

Valerianella radiata

Beaked Cornsalad

Valerianaceae



Valerianella radiata by Larry Allain, USGS

***Valerianella radiata* Rare Plant Profile**

New Jersey Department of Environmental Protection
State Parks, Forests & Historic Sites
State Forest Fire Service & Forestry
Office of Natural Lands Management
New Jersey Natural Heritage Program

501 E. State St.
PO Box 420
Trenton, NJ 08625-0420

Prepared by:
Jill S. Dodds
jsdodds@biostarassociates.com

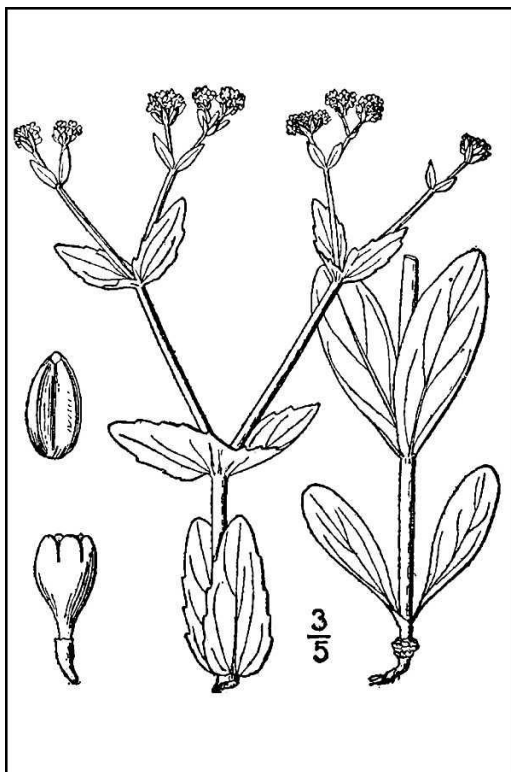
October, 2022

For:
New Jersey Department of Environmental Protection
Office of Natural Lands Management
New Jersey Natural Heritage Program
natlands@dep.nj.gov

This report should be cited as follows: Dodds, Jill S. 2022. *Valerianella radiata* Rare Plant Profile. New Jersey Department of Environmental Protection, State Parks, Forests & Historic Sites, State Forest Fire Service & Forestry, Office of Natural Lands Management, New Jersey Natural Heritage Program, Trenton, NJ. 14 pp.

Life History

Valerianella radiata (Beaked Cornsalad) is a small winter annual in the Valerianaceae with a slender, branching taproot. The plants germinate in the fall, winter as low rosettes of leaves, and flower the following spring. The basal leaves are narrowly oval and contracted at the base. The stem leaves are opposite, stalkless, and often have a few teeth—they are usually smooth or have sparse hair on the undersides. The stout, squarish stems are 15–60 cm high with hairs on the angles, and they fork into paired branches which terminate in small, dense, flat-topped flower clusters that can appear somewhat rectangular when viewed from above. Each cluster has a pair of bracts at the base and contains 4–8 funnel-shaped flowers with five white petals. The corollas are 1.5–2 mm long and the flower lobes are 0.4–0.8 mm long (See Britton and Brown 1913, Dyal 1938, Fernald 1950, Gleason and Cronquist 1991, Hilty 2020, LeGrand et al. 2022, Weakley et al. 2022).



Left: Britton and Brown 1913, courtesy USDA NRCS 2022a. Right: Larry Allain, USGS.

In New Jersey, *Valerianella radiata* flowers and fruits from April–June (Stone 1911, Hough 1983, NJNHP 2022). The blooming period of *V. radiata* usually lasts for approximately a month (Hilty 2020) and the fruits develop shortly after flowering (LeGrand et al. 2022). In Texas flowering begins in March and fruit dispersal is completed by the end of May (Chenault 1940). Flower production in Beaked Cornsalad is triggered by temperature rather than by day length. At low temperatures growth and development proceeds slowly and blooming can be delayed, while at high temperatures the plants are likely to produce multiple rosettes that have shorter scapes and the blooming period begins earlier and lasts longer (Baskin and Baskin 1974).

Three additional species of *Valerianella* have been documented in New Jersey (Kartesz 2015), although two of them (*V. chenopodiifolia* and *V. umblicata* are presently ranked as historical (NJNHP 2022). The third, *Valerianella locusta*, is an introduced species that is moderately invasive (Van Clef 2009). Close examination of the fruits and flowers is needed to identify the species. That can be challenging as many *Valerianellas* have more than one fruit form and *V. radiata* fruits are particularly variable (Dyal 1938, Ware 1983). *Valerianella* fruits are dry achenes with three chambers (locules), one of which is fertile and single-seeded while the other two are sterile (Ferguson 1965). *Valerianella locusta* can be distinguished from the native species by a corky mass on the back of the fertile locule that thickens the fruit, and its flowers may be pale blue although they can also be white. In *Valerianella chenopodiifolia* the fertile locule is much wider than the combined width of the sterile locules, in contrast with *V. radiata* where it may be narrower or only slightly wider. The fruits of *V. umblicata* are similar to those of *V. radiata* but the flowers are larger, having 3–5 mm long corollas with lobes that are 1–2 mm long (Gleason and Cronquist 1991, Weakley et al. 2022).

Pollinator Dynamics

Ware (1983) reported that self-fertilization can easily occur in *Valerianella radiata* because the anthers are positioned to deposit pollen on the stigmas as the flowers open, noting that outcrossing was also likely to be achieved as a result of abundant insect activity. The plants apparently produce nectar, although there is no noticeable floral scent (Hilty 2020). During an eight-day period, Robertson (1929) recorded 24 insect species visiting *V. radiata* flowers including an assortment of long- and short-tongued bees, wasps, flies, and a butterfly.

Seed Dispersal and Establishment

The one-seeded fruits of *Valerianella radiata* are indehiscent and serve as the distribution units (Ware 1983). The small propagules have no specialized adaptations for dispersal and it is likely that many are deposited close to the parent plants. Hilty (2020) observed that *V. radiata* had "a strong tendency to form colonies by re-seeding itself" and Dyal (1938) noted that at some sites in Missouri "the roadsides and whole fields were white with it."

Long-distance dispersal of Beaked Cornsalad is probably reliant on animals, particularly mammals. While *Valerianella radiata* has been cited as an important food source for Northern Bobwhites (*Colinus virginianus*) the birds mainly consumed the leaves (Chenault 1940). Janzen (1984) proposed that some plant species are particularly well adapted for dispersal by mammalian herbivory, citing characteristics such as edible foliage with nutritive value, mature seeds that are retained on parent plants and positioned to be ingested with browsed foliage, toxins absent or present only in low levels that deter insects but are not sufficient to harm large mammals, and seeds that are structurally resistant to damage by mastication or digestive processes and germinate well in disturbed habitats. *Valerianella radiata* appears to fit Janzen's criteria. The foliage can be eaten by humans (Allain et al. 2022) and other large mammalian herbivores (Hilty 2020), and Rosas (2003) documented the post-consumption dispersal of viable seeds by Bison (*Bison bison*). Monitoring of the outcome of a forest restoration project showed

a greater abundance of *V. radiata* plants establishing in areas with high levels of White-tailed Deer (*Odocoileus virginianus*) herbivory on saplings, and other herbaceous species in the study that showed a similar pattern were known to be preferred browse species for the deer (Ruzicka et al. 2010).

Like the seeds of many winter annuals those of *Valerianella radiata* are usually dormant at the time of dispersal, waiting out the hot, dry months of summer in that state. When some *V. radiata* seeds germinated during an unusual mid-summer cool spell in 1970 the seedlings did not survive into the autumn months (Baskin and Baskin 1971). Germination in the species usually peaks the first autumn after dispersal, although some seeds may persist in the soil and sprout within the next year or two (Baskin and Baskin 1988). No reports of fungal associations were found for *Valerianella radiata*, although mycorrhizae have been reported in *V. locusta* (Fester et al. 2002).

Habitat

Most North American *Valerianella* species can grow in a variety of moist places (Dyal 1938) and *V. radiata* is no exception. One Texas habitat was described as "shallow soils over mudstone" (George and Nixon 1990) while other substrates have been reported as sandy, gravelly, loamy, or clayey (Stone 1911, Hilty 2020, Allain et al. 2022). Full sun is preferred but partial sun is also tolerated (Hilty 2020).

Natural communities where *Valerianella radiata* has been found include limestone cedar glades (Baskin and Baskin 1978) and Appalachian shale barrens (Kalhorn et al. 2003), but the habitats are usually described more broadly as meadows, prairies, glades, woods, slopes, open floodplain forests, creek banks, and stream edges (Hough 1983, Ware 1983, Hilty 2020, Allain et al. 2022, Weakley et al. 2022). However, *V. radiata* is more typically associated with disturbed sites (Herman et al. 2006, LeGrand et al. 2022). All of New Jersey's extant occurrences are situated along the edges of roads or trails (NJNHP 2022), and in other areas it has also been found in abandoned agricultural fields and pasturelands, ditches, utility right-of-ways, and other cleared areas (Ware 1983, Hilty 2020, LeGrand et al. 2022). In such sites, *V. radiata* can become locally abundant or seasonally dominant (Corbett and Patton 2016, Gibson et al. 2005). A report on the results of an experimental modification of the mowing regime in the center strip of a Florida highway categorized *V. radiata* as an undesirable colonizer out of concern that it might compete with the planted turfgrass (*Paspalum notatum*) when established at high densities (Norcini 2014).

Wetland Indicator Status

Valerianella radiata is a facultative species, meaning that it occurs in both wetlands and nonwetlands (U. S. Army Corps of Engineers 2020).

USDA Plants Code (USDA, NRCS 2022b)

VARA

Coefficient of Conservatism (Walz et al. 2018)

CoC = 1. Criteria for a value of 1 to 2: Native invasive or widespread native that is not typical of (or only marginally typical of) a particular plant community; tolerant of anthropogenic disturbance (Faber-Langendoen 2018).

Distribution and Range

The global range of *Valerianella radiata* is restricted to the United States (POWO 2022). The map in Figure 1 depicts the extent of Beaked Cornsalad in North America.

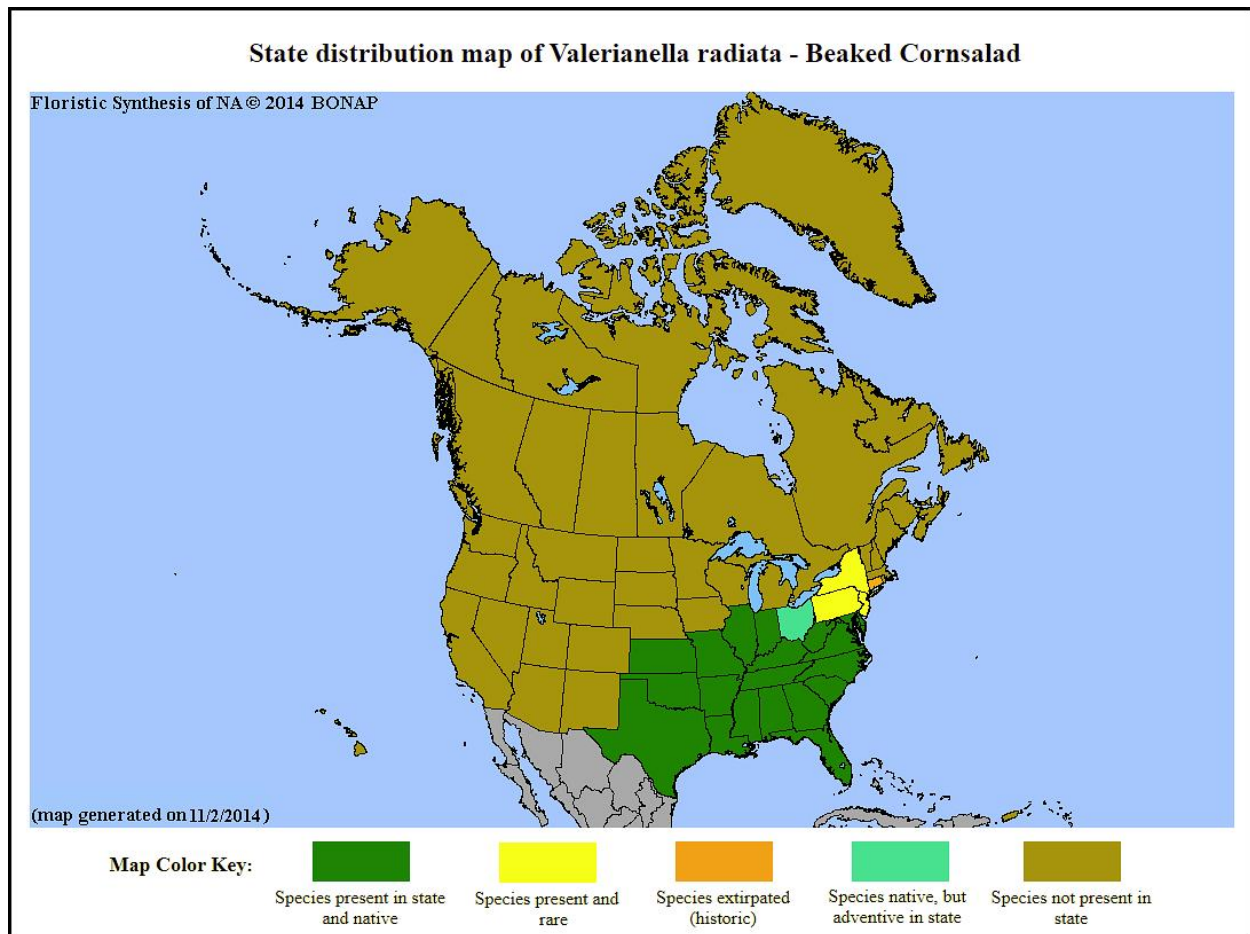


Figure 1. Distribution of *V. radiata* in North America, adapted from BONAP (Kartesz 2015).

The USDA PLANTS Database (2022b) shows records of *Valerianella radiata* in five New Jersey counties: Burlington, Cape May, Cumberland, Gloucester, and Hunterdon (Figure 2 below). Plant specimens labeled as *V. radiata* have also been collected in Mercer, Middlesex, and Monmouth counties (Mid-Atlantic Herbaria 2021). Reports of the species in Camden County were cited by Taylor (1915) and Hough (1983). The data are based on historic observations and do not reflect the current distribution of the species, which now includes Ocean County as well as Cape May, Cumberland, and Monmouth (NJNHP 2022).

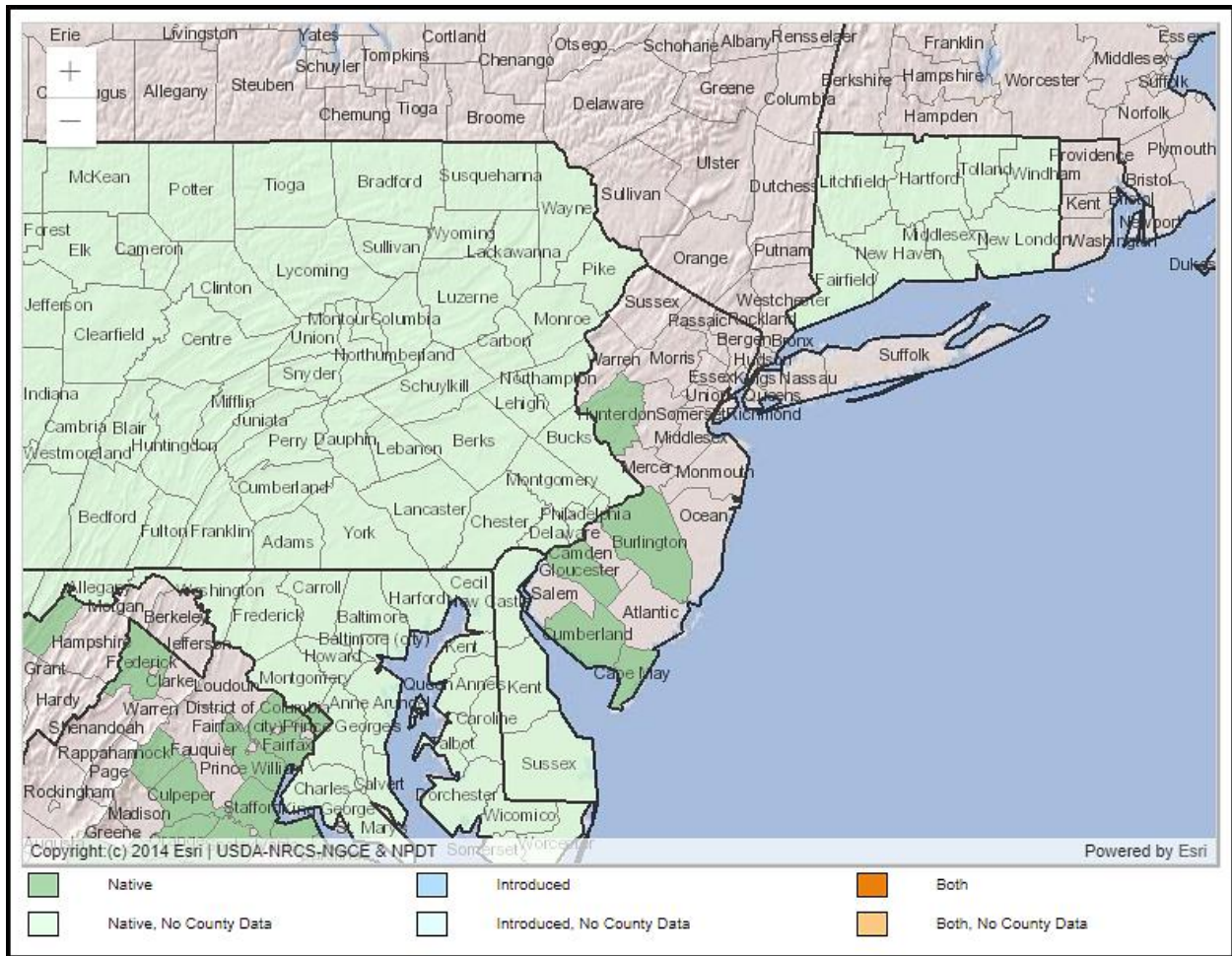


Figure 2. County records of *V. radiata* in New Jersey and vicinity (USDA NRCS 2022b).

Conservation Status

Valerianella radiata is considered globally secure. The G5 rank means the species has a very low risk of extinction or collapse due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats (NatureServe 2022). The map below (Figure 3) illustrates the conservation status of *V. radiata* throughout its range. In most of the states where it occurs, Beaked Cornsalad is either unranked or ranked as secure or apparently so. At its northeastern extent, *V. radiata* is critically imperiled (very high risk of extinction) in New Jersey, vulnerable (moderate risk of extinction) in New York, and possibly extirpated in Connecticut.

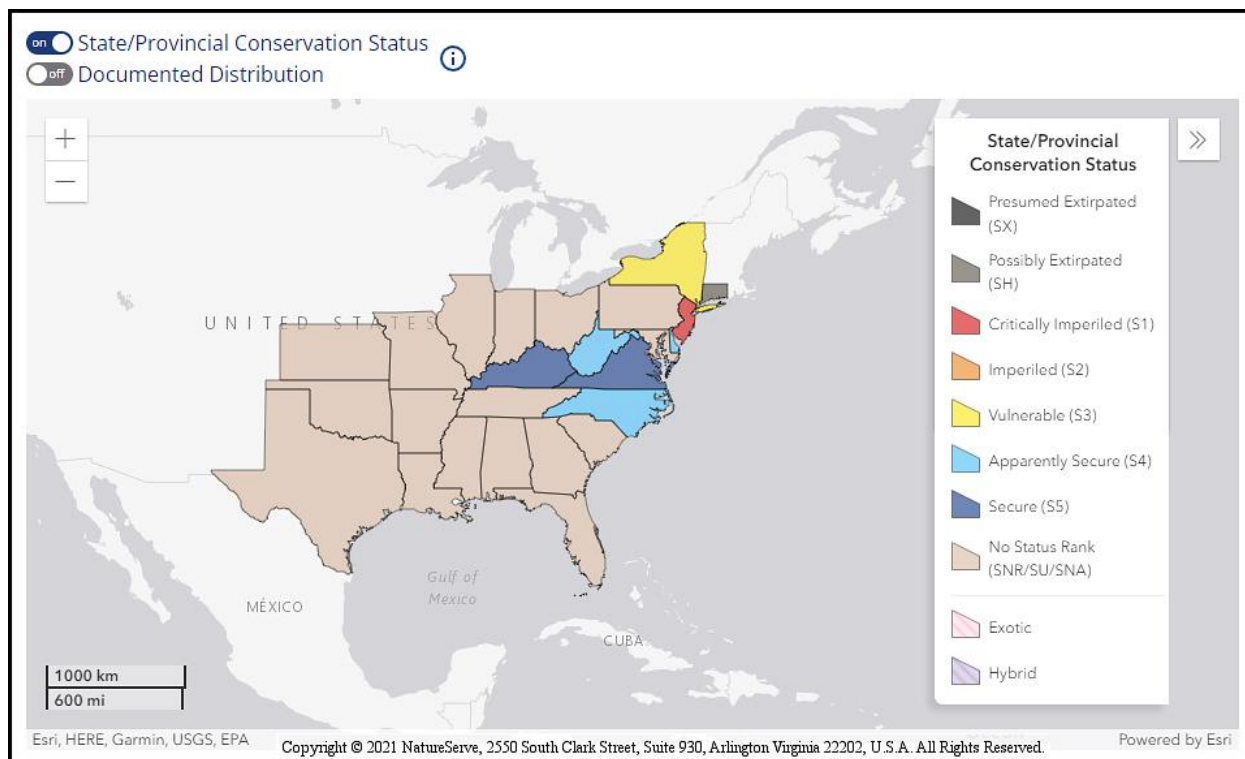


Figure 3. Conservation status of *V. radiata* in North America (NatureServe 2022).

New Jersey's assignment of an S1 rank for *Valerianella radiata* signifies five or fewer occurrences in the state. A species with an S1 rank is typically either restricted to specialized habitats, geographically limited to a small area of the state, or significantly reduced in number from its previous status. *V. radiata* is also listed as an endangered species (E) in New Jersey, meaning that without intervention it has a high likelihood of extinction in the state. Although the presence of endangered flora may restrict development in certain communities, being listed does not currently provide broad statewide protection for plants. Additional regional status codes assigned to *V. radiata* signify that the species is eligible for protection under the jurisdictions of the Highlands Preservation Area (HL) and the New Jersey Pinelands (LP) (NJNHP 2010).

During the 1800s, *Valerianella radiata* was reported in a number of western New Jersey counties including Gloucester, Hunterdon, and Mercer (Britton 1889). Stone (1911) said it was present in Cape May County and occasional in central New Jersey and Taylor (1915) remarked that it was very rare in the region. *V. radiata* was not documented in the state for decades during the mid-1900s, and Hough (1983) noted that all known records of the species pre-dated the 1930s and that recent searches for the plants had been unsuccessful. In 1987 Snyder (1989) found a small colony of Beaked Cornsalad in the vicinity of a historic occurrence, and a larger population was documented in Cumberland County in 1996 (Snyder 2000). During the past decade two additional populations were found in central New Jersey, bringing the state's current total up to four extant occurrences (NJNHP 2022).

Threats

The location of New Jersey's *Valerianella radiata* populations alongside trails and roadways makes them particularly vulnerable to direct human disturbance, and potential impacts from mowing, application of herbicides, or competition with lawngrasses and other weedy perennial species have been noted (NJNHP 2022). One New Jersey occurrence may have been lost after it was overrun by an invasive plant, *Lonicera japonica* (Snyder and Kaufman 2004). Short-lived annual plants like *V. radiata* are often poor competitors (Grime 1977) so local populations may be eliminated as other vegetation becomes established but that is only a threat if the species is unable to successfully disperse and colonize new sites. As noted in the habitat section, *Valerianella radiata* has been known to readily establish in opportunistic settings throughout most of its range.

On the whole, no broad or significant threats have been reported for *Valerianella radiata*. The plant's palatability could make it somewhat vulnerable to herbivory, but that may also promote dispersal. During the course of research on how adult shore flies (*Scatella stagnalis*) serve as aerial vectors for the fungal pathogen *Thielaviopsis basicola* on *Valerianella locusta*, El-Hamalawi (2008) obtained fungal spores for the study from naturally infected *V. radiata* plants. However, no impacts to the plants were discussed in the paper and Hilty (2020) indicated that *V. radiata* is not significantly damaged by insects or disease.

Management Summary and Recommendations

New Jersey's three largest *Valerianella radiata* populations could benefit from the creation of a management regime that restricts mowing in the vicinity of the plants until late spring following seed dispersal. The fourth and longest-known population has persisted at one site for many decades but the most recent numbers were low and an updated survey is needed. Creation of small clear patches near remaining plants might promote seedling establishment and help to maintain the species' presence.

It is not clear what restricts the expansion of *Valerianella radiata* along the northern perimeter of its range. If the boundaries have been determined by climactic conditions it is possible that rising temperatures will favor it spread northward. This is an area where further research would be beneficial in order to plan for management of Beaked Cornsalad in the northeastern states where it is imperiled.

Synonyms

The accepted botanical name of the species is *Valerianella radiata* (L.) Dufr. Orthographic variants, synonyms, and common names are listed below (Kartesz 2015, ITIS 2022, POWO 2022, USDA NRCS 2022b). The matter of whether *V. woodsiana* should be treated as a distinct taxon has not been fully addressed (Ware 1983, Weakley et al. 2022). POWO (2022) agrees with other current authors in combining the species but prioritizes the name *V. woodsiana* over *V. radiata*.

Botanical Synonyms

Fedia woodsiana Torr. & A. Gray
Fedia radiata (L.) Michx.
Valeriana locusta var. *radiata* L.
Valeriana radiata (L.) Willd.
Valeriana valerianella Christenh. & Byng
Valerianella radiata f. *demareei* Egg. Ware
Valerianella radiata f. *fernaldii* (Dyal) Egg. Ware
Valerianella radiata f. *parviflora* (Dyal) Egg. Ware
Valerianella radiata var. *fernaldii* Dyal
Valerianella radiata var. *missouriensis* Dyal
Valerianella stenocarpa var. *parviflora* Dyal
Valerianella woodsiana (Torr. & A. Gray) Walp.

Common Names

Beaked Cornsalad
Woods Corn-salad

References

- Allain, Larry. Undated photos of *Valerianella radiata*. Images courtesy of Plants of Louisiana. <https://warcapps.usgs.gov/PlantID/Species/Details/1234>
- Allain, Larry, Sairah Javed, Lilli Voorhies, Elisabeth Pigott, and Nicholas Latiolais. 2022. *Valerianella radiata*. Plants of Louisiana [web application]. Accessed October 17, 2022 at <https://warcapps.usgs.gov/PlantID/Species/Details/1234>
- Baskin, Jerry M. and Carol C. Baskin. 1971. Germination of winter annuals in July and survival of seedlings. *Bulletin of the Torrey Botanical Club* 98(5): 272–285.
- Baskin, Jerry M. and Carol C. Baskin. 1974. Influence of low winter temperatures on flowering of winter annuals. *Castanea* 39(4): 340–345.
- Baskin, Jerry M. and Carol C. Baskin. 1978. Plant ecology of cedar glades in the Big Barren region of Kentucky. *Rhodora* 80(824): 545–557.
- Baskin, Carol C. and Jerry M. Baskin. 1988. Germination ecophysiology of herbaceous plant species in a temperate region. *American Journal of Botany* 75(2): 286–305.
- Britton, N. L. 1889. Catalogue of plants found in New Jersey. Geological Survey of New Jersey, Final report of the State Geologist 2: 27–642.
- Britton, N. L. and A. Brown. 1913. *An Illustrated Flora of the Northern United States and Canada in three volumes: Volume III (Gentian to Thistle)*. Second Edition. Reissued (unabridged and unaltered) in 1970 by Dover Publications, New York, NY. 637 pp.
- Chenault, Tandy P. 1940. The phenology of some Bob-white food and cover plants in Brazos County, Texas. *The Journal of Wildlife Management* 4(4): 359–368.

- Corbett, Erica A. and Tim Patton. 2016. 14. Ten years of vegetation observations on formerly grazed Oklahoma grassland. North American Prairie Conference Proceedings. 12: 165–170. Available at <https://ir.library.illinoisstate.edu/cgi/viewcontent.cgi?article=1006&context=nape>
- Dyal, Sarah C. 1938. *Valerianella* in North America. *Rhodora* 40(473): 185–213.
- El-Hamalawi, Z. A. 2008. Acquisition, retention and dispersal of soilborne plant pathogenic fungi by fungus gnats and moth flies. *Annals of Applied Biology* 153(2): 195–203.
- Faber-Langendoen, D. 2018. Northeast Regional Floristic Quality Assessment Tools for Wetland Assessments. NatureServe, Arlington, VA. 52 pp.
- Ferguson, I. K. 1965. The genera of Valerianaceae and Dipsacaceae in the southeastern United States. *Journal of the Arnold Arboretum* 46(2): 218–231.
- Fernald, M. L. 1950. *Gray's Manual of Botany*. Dioscorides Press, Portland, OR. 1632 pp.
- Fester, Thomas, Bettina Hause, Diana Schmidt, Kristine Halfmann, Jürgen Schmidt, Victor Wray, Gerd Hause, and Dieter Strack. 2002. Occurrence and localization of apocarotenoids in arbuscular mycorrhizal plant roots. *Plant and Cell Physiology* 43(3): 256–265.
- George, Robert J. and Elray S. Nixon. 1990. The herbaceous flora of three weches formation outcrops in eastern Texas. *SIDA* 14(1): 117–127.
- Gibson, David J., Beth A. Middleton, Kari Foster, and Erik W. Hoyer. 2005. Species frequency dynamics in an old-field succession: Effects of disturbance, fertilization and scale. *Journal of Vegetation Science* 16(4): 415–422.
- Gleason, H. A. and A. Cronquist. 1991. *Manual of Vascular Plants of Northeastern United States and Adjacent Canada*. Second Edition. The New York Botanical Garden, Bronx, NY. 910 pp.
- Grime, J. P. 1977. Evidence for the existence of three primary strategies in plants and its relevance to ecological and evolutionary theory. *The American Naturalist* 111(982): 1169–1194.
- Herman, Brook D., John D. Madsen, and Gary N. Ervin. 2006. Development of Coefficients of Conservatism for Wetland Vascular Flora of North and Central Mississippi. GeoResources Institute Report 4001, Mississippi State, MS. Available at <https://www.gri.msstate.edu/publications/docs/2006/03/4097MS-Coeff-of-Conservatism.pdf>
- Hilty, John. 2020. Beaked Corn Salad, *Valerianella radiata*. Illinois Wildflowers. Accessed October 17, 2022 at https://www.illinoiswildflowers.info/weeds/plants/corn_salad.htm
- Hilty, John. Undated. Final page image of *Valerianella radiata* colony. Photo from Illinois Wildflowers https://www.illinoiswildflowers.info/weeds/plants/corn_salad.htm used with permission https://www.illinoiswildflowers.info/files/photo_use.html

Hough, Mary Y. 1983. *New Jersey Wild Plants*. Harmony Press, Harmony, NJ. 414 pp.

ITIS (Integrated Taxonomic Information System). Accessed October 16, 2022 at <http://www.itis.gov>

Janzen, D. H. 1984. Dispersal of small seeds by big herbivores: Foliage is the fruit. *American Naturalist* 123: 338–353.

Kalhorn, Kathryn D., Edward M. Barrows and Wallace E. LaBerge. 2003. Bee (Hymenoptera: Apoidea: Apiformes) diversity in an Appalachian Shale Barrens. *Journal of the Kansas Entomological Society* 76(3): 455–468.

Kartesz, J. T. 2015. The Biota of North America Program (BONAP). Taxonomic Data Center. (<http://www.bonap.net/tdc>). Chapel Hill, NC. [Maps generated from Kartesz, J. T. 2015. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP) (in press)].

LeGrand, H., B. Sorrie, and T. Howard. 2022. *Valerianella radiata*. Vascular Plants of North Carolina, North Carolina Biodiversity Project and North Carolina State Parks, Raleigh, NC. Accessed October 17, 2022 at https://auth1.dpr.ncparks.gov/flora/species_account.php?id=2766

Mid-Atlantic Herbaria. 2021. <https://midatlanticherbaria.org/portal/index.php>, Accessed on December 17, 2021.

NatureServe. 2022. NatureServe Explorer [web application]. NatureServe, Arlington, VA. Accessed October 16, 2022 at <https://explorer.natureserve.org/>

NJNHP (New Jersey Natural Heritage Program). 2010. Special Plants of NJ - Appendix I - Categories & Definitions. Site updated March 22, 2010. Available at https://nj.gov/dep/parksandforests/natural/docs/nhpcodes_2010.pdf

NJNHP (New Jersey Natural Heritage Program). 2022. Biotics 5 Database. NatureServe, Arlington, VA. Accessed February 1, 2022.

Norcini, Jeffrey G. 2014. Madison County Energy Conservation Study 2012-2013 Survey of Roadside Vegetation. Florida Department of Transportation, Tallahassee, FL. 107 pp.

POWO. 2022. Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Retrieved October 16, 2022 from <http://www.plantsoftheworldonline.org/>

Robertson, Charles. 1929. *Flowers and Insects: Lists of Visitors of Four Hundred and Fifty-three Flowers*. Science Press Printing Company, Lancaster, PA. 221 pp.

Rosas, Claudia de Abreu. 2003. Some aspects of bison ecology and behavior in a tallgrass prairie. Doctoral dissertation, National University of Mar del Plata Mar del Plata, Argentina.

Available at <https://shareok.org/bitstream/handle/11244/44752/Thesis-2003D-R789s.pdf?sequence=1>

Ruzicka, Kenneth J., John W. Groniger, and James J. Zaczek. 2010. Deer browsing, forest edge effects, and vegetation dynamics following bottomland forest restoration. *Restoration Ecology*, September 2010: 702–710.

Snyder, David B. 1989. Notes on some recently rediscovered New Jersey plant species. *Bartonia* 55: 40–46.

Snyder, David. 2000. One hundred lost plants found. *Bartonia* 60: 1–22.

Snyder, David and Sylvan R. Kaufman. 2004. An overview of nonindigenous plant species in New Jersey. New Jersey Department of Environmental Protection, Division of Parks and Forestry, Office of Natural Lands Management, Natural Heritage Program, Trenton, NJ. 107 pp.

Stone, Witmer. 1911. *The Plants of Southern New Jersey*. Quarterman Publications, Boston, MA. 828 pp.

Taylor, Norman. 1915. Flora of the vicinity of New York - A contribution to plant geography. *Memoirs of the New York Botanical Garden* 5: 1–683.

U. S. Army Corps of Engineers. 2020. National Wetland Plant List, version 3.5. https://cwbi-app.sec.usace.army.mil/nwpl_static/v34/home/home.html U. S. Army Corps of Engineers Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH.

USDA, NRCS (U. S. Dept. of Agriculture, Natural Resources Conservation Service). 2022a. *Valerianella radiata* illustration from Britton, N. L. and A. Brown, 1913, *An illustrated flora of the northern United States, Canada and the British Possessions*, 3 vols., Kentucky Native Plant Society, New York, Scanned By Omnitek Inc. Image courtesy of The PLANTS Database (<http://plants.usda.gov>). National Plant Data Team, Greensboro, NC.

USDA, NRCS (U. S. Dept. of Agriculture, Natural Resources Conservation Service). 2022b. PLANTS profile for *Valerianella radiata* (Beaked Cornsalad). The PLANTS Database, National Plant Data Team, Greensboro, NC. Accessed October 16, 2022 at <http://plants.usda.gov>

Van Clef, M. 2009. *New Jersey Strategic Management Plan for Invasive Species: The Recommendations of the New Jersey Invasive Species Council to Governor Jon S. Corzine, Pursuant to New Jersey Executive Order #97*. 220 pp. Appendix II, Prioritized Listing of New Jersey's Nonindigenous Plant Species, prepared by David Snyder.

Walz, Kathleen S., Linda Kelly, Karl Anderson and Jason L. Hafstad. 2018. Floristic Quality Assessment Index for Vascular Plants of New Jersey: Coefficient of Conservatism (CoC) Values for Species and Genera. New Jersey Department of Environmental Protection, New

Jersey Forest Service, Office of Natural Lands Management, Trenton, NJ. Submitted to United States Environmental Protection Agency, Region 2, for State Wetlands Protection Development Grant, Section 104(B)(3); CFDA No. 66.461, CD97225809.

Ware, Donna M. Eggers. 1983. Genetic fruit polymorphism in North American *Valerianella* (Valerianaceae) and its taxonomic implications. *Systematic Bot.* 8: 33–44.

Weakley, A. S. and Southeastern Flora Team. 2022. *Flora of the Southeastern United States*. University of North Carolina Herbarium, North Carolina Botanical Garden, Chapel Hill, NC. 2022 pp.



Courtesy of John Hilty, Illinois Wildflowers (undated).