://cfpub.epa.gov/npdes/]

GROUND WATER BEST MANAGEMENT PRACTICES (BMPs) - Ground Water Best Management Practices include methods, measures or practices suggested or selected for use in protecting ground water. They include structural and nonstructural controls, operation, or maintenance procedures. DEC has developed a catalog of management practices as part of its Nonpoint Source Management Program. The catalog includes a separate review of management practices in nine separate activities relating to:

Urban/Stormwater Runoff Agriculture Silviculture	Construction Hydrologic/Habitat Modification Road/Right-of-Way Maintenance	Leaks, Spills, Accidents Resource Extraction On-Site Waste Disposal

Each subject, while considering more than just impacts to ground water, specifically reviews ground water concerns. Other state programs including the Agricultural Environmental Management (AEM) Program, under NYS Agriculture and Markets, have also developed worksheets which, in part, consider ground water protection. In another example NYSDOT has developed an Environmental Handbook for Transportation Operations which is intended to provide general awareness and guidance related to state DOT operations. [For further information, go to: www.dec.ny.gov/about/859.html, www.agmkt.state.ny.us/SoilWater/aem, www.nysdot.gov]

GROUND WATER RELATED LEGISLATION

- SMALL BUSINESS POLLUTION PREVENTION AND ENVIRONMENTAL COMPLIANCE ASSISTANCE PROGRAM – This law took effect September 16, 2005 establishing a new Article 28 under Environmental Conservation

Law titled Pollution Prevention. Among other things this law specifically cites protection of groundwater.

- MTBE - As of January 1, 2004, NYS law prohibits gasoline products containing MTBE as an additive from being imported, sold, dispensed or offered for sale in New York State.

- BROWNFIELD / GROUNDWATER GIS – In October of 2003, the NYS Brownfield Cleanup Program (BCP) was signed into law. This legislation sets forth requirements and criteria for participation and clean-up efforts as well as tax and grant incentives plus liability limitation once a Certificate of Completion is issued.

GROUND WATER CLASSIFICATION - Classification of ground water has been established through state environmental regulations since 1985. All fresh ground water in NYS is classified as GA. Class GA waters are assigned a best usage as a source of potable water supply. [For further information, go to: www.dec.ny.gov/chemical/23853.html]

GROUND WATER QUALITY STANDARDS - Regulations establishing ground water quality standards in NYS were first promulgated in 1967. These regulations continue under authority of NYS Environmental Conservation Law and are enforced by DEC. Under NYS law DEC maintains these standards as part of its charge to protect the waters of the state. These standards closely parallel but should not be confused with NYS drinking water standards maintained by NYS DOH for public water supplies. [For further information, go to: www.dec.ny.gov/chemical/23853.html]

INTERAGENCY COORDINATION FOR GROUND WATER PROTECTION INITIATIVES - Interagency coordination of ground water protection issues occurs on various levels of federal, state and local governments from staff level on up through the bureau and director levels including both short and long term committees such as the NYS Nonpoint Source Coordinating Committee, Water Quality Coordinating Committees, the NYS Soil and Water Conservation Committee, and the Source Water Protection Coordinating Committee (SWPCC). Most recently coordination between DEC, NYSDOH, and USGS has been underway concerning the development of a groundwater related data system. (See section on COMPREHENSIVE DATA MANAGEMENT SYSTEM for additional details.)

NONPOINT SOURCE CONTROLS - New York's strategy for dealing with nonpoint source pollution is based on the following source control mechanisms: planning, monitoring, direct implementation, regulatory programs, financial incentives, demonstration projects, technical assistance, technical training, and outreach. This strategy is pursued at the state level through the New York Nonpoint Source Coordinating Committee (NPSCC) representing 18 federal, state, and local agencies. It is also pursued at the local level by County Water Quality Coordinating Committees (WQCCs) established through the efforts of the NYS Soil and Water Conservation Committee (NYSSWCC) and DEC. [For further information, go to: www.dec.ny.gov/docs/water_pdf/npsmgt.pdf, and www.agmkt.state.ny.us/soilwater/aem]

PESTICIDE STATE MANAGEMENT PROGRAM - DEC is responsible for the regulation of pesticides and pesticide application reporting, providing compliance assistance, water quality monitoring for pesticides, public outreach activities and enforcement of State pesticide laws. Registration of pesticides in New York State predates DEC's creation in 1970. Products that constitute a major change in use or contain a new active ingredient undergo a thorough review prior to approved registration. Commercial application businesses are required to register with DEC with certification required for each individual who performs pesticide application. NYS has also adopted a Neighbor Notification Law that requires the posting of visual notification markers when 100 square feet or more of residential lawn application occurs. This law is in effect only when adopted at the county level. January 1, 2008, the following have "opted in": Albany, Erie, Monroe, Nassau, Rockland, Suffolk, Tompkins, Ulster, and Westchester Counties, and New York City. Lastly, a permit is required for the sale of restricted use pesticides in New York State. Pesticides are also a component of New York States' Department of Agriculture and Markets Agricultural Environmental Management (AEM) program. The voluntary, incentive-based program has developed two pesticide management worksheets dealing with use, storage, mixing, and loading. AEM operates at state and local levels providing financial, educational and technical assistance to farmers to deal with environmental concerns. [For further information, go to: www.dec.ny.gov/chemical/298.html, and www.agmkt.state.ny.us/soilwater/aem]

POLLUTION PREVENTION PROGRAM - The Pollution Prevention Unit of DEC works to "Reduce or eliminate the use of toxic substances and the generation of pollutants at the source." This is done through technical assistance outreach and targeted prevention planning development with small & large businesses, local governments, state agencies, and the public. [For further information, go to: www.dec.ny.gov/about/817.html]

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) PRIMACY - New York State initially received EPA interim base authorization to implement and enforce the federal RCRA-C program in July of 1982, with final base authorization granted in May of 1986. Currently, NYS has adopted 100+ percent of the federal program, including some optional rules. [For further information, go to: www.dec.ny.gov/chemical/8477.html]

SOURCE WATER ASSESSMENT PROGRAM - In NYS, the Source Water Assessment Program (SWAP) was developed and implemented by the New York State Department of Health (DOH) with input from other government agencies and private and public interest groups[4]. New York's SWAP was approved by EPA in November 1999. Over 9,000 public water systems maintain a total of approximately 14,000 sources of water in NYS. There are roughly 1,700 additional systems that purchase their water and were excluded from SWAP requirements. To accomplish the assessments, DOH awarded a contract to URS Corporation for upstate New York including 8,400 public water systems with 12,300 wells. An additional contract was awarded to Camp, Dresser and McKee to complete assessments for Nassau and Suffolk counties including over 500 public water systems with more than 1,500 wells. The source water assessments for the approximately 350 public supply surface water sources and springs in New York State were completed by NYSDOH. [For further information, go to: www.health.state.ny.us/nysdoh/water/swap.htm]

STATE SUPERFUND - In NYS the Superfund program is known as the Inactive Hazardous Waste Disposal Site Remedial Program. The program seeks to identify and characterize suspected inactive hazardous waste sites and remediate those that have consequential amounts of hazardous waste which pose a significant threat to public health and the environment[5]. As part of the program a registry of sites is maintained with each assigned a classification based on its current stage of investigation or remediation. For a breakdown of the current list see section titled Summary of Ground Water Contamination Sources. [For further information, go to: www.dec.ny.gov/chemical/8439.html]

STATE RCRA PROGRAM INCORPORATING MORE STRINGENT REQUIREMENTS THAN RCRA PRIMACY - New York State has adopted the full federal RCRA program including some optional rules making the state program more stringent than RCRA primacy requirements, see *RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) PRIMACY above.* [For further information, go to: www.dec.ny.gov/chemical/8477.html]

STATE SEPTIC SYSTEM REGULATIONS - Statewide minimum regulations for septic systems with a design capacity of 1,000 gallons per day (gpd) or less have been in place since 1967 under NYS Public Health Law regulations (NYCRR Title 10, Volume A-1a, Part 75 including Appendix 75-A). Septic systems with a design capacity of 1,000 gpd or more must be designed or approved by a licensed professional, and require a wastewater discharge permit from NYSDEC. [For further information, go to: www.health.state.ny.us/nysdoh/water/appendix_75a.htm]

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[4] Source Water Assessment Program Plan, NYS Dept. of Health, November 1999.

[5] Remedial Programs Annual Report for State Fiscal Year 2004-05, NYSDEC, Div. of Environmental Remediation, 625 Broadway, Albany, New York 12233-7010

UNDERGROUND STORAGE TANK INSTALLATION REQUIREMENTS - Since 1994 DEC regulations have contained standards for the installation of new or replacement underground hazardous substance storage tanks dealing with: tank construction specifications; secondary containment; leak monitoring; installation; piping; spill/overfill prevention; vents, gauges and alarms; and tank labeling. Similar regulations have been in effect for new or replacement underground petroleum storage tanks since 1985 for facilities with a combined capacity of 1,100 gallons or more. [For further information, go to: www.dec.ny.gov/chemical/287.html]

UNDERGROUND STORAGE TANK REMEDIATION FUND - This fund was established by the New York State Legislature in 1977 and is officially known as the New York Environmental Protection and Spill Compensation Fund. It is more commonly known as the (NYS) Oil Spill Fund and other times as the Leaking Underground Storage Tank Fund. The fund is used where the responsible party is unknown or unable to pay for a cleanup that is considered necessary to prevent risking public health or the environment. The fund is administered by the State Comptroller's Office. Technical guidance is provided by NYSDEC while the NYS Attorney General's Office pursues fund compensation and criminal charges as appropriate. [For further information, go to: www.osc.state.ny.us/oilspill/index.htm , www.oag.state.ny.us/press/reports/oil_spills/oil_spill.html , www.dec.ny.gov/chemical/8638.html]

UNDERGROUND STORAGE TANK PERMIT PROGRAM - New York State has had a tank registration program since 1986. See section on *STORAGE TANKS (ABOVE GROUND)* for discussion of this item.

UNDERGROUND INJECTION CONTROL PROGRAM - Currently NYS has not requested program primacy for the federal UIC program. As indicated above, NYS does maintain stringent requirements through its SPDES permitting process for discharges to ground water greater than 1,000 gpd. While this may exclude smaller facilities of concern, larger municipal & industrial ground water discharges are regulated. [For further information, go to: www.epa.gov/safewater/uic/index.html]

VULNERABILITY ASSESSMENT FOR DRINKINGWATER/WELLHEAD PROTECTION - Vulnerability assessments have been undertaken for each public drinking water supply as part of the Source Water Assessment Program implemented by NYSDOH. See *SOURCE WATER ASSESSMENT PROGRAM* for additional details.

WELL ABANDONMENT REGULATIONS - Abandonment of mineral resource related wells is regulated by DEC. Types of wells include oil, gas, solution mining, geothermal, and exploration. To insure proper closure of wells, DEC requires each applicant to post appropriate financial bonding. NYS DOH has established regulations for abandonment of public and private water supply wells. [For further information, go to: www.dec.ny.gov/energy/1618.html, www.health.state.ny.us/environmental/water/drinking/part5/appendix5b.htm , www.health.state.ny.us/environmental/water/drinking/part5/appendix5d.htm , www.dec.ny.gov/lands/5000.html]

WELLHEAD PROTECTION PROGRAM (EPA-APPROVED) - New York State's approved wellhead protection plan was transferred from DEC to DOH at the start of the Source Water Protection Program. DEC's program was approved by EPA in 1990. Wellhead protection is handled jointly by DOH and DEC for each new public water supply well as it goes through the water supply permitting process. [For further information, go to: www.health.state.ny.us/environmental/water/drinking/wellhead/wellfact.htm]

WELL INSTALLATION REGULATIONS - In 1999 the NYS Well Driller Registration Law was enacted and became effective in January of 2000. One aspect of this law called for the NYS Department of Health (DOH) to establish water well construction regulations. Separate regulations have been established for both private and public water supply wells. Important aspects of the regulations include: minimum casing, grouting, and separation distances from contamination sources. [For further information, go to: www.health.state.ny.us/environmental/water/drinking/part5/appendix5b.htm, and www.health.state.ny.us/environmental/water/ drinking/part5/appendix5d.htm]

OTHER NYS PROGRAMS OR ACTIVITIES

FRESHWATER WETLANDS PROGRAMS **-** Freshwater wetlands are an important component of ground water protection. Wetlands help break down, use and immobilize pollutants. This is particularly important where involved in recharging groundwater. New York's Freshwater Wetlands Program was established after state passage of the State Freshwater Wetlands Act in 1975. The state regulates wetlands larger than 12.4 acres including an adjacent area of 100 feet. The U.S. Army Corps of Engineers also regulates activities in wetlands of any size. [For further information, go to: www.dec.ny.gov/lands/4937.html]

DRINKING WATER STATE REVOLVING FUND (DWSRF) **-** The Drinking Water State Revolving Fund (DWSRF) was created in 1996 as a means to provide a significant financial incentive for municipally and privately owned drinking water systems to finance needed drinking water infrastructure improvements. The DWSRF is administered jointly by the New York State Department of Health (DOH) and the New York State Environmental Facilities Corporation (EFC). [For further information, go to: www.nysefc.org , and www.nyhealth.gov/environmental/water/drinking/water.htm]

CLEAN WATER STATE REVOLVING FUND (CWSRF) **-** The NYS Clean Water State Revolving Fund was established in 1990 to provide low-interest financing to preserve, protect, or improve water quality. Eligible projects may involve point or nonpoint sources of pollution. [For further information, go to: www.nysefc.org]

CLEAN WATER/CLEAN AIR BOND ACT **-** New York's Clean Water/ Clean Air Bond Act was approved by NYS voters in November 1996 part of which provided funding for investigations and cleanup of Environmental Restoration Projects. Enhancements to the program were enacted on October 7, 2003. Projects are evaluated on, among other things, the potential for public or recreational use after the site is cleaned up. Applications have not been approved since 2008 and new applications are not being accepted due to lack of funding. [For further information, go to: www.dec.ny.gov/chemical/8444.html]

Summary of Ground Water Contamination Sources

New York State Superfund Program

New York's Superfund Program maintains a Registry of Inactive Hazardous Waste Disposal Sites where a disposal of a consequential quantity of hazardous waste has occurred. The program also maintains a list of non-registry site (i. e., Brownfield Cleanup Program, Environmental Restoration Program, and Voluntary Cleanup Program sites) where remedial program work is underway. The breakdown of sites as of July 14, 2010 is shown in Table 2. For current information see www.dec.ny.gov/chemical/8439.html .

Table 2 - Status of Sites Currently Listed on the Registry as of July 14, 2010

Registry Class	Class Description	No. of Sites
Class 1	Causing or presenting an imminent danger of causing irreversible or irreparable damage to public health or environment - immediate action required	0
Class 2	Significant threat to the public health or environment - action required	523
Class 3	Does not present a significant threat to the public health or environment - action may be deferred	70
Class 4	Site properly closed - requires continued management	275
Class 5	Site properly closed - no further action required	16
	Sites on Registry	**884**
Class A	The classification assigned to a non-registry site in any remedial program where work is underway and not yet complete.	671
Class C	The classification used for sites where the Department has determined that remediation has been satisfactorily completed under a remedial program.	550
	Total	**2,105**

Federal Superfund Program

Some inactive hazardous waste disposal sites listed on New York's Registry are also listed on the National Priorities List (NPL). EPA is the lead agency responsible for remediating NPL sites in New York. The Department provides oversight of EPA's remedial program at NPL sites in New York. As of July 14, 2010, 90 sites in New York have been listed on the NPL. For current information see www.epa.gov/region02/superfund .

Summary of Ground Water Monitoring Data

NYS established a statewide Ambient Groundwater Monitoring Program in 2002 in cooperation with the U.S. Geological Survey (USGS). The program is designed to monitor all major drainage basins in the state once every five years. As of 2008 one full rotation of monitoring has been completed for the state. Since 2003 data reports have been developed for each major basin. Below are links to each year's data report for those that have been completed and published. Analytical data is also available online at the USGS National Water Information System (NWIS) web portal (http://waterdata.usgs.gov/nwis).

2003 - Ground-Water Quality in the Chemung River Basin, New York, 2003

2004 - Ground-water quality in the upper Susquehanna River Basin, New York, 2004-05
2004 - Ground-Water Quality in the Lake Champlain Basin, New York, 2004

2005 - Ground-Water Quality in the Delaware River Basin, New York, 2001 and 2005-2006
2005 - Ground-Water Quality in the St. Lawrence River Basin, New York, 2005-06
2005 - Ground-Water Quality in the Genesee River Basin, New York, 2005-2006

2006 - Ground-Water Quality in the Mohawk River Basin, New York, 2006
2006 - Ground-Water Quality in Western New York, 2006

2007 - Ground-Water Quality in the Upper Hudson River Basin, New York, 2007
2007 - Groundwater Quality in Central New York, 2007

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

DECinfo Locator

Base Map: Topographical

Help

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Tools

DEC Information Layers

Environmental Quality | Outdoor Activity

Permits and Registrations

- [ ] **Combined Sewer Overflow (CSO) Outfalls**
- [ ] **Multi-Sector General Permits (MSGP)**
- [x] **Petroleum Bulk Storage Facilities**
- [x] **Major Oil Storage Facilities**
- [ ] **Chemical Bulk Storage Facilities**
- [ ] **Permitted and Reclaimed Mines**

Permitted Mine

Environmental Cleanup

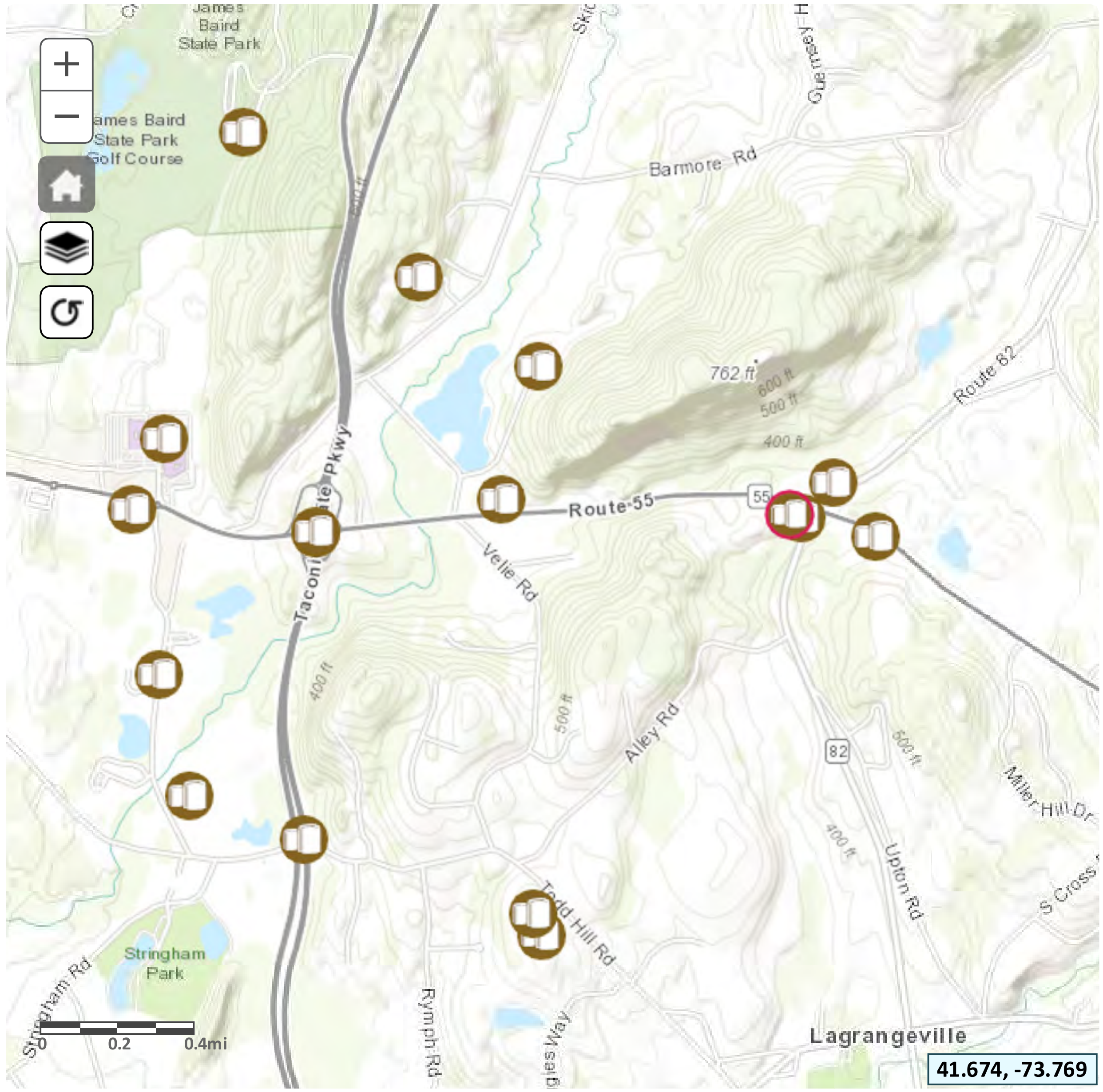
Environmental Monitoring

Public Involvement

Environmentally Sensitive Areas

Legal Information

Reference Layers



NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Environmental Remediation Databases Details

Facility Information

Site No.: 3-1100
Status: Active
Expiration Date: 03/31/2020
Site Type: MOSF
Facility Type: Storage Terminal/Petroleum Distributor
Site Name: RYAN OIL
Address: 1496 ROUTE 55 (ROUTES 55 & 82)
Locality: BILLINGS
State: NY
Zipcode: 12510
County: Dutchess

Facility(Property) Owner(s) Information

Facility Owner: PETRO, INC.
9 WEST BROAD STREET, 3RD FLOOR . STAMFORD, CT. 06902

Facility Operator

Facility Operator: ROBERT MICCARELLI

Tank Information

Tank Information withheld (not releaseable under Freedom of Information Law) in accordance with Public Officers Law Sections 86.5, 87.2(f), 89.5(a)(1)(1-a)

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Environmental Remediation Databases Details

Facility Information

Site No.: 3-139785
Status: Unregulated/Closed
Expiration Date: 08/17/2017
Site Type: PBS
Facility Type: Other
Site Name: TACONIC OFFICE PARK
Address: 1351 ROUTE 55
Locality: LAGRANGEVILLE
State: NY
Zipcode: 12540
County: Dutchess

Facility(Property) Owner(s) Information

Facility Owner: TACONIC REALTY ASSOCIATES
189 FREEDOM ROAD . PLEASANT VALLEY, NY. 12569
Mail Contact: TACONIC REALTY ASSOCIATES
189 FREEDOM ROAD . PLEASANT VALLEY, NY. 12569

Facility Operator

Facility Operator: PARAGON AQUATICS

Tank Information

2 Tanks Found

Tank No	Tank Location	Status	Capacity (Gal.)
1	Underground including vaulted with no access for inspection	Closed - Removed	4000
2	Aboveground on saddles, legs, stilts, rack or cradle	Closed - Removed	3000

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Environmental Remediation Databases Details

Facility Information

Site No.: 3-413615
Status: Unregulated/Closed
Expiration Date: 04/19/1993
Site Type: PBS
Facility Type: Unknown
Site Name: ARTIES GAS CITY
Address: ROUTE 55
Locality: LAGRANGEVILLE
State: NY
Zipcode: 12540
County: Dutchess

Facility(Property) Owner(s) Information

Facility Owner: GAS CITY SERVICE STATION INC.
228 MYERS CORNERS ROAD . WAPPINGER FALLS , NY. 12590
Mail Contact: GAS CITY SERVICE STATION INC.
228 MYERS CORNERS ROAD . WAPPINGER FALLS , NY. 12590

Facility Operator

Facility Operator: GAS CITY SERVICE STAION INC.

Tank Information

4 Tanks Found

Tank No	Tank Location	Status	Capacity (Gal.)
1	Underground including vaulted with no access for inspection	Closed - Removed	10000
2	Underground including vaulted with no access for inspection	Closed - Removed	10000
3	Underground including vaulted with no access for inspection	Closed - Removed	6000
4	Underground including vaulted with no access for inspection	Closed - Removed	4000

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Bulk Storage Database Search Details

First Site | Previous Site | Next Site | Last Site

Facility Information

Site No.: 3-505145
Status: Active
Expiration Date: 09/27/2020
Site Type: PBS
Facility Type: Apartment Building/Office Building
Site Name: LINDAR ASSOCIATES INC.
Address: 1540 ROUTE 55 PO BOX 130
Locality: LAGRANGEVILLE
State: NY
Zipcode: 12540
County: Dutchess

Facility(Property) Owner(s) Information

Facility Owner: MAYNARD DARROW -(LINDAR ASSOCIATES)
121 WALSH ROAD . LAGRANGEVILLE, NY. 12540
Mail Contact: LINDAR ASSOCIATES INC.
1540 RT. 55 PO BOX 130 . LAGRANGEVILLE , NY. 12540

Facility Operator

Facility Operator: DARLIND CONST. INC.

Tank Information

5 Tanks Found

Tank No	Tank Location	Status	Capacity (Gal.)
2	Aboveground on saddles, legs, stilts, rack or cradle	Closed - Removed	275
3	Aboveground on saddles, legs, stilts, rack or cradle	In Service	500
4	Underground including vaulted with no access for inspection	Closed - Removed	1000
505	Aboveground on saddles, legs, stilts, rack or cradle	In Service	2000
506	Aboveground on saddles, legs, stilts, rack or cradle	In Service	1000

Return To Results

Refine This Search

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Bulk Storage Database Search Details

Tank Information

First Tank   Previous Tank

Site No: 3-505145
Site Name: LINDAR ASSOCIATES INC.
Tank No: 506
Tank Location: Aboveground on saddles, legs, stilts, rack or cradle
Subpart: 4
Category: 2
Tank Status: In Service
Tank Install Date: 01/20/2004
Tank Closed Date:
Tank Out Of Service Date:

Tank Capacity: 1000 gal.
Product Stored: diesel
Percentage: 100%
Tank Type: 01 - Steel/Carbon Steel/Iron
Tank Internal Protection: None
Tank External Protection: Jacketed
Tank Secondary Containment: Double-Walled (Underground)
Tank Leak Detection: None
Overfill: Product Level Gauge (A/G)
Spill Prevention: None
Dispenser: Suction Dispenser

Pipe Location: No Piping
Pipe Type: No Piping
Pipe External Protection: None
Piping Secondary Containment: None
Piping Leak Detection: None
UDC: Yes

Tank Next Test Due:
Tank Last Test:
Tank Test Method:

Line Next Test Due:
Line Last Test:
Line Test Method:

Tank Owner Information

Company: MAYNARD DARROW -(LINDAR ASSOCIATES)
Address: 121 WALSH ROAD . LAGRANGEVILLE, NY. 12540

Refine This Search

Return To Facility

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Bulk Storage Database Search Details

Tank Information

First Tank | Previous Tank | Next Tank | Last Tank

Site No: 3-505145
Site Name: LINDAR ASSOCIATES INC.
Tank No: 505
Tank Location: Aboveground on saddles, legs, stilts, rack or cradle
Subpart: 4
Category: 2
Tank Status: In Service
Tank Install Date: 10/01/1990
Tank Closed Date:
Tank Out Of Service Date:

Tank Capacity: 2000 gal.
Product Stored: gasoline
Percentage: 100%
Tank Type: 01 - Steel/Carbon Steel/Iron
Tank Internal Protection: None
Tank External Protection: None
Tank Secondary Containment: Vault (w/o access)
Tank Leak Detection: None
Overfill: Product Level Gauge (A/G)
Spill Prevention: None
Dispenser: Suction Dispenser

Pipe Location: No Piping
Pipe Type: Galvanized Steel
Pipe External Protection: None
Piping Secondary Containment: None
Piping Leak Detection: None
UDC: Yes

Tank Next Test Due:
Tank Last Test:
Tank Test Method:

Line Next Test Due:
Line Last Test:
Line Test Method:

Tank Owner Information

Company: MAYNARD DARROW -(LINDAR ASSOCIATES)
Address: 121 WALSH ROAD . LAGRANGEVILLE, NY. 12540

Refine This Search

Return To Facility

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Bulk Storage Database Search Details

Tank Information

First Tank | Previous Tank | Next Tank | Last Tank

Site No: 3-505145
Site Name: LINDAR ASSOCIATES INC.
Tank No: 3
Tank Location: Aboveground on saddles, legs, stilts, rack or cradle
Subpart: 4
Category: 2
Tank Status: In Service
Tank Install Date: 10/01/1991
Tank Closed Date:
Tank Out Of Service Date:

Tank Capacity: 500 gal.
Product Stored: diesel
Percentage: 100%
Tank Type: 01 - Steel/Carbon Steel/Iron
Tank Internal Protection: None
Tank External Protection: Painted/Asphalt Coating
Tank Secondary Containment: None
Tank Leak Detection: None
Overfill: None
Spill Prevention: None
Dispenser: Suction Dispenser

Pipe Location: Aboveground
Pipe Type: No Piping
Pipe External Protection: None
Piping Secondary Containment: None
Piping Leak Detection: None
UDC: Yes

Tank Next Test Due:
Tank Last Test:
Tank Test Method:

Line Next Test Due:
Line Last Test:
Line Test Method:

Tank Owner Information

Company: MAYNARD DARROW -(LINDAR ASSOCIATES)
Address: 121 WALSH ROAD . LAGRANGEVILLE, NY. 12540

Refine This Search

Return To Facility

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Bulk Storage Database Search Details

Facility Information

Site No.: 3-410659
Status: Active
Expiration Date: 01/13/2022
Site Type: PBS
Facility Type: Retail Gasoline Sales
Site Name: GAS LAND LAGRANGE
Address: 1220 ROUTE 55
Locality: LAGRANGEVILLE
State: NY
Zipcode: 12540
County: Dutchess

Facility(Property) Owner(s) Information

Facility Owner: GAS LAND PETROLEUM
3 SOUTH OHIOVILLE ROAD . NEW PALTZ, NY. 12561
Mail Contact: GAS LAND PETROLEUM
3 SOUTH OHIOVILLE ROAD . NEW PALTZ, NY. 12561

Facility Operator

Facility Operator: AMARJIT SINGH

Tank Information

8 Tanks Found

Tank No	Tank Location	Status	Capacity (Gal.)
1	Underground including vaulted with no access for inspection	Closed - Removed	8000
2	Underground including vaulted with no access for inspection	Closed - Removed	8000
3	Underground including vaulted with no access for inspection	Closed - Removed	8000
4	Underground including vaulted with no access for inspection	Closed - Removed	4000
5	Underground including vaulted with no access for inspection	Closed - Removed	1000
6	Underground including vaulted with no access for inspection	In Service	12000
7A	Underground including vaulted with no access for inspection	In Service	7000
7B	Underground including vaulted with no access for inspection	In Service	5000

Return To Results

Refine This Search

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Bulk Storage Database Search Details

Tank Information

First Tank | Previous Tank | Next Tank | Last Tank

Site No: 3-410659
Site Name: GAS LAND LAGRANGE
Tank No: 7A
Tank Location: Underground including vaulted with no access for inspection
Subpart: 2
Category: 2
Tank Status: In Service
Tank Install Date: 09/19/2012
Tank Closed Date:
Tank Out Of Service Date:

Tank Capacity: 7000 gal.
Product Stored: diesel
Percentage: 100%
Tank Type: 06 - Fiberglass Reinforced Plastic (FRP)
Tank Internal Protection: None
Tank External Protection: Fiberglass
Tank Secondary Containment: Double-Walled (Underground)
Tank Leak Detection: Interstitial - Electronic Monitoring
Overfill: Float Vent Valve
Overfill: Automatic Shut-Off
Spill Prevention: Catch Basin
Dispenser: Pressurized Dispenser

Pipe Location: Underground/On-ground
Pipe Type: Fiberglass Reinforced Plastic (FRP)
Pipe External Protection: Fiberglass
Piping Secondary Containment: Double walled UG
Piping Leak Detection: Interstitial - Electronic Monitoring
Piping Leak Detection: Pressurized Piping Leak Detector
UDC: Yes

Tank Next Test Due:
Tank Last Test:

Line Next Test Due:
Line Last Test:
Line Test Method: -

Tank Owner Information

Company: GAS LAND PETROLEUM
Address: 785 BROADWAY . KINGSTON, NY. 12401

Class Operator Information

Class A Operator: AMARJIT SINGH
Class B Operator: AMARJIT SINGH

Refine This Search

Return To Facility

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Bulk Storage Database Search Details

Tank Information

First Tank | Previous Tank | Next Tank | Last Tank

Site No: 3-410659
Site Name: GAS LAND LAGRANGE
Tank No: 6
Tank Location: Underground including vaulted with no access for inspection
Subpart: 2
Category: 2
Tank Status: In Service
Tank Install Date: 09/19/2012
Tank Closed Date:
Tank Out Of Service Date:

Tank Capacity: 12000 gal.
Product Stored: gasoline/ethanol
Percentage: 10%
Tank Type: 06 - Fiberglass Reinforced Plastic (FRP)
Tank Internal Protection: None
Tank External Protection: Fiberglass
Tank Secondary Containment: Double-Walled (Underground)
Tank Leak Detection: Interstitial - Electronic Monitoring
Overfill: Float Vent Valve
Overfill: Automatic Shut-Off
Spill Prevention: Catch Basin
Dispenser: Pressurized Dispenser

Pipe Location: Underground/On-ground
Pipe Type: Fiberglass Reinforced Plastic (FRP)
Pipe External Protection: Fiberglass
Piping Secondary Containment: Double walled UG
Piping Leak Detection: Interstitial - Electronic Monitoring
Piping Leak Detection: Pressurized Piping Leak Detector
UDC: Yes

Tank Next Test Due:
Tank Last Test:

Line Next Test Due:
Line Last Test:
Line Test Method: -

Tank Owner Information

Company: GAS LAND PETROLEUM
Address: 785 BROADWAY . KINGSTON, NY. 12401

Class Operator Information

Class A Operator: AMARJIT SINGH
Class B Operator: AMARJIT SINGH

Refine This Search

Return To Facility

Bulk Storage Database Search Details

Tank Information

First Tank Previous Tank

Site No: 3-410659
Site Name: GAS LAND LAGRANGE
Tank No: 7B
Tank Location: Underground including vaulted with no access for inspection
Subpart: 2
Category: 2
Tank Status: In Service
Tank Install Date: 09/19/2012
Tank Closed Date:
Tank Out Of Service Date:

Tank Capacity: 5000 gal.
Product Stored: gasoline/ethanol
Percentage: 10%
Tank Type: 06 - Fiberglass Reinforced Plastic (FRP)
Tank Internal Protection: None
Tank External Protection: Fiberglass
Tank Secondary Containment: Double-Walled (Underground)
Tank Leak Detection: Interstitial - Electronic Monitoring
Overfill: Float Vent Valve
Overfill: Automatic Shut-Off
Spill Prevention: Catch Basin
Dispenser: Pressurized Dispenser

Pipe Location: Underground/On-ground
Pipe Type: Fiberglass Reinforced Plastic (FRP)
Pipe External Protection: Fiberglass
Piping Secondary Containment: Double walled UG
Piping Leak Detection: Interstitial - Electronic Monitoring
Piping Leak Detection: Pressurized Piping Leak Detector
UDC: Yes

Tank Next Test Due:
Tank Last Test:

Line Next Test Due:
Line Last Test:
Line Test Method: -

Tank Owner Information

Company: GAS LAND PETROLEUM
Address: 785 BROADWAY . KINGSTON, NY. 12401

Class Operator Information

Class A Operator: AMARJIT SINGH
Class B Operator: AMARJIT SINGH

Refine This Search

Return To Facility

Appendix F – Blackline version of 2019 FGEIS

Town of LaGrange
~~2018~~2005 Comprehensive Plan Amendment
& Proposed Zoning changes
Draft Supplemental Generic Environmental Impact Statement

Location:
Town of LaGrange, Dutchess County, New York

Lead Agency:
Town of LaGrange Town Board
Alan Bell, Town Supervisor
120 Stringham Road, LaGrangeville, NY 12540
Phone: 845-452-9064 Email: abell@lagrangeny.gov

For Questions/Comments:
~~Wanda Livigni, Town of LaGrange Administrator of Planning and Public Works~~
Alan Bell, Town Supervisor
120 Stringham Road, LaGrangeville, NY 12540
Phone: 845-452-~~8562~~9064 Email: ~~wlivigni~~abell@lagrangeny.gov

Action:
The proposed action entails the adoption of amendments to the 2005 Comprehensive Plan and ~~Map and local law amending~~amendments to the Town Zoning Map to change ~~two (2)~~ parcels west of the Taconic State Parkway on State Route 82 from the Town Center-Business (TC-B) District to the Commercial (C) District and ~~fourteen (14)~~16 parcels east of the Taconic State Parkway on State Route 82 and 55 from the General Business (GB) District to the Commercial (C~~.~~) District. In addition, a portion of a 68.5-acre parcel in the Residential Low Density (RLD) zoning district, approximately 0.50 acres, would be rezoned to the Commercial (C) District.

A total of 19 parcels are proposed to be rezoned to the Commercial (C) District. The parcels are identified in a table in Section 2 below.

DGEIS Prepared By:

CPL (Clark Patterson Lee)
50 Front Street
Suite 202
Newburgh, NY 12550

Date of ~~DGEIS~~SDGEIS Acceptance:	~~November 28, 2018~~
~~DGEIS~~SDGEIS Comment Period:	~~March 13-25, 2019~~
~~DGEIS~~SDGEIS Public Hearing:	~~March 13, 2019~~

Table of Contents

Executive Summary

In 2018, the Town Board of the Town of LaGrange commenced a strategic update to the 2005 Comprehensive Plan in order to provide development and land use guidance to several commercial areas along State Route 55. While much of LaGrange's focus and priority has been on investment in and building up Town Center, an idea that has existed since the 1970's, some of the smaller commercial areas have remained stagnant or otherwise seen little movement over the past 13 years. ~~In turn, the Town Center development has been dormant. A public hearing on the Project's DEIS was conducted as long ago as July 9, 2009. An FEIS has not yet been submitted. The Town Center development was the subject of an Illustrative Plan included within 2009 amendments to the LaGrange Comprehensive Plan. The easterly edge of the Illustrative Plan is at least 1,200 feet from the TC-B properties located just west of the Taconic Parkway which are the subject of the rezoning from TC-B district to the C district. The update reflects the Town's desire to expand opportunities to these areas which have otherwise remaining underutilized since the 2005 Plan and subsequent rezoning that occurred thereafter~~In 2009, an amendment to the Town's Plan included more detail on Town Center, including an illustrative plan that identified the desired land uses as well as a more clearly defined limit of that area. Despite these efforts, though some improvements have been made, the Town Center development has remained relatively dormant.

~~The Comprehensive Plan amendment recommends land use and zoning changes that would allow a greater variety of developments, but still emphasizes the importance of protecting the various natural resources found in the area, including wetlands, floodplains, and waterbodies. The existing Town zoning code, coupled with other State and Federal regulations, provide varying levels of review, permitting, and overall use of land in order to protect these resources – these mitigation measures will remain in place regardless of any legislative land use changes. In addition to environmental resources, the impact of land use and zoning changes to transportation networks and circulation are equally important. The stagnant commercial areas, comprised of fourteen (14) distinct parcels, are all located on State highways, which are under the jurisdiction of the NYS Department of Transportation (NYS DOT). As a result, the Town's authority primarily pertains to internal movement and circulation on the individual sites – NYS DOT provides review, approval, and permitting for any actions or changes within the right-of-way, including any changes in volume. State Route 55 and 82 are all constructed to State/Federal standards as higher volume roadways and therefore can handle significant traffic.~~

~~Overall, the existing regulations that are in place for environmental protection and traffic provide a process that includes a significant level of review and approvals that are dependent on compliance with set standards. Additional mitigation is not anticipated as a result of the Comprehensive Plan amendment nor the changes to the zoning map.~~

Accordingly, the Town began evaluating strategies to attract investment and development in the Town Center and surrounding areas, most notably the State Route 55 corridor from the Taconic State Parkway up to State Route 82 which consists of a variety of existing commercial businesses, vacant lands, and some scattered residential. Within this corridor, nineteen parcels are currently zoned as Town Center Business (TCB), General Business (GB), and Residential Low Density (RLD) and are the focus of the Comprehensive Plan and zoning map amendment subject to this SGEIS. Of these nineteen parcels, ten of them contain uses that are currently considered "non-conforming" compared with their current zoning designation, resulting in limitations on further development/improvements or redevelopment without the need for variances. Further, several of the current property owners have requested rezoning of their parcels from the TCB or GB Districts to the Commercial (C) District in order to better utilize their lands in relation to what they are currently used as. The intent of the Proposed Action is to consider amending the Comprehensive Plan and the Town Zoning Map to allow and attract more appropriate land uses in this corridor by rezoning them to the Commercial District. Such rezoning would also render several currently non-conforming lots zoning compliant, thereby encouraging reinvestment and improvement. It is submitted that these steps will provide an opportunity to expand upon the 2009 Town Center initiative and create more commercial opportunities in the corridor where they currently exist.

The purpose of this SGEIS is to evaluate at a conceptual level the future development activity that may occur in the event the Town amends the Comprehensive Plan and the Town Zoning Map to redesignate the parcels in the Study Area (as illustrated on Map 1, and discussed in Section 2 below), to the Commercial (C) District. The SGEIS would not replace any site-specific environmental review that would occur if a subsequent project is proposed if the Comprehensive Plan and Zoning Map amendments were adopted. This SGEIS builds upon the analysis and assessment of a Generic Environmental Impact Statement ("2019 GEIS") that was prepared by the Town Board in 2019, providing expanded assessment of potentially significant adverse impacts pertinent to the Proposed Action based on new, relevant information that was not previously considered or adequately considered. Additionally, during the preparation of the 2019 GEIS, a proposal was submitted to the Town seeking to rezone three parcels of land at the eastern edge of the Study Area to the Commercial District (commonly referred to as the "Stewarts Project"). The methodology utilized within this SGEIS seeks to re-assess and re-evaluate previous data, ensuring the information is not "stale" and update this data based on the current environment in terms of regulations, land use, and physical conditions. The SGEIS follows the same format as the 2019 GEIS with a description of action, description of the existing conditions, evaluation of potentially significant adverse environmental impacts, alternatives, mitigation measures, other issues, and future actions.

In order to evaluate the potential future activity that could occur if the Proposed Action were undertaken, the Lead Agency took to following steps: (i) identified the existing pattern of development in the Study Area, including any environmental or regulatory constraints currently limiting the use and/or building footprint of lots; (ii) identified the reasonable "worst case" full build out in the Study Area if rezoned to the Commercial (C) District, including consideration of the environmental and regulatory constraints, which would not change; and (iii) determined whether the change in potential build out in the Study Area would result in any significant adverse environmental impacts, and if so, whether there were mitigation measures available to avoid or reduce to the maximum extent practicable such impacts.

Based upon this analysis, the SGEIS demonstrates that following change in build out within the Study Area could occur if the Proposed Action were undertaken:

- An additional 18 and 20 uses would be permitted or specially permitted within lands formerly zoned as Town Center Business (TCB) and General Business (GB).
- Minimum lot width (25 to 150 ft); side (0 to 20 ft), rear (6 to 60 ft), and residential district setbacks (25 to 30 ft); and maximum floor area (n/a to 60%) increase significantly in the rezoning from TCB to Commercial. Lot frontage (115 to 200 ft), maximum lot coverage (20 to

30%), maximum floor area (40 to 60%), total maximum lot coverage (50 to 70%) also increases in the rezoning from GB to Commercial.

- Decreases in maximum height (50 to 35 ft), front yard (48.5 to 45 ft), maximum lot coverage (85 to 30%), and total maximum lot coverage (90 to 70%) are noted in the rezoning from TCB to Commercial. Minimum lot size for residential uses is the only notable decrease in the rezoning from GB to Commercial.
- Effective developable area (taking into account the changes in lot coverage and setbacks) for the 19 parcels ranges from a decrease of 0.5 acres to an increase of 3.8 acres with the rezoning from TCB, GB, and RLD to Commercial.

The Lead Agency also identified, based upon public input during the SEQRA Scoping process, areas of environmental concern to be evaluated under the aforementioned methodology. These areas include land use and zoning, transportation, and water resources (floodplains, wetlands, and waterbodies), as well as expanded evaluation of groundwater (within context of water resources section), vegetation and fauna habitat, and cultural resources. Each impact area included an evaluation of this development potential compared with the local, State, and Federal regulations that apply to the parcels which, in almost every case, apply to the land regardless of what zoning district it is in.

Within each impact area, the following evaluation of impacts and mitigation conclusions were reached:

- <u>Land Use and Zoning</u>: An increase in the number of permitted uses is anticipated with the Proposed Action though the change in dimensional requirements (lot coverage and setbacks) balances this out with greater setbacks and less coverage in the Commercial District. Additionally, several parcels contain environmental constraints (*see water resources*) that further restrict or more tightly control the amount of developable land. These development restrictions/controls would apply to the property regardless of the zoning designation. In addition, the additional commercial uses that are permitted as a result of the Proposed Action are already found within the corridor and, due to the current lot configurations with the proposed dimensional requirements taken in account and the environmental limitation, not all of the permitted uses would be feasible on every single property. With the variety of local, State and Federal regulations that pertain to water resource protection and the review processes in place, it is not anticipated that a significant adverse impact to pattern of future development in the Study Area would occur. Accordingly, no mitigation measures are anticipated as a result of the Proposed Action.

- <u>Transportation</u>: Utilizing a "worst case scenario" for development within the corridor, including additional data provided by traffic data with the proposed "Stewarts Project," the State Route 55 corridor can adequately handle any increases in traffic and still maintain an acceptable level of service (LOS rating of "C" or "D") according to transportation engineering and design standards – over 1,000 trips beyond those identified in the "worst case scenario" within the SGEIS would be needed in order to move the LOS to a rating of "E" and require possible roadway changes to accommodate the additional traffic. Additionally, regardless of the zoning designation of the parcels, development is permitted which would increase traffic volumes beyond its current state. Since the LOS under a "worst case scenario" would not result in significant adverse impacts upon area transportation conditions (including traffic operation, noise and air quality). Accordingly, no mitigation measures are anticipated as a result of the Proposed Action.

- Water Resources: For this impact area, four resources were looked at including wetlands, floodplains, waterbodies, and aquifers/groundwater. At least four parcels had some presence of any one (or more) of these environmental constraints that restricted the extent of future development, either with specific activities/uses prohibited or otherwise significantly regulated for resource protection. The most heavily constrained parcel was #3 (945946) with approximately 50% of the land subject to restrictions due to wetlands, waterbodies (Sprout Creek), and floodplains. The combination of local regulations for floodplains (Chapter 120), wetlands (Chapter 124), and waterbody buffers (Chapter 124 and 240-31); State regulations for wetlands (ECL Article 24), protected streams (ECL Article 15, Part 608) and groundwater (6 NYCRR Chapter 5, Part 596-599); and Federal regulations for wetlands and waterbodies under the Clean Water Act (Section 404) and groundwater (40 CFR Parts 280 & 281 provides an extensive array of regulatory authority over activities in effected lands that would apply regardless of the zoning designation, and would ensure that any development in the Study Area would maintain the health and safety of property owners in the vicinity As a consequence, no further mitigation measures are anticipated as a result of the Proposed Action.
- Vegetation, Fauna and Habitat: The presence or potential presence of several threatened, endangered, and State significant species within the Study Area were identified in the SGEIS according to current NYSDEC and US Fish and Wildlife Services (USFWS) databases. While there are no Town regulations pertaining to the protection of wildlife resources, the aforementioned regulations for water resources that are in place at the local, State, and Federal level provide habitat protections that are directly attributable to species protection and avoidance. As noted, these regulations are feature-specific and apply to lands throughout the Town regardless of their zoning designation. Additionally, any development that is proposed within the Study Area would undergo an environmental screening and review that would require consultation with NYSDEC in conjunction with the NY Natural Heritage Program and USFWS to provide up-to-date information. Wildlife protection guidance is also available from USFWS, NYSDEC, and other regional agencies such as Hudsonia, Ltd. that can be referenced during the project review, development, and construction phases. These measures would ensure that any development in the Study Area would protect the wildlife and habitat within the Study Area. As a consequence, no mitigation measures are anticipated as a result of the Proposed Action.
- Cultural Resources: Within the Study Area only one listed resource (Taconic State Parkway) and one eligible resource (#1325 State Route 55) are found. As such, the State Historic Preservation Office (SHPO) has jurisdiction over these resources under Section 106 of Federal regulations, though the Town also has plan review authority under Chapter 240 for historic resources as mapping becomes available. During environmental screening of projects, consultation with SHPO would provide the level of effort required in order to protect the visual/aesthetic quality of these resources ranging from additional screening to viewshed analysis to design adaptations, for example. As these resources are protected at the State level and are feature-based, they would apply regardless of the zoning designation. These measures would ensure that any

development in the Study Area would protect cultural resources. As a consequence, no mitigation measures are anticipated as a result of the Proposed Action.

Section 1.0 Overview

This document is being prepared for the Town of LaGrange as a Supplemental Draft Generic Environmental Impact Statement (~~DGEIS).~~ SDGEIS). The purpose of this SDGEIS is to supplement the information contained in the 2019 GEIS dated April 5, 2019 (accepted November 28, 2018), by updating the 2019 GEIS with new information that was not previously considered in the GEIS and Findings Statement. New information not contained in the 2019 GEIS will be incorporated into the pertinent sections of this DSGEIS in redline; this version of 2019 GEIS is provided in Appendix F.

As the proposed action noted below encompasses several areas of the Town and does not pertain to any site-specific actions (e.g. development proposals), a DGEIS can be used to consider and examine broad-based actions such as comprehensive plans, amendments, and code revisions. This ~~DGEIS~~SDGEIS is a broad analysis of the proposed legislative actions and does not supplant any site-specific environmental analysis that would typically be required for any proposed development project as the adoption of the plan and code amendments will not directly result in any new construction or development. ~~Site specific environmental analysis that would accurately study and mitigate any specific impacts is still required for individual projects and is not discussed under this DGEIS. Fourteen of the sixteen~~This SGEIS aims to provide guidance on future site-specific project reviews for parcels in the Project Location, by analyzing the full build-out potential under the proposed rezoning, comparing said buildout to the baseline condition (i.e., the pattern of development currently permitted), and determining if the “future build” conditions would result in any significant new impacts. If it is determined that the rezoning could result in new significant impacts, then the Lead Agency will identify measures, which could be incorporated into any subsequent proposed actions to avoid or mitigate the impact to the maximum extent practicable. The goal of the SGEIS is to identify impact thresholds, conditions and mitigation measures for future proposed actions in the area proposed to be rezoned, which if exceeded would require additional SEQRA review prior to the reviewing board taking action on the future proposed project. Site specific environmental analysis for projects exceeding the thresholds and conditions identified herein would accurately study and mitigate any specific impacts identified by the reviewing agency for individual projects. Such site-specific studies are not discussed under this DGEIS. ~~parcels are situated within the GB zoning district, and the proposal is to amend the zoning map to designate them within the C zoning district. Interestingly, virtually the same site design standards apply to the GB and C zoning districts. (Town Code Section 240-39.)~~

Minor adjustments to the draft amendments to these documents that may be considered as a result of the public review process would not necessarily require a full revision of this impact analysis. Instead, any recommended change(s) to the specific zoning regulations as a result of this process will be assessed to determine if it would warrant a revision or recalculation of this document, or if it would still fall under the global thresholds, scope and evaluations considered in this ~~DGEIS~~SDGEIS. Minor adjustments to the proposed action can be specifically addressed in the ~~Determination of Significance/Negative Declaration/~~Final SGEIS (“FSGEIS”) and the lead agency’s Findings Statement that will be prepared at the conclusion of the environmental review process. This ~~DGEIS~~SDGEIS was prepared in accordance with the State Environmental Quality Review Act (SEQR) and its implementing regulations 6 NYCRR Part 617.

Section 2.0 Description of Action

The Proposed Action subject to this environmental review is the amendment to the Town's 2005 Comprehensive Plan, recommending a change in future land use and development around the intersections of State Route 55 and the Taconic State Parkway and State Routes 82 and 55. Based on this amendment, revisions to the Zoning Map are also proposed to change ~~14~~16 parcels on the east side of the Parkway from General Business (GB) to Commercial (C) and two (2) parcels on the west side of the Parkway from Town Center-Business (TC-B) to Commercial (C). In addition, a portion of a 68.5-acre parcel in the Residential Low Density (RLD) zoning district east of the Parkway, approximately 0.50 acres, would be rezoned to the Commercial (C) District. Sixteen of the nineteen parcels are situated within the GB zoning district, and the proposal is to amend the zoning map to designate them within the C zoning district. Interestingly, virtually the same site design standards apply to the GB and C zoning districts. (Town Code Section 240-39.)~~), those parcels include the following tax lot numbers (and addresses):~~

The following properties east of the Taconic State Parkway are included in the proposed amendments, rezoned from General Business (GB, formerly C-2) to Commercial (C):

Tax Map ID	**Parcel Address**	**Property Owner**	**Owner Address**	**Current Land Use** *(RPS/Assessor Land Use Code)*
6460-02-945946	22 Taconic Center Lane	Page Park Associates	PO Box 792 Poughkeepsie, NY 12602	Health Spa (544)
6560-01-457972	1463 Route 55	Red Wing Properties, Inc.	675 Leetown Road Stormville, NY 12582	1 Family Residential (210)
6560-02-501968	1477 Route 55	KH Properties, LLC	1320 Route 44 Pleasant Valley, NY 12569	Commercial (400)
~~802900~~ ~~(1215 Route 55)~~6560-02-515970	~~823867~~ ~~(1220-1224~~1489 Route 55~~)~~	~~945946~~ ~~(~~Steven Betancourt, Jr.~~22 Taconic Center Lane)~~	~~417899~~ ~~(1456~~1489 Route 55~~)~~ Lagrangeville, NY 12540	~~473908~~ ~~(~~1 Family Residential (210)~~1474 Route 55)~~
6560-02-546974	1493 Route 55	Brian W. Page	100 Salt Point Tpke Poughkeepsie, NY 12603	Other Storage (449) - vacant commercial

Tax Map ID	Parcel Address	Property Owner	Owner Address	Current Land Use *(RPS/Assessor Land Use Code)*
6560-02-564958	Route 82 (unimproved)	Reuccio Tallini	1311 Hempstead Tpke Elmont, NY 11003	Vacant Commercial (330)
6560-02-601974	2295 Route 82	Joseph Kenneth Parsons, Jr.	2295 Route 82 Lagrangeville, NY 12540	2 Family Residential (220)
6560-02-546919	1502-1504 Route 55	Majac Enterprises, Inc	120 Northfield Ave Dobbs Ferry, NY 10522	Gas Station (432) - active
6560-02-541906	1498 Route 55	Ronald R. D'souza	9 Cross Road Lagrangeville, NY 12540	2 Family Residential (220)
6560-02-530919	1496 Route 55	Petro, Inc	47 Patrick Lane Poughkeepsie, NY 12603	Fuel Storage & Distribution (441)
6560-02-504909 ~~(1486 Route 55)~~	~~530919~~ ~~(1496~~1486 Route 55~~)~~	~~541906~~ ~~(~~ARCOS Construction Mgmt~~1498 Route 55)~~	~~501968~~ ~~(1477~~1486 Route 55~~)~~ Lagrangeville, NY 12540	1 Family Resid. (210) - contractor yard
6560-01-492906	~~515970~~ ~~(1489~~1482 Route 55~~)~~	RPLF LLC	~~546974~~ ~~(1493~~1482 Route 55~~)~~ Lagrangeville, NY 12540	~~564958~~ ~~(Route 82)~~Diner/Lunch (422)
6560-01-473908	1474 Route 55	Roger Realty, Inc.	1474 Route 55 Lagrangeville, NY 12540	Office Building (464) - contractor yard
6560-01-417899	1456 Route 55	John Page Development, LLC	1456 Route 55 Lagrangeville, NY 12540	Other Storage (449) - self-storage

The following properties west of the Taconic State Parkway are included in the proposed amendments to be rezoned from Town Center Business (TCB, formerly TC-B) to Commercial (C):

Tax Map ID	Parcel Address	Property Owner	Owner Address	Current Land Use *(RPS/Assessor Land Use Code)*
6460-02-802900	1215 Route 55	Jaclyn Sayegh	2537 Route 52 Hopewell Junction, NY 12533	Gas Station (432) - former/vacant
6460-02-823867	1220 – 1224 Route 55	Gasland Petroleum, Inc.	785 Broadway Kingston, NY 12401	Gas Station (432) - active

The following properties east of the Taconic State Parkway are also included in the proposed amendments to be rezoned from the General Business (GB, formerly C-2) to Commercial (C) in connection with a proposal to develop a gasoline filling station and convenience store:

Tax Map ID	Parcel Address	Property Owner	Owner Address	Current Land Use *(RPS/Assessor Land Use Code)*
6560-02-592941	2292 Route 82	55-82 LaGrange LLC	315 N Broadway Sleepy Hollow, NY 10591	1 Family Residential (210) - vacant
6560-02-582930	1515-1519 Route 55	55-82 LaGrange LLC	315 N Broadway Sleepy Hollow, NY 10591	Education Facility (615) - vacant

A 0.50-acre portion of the following property east of the Taconic State Parkway is also included in the proposed amendments to be rezoned from Residential Low Density (RLD) to Commercial (C) in connection with the above-mentioned proposal to develop a gasoline filling station and convenience store:

Tax Map ID	Parcel Address	Property Owner	Owner Address	Current Land Use *(RPS/Assessor Land Use Code)*
6560-02-715980	2296 Route 82	Red Wing Properties, Inc.	675 Leetown Road Stormville, NY 12582	Mine/Quarry (720) - active

The intent of these amendments is to provide opportunities for future development in these areas where development has been stagnant or otherwise limited since the completion of the 2005 Comprehensive Plan and subsequent zoning code updates. Many of the uses that currently exist in these areas have existed for some time. Most are pre-existing, non-conforming with limitations on changes, expansion, or growth. Most of the parcels are more consistent with the uses and site development allowed in the Commercial district as compared to the General Business or the Town Center-Business district. The current use and development of the properties define community character and establish a de facto aspect of the Town's Comprehensive Plan. The zoning map changes are designed to promote land use development patterns that still fit with the overall goals and policies of the Town and promote reasonable growth in the Town, taking into context shifts in economic and market changes since 2005. The Town is subject to state tax cap limitations on annual percentage increases in townwide tax levies. Consequently, it is more important to augment tax ratables which the proposed action purports to do. ~~The real estate recession commencing in 2007 has reduced residential development and increased the desirability of commercial development.~~. The roundabouts at Route 55 have mitigated Route 55 traffic. The full proposed text of the Comprehensive Plan amendments and the supporting proposed zoning map are included in Appendix C, in general, the amendments consist of the following changes:

- Updating the Land Use recommendations contained within Section 3.3 under item #3 to reflect the changes to the former Commercial 1 and 2 Districts and to recommend the Study Area parcels as being rezoned to Commercial rather than General Business
- Updating the Proposed Zoning Districts Map (Figure 3.4-1) to reflect the 19 properties within the Study Area zoned as Commercial (C)

It is well recognized that commercial development does not put excessive burden on public expenditures, but rather improves the public purse through enhanced tax ratables. The following general policies have guided the development of the proposed action ~~has public benefits, as follows:~~::

a. ~~All~~The subject areas are traditional commercial centers located at or near the intersection of two major state or county highways where visibility is key and commercial uses provide the "highest and best use" in terms of economic development.
b. The majority of the existing businesses in the corridor are more consistent with a "Commercial" designation than they are with a "General Business" designation. By rendering these uses zoning compliant, owners will not have to obtain variances and other relief just to upgrade or modify the physical plant of their business operations. Eliminating this review requirement, in turn, would encourage investment and upgrades to existing businesses within the proposed rezoned area.
c. The changes proposed support the comprehensive plan's goals with respect to encouraging expansion of commercial development in these areas, and expansion of existing retail and commercial uses in these districts.
d. It encourages a revitalization or redevelopment of properties in the district which have either become vacant or have not been able to perform updated design and services.
e. Commercial development is permitted in each of the existing districts and the uses that are permitted within the proposed action are consistent with the current land uses in the subject area ~~affected.~~

~~Will~~ Based on the environmental review and analysis contained within this SDGEIS, the following benefits have been generally identified as a result ~~in~~ of the proposed action:

a. A reduction in the number of non-conforming uses in the town. [See Section 4.1, Land Use & Zoning Evaluation]

b. ~~Will~~An increase the variety of permitted commercial uses. [See Section 4.1, Land Use & Zoning Evaluation]

~~f.~~ Encourage commercial development~~.~~

c. ~~Provide employment~~ and support opportunities for ~~town~~additional employment for local residents. [See Section 4.1, Land Use & Zoning Evaluation]

~~g.~~ Broaden opportunities for expanding the commercial tax base~~, benefiting~~ and therebybenefiting residential taxpayers~~.~~

d. ~~Provide necessary and desirable services~~ by increasing the value and assessment of these underutilized or vacant lands and contributing to ~~town residents.~~the overall value of the Town. [See Section 4.1, Land Use & Zoning Evaluation]

e. Allow existing businesses to enhance their operation to remain successful, currently restricted due to non-conforming status. [See Section 4.1, Land Use & Zoning Evaluation]

f. ~~No~~Provide expanded development opportunities on some properties without significant impact on school population or traffic. [See Section 4.2, Transportation Evaluation]

g. Will not diminish adjacent property values~~. In fact, if anything, it will increase them.~~ as the existing properties are primarily commercial in nature and the corridor is overall characteristically commercial. [See Section 4.1, Land Use & Zoning Evaluation]

~~h. No subsurface water impact.~~

h. Existing regulations at the local, State, and Federal levels provided enhanced protections to subsurface waters compared to earlier commercial development elsewhere in the Town. [See Section 4.3, Evaluation of Water Resources]

~~h.~~i. No significant further drain on public facilities or services. [See Section 7.2, Irreversible and Irretrievable Commitment of Resources & Section 7.3, Growth Inducing Impacts, Cumulative and Secondary Impacts]

~~i.~~j. No negative effect on living conditions in the neighborhood~~.~~ as the corridor is already primarily commercial in use. [See Section 4.1, Land Use & Zoning Evaluation]

~~j.~~k. No negative impact on public safety. [See Section 7.2, Irreversible and Irretrievable Commitment of Resources & Section 7.3, Growth Inducing Impacts, Cumulative and Secondary Impacts]

~~k.~~l. Not detrimental to environmentally sensitive areas~~.~~ as existing local, State, and Federal regulations provide significant buffering and development/operation standards for specific uses that could potentially impact environmental quality. [See Section 4.3, Evaluation of Water Resources]

Section 3.0 Environmental Setting – Existing Conditions

Section 3.1. Community and Regional Setting

The Town of LaGrange, in central western portion of Dutchess County, is located in the heart of the Mid-Hudson Valley region. Comprised of a land area of approximately 40 square miles, the Town generally consists of more dense development occurring to the west of the Taconic State Parkway and substantial undeveloped areas to the east and north, primarily due to natural resource constraints. With a population of approximately 15,~~720~~577 people according to the ~~2012-2016~~2019 U.S. Census ~~(~~American Community Survey (5-year estimates), the Town has been steadily growing since 1960, with a substantial spike between 1990 and 2000. While many of New York State's metropolitan regions have been experiencing negative growth trends in recent years, the Hudson Valley area is growing, with some community's subject to intense growth pressures. Several of LaGrange's neighbors, including the Towns of Beekman, Union Vale, and Fishkill experienced significant growth during the 1990s and have continued to do so today. From a regional perspective, between 1990 and 2010, LaGrange's growth rate was 18.5%, slightly ahead of Dutchess County's overall growth rate of 14.7%.

Section 3.2. Existing Land Uses, Ownership, Zoning

The existing properties in the area subject to the proposed rezoning ("Study Area") are all privately owned by various property owners as highlighted in ~~Table 1~~the tables contained within in Section ~~3~~2.0. Land uses include single and two-family residential dwellings, gas stations, office building, health spa, storage facilities, general commercial, and vacant (land and improved lands). Lot sizes range in size from a quarter acre up to 21 acres. ~~Only two~~Three zoning districts exist in the subject area – Town Center Business (TCB) on the west side of the Taconic State Parkway and General Business (GB) and Residential Low Density (RLD) on the east side of the Parkway.

~~The individual parcels are further outlined below:~~

An analysis of the land use of each property in the Study Area (use classification codes as outlined by NYS Real Property Services (RPS) and utilized by local assessors for taxing evaluations) as well as the actual, current use of the property if it differs from the use classification code indicates the level of conformity with the existing zoning as noted in Table 3-1 below. The "zoning class" was determined based on the RPS use type or the current use and compared with the list of permitted uses for the existing zoning district each property is contained in (Chapter 240 Attachment A1 & A2). "Conformance" indicates whether the use is in conformance (permitted/special permit) with the existing district or non-conforming (not permitted). Overall, 10 of the 19 properties are not permitted and therefore considered non-conforming.

TABLE 3-1: Property Use Conformance

Tax Map ID	RPS Use Type	Current Use	Zoning Class	Conformance
945946	health spa	(same)	fitness center	conforms
457972	SF resid	(same)	SF dwelling	conforms
501968	commercial	Retail business	retail business	conforms
515970	SF resid	(same)	SF dwelling	conforms
546974	storage/vacant comm	Contractor yard	contractor yard	non-conform
564958	vacant comm	Unimproved vacant land	n/a[1]	n/a[1]
601974	2 fam resid	(same)	2 fam dwelling	non-conform
546919	gas station	(same)	gas mart	non-conform
541906	2 fam resid	(same)	2 fam dwelling	non-conform
530919	fuel storage/dist	(same)	N/A	non-conform
504909	SF resid	Contractor yard	contractor yard	non-conform
492906	diner	(same)	restaurant	conforms

TABLE 3-1: Property Use Conformance				
Tax Map ID	RPS Use Type	Current Use	Zoning Class	Conformance
473908	office	Contractor yard	contractor yard	non-conform
417899	other storage	self storage	storage (self)	non-conform
592941	SF resid	Vacant bldg	SF dwelling	conforms
582930	ed facility	Vacant bldg	childcare center[2]	conforms
~~1215 State Route 55/Lot Number~~ 802900	gas station	Vacant/inactive	gas station (dispensing)	non-conform
823867	gas station	(same)	gas mart	non-conform
715980	quarry	residential accessory bldg.[3]	excavation operations	conforms

1: Property is currently vacant with no structures.
2: Former use of building was childcare center but has been vacant for significant time
3: Structure associated with adjacent use, not quarry operation. Legality of structure in question (i.e. encroachment).

The intent/purpose of these Districts are as follows:

- Town Center Business (TCB): Mixed office, governmental, commercial and residential uses. It is one of the primary districts for adding to the multifamily housing stock in LaGrange. Located in Freedom Plains, this district will provide identity as well as functional coherence to the Town of LaGrange. The district will potentially benefit from the availability of public water and sewer facilities and from pedestrian linkages. Therefore, certain incentives are designed to encourage such development. To date, however, development of a public water and sewer facilities serving the parcels in the Study Area has not occurred. [Note: The intent of Town Center Residential (TCR) is the same as TC-B.]
- General Business (GB): Lower intensity uses. Business and commercial (GB) Districts are generally smaller in scale and form compared with the Commercial (C) Districts.
- Residential Low Density (RLD): Primarily for open space, low-density residential and agricultural uses. This district features many constraints to development, including steep slopes, mapped and unmapped wetlands, and shallow depth to bedrock. This area also has a relatively less developed road system and lacks public water and sewer infrastructure. Many residential uses rely on individual wells and septic systems. The minimum lot size in this district is 120,000 square feet.

The list of uses that are allowed within each district are outlined below with “P” indicating permitted, “SP” as special permit, “N” not permitted, “A” permitted only as accessory use, and “M” permitted only as a mixed use.

TABLE 3-2: Existing Zoning District Uses				
Use	**TCB**	**GB**	**RLD**	**C**
Accessory Structure	P	P	A	P
Adult-oriented Business	N	N		N
Ambulance Service (private)	N	N		P
Auto audio installation service	N	N		P
Auto body shop and collision repair	N	N		N
Auto brake service	N	N		P
Auto car wash (automated)	N	N		P
Auto car wash (self-service)	N	N		P
Auto detailing service	N	N		P
Auto diagnostic service	N	N		SP
Auto towing service (light duty)	N	N		P
Auto towing service (medium duty)	N	N		N
Auto towing service (heavy duty)	N	N		N
Auto muffler service	N	N		P
Auto quick lube and oil change	N	N		P
Auto repair (major)	N	N		SP
Auto sales (new car dealership)	N	N		P
Auto sales (used car dealership)	N	N		N
Auto state inspection service	N	N		P
Auto tire sales and service	N	N		P
Auto transmission service	N	N		N
Bank and financial institutions	P	P		P
Barber, beauty salon, nail salon	P	P		P
Bed & Breakfast	N	SP	SP	N
Cemetery	P	N	SP	N
Child care center	SP	SP		P

TABLE 3-2: Existing Zoning District Uses				
Use	**TCB**	**GB**	**RLD**	**C**
Clubhouse	P	SP		N
Commercial kennel	N	SP	SP	SP
Conference center	P	N		P
Contractor's yard	N	N		P
Convenience store	P	P		P
Dance studio	P	P		P
Drive-in restaurant	SP	SP		SP
Drive-through service facility	A, SP	A, SP		A, SP
Dry cleaning and laundry service	P	P		P
Educational services	P	P		P
Essential services	P	P	P	P
Excavation or removal of earth, topsoil, sand, gravel, clay, or stone; soil and stone crushing, washing and processing operation	N	N		N
Farming/Farm	N	N	P	N
Farm stand	P	N		N
Fast food restaurant	M	SP, M		SP
Fitness center/gymnasium	P	P		P
Food service business	P	P		P
Funeral parlor	P	SP		P
Gas station (fuel dispensing only)	N	N		SP
Gas mart	N	N		SP
Hotel	SP	SP		P
Indoor Theater	P	SP		P
Inn	P	SP		SP
Laboratory (testing & research)	N	N		SP
Land trust facility	P	P		P
Laundromat (self service)	N	P		P
Library	P	P		P
Light industry	N	N		SP
Livery/taxi service	N	N		P
Lumber yard (outdoor)	N	N		N
Medical and dental office	P	SP		P

TABLE 3-2: Existing Zoning District Uses				
Use	**TCB**	**GB**	**RLD**	**C**
Motel	N	N		SP
Museum	P	SP		P
Nightclub	SP	N		P
Office	P	P		P
Outdoor sports/recreation	SP	SP	SP	SP
Passive recreation	P	P		P
Place of public assembly	SP	P		P
Civic buildings and place of public assembly, e.g. community buildings, churches, schools	P	P	SP	P
Pharmacy	P	P		P
Print shop	P	P		P
Private school	SP	AP		SP
Public swimming pool	N	A		A
Radio and television stations	N	N		N
Residential health-care facilities, adult homes and group homes (congregate housing)	SP	SP	P	SP
Single-family dwelling	SP	P	P	N
Townhouse	P	N	N	N
Two-family dwelling	N	N	N	N
Multifamily dwelling	P	N	N	N
Rental apartment	N	N	N	N
Accessory apartment	SP	N	A, SP	N
Detached accessory apartment	SP	N	A, SP	N
Carriage unit	SP	N	N	N
Residential mixed use	M	M, SP		N
Home occupation	A, SP	A	A	A
Restaurant	SP	P		P
Retail business	P	P		P
Retail sale of products of horticulture, as well as hand tools, fertilizer, seeds, bulbs, and other material customarily used in horticulture on	SP	P	SP	P

TABLE 3-2: Existing Zoning District Uses				
Use	**TCB**	**GB**	**RLD**	**C**
parcels of 5 acres or more				
Skating rink	N	N		N
Stables, riding establishments and clubs	N	SP	SP	N
Storage (self service)	N	N		P
Summer day camp	N	SP		SP
Tavern, bar and pub	P	SP		SP
Tennis club	N	N		N
Theaters	P	SP		SP
Veterinary clinic	SP	SP		SP
Veterinary office	P	P		P
Warehousing and wholesale goods	N	N		SP
Wireless telecommunications facilities	SP	SP	SP	SP
Solar panels (roof mounted)	A	A	A	A
Solar panels (ground mounted)	A, SP	A, SP	A, SP	A, SP
Solar farms	N	P, SP	P, SP	P, SP
Swimming pool	P	P	A	P
Pool house/cabana	A, SP	A, SP	A	A, SP
Outdoor kitchen	A	A	A	A
Outdoor fuel burning device	N	N	SP	N
Tennis/sport court	A	A	A	A
Second kitchen			A, SP	
Adaptive Reuse			SP	
Farming			P	

The schedule of dimensional requirements for each parcel (bulk and coverage) within each district are outlined below.

TABLE 3-3: Existing Zoning District Area Requirements				
	TCB	**GB**	**RLD**	**C**
Minimum single-family residential lot area (SF)	N/A	40,000	120,000	30,000
Single-family residential with public sewers	6,000	N/A	120,000	N/A
Townhouse lot area (square feet) with public sewers	2,500	N/A	N/A	N/A
Minimum width of lot along building line (feet)	25	150	200	150
Minimum width of lot at any point	25	50	150	50
Minimum dimension of building square on lot (feet)	N/A	100	200	100
Minimum lot frontage on Town right-of-way line (feet)	25	75	100	75
Minimum lot frontage on county or state highway	25	115	225	200
Maximum number of stories of a building	3	3	3	3
Maximum height of a building or structure (feet)	50	35	35	35
Minimum dimensions (in feet) from center line of NYS Route 55	48.5-58.5	N/A	N/A	N/A
Front yard, state or county road	48.5-58.5	45	90	45
Front yard, Town road	NOTE 1	40	55/80	40
Rear yard	6	20	40	20
Side yard	0	20	40	20
Residential district boundary line	25	30	30	30
Maximum lot coverage by buildings as percent of lot area	85%	20%	10%	30%
Maximum floor area of buildings as percent of lot area	N/A	40%	20%	60%
Maximum total lot coverage as percent of lot area (buildings, structures, outdoor deposit, paving)	90%	50%	15%	70%
Minimum floor area of dwelling unit (square feet)	500	N/A	1200	N/A
Minimum floor area of apartment	500	500	N/A	N/A

The individual parcels are further outlined on the following pages and highlighted in Map 1, Location Map (stars denote a nonconforming use).

Parcel #1*	1215 State Route 55/Lot Number – 802900
	
Existing Land Use Description & History	Existing property consists of a vacant, former gas station (pumps removed) with canopy and convenience store structure still remaining though deteriorating (broken/missing windows); in 2004 the existing land use was commercial. Following the 2005 Comprehensive Plan the property was rezoned to Town Center Business and considered a continuing non-conforming in use. The business has been shut down since 2010 and it was determined by the Town that the property had lost its non-conformity in use status on March 4, 2013~~.~~, meaning that any redevelopment of this lot would likely require substantial demolition costs. No signage exists and the existing pavement is ripped up due to removal of underground tanks. NYS DEC bulk storage database notes that the site (3-413615) is unregulated/closed as of 1993 with four underground PBS tanks removed July 1992. The property is minimally maintained, and no mapped environmental features are noted on the site.

Parcel #2*	1220-1224 State Route 55/Lot Number -– 823867
	
Existing Land Use Description & History	The 2004 land use was commercial on the front lot with a vacant rear lot; both lots have since been consolidated into one. Following the 2005 Comprehensive Plan the property was zoned to Town Center Business and considered a continuing non-conforming in use. The former "front" lot consists of an active gas station (Shell) with five pumps, canopy, and a detached 1-1/2 story convenience store. Three active underground PBS tanks are registered and in service on the site (3-410659) with five previous tanks removed in the past; NYS DEC registration expires 01/13/2022. The site is landscaped with site lighting and three access points serve the property. A mix of woods and scrub vegetation surrounds the site where the former "rear" property was; no mapped environmental features are noted on the site. The property owner submitted an application to expand the use to include a Dunkin Donuts in 2013 but was denied as an expansion of a non-conforming use.

Parcel #3	22 Taconic Center Lane/Lot Number - 945946
	
Existing Land Use Description & History	In 2004 the existing land use was commercial on the “front” lot with the “rear” lot vacant. Following the 2005 Comprehensive Plan, the “front” property was zoned as C-2 (now GB) and the “rear” as R-120 (now RLD); these parcels have since been consolidated into one with rezoning approval by the Town Board to C-2 (GB) in 2010. The site is referred to as “Taconic Center” and it contains a single-story, standalone building (Planet Fitness franchise) surrounded by parking, but predominantly located in the front. A single entrance provides access to the site from State Route 55. A small stormwater pond exists on the southeastern corner of the parking lot and a gravel parking area is found at the southwest corner. Cleared lands exist at the south end of the property adjacent to the access road with the remaining areas consisting of a mix of forest and scrub-brush vegetation. Compared with other properties subject to this ~~GEIS~~SGEIS, this site is the most constricted due to the presence of floodplains, wetlands, and Sprout Creek (with Town regulated buffer zone) located on the eastern side of the property, thereby limiting the amount of developable land – additional information is found in subsequent sections. A site plan is on file for a mixed-use development with an environmental review (SEQRA) performed on full site development with permitted uses in the C-2 District; a negative declaration was granted on 7/20/2010, though full site plan approval for complete build out of the site was not granted. The mixed-use site plan utilized a private well water supply and a package wastewater treatment plant; the building is currently served by this supply and a subsurface wastewater disposal system. The existing building and use, parking, and stormwater improvements were approved on October 2010 with no other applications for additional site development submitted to the Town since that time. In 2015, the property owner requested the Town consider rezoning the parcel to C-1 (now C) to entice more businesses to the site.

Parcel #4*	1456 State Route 55/Lot Number - 417899
	 

Existing Land Use Description & History	In 2004 the existing land use was commercial as an existing storage facility with an approved site plan and zoned C-1. Following the 2005 Comprehensive Plan, the property was changed to C-2 (now GB) and considered a continuing non-conforming in use. This property consists of a multi-unit self-storage facility with an open storage area at the south end for vehicles and miscellaneous materials. Access to the site is provided by a single driveway and the frontage is secured with fencing. Site lighting is limited to the entrance and landscaping buffers the property from State Route 55. The western end of the site is elevated above the roadway due to topography, coming up to grade at the entrance. Beyond the existing open storage areas to the south, the remainder of the property consists of trees and scrub vegetation; no mapped environmental features are noted on the site. It was identified in 2015 that the site had expanded beyond its approved site plan and was in violation with additional RV storage and construction equipment. Subsequently, the property owner applied for an amended site plan to rectify the violation, but it was suspended due to it being an expansion of a non-conformity when the construction yard moved into the rear of the lot. The site has remained stagnant with no amended site plan.

Parcel #5*	1474 State Route 55/Lot Number – 473908
	
Existing Land Use Description & History	In 2004 the existing land use was commercial as a construction yard and zoned C-1. Following the 2005 Comprehensive Plan, the property was changed to C-2 (now GB) and considered a continuing non-conforming in use. The existing use, still a construction company, is set back significantly from State Route 55 and is screened by landscaping. Several structures exist on the site including an office building and a larger 1-1/2 story storage building. Vehicle, materials, and other equipment is stored throughout the narrow site with an access road providing egress from Route 55 and through to the south end of the developed portion of the property. The remainder of the site is vegetated with woods and scrub vegetation; no mapped environmental features are noted on the site. In 2010, the property owner submitted for amended site plan to obtain a roof over an existing porch. The ZBA granted an area variance based on the site being a legal non-conforming use. The PB approved the amended site plan in 2010.

Parcel #6	1482 State Route 55/Lot Number – 492906
	
Existing Land Use Description & History	In 2004, the existing land use was commercial as a restaurant and zoned C-1; following the 2005 Comprehensive Plan, the property was changed to C-2 (now GB). This narrow lot consists of a 2-1/2 story commercial building housing a deli and parking lot with a single access driveway. From 1997 to now, there have been various restaurants, bars, and delis on the site with periods of closure in between active uses. The remainder of the site is vegetated with woods and scrub vegetation; no mapped environmental features are noted on the site.

<table>
<tr><td>Parcel #7*</td><td>1486 State Route 55/Lot Number - 504909</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Existing Land Use Description & History</td><td>In 2004 the existing land use was single-family residential and zoned R-120 (now RLD); following the 2005 Comprehensive Plan, the property was changed to C-2 (now GB). In 2014, the parcel was purchased and converted to a construction yard which resulted in a violation that exists today; ~~it~~the construction (contractor) yard is considered a continuing non-conforming in use.

This property consists of a 1-1/2 story, one-family residential dwelling that is setback from State Route 55 and screened from the roadway by significant trees and vegetation. According to property records, a detached garage also exists on the site with trees and vegetation making up the remainder; no mapped environmental features are noted on the site.</td></tr>
</table>

Parcel #8*	1496 State Route 55/Lot Number - 530919
	
Existing Land Use Description & History	In 2004 the existing land use was commercial; following the 2005 Comprehensive Plan, the property was changed to C-2 (now GB) and considered a continuing non-conforming in use. The property contains two, large aboveground fuel oil storage and distribution tanks as well as a refueling/distribution station. A single driveway provides access to the site and trees screen most of the property from the roadway. No mapped environmental features are noted on the site.

Parcel #9*	1498 State Route 55/Lot Number – 541906
	 View from State Route 55 (top) and State Route 82 (below) 
Existing Land Use Description & History	In 2004, the existing land use was residential as a two-family and zoned R-120 (now RLD); following the 2005 Comprehensive Plan, the property was changed to C-2 (now GB) and considered a continuing non-conforming in use. The property consists of a 2-1/2 story dwelling set back behind the existing gas station/convenience store at the corner of State Route 55 & 82. Though the property has frontage on State Route 82, access is provided by a driveway on Route 55 between the gas station and fuel storage site that appears to be split between these two parcels; security fencing separates the property from the fuel storage site. Vegetation is mainly found on the east side of the site adjacent to Route 82; no mapped environmental features are noted on the site.

Parcel #10*	1502-1502 State Route 55/Lot Number – 546919
	 View from State Route 55 (top) and State Route 82 (following page) 
Existing Land Use Description & History	In 2004, the existing land use was commercial (gas station); following the 2005 Comprehensive Plan, the property was changed to C-2 (now GB) and considered a continuing non-conforming in use. A two-pump gas station with canopy and convenience store are found at this site. Three active underground PBS tanks are registered and in service on the site (3-172073) with five previous tanks removed in the past; NYS DEC registration expires 11/10/2020. Wide access drives are found on both State Route 55 and 82 with a larger parking area surrounding the structures. Vegetation is limited to minimal maintained lawn and some landscaping (trees/shrubs); no mapped environmental features are noted on the site.

Parcel #11	0 State Route 55/Lot Number - 457972
	
Existing Land Use Description & History	In 2004, the existing land use was residential and zoned R-120 (now RLD); following the 2005 Comprehensive Plan, the property was changed to C-2 (now GB~~) and considered a continuing non-conforming in use.~~). The property consists of a one-family residential dwelling that is accessed by a long driveway with distance and significant vegetation obscuring any structures from the roadway. According to property records several structures exist including a house and several garages/sheds/outbuildings. A small, unnamed tributary of Sprout Creek is located at the northern and western edge of the property with a mapped floodplain adjoining it. The majority of the site consists of trees and other scrub/shrub vegetation which would require significant site preparation thereby limiting the development potential. An application for the parcel has been submitted to the Town for consideration to subdivide the parcel into three (3) lots for the single-family residence and two future commercial lots – no action has yet been taken.

Parcel #12	1477 State Route 55/Lot Number - 501968
	
Existing Land Use Description & History	In 2004, the existing land use was residential and zoned R-120 (now RLD); following the 2005 Comprehensive Plan, the property was changed to C-2 (now GB). An existing commercial business is found at this property, The Pools Guys Pool & Spa, with an approved site plan on record in 2011. A 1-1/2 story structure and parking lot with single access driveway takes up approximately two-thirds of the property with the remainder consisting of trees and other scrub/shrub vegetation; no mapped environmental features are noted on the site.

Parcel #13	1489 State Route 55/Lot Number – 515970
	
Existing Land Use Description & History	In 2004, the existing land use was single-family residential and zoned R-120 (now RLD); following the 2005 Comprehensive Plan, the property was changed to C-2 (now GB). The site contains a 2-1/2 story, one-family residential dwelling with two access points on Route 55. The property is fenced and consists of a mix of maintained lawn, mature trees, and scrub/shrub vegetation. No mapped environmental features are noted on the site.

Parcel #14*	1493 State Route 55/Lot Number – 546974
	
Existing Land Use Description & History	In 2004, the existing land use was commercial; following the 2005 Comprehensive Plan, the property was changed to C-2 (now GB). A single-story commercial structure exists on the property with fencing along the frontage; a u-shaped driveway provides access with two points of ingress on Route 55. The building is vacant (build to suit sign posted on fence) with the site being ~~currently~~ used in the past for temporary storage of utility trailers and other construction/utility materials associated with public utility work by Central Hudson; there is currently no temporary storage as of the date of this document. The building is in a state of neglect with missing doors and windows and has been vacant for at least 17 years. Approximately half of the property is developed (maintained lawn, pavement, building) and the other half consists of trees and scrub/shrub vegetation. Though a small unnamed creek does not run through the property, some of the floodplain that abounds it is located on the northern 0.9-acre portion of the site~~.~~, limiting development potential.

Parcel #15	0 State Route 82/Lot Number – 564958
	
Existing Land Use Description & History	In 1981, this parcel was subdivided off of a larger Red Wing parcel (mining property/company). In 2004, the existing zoning was R-120 (now RLD); following the 2005 Comprehensive Plan, the property was changed to C-2 (now GB). This vacant parcel contains no structures and consists of heavy vegetation; no mapped environmental features are noted on the site.

Parcel #16*	2295 State Route 82/Lot Number - 601974
	
Existing Land Use Description & History	In 2004, the existing land use was single-family residential and zoned as R-120 (now RLD). The Town Board approved a rezoning of this parcel to GB (former C-2) based on the property owner's request to have the parcel match the surrounding zoning. Recent real property classifications indicate the property as two-family residential, deeming the property as non-conforming. Several structures exist on the site including a 2-1/2 story dwelling and several outbuildings. Woods and other vegetation surrounding the majority of the site; no mapped environmental features are noted on the site.

Parcel #17	1515-1519 Route 55/Lot Number - 582930
	
Existing Land Use Description & History	In 2004, the existing land use was an educational facility/daycare and zoned as GB. The parcel is current vacant and has been for sale under various realtors since approximately 2008. Several structures exist on the site including a 2-1/2 story dwelling and an outbuildings. The property is fenced along the roadway and contains a former playground area, parking lot and open/maintained lawn; no mapped environmental features are noted on the site. A pending application for a commercial gas station and convenience store is being considered for this site as well as parcels 18 and a 0-5 acre portion of parcel 19, subject to rezoning.

Parcel #18	2292 Route 82/Lot Number - 592941
	
Existing Land Use Description & History	In 2004, the existing land use was single-family residential and zoned as GB. Only one structure exists on the site (yellow barn is on adjacent property) consisting of a 1-1/2 story dwelling, currently vacant and for sale. The property consists of maintained lawn and also contains a walkway connecting the property to parcel #17/582930; no mapped environmental features are noted on the site. The property was likely utilized in conjunction with the educational/daycare facility (parcel 17). A pending application for a commercial gas station and convenience store is being considered for this site as well as parcels 17 and a 0-5 acre portion of parcel 19, subject to rezoning.

Parcel #19	2296-2332 Route 82/Lot Number - 715980
	
Existing Land Use Description & History	In 2004, the existing land use of the entire parcel was mine/quarry and zoned as R-120 (now RLD). The overall parcel consists of an active mine/quarry operation and this structure was part of a small-scale retail business portion of the mine, offering residential and small business purchases of material. Currently, this portion of the business is not active. Outside of the mined area, the property consists of cleared lands adjacent to the mine and heavy woods; floodplains and wetlands are found further east of this area within the remaining 68.5 acres, though no features are within the area subject to the proposed action. A commercial gas station and convenience store is being considered for a 0-5 acre portion of this site as well as parcels 18 and 19, subject to rezoning.

Section 3.3. Buildings/Structures

As noted above, a variety of land uses exist in the area with buildings that include residential dwellings, storage buildings, and commercial and office buildings. These structures range in height from single story to two stories and up to approximately 62,500 square feet in size (mini-warehouse/storage facility).

Section 3.4. Infrastructure/Transportation Network

Water and sewer utilities are mainly private systems (well and septic) with only ~~a few locations that have~~ the two properties west of the Taconic State Parkway (parcels #1 & 2) in the Study Area having public water. Natural gas, electric service, and telecommunications are all available as well. Within the Study Area, State ~~highways (~~Route 55 serves as a principal arterial and State Route 82~~) service the area~~ serves as a major collector with the Taconic State Parkway providing high-volume transportation as a principal arterial expressway beyond the region. Other roadways function as local roads maintained by the Town and County.

In 2019, the average annual daily traffic (AADT) of State Routes 55 and 82 were 14,216 and 7,320/7,464 (north/south of Route 55), respectively, east of the Parkway. State Route 55 west of the parkway had an AADT of 17,308 in 2019. Both of these roadways are designated truck routes in addition to serving personal automobiles. According to 2019 NYSDOT figures, only six (6) percent of the total traffic in 2019 was estimated to be truck traffic for both Routes 55 and 82 (887 and 444). Ambient and daytime noise levels for these areas have not been measured, though according to the Federal Highway Administration (FHWA), typical high traffic noise ranges from 70 to 80 db(A) at a distance of 50 feet from the highway; noise generated from a conservation between two people standing three feet apart, by comparison, is usually in the 60-65 dB(A) range. Diesel trucks and noisy urban daytime environments can reach 80 dB(A). It can be assumed that these noise ranges are found along the Route 55 and 82 corridors given the most current AADT traffic volumes with occasional peaks due to periodic truck traffic.

Section 3.5. Natural Resources

A number of waterbodies exist in the area including wetlands and floodplains as a result of the presence of Sprout Creek and other tributaries~~.~~ (see Maps 2-4). With the exception of a few parcels, namely parcel #3, 11, 14, and 16, these water resources are primarily found outside of the ~~subject~~Study Area or immediately adjacent to it. Parcel #3 contains the greatest combination of these resources including wetlands (NYSDEC and Federal), floodplains/floodway, and Sprout Creek. Sprout Creek is one of the major waterbodies found within the Town of LaGrange, running in a southerly direction beginning in Millbrook, NY and eventually joins with Fishkill Creek outside of the Town prior to ending in the Hudson River. The creek is not only an important local resource in terms of watershed drainage, but it is also a key recreational asset as only one of a few trout creeks within Dutchess County, with an annual stocking program as well as the presence of native, wild trout~~.~~; the creek is classified by the NYSDEC as C(T) – best usage for fishing and designated trout waters). As a result, the environmental health of the creek is an important aspect not only in LaGrange, but to the County overall. The creek is not on the 303(d) list of impaired waters but is regularly monitored by the NYSDEC for aquatic biology health/quality; a monitoring site (13-SPRO-10.6) is located just north of Todd Hill Road south of the project area. This monitoring is part of the DECs water quality assessment which uses a four-tiered system of impact categorization to assign a "Biological Assessment Profile" – non-impacted, slightly impacted, moderately impacted and severely impacted, with the latter indicating very poor water quality and the biological community limited to only a few tolerant species. The most recent assessment (September 10, 2002) indicates the creek is "slightly impacted" indicating that:

"*Metrics reflect good water quality. The biological community is slightly, but not significantly altered from the pristine state. Water quality is usually not limiting to fish, shellfish, and wildlife survival, but may be limiting to fish propagation, especially sensitive coldwater fish taxa*." (NYSDEC Fact Sheet on Assessment of Water Quality Impact in Streams and Rivers)

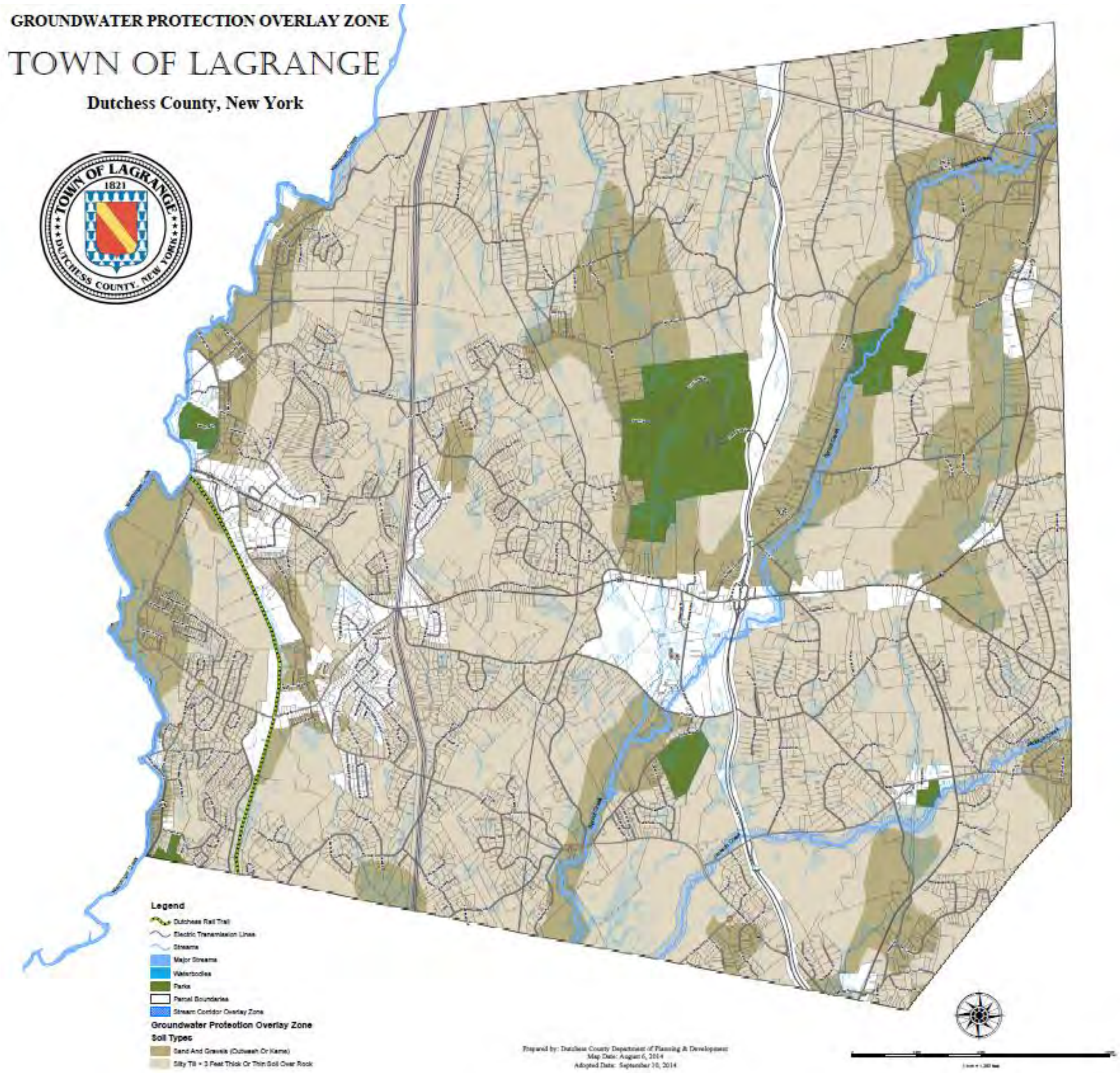
According to the *Natural Resources Management Plan for the Fishkill Creek Watershed (2013),* the likely cause for the water quality rating is non-point nutrient enrichment from sources including, but not limited to, sewer treatment plant effluents, faulty septic systems, and agricultural operations that were not following best management practices.

Along with Sprout Creek, several other water features exist throughout the Study Area in proximity to or adjacent to the creek including FEMA-designated, 100-year floodplains and floodways and NYSDEC-regulated and Federal-regulated (US Army Corps of Engineers) wetlands. As noted, these resources are predominantly centered around Sprout Creek (and consequently encumbering a significant portion of parcel #3), but also in the northwestern corner of Route 55 and 82 along the northern edges of parcels #11-14 and 16 in the Study Area.

Properties that contain NYSDEC-regulated wetlands are subject to review and permitting under Title 23 of Article 71 of the NYS Environmental Conservation Law (ECL) – Article 24, Freshwater Wetlands; disturbance of these wetlands is highly regulated as well as a 100-foot buffer area beyond the delineated boundary. While the NYSDEC regulates wetlands greater than 12.4 acres in size, other wetlands of a smaller size are covered under US Army Corps of Engineers under Section 404 of the Clean Water Act as well as at the local level through Chapter 124 of the LaGrange Town Code. Development within floodplains is regulated under Town Code Chapter 120, which provides for a review and permitting structure that outlines building and site standards as well as requiring technical evaluation(s) by professional engineers to ensure no additional flooding impacts beyond base levels. Additional permitting and regulatory details for floodplains and wetlands are found in Sections 4.3.1 and 4.3.2, respectively, of this SGEIS.

A principal aquifer is also found within the Study Area, encompassing Sprout Creek and the Route 82 corridor – this aquifer extends north and south through the remainder of the Town. According to NYSDEC, principal aquifers are “aquifers known to be highly productive or whose geology suggests abundant potential water supply, but which are not intensively used as sources of water supply by major municipal systems at the present time.” This aquifer is used by individual property owners (private wells) with each well owner being responsible for treatment, maintenance, and testing. By comparison, primary or sole-source aquifers are highly productive groundwater sources that are used as a water supply for major municipal water systems, serving multiple properties and under the jurisdiction of a local government, including treatment, maintenance, and testing; there are no primary or sole-source aquifers found in the Town of LaGrange. There are no reported significant contamination issues with this aquifer. Additional details with respect to random private well quality testing undertaken by Dutchess County Department of Health in 2008 are found in Section 4.4.

As noted in Section 4.4, Chapter 240-31.G of the Town Code regulates development and land uses within a groundwater protection zone (see “GROUNDWATER PROTECTION OVERLAY ZONE” map on following page), shown as a dark or light brown shaded area. These regulations provide restrictions on specific new uses where public water and sewer exists, specifically underground tanks less than 1,100 gallons. Tanks over this capacity are subject to NYSDEC permitting under 6 NYCRR Chapter 5.



Section 3.6. Cultural Resources

According to the NYS Historic Preservation Office's (SHPO) Cultural Resource Information System (CRIS), there is only one listed cultural resource in the Study Area. The Taconic State Parkway, a National Register listed historical resource (02NR05036), traverses the Town of LaGrange and bisects State Route 55; the Parkway was initially designated as a State scenic byway in 1992. Within the Town, the only interchange from the Parkway is at State Route 55 with a significant cloverleaf design that is screened with a dense mix of evergreen and deciduous trees; the Parkway crosses Route 55 via a decorative stone overpass.

There are no other listed or eligible resources within the project area, though #1325 State Route 55, located east of Veile Road and outside of the Study Area, is noted as being eligible by SHPO. As part of the standard environmental review process, projects that are within or contiguous to listed or eligible resources or within sensitive archeological areas are to coordinate development with SHPO. The scale and proximity of the development will determine the level of follow-up and mitigation required for cultural resource protection, which could include, but not be limited to Phase 1A/B survey, resource documentation, or resource protection and listing.

Section 3.7. Wildlife Resources

The NYS Department of Environmental Conservation (NYSDEC) and the US Fish and Wildlife Service (USFWS) both maintain databases that provide mapping and guidance for the presence of endangered, threatened, and rare species. The mapping provided by these agencies provide general locations for areas in which environmental conditions may be present to support these species and/or habitats may exist in the vicinity. The actual presence of these species is dependent upon completed studies by biologists where conditions exist to support them. According to these databases, the general area that encompasses the Study Area and extending well throughout the entirety of the Town of LaGrange could potentially support the Indiana Bat (*Myotis sodalis*, NYS/Federal Endangered) and the Bog Turtle (*Clemmys muhlenbergii*, Federal Threatened/NYS Endangered) – no critical habitats for either of these species is identified in either database.

As part of the standard environmental review process, these databases would be consulted and the results included in documentation. Site-specific studies may be warranted based on the scale and extent of any proposed development regardless of the zoning district and eventual construction work would be subject to best management practices to avoid impacts to species or their habitats, i.e. seasonal tree removal for bats and wetland disturbances for turtles.

Beyond NYSDEC and USFWS, *Hudsonia, Ltd.*, a Hudson Valley-based non-profit environmental research insititute, has conducted various wildlife studies that have included the proposed project area. Specifically, their *2019 Significant Habitats in the Fishkill and Sprout Creek Corridors* has indicated that habitat conditions exist along various locations of Sprout Creek for the wood turtle (*Clemmys insculpta*, NYS Special Concern) and Blandings Turtle (*Emydoidea blandingii,* NYS Threatened). Further studies specifically centered around the Blandings Turtle (*2009 Blandings Turtle Habitats in Southern Dutchess County*) have identified a significant number of core habitats with none within the Study Area and the closest found just south of Town Center; a 200-meter priority zone extends from this core habitat up to the TSP with a 1,000-meter conservation zone and 2,000-meter area of concern extending beyond that. The conservation zone encompasses the majority of the project area with the area of concern taking up all of the Town of LaGrange. While several types of ecological habitats exist throughout the Town of LaGrange and along the Sprout Creek corridor, the only area in which there are State-designated significant natural communities is the *Appalachian oak-hickory forest* found on the west side of the TSP, north of Route 55 and extending north up to Mountain Road; this resource is not found in the Study Area.

Section 4.0 Evaluation of Potential Significant Adverse Environmental Impacts

The Town of LaGrange determined that a strategic scope of evaluation of the potential significant adverse environmental impacts associated with the proposed action based on key elements would be undertaken. ~~As there are no official projects that are proposed for the subject properties at this time, there is enhancement of extent of development potential. The scope of analysis should entail an evaluation of the following~~In order to identify potential impacts associated with the Proposed Action, the Lead Agency: (i) identified the existing conditions in the Study Area (i.e., the Baseline Conditions); (ii) identified the potential full build out under the proposed rezoning of the Study Area to the C District; and (iii) determined if the change in development potential could result in a pattern of development that may result in any new significant impacts. The scope of analysis covered the following impact areas:

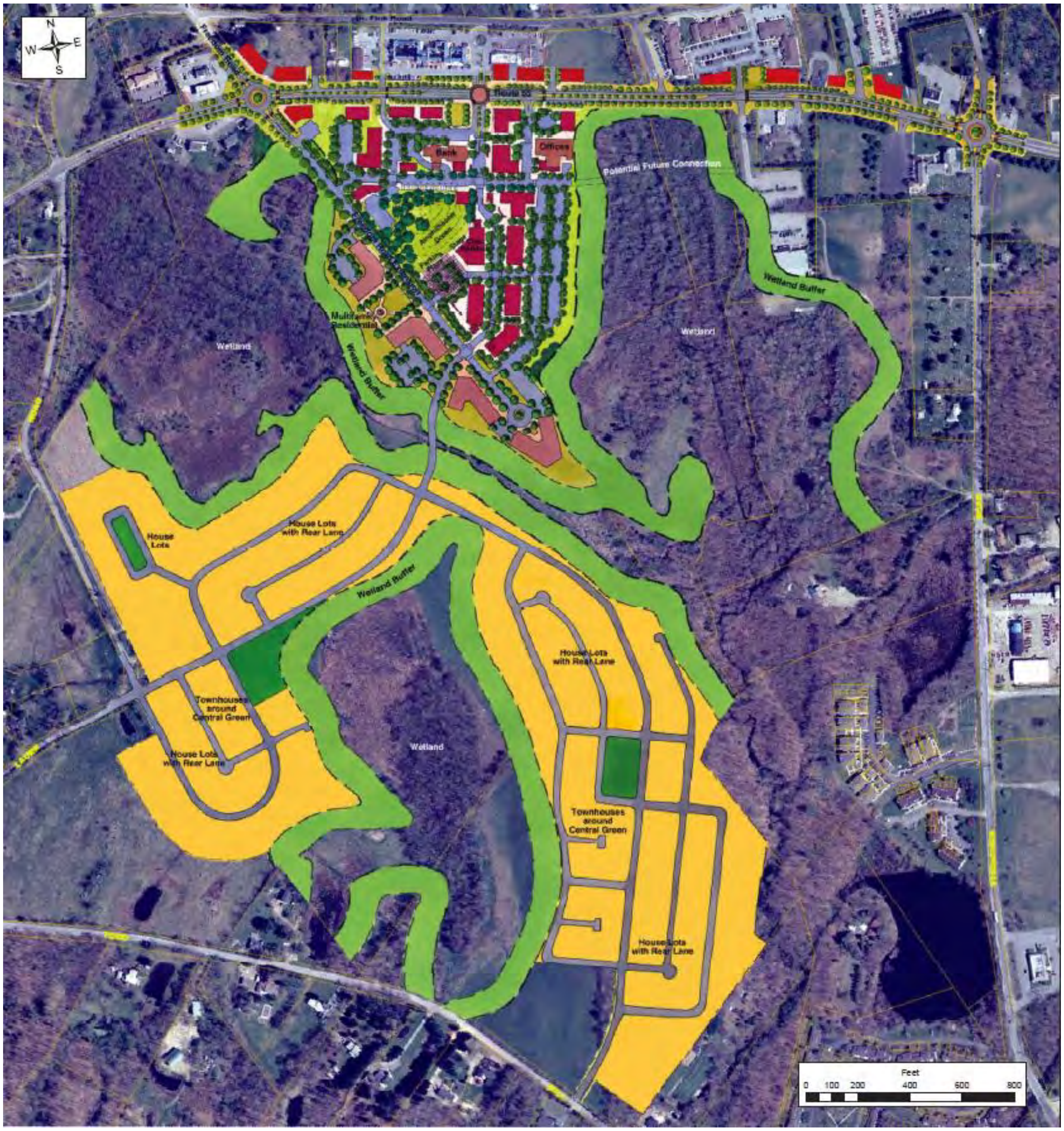
- Land Use and Zoning
- Transportation (volumes, trip ends)
- ~~Wetlands~~
- Water Resources (Floodplains, Wetlands, Waterbodies, Groundwater)
- ~~Sprout Creek (the primary waterbody in the area, but also including any other pertinent waterbodies)~~
- Vegetation, Fauna and Habitat
- Cultural Resources (including historic)

Regardless of what type of development is proposed in the future, ~~these~~there are various environmental encumbrances that would be a significant influencing factor both in terms of internal site constraints and external influence to the road network and water quality. ~~These impacts would be reviewed in special permit or site plan proceedings before the Planning Board.~~These constraints were considered when identifying the build out potential of the Study Area if the Proposed Action were adopted.

The Town's 2005 Comprehensive Plan outlined policies, goals, actions, and recommended land uses for their vision for the future of the community. The concept of a "town center" has existed since the 1970's and was noted in the 2005 Plan. In 2009, an amendment to the Plan expanded upon that idea with an illustrative concept that included more detail on a formal Town Center, identifying the desired land uses as well as a more clearly defined limit of that area. This concept plan, provided below, highlights the long-term vision for creating a true Town Center in LaGrange and has been actively sought after, though a significant time period of more than nine years has passed between the public hearing on the Draft Environmental Impact Statement and the submission of an FEIS. Despite these efforts, though some improvements have been made, the Town Center development has remained relatively dormant.

While Town Center is an important component of LaGrange and the design objectives of the corresponding districts seek to create a well-designed mixed-use area, it should be noted that the original illustrative plan extended west to east from Lauer Road/Freedom Road to Stringham Road and north to south from State Route 55 down to Todd Hill Road. Beyond these areas, especially to the east near parcels #1 (1215 Route 55) and #2 (1220-1224 Route 55), creating a walkable, mixed-use area close to a major intersection with eight (8) access points is not likely to occur given the combination of vehicle speeds, circulation, safety, and the overall character of the interchange area.

<ins>In addition, these parcels are approximately 1,200 feet from the roundabout on State Route 55 that identifies the eastern end of Town Center Illustrative Plan. 1,200 feet is beyond a comfortably safe walking distance from the commercial core of a Town Center, particularly given traffic conditions along Route 55.</ins>



In general, the Proposed Action will provide more opportunities for development within the Study Area, which includes 18-20 more commercial uses compared to the existing zoning districts. Of the 19 total lots, only one is undeveloped (no structures or improvements) with the remaining 18 lots subject to redevelopment of some level. Although additional commercial uses are permitted or specially permitted, lot dimensional requirements (i.e. lot size, setbacks, lot coverage) also factor into the extent and breath of development upon in each lot. The most significant of these changes is with the lot coverage by buildings/impervious area in which there is a 20-45% reduction with the Town Center Business to Commercial and a 10-20% increase with the General Business to Commercial change. Setbacks are also much greater in the Commercial district compared to the Town Center Business and General Business districts. The lot configurations and sizes of parcels #1, 10, and 18 make them virtually undevelopable under any of the zoning districts as their developable area (accounting for setbacks and lot coverage) are under 0.5 acres. Taking into account the environmental constraints as noted above and further detailed in the sections below, the actual developable land is further reduced or otherwise significantly restricted on parcels #3, 11, 14, and 16 by as much as 50%; this would be the case for either the existing zoning districts or the proposed rezoning. Parcel #3 is the most encumbering property in the Study Area as is contains floodplains, wetlands, streams, and is within the aquifer overlay zone with between 3-5 acres of land unable to be developed or subject to significant regulation of the total 6.48 acres of developable land under the current zoning and 4-6 acres regulated of the total 9.08 acres of developable land.

		Total Development Area Minus Setbacks and Lot Coverage (Acre)			Development Area Subject to Add'l Dev Restrictions (Acre)											
					Floodplains			Wetlands			Streams			Aquifer		
Parcel	Lot No	Existing Zoning	Proposed Zoning	Difference	Existing Zoning	Proposed Zoning	Difference	Existing Zoning	Proposed Zoning	Difference	Existing Zoning	Proposed Zoning	Difference	Existing Zoning	Proposed Zoning	Difference
TCB																
1	802900	0.53	0.30	-0.23	N/A	N/A		N/A	N/A		N/A	N/A		-	-	
2	823867	1.31	0.82	-0.48	N/A	N/A		N/A	N/A		N/A	N/A		-	-	
GB																
3	945946	6.48	9.08	2.59	3.21	4.50	1.29	1.67	2.34	0.67	2.17	3.03	0.87	3.20	4.48	1.28
4	417899	9.52	13.33	3.81	N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A	
5	473908	0.97	1.36	0.39	N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A	
6	492906	0.63	0.88	0.25	N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A	
7	504909	1.45	2.03	0.58	N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A	
8	530919	0.40	0.56	0.16	N/A	N/A		N/A	N/A		N/A	N/A		0.00		
9	541906		Note 1			Note 1			Note 1			Note 1			Note 1	
10	546919	0.04	0.06	0.02	N/A	N/A		N/A	N/A		N/A	N/A		0.00	0.00	
11	457972	2.85	3.99	1.14	0.49	0.69	0.20	N/A	N/A		N/A	N/A		0.49	0.69	0.20
12	501968	0.49	0.68	0.20	N/A	N/A		N/A	N/A		N/A	N/A		0.04	0.05	0.01
13	515970	0.73	1.02	0.29	N/A	N/A		N/A	N/A		N/A	N/A		0.37	0.52	0.15
14	546974	1.58	2.21	0.63	0.29	0.40	0.11	N/A	N/A		N/A	N/A		1.54	2.15	0.62
15	564958	1.03	1.44	0.41	N/A	N/A		N/A	N/A		N/A	N/A		0.00	0.00	
16	601974	0.68	0.95	0.27	0.10	0.15	0.04	N/A	N/A		N/A	N/A		0.00	0.00	
17	582930		Note 2			Note 2			Note 2			Note 2			Note 2	
18	592941	0.06	0.09	0.02	N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A	
RLD																
19	715980		Note 3			Note 3			Note 3			Note 3			Note 3	

Note 1: Does not meet min lot frontage requirements, therefore is considered undevelopable
Note 2: Due to the configuration of the lot, the parcel is undevelopable under current setbacks.
Note 3: 715980 is proposed to be resubdivided. On its own, the parcel is 100% undevelopable.

Section 4.1. Land Use & Zoning Evaluation

Existing Conditions

As noted in Section 2.0, the proposed action would rezone the parcels ~~below~~in the Study Area from General Business (GB~~) and~~), Town Center – Business (TC-B), and a small portion of the Residential Low Density (RLD) to Commercial (C). The purpose of the Proposed Action is to provide a greater opportunity for revitalization and redevelopment of the parcels in the Study Area, a significant number of them being underutilized or non-conforming under their current zoning designation. Several property owners have requested their properties to be rezoned in order to better utilize their lands.

The properties consist of a mix of uses ranging from vacant land to gas stations to residential to active warehousing as outlined in Table 4-1 below and ~~shown~~Table 3.1 in ~~Figure 1 on the following page~~Section 3.2 . All together, these parcels constitute approximately ~~67.5~~68.0 acres of land or 0.2 percent of the total land area (24,786.5 acres) of the Town of LaGrange. It should be noted that the 68.0 acres does not take into account the full 68.5 acres of parcel #19 (715980) as the proposed project for that site as currently proposed in an application to the Planning Board will consist of a 0.5-acre subdivision of land to be rezoned to Commercial and leaving the remaining 67.5 acres as RLD for the active mine/quarry operation.

Parcel	Lot Number	Lot Size (acre)	Land Use Code	Land Use Description	Zoning Code	Parcel Number	Parcel Address	Owner	Roll Section	Comment
1	802900	0.87	330*	Vacant Commercial	TCB	133400-6460-02-802900-000	1215 Route 55	M Spiegel & Sons Oil Corp.	1	Unused, NC
2	823867	1.81	432	Gas Station	TCB	133400-6460-02-823867-000	1220-1224 Route 55	Gasland Petroleum Inc.	1	NC
3	945946	14.47	544	Health Spa	C2	133400-6460-02-945946-000	22 Taconic Center Ln	Page Park Associates LLC	1	
4	417899	21.00	449	Other Storage	C1	133400-6560-01-417899-000	1456 Route 55	John Page Development	1	NC
5	473908	2.81	464	Office Building	C1	133400-6560-01-473908-000	1474 Route 55	Roger Realty Inc	1	NC
6	492906	2.03	442	Diner/Lunch	C1	133400-6560-01-492906-000	1482 Route 55	RPLF LLC	1	
7	504909	3.05	449*	Other Storage	C1	133400-6560-02-504909-000	1486 Route 55	ARCOS Construction Management	1	NC
8	530919	1.27	441	Fuel Store & Dist.	C1	133400-6560-02-530919-000	1496 Route 55	Petro Inc.	1	NC
9	541906	0.24	220	2 Family Residential	C1	133400-6560-02-541906-000	1498 Route 55	D'souza, Ronald & Rasalie M	1	NC
10	546919	0.32	432	Gas Station	C1	133400-6560-02-546919-000	1502-1504 Route 55	Majac Enterprises Inc	1	NC
11	457972	6.76	210	1 Family Residential		133400-6560-01-457972-000	???? Route 55	Red Wing Properties	1	
12	501968	1.53	400	Commercial	C2	133400-6560-02-501968-000	1477 Route 55	KH Properties LLC	1	
13	515970	2.28	210	1 Family Residential	C2	133400-6560-02-515970-000	1489 Route 55	Betancourt, Steven Jr	1	
14	546974	4.04	330*	Vacant Commercial	C1	133400-6560-02-546974-000	1493 Route 55	Page, Brian W	1	Unused, NC
15	564958	3.00	330	Vacant Commercial	C1	133400-6560-02-564958-000	??? Route 82	Tallini, Reuccio & Muzzio & Sisto	1	Vacant Land
16	601974	2.00	220	2 Family Residential	R120	133400-6560-02-601974-000	2295 Route 82	Parsons, Joseph Kenneth & Geodi	1	NC
17	582930	0.56	615	Educational Fac.	C1	133400-6560-02-582930-000	1515-1519 Route 55	55-82 LaGrange LLC	1	Unused
18	592941	0.39	210	1 Family Residential	C1	133400-6560-02-592941-000	2292 Route 82	55-82 LaGrange LLC	1	Unused
19	715980	68.50	720	Mining & Quarrying	C1	133400-6560-02-715980-000	2296-2332 Route 82	Red Wing Properties	1	Unused

*Table 4-1: Baseline parcel data (*indicates difference from County property records, reflecting current conditions/property use~~)~~). Zoning code noted above is from County records and differs from Town Zoning Districts. Those parcels that are "non-conforming" are noted as "NC" in the comment column.*

~~Fourteen (14) of the sixteen~~The current land use and zoning of each of these parcels within the Study Area remains as records currently indicate. A further examination of the land uses adjoining and within the vicinity of the Study Area indicates that they consist of the following:

- Immediately adjacent to parcel #1 and #2 (west of TSP), the lands are classified as vacant with the Parkway right-of-way as community services. North of parcel #1 is residential lands and further west are a mix of commercial, community service, and residential uses.
- Adjacent to parcel #3 (east of TSP) are vacant lands and the Parkway right-of-way as community services.

- Between the Route 55/TSP intersection and the Route 55/82 intersection, the lands consist of larger lots classified as commercial, industrial, vacant, and large lot residential (between 1 and 25 acres in size).
- Parcels adjacent to parcels #11-19 in the Route 55/82 intersection consist of large vacant lands, industrial (existing mine/quarry), commercial, recreation/entertainment, and large lot residential (2-25 acres)

Seventeen (17) of the (19) nineteen parcels are located east of the Taconic State Parkway within the General Business (GB) District, which, according to the intent of the district under §240-24F of the Town's Zoning Code is "*for lower-intensity uses. Business and commercial (GB) Districts are intentionally smaller in scale in form compared with the Commercial (C) Districts*." According to the list of permitted and specially permitted uses in Schedule A2 of Chapter 240, Zoning, of the Town Code, approximately half of these uses are not currently permitted, including gas stations (gas mart), other storage (warehousing or storage/self-storage), two-family residential dwelling, fuel storage & distribution, and contractor's yard. The two properties on the west side of the Parkway (#1 – 1215 Route 55 and #2 – 1220-1224 Route 55) are zoned for Town Center-Business which is intended "*for mixed office, governmental, commercial and residential uses. They are the primary districts for adding to the multifamily housing stock in LaGrange. Located in Freedom Plains, these districts will provide identity as well as functional coherence to the Town of LaGrange. The districts will potentially benefit from the availability of public water and sewer facilities and from pedestrian linkages. Therefore, certain incentives are designed to encourage such development*."
~~A review~~

Impact Evaluation

Table 4-2 on the following pages provide a comparison of the permitted uses ~~in~~within each existing zoning district ~~is included in Appendix A, noting~~versus those that are permitted by the new zoning district for the parcels; additional uses that are ~~considered permitted in some fashion (outright permitted or specially~~ permitted~~) or~~ under the new zoning are highlighted as well as those that are not permitted under the new zoning. . For simplicity of review and evaluation, these were categorized as permitted (permitted – P, special permit – SP, permitted as accessory – A, permitted as mixed use – M) or not permitted (N). A total of 103 different uses are outlined in Schedule A2, with around 57-58 uses permitted in the Town Center Business (TCB) and General Business (GB) Districts. Changing the subject parcels to Commercial (C) would result in an additional 18-19 uses permitted, many of which are currently found in the area and have been since the completion of the 2005 Plan, bringing them into compliance and providing development opportunities that are consistent with the community character of the area. It should be noted that the change from RLD to C zoning pertains to the 0.5-acre parcel that is proposed to be resubdivided and included with the proposed project at parcel #17 (582930) and #18 (592941).

Despite the addition of several automobile-centric uses in the Commercial District compared to General Business and Town Center-Business, the areas proposed for rezoning are concentrated in nodal areas, following the development goals of the Comprehensive Plan to develop in a nodal fashion and avoid typical strip development. In addition, several properties are already significantly developed (i.e. parcel #4, 1456 State Route 55 and parcel #10, 1502-1504 State Route 55) and/or contain a variety of environmental constraints limiting additional development as highlighted in later sections (i.e. parcel #3, 22 Taconic Center Lane). The additional permitted/special permitted uses that are allowed by the Proposed Action would match the land use characteristics that are currently found in the corridor and do not significantly differ from current land uses.

Table 4-3 on the following pages highlight the differences between the dimensional requirements (bulk and area) in the districts, with increases, decreases, and no net changes highlighted accordingly. As the proposed action entails only updates to the zoning map, no changes to the existing bulk and area regulations are proposed. A comparison of the General Business (GB) and Commercial (C) districts highlights only a few differences, with the latter generally allowing 10-20 percent more building area though also requiring a larger lot with more frontage and width in order to accommodate any future uses. Lot coverage increases from 20/50% to 30/70% for building area and overall impervious surfaces (paving, building, and other structures), respectively. The difference in area regulations between the Town Center-Business (TC-B) and Commercial (C) districts are more pronounced by comparison, requiring more lot frontage and therefore larger lots. However, a closer review reveals that this also includes ~~less~~a 20-45% reduction in lot coverage (~~overall lot and~~ building area and overall impervious surfaces), larger setbacks (less buildable area), and lower maximum heights, yielding less development capacity on for smaller lots and reflecting the lower density differences between the TC-B and C districts. A further impact analysis of the development potential for each parcel is provided under the *Impact Evaluation* subsection below. As explained in more detail below, the proposed rezoning amounts to a significant reduction in developable land in the Study Area.

In addition to regulations pertaining to use and bulk and area dimensions, each district also has in place specific design standards as outlined in Article III (Special Zoning District Provisions), subsections §240-35 (Town Center) and §240-39 (Commercial and General Business). As outlined in the Town Center standards, the general intent is to "*create walkable, highly integrated, multifunctional public and private spaces, through a network of connected streets, sidewalks, and uses. Structures in the TCB District are generally to have two to three stories, with retail on the ground floor and office or residential uses above*;" this is in line with the illustrative plan that is contained in the 2005 Comprehensive Plan. As further noted in §240-35, the objectives of the design principles are to create a traditional Main Street area.

~~The Town Center Illustrative Plan, is reproduced below, highlights the long-term vision for creating a true Town Center in LaGrange and has been actively under development, though a significant time period of more than nine years has passed between the public hearing on the Draft Environmental Impact Statement and the submission of an FEIS.~~

Utilizing the information contained in the subsection above, a generalized buildout analysis for the subject properties was developed to identify the amount of developable land available under the existing and proposed zoning districts, taking into account setbacks and other site limitations including buffers, restricted areas, etc. by local or other regulations (see Section 4.3 for additional regulatory restrictions related to water features). This evaluation does not take into account variances could be sought and or if land can be resubdivided, rather than it is a straight evaluation of parcels as they stand.

For this evaluation, the following development restrictions were utilized to provide the "Base Development Area" for the existing zoning districts and the "Proposed Base Development Area" for the proposed rezoning:

	TCB	GB	RLD	C
Front Setback	48.5	45	90	45
Side Setback	0	20	40	20
Rear Setback	6	20	40	20
Max. Lot Coverage as % of Total Lot Area	90	50	15	70
Min. Lot Frontage on State Routes	25	115	225	200
Min. Width of Lot at any point	25	50	150	50

Following the compilation of the base development area (existing and proposed), the following additional development regulations were applied based on local, State, County, or Federal regulations as indicated herein. For each of these elements, if no development activity (e.g. construction, excavation) is permitted, it is indicated as such, otherwise applicants may submit for special permits in order to determine the extent of development that may occur based on the project that is proposed. It is generally assumed that given the restrictions and standards that exist for these special permits that the "impacted areas" would not allow 100% of the land to be developed or utilized.

- Sprout Creek 200-foot buffer (§240-31B) – no construction activity without special permit
- NYSDEC wetlands and 100-buffer – no construction activity permitted without permit (compensatory measures required for any disturbances)
- Federal wetlands – no construction activity permitted without permit (compensatory measures required for any disturbances)
- FEMA floodplains and floodways – floodplain development permit
- Automobile filling station, 500-foot setback from surface water, drainage channel, or environmentally sensitive area – special permit

The Table on page 47 provides a comparison of and highlights the differences in developable area of the parcels (maximum lot coverage after accounting for setbacks) under the existing and proposed zoning districts. The proposed rezoning from General Business (GB) to Commercial (C) will result in a increase in the developable area (between 0.02 and 3.81 acres +/-) taking into account the increase in the maximum lot coverage with the greatest increase noted for parcels #3 (2.59 acres) and #4 (3.81 acres +/-). However, the change between Town Center Business (TCB) and Commercial (C) would result in a decrease in the potential developable area of 0.23 and 0.48 acres for parcels #1 and #3, respectively.

Further evaluation of the build out potential indicates that eight of the 19 parcels have less than an acre of developable land, five of them are between 1-3 acres, and three are between 3 and 14 acres. Three of the parcels are technically undevelopable under the existing or proposed zoning due to frontage requirements (#9), lot configuration (#17), or size (#19).

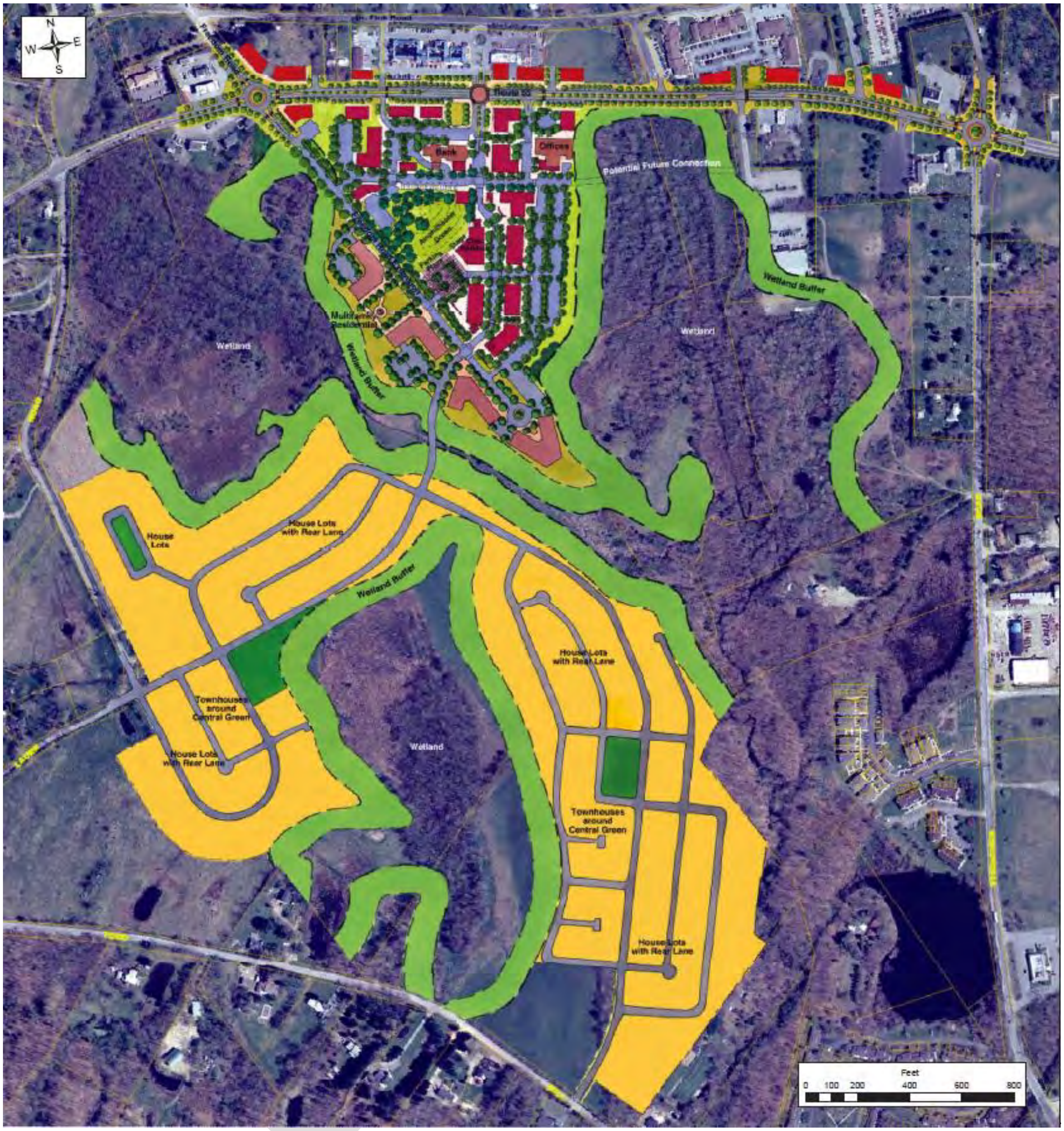
Taking into account the additional development restrictions brought on by the previously noted environmental resources and their associated regulations (wetlands, floodplains, stream corridors, and aquifers) which would apply irrespective of the zoning the potential developable area for those parcels that contain these features is further restricted regardless of the zoning district that they fall under, existing or proposed. Those restrictions associated with wetlands are the most restrictive with complete avoidance required or significant compensatory measures required (e.g. 1:1 creation for disturbance), followed by aquifers and stream corridors which restrict certain activities or require more strict permitting by State/Federal agencies. Floodplain development is permitted provided certain standards are met and professional engineering review provides a certified “no net impact” to current conditions. Specific regulations pertaining to each of these development restrictions are provided in Appendix D.

Mitigation Considerations

The rezoning from TCB and GB to Commercial (C) Development will result in a greater amount of developable land and an increase in the number of permitted uses. The regulations that are currently in place for the Commercial District do provide a level of protection in terms of lot coverage and setbacks. In addition, other development restrictions reduce the developable area further for the sole purpose of the protection of sensitive environmental features. Other qualitative regulations are included in the zoning code for non-residential development such as buffering and screening in order to lessen development impacts to adjacent properties. Noted in later sections, maintenance, inspection, and other standards exist at the State and Federal level for bulk petroleum storage in the case of Gasoline Filling Stations. With either the existing districts in place or the proposed rezoning to Commercial, commercial development can occur which can impact environmental features regardless.

While there are additional commercial uses that are permitted under the Commercial District that were not previously permitted under the TCB, GB, od RLD Districts, only five of the parcels provide sufficient developable land (more than two acres) for viable commercial development as they stand without significant variances or potential resubdivision to accommodate larger development. The largest parcel, (#3) is also the most hampered by environmental constraints. Strict adherence to buffering, screening, and other development standards will help to protect environmental features and promote development that is compatible with the surrounding uses.

~~While Town Center is an important component of LaGrange and the design objectives of the corresponding districts seek to create a well-designed mixed-use area, it should be noted that the original illustrative plan extended west to east from Lauer Road/Freedom Road to Stringham Road and north to south from State Route 55 down to Todd Hill Road. Beyond these areas, especially to the east near parcels #1 (1215 Route 55) and #2 (1220-1224 Route 55), creating a walkable, mixed-use area close to a major intersection with eight (8) access points is not likely to occur given the combination of vehicle speeds, circulation, safety, and the overall character of the interchange area.~~



~~In addition, these parcels are approximately 1,200 feet from the roundabout on State Route 55 that identifies the eastern end of Town Center Illustrative Plan. 1,200 feet is beyond a comfortably safe walking distance from the commercial core of a Town Center, particularly given traffic conditions along Route 55.~~

The design standards for the Commercial and General Business districts under §240-39 are intended to encourage "*commercial development is to provide positive examples of the forms and patterns of development that are desirable within the C and GB Districts of the Town of LaGrange and consistent with Greenway Design Principles. They are also intended to encourage development that is in keeping with the Town's semirural character and its aesthetic environment*." The standards, which overlap the

GB and C zones, also encourage development that fosters pedestrian activity and quality design but take into consideration the greater reliance on vehicles and vehicle movement as these areas are catered to lower density, rural transition environments. Overall, the design principles and objectives of the Commercial and General Business districts are very similar and share a number of standards including streetscape, planning board review processes, site standards, and architectural standards.

The proposed zoning map changes are limited to a relatively localized area of the Town along state highways. They will encourage a variety of commercial uses in these areas. Additionally, the amendments will bring existing uses into conformance, fostering growth and long-term success of these areas in a fashion that better reflects their historical function and use. As development is proposed for these various properties, the Town will continue to utilize the existing design standards, site plan review, and approval processes to control the extent and design of development.

Section 4.2. Transportation Evaluation

Existing Conditions

The current land uses of the parcels were identified using real property data available from the Dutchess County ParcelAccess online application and cross-referenced with Town documents, were matched up with appropriate land use codes found in the Institute of Transportation Engineers (ITE) Trip Generation Manual (10th edition, most current version) to determine the daily average rate of vehicles for a land use of that type. The ITE Manual ~~is~~remains the premiere reference document for analyzing estimated peak hour and daily site traffic volumes for a particular land use, using thousands of data points throughout the country. The manual provides calculations for theoretical daily trips generated based on the size of the structures on each parcel. This is the baseline data to determine the extent of potential impact of any future rezoning and/or development (See also Table 3-1 and ~~Figure~~Map 1).

The table for Existing Daily Vehicle Trips, shown below, indicates the approximate trip generations for each parcel - in total, these existing uses constitute approximately 2,977 daily trips.

Parcel	Town Land Use Code	Town Land Use Description	ITE Land Use Code	ITE Land Use Description	Rate type (Vehicle Trip Ends per)	Weekday Average	Weekend Average	Daily Average Rate	Variable	Daily Trips Generated
1	330*	Vacant comm	944	Gasoline/Service Station	Vehicle Fueling Position	172.01	174.53	172.73	UNUSED	**0**
2	432	Gas Station	944	Gasoline/Service Station	Vehicle Fueling Position	172.01	174.53	172.73	8 Pumps	**1382**
3	544	Health Spa	492	Health/Fitness Club	1000 Sq. Ft. GFA	21.28	25.52	22.49	20,000 Sq. Ft.	**450**
4	449	Other Storage	151	Mini-Warehouse	1000 Sq. Ft. GFA	1.51	1.92	1.63	62,200 Sq. Ft.	**101**
5	464	Office Building	180	Specialty Trade Contractor	1000 Sq. Ft. GFA	10.22	-	10.22	5,500 Sq. Ft.	**56**
6	442	Diner/Lunch	932	High-Turnover (Sit-Down) Restaurant	1000 Sq. Ft. GFA	112.18	133.51	121.32	1,700 Sq. Ft.	**206**
7	449*	Other Storage	180	Specialty Trade Contractor	1000 Sq. Ft. GFA	9.44	9.045	9.33	90 Sq. Ft.	**840**
8	441	Fuel Store & Dist.	170	Utility	1000 Sq. Ft. GFA	13.24	-	13.24	800 Sq. Ft.	**11**
9	220	2 Family Residential	220	Multifamily Housing (Low-Rise)	Dwelling Units	7.32	7.21	7.29	2 Dwelling	**15**
10	432	Gas Station	944	Gasoline/Service Station	Vehicle Fueling Position	172.01	174.53	172.73	4 Pumps	**691**
11	210	1 Family Residential	210	Single-Family Detached Housing	Dwelling Units	9.44	9.045	9.33	1 Dwelling	**9**
12	400	Commercial	890	Furniture Store	1000 Sq. Ft. GFA	6.3	6.915	6.48	3,500 Sq. Ft.	**23**
13	210	1 Family Residential	210	Single-Family Detached Housing	Dwelling Units	9.44	9.045	9.33	1 Dwelling	**9**
14	330*	Vacant comm	151	Mini-Warehouse	1000 Sq. Ft. GFA	1.51	1.92	1.63	UNUSED	**0**
15	330	Vacant comm	-	VACANT PARCEL	-	-	-	0	UNUSED	**0**
16	220	2 Family Residential	220	Multifamily Housing (Low-Rise)	Dwelling Units	7.32	7.21	7.29	2 Dwelling	**15**

Existing Daily Vehicle Trip Generations

Parcel	Town Land Use Code	Town Land Use Description	ITE Land Use Code	ITE Land Use Description	Rate type (Vehicle Trip Ends per)	Weekday Average	Weekend Average	Daily Average Rate	Variable	Daily Trips Generated
1	330*	Vacant comm	944	Gasoline/Service Station	Vehicle Fueling Position	172.01	174.53	172.73	UNUSED	**0**
2	432	Gas Station	944	Gasoline/Service Station	Vehicle Fueling Position	172.01	174.53	172.73	8 Pumps	**1382**
3	544	Health Spa	492	Health/Fitness Club	1000 Sq. Ft. GFA	21.28	25.52	22.49	20,000 Sq. Ft.	**450**
4	449	Other Storage	151	Mini-Warehouse	1000 Sq. Ft. GFA	1.51	1.92	1.63	62,200 Sq. Ft.	**101**
5	464	Office Building	180	Specialty Trade Contractor	1000 Sq. Ft. GFA	10.22	-	10.22	5,500 Sq. Ft.	**56**
6	442	Diner/Lunch	932	High-Turnover (Sit-Down) Restaurant	1000 Sq. Ft. GFA	112.18	133.51	121.32	1,700 Sq. Ft.	**206**
7	449*	Other Storage	180	Specialty Trade Contractor	1000 Sq. Ft. GFA	9.44	9.045	9.33	90 Sq. Ft.	**1**
8	441	Fuel Store & Dist.	170	Utility	1000 Sq. Ft. GFA	13.24	-	13.24	800 Sq. Ft.	**11**
9	220	2 Family Residential	220	Multifamily Housing (Low-Rise)	Dwelling Units	7.32	7.21	7.29	2 Dwelling	**15**
10	432	Gas Station	944	Gasoline/Service Station	Vehicle Fueling Position	172.01	174.53	172.73	4 Pumps	**691**
11	210	1 Family Residential	210	Single-Family Detached Housing	Dwelling Units	9.44	9.045	9.33	1 Dwelling	**9**
12	400	Commercial	890	Furniture Store	1000 Sq. Ft. GFA	6.3	6.915	6.48	3,500 Sq. Ft.	**23**
13	210	1 Family Residential	210	Single-Family Detached Housing	Dwelling Units	9.44	9.045	9.33	1 Dwelling	**9**
14	330*	Vacant comm	151	Mini-Warehouse	1000 Sq. Ft. GFA	1.51	1.92	1.63	UNUSED	**0**
15	330	Vacant comm	-	VACANT PARCEL	-	-	-	0	UNUSED	**0**
16	220	2 Family Residential	220	Multifamily Housing (Low-Rise)	Dwelling Units	7.32	7.21	7.29	2 Dwelling	**15**
17	615	Educational Fac.	565	Daycare Facility	1000 Sq. Ft. GFA	47.62	6.03	35.74	UNUSED	**0**
18	210	1 Family Residential	210	Single-Family Detached Housing	Dwelling Units	9.44	9.045	9.33	UNUSED	**0**
19	720	Mining & Quarrying	-	VACANT/UNUSED PORTION	-	-	-	-	UNUSED	**0**

*Table ~~2~~4-3: Existing Daily Vehicle Trip Generation (*indicates difference from County property records, reflecting current conditions/property use)*

By comparison, the 2019[1] estimated Average Annual Daily Traffic (AADT) for State Route 55, as obtained from the NYSDOT Traffic Data website, east of the Taconic State Parkway (TSP) to State Route 82 (1.33 miles) is ~~13,761~~14,216 and west of the Parkway to ~~Freedom Road/~~County Road ~~47~~21 (0.87 miles) is ~~18,585~~17,308. Due to the higher density, variety of existing development, and greater level of infrastructure investment found in Town Center, the traffic volumes are larger as expected for the segment of State Route 55 west of TSP. ~~When extrapolated out on a per mile basis, volumes are 50% less on the eastern side of the Parkway compared to the western side (10,346 trips/mile versus 21,362 trips/mile).~~

Impact Evaluation

As shown in Table 4-1, currently, ~~13~~15 of the ~~16~~19 parcels in the subject area are developed to some extent (i.e. an occupied or active building is found on-site), resulting in ~~three~~four parcels with approximately ~~7.9~~8.6 acres of developable/redevelopable lands. Of these properties, two of them have improvements to the extent that they could potentially be re-activated (gasoline/service station~~ and~~, mini-warehouse), without taking into account existing zoning regulations, leaving a 3.0-acre parcel as

[1] Due to the ongoing COVID-19 Pandemic, the 2020 AADT counts for Route 55 were not utilized. It is assumed that any counts taken during the Pandemic would not reflect normal operating conditions on Route 55.

the only undeveloped property (parcel #15, unknown address - parcel number 6560-02-564974). Parcel #15, consisting of a proposed 0.5 acres of land, is proposed to be subdivided from the larger 68.5-acre property (active mine), though this portion of the property is not an active part of the mining operation and consists of a vacant barn/garage structure that appears to have been part of the single-family residential dwelling located to the south. If ~~these~~the three aforementioned parcels were re-activated, the existing daily trip generation from Table ~~2~~4-3 above would be increased by approximately 698 daily trips bringing the total to 3,677 (from 2,977), constituting a 5 percent increase on State Route 55 from the existing AADT noted above.

There are a number of different uses that could be developed on the remaining 3.0-acre parcel (parcel # 15, noted previously) using the existing zoning regulations. Given the visibility of the property as a corner site and using typical development trends, a free-standing discount store (ITE code 815), related to the "Retail Business" permitted use in the General Business District, would be the highest impact from a traffic evaluation and impact perspective. Utilizing a 15 percent building footprint (16,000 SF) taking into account setbacks, pavement, and required building coverage, this would add approximately 906 additional daily trips to the area, bringing the total daily trips from full build-out/activation of the area to 4,581.

Currently, there is only one proposed development within the project area consisting of a four-pump gas station and a 3,695 SF convenience store encompassing three properties - #17 (582903, 0.56 acres), #18 (592941, 0.39 acres), and the subdivided portion of #19 (715980, 0.5 acres subdivided). Potential trip generation associated with the project has been provided by the applicant, utilizing the 9th and 10th Edition ITE Trip Generation Manual, for Land Use Code 853, "Convenience Market with Gasoline Pumps." As a result, taking into account pass-by trips, the new net trips generated by the proposed project would be 55 (weekday AM), 68 (weekday PM), and (63 Saturday midday). Assuming that this project moves forward, this would remove three of the parcels from the total development potential and replace them with a single development.

Depending on what kind of development is envisioned for the remaining parcels, many different assumptions could be made. As noted, there is one empty parcel and two parcels that have structures on them but aren't currently being used at this time (any proposed developments under consideration by the Town notwithstanding). Each parcel could be re-developed with a separate business or potentially multiple parcels could be combined to make room for a large business. A list of potential uses (Table ~~3~~4-4) and their corresponding Daily Trips Generated was developed, using a "worst case scenario" approach for the various permitted or specially permitted uses in the proposed rezoning district – Commercial (C). The "worst case scenario" envisions the use that would likely generate the most traffic for the size of the property, assuming development occurs on a single property and no other resubdivisions take place. The daily trips were calculated by assuming an average size for a business of that type.

ITE Code	Description	Rate type (Vehicle Trip Ends per)	Weekday Average	Weekend Average	Daily Average Rate	Assumption of Variable	**Daily Trips Generated**	Pass-by Trip Percentage	**Additional Trips on Rte 55**
310	Hotel	Rooms	8.36	7.07	7.99	150 Rooms	**1199**	5%	**1139**
320	Motel	Rooms	3.35	-	3.35	100 Rooms	**335**	5%	**318**
435	Multipurpose Recreational Facility	1000 Sq. Ft. GFA	28.64	-	28.64	20,000 Sq. Ft.	**573**	15%	**487**
488	Soccer Complex	Fields	71.33	404.88	166.63	2 fields	**333**	15%	**283**
492	Health Fitness Club	1000 Sq. Ft. GFA	21.28	25.52	22.49	20,000 Sq. Ft.	**450**	25%	**338**
620	Nursing Home	Beds	3.64	2.37	3.28	150 Beds	**492**	5%	**467**
630	Clinic	1000 Sq. Ft. GFA	38.16	-	38.16	15,000 Sq. Ft.	**572**	15%	**486**
640	Animal Hospital/Veteranary	1000 Sq. Ft. GFA	21.50	-	21.50	6,000 Sq. Ft.	**129**	15%	**110**
710	General Office Building	1000 Sq. Ft. GFA	9.74	1.46	7.37	40,000 Sq. Ft.	**295**	10%	**266**
720	Medical-Dental Office Building	1000 Sq. Ft. GFA	34.80	5.00	26.28	15,000 Sq. Ft.	**394**	20%	**315**
812	Building Materials and Lumber Store	1000 Sq. Ft. GFA	18.05	38.06	23.77	40,000 Sq. Ft.	**951**	30%	**666**
813	Free-Standing Discount	1000 Sq. Ft. GFA	50.70	59.95	53.34	125,000 Sq. Ft.	**6668**	20%	**5334**
815	Free-Standing Discount Store	1000 Sq. Ft. GFA	53.12	65.49	56.65	80,000 Sq. Ft.	**4532**	25%	**3399**
816	Hardware/Paint Store	1000 Sq. Ft. GFA	9.14	-	9.14	12,000 Sq. Ft.	**110**	30%	**77**
817	Nursery (Garden Center)	1000 Sq. Ft. GFA	68.10	119.76	82.86	20,000 Sq. Ft.	**1657**	25%	**1243**
840	Automobile Sales	1000 Sq. Ft. GFA	27.84	36.99	30.45	15,000 Sq. Ft.	**457**	20%	**366**
850	Supermarket	1000 Sq. Ft. GFA	106.78	172.05	125.43	40,000 Sq. Ft.	**5017**	40%	**3010**
862	Home Improvement	1000 Sq. Ft. GFA	30.74	56.26	38.03	80,000 Sq. Ft.	**3042**	40%	**1825**
881	Pharmacy/Drugstore with Drive-Through Window	1000 Sq. Ft. GFA	109.16	80.23	100.89	15,000 Sq. Ft.	**1513**	45%	**832**
890	Furniture Store	1000 Sq. Ft. GFA	6.30	6.92	6.48	40,000 Sq. Ft.	**259**	50%	**130**
899	Liquor Store	1000 Sq. Ft. GFA	101.49	-	101.49	2,000 Sq. Ft.	**203**	60%	**81**
912	Drive-in Bank	1000 Sq. Ft. GFA	100.03	59.22	88.37	3,000 Sq. Ft.	**265**	35%	**172**
930	Fast Casual Restaurant	1000 Sq. Ft. GFA	315.17	318.62	316.16	4,000 Sq. Ft.	**1265**	40%	**759**
934	Fast-Food Restaurant with Drive-Through Window	1000 Sq. Ft. GFA	470.95	544.35	491.92	4,000 Sq. Ft.	**1968**	50%	**984**
937	Coffee/Donut Shop with Drive-Through Window	1000 Sq. Ft. GFA	820.38	-	820.38	2,000 Sq. Ft.	**1641**	70%	**492**
945	Gasoline/Service Station with Convenience Market	ehicle Fueling Positior	205.36	-	205.36	32 pumps	**6572**	70%	**1972**
947	Self Service Car Wash	Wash Stall	108.00	132.80	115.09	8 stalls	**921**	60%	**368**
949	Car Wash and Detail Center	Wash Stall	156.20	-	156.20	10 stalls	**1562**	55%	**703**
950	Truck Stop	1000 Sq. Ft. GFA	455.53	-	455.53	12,000 Sq. Ft.	**5466**	65%	**1913**

Table ~~3~~4-4: Proposed Potential Daily Vehicle Trip Generation

Any new development may add to the AADT values for Route 55. Depending on the type of business anticipated to be developed, some of the daily trips would come from traffic that already travels through that corridor (pass-by trips) and some of the daily trips would generate new and additional traffic on Route 55. The proposed Potential Use Daily Vehicle Trips table has a column of assumed approximate percentage of trips that would come from vehicles that already travel on State Route 55. That allows the calculation of new traffic that theoretically would be added to the daily traffic on State Route 55 after subtracting the trips generated from existing businesses being replaced.

The numbers from the proposed Potential Use Daily Vehicle Trips (Table ~~3~~4-4) can be used to determine any potential traffic increases based on the anticipated rezoning and development, though the scenario above represents the most significant. Within the Town's zoning code, §240-27 outlines the list of permitted uses for each district, with those in the non-residential districts (TCB, H, MGH, GH, GB, C, and I) provided in Schedule A2. A review of the permitted land uses in the existing (Town Center Business/TCB~~ and ~~,General Business/GB, Residential Low Density/RLD) and proposed zoning district (Commercial/C) highlights the differences in uses between the two which can then be compared to the ITE uses in Table ~~3~~4-4.

The “worst case scenario” given the proposed zoning map change to Commercial (C) would be the development of a Free-standing discount commercial store (ITE code 813) at 125,000 SF, resulting in approximately 5,334 additional trips. (It should be noted, however, that in order for this to occur, it would entail the resubdivision of approximately 14 acres of land (utilizing the 20% building coverage after setbacks and pavement), thus combining several smaller lots together to provide the necessary mass and the subsequent demolition of numerous existing structures.)

The current configuration of State Route 55 on the east side of the Taconic State Parkway consists of a two-lane roadway with dedicated turn lanes at the intersection of the Parkway, Veile Road, and State Route 82. The Highway Design Manual (HDM) provides reference on level of service (LOS) based on the AADT and roadway speed; a ~~2015~~2018 speed study highlighted the 85th percentile speed at 55 MPH. Given the existing AADT of the roadway (~~13,761~~14,216) and this reference information, this section of State Route 55 could handle up to 14,300 vehicles per day (VPD) to maintain a LOS of C or better; up to 20,600 VPD would be LOS “D” and beyond that would be LOS “E” or lower. West of the Taconic State Parkway, the improvements by NYS DOT on State Route 55, including lane reconfigurations and the three roundabouts, were undertaken in anticipation of full build out of Town Center as shown in the illustrative plan, providing sufficient capacity for future volumes.

Noise associated with typical traffic conditions (automobiles and truck traffic) is typically in the 80-84 dB level according to US EPA and National Institutes of Health metrics and is associated with transport and movement of products, goods, and people, with a sound level of 60-70 dB starting to create a condition of significant noise effect and a prolonged exposure above 85 dB leading to increases in hearing loss. Several factors can influence the impact of noise including distance from the source, surrounding terrain, ambient sound levels, time of day, wind direction, temperature and humidity. Most noticeable is where sound increases above ambient noise levels. Concentrating truck traffic on designated haul routes can increase the frequency of this exposure and possibly duration; with most impacts, the extended duration of exposure magnifies the risk. State Routes are considered truck roads and therefore permitted haul routes.

In conjunction with potential noise impacts, increases in traffic can also include potential impacts to air quality from an increase in emissions/exhaust, which can generally consist of one or more the following pollutants of national concern (USEPA): carbon monoxide, sulfur dioxide, nitrogen dioxide, particulate matter, lead, and ozone. The USEPA and NYSDEC, locally, regulate air quality standards through State and National Ambient Air Quality Standards under the Clean Air Act as well as under Article 16 of State Environmental Conservation Law. At the State level, NYSDEC issues permits for air emissions at stationary sources, runs local monitoring, and enforces a vehicle inspection and maintenance (I/M). The latter is a key element of the State that seeks to decrease and maintain lower emissions of light-duty (i.e. personal) vehicles as well as heavy-duty diesel vehicles in conjunction with the NYSDMV; emissions inspections are required of all motor vehicles.

In terms of air monitoring stations, Currently, there are no stations within the Study Area to provide ambient/base air quality levels. The nearest stationary NYSDEC monitoring station is in Newburgh followed by Millbrook. Beyond these stations, NYSDEC leads and assists in special, community-requested studies as resources allow through their Community Air Quality initiative. There have been no screening assessments, special studies, or community air screenings undertaken in LaGrange. There are two NYSDEC-registered air facilities in the vicinity of the Study Area, including Precision Air Body

(2187 State Route 55) and Red Wing Sand and Gravel (2296-2332 State Route 82), neither of which have any violations and both maintaining up-to-date registrations.

Regardless of this, it can be generally assumed that increases in vehicular traffic may lead to increases in mobile source emissions. Generally, carbon monoxide (CO) is the most prevalent pollutant associated with vehicles and increased concentrations can be expected where large numbers of motor vehicles are present, including intersections where traffic delays are common during peak times. With the amount of potential additional traffic that could generated under the worst-case scenario noted above, the service levels of the roadway and intersections would not be anticipated to decrease to such a level that it would result in significantly longer traffic delays and thereby increase long-term, local pollutant levels out of compliance with State and National Ambient Air Quality Standards.

Mitigation Considerations

From a traffic management and operations perspective, it is generally accepted that a LOS of "C" or "D" is the preferred level for a roadway, indicating that the facility is built accordingly and balances volume and capacity to an adequate level. Given the "worst case" development scenario outlined above, the potential addition of 5,334 would raise the AADT of the eastern leg of State Route 55 to approximately 19,095 VPD, ~~still within~~ bringing the roadway to a LOS "~~C~~D" rating ~~and~~, but still maintaining an adequate ratio of volume to capacity. As development projects for these parcels come to fruition in the future, various roadway improvements may need to be considered on a case-by-case basis, subject to detailed review by the NYS DOT with supplemental information to this GEIS as necessary. These improvements may include, but not be limited to:

- Left or right turn lanes added to individual driveways, and/or;
- If there are parcels that would benefit from a left-turn lane, a two-way center turn lane may be warranted, and/or;
- The addition of traffic signals at specific sites, especially if some of the parcels are combined into a larger parcel, and/or;
- Controlling access with a center raised median and roundabouts similar to what was done on the west side of State Route 55.

Rezoning the subject properties from Town Center Business (TCB) and General Business (GB) to Commercial (C) still allows a variety of commercial development to occur in a similar fashion to what currently exists. It should be noted that since these parcels have access to not only State Route 55, but also State Route 82 to the east, that any new development (or redevelopment) will undergo a review by the NYS Department of Transportation (NYS DOT), in regard to new or reconfigured access or any changes that require a highway work permit, in accordance with NYS Highway Law, Article 3, Section 52. A highway work permit process involves an initial review with DOT concurrent with local regulations followed by a design review with detailed construction plans, and final review. Simple driveway projects may be processed in a single review and approval stage as an *expedited review* as determined by the NYS DOT Regional Permit Coordinator. This permitting/approval process provides a layer of review specifically regarding transportation impacts.

In terms of noise mitigation, the Town only has the ability to control noise on local property and within the purview of local ordinances (Chapter 162, Town Code). On the State roadways, provided the noise level of permitted trucks is within the regulatory limits, mitigation would include measures to limit the effects of noise through buffering on private or public property or in coordination with NYSDOT in the State right-of-way. New York State regulations (6NYCRR Parts 450 -454) addresses allowable sound level limits on certain motor vehicles greater than 10,000 pounds in gross weight.

Due to the presence of the two State highways (Route 55 and 82) in the subject area, local transportation review by the Town in the site plan process is limited to internal circulation of properties, though done in conjunction NYS DOT; DOT has jurisdiction over access, volumes, lane configurations, traffic signals, and intersections. The Town of LaGrange has several sections within Chapter 240 (Zoning) that contains standards for internal circulation and site design that dictate the extent of development, including supplemental non-residential regulations (Article VI), special permits and site plan review (Article VII), and design standards (Article III, §240-39). When combined with these local regulations, sufficient mechanisms and processes are in place for ensuring minimal transportation impacts.

Section 4.3. Evaluation of Water Resources

Existing Conditions

As noted in Section 3.0, there are numerous water features found throughout the Town of LaGrange, prevalent through the central section of the community. Sprout Creek crosses the Taconic State Parkway near the intersection with State Route 55, cutting through parcel #3; though other parcels subject to the Proposed Action may contain some water features, ~~this~~Parcel #3 is the only parcel that this Creek directly crosses. Another smaller, unnamed stream connects to Sprout Creek from the east, traversing the northern boundary of the parcels around the State Route 82 & 55 intersection. Due to the presence of these waterbodies, several other water features are found in and around them including floodplains, floodways, aquifers, and wetlands.

Section 4.3.1. Floodplains

Existing Conditions

The FEMA floodplain (**~~Figure 2~~Map 3**) found adjacent to Sprout Creek extends well beyond normal boundaries of the water, more pronounced to the east, but also encompassing approximately 6.7 acres of parcel #3 as well. As a result, this effectively reduces the amount of developable land by approximately 50%. The unnamed stream north of the State Route 82 & 55 intersection and its corresponding floodplain do not cross into the adjacent properties (parcel #11, 14, & 16) to the same extent as compared to parcel #3; therefore, the level of development impact is significantly reduced. The remaining parcels subject to the Proposed Action do not contain floodplains. Regulations currently exist regarding development in or near mapped floodplain, found in Chapter 120 of the Town Code (Flood Damage Prevention, see Appendix D).

As noted in §120-1, the intent of these regulations are "*to promote the public health, safety and general welfare, and to minimize public and private losses due to flood conditions in specific areas by provisions designed to:*

A. Regulate uses which are dangerous to health, safety and property due to water or erosion hazards, or which result in damaging increases in erosion or in flood heights or velocities;

B. *Require that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;*
C. *Control the alteration of natural floodplains, stream channels, and natural protective barriers which are involved in the accommodation of floodwaters;*
D. *Control filling, grading, dredging and other development which may increase erosion or flood damages;*
E. *Regulate the construction of flood barriers which will unnaturally divert floodwaters or which may increase flood hazards to other lands; and*
F. *Qualify for and maintain participation in the National Flood Insurance Program."*

The regulations were last amended in 2016 to reflect updated floodplain mapping undertaken by FEMA. As the local administrator, the Zoning Enforcement Officer issues floodplain development permits in accordance with the provisions set forth in Chapter 120. Spout Creek is not only within a special flood hazard area (i.e. Zone AE, 100-year floodplain), but it is also classified as a floodway. As a result, in addition to a standard floodplain development permit, any encroachments require a technical evaluation by a licensed professional engineer certifying that such activity will not increase flood levels during the occurrence of a base flood event. An alternative course of action is an application to and approval by FEMA for a conditional FIRM (flood insurance rate map) and floodway revision. The latter process requires a significant amount of data, analysis, and mapping by the applicant's engineer to support the revision. These processes ensure that any encroachments are adequately evaluated, and mitigation measures are taken to ensure no loss of life or property to downstream areas.

In addition to the engineering analysis, specific construction standards are outlined for new structures that includes anchoring, use of flood-resistant materials, limits on use for sub-flood level floors, minimum openings and structural components for sub-flood level floors, utility protection, and floodproofing for non-residential structures, among others. Specific standards are outlined for all structures as well as residential, non-residential, and manufactured/recreational vehicles. Chapter 120 does not outline any specifically prohibited uses in special flood hazard areas.

As with any permitting process in a community, an appeal process is also outlined providing relief for applicants with twelve (12) factors to be considered in that decision-making process. Properties less than ½ acre in size are more likely to receive a variance for improvements or construction within a floodplain, though still subject to the criteria indicated previously – technical justification increases as lot size increases.

Impact Analysis

As noted in Section 4.1, the amount of developable land is further restricted by the presence of environmental features, such as floodplains, regardless of the zoning district any parcel is located in. The changing of the zoning designation for the properties within the Study Area and therefore the increase in permitted uses will not impact floodplains to any more of a degree as compared to the existing conditions. Although the floodplain regulations in and of themselves do not restrict activities and uses to the extent that regulations for other noted environmental resources do (these regulations provide standards for anchoring and not expanding flooding boundaries), when coupled with the regulations for stream corridors (floodplains typically encompass streams/creeks), regulations do exist to limit uses within 500 feet of the centerline of streams.

Mitigation Considerations

The Proposed Action will not result in any significant adverse environmental impacts to floodplains. Rezoning the subject properties from Town Center Business (TCB) and General Business (GB) to Commercial (C) still allows development to occur in a similar fashion to both what is there currently and what was permitted under prior zoning. While the number of potential uses could increase as a result, Chapter 120 and the associated permitting process contained within it apply to a variety of uses and do not specifically call out any in particular, with the exception of manufactured homes and recreational vehicles due to their transient nature. Any proposed commercial development will be required to adhere to the above referenced regulations as part of the site review and approval process. Furthermore, only parcel #3 would be significantly impeded by the Proposed Action and the regulations put in place under Chapter 120 limit the extent of development and proximity to water resources in order to protect property on-site and downstream as well as environment quality. The policies and goals outlined in the current Comprehensive Plan still generally encourages development to occur outside of sensitive environmental features such as floodplains and the regulations set forth in Chapter 120 provide the proper mechanism for ensuring minimal impacts.

Section 4.3.2. Wetlands

Existing Conditions

Wetlands, both Federally- and State-regulated, are generally found in and adjacent to the Creeks (~~**Figure 3**~~**Map 2**). Much the same as the floodplains, wetlands predominantly impact the east side of the Taconic State Parkway/State Route 55 intersection on parcel #3. State-regulated wetlands are under the jurisdiction of the New York State Department of Environmental Conservation (NYS DEC) and include not only the wetland itself, but also a 100-foot "no disturbance" buffer zone. With this taken in account, approximately 3.0 acres of parcel #3 is constrained by State wetlands. While wetlands of 12.4 acres (5 hectare) in size are specifically regulated by the NYS DEC, the Federal government also has jurisdiction through the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act, irrespective of size, but typically for all other wetlands smaller than 12.4 acres. As shown on Map 2, federal wetlands are again found on Parcel #3, impeding approximately 3.46 acres of land, while a smaller grouping of wetlands is located north of the State Route 82 & 55 intersection, outside of the subject parcels.

Chapter 124 of the Town Code (see Appendix D) regulates freshwater wetlands, watercourses, and waterbodies with the intent *"to ensure that activities in and adjacent to wetlands, watercourses and water bodies do not unduly impact the public safety, the natural environment or cause environmental degradation."* It is noted that NYS DEC has specific regulations imposed on wetlands, watercourses, and waterbodies under Title 23 of Article 71 of the NYS Environmental Conservation Law (ECL) – Article 24, Freshwater Wetlands. Title 5, §24-0501 of Article 24 provides a mechanism for implementation of wetland regulation to local government provided that said regulations are the same or no less protective than those found in Article 24 and reference to the procedures and concepts contained within are "sufficient" as noted below. The Town's regulations are concurrent with those of the state DEC. They adequately reference Article 24 and specifically state that they are intended to impose local regulation and "to exercise shared authority" over these resources (§124-2B).

24-0501. Local freshwater wetlands protection procedures.

1. On or after September 1, 1975, each local government may adopt, amend, and, upon the filing of the appropriate freshwater wetlands map, implement a freshwater wetlands protection law or ordinance in accordance with this article to be applicable to all freshwater wetlands wholly or partially within its jurisdiction. No freshwater wetlands protection law or ordinance adopted by a county pursuant to this section shall be applicable within the boundaries of any city, town or village which has adopted and is implementing a local freshwater wetlands protection law or ordinance consistent with this article.

2. Said freshwater wetlands protection law or ordinance may be in such form and with such procedures prescribed as may be determined by the local government adopting the same, or it may set forth the procedures and concepts contained in this article; provided, however, that no local freshwater wetlands protection law or ordinance enacted pursuant to subdivision one hereof shall be less protective of freshwater wetlands or effectiveness of administrative and judicial review, than the procedures set forth in this article, nor shall such local law or ordinance affect the activities exempted from permit by section 24-0701 of title seven hereof.

3. Adoption by a local government, pursuant to this article, of a local freshwater wetlands protection law or ordinance by reference to the procedures and concepts set forth herein shall be sufficient if reference is made to the procedures and concepts of this article with exceptions, additions, and modifications thereto noted; and the adoption, once effected, shall include subsequent statutory amendments to this article as aforesaid; subject, again, to exception, addition, or modification by such municipality, without time limitation. At any time after a local adoption of the procedures contained in this article, a local government subject to this section may rescind its adoption thereof and simultaneously adopt a local freshwater wetlands protection procedure in accordance with subdivisions one and two of this section.

The local permitting process includes an application to the Wetlands Administrator (designated as the Town Administrator of Public Works) with mapping, statement of activity, description of existing natural features, environmental assessment form, and any technical supporting information. Decisions on permits are made under a specific listing of considerations, in accordance with ECL Article 24, with review by not only the Wetlands Administrator, but also the Conservation Advisory Council, and the Town Planning Board, as the approval authority. Strict adherence to the regulations is expected with enforcement, expiration, and violation conditions noted; there is no appeals process outlined for decisions.

Under §124-7 of the Town regulations, there are specific activities that are designated as permitted without the need for a permit including, but not limited to, normal ground maintenance, repair of walkways, or agricultural activity related to livestock grazing or watering. A number of construction activities that include draining, dredging, excavation, etc. or alteration of natural land forms, among others, are regulated activities that are subject to a local permit and the aforementioned review/approval process. Prohibited activities specifically include the “place[ment] or deposit [of] chemical wastes or to introduce influents of sufficiently high thermal content as to cause deleterious ecological effects in any wetland, watercourse, water body or buffer area.” (§124-7D).

In terms of wetlands smaller than the 12.4 acre size under the jurisdiction of the NYS DEC, Chapter 124 also provides protection of wetlands down to one acre in size (see definition of wetland, §124-5) that *"comprise hydric soils and/or are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and under normal conditions do support, a prevalence of hydrophytic vegetation as defined by the Federal Interagency Committee for Wetlands Delineation, 1989, in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands, Washington, DC, and adopted by the US Army Corps of Engineers, US Environmental Protection Agency, and the US Fish and Wildlife Service, or as amended and updated. Hydric soils referenced above shall include the soil types taken from the revised Dutchess County Soil Survey Series, 1991, or such revised, updated and adjusted soil surveys as may be completed."* This definition incorporates wetlands that would normally fall under the guise of the U.S. Army Corps of Engineers, though compliance with said agency may be required on a case-by-case basis by the Wetlands Administrator or Town Planning Board.

Impact Analysis

As noted in Section 4.1, the amount of developable land is reduced by the presence of environmental features, such as wetlands (State or Federal), regardless of the zoning district any parcel is located in. The changing of the zoning designation for the properties within the Study Area and therefore the increase in permitted uses will not impact wetlands to any more of a degree as compared to the existing conditions. Although more automobile service-related uses would be permitted under the Proposed Action, current regulations do not permit underground or aboveground storage within wetlands (State/Federal). Nor are storage tanks permitted within 500 feet of their outer boundaries (local). These additional restrictions limit the location of specific uses regardless of whether they are noted as a permitted use.

Mitigation Considerations

As with any wetland, proper identification and delineation of boundaries is a required initial step with any proposed development within the Town through mapping research and field investigation. Following delineation, and as part of the site plan approval process, site design is undertaken with proper site engineering, technical review/analysis, and the aforementioned permitting process specific to wetlands incorporated. With this review in place, regardless of any specific zoning district, land use, or proposed development, wetlands (including buffer zones as applicable) are properly protected from encroachment, ensuring minimal impact(s) and including mechanisms for any necessary mitigation measures. ~~Similar to floodplains, only one property would be significantly impeded by the Proposed Action and~~The current regulations that are in place at the local, State, and Federal levels are sufficient to avoid or reduce to the greatest extent practicable any potential impacts; the policies and goals outlined in the current Comprehensive Plan still generally encourage development to occur outside of sensitive environmental features.

Section 4.3.3. <u>Waterbodies</u>

Existing Conditions

As noted under the **<u>Floodplains</u>** evaluation, Sprout Creek is the primary waterbody that flows through the area subject to the Proposed Action (~~**Figure 4**~~**Map 5**). This 24.8-mile creek flows through the center part of Town before joining with Fishkill Creek and emptying into the Hudson River further to the southeast. Sprout Creek roughly follows the eastern boundary of parcel #3 and traverses the eastern portion of the parcel before crossing State Route 55 and the Taconic State Parkway to the south. As shown in Map 5, a smaller, unnamed tributary follows State Route 82 and 55 to the east, adjoining the northern boundary of a number of the subject parcels at that same intersection, before joining Sprout Creek south of State Route 55.

NYS DEC regulates activities of protected streams through Article 15 of the NYS Environmental Conservation Law (ECL), 6NYCRR Part 608. The Protection of Water Regulatory Program identifies activities as the *"disturbance of bed or banks"* and protected streams as those with the classification of AA, A, B, or C with a standard of (T) or (TS) (disturbance for the latter may be temporary or permanent) – Sprout Creek is classified as C(T). While there are specific instances for exempt activities, most land development would fall under a minor or major project classification with a longer review time, procedures, and requirements necessary for approval. The application and permitting process by the NYS DEC includes a Joint Application Permit Form, mapping, project plans, photographs, and other engineering/technical information to support the application review. The basis for issuing a permit includes conformance with general criteria as well as specific considerations regarding water quality, natural resources, operation and maintenance, and safeguarding life and property, among other factors.

Chapter 124 of the LaGrange Town Code (see Appendix D) not only addresses wetlands, but also waterbodies and specifically calls out buffer zones for Sprout Creek under §124-5, referencing the Stream Corridor Overlay Zone (§240-31B) under Chapter 240, Zoning. While the NYS DEC Protection of Water Program indicates a water bank as the area *"extend[ing no] more than 50 feet horizontally from the mean high water line; with the following exception: Where a generally uniform slope of 45 degrees (100%) or greater adjoins the bed of a watercourse, the bank is extended to the crest of the slope or the first definable break in slope, either a natural or constructed (road, or railroad grade) feature lying generally parallel to the watercourse,"* a larger buffer zone of 200 feet is called for in §240-31B(2). Applying this buffer zone to the only impacted parcel (#3) impedes approximately 5.3 acres of land or 35% of the total land, leaving approximately 10 acres of land available for development – the remaining parcels subject to the Proposed Action remain unimpeded by these regulations.

Impact Analysis

As noted in Section 4.1, the amount of developable land is reduced by the presence of environmental features, such as streams and waterbodies, regardless of the zoning district any parcel is located in. The changing of the zoning designation for the properties within the Study Area and therefore the increase in permitted uses will not impact waterbodies to any more of a degree as compared to the existing conditions. Although more automobile service-related uses would be permitted under the Proposed Action, current regulations do not permit underground or aboveground storage within 500 feet of their outer boundaries (Chapter 240-65) and construction/disturbance within 200 feet of the centerline is regulated under Chapter 240-31B. These additional restrictions limit the location of specific uses regardless of whether they are noted as a permitted use.

Mitigation Considerations

The project review and permitting process for waterbodies are the same as outlined above for wetlands with an added layer of regulations set forth under §240-31B (Stream Corridor Overlay Zone).

Construction, filling, excavation, clearing of mature trees, grading or other alteration of land is subject to the issuance of a special permit by the Planning Board with specific considerations outlined.

With this review in place, regardless of any specific zoning district, land use, or proposed development, waterbodies such as Sprout Creek (including buffer zones) are properly protected from encroachment, ensuring minimal impact(s) and including mechanisms for any necessary mitigation measures. Only one property would be significantly impeded by the Proposed Action and the policies and goals outlined in the current Comprehensive Plan still generally encourage development to occur outside of sensitive environmental features.

Section 4.4. Evaluation of Aquifers/Groundwater

Existing Conditions

Aquifers, or groundwater, are found throughout the Town of LaGrange and a majority of the Town still relies on private wells for their potable water supply. A principal aquifer extends along Sprout Creek as well as part of the State Route 82 corridor. (See Map 4.)

Chapter 240 of the Town Code, Zoning, includes a section on groundwater protection (240-31.G) as an overlay zone. (See Section 3.5) The intent of these regulations is "*to protect the public health, safety, and general welfare by preserving and maintaining the quality and quantity of the Town's major groundwater resources in order to ensure an adequate and safe potable water supply for present and future residents, employees, and the general public*." The overlay zone applies to any new development and uses within the zone with more generalized provisions applicable to parcels with public water and sewer. These general regulations prohibit underground fuel tanks more than 1,100 gallons combined (NYSDEC permitting is required for installations over 1,100 gallons); the storage of farm animal wastes shall be contained or protected from water wells; bulk fertilizer storage shall be enclosed; and septic systems shall be a minimum of 400 feet from public wellheads. Gas stations are new permitted uses under the proposed Commercial (C) district, of which two (2) already exist within the Study Area (1502 Route 55, Site 3-172073 and 1220 Route 55, Site 3-410659). It should be noted that none of the parcels within the Study Area are within the Groundwater Protection Overlay.

There are other applicable regulatory protections, which protect groundwater resources. NYSDEC environmental regulations contained within 6 NYCRR, Chapter 5 (Resource Management Services), Part 596 through 599, for example, cover bulk storage facilities (over 1,100 gallons) for petroleum and hazardous substances. These regulations provide a mechanism for siting, review, maintenance, inspection, recordkeeping, training & operations, deliveries, and closures for above- and underground tanks. In terms of groundwater protection, the regulations dictate regular inspections and a high level of maintenance required, including recordkeeping, in order to maintain operating permits. In addition, operators must be trained in all of these aspects. Any illegal discharges are subject to significant fines and immediate corrective action(s). This is especially important in any areas where fueling stations are allowed – within a two-mile radius of the project area, there are currently 16 petroleum bulk storage facilities and one major oil facility according to NYSDEC databases. A further review of these databases indicates that all of these facilities are operating in accordance with NYSDEC requirements with no violations are on record or spills reported. Uses that utilize above- or underground storage tanks are found in the TCB, GB, and Commercial Districts, though gasoline fuel pumps are specifically permitted in the Commercial District. There are currently several uses already in existence at the Route 55 and 82 intersection that contain underground storage tanks and are within the aquifer area.

In addition to regulating storage tanks, the NYSDEC also enforces and responds to spills of petroleum and other hazardous materials – approximately 90 percent of spills involve petroleum products. NYSDEC maintains a database of spills throughout the State dating back to 1978 and updated nightly. A review of reported spills for the Route 55 corridor going back to 2005 indicates only six spills in the Study Area, two of which were related to Central Hudson Gas and Electric transformers and the remaining pertaining to gas/oil facilities. Three other petroleum-based spills were recorded at Town Center with the most current noted in 2017. All of these were since cleaned up with no impacts to groundwater and closed with no further action needed.

b) Groundwater Testing

Further evaluation of ground water quality is limited as private water wells are not required to be tested nor are results required to be maintained in a database of any kind. Public water supply, on the other hand, is regulated by the US EPA, NYSDEC, and County Department of Health, with specific minimum thresholds required for water quality in terms of inorganic, organic, chemical, and other substances. Water quality reports provide the community with a breakdown of sources, levels, and treatment methods to provide safe, potable water. In 2007 and 2008, the Dutchess County Comprehensive Private Well Testing Initiative was conducted by the County DOH to collect information about private well water source quality that serve single-family, owner-occupied residences. More than 250 random private wells were selected throughout the County including 21 within the Town of LaGrange. Of those 21, five were in the vicinity of the Study Area.

The results of those random well samples generally indicated various levels of organic substances such as barium, chloride, iron, manganese, sodium, sulfate, etc. that would require some level of treatment to remove these substances or have them meet USEPA water quality standards. The only locations that contained the presence of inorganic contaminants were at Amandas Way (MTBE, 0.1 microgram/liter over threshold) and Todd Hill Road (toluene, at threshold), both located over a quarter mile south of the project area. The remaining three were located north of the Study Area including one on Route 82 within the aquifer that extends through the Study Area; none of which reporting inorganic contaminants.

Monitoring of MTBE, a known carcinogen in high levels and susceptible to contaminating groundwater, has been undertaken in the County since 2004, under direction from the State. Since that time, and in conjunction with stricter monitoring and maintenance, there has been a dramatic decline in MTBE levels within the County according to a 2014 trend report. That report indicates that "…since 2005 no new public water supplies have been found to have MTBE contamination above the MCL [0.01 micrograms/liter] and that by 2013, only 7 out of 109 supplies sampled had MTBE concentrations above 0.01 mg/L."

Impact Analysis

As noted in Section 4.1, any developable land within the ground protection overlay is subject to additional regulations due to the presence of aquifers, regardless of the zoning district any parcel is located in. The changing of the zoning designation for the properties within the Study Area and therefore the increase in permitted uses will not impact groundwater to any more of a degree as compared to the existing conditions. Although more automobile-related uses are permitted, the groundwater regulations that are in place at the local level (Chapter 240-31G), State level (6 NYCRR Parts 596-599), and Federal level (40 CFR Parts 280 & 281) provide a program for installation, operation (handling/storage), maintenance, and inspection of underground storage tanks (USTs) over 1,100 gallons in capacity. Additionally, the Dutchess County Department of Health (DOH) and State DOH provide regulations on water quality (surface and ground) with respect to pollutants, including gasoline as well as biological contaminants such as those from failing or overburdened septic systems, a much more common cause of groundwater quality issues. The State and Federal regulations that pertain to USTs were updated in 2015 to further strengthen the 1988 Federal regulations with respect to operation and maintenance. These additional regulations provide further oversight from multiple agencies for uses that proposed USTs as part of their operations, regardless of the zoning district.

Mitigation Considerations

The Town of LaGrange will continue to enforce the existing local laws regarding the construction and installation of above- and underground petroleum bulk storage facilities along with the NYSDEC for tanks over 1,100 gallons in combined capacity. Regulations that are in place pertain to private and public uses whether for commercial or other use.

Section 4.5. Evaluation of Wildlife Resources

Existing Resources

As noted in Section 3.7, several species are noted as potentially being found within the Project Area, including threatened, endangered, and State significant species according toa review of Federal and State databases (NYSDEC Natural Heritage Program, US Fish and Wildlife Service (US FWS) Information for Planning and Consultation (IPaC)) and regional environmental agencies (Hudsonia, Ltd.) – see Appendix E. The species include the Blanding's Turtle, Bog turtle, wood turtle, Northern Long-eared bat, and Indiana bat. The NYSDEC maintains a listing of local communities that have summer/winter occurrences of the Northern Long-eared bat and there are no critical habitats within the Study Area, though the local ecology supports conditions which may support Indiana bats. According to habitat reports from Hudsonia, Ltd. (*Significant Habitats in the Fishkill and Sprout Creek Corridors* & *Blanding's Turtle Habitats in Southern Dutchess County*), the only species that has a core habitat in proximity of the Study Area is the Blanding's Turtle, located just south of Town Center.

Impact Analysis

Though the Town of LaGrange does not have specific regulations pertaining to wildlife resources, the development regulations that are in place at both the local and State/Federal level for water resources (wetlands, floodplains, and waterbodies), as noted in Section 4.1. These regulations are feature-based and not based solely on specific districts; therefore, whether or not the properties included within the Study Area were rezoned, these regulations would still apply if the environmental features noted are found. The local regulations, as well as the State and Federal regulations pertaining to water resources, achieve the same goal for wildlife resource protection by reducing the loss of potential habitats and. Additionally, the guidance measures outlined below for the bat and turtle species provide another layer of protection and awareness of wildlife species during project review, development and construction.

Mitigation Considerations

Any development that is proposed within the Project Area would undergo an environmental screening and review that would include consultation with the NYSDEC in conjunction with the Natural Heritage Program and the USFWS to provide up-to-date details or information on the presence of species within the Study Area. Based on the information contained herein, it is more likely that any of the above species noted above would occur in and around the vicinity of Sprout Creek, which flows through parcel #3 (see Maps 2 and 5). Given the fact that many of the noted species are reptiles that live near water features, it is also likely that these species may also be found on the northern edge of parcels #11-14 (see Maps 2 & 5). As part of site-specific reviews, the Town Board and/or Planning Board would require coordination and correspondence with NYSDEC and the Natural Heritage Program to provide any recent reporting of listed endangered, threatened, or rare species and follow up with field investigations in areas where potential habitats may exist, especially in the vicinity of Sprout Creek and any water features surrounding it.

Regardless of the districts, development is permitted at each parcel, which would result in some level of vegetative removal and possible displacement of local wildlife. However, several environmental regulations are in place by the Town of LaGrange to provide a level of protection for natural features that also contribute to the local habitats of wildlife, including potentially endangered, threatened, or rare species including Chapter 124 (Freshwater Wetlands, Watercourse and Waterbodies) and Chapter 24, subsection 31 (Zoning, Preservation Overlays). Further, USFWS provides guidance to avoid or minimize potential adverse effects with respect to Northern Long-eared and Indiana bats where there may be potential occurrence including seasonal restrictions on tree cutting between November 15 (swarming)/October 15 (summer habitat only) and March 31 (USFWS Indiana Bat Conservation Guidance, July 26, 2011); this is mirrored in NYSDEC guidance under Program Policy ONR-DLF-2, March 21, 2011.

Hudsonia, Ltd. has also provided guidance with respect to Blanding's Turtles (which could also be extended out to Bog or Wood Turtles, though no specific guidance is provided) in which the following general steps are recommended (additional details and information can be found in the document *Blanding's Turtle Habitats in Southern Dutchess County*):

1. If the proposed project is within a Conservation Zone, notify NYSDEC
2. Submission of an onsite Blanding's turtle habitat assessment
3. Comparison of results to Hudsonia, Ltd. mapping
4. Establish permit conditions following general recommendations contained with the above document based on the presence of "suitable wetland or upland habitats"

Section 4.6. Evaluation of Cultural Resources

Existing Resources

According to the State Historic Preservation Office's (SHPO) Cultural Resources Information System (CRIS), there is one listed historic resource in the Study Area, the Taconic State Parkway (02NR05036) and one eligible historic resource nearby, #1325 State Route 55. The Parkway is a 104.12-mile-long roadway that extends between Kensico Dam in North Castle/Mount Pleasant and Chatham and traverses through the midsection of the Town. Within the Study Area, the Parkway is elevated, and a cloverleaf intersection provides on- and off-ramps to State Route 5; the overpass consists of a decorative stone structure.

Impact Analysis

Development regulations pertaining to cultural resources are in place at both the local and State level as noted in Section 4.1 and below. These regulations are feature-based and not based solely on specific districts; therefore, whether or not the properties included within the Study Area were rezoned, these regulations would still apply if the cultural resources noted are found.

Mitigation Considerations

The Taconic State Parkway is contiguous to only three of the parcels subject to the Study Area; however, as the Proposed Action does not involve physical development, no direct impacts are anticipated. Additionally, the Parkway is an overpass in this area with significant screening from dense vegetation – this vertical separation and buffering significantly limits visibility to and from the Parkway. Travelers get only a brief view on either side of the Parkway as it crosses State Route 55. In conjunction with the Town's site plan review processes, the standard environmental review process for any proposed projects includes consultation with SHPO as necessary to coordinate any potential impacts, including physical disturbance and visual, and provide necessary recommendations. The *Taconic State Parkway Scenic Byway Corridor Management Plan* was developed in 1999 that can also be utilized and referenced for potential projects, providing further guidance and recommendations for minimizing visual impacts including scenic, natural, and cultural landscape resource management. Furthermore, the Town has regulations in place under Chapter 240-31D (Preservation Overlay Zones) for historic resources as mapping becomes available and is updated to protect and preserve lands within 500 feet of said resources, including plan review by the Town Planning Board.

Section 5.0 Alternatives

Section 5.1. No Action/Null Alternative

An alternative to the Proposed Action is the *No Action* or *Null* alternative, retaining the zoning as it is currently defined for the subject area. The presence of floodplains, wetlands, ~~and~~ waterbodies, groundwater and aquifers (along with their respective buffers) will not change as a result and they will continue to encumber properties, limiting the extent of future development. Increases in traffic volume may still increase if a viable development were proposed that resulted in resubdivision of multiple properties and demolition of existing structures to provide ample land. However, given the track of the past decade in terms of development on the eastern portion of the State Route 55 corridor, this is unlikely. All ten (10) of the zoning noncompliant parcels identified in Section 3 above would remain as pre-existing nonconforming uses and could not be substantially upgraded or expanded without a variance. The 18-19 additional uses that would be permitted (special or otherwise) under the Proposed Action provide a small number of other commercial uses to otherwise expand limited opportunities in the area. With the overall goal of the Town to "re-activate" this portion of the corridor, expand development/redevelopment opportunities, reduce non-conformities of existing businesses, and encourage investment, this alternative would not achieve these, and other objectives noted in Section 2.0. Many of the uses that are in place today have existed in much the same condition as they were originally zoned in 2005, with limited improvements made.

Section 5.2. Rezoning to Other Districts/Modifications to Commercial (C) District Regulations

Based on the existing uses in these areas, no other zoning districts currently available in the Town's Zoning Code (Chapter 240) would apply, including Residential (RFD, RMD, RLD, RFS, TCR); Hamlet (H, GH, MGH); Industrial; Planned Districts (PO, PDD, DFPD, OPD); Park (TPK, SPR) or Senior Housing (SCHD, ASCHD). Modifications to the existing Commercial (C) District for the sake of these areas would impact the much larger commercially-zoned areas on the western end of State Route 55 between the Poughkeepsie Town line and the electric transmission corridor which crosses Route 55 near Mandaly Drive. As noted previously, this alternative would not achieve these, and other objectives noted in Section 2.0 as none of the other zoning districts provide the same character that currently exists within the Study Area or in lands adjacent to it. In fact, the other zoning districts would provide an even greater number of non-conformities or greater restriction in land development that would differ from the current character of the corridor.

Section 6.0 Description of Mitigation Measures

Based on the review and evaluation above, the Proposed Action is not expected to directly cause any significant adverse environmental impacts as further outlined below. Therefore, no mitigation measures are proposed for the Proposed Action. Post legislative applications for specific project approvals will generate an independent SEQRA review and assessment of appropriate mitigation.

Section 6.1. Land Use and Zoning

No additional mitigation measures are anticipated as the subject properties will still permit a variety of commercial uses, though slightly more than allowed in the Town Center-Business and General Business districts. Limitations on previously pre-existing, non-confirming uses would be reversed, providing greater opportunity for redevelopment or improvements to these properties, but still under the review and approval from the appropriate Town Boards in regard to various site and architectural design, streetscape, and overall character elements. These review process, outlined in Chapter 240, provide sufficient permitting, management/oversight, and enforcement of land use and development as it is proposed. The Proposed Action is not expected to result in a significantly higher level of growth than that which could be expected under existing zoning.

As stated in the Description of Action, supra, the proposed action has significant public benefits.

Section 6.2. Transportation

No additional mitigation measures are anticipated as the current land use and development regulations set forth in Chapter 240 provide sufficient local review, design standards, permitting, and enforcement. The current configuration of State Route 55 has sufficient capacity to handle additional volumes on the eastern leg while maintaining an adequate level of service (LOS). In addition, the NYS DOT maintains jurisdiction over State Route 55, with any new or revised access, changes in volume, or general changes within the right-of-way subject to their review and approval in accordance with State roadway standards on a case-by-case basis.

Section 6.3. Floodplains

No additional mitigation measures are anticipated as the current land use and development regulations set forth in Chapter 120 provide sufficient permitting, management/oversight, and enforcement in accordance with Federal regulations of the same.

Section 6.4. Wetlands

No additional mitigation measures are anticipated as the current land use and development regulations set forth in Chapter 124 provide sufficient permitting, management/oversight, and enforcement in accordance with Article 24 of NYS Environmental Conservation Law, Freshwater Wetlands, and Section 404 of the Federal Clean Water Act.

Section 6.5. Waterbodies

No additional mitigation measures are anticipated as the current land use and development regulations set forth in Chapter 124 and Chapter 240, §240-31B, provide sufficient local permitting, management/oversight, and enforcement. In conjunction with these local regulations, the NYS DEC requirements for a Protection of Waters Permit and the associated review and permitting process provide additional oversight of these resources.

Section 6.6. Aquifers/Groundwater

No additional mitigation measures are anticipated as the current land use and development regulations set forth in Chapter 240, §240-31G, provide sufficient local permitting, management/oversight, and enforcement. In conjunction with these local regulations, the NYSDEC requirements for underground storage tanks and the associated review, permitting, and maintenance/operations processes provide additional oversight of these resources.

Section 6.7. Wildlife

No addition mitigation measures are anticipated as the environmental review processes provide an avenue for future projects to identify potential occurrences of regulated species and coordinate additional actions with Federal, State, and local agencies. Additional local regulations that protect sensitive environmental features through overlays that are feature-specific and not district-specific, further restricting development areas or providing an avenue for limited development through a special permitting process.

Section 6.8. Cultural resources

No addition mitigation measures are anticipated as the environmental review processes provide an avenue for future projects to identify potential impacts and coordinate additional actions with State agencies. Additional local regulations that protect cultural (historic) resources through overlays that are feature-specific and not district-specific, further restricting development areas or providing an avenue for limited development through a special permitting process.

Section 7.0 Other Issues

Section 7.1. Unavoidable Adverse Impacts

Being a legislative action only, the Proposed Action will not result in any direct unavoidable adverse environmental impacts. It should be noted ~~that~~ regardless of the ~~anticipated~~ zoning district, existing or proposed, future development ~~of lands under~~ in the ~~proposed rezoning will likely~~Study Area is anticipated to some degree which, depending on the specific use and the developable area on the subject parcel, could result in ~~impacts typical of all development,~~an increase will result in an intensity such ~~as~~that there may be an increase in demand for community services~~;~~, increased solid waste generation~~;~~, increased water use and sewage generation~~;~~, increased usage of electricity and energy resources~~;~~, and increased traffic. However, any such increase in demand is not anticipated to result in an adverse significant environmental impact. As part of the site plan, review, and permitting process that is currently in place for any proposed development projects within the Town, including subsequent environmental reviews/SEQRA, all of these potential impacts would be thoroughly analyzed with changes to the proposed project or mitigation measures identified to address impacts. ~~In terms of the proposed action.~~ In terms of the proposed action, however, it is not anticipated that such demands will exceed the town's capacity to meet them, especially as it is not expected to create a sudden increase in new development.

It is also noted that any proposed development of land affected by the proposed action discussed in this ~~DGEIS~~SDGEIS will be subject to its own environmental review under SEQR when such development is proposed. Through that process, the potential impacts would be reviewed and mitigated to the maximum extent practicable. The ~~DGEIS~~SDGEIS is not intended to serve as a substitute for a site or design-specific environmental review which will still be required on a case-by-case basis at the time that an application for development approval is submitted.

Section 7.2. Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable commitments to resources typically include land resources, construction manpower, building materials (e.g. wood, steel, concrete, etc.), energy (e.g. gasoline/diesel, electricity, natural gas, etc.), and water for domestic and irrigation purposes. Regardless of the zoning district that is in place for these properties, these resources would be utilized in some capacity. The Proposed Action, as a legislative action alone, would not entail any irreversible and irretrievable commitments to resources.

Section 7.3. Growth Inducing Impacts, Cumulative and Secondary Impacts

The Proposed Action involves changes to zoning for a number of properties, involving additional permitted uses that were not permitted under previous (existing) zoning regulations. While growth has the potential to occur as a result of the Proposed Action, the proposed zoning districts still entail a mix of commercial uses just as the existing zoning does. In addition, there is substantial overlap in uses between the General Business and Town Center districts as outlined above and the proposed rezoning of these properties to Commercial seeks to steer development that is not encouraged or appropriate within Town Center to these other areas where they are compatible and appropriate. Another element for consideration is public water and sewer.

Currently, these utilities are limited/unavailable east of the Taconic State Parkway with the vast majority of the subject properties relying on private water and septic systems; at present, there are no plans to extend public water and sewer to these areas. Any future considerations for extension of public water or sewer to these areas would require a separate environmental review undertaking. It is assumed that the cost to extend public water and sewer from the Parkway to Route 82 would cost between $100-$300/LF for each utility. Therefore, the development potential for parcels east of the Parkway is limited to the extent that the individual properties can support on-site septic systems and/or provide sufficient private water, with regulations set forth by the State Departments of Health and Environmental Conservation for distance separation and water quality. Though the proposed action will result in opportunities for additional uses above what is currently permitted, it is not anticipated that the action will result in significantly higher levels of growth than that which could be expected under the existing zoning. Over time if development does increase in these areas, a case could be made for water and sewer extension, thereby increasing more growth potential at that time; however, an extension of this magnitude would be subject to its own environmental review, with considerations given to any development that is actually constructed at that time. The existing zoning regulations/permitting and planning that is in place will provide guidance for strategic growth and development will continue to be overseen by an existing site plan review process that includes management and protection for natural features that are found on individual properties.

~~On or about August 1, 2018, Stewart's Shops Corporation filed an application with the Town Board and with the Planning Board for a combination of rezoning of the following parcels to Commercial, and site plan approval of a proposed Stewart's store: 6560-02-582930, 6560-02-592941 and a portion of 6560-02-715980. Unlike the rezoning of the parcels covered by this DGEIS, any rezoning of the Stewart's properties would be contingent on site plan approval. The Town Board is not the sole reviewing agency. The matter of the application of Stewart's is functionally independent of the change of zoning covered by the DGEIS. Nonetheless, the Town examines cumulative traffic impacts of the establishment of a Stewart's store at this location.~~

~~"SEQRA does not change the existing jurisdiction of agencies…" (6 NYCRR 617.3[b]). The Town Board is exercising its policy jurisdiction to avoid mixing the unconditional rezoning of 16 parcels by including site planning details of a new Stewart's Shop in the SEQRA review. The new Stewart's Shop will still require Comprehensive Plan amendment, rezoning by the Town Board, and site plan approval by the Planning Board. Full and complete SEQRA review will accompany those actions. The Town Board will not use the current SEQRA exercise to separate the SEQRA review of any aspect of a new Stewart's Shop.~~

~~The Town has obtained traffic data from Stewart's and this information is appended to the DGEIS as Appendix E. The traffic data for the Stewart's project has been accumulated into the traffic numbers set forth within the DGEIS. The existing properties that constitute the proposed Stewart's Shops application consist of a single-family residential dwelling and a former daycare facility with a separate apartment building. Though both of these uses are vacant and have been for more than one (1) year, using the same methodology outlined in Section 4.2, if they were reactivated with their current use similar to other properties the daily average rate would be approximately 117 daily trips according to ITE trip generation data. This would raise the daily trips from 3,677 to 3,784. When compared to the provided traffic generation data for the proposed Stewart's Shops application (between 28 and 68 net new trips taking into account pass-by trips), the additional traffic volumes for the proposed use would be lower.~~

~~As previously noted, when reviewing the AADT and Level of Service (LOS) of State Route 55, the roadway has the capacity to handle up to 14,300 vehicles per day to maintain its current LOS and not negatively impact current traffic operations or management, the same is true of State Route 82 – the proposed Stewart's Shops project will not raise the traffic volumes to this level for either roadway. As also previously noted, the NYS DOT has jurisdiction over Routes 55 and 82 and the proposed project will be subject to detailed review by the Department with subsequent improvements to site access and/or roadways changes as necessary.~~

Section 7.4. Effects on the Use and Conservation of Energy

The energy resources that will potentially be affected by the rezoning include electricity, gas, and oil. The use and conservation of these energy resources are not anticipated to be affected by the Proposed Action.

Section 7.5. Effects on Solid Waste Management

The Proposed Action involving the changes to the zoning code and other development guidelines is not expected to result in any significant increase of solid waste production than that which could be expected under existing zoning.

Section 7.6. Impacts of Public Acquisitions of Land

The Proposed Action involving the changes to the zoning code and other development guidelines has no purposes toward (as per 6 CRR-NY 617.9) "...public acquisitions of land or interests in land or funding for non-farm development on lands used in agricultural production and unique and irreplaceable agricultural lands within agricultural districts pursuant to subdivision (4) of section 305 of article 25-AA of the Agriculture and Markets Law."

Section 7.7. Effects on Cultural Resources

The Taconic State Parkway is contiguous to ~~a~~ only three of the parcels subject to this Proposed Action; however, as the Proposed Action does not involve physical development, no direct impacts are anticipated. Additionally, the Parkway is an overpass in this area with significant screening from dense vegetation – this vertical separation and buffering significantly limits visibility to and from the Parkway. Travelers get only a brief view on either side of the Parkway as it crosses State Route 55. In conjunction with the Town's site plan review processes, the standard environmental review process for any proposed projects includes consultation with the State Historic Preservation Office (SHPO) as necessary to coordinate any potential impacts, including physical disturbance and visual, and provide necessary recommendations. This holds true for any all properties "contiguous" to the Parkway, including those not subject to the Proposed Action. A Corridor Management Plan was developed for the Parkway that can also be utilized for potential projects, providing further guidance and recommendations for minimizing visual impacts.

Appendix A – Comparison of Land Uses and Area Regulations

Appendix B – Additional Traffic Evaluation Information

Appendix C – Proposed Comprehensive Plan Amendment

Appendix D – Local Regulations

Appendix E – ~~Traffic memorandum for proposed Stewart's Shops~~Additional Environmental Supporting Information

Appendix F – Blackline version of 2019 FGEIS