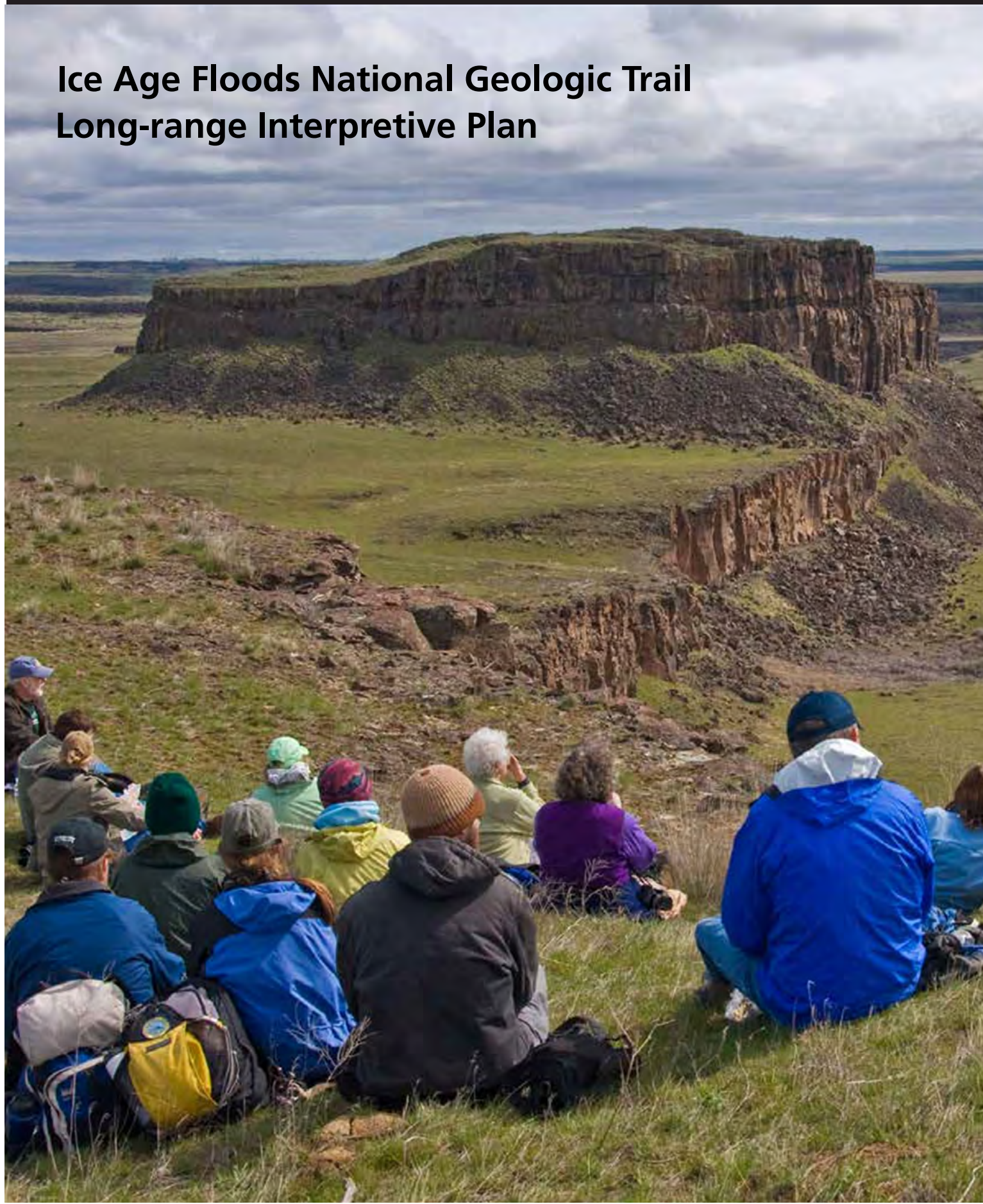




Ice Age Floods National Geologic Trail Long-range Interpretive Plan





Hikers visit a large granite glacial erratic on top of Steamboat Rock in central Washington.
Photo: Bruce Bjornstad

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June 2016

Prepared by

**Goolrick Interpretive Group
with Harpers Ferry Center Interpretive Planning for
Ice Age Floods National Geologic Trail**

On the cover: An Ice Age Floods tour group breaks for lunch in the Drumheller Channels, one of several National Natural Landmarks to be found along Ice Age Floods National Geologic Trail. *Photo: Bruce Bjornstad*

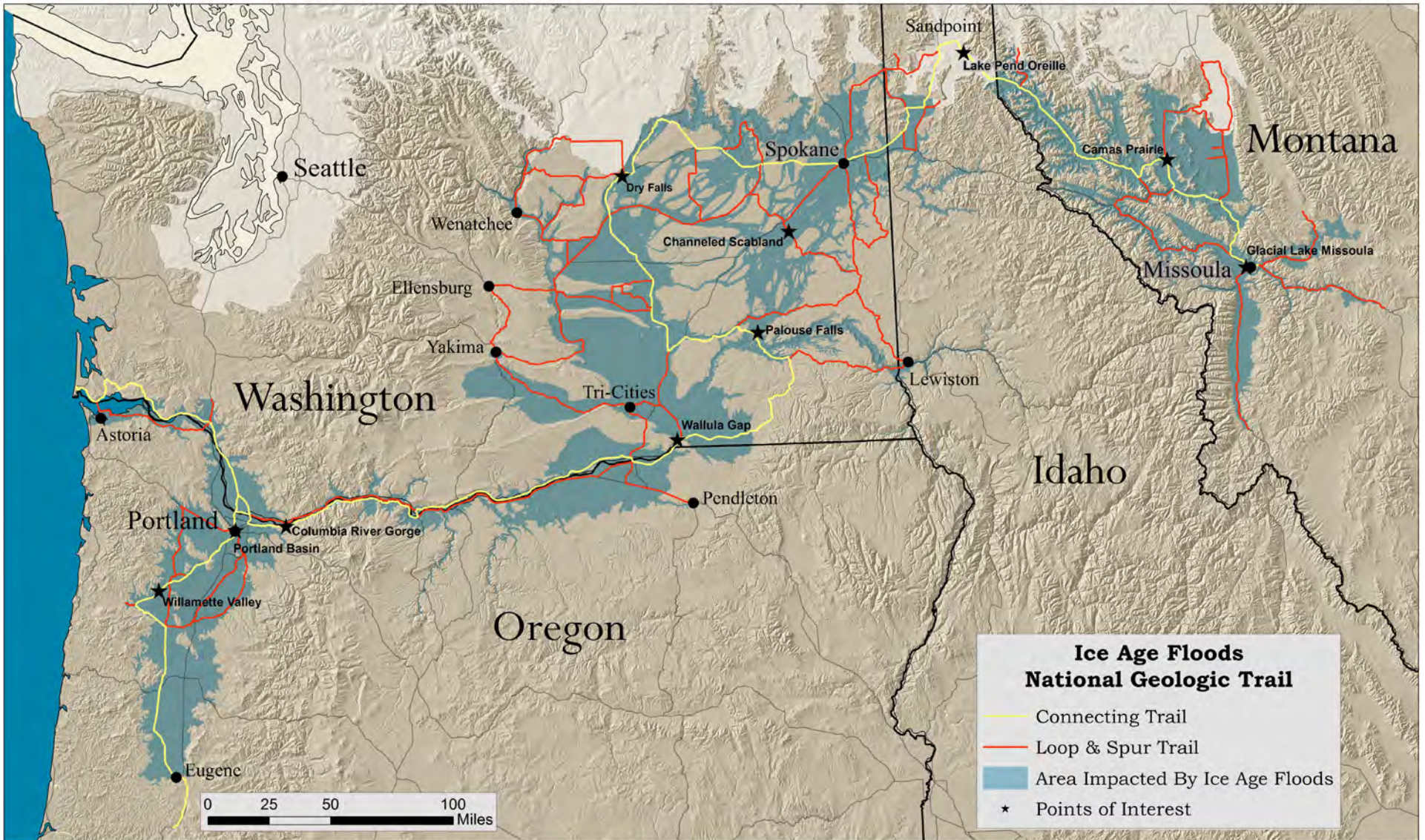
**National Park Service
U.S. Department of the Interior**

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Ice Age Floods National Geologic Trail - Master Trail Map

National Park Service
U.S. Department of the Interior
Ice Age Floods NGT



The Nation's First National Geologic Trail

Ice Age Floods National Geologic Trail is one of the few national trails in the United States focused on natural, rather than human, history. This unusual trail highlights the extraordinary geologic features left behind by a series of huge, cataclysmic floods that swept across the Pacific northwest some 12,000 to 17,000 years ago. This sudden, cataclysmic flooding happened repeatedly, probably over thousands of years, as the glacial ice dams on the Clark Fork River built up and then broke, unleashing some 500 cubic miles of water from Glacial Lake Missoula. The water in these ancient lakes – more water than modern-day Lake Ontario and Lake Erie combined – flooded repeatedly across more than 16,000 square miles in a thundering rush to the ocean. Today, the pathways of these floods extend more than 1,300 linear miles across the region, beginning in the intermountain valleys of western Montana and traversing northern Idaho, central and eastern Washington, and northern Oregon to the coast at Cape Disappointment, where the Columbia River flows into the Pacific Ocean.

The as-yet unsigned route of the trail, designated by an act of Congress in 2009, encompasses several federal and state highways and Scenic Byways, as well as a number of loops and spurs across a vast, varied landscape with more than 350 sites and features created by the Ice Age floods. The terrain includes seven National Natural Landmarks, six National Forests, six National Wildlife Refuges, two National Trails, a National Recreation Area, a National Scenic Area, a National Monument, 16 federally recognized American Indian tribes or confederations of tribes whose traditional lands the trail intersects, several state and national Scenic Byways, a number of National Register properties, and more than a dozen state parks across the four states. The 16,000-

square-mile landscape carved and rearranged repeatedly by the floods is alternately lush or arid, wild or intensively farmed, flat or sculpted into undulating ripples, gravel bars, and shorelines left by ancient torrents of water. For those who know its stories, this land reveals a saga of nature's power, ageless and unrivaled by any but the most spectacular landmarks on the planet.

Creating an Interpretive Plan

Unlike financial plans, management plans, facilities plans, marketing plans, or resource protection plans, an interpretive plan focuses explicitly on providing opportunities for visitors to experience, learn about, and enjoy the natural, cultural, and historical resources of a site. Typically, a long-range interpretive plan offers guidance for comprehensive, site-wide interpretive programming for the next seven to ten years.

Accordingly, this Long-range Interpretive Plan (LRIP) expands on the key visitor-oriented elements introduced in earlier planning efforts for Ice Age Floods National Geologic Trail. Based on input from trail stakeholders across four states (see Appendix C), this plan reviews potential visitor experiences and proposes creative interpretive programming – stories, signs, interactive activities, exhibits, web-based media, and more – to illustrate the set of five primary interpretive themes identified in the trail's 2014 Foundation Statement. These themes focus on the following:

- Geologic Setting
- Cataclysmic versus Incremental
- Evidence that Remains
- In Search of the Truth
- Lives and Livelihoods

In essence, this Long-range Interpretive Plan is a blueprint to aid trail partners in bringing the trail's themes – its essential meanings – to life.

It is fitting that the first-ever National Geologic Trail should highlight the unique and dramatic landscape of the inland Northwest, which was shaped by these Ice Age floods. This trail will serve to inform local residents about our unique geologic history, attract and support tourism to the region, and do so by interpreting sites on existing public lands rather than adding new regulations to private landowners or through the costly acquisition of new federal lands.

—U.S. Congressman Doc Hastings
May 27, 2009



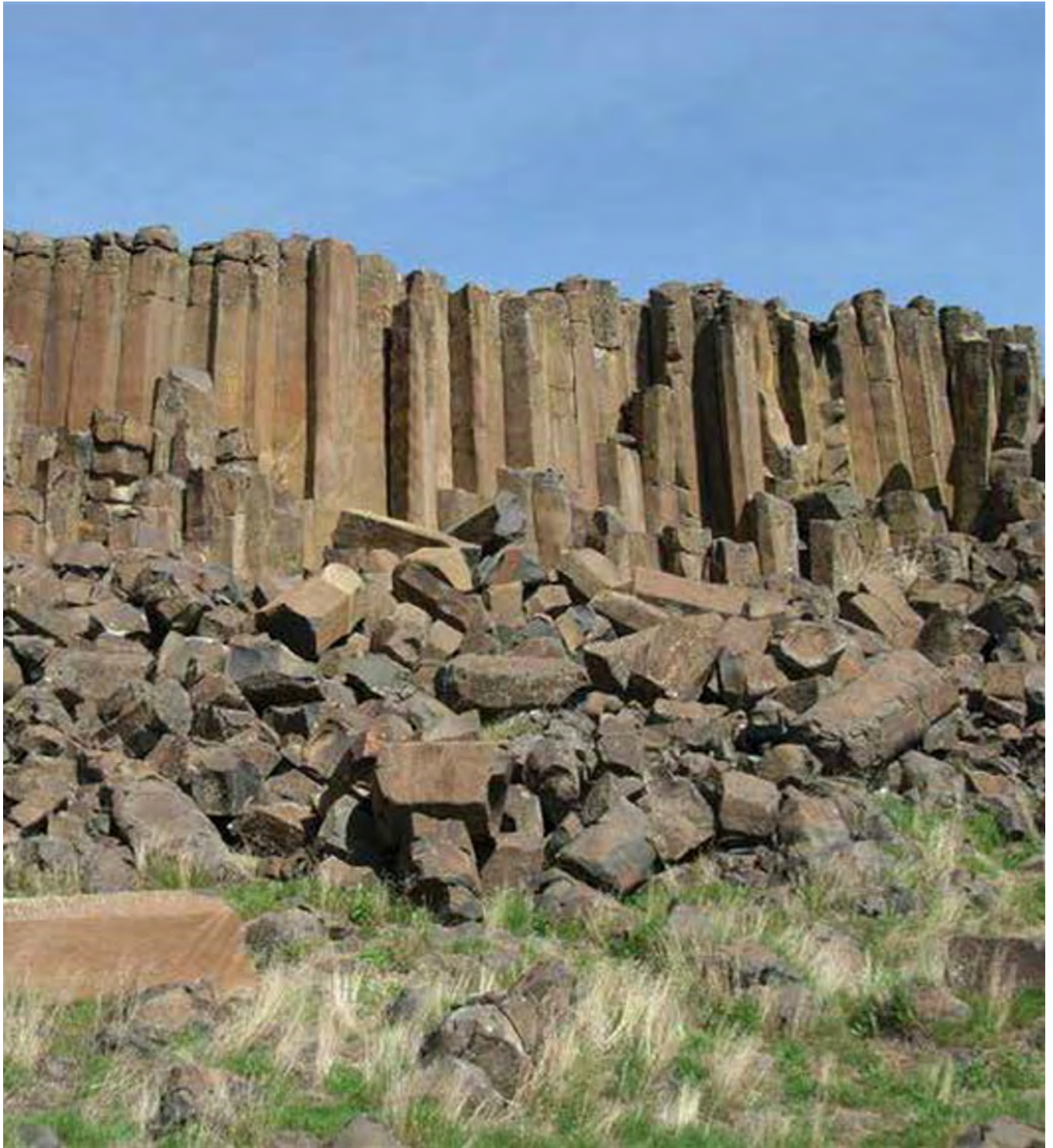
Ice Age Floods National Geologic Trail supporters held a celebratory news conference on May 27, 2009, two days after Congress passed long-awaited legislation to establish the trail. U.S. Senator Maria Cantwell (at the podium) and U.S. Congressman Doc Hastings (third from right) were the primary sponsors of the trail legislation. Other participants included (left to right) Kris Watkins of the Tri-Cities Convention and Visitors Bureau, Keith Dunbar of the National Park Service (NPS), and Gary Kleinknecht (far right), then president of the Ice Age Floods Institute.

Congressman Hastings and Senator Cantwell learn first-hand about glacial erratics along the trail.



Photos: Lorraine Cooper, courtesy of Kennewick School District.

Opposite page: Basalt columns tower against the sky. Photo: Lake Lewis chapter/IAFI



Foundation for Planning

Section 1: Foundation for Planning

Effective long-range interpretive planning begins with reviewing, documenting, and clarifying the foundational elements utilized in park planning. The following foundational elements for Ice Age Floods National Geologic Trail, presented in detail in the 2014 Foundation Statement, are summarized briefly here.

Legislative Background

After nearly two decades of consideration, Ice Age Floods National Geologic Trail was formally established by Public Law 111-11 on March 30, 2009. The legislation (see Appendix A) defines the trail and highlights its “dramatic and distinguishing features” as having “exceptional value and quality” in illustrating the route and impact of the floods on some 16,000 square miles of land stretching from western Montana to the Pacific Ocean. Among other stipulations, the law charges its partners to

“to provide for public appreciation, understanding, and enjoyment of the nationally significant natural and cultural features of the Ice Age floods and to promote collaborative efforts for interpretation and education....”

Under terms of the legislation, the National Park Service serves as administrator for the trail, but all planning is to be conducted in cooperation with the appropriate state, local, and tribal governments, the Ice Age Floods Institute, private property owners, other interested stakeholders, and more than two dozen state parks across the four

states. The legislation specifically calls for “strategies for the coordinated development of the Trail, including an interpretive plan for facilities, waysides, roadside pullouts, exhibits, media, and programs that present the story of the floods to the public effectively.”

Interagency Memorandum of Understanding

As an outgrowth of the establishing legislation, the trail is governed by an interagency Memorandum of Understanding (MOU) among the seven federal agency partners regarding planning, development, and management of the trail. This MOU (National Park Service Agreement – IAFL # G9003-10-0001), which runs from 2010 to 2020, includes five agencies within the U.S. Department of the Interior (National Park Service, U.S. Geological Survey, Bureau of Land Management, Bureau of Reclamation, and U.S. Fish and Wildlife Service), as well as the USDA Forest Service and the U.S. Army Corps of Engineers.

The memorandum asks its signers “to develop a coordinated and scientifically accepted interpretation of the nationally significant values and features associated with the Ice Age Floods National Geologic Trail that are found on federal lands in the States of Idaho, Montana, Oregon, and Washington.” The agencies acknowledge that they “share a mutual interest in federal land management, scientific research, and a responsibility for providing the public with high quality, cohesive and educational interpretive programs.”

Purpose Statement

- Ice Age Floods National Geologic Trail tells the stories of the cataclysmic Ice Age floods and invites people to discover and explore the resulting extraordinary landscapes and distinctive features. Interpretation, research, and stewardship are achieved through collaboration between public and private partners.

Significance Statements

- **Cataclysmic Ice Age Floods:**
Ice Age Floods National Geologic Trail represents some of the greatest floods on earth. Repeated cataclysmic releases of water exploding from glacially dammed Lake Missoula thundered across the landscape to the Pacific Ocean, carrying water, debris, rock, and ice with a discharge equal to 10 times the flow from all of today's rivers worldwide.
- **Distinctive Geologic Resources:**
The Ice Age floods sculpted extraordinary landscapes and left behind a variety of distinctive geologic features across a vast area of the northwestern United States. Gigantic basalt coulees, enormous waterfalls, and flood ripples of immense proportion are just a few examples of the evidence that survives to illustrate the scale and power of the floods.
- **Science and Research:**
The discovery and investigation of the Channeled Scabland led to an understanding of cataclysmic origin, which challenged prevailing geologic thought. Ongoing research has established the Ice Age floods as the quintessential example of megaflood landscapes throughout the world.

- **Human Settlement and Use:**

The Ice Age floods transformed the environment of the northwestern United States, greatly influencing the use of the land and its resources from early native peoples to contemporary society.

Fundamental Resources

In addition to providing purpose and significance statements, the 2014 Foundations Statement defines the trail's fundamental resources in several interrelated categories:

- Outstanding floods-related geologic resources
- Exceptional scenery and views
- Scientific knowledge and research
- Floods-related cultural resources
- Access to diverse recreational, educational, and cultural opportunities

Interpretive Themes

Interpretive themes are the “main messages” about a place – the fundamental ideas, concepts, and inherent meanings – that should be readily apparent and accessible to all visitors. Depending on the complexity of a site’s resources and the breadth of its offerings, each major theme may accommodate several concepts or subthemes that help interpreters delve deeper into the stories and resources. The storylines collected within these concepts illustrate the site’s big themes in ways that invite people to listen, learn, and care.

The 2014 Ice Age Floods National Geologic Trail *Foundations Statement* presented five primary interpretive themes to guide partners in developing consistent,

cohesive interpretive programming for the newly designated trail. Starting with these five primary themes, the 2015 long-range interpretive planning team asked trail stakeholders to identify concepts, stories, and sites that interpreters might use to illustrate each theme. Convening in two two-day sessions held in Spokane and Portland in early 2015, some 35 stakeholders contributed their ideas to expand and enrich the original primary themes.

These five primary themes, with supporting concepts and a range of possible storylines, have been organized in a flexible, easily updatable interpretive theme matrix for interpretive partners to customize as needed.



Planning participants worked together in a series of workshops in Spokane, Richland, and Portland to review themes and craft desired visitor experiences for the trail. *Photos: Faye Goolrick/GIG*

Ice Age Floods National Geologic Trail: Interpretive Theme Matrix

Theme Title: Geologic Setting	
A remarkable alignment of past geologic forces, resulting terrain, and Ice Age conditions produced a series of some of the greatest floods on earth, dramatically sculpting 16,000 square miles of the northwestern United States and as much of the Pacific Ocean floor.	
Concepts and Ideas	Topics and Storylines
<i>Examples to be explored within each theme, written as objectives</i>	<i>Examples or sample storylines within this theme</i>
<ul style="list-style-type: none"> Describe the geology of the region before the floods occurred. Explain how the North American continent looked during past periods of glaciation. 	<ul style="list-style-type: none"> Millions of years of volcanic activity; basalt flows; river drainages before the floods What are the Ice Ages? What is the Cordilleran Ice Sheet, and how/why did it form?
<ul style="list-style-type: none"> Explore how, why, and where the floods happened. 	<ul style="list-style-type: none"> Ice dams and their repeated failures
<ul style="list-style-type: none"> Explain the concept of geological stratigraphy and what the rock and sediment layers can reveal. 	<ul style="list-style-type: none"> Deposits (layers) left by the floods; discovery of many floods, not just one
<ul style="list-style-type: none"> Discuss the floods as a revelatory aspect of earth's possibilities for climate change. 	<ul style="list-style-type: none"> Floods as a result of glacial cycles that happened repeatedly over thousands of years Floods as a particularly dramatic part of earth's age-old water cycle – water from glaciers returns to the sea Comparison to geology of Planet Mars

Theme Title: Cataclysmic versus Incremental	
The Ice Age floods remind us that the slow, incremental processes shaping our earth can be punctuated by sudden, epic, cataclysmic events, and that such events are possible in our lifetimes.	
Concepts and Ideas	Topics and Stories
<i>Examples to be explored within each theme, written as objectives</i>	<i>Examples or sample storylines within this theme</i>
<ul style="list-style-type: none"> • Illustrate/explain the “normal” processes of geological change through erosion, weathering, sedimentation, etc. 	<ul style="list-style-type: none"> • Examples of erosion, weathering, sedimentation, and other gradual processes that shape the landscape over millions of years (creation of canyons, river deltas)
<ul style="list-style-type: none"> • Define the Ice Age floods as sudden, cataclysmic changes in the natural world – in contrast to contemporary natural catastrophes or disasters in the human sense of these terms. 	<ul style="list-style-type: none"> • The astounding size, velocity, and landscape-altering power of the floods: approximately 500 cubic miles of water rushing westward over 16,000 square miles, other factual details of the floods’ horizontal and vertical scope and scale
<ul style="list-style-type: none"> • Compare the Ice Age floods to other natural cataclysmic events that occur in our lifetimes. 	<ul style="list-style-type: none"> • Comparisons to sudden, epic events in contemporary times: volcanic eruptions in human history (Pompeii, Krakatoa, Mount St. Helens); tsunamis (Indonesia, Japan); earthquakes (San Francisco, Haiti)



Green Monarch Ridge rises above Lake Pend Oreille in Idaho. Massive ice dams formed here and held back Glacial Lake Missoula -- until they collapsed! The result: Cataclysmic Ice Age floods. *Photo: Bruce Bjornstad*

Theme Title: Evidence that Remains

In the wake of the floods, a wide array of flood-formed features remained, just waiting for human curiosity to discover. Some features are gigantic – more readily visible from space than from the ground; others are subtle – only recognized and appreciated through close observation.

<p style="text-align: center;">Concepts and Ideas</p> <p style="text-align: center;"><i>Examples to be explored within each theme, written as objectives</i></p>	<p style="text-align: center;">Topics and Stories</p> <p style="text-align: center;"><i>Examples or sample storylines within this theme</i></p>
<ul style="list-style-type: none"> • Help visitors “read the landscape” for evidence by identifying flood features, large and small. • Use a variety of presentation techniques to help visitors envision the landscape underwater to understand today’s remaining flood features. 	<ul style="list-style-type: none"> • Stories explaining large, dramatic landscape features such as Dry Falls • Stories explaining the various individual flood features found throughout the affected landscape: ripples, strand lines, shore lines, scablands, Ephrata fan, coulees, erratics, etc.
<ul style="list-style-type: none"> • Introduce the geological theories and controversies related to how the floods landscape was created. 	<ul style="list-style-type: none"> • Stories about Harlen Bretz and Joseph Pardee • Stories illustrating increasing scientific knowledge and understanding of the floods
<ul style="list-style-type: none"> • Introduce tribal presence, cultural ties to the landscape, and ideas about its creation. • Inspire visitors to consider how traditional tribal beliefs reflect intimate knowledge of and enduring ties to the land. 	<ul style="list-style-type: none"> • Tribal histories and stories related to different landscape features across the region • Stories illustrating how tribal history stories often reflect traditional ecological knowledge (TEK)
<ul style="list-style-type: none"> • Illustrate floods’ impact on the region’s ecosystems. 	<ul style="list-style-type: none"> • Paleo-biology and native First Foods connections in the region • Indigenous versus transported plants in flood sediments • Rich soils in some areas (Willamette Valley) due to flood sediments
<ul style="list-style-type: none"> • Describe how the floods’ impact extends for hundreds of miles onto the ocean floor beyond Cape Disappointment. 	<ul style="list-style-type: none"> • Longer, lower shoreline during floods era than we see now • Dangerous currents over Columbia Bar because of flood sediments on the ocean floor

Theme Title: In Search of the Truth

Unraveling the mysteries of the Ice Age floods reveals the human, often subjective and sometimes contentious, side of the scientific method that arises when new evidence challenges prevailing paradigms.

<p>Concepts and Ideas</p> <p><i>Examples to be explored within each theme, written as objectives</i></p>	<p>Topics and Stories</p> <p><i>Examples or sample storylines within this theme</i></p>
<ul style="list-style-type: none"> • Establish context of geological study and research prior to the modern era. • Describe Harlan Bretz’s controversial theory about the huge flood. • Describe Joseph Pardee’s scholarship confirming the where the floods originated (i.e., Glacial Lake Missoula). 	<ul style="list-style-type: none"> • Research tools and technology limited to traditional field observations and mapping; no satellite or aerial imagery to augment findings of on-the-ground field research • Bretz’s 1927 presentation at the Geological Society of Washington, D.C. – and other geologists’ resounding rejection of his ideas • Pardee’s research on Glacial Lake Missoula from 1910 to 1942, which supported Bretz’s hypotheses
<ul style="list-style-type: none"> • Describe current scientific knowledge on the floods as not “the last word” but as an evolving field where many people can and do contribute. • Describe continuing research and evolving understanding of these floods and other related Ice Age events around the globe. 	<ul style="list-style-type: none"> • New ways to study floods features: high-tech tools such as aerial surveys and LiDAR (Light Detection and Ranging) remote sensors, which provide scientific data to support theories of the floods • Ice-dam floods <i>research</i> in Iceland and elsewhere
<ul style="list-style-type: none"> • Explore the floods through traditional ecological knowledge handed down by generations of tribal people in the region. 	<ul style="list-style-type: none"> • Flood stories from tribal communities



Giant current ripples along the West Bar of the Columbia River were a mystery until the geologists J. Harlan Bretz and Joseph Pardee traced their origins to torrential Ice Age floods. *Photo: Bruce Bjornstad*

Theme Title: Lives and Livelihoods

Just as the Ice Age floods left an enduring mark on the landscape of the northwestern United States, so too has that landscape profoundly shaped human history and culture across the region. The impact of the floods continues to this day.

<p>Concepts and Ideas</p> <p><i>Examples to be explored within each theme, written as objectives</i></p>	<p>Topics and Stories</p> <p><i>Examples or sample storylines within this theme</i></p>
<ul style="list-style-type: none"> • Show how present-day agriculture relates directly to floods deposition. 	<ul style="list-style-type: none"> • Agriculture (apple orchards) and vineyards in western Washington, the Tri-Cities area, and Oregon's rich Willamette Valley, the ultimate destination for settlers traveling west on the Oregon Trail
<ul style="list-style-type: none"> • Connect modern transportation and settlement patterns to the landscape left by the Ice Age floods. 	<ul style="list-style-type: none"> • Locations of railroads and highways in coulees and through water gaps • Locations of towns at river confluences: The Dalles, Richland, Wenatchee • Location of Hanford Reach facility
<ul style="list-style-type: none"> • Interpret the history of water and water use in the region via a landscape carved by floods. 	<ul style="list-style-type: none"> • Columbia River Gorge as lifeline for the region • Grand Coulee and other dams for reservoirs and electrical power
<ul style="list-style-type: none"> • Explore the floods landscapes as a pathway for learning more about native cultures and traditional knowledge and lifeways. 	<ul style="list-style-type: none"> • Stories of different tribes in their various regions and culture areas • Tribal flood stories that exemplify native peoples' cultural continuity over time • Tribal settlement patterns and livelihoods based on the flood landscapes
<ul style="list-style-type: none"> • Connect the region's industrial and economic sustainability to the terrain and resources brought about by the floods. 	<ul style="list-style-type: none"> • Mining and other resource extraction • Columbia River shipping corridor
<ul style="list-style-type: none"> • Interpret the establishment of Ice Age Floods National Geologic Trail. 	<ul style="list-style-type: none"> • Grassroots initiative led by all-volunteer Ice Age Floods Institute • The trail as a tourism resource for visitors and communities in the region • The trail as a continuing research resource for geologists and other scholars locally and worldwide

Management Goals for the Interpretive Plan

As part of the interpretive planning process, the planning team worked with trail managers and partners to identify management goals for the Ice Age Floods National Geologic Trail Long-range Interpretive Plan. These goals have been identified as follows:

- Set the stage for future trail interpretation and clarify how partners will work together.
- Emphasize and highlight interpretation of the trail as a separate endeavor from other partner roles.
- Help partners identify the best stories along the trail and develop the best methodologies for communicating these stories to the public.
- Clarify for partners that the NPS will take the lead in guiding and supporting partners in trail interpretation by providing structure for collaborative, consistent efforts on interpretation.
- Establish the Long-range Interpretive Plan as the key document for trail partners in providing a roadmap for how partners can work together on trail interpretation.
- Help elucidate the trail's thematic content and the roles and responsibilities of trail partners in communicating this content.
- Clarify that while groups with different goals or at a distance from the trail may not be a good match as primary partners, they may provide accurate, IAFL-approved interpretation of the trail.



Steamboat Rock State Park is one of more than a dozen Washington State Parks along the trail. The rock itself, a massive butte of exposed basalt, is a typical Ice Age floods feature. *Photo: Adam Jones/Creative Commons*

Visitor Experience Goals

What kind of experiences are visitors seeking when they set out to explore Ice Age Floods National Geologic Trail? How can trail partners support or enhance visitors' experiences along the way?

A comprehensive interpretive program seeks to provide all visitors with multiple opportunities for memorable, meaningful experiences as they explore any site. Along this long, highly variable trail, different visitors will experience its offerings in many different ways:

- sightseeing by car or bus tour, by boat, by train (Amtrak Empire Builder route), or by air;
- recreational hiking, biking, boating, fishing, camping, horseback riding, hunting, or bird watching;
- exploring regional museums and cultural centers, including tribal traditional sites;
- attending guided programs, lectures, field trips, or educational excursions; or
- virtually via online and audiovisual materials such as websites, films, podcasts, virtual tours, and online museum collections.

Whatever approach or activity they prefer, all visitors to Ice Age Floods National Geologic Trail should have ample, accessible opportunities to explore key resources and appreciate the intrinsic values and meanings of this vast, unusual landscape.

Based on analysis of the trail's resources and input from workshop participants, the following visitor experience goals have been identified for Ice Age Floods National Geologic Trail. To guide partners in

creating multi-faceted, universally accessible programming, the trail's visitor experience goals are presented here in four ways: what visitors can do, physically, along the trail (experiential goals); what visitors can learn (cognitive goals); what universal human feelings might be evoked along the trail (emotional goals); and how visitors' behavior might change as a result of encountering the trail (behavioral goals). Ideally, the majority of interpretive offerings for the trail will be designed in ways that support multiple goals across these categories, thereby accommodating persons of differing abilities and interests as they explore the trail.

Experiential Goals: What should visitors have the opportunity to do along Ice Age Floods National Geologic Trail?

Trail interpretation will help enable visitors to:

- "Get out of the car" to explore and experience the geological landscape features of the trail physically.
- Experience parts of the trail through hiking, camping, bicycling, and other on-site physical recreational activities.
- Access the trail from the water via a variety of boating options.
- Recognize and locate multiple features of the Ice Age floods – ripples, shorelines, wet and dry falls, glacial and flood-rafted erratics, and other features – along the route.
- Connect with Ice Age floods experts.
- Discover cultural aspects of the trail and the region, many of which are a direct result of the floods' impacts on the landscape.

- Explore tribal relationships with, and stories about, the floods and its associated landscapes.
- Explore the vast biological diversity and ecosystems along the trail.
- Ask questions and participate in active, hands-on learning about the Ice Age, the floods, and the trail.
- Participate in citizen science projects related to the trail.
- Become a trail volunteer.

Cognitive Goals: What should visitors have the opportunity to **learn** when they visit Ice Age Floods National Geologic Trail?

Trail interpretation will provide visitors with opportunities to:

- Identify Ice Age floods landscape features along the trail.
- Explore and learn about the geological and hydrological processes the floods features illustrate: how, why, and where the floods occurred.
- Understand the vast magnitude of the floods, their timeframe, scope, and scale.
- Acquire or renew basic understanding of how the earth's geology changes our world through the ages – both rapidly (cataclysmically) and slowly (incrementally).
- Learn about the evolving scientific theories and controversies explaining the floods landscapes we see today.
- Gain insight into tribal cultures in the region and their ways of interpreting the floods and landscape features.

- Learn about laws pertaining to the protection of Native American archeological sites and burial areas, such as the Archaeological Resource Protection Act of 1979 (ARPA) and the Native American Graves Protection and Repatriation Act (NAGPRA).
- Understand the impact of the floods on the soils, agriculture, and settlement of the affected area through the centuries.
- Identify key aspects of the region's biological diversity and ecosystems.
- Learn how the trail was established and how it is sustained.

Emotional Goals: What emotions or feelings might Ice Age Floods National Geologic Trail evoke among visitors?

Trail interpretation will support opportunities for visitors to:

- Feel a sense of adventure and personal discovery while traveling the trail.
- Experience feelings of awe, wonder, and astonishment at the immense scale of the floods.
- Gain perspective on humans' place in earth's ancient and ever-changing landscape.
- Find solitude and solace in nature.
- Relax and enjoy the scenic beauty along the trail, from its intriguing land formations to its serene lakes.
- "Get lost" in personal curiosity about the various aspects of the Ice Age floods.
- Be motivated to continue exploring the trail, both on site and from afar.
- Stimulate repeat visitation to the trail.

Behavioral Goals: How might visitors' lives or behaviors be changed from their encounters with Ice Age Floods National Geologic Trail?

Trail interpretation will encourage visitors to:

- Develop or renew personal appreciation for nature and the great outdoors.
- Continue researching and learning more about the floods and the trail after returning home.
- Attend additional interpretive programs and events about the floods and the trail.
- Volunteer to assist with trail interpretation and resource protection through the Ice Age Floods Institute, the NPS, state parks, or other partners.
- Become ambassadors and advocates for the trail and its scenic, geological, biological, and cultural resources.
- Recognize and support our nation's public lands and the mechanisms, agencies, and institutions that protect them.
- Come back and bring others.



Dry Falls and other floods features have long been tourist destinations. In 1946 Rufus Woods, coowner of the Wenatchee Daily World newspaper, photographed visitors including Julius Krug, U.S. Secretary of the Interior, and F.A. Banks, supervising engineer of Grand Coulee Dam.

Photo: Rufus Woods Papers, Central Washington University Archives and Special Collections

Trail Audiences and Visitor Data

Thousands of people explore portions of Ice Age Floods National Geologic Trail every year. Given the nature of the trail, with its nearly 3,400-mile length and multiple entrance points, precise visitation numbers are impossible to obtain; however, indications of the trail's current and potential visitation can be gleaned from a variety of sources.

At present, anecdotal evidence of trail visitation indicates a surprisingly wide range of visitors, at least some of whom may be unaware that they are on a national trail. In general, workshop participants for this plan identified several broad categories of visitors:

- People with prior knowledge of the Ice Age floods, including members and others drawn to the work and programs of the Ice Age Floods Institute, who come specifically to trace the pathways of the floods;
- Local residents who visit existing parks and museums and/or use parts of the trail or its landscape features (rivers, lakes, waterfalls, hiking trails) for recreation;
- K-12 students and educators on field trips;
- Special-interest visitors such as rock climbers, college geology classes, researchers, mountain bicyclists, or “trail trekkies”; and
- Tourists discovering the trail by accident, such as cruise ship passengers, RV'ers, birders and anglers, wine enthusiasts, military/Hanford visitors, retirees, or families heading for other, better-known

tourist destinations in the region (Portland, Mount Hood, Mount St. Helens, regional National Parks, numerous national forests).

Demographically, trail observers report a predominance of well-informed Baby Boomers, many of whom have chosen the northwest region for retirement, balanced by a younger cohort of locals and nearby urban residents pursuing vigorous recreational opportunities (hiking, backcountry camping, cycling, kayaking).

Visitation data from selected sites along trail pathways provides insight into the trail's potential. For example:

- Multnomah Falls (OR) attracts more than 2 million visits a year, the largest visitation of any tourism site in the entire Pacific Northwest.
- The Columbia Gorge Discovery Center & Museum (The Dalles, OR) gets roughly 46,000 visitors a year, many from cruise boats on the Columbia River. About 5,000 to 6,000 Discovery Center visitors arrive via organized groups, including K-12 and college students. Visitors come from some 40 different countries every year.
- The Lewis and Clark Interpretive Center at Cape Disappointment State Park (Ilwaco, WA) records visitation of approximately 35,000 every year, while the state park (including its beaches) logs more than 1 million day-use visits annually.
- Lake Roosevelt National Recreation Area entertained 1.17 million recreational visits in 2015.

- Farragut State Park (ID) welcomed more than 361,000 day-use visitors in 2013, at least 115,000 of them from out of state.
- Dry Falls Visitor Center (WA) receives more than 100,000 visitors a year.

Tourism statistics and marketing studies for three major gateway cities along the trail provide further insight into potential visitation.

- The DestinationMissoula (MT) tourism organization reports 3.1 million annual visitors –of whom 1.1 million or more spend at least one night.
- According to the VisitSpokane tourism board in Spokane County (WA), area hotels hosted 3.4 million overnight visitors in 2014, and these visitors spent more than \$900 million in the area.

- The Portland (OR) metro area welcomed 8.9 million visitors in 2015.

In addition to tourists from afar, the trail corridor lies within a half-day’s drive of most residents across the four states. Based on U.S. Census estimates, this fourstate population totaled more than 13.6 million people in 2014.

Like all national trails, even long-established ones such as the Lewis & Clark or Oregon Trails, Ice Age Floods National Geologic Trail can be expected to present significant challenges in measuring visitation. Over time, however, data gleaned from partners and tourism sources in the region can help provide a reasonably accurate picture of trail visitation and potential growth.

State	2015 Population	Under age 18	Age 65 or over
Idaho	1,634,930	431,622 (26.4%)	233,795 (14.3%)
Oregon	4,028,977	870,259 (21.6%)	644,636 (16.0%)
Montana	1,032,949	227,249 (22.0%)	172,502 (16.7%)
Washington	7,170,351	1,627,670 (22.7%)	1,011,019 (14.1%)
Totals	13,867,207	3,156,800	2,061,952

Other Planning Considerations

While this Long-range Interpretive Plan focuses directly on interpretation of the trail and its sites, it is important to note that contemporaneous planning activities and organizational goals among the partners and stakeholders may also address aspects of interpretation.

The Ice Age Floods Institute

The Ice Age Floods Institute, a non-profit educational organization founded in 1995, is recognized in the trail's enabling legislation as the primary private-sector partner in the trail's development and implementation. The Institute played a key role in establishing the trail and continues to be a vital resource for all trail partners, especially with regard to scientific understanding and interpretation. The Institute provides trail partners with up-to-date, science-based information on floods landscapes and reviews interpretive and promotional materials for accuracy and consistency across the length of the trail.

While in some respects the Institute functions as a "Friends Group" to the trail, it also stands as an entirely separate organization with its own mission, priorities, and funding needs. The formal mission statement of the Ice Age Floods Institute positions the Institute as "the recognized advocate, educator, and marketer of the Ice Age floods experiences as a significant international natural and cultural heritage phenomenon." Its 2015 priorities were to:

- Strengthen the Institute administratively and financially.
- Form appropriate partnerships and sponsorships with ensuing revenue generation.

- Expand Institute collaboration in development of interpretive projects.
- Expand the role in the education and advocacy of the 'floods story'.
- Develop the organization and trail brand.
- Proactively market the Ice Age Floods National Geologic Trail experience.

With some 700 members, including a wide range of professionally trained geologists and geology enthusiasts, the Institute is an all-volunteer organization supported by member dues and contributions. These dedicated Institute volunteers maintain several vibrant and informative websites and newsletters, publish new findings and trip reports regularly, and offer a regular schedule of day-long trail interpretive field trips, evening lectures, and programs across the region.

Organizationally, the Institute operates through 11 local chapters, with volunteers in the various chapters working closely with other partners and providing personal interpretation and field trips in their respective areas.

Ice Age Floods Institute/ Local Chapters	Location
Glacial Lake Missoula	Missoula, MT
Coeur Du Deluge	Sandpoint, ID
Cheney/Spokane	Cheney and Spokane, WA
Lower Grand Coulee	Soap Lake/Ephrata, WA
Wenatchee Valley Erratics	Wenatchee, WA
Lake Lewis	Tri-Cities, WA (Richland, Pasco, & Kennewick)
Ellensburg	Ellensburg, WA
Columbia River Gorge	Hood River/ The Dalles OR; White Salmon/Stevenson, WA
Palouse Falls	Washtucna, WA
Lower Columbia	Willamette Valley, OR
Puget Lobe, Seattle/Puget Sound	Seattle and Puget Sound, WA

Trail Partnership Committees

The Ice Age Floods National Geologic Trail Partnership Workshop, held in July 2012 in Wenatchee, Washington, established several key committees to work toward developing, operating, promoting, and interpreting the trail. Convened by the Ice Age Floods Interagency Coordination

Committee representing the seven federal agencies within the floods region, the partnership workshop resulted in five task forces to handle different needs for the trail:

- Geologic Resources and Research Team
- Transportation and Public Access Team
- Interpretation and Education Team
- Tourism and Marketing Team
- Logo Committee

Partnership workshop participants and task force team members have been an integral part of the creation of this Longrange Interpretive Plan, working to ensure the collaborative process that is central to the trail's organizational mandate.

State Park and Other Institutional Planning

In addition to this NPS-sponsored interpretive plan, planning documents by partners may also influence trail interpretation. Each of the four state park systems has its own mission statements, strategic plans, and/or interpretive plans, and some individual parks and other interpretive sites have plans in place as well. Throughout this planning process, partners have been invited to share their organizations' plans regarding interpretation along the trail.

Existing Interpretation

In 2016, only seven years after its establishment, Ice Age Floods National Geologic Trail has a remarkably good foundation upon which to build future interpretation. Many sites and partner organizations have been interpreting the Ice Age floods landscape across the region for years.

At the same time, significant challenges remain before this ambitious new trail will have an optimal level of interpretive programming from end to end. According to the 2001 *Ice Age Floods Study of Alternatives and Environmental Assessment*, the trail's 1,300-mile main route and nearly 3,400 miles of loops and spurs include roughly 350 distinct locations that showcase geological aspects of the floods. Among those 350 possible sites, only a small percentage are being interpreted directly at the scene today, typically via permanent wayside exhibits or through scheduled or pre-arranged tours.

At present, partners of Ice Age Floods National Geologic Trail are providing a range of personal and/or non-personal interpretation of the floods in a number of settings. An inventory of this interpretation appears below.

Sites and Facilities

Existing interpretive facilities along the floods pathways include an array of state park and federal visitor centers, privately run non-profit museums, science and nature centers, and historical societies. However, the only visitor facility dedicated exclusively to the Ice Age floods is Washington State Parks' Dry Falls Visitor Center.

Approximately 25 sites along the designated trail, including Dry Falls Visitor Center (open since 1966) and Vista House (open

since 1928), have vehicular or pedestrian access with pull-offs, informational kiosks and interpretive signage. Some of these installations are aging, with pull-offs that do not meet current standards for safety and accessibility.

Personal Interpretive Services

Personal interpretive programming describes programs delivered "live and in person" by rangers, volunteers, educators, or subject experts. In most locations, such personal programming varies by audience, visitation levels, staffing, and seasonal needs. Personal interpretive services may include guided tours, storytelling, ranger talks, supervised hands-on activities, living history, first-person reenactments, educational programs, artisan or crafts demonstrations, or other face-to-face activities.

As noted earlier, much of the personal interpretation for Ice Age Floods National Geologic Trail is provided by volunteers from one of the 11 local chapters of the 700-member Ice Age Floods Institute. A sampling of interpretive programs provided by Institute volunteers in 2015 includes monthly lectures and/or audiovisual presentations at Institute chapter meetings across the region, as well as frequent day-long field trips, weather permitting, for the general public or by pre-arrangement with special audiences. In a three-month period in 2015, these activities included:

- Perspective from Above and Within: Lecture/presentation of floods views by flying trike (specialty aircraft) (Ellensburg chapter)
- Lower Grand Coulee and Crab Creek Floodways: Lecture/presentation (Cheney-Spokane chapter)

- Lower Grand Coulee field trip (CheneySpokane chapter)
- Central Columbia Gorge field trip (Columbia Gorge chapter) Ice Age Floods Features by Drone: Lecture/presentation (Lake Lewis chapter)
- Willamette Valley: Flood Channels, Ripple Marks, Erratics, and Wine Tour (Lower Columbia chapter)
- Floods, Flowers, and Feathers Festival at Turnbull National Wildlife Refuge (Cheney-Spokane chapter)
- Megafloods: The Channeled Scablands, Siberia, Mars, and Beyond: Lecture/presentation (Cheney-Spokane chapter)
- Making Casts of Ice Age Fossils (Lower Columbia chapter)

Institute members also served as guides and content experts accompanying a number of day-long excursions from the Hanford Reach Interpretive Center (The REACH) in Tri-Cities. Sample excursions include:

- Jet-boat geology tour and wildflower hike along White Bluffs
- Jet-boat geology tour through Wallula Gap to Boardman
- The Western Scablands: Ice Age/Dry Falls/Vantage day trip

In addition to personal interpretive services programming provided by Ice Age Floods Institute members, trail visitors can attend various programs delivered by interpreters or volunteers at selected sites. Examples include:

Farragut State Park, Idaho:

- Ranger- or volunteer-led programs about the floods during school field trips
- One or two weekly campfire programs about the floods in summer season, provided by volunteers with a non-profit religious organization

Vista House/Crown Point, Oregon:

- Summer programs on the Gorge, including interpretation of the Ice Age floods

Lewis and Clark Interpretive Center, Cape Disappointment State Park, Washington:

- Occasional programming in the center with PowerPoint and a large topographic map depicting Glacial Lake Missoula, the Channeled Scablands, and the floods' trajectory to the coast

Fort Spokane Visitor Center

- Occasional programming explaining visible flood and glacial lake features

Dry Falls Visitor Center

- Routine summer season programs

Interpretive Media

Audiovisual, Digital, and Social Media

The rapidly changing fields of audiovisual and emerging digital media have the capacity to combine and integrate email, audio, film, video, photography, websites, print, downloadable audio and multimedia (podcasts), apps, interactive distance learning, social media (Facebook, Twitter, Instagram), and instant messaging – and then to deliver all these media rapidly to a personal computer, smartphone, or other personal electronic device. When used for interpretation, the digital world has no boundaries: an interpreter in Montana can share Ice Age floods stories with audiences in Memphis or Milan as easily as with audiences in Missoula.

In fact, the Ice Age floods' online digital media presence is surprisingly robust, with a core of professional-quality films, frequent coverage on a geology-focused YouTube channel, websites with computer-generated imagery (CGI) and animations, and podcasts for download. However, two issues should be noted:

- (1) From a visitor perspective, accessing the full range of these materials is currently a hit-or-miss exercise, with no intuitive one-stop online site providing comprehensive information and access.
- (2) With the exception of YouTube entries, the current digital offerings on the floods are computer-based and not necessarily optimized for mobile use, either as downloadable apps or as mobile-optimized websites.

The NPS.gov website for Ice Age Floods National Geologic Trail (www.nps.gov/iafl) launched in first quarter 2016 and will continue to grow, building on the long-awaited revamping of the NPS web presence (and mobile adaptability) nationwide. The IAFL Chief of Interpretation and Education established an Ice Age Floods Facebook page and Instagram presence in mid-2015, both of which are building audiences as well.

Other notable digital offerings about the floods and the trail include the following:

- The Ice Age Floods Institute maintains a central Institute website (www.iafi.org) with extensive information on the floods and links to other useful sites. In addition, several Institute chapters have Facebook pages. Some are current, while others appear to be minimally maintained.
- At www.hugefloods.com, visitors find a content-rich website on the floods, as well as access to “Huge Floods in the Pacific Northwest” – a 16-minute introductory video on Ice Age floods by Tom Foster (site producer) and Nick Zentner of Central Washington University. Part of a series called “2-Minute Geology,” the 16-minute video and more than a dozen “2-Minute Geology” programs are available online on a YouTube Channel established by hugefloods.com.
- At the website www.brucebjornstad.com, established by geologist and author Bruce Bjornstad, visitors can access photos, information, and links, as well as click to purchase several guidebooks written by Bjornstad.
- The film “Mystery of the Megaflood,” produced in 2006 for the Public Broadcasting System television show Nova (<http://www.pbs.org/wgbh/nova/megaflood>), is a popular and widely used video available for preview and purchase on DVD. Several visitor centers in the floods pathways have the video available for viewing or for sale. At 56 minutes long, it provides a dramatic, memorable telling of the Ice Age floods stories but is usually shown only on request due to its length.
- Washington State Parks provides an overview of floods sites in the state at the state parks website at www.parks.wa.gov/225/Ice-Age-Floods-in-Washington.
- The Montana Natural History Center offers a virtual tour of Ice Age floods sites at <http://www.glaciallakemissoula.org/virtualtour/index.html>.
- At the Columbia Gorge Discovery Center in The Dalles, OR, an introductory film on the Ice Age plays continually in the exhibit section on the Ice Age. The center also conducts distance learning programs by video conference with schools and senior centers, with one program specifically addressing the Ice Age floods.
- A number of trail partners use social media to communicate with audiences and promote events, but these avenues of communication rarely reference the Ice Age floods or the trail.

Exterior Exhibits/Waysides

Exterior exhibit kiosks and low-profile wayside signs offer simple, relatively inexpensive ways to present consistent,

readily available interpretation for a wide range of visitors. The following list benchmarks interpretive signage addressing the Ice Age floods state-by-state in mid-2015.

Montana

- Camus Prairie (ripples)
- Marked rocks on trails around the city of Missoula

Idaho

- Cabinet Gorge Dam
- Farragut State Park near Lake Pend Oreille
- Highway 53, Newman Lake (Purcell Trench)
- Highway 97, near Harrison (Coeur d'Alene Lake)
- Idaho Highway 200 near Hope (formation of Lake Pend Oreille and the Green Monarch Mountains)

Washington

- Badger Mountain, Lake Lewis area (Friends of Badger Mountain)
- Beacon Rock State Park, Columbia River
- Bridgeport State Park (upper Columbia River)
- Centennial Trail State Park (Spokane River)
- Columbia Hills State Park
- Columbia Plateau State Park Trail (Fish Lake Overlook)
- Drumheller Channels National Natural Landmark (Columbia National Wildlife Refuge)
- Ginkgo Petrified Forest State Park
- Lake Lenore Caves State Park
- Lincoln Mill Boat Launch, Lake Roosevelt National Recreation Area
- Lincoln Rock State Park (Wenatchee Valley of Columbia River)

- Maryhill State Park (east Columbia Gorge)
- Palouse Falls State Park
- Steamboat Rock State Park
- Sun Lakes-Dry Falls State Park
- Twin Sisters (Cayuse Sisters) basalt columns
- Yakima Sportsman State Park

Oregon

- Bellevue Erratic, McMinnville
- Hat Rock State Park
- Multnomah Falls, Columbia River Gorge National Scenic Area
- Rowena Crest Overlook, Historic Columbia Highway, Columbia River Gorge National Scenic Area
- Tamastlikt Cultural Institute
- Vista House, Columbia River Gorge National Scenic Area
- Willamette meteorite, West Linn

Interior Exhibits (Museums and Visitor Centers)

The Ice Age floods (and in some cases, the trail itself) are included in interior exhibits in each of these settings. As might be expected, some sites have more extensive coverage than others.

Montana

- Montana Natural History Center

Idaho

- Farragut State Park (new wing to visitor center mid-2015; additional exhibits on IAFL)

- Museum of North Idaho, Coeur d'Alene

Washington

- Sun Lakes-Dry Falls State Park and Visitor Center (new exhibits planned)
- Hanford Reach Interpretive Center, Richland

- Columbia Gorge Interpretive Center, Stevenson
- Grand Coulee Dam Visitor Center
- Fort Spokane Visitor Center, Lake Roosevelt National Recreation Area

Oregon

- Columbia Gorge Discovery Center, The Dalles
- Bonneville Dam Visitor Center
- Multnomah Falls Lodge/USDA Forest Service Visitor Center, Columbia River Gorge National Scenic Area
- Oregon Museum of Science and Industry, Portland
- Tualatin Historical Society, Tualatin

Print Publications

Dozens of tourism publications across the region describe aspects of the Ice Age floods. In addition, several state parks' brochures provide brief, basic interpretation on the floods. The following publications provide varying degrees of focused, detailed interpretation and information about the floods.

- *Dry Falls: A Washington State Parks Heritage Area*. Four-panel, two-color brochure, Washington State Parks and Recreation Commission, 2014.
- *The Eastern Washington Spillways of the Ice Age Floods*. Large color driving map and text, folded to #10 envelope size; CheneySpokane Chapter/Ice Age Floods Institute with support from the City of Cheney, the National Student Clearinghouse, and students from Eastern Washington University.
- *Flood Scene Investigator (FSI)*. Rack card (color) with map and GPS location numbers along Coulee Corridor. Issued by Coulee Corridor National Scenic Byway, no date.
- *Glacial Lake Columbia and the Ice Age Floods*. Large color driving map and text, folded to #10 envelope size; CheneySpokane Chapter/Ice Age Floods Institute with support from the City of Cheney and Eastern Washington University.
- *Glacial Lake Missoula: Points of Interest in and around the Missoula Valley*. Four-panel color brochure. Ice Age Floods Institute/ Glacial Lake Missoula Chapter; published by Montana Natural History Center, no date.
- *Ice Age Flood Features near Richland, Washington*. Large color driving map and text, folded to #10 envelope size; Lake Lewis Chapter/Ice Age Floods Institute with support from Battelle, Tri-Cities Visitor and Convention Bureau, and City of Richland; 3rd edition, 2013.
- *Ice Age Floods Left Their Mark*. Three-panel color brochure with map and QR code, c. 2013. By Ice Age Floods Institute; design by Jones & Jones.
- *Lake Roosevelt and the Case of the Channeled Scablands*. Booklet (green) issued by Lake Roosevelt National Recreation Area, based on work of Dr. E.K. Peters, Washington State University; no date.
- *Lake Roosevelt National Recreation Area*. National Park Service unigrid brochure.
- *The Story of Immensely Powerful Ice Age Floods*. Four-panel, two-color brochure, 2006. By Ice Age Floods Institute.
- *The West Plains Steptoes and the Ice Age Floods*. Large color driving map and text, folded to #10 envelope size; Cheney-Spokane Chapter/Ice Age Floods Institute with support from the City of Cheney, the National Student Clearinghouse, and students from Eastern Washington University.

As of this writing, the trail itself does not yet have a National Trail unigrid brochure.

Opposite: Trail travelers can also explore floods features by water. A lone kayak waits on Bank Lake in Steamboat Rock State Park. *Photo: Bruce Bjornstad*



Issues and Influences



In this 1928 photograph of downtown Missoula, the strand lines of Glacial Lake Missoula stand out clearly on a hillside. Similar strand lines can be found in several spots along the trail. *Photo: U.S. Geological Survey (USGS), 1928.*



Another early USGS photo captures evidence of ancient lake beds in the layered cliffs south of Missoula in the Bitterroot Valley. The higher layers are sediments left by Glacial Lake Missoula. *Photo: U.S. Geological Survey (USGS), 1927*

Issues and Influences

As the inventory of existing interpretation clearly shows, Ice Age Floods National Geologic Trail is fortunate to have a remarkable group of dedicated supporters and collaborators working to develop first-rate interpretive programming for the trail. Many of these individuals and organizations have been involved for years in preserving the landscape resources of the floods and lobbying to launch the trail. In the stakeholder workshops for this plan, enthusiasm and commitment to trail interpretation remained high and very positive among both seasoned veterans in trail planning and newcomers to the trail. The following paragraphs acknowledge a set of known issues and influences – both positive and negative – that will affect future interpretation along the trail.

A Trail with Many Layers

Geographically, geologically, jurisdictionally, and organizationally, Ice Age Floods National Geologic Trail has many layers. Passing through scores of counties and municipalities, state lands managed by four states, and federal lands managed by seven different agencies, the trail requires an organizational structure that is flexible yet offers reliable guidance and clear standards for accurate, appropriate interpretation. Communication among partners and with broader community-based constituencies across the trail's length will be critical for successful trail operation and positive visitor experiences.

At present the trail's National Park Service management oversight, Interagency Coordination Committee and task forces, and input from the Ice Age Floods Institute provide an effective structure for continued trail development and interpretation. As the trail continues to develop in the coming years, its organizational structure will doubtless need to grow and change as well.

Funding for Interpretation

Funding for trail interpretation is a distinct need that is separate from the need for trail identification and wayfinding, marketing and promotion, or other efforts. Unfortunately, federal and state budget cuts across all the multiple jurisdictions of the trail (all four states, all DOI agencies, etc.) have profoundly affected interpretive staffing levels and funds for interpretive media at present. Consequently, many trail partners lack resources and face a great deal of uncertainty in developing future interpretation.

It is unlikely that government budget pressures will improve significantly in the foreseeable future. Given this scenario, trail needs for interpretation may need to be funded through creative exploration of other sources:

volunteerism (already at very high levels for this trail); private donations, grants, and other fundraising; and public-private partnerships with corporations, educational institutions, and municipalities, etc., in order to reach full interpretive potential in the coming decade.

Complex Science

The science behind this first national geological trail in the United States is indisputably complex. The geology and hydrology explaining the floods requires not only an understanding of basic earth science concepts, but also the willingness to look beyond the static gray rock before us and imagine a wild, churning, cataclysmic ancient past. Many visitors may arrive with minimal understanding of geology and the earth sciences, and many others may find it difficult to conjure an immense flooded world from the view of gentle ripples or gravel bars on a distant hillside.

Yet Ice Age Floods National Geologic Trail offers excellent opportunities for engaging youth and adults alike in real-world, hands-on

exploration of science, technology, engineering, the arts, and mathematics (STEAM), as well as unexplored aspects of cultural history. Skilled, solidly supported interpretation drawing on best practices and well-trained interpreters can convey these complex topics effectively; anything less will shortchange visitors seeking to understand the resources and impact of this remarkable trail.

Trail and Tourist Infrastructure

At present, travel along Ice Age Floods National Geologic Trail can be a somewhat uncertain adventure, because many infrastructure elements to support the trail and tourism have yet to be developed. For example:

- The trail does not yet have highway markers or directional/orientation signage. A trail logo is under development in the rounded triangle style of other national trails; when the logo is finalized, each state will then install route signage. The initial trail legislation authorized up to \$12 million in funding for this goal.
- Although some highway vantage points along the trail already have vehicle pull-offs where visitors can view flood features safely, a number of safe, ADA-accessible overlooks and smaller pull-offs will need to be constructed in each of the four states before orientation and interpretive kiosks can be developed. Prioritizing and funding these installations will be a challenge.
- Along the trail's more remote or rural stretches, typical tourist amenities such as restaurants, restrooms, lodging, gasoline, and Wi-Fi service are sparse, and often visitors can find very little tourism information to help them locate these necessities along the way.
- Winter weather may make some areas of the trail impassable part of the year.

Resource Protection

In any vast natural area, the prospect of damage to precious natural and cultural resources is a

concern. At an individual level, ancient petroglyphs, glacial and flood-borne erratics, and biological specimens may be at risk from incautious travelers or deliberate destruction or taking. On a larger scale, industrial, commercial, or residential development remains possible, even for areas already designated as National Register properties or other protected status.

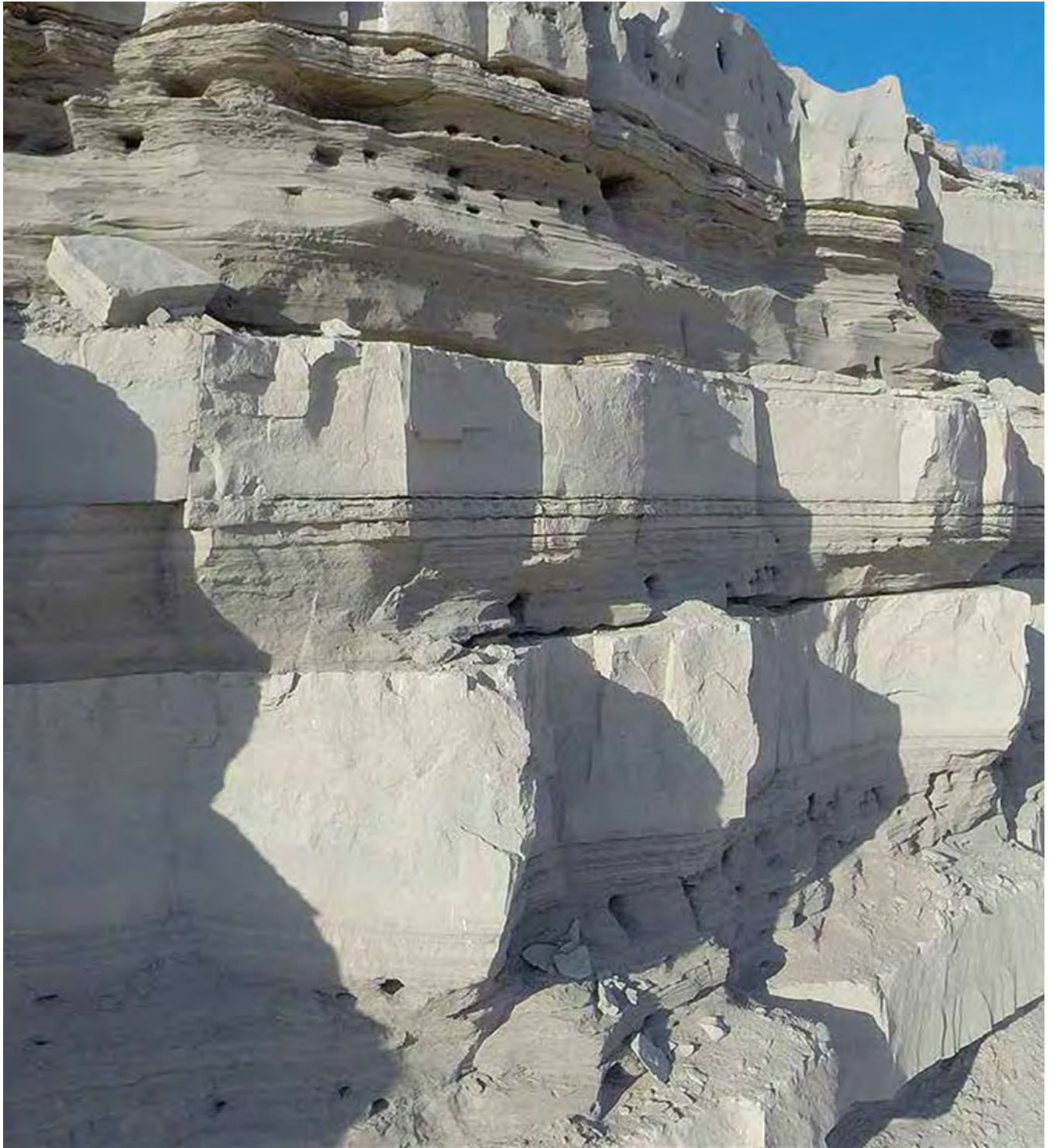
Interpretation can play a crucial role in educating visitors and the general public about the need to protect the resources found along the trail.

Competing Interests

Both interpreters and visitors along the trail must balance a variety of interests. Often, Ice Age Floods National Geologic Trail will be only one among many topics for interpretation, and the floods may not be prioritized for inclusion in interpretive media requiring out-of-pocket expenditures. For example, the high-quality printed materials currently in distribution for Historic Columbia River Highway and Vista House at Crown Point/State Scenic Corridor do not mention the Ice Age floods or the trail.

At present, the frequency or depth of floods interpretation at different sites varies, largely dependent on the interests of individual interpreters or the availability of special programs conducted by Ice Age Floods Institute volunteers. In the future, with guidance from this interpretive plan, trail stakeholders and partners can work together to ensure that trail interpretation will be delivered consistently and strategically, using different techniques and materials as appropriate. Such a process should create at least a baseline level of interpretation across the entire length of the trail, complementing rather than impinging on partners' other interpretive needs.

Opposite: Massive rhythmites laid down by Ice Age floods form these striking White Bluffs in Hanford Reach National Monument. Photo: Bruce Bjornstad



Recommendations

Section 2: Recommendations

In a setting as vast as Ice Age Floods National Geologic Trail, visitors need assistance in exploring and understanding the floods' magnitude and meaning. How can trail supporters help every visitor have an outstanding experience along the trail?

The answer to this question encompasses dozens of important details, among them physical access (good directions, wellmaintained roads, safe pull-offs, and National Trail signage), tourism infrastructure (bathrooms, Wi-Fi), and operational coordination across four states. Perhaps no single factor is more important, however, than consistent and engaging trail interpretation. Without interpretation, Ice Age floods features, despite their immense size and grandeur, will remain invisible to most observers, hidden within the rocky cliffs and undulating grasslands of one of the most unusual landscapes on earth.

A Note on Timing

In the long trajectory of setting aside and establishing public lands as parks or trails, it is important to remember that Ice Age Floods National Geologic Trail is still in its infancy. Although this Long-range Interpretive Plan makes recommendations to guide development of interpretive programs and services along the trail over the next seven to ten years, the establishment of suggested frameworks and strategies will influence interpretation for a much longer time period.

However, as with most plans, many aspects of implementation depend on funding – and historically, funding for these kinds of projects can take a long time, even decades, to achieve. Many of our

nation's monuments, parks, and trails, from the Washington Monument to Lewis & Clark National Historic Trail, have had long struggles for recognition and funding. Yet despite setbacks, leadership changes, and seemingly endless planning, supporters persevered, passing along enduring national legacies to future visitors they will never know.

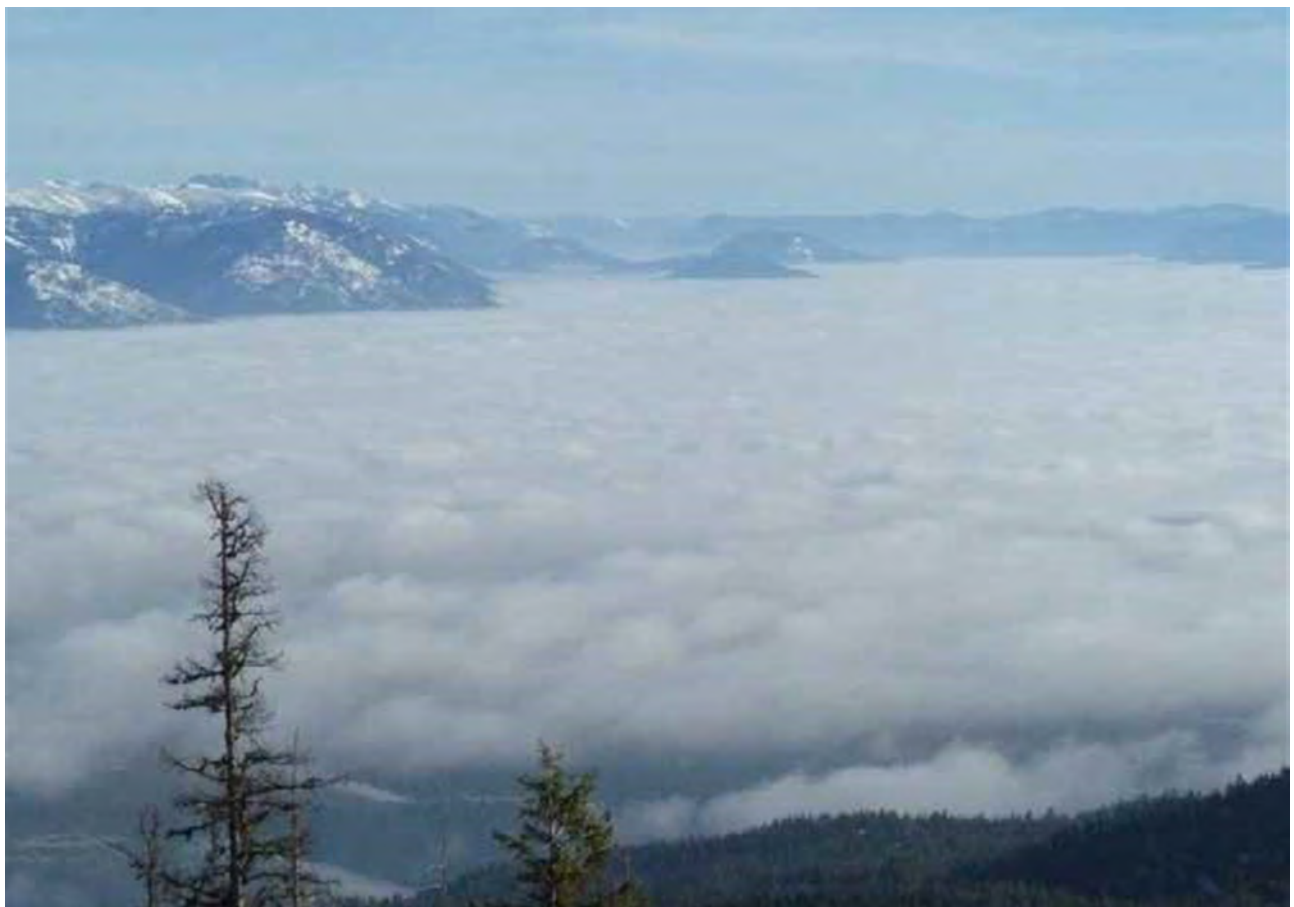
Over the past ten years, the Ice Age Floods Institute has had some success in obtaining public funding for trail interpretation at the chapter and state levels. Recommendations in this interpretive plan will require federal funding, which is subject to budget fluctuations and cycles. Certain plan elements may be funded later (or somewhat differently) than expected, while other elements may be funded earlier, at a much lower budget, or not at all. Some elements will be eliminated from the plan as circumstances change.

In order to implement the recommendations of this Long-range Interpretive Plan for the trail fully and in a timely manner, it will be necessary for trail staff, volunteers, and supporters to pursue other potential funding sources to augment future federal appropriations from Congress in support of trail interpretation. These sources can include additional funding from state and local governments in the area, along with private sector funding support from foundations, charitable trusts, and organizations such as the Ice Age Floods Institute and other private sources.

Years from now, Ice Age Floods National Geologic Trail will be a fixture on the landscape of Pacific Northwest tourism, a well-established route enabling visitors of all ages and abilities to explore extraordinary scenes illustrating ancient stories and modern science. That said, professional-

quality interpretive and educational materials cannot be created for Ice Age Floods National Geologic Trail without adequate, reliable funding for hard costs such as staffing and media production (i.e., waysides, interior exhibits, brochures, and digital media). While interpretive programs and services may be less visible and less expensive than major capital improvements such as new highway pull-offs or public restrooms, sustained funding for the development and maintenance of interpretive facilities and programming is critical to the trail's success.

To help the trail's interpretive teams strategize, fund, and staff for future interpretive needs, this plan proposes recommendations in three stages. Short-range recommendations are proposed for years 1 to 3; mid-range recommendations span years 4-6; and long-range recommendations address years 7 to 10 and beyond. The intent of the NPS is to address the recommendations within each time range, as funding and staffing levels permit. It is expected that there will be a number of different focuses moving forward at the same time, at different rates.



Thick white clouds in the Purcell Trench near Lake Pend Oreille evoke the icy glacial fingers that filled the trench 15,000 years ago. *Photo: Tony Lewis/IAFI*

Short-range Recommendations

SHORT-RANGE FOCUS ONE: Defining the Trail

(1) Map It

At the risk of stating the obvious, visitors need a first-rate roadmap to explore Ice Age Floods National Geologic Trail. More accurately, visitors need one consistent, universally available master map showing the trail routes through all four states.

Over the years, many volunteers and partner sites have interpreted floods-related itineraries, views, and features – but not all of the sites chosen for interpretation lie along designated trail routes. Conversely, some areas lying along the designated routes have yet to be interpreted as part of the trail.

As longtime trail supporters know, Congress directed the National Park Service to study the significant resources associated with the ice age floods in the northwest United States. The resultant study, an NPS-commissioned Study of Alternatives and Environmental Assessment (Jones & Jones, 2001), includes a master map depicting the major flood channels and the recommended trail tour routes for the public to view flood features throughout the four-state region. This map defined an Ice Age Floods Pathways Tour Route consisting of three intertwined routes: *connecting pathways* (usually depicted in yellow) that link the floods' course via named roadways leading from western Montana to the Pacific Ocean, supplemented by numerous *loop pathways* and *spur pathways* that branch off the main route. When Congress established Ice Age Floods National Geologic Trail on March 30, 2009 (Public Law 111-11), the act included a reference to this master map, which was delineated in the Study of Alternatives. This map became the official map of Ice Age

Floods National Geologic Trail. Importantly, Congress provided for the potential of future changes in trail routing and alignment without having to go back again to Congress for approval. Therefore, so long as any change to the trail that might be proposed by the National Park Service is vetted in a public planning process, and the results published in the Federal Register, the official trail map can be modified and changed as appropriate.

Since this Long-range Interpretive Plan is being produced in a public forum, with input from numerous trail partners and the general public, the NPS can move to incorporate suggested map changes (as described below) officially by publishing a new map number in the Federal Register, following the finalization and official adoption of this plan.

- A new master map created for the June 2015 recommendations workshop is a good starting point to become the trailwide interpretive map used universally by all trail partners. This new map should be refined, completed, and put to use as soon as possible. (Among other points, the 2015 map needs Interstate, US, and state road numbers and major towns as well as Ice Age floods sites.) Trail partners will need timely and equitable consideration of sites to be included on the map. A set of criteria needs to be established by the Interagency Technical Committee, with input from the other working groups established at the 2012 Summary Workshop. When finalized and approved by the Interagency Technical Committee, the new map should replace the 2001 map in all visitor use applications throughout the trail.
- Ron Hall, an interpretive planning participant and volunteer, has created an interactive map based on Jones Report and the draft of this plan. This map is

available online at <https://www.google.com/maps/d/viewer?mid=1XyPcxIOpCsRywER45MXsaXmJ9Gk>. The map is interactive, so map scale is not a limitation (a problem with paper/ printed maps); users simply just use “zoom” tools (“+”/“-”) in lower right corner of the screen/map. A paper map can be created from the material in this map, and it can be “shared” via Facebook, Twitter, Google+, general email, or embedded on a website, including the [nps.gov/iafl](https://www.nps.gov/iafl) site. The map is in a format that can be worked on collaboratively. Ice Age Floods Institute Chapters, Gateways, and Portal locations are included, as well as the location of all Washington State Parks and the routes of the John Wayne and Columbia Plateau Rail Trails. (Click these layers in the map legend on the left; all layers have this capability). Pieces/ layers of the map are based on a Fusion Table (cloud database), which can also be shared, worked on, edited, and updated collaboratively. The “Sites” icon is the image from the Jones Report, which illustrates one way the trail can be branded. The background of the map can be changed to “Satellite View” (button on lower left), and the opening background can also be changed.

Format: Ultimately the master trail map should be available on paper, online on NPS and other websites, as a digital download in a variety of formats, and as a complex online interactive. Regardless of its eventual formats and platforms, it is important to recognize that the map’s essential content creation and completion can and should be done without delay. Once the basic trail map is approved, others can use digital technology to adapt it to specific purposes at will.

For example, the upgraded, visitor-friendly master map can be adapted for use as a stand-alone tear-off map pad, in an NPS

unigrid brochure, in all itinerary-based interpretive media and programs by all partners, and in all new exterior (wayside) and interior exhibits about the trail.

(2) Choose Trail Hubs.

To grasp the vastness of the trail’s terrain, visitors need well-marked places to go for orientation, suggested itineraries, guided tours if preferred, and various other levels of interpretation and guidance. In many public lands, these stopping points are identified as Visitor Contact Stations. Some are staffed, while others are 24-hour self-accessed kiosks. For Ice Age Floods National Geologic Trail, a network of clearly identified “trail hubs” (mostly at existing partner sites) should be formally designated to fulfill these visitor-contact functions. A number of trail partner sites are already functioning as hubs or portals for visitors exploring the Ice Age floods. Acknowledging these contributions, this plan recommends the following places be designated as the initial hubs for Ice Age Floods National Geologic Trail. In sequence, following the general path of the floods, these locations are:

- Montana Natural History Center, MT
- Farragut State Park, Athol, ID
- Fort Spokane Visitor Center (Lake Roosevelt National Recreation Area), WA
- Sun Lake-Dry Falls State Park Visitor Center, central WA
- Hanford Reach Interpretive Center/The REACH, Richland, WA
- Columbia Gorge Discovery Center and Museum, The Dalles, OR
- Vista House and Portland Women’s Forum, Crown Point, OR
- Multnomah Falls, OR
- Lewis and Clark Interpretive Center, Cape Disappointment State Park, WA

Once these hubs have been designated and enhanced as appropriate, a second group can be selected to expand the potential for visitor contacts:

- National Bison Range, near Polson, MT
- Turnbull National Wildlife Refuge, near Spokane, WA
- Grand Coulee Dam Visitor Center, WA
- Ice Age Floods National Geologic Trail administrative headquarters, Lake Roosevelt National Recreation Area, WA
- Gingko Petrified Forest State Park, central WA
- Palouse Falls/Lyons Ferry State Park, central WA
- Sacajawea State Park, WA
- Oregon Museum of Science and Industry, Portland, OR
- Tualatin Heritage Center, OR

In addition, several other state, NPS, US Fish & Wildlife Service, and US Army Corps of Engineers (USACE) sites along the route should be considered as potential contact stations.

While the hubs can take various forms, each should have four essential things:

- (1) a consistent set of basic, approved interpretive materials, readily available to visitors, about not only the Ice Age floods, but the trail itself;
- (2) a designated, informed staff member or local volunteer who is charged with communicating regularly with trail interpretive staff, maintaining the interpretive offerings of the hub, and providing or arranging for some level of personal interpretation (i.e., guided tours) of nearby trail sites;
- (3) basic 21st-century visitor amenities including adequate parking, ADA accessible restrooms, drinking water, and cell phone connectivity; and

(4) a clear identity as an Ice Age Floods National Geologic Trail hub, including the ability to provide National Parks Passport Stamps.

- For an excellent example of a trail's approach to granting NPS passport stamps, see the Passport page at the website for Juan Bautista de Anza National Historic Trail (www.nps.gov/juba/planyourvisit/nps-passportstamps.htm). A total of 26 sites have their own Anza Passport stamps, and visitors are encouraged to collect all 26!
- Individual sites might also want to introduce unique visitor participation opportunities, such as tactile trail logos suitable for making tracings or rubbings, commemorative trail coins, etc.

Each partnership site that serves as a trail hub, and any future hub sites that may be added later, will be permitted to display the official Ice Age Floods National Geologic Trail logo along with their own logo or signage at each site. Where certain partnership arrangements are formalized through agreements with the National Park Service, the NPS arrowhead logo may also be displayed as appropriate.

Use of the official trail logo at each of these visitor contact sites, reinforced by use of trail signs on the trail route, spurs and loops, along with trail logo use on interpretive media, websites, and other interpretive materials, will help reinforce the trail experience at each trail location for the visiting public. Consistent use of the trail logo and interpretive messaging will provide continuity for visitor experiences up and down the trail, regardless of the trail location or partner site being visited.

Of the suggested hubs listed above, four are private non-profit sites, four are federal agency sites, four are Washington state parks, two are Oregon state parks, one is an Idaho state park, and one is a city museum. Each hub should be willing to sign an agreement committing to the four basic elements listed above.

The Washington State Parks listed are among more than a dozen Washington parks identified in the *Interpretive Master Plan for the Ice Age Floods in Washington State Parks* (Bucy Associates, 2006) as premier sites for interpreting the floods. Completed three years before Congressional action creating the trail, the Washington State Parks plan offers detailed recommendations for an array of interpretive programs and materials focused on the Ice Age floods in 22 different state parks and recreation areas across the state. At many of these parks, the only additional information needed for interpretation of the trail is specific trail and route information at appropriate sites.

Various elements of this plan are being put in place at selected parks as funding becomes available. For example, the Dry Falls Visitor Center Concept Plan, adopted in 2009, was created with the idea that the NPS and others, such as federal and state transportation agencies, may contribute to the development of this key facility. Washington State Parks is willing to develop an agreement related to desired amenities for designated Ice Age Floods National Geologic Trail hubs, as its resources permit.

(3) “Open the Gateways” to the Trail.

The 2001 study identified 13 “gateway communities” on the perimeter of Ice Age floods zones; presumably, trail travelers would enter the region and/or access the trail through these locations. The communities identified in the study include Missoula and

Polson, Montana; Sandpoint and Lewiston, Idaho; Spokane, Wenatchee, Ellensburg, Longview/Kelso, Yakima, and Ilwaco, Washington; and Pendleton, Eugene, and Astoria, Oregon.

One of the principal purposes for identifying these communities is to encourage tourism-related business owners and non-profits within these trail gateways to become more knowledgeable about the trail and include promotion of trail experiences in the tourism promotion programs in their area. Since the traveling public will be accessing the trail from at least one or more of these larger population centers, trail visitors can be expected to take advantage of lodging, food, and other commercial services these communities offer.

To date, however, visitor guidance for Ice Age floods explorations starting in communities along the trail is highly variable. Some gateways, especially those with active Ice Age Floods Institute chapters, offer excellent materials and programs, while others have minimal materials and information available.

To the fullest extent possible, tourism and museum/nature center organizations in each named gateway community should be contacted and provided with a set of basic interpretive materials created to emphasize and define the trail. These communities should also be encouraged to include the trail as a major recreational and educational resource in local marketing and tourism information, local festivals, websites, visitor centers, and other outlets.

In reaching out to the gateway communities, the NPS trail leadership can take the opportunity to clarify the two formal categories of partners with the trail:

- 1) formal partners governed by legislation or memoranda, including

the Ice Age Floods Institute and landowners along the trail (primarily state or federal agencies); and

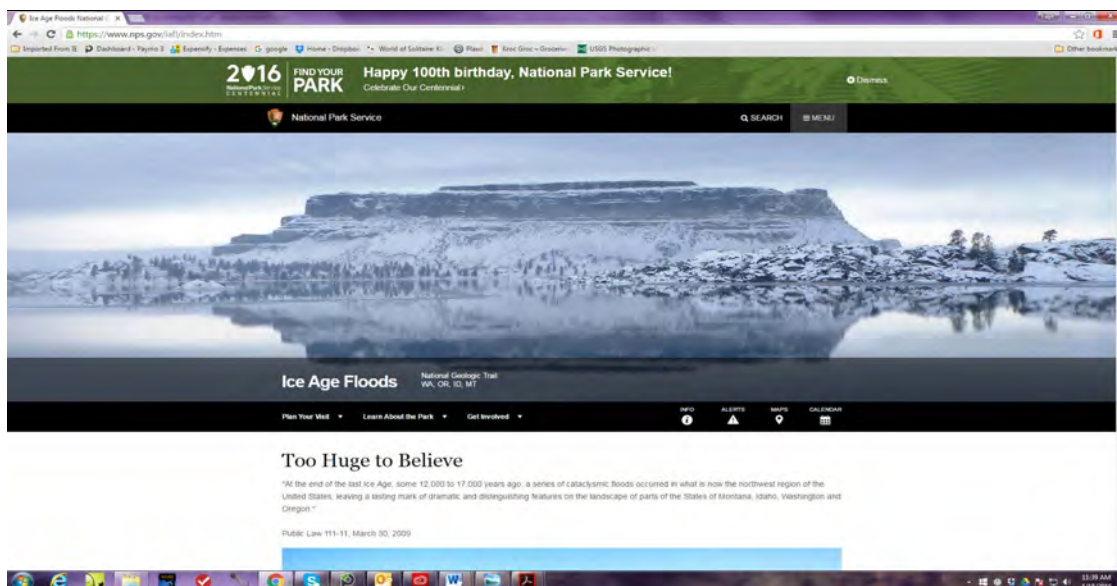
- 2) museums, interpretive centers, and local park systems within known Ice Age floods regions.

A third category for outreach, also vitally important to the trail's success, includes organizations in the tourism/hospitality industry, local chambers of commerce, and other entities providing marketing and promotion for the trail.

Of course, similar efforts to acquaint the traveling public with visitor services and other tourism opportunities should be emphasized in *all* communities up and down the trail – whether they are smaller towns like Davenport or Hood River, or larger populated centers such as the Tri-Cities or Portland/Vancouver metropolitan areas. While this plan does not list all communities along the trail by name, it should be clear that similar recommendations and support apply to all the communities on the route. In that spirit, each community within the four-state trail region is enthusiastically

encouraged to become an active participant in learning about and promoting the trail, sharing information with the traveling public, and providing tangible support to trail development and ongoing operations.

The Oregon city of Tualatin is an inspiring example of one municipality that has taken significant steps to become a gateway to the trail. In October 2010, the Tualatin-Sherwood Road exit on Interstate 5 was recommended by a national branding expert (Total Destination Management) as a key gateway to local Ice Age floods history and visitor areas and a central element of the Tualatin Ice Age Heritage Tourism Plan (funded by a grant from the Washington County Visitors Association to the Tualatin Historical Society). In the spring of 2016, the \$3 million-plus Tualatin River Trail (I-5 Exit 289) along the south side of Tualatin River was completed, which holds some of the lowest elevation points of the Ice Age floods. An Ice Age interpretive timeline is included this trail. In 2014, CenterCal Corporation erected a \$220,000 bronze sculpture at an adjacent remodeled shopping center depicting the Tualatin mastodon, whose bones are now at the Tualatin Library and Heritage Center.



The new NPS website for Ice Age Floods National Geologic Trail launched in March 2016. NPS websites are now optimized for mobile use.

SHORT-RANGE FOCUS TWO: Getting the Word (and Pictures) Out

(1) Enable More Partner-to-Partner Communication.

Trail partners can improve interpretation – for their own visitors and for the trail as a whole – by communicating and sharing with each other in productive working partnerships. For example:

- Partners need to share relevant calendars of events throughout the year.
- Partners need to communicate with each other about proposed interpretive programs and media and coordinate efforts to enhance visitor experience and avoid duplication.
- Partners need to share knowledge and resources as they work on interpretive programming for different aspects of the trail.
- Partners could work collaboratively to compile visitation data along the length of the trail.
- Partners could establish a volunteer/experts database as a trailwide interpretive resource.
- Partners could help each other compile a master inventory of interpretive media used along the trail.

To encourage higher levels of partner-to-partner communication, the following recommendations are proposed:

- An informal, online interpreters' working group could offer guidance and inspiration to trail interpreters in a variety of settings. Simple online tools such as members-only list-servs, Google or Yahoo groups, LinkedIn groups, and the NPS Common Learning Portal offer a variety of options for instant, free communication with minimal set-up and administrative time. While some of these popular online programs may be off-limits for government employees using

government websites, an alternative might be to launch the discussion group through the Ice Age Floods Institute or another non-profit organization. Ideally, this interpreters' working group would be initiated from the field, not as a one-way communication from the NPS.

- Partners should take the initiative and actively seek ways to collaborate on ambitious, high-investment trail interpretive projects such as new exhibits, festivals, scholarly/academic conferences, multi-day field trips, and educational curricula. For example, a traveling exhibit with customizable local elements can be funded jointly and enjoyed by multiple audiences for years.

The Ice Age Floods Institute and its 11 chapters constitute a remarkably successful all-volunteer, self-governing organization that provides invaluable service to the trail, its partners, and its visitors. As a founding partner providing geological and technical expertise, the Institute's many contributions to the trail are absolutely vital to its success. Now that the trail has been established, it may be time for the Institute (a named partner within the Congressional legislation) to undertake a self-study or develop a strategic plan to help reposition the organization for the challenges ahead.

For example, the Institute has very strong chapters in some locations, while chapters in other locations are less active; chapter formation depends in large part on interested individuals stepping forward in their local areas. Looking to the future, the trail and trail partners will likely need more in-depth, consistent, trail-wide technical assistance with interpretation from Institute members, even in locations with less active or widely dispersed chapters. One suggestion is that as trail hubs are identified and developed, the Institute might take a strategic look at each

hub’s individual needs and explore how existing (or new) chapters could meet those needs. Another suggestion is to consider launching an aggressive membership drive among targeted areas and populations to grow the organization and ensure its future vitality as the trail becomes more visible and viable across its full length. A third need may be to examine the volunteer opportunities within the Institute, so as to spread and share volunteer duties, help members avoid burnout, and build a broader base of active, engaged volunteers over time. In reviewing these suggestions, however, it is important to recognize that the Institute is an independent organization with its own management team and strategic vision. Going forward, open and regular communication about trail needs and organizational concerns will be essential for both the Institute and its multiple trail partners across the four-state region. Unless there are deliberate efforts to improve communication and coordination among partner organizations responsible for interpreting the trail, visitors will not perceive the flood pathways as a cohesive whole. Without this improved communication among partners, the trail’s visitors will continue to perceive flood features as separate, localized attractions championed by local individuals or groups.

(2) Brand the trail.

- Complete, approve, and introduce the trail logo.

After several years of work, the new trail logo is expected to be approved within FY2016. The logo will be the center element in the Ice Age Floods National Geologic Trail road signs, which will use the “rounded triangle” template that is standard on all National Trails.

Once the logo is finalized, it should be made available (with guidelines for proper use) in multiple formats for download by partners and supporters to use in a variety of contexts.

Although the most visible use of the logo will eventually be on Department of Transportation road signs, the approved trail logo can be put into circulation for other uses without waiting on the state DOTs.

- Clarify abbreviations.

Effective branding captures not only the full name of an entity, but also its familiar abbreviations: The Coca-Cola Company/ Coke, the Hanford Reach Interpretive Center/ The REACH. Unfortunately, the various abbreviations for Ice Age Floods National Geologic Trail can confuse casual visitors.

- The NPS internal abbreviation for Ice Age Floods National Geologic Trail is IAFL, a tag reflected in the NPS trail website launched in 2016: www.nps.gov/iafi. (This nomenclature helps differentiate this trail from a Wisconsin site, the Ice Age National Scenic Trail, found at www.nps.gov/iatr.)
- Many interagency materials and partners refer to the trail as IAFNGT.
- The Ice Age Floods Institute abbreviates itself as IAFI, with the website styled www.iafi.org.

This plan recommends that the partners reach a consensus on a short common name (for example, “Floods Trail” as a possible common name on second reference) in documents aimed at the general public:

Welcome to Ice Age Floods National Geologic Trail. When you follow the Floods Trail, you can see. . . .

Precedents for this kind of common-use identification already exist with other national trails: the Pacific Crest Trail, the Oregon Trail, the Mormon Trail. Using “Floods Trail” distinguishes this trail from the Wisconsin Ice Age National Scenic Trail and emphasizes the essential element of the trail – the floods.

(3) Deliver Fact Sheets.

Prepare and distribute a series of concise, accurate fact sheets about key locations along the trail. These fact sheets will become the foundation of the Interagency Technical Committee and Interpretation and Education working group content database. At a minimum, fact sheets should be created on the following topics:

- The overall story of the floods' torrential rush from Montana to the sea;
- The ice dam at Sandpoint, including the repeated cycles of forming and collapsing;
- Glacial Lake Missoula, a body of water as large as two of the Great Lakes;
- The channeled scablands, created by floods scouring down to bedrock;
- Columbia Gorge and how the floods carved cliffs for waterfalls we see today;
- Willamette Valley and its large deposits of sediments and glacial erratics;
- The mouth of the Columbia River, where floodwaters entered the Pacific Ocean; and
- The Ice Age shoreline, where the floods reached their highest point.

Fact sheets should be widely distributed across hub sites, gateway communities, other partners, and the Institute membership across all four states.

(4) Start a Photo Bank.

All trail partners need high-resolution, clearly identified photographs of major trail features, as well as images showing visitors enjoying the trail. These photos need to be available at no cost, with usage rights granted for any purpose (print, posters, exhibits, video stills, etc.) as public domain images.

- Hire one or more professional photographers to photograph specific flood features in different regions.

- Explore ways to commission aerial photographs of the trail.
- Negotiate or purchase rights to selected photographs taken by Institute members and others.

Make this photography collection available online at the NPS.gov website for the trail, and include selection and links in all publicity materials for the trail.



Ice Age floodwaters reached the Pacific Ocean about 30 miles beyond the present coastline of Washington's Cape Disappointment State Park. The park's Lewis and Clark Interpretive Center provides a good vantage point for interpreting the floods. *Photo: Allie Goolrick/GIG*

SHORT-RANGE FOCUS THREE: Prioritizing Interpretive Media

(1) Develop a Feature-Rich National Park Service Website for Ice Age Floods National Geologic Trail.

Launched in March 2016, the NPS website for the trail will grow to become a pivotal resource for trail partners and communities, as well as for visitors near and far.

- The NPS website should include the new master map featuring pathways, major sites, and trail hubs, with clickable links to the hub sites. Website users should also be able to click from the master map to a series of segmented regional maps supportive of day-trip itineraries.
- The NPS website content should include interpretation that addresses each of the five primary interpretive themes of the trail.
- The NPS website should present an up-to-date seasonal calendar of interpretive programs, tours, and events available from all trail partners. Ideally, this capability could be automated – even if it must be housed outside the NPS site.
- All NPS-generated visitor-oriented print materials (site bulletins, etc.) about the trail should be available on the website.

- The website should contain at least a dozen high-resolution, public-domain photographs available for download by news media, chambers of commerce, and the general public. These photographs should be representative of the geological highlights, geographical regions, and major stories of the trail.
- All planning documents for the trail, including this plan, should be available to the public on the NPS website.
- The NPS website should provide links to the trail's social media sites.
- The NPS website should provide a link to the Ice Age Floods Institute main website.

Now that the NPS.gov website is established for Ice Age Floods National Geologic Trail, the trail should be added to the National Trails system map and the website included in other relevant federal and state listings.

(2) Produce Essential Publications.

Several essential publications (available both in print and electronically) need to be developed as basic benchmark interpretive tools for the trail. Other, more in-depth pieces may be developed later, but key publications are needed as soon as possible.



Guided by members of the Ice Age Flood Institute, city leaders in Tualatin, Oregon, have incorporated Ice Age floods interpretation into city parks. *Photo: Rick Thompson/IAFI*

- Prepare and distribute a master NPS site bulletin on the trail. This publication, which can be locally produced (and already in draft in mid-2015), can serve as an interim brochure until an NPS unigrid brochure is created.
- Prepare and distribute an NPS rack card promoting the trail. Produced in large quantities, these colorful, durable cards can be stocked in brochure racks at interstate highway rest stops, other NPS sites, state parks, and local tourism venues across the entire northwestern Pacific region.
- Prepare and distribute an NPS unigrid brochure (with map) for Ice Age Floods National Geologic Trail. These distinctive full-color multi-fold brochures are produced by the National Park Service Interpretive Media division in Harpers Ferry Center, West Virginia, for every National Park Service unit in the nation.

Depending on funding, these essential NPS print publications should be completed no later than FY 2017.

These publications will complement, but not replace, a series of Ice Age Floods Institute brochures for each region. The Institute has undertaken an effort to develop interpretive materials in each of its main chapter areas. The first of these, created for the Lake Lewis chapter, is already available online at <http://www.iafi.org/brochures/documents.asp>. Hard copies (7,500 printed) are available at the Tri-Cities Visitor and Convention Bureau (www.visittri-cities.com) in Kennewick, WA, and at The REACH in Richland, WA.

The Lake Lewis Chapter map is an example of the publications to be developed and produced by the Ice Age Floods Institute to complement the NPS unigrid brochure. These trail segment maps will provide the traveling public with much greater detail about the features located along that portion

of the trail, along with a larger and more readable scale of precise trail routing of the main trail and any loop or spur trails within that particular segment. This plan proposes that the segment maps be developed with oversight by NPS trail management, with review and advice from the interpretive and geology subcommittees of the Interagency Technical Committee, and with the key support, content input, and financial sponsorship of the Ice Age Floods Institute and its local chapters.

All segment maps will be from the same template, in order to standardize map size, fonts and colors, use of trail logo, and overall map configuration. Segment maps could be color-coded, with the name of the segment clearly marked. Each segment could be numbered sequentially, starting with Missoula and ending at the mouth of the Columbia River, and also given a name associated with its dominant geography and floods-related geology. In the next few years, then, individual trail segment maps would become available for the following segments:

- Segment One: Glacial Lake Missoula Region
- Segment Two: Lake Pend Oreille-Spokane Valley Region
- Segment Three: Cheney-Palouse Region
- Segment Four: Grand Coulee-Glacial Lake Columbia Region
- Segment Five: Quincy Basin Region
- Segment Six: Glacial Lake Lewis and Lower Snake River Region
- Segment Seven: Wallula Gap-Walla Walla Basin Region
- Segment Eight: Lake Condon-Eastern Columbia Gorge Region
- Segment Nine: Western Columbia Gorge/Portland Area Region

- Segment Ten: Willamette Valley Region
- Segment Eleven: Lower Columbia Region

The design concept for the segment maps is to show the map and details on one side, with legend keys denoting key features along the trail segments. Small photographs and short descriptions of key features at each site could be placed down the sides of the maps. On the reverse, advertising from tourism-related businesses might appear; this advertising can help pay for the cost of producing and printing the maps, with a reimbursement account set up at the Ice Age Floods Institute to cover its costs. Segment maps can be produced and released in phases as funding support and production schedules allow. County and community tourism offices and chambers of commerce may also be asked for support, along with area businesses.

Ideally, printed segment maps may be available free of charge to trail users, used in conjunction with the NPS-produced unigrid brochure, and available on the NPS and Ice Age Floods Institute websites and other supporting websites as appropriate.

(3) Go Digital.

Visitors everywhere now expect instant digital access to information and interpretation. To meet visitor expectations, Ice Age Floods National Geologic Trail should begin providing quick, convenient digital versions of interpretive materials. Regardless of their eventual digital platform, the interpretive content of digital programs can be determined and developed using readily available technology such as simple podcasts (audio only, or audio plus images) housed within and downloadable from the new NPS website.

- As a first step, make all printed trail interpretive materials (now under

development) available as digital downloads from the new nps.gov website for the trail.

- The NPS employee who maintains the nps.gov/iafl website will contact all trail partners to gather, approve, and post their many short videos and slide shows.
- Consider using existing tools such as Google Groups and Hangouts to capture and share the many lectures the various IAFL chapters sponsor.
- Consider using streetview/360° images to engage users with the various trail landscapes.
- Make sure that all digital tools used by the trail also enable the content to be accessed and used on mobile devices.
- Support grant requests and provide trail materials for development of a prototype trail app, as proposed in 2015 by an Eastern Washington University public history professor and his students, the successful developers of Spokane Historical, a web and mobile story-telling platform.
- Continue to work on providing downloadable, self-guided audio tours, itineraries, and apps to enrich visitors' experiences along the trail, with or without personal guides or rangers.

(4) Continue Social Media.

All partners and volunteers can take an active part in promoting the trail through social media, including Facebook and Instagram. On the official NPS Facebook page (Ice Age Floods National Geologic Trail NPS), individuals can promote the page across their own social networks, share news and observations, post photos, "like" the page, and suggest items to feature.

- Consider establishing a schedule for

partner contributions to the trail Facebook page. For example, each hub site and Institute chapter could be asked to make at least two contributions per month, assigned one week per quarter, or some other arrangement.

- Develop a social media policy for the trail. The NPS introduced a Directors Order for Social Media in December 2011 (www.nps.gov/policy/Socialmedia.pdf) addressing NPS units' use of Facebook, Twitter, Flickr, and YouTube and requiring each park to submit a social media strategy.
- Maintain and regularly update trail entries in Wikipedia and other popular user-generated online resources such as www.historylink.org, a free online encyclopedia of Washington state history.

(5) Start the Wayside Exhibit Plan

Provide new or expanded wayside interpretation along the trail, using the wayside exhibit recommendations charted in this plan as a guide (see Section 3).

As prioritized in this Long-range Interpretive Plan, the wayside recommendations focus only on visitors' needs for information and interpretation; the list does not attempt to address cost-efficiencies in sign production or installation. These efficiencies may be achieved if future matching funding is secured by partners, with NPS aid, to support wayside exhibit fabrication and installation at partner sites in cooperation with site owners/ managers.

Using the Columbia River Gorge National Scenic Area as an example of continuity, the long-term goal for trail signing is that all trail interpretive signs will have the same general template in terms of style, font, use of colors, etc., as well as the official trail logo, along with the logo of the host agency

or organization at individual sites. This approach can best be accomplished when the managing partner determines that new wayside exhibits are needed, or that current interpretive exhibits are out of date, inaccurate, or in poor condition and need to be replaced.

As listed in this plan, the prioritized sites for new waysides fall into three categories: (1) places with higher visitation, including proposed trail hubs where existing interpretation on the floods may be excellent but the trail itself is not highlighted, (2) places with older signs that do not meet accessibility standards or are otherwise in disrepair, and (3) floods sites currently lacking any level of Ice Age floods or trail interpretation.

At a minimum, all partners involved with the trail should be cognizant of the need to integrate trail interpretation into any forthcoming, new, or proposed wayside signs.

Short-range recommendations for trail information to be added to existing outdoor Ice Age floods interpretation include:

- Turnbull National Wildlife Refuge, WA
- Grand Coulee Dam Visitor Center, WA
- Sun Lakes-Dry Falls State Park, WA
- Steamboat Rock State Park, WA
- Palouse Falls State Park, WA
- Ginkgo Petrified Forest State Park, WA
- Beacon Rock State Park, WA
- Columbia Hills State Park, WA
- Maryhill State Park, WA
- Bridgeport State Park, WA
- Lincoln Rock State Park, WA
- Yakima Sportsman Sate Park, WA
- Columbia Plateau Trail State Park, WA

- Centennial Trail State Park, WA
- Columbia Gorge Discovery Center and Museum, OR
- Portland Women’s Forum, OR
- Lewis & Clark Interpretive Center, Cape Disappointment State Park, WA

Short-range recommendations for new wayside installations include:

- Lake Como/Bitterroot National Forest, MT
- Montana Natural History Center, MT
- Downtown Sandpoint, ID
- Lake Pend Oreille, ID
- Farragut State Park, ID

(6) Expand Interior Exhibits.

- Create several small, easily portable traveling exhibits (perhaps consisting of one or two roll-up stands per set) about the trail for use at public lectures, community events, festivals, public libraries, and special events. These portable exhibits can be checked out by partners for use as needed.
- Work with Farragut State Park to incorporate the trail into forthcoming exhibits on the Ice Age floods in the new exhibit wing.
- Begin discussions with the Oregon Museum of Science and Industry (OMSI) to create and install an exhibit featuring the Ice Age floods and the trail.
- Begin discussions with the Museum of Natural and Cultural History, an affiliate of the University of Oregon in Eugene, to incorporate the Ice Age floods and the trail into exhibits and/or programming.
- Begin discussions with the Lewis and Clark Interpretive Center at Cape Disappointment State Park regarding inclusion of the Ice Age floods in the “Changes at the Mouth of the River” exhibit and future exhibits.

(7) Seek Visitor Input.

- Explore ways to start collecting visitor feedback regarding trail visitation and visitor experiences. Opportunities may include observations/reports from field interpreters, visitor survey cards, exhibit evaluations, online travel ratings (Travelocity, TripAdvisor), and social media review sites such as Yelp.
 - Seek interpreters’ input on evaluating and using this data.
 - The protocol for collecting data should be established early on, in order that statistics can be efficiently managed and compared.
 - Develop a protocol for appropriate responses/feedback to critical or incorrect user-generated social media entries.

SHORT-RANGE FOCUS FOUR: Building Capacity

(1) Train Interpreters about the Trail.

Launch an annual two-day training conference for interpreters at a central location along the trail. This training conference could include presentations by Ice Age Floods Institute experts, updates on educational programming and curricula, work sessions on the unique challenges of interpreting geology, and examples of effective programs for different audience types, as well as time for networking and sharing ideas.

- Seek to engage more experienced interpreters in the process as instructors.
- Prepare a digital Interpreters Notebook (with optional hard copy) about the trail as a take-away from these meetings. The notebook should include the basic factual and interpretive materials about the trail, including trail themes, site bulletins, fact sheets, and images of trail features.

- These notebooks could be developed further and customized by individual interpreters and sites over time. (Washington State Parks has already developed a similar resource, which includes a comprehensive series of sitespecific fact sheets.) The notebooks could guide personal interpretation across the entire trail and minimize duplication at the different sites.

- Ask trained interpreters to share their training with other visitor services personnel and volunteers within their site or region. These additional trainees might include park/site bookstore workers, shuttle bus drivers, front-desk staff, fee takers, safety/security personnel, and any others on the front lines of customer/visitor services.
- Encourage partner interpreters and volunteers to seek professional training through organizations such as the National Association for Interpretation or inexpensive online courses from the Eppley Institute for Parks and Public Lands at Indiana State University (www.eppley.org) and other vendors.
- Encourage trail supporters from different areas to attend the next biennial National Trails Conference in 2017.

(2) Train Other Visitor Contact Personnel about the Trail.

- Host a “get acquainted” program on-site to introduce the trail to representatives of tourism, hospitality, and service-sector industries in the area.
- Provide basic trail information, invitations and free passes for workers to visit sites, and tokens such as window decals, stickers, or pins acknowledging their support of the trail.
 - The outreach program will help trail visitors coming from out of town – but it will also promote NPS sites, state parks, and public lands among low-

wage workers and other underserved local constituencies.

(3) Lay Groundwork for a Trail Education Program

As detailed in the Education Plan (Section 3) in the next three years Ice Age Floods National Geologic Trail should work to build awareness, review existing programs, and seek funding and staff to start a comprehensive curriculum-based K-12 educational program starting in 2019.

(4) Support Capacity Building for the Ice Age Floods Institute.

As a named partner in the trail’s legislation and a key resource for information, interpretation, education, and scientific research, the Ice Age Floods Institute plays a vital role in working with other partners and helping the public understand the extraordinary landscape wrought by the ancient floods. Now that the trail is a reality, it is essential that this mission-critical group function smoothly and cohesively as a resource across the length of the trail and serve as a key “go to” organization for the NPS and other trail partners to help advance the trail and its interpretive, educational, and scientific programs.

Organizationally, the Ice Age Floods Institute operates as an entirely volunteer organization with 11 local chapters plus the parent organization. Each chapter does its own fundraising and initiates its own community and trail activities. At least three chapters have their own websites, each with a different design template and each hosted separately from the main IAFI.org website. (While all four of the websites link accurately to the current calendar of events, all the sites have a number of bad links and out-of-date information.) Some chapters produce proprietary materials with usage restrictions, such as an elementary school curriculum available for purchase only, or a field guide

researched for one chapter that “should not be used for other purposes without written consent of the authors.”

Like many volunteer organizations, the Institute has a robust general membership but relies heavily on a small core of people for the majority of its administrative and organizational tasks. At the local chapter level, this group of active volunteers may be very small indeed.

Capacity-building support for Ice Age Floods Institute should focus on the following points:

- Identifying the main chapter and central organization as the primary contact point for trailwide initiatives;
- Expanding the core group of active volunteers;
- Ensuring a reliable chain of succession when active members step down;
- Clarifying circumstances under which Institute-produced or sponsored materials may be shared among partners;
- Providing the technological bandwidth to compile and archive the Institute’s extensive research and knowledge from all its chapters into one searchable, accessible online repository;
- Informing the Institute of specific interpretive needs centered on the trail, in contrast to interpretation of other Ice Age floods sites beyond the trail routes; and
- Developing more reliable funding resources for the Institute as a whole and for local chapters.

SHORT-RANGE FOCUS FIVE: Funding

(1) Explore Creating a Friends Group or Foundation for Trailwide Fundraising.

Given the ongoing budgetary pressures facing federal and state agencies, Ice Age

Floods National Geologic Trail could benefit immensely from a dedicated 501(c)3 Friends organization or foundation devoted to fundraising for the trail as a whole. A fundraising Friends group could pursue various grants for interpretive projects, including facilities, media or programming, funding support for contract or temporary staffing to augment NPS or partner staff, special events, media production, and much more. In a legal sense, this function could be housed under the Ice Age Floods Institute. However, given the rather decentralized nature of the current chapter structure, centralized fundraising by the Institute may prove somewhat difficult.

To address this issue, the Institute could shift some of its current focus and take on a trail funding support role, which could involve hiring a grants specialist to pursue grants from non-profit foundations, charitable trusts, and individuals. If the Institute Board of Directors felt uncomfortable taking on this role, a separate dedicated fundraising organization in the form of a “trail friends group” could be established as a separate entity. The Friends group would have to work with the chapters to establish consensus on the method used for distribution of funds. However, if the Institute Board is willing to take on this new role, it is important not to dilute the critical role that Institute members already play as scientific and educational experts and advisors for the trail.

A trailwide fundraising group, whether part of the Institute’s organization or not, could seek grant eligibility status with national resources such as the “Google Grants for Non-profits” program, as well as regionally based philanthropic community foundations in Portland, Seattle, Spokane, and Missoula. Many community foundations have grants categories earmarked for environmental and

educational needs. To cite only one example, the Spokane-based Inland Northwest Community Foundation recently awarded \$18,000 for protection of native plants in the Idaho Panhandle National Forest, \$10,000 to Lake Pend Oreille Waterkeeper organization, and \$6,000 to the Friends of Scotchman Peaks Wilderness.

Having a dedicated organization, or a designated arm of the Ice Age Floods Institute, committed to fundraising could make a world of difference for trail interpretation. A successful fundraising program could enable trail leaders to plan ahead with confidence, invest in interpretive staffing and media, and relieve the Ice Age Floods Institute chapters of some of the burden of funding brochures and programming along the trail. Also, if the NPS is able to secure some future matching federal funds for development of interpretive

facilities and media, matching private, state, or local government funds could move interpretive projects from plan to reality.

- To start, the NPS interpretive team might present this need for discussion among the Interagency Technical Committee and the Institute board, as well as poll stakeholders from the interpretive planning workshops to identify volunteers with fundraising expertise.

(2) Log Volunteer Hours

Develop a simple system to log and calculate the monetary value of volunteer hours. These calculations should be based on NPS standards as well as those developed by established non-profits to document their engagement and support within their communities. This kind of data can be very persuasive in making the case for support from many grant-making organizations.



Employees of the Battelle Memorial Institute, the world's largest nonprofit research and development organization, support many Ice Age Floods Institute projects. "Team Battelle" and other community and corporate supporters are vital to the trail's success. *Photo: Lake Lewis Chapter/IAFI*

(3) Join the Partnership for the National Trails System.

Ice Age Floods National Geologic Trail is clearly identified in its founding legislation as among the 2009 additions to the National Trails System (Public Law 111-11, Title V: Rivers and Trails, Subtitle C). Therefore, one or more entities associated with Ice Age Floods National Geologic Trail should pursue membership in the Partnership for the National Trails System (www.pnts.org), a well-established organization that lobbies for trail funding and provides an extensive network of resources for managing and interpreting trails. Among other activities, the partnership is currently sponsoring nationwide activities as part of “A Decade for National Trails”; it also sponsors National Trails Day every June and holds a biennial conference. The next conference is set for summer 2017.

One initiative of particular importance for Ice Age Floods National Geologic Trail is the “Next Generation” program, described as follows:

“Engaging the next generation of trail stewards and champions is a priority for the Partnership and its member organizations. These programs directly align with the goals of the Decade for the National Trails Outreach, Protection and Capacity building. A variety of programs, scholarships and interns have been offered to help develop an interest in the outdoors and the national scenic and historic trails.”



Photo: Djembayz/Creative Commons



Following a city tradition established decades ago, the Missoula chapter of the IAFI has placed huge stones along the high-water mark of ancient Glacial Lake Missoula. Photo: Jim Sheldon/IAFI

Mid-range Recommendations

By the second phase of this long-range interpretive plan – approximately 2019 through 2021 – Ice Age Floods National Geologic Trail will have far greater visibility than it does today. Highway signage with the trail logo will likely be in place across all four states, and a new generation of wayside signs about the Ice Age floods will have begun incorporating the trail into the stories of the floods. At the same time, many individuals currently holding staff or volunteer positions serving the trail will have moved on. These mid-range recommendations focus on continuing to move trail interpretation forward even as personnel, funding, and site-by-site priorities may change.

MID-RANGE FOCUS ONE: Youth and Educational Programming

(1) Build an Educational Program.

- As detailed in the Education Plan (Section 3), by the years 2019-2021 Ice Age Floods National Geologic Trail should be positioned to start comprehensive curriculum-based educational programming for grades K-12.
 - In brief, the Education Plan recommends outreach and relationship-building in the short term, hiring an NPS trail education specialist and developing middle school and K-2 curricula in the midterm, and developing curricula for high school and grades 3-5 in within the next seven to ten years.

(2) Introduce Junior Rangers.

- Create a series of simple, engaging Junior Ranger activities for children to enjoy and learn from when they visit Ice Age floods sites. Junior Ranger activities are a widely used approach for youth programming, offered in most NPS sites, in all four state

park systems along the trail, and in some private non-profit partner sites as well. Ideally, trail partners could work together (or jointly outsource) to develop a collaborative Junior Ranger program, either under the adopted Ice Age Floods National Geologic Trail logo or under the adopted trail partner logos.

- Introduce the Junior Ranger program as an online interactive offering with virtual tours and animations, and propose adding an Ice Age floods component to other relevant NPS Webrangers online programs.
- Web-based Junior Ranger activities can be downloaded at home or onsite. Trail hubs, gateway communities, and visitor centers can direct young visitors to these materials as part of an on-site visit as well as in response to inquiries from afar.
- When a child finishes the Junior Ranger activities and submits the completed worksheets, he or she receives an online Junior Ranger badge, patch, or certificate.
- However the Junior Ranger program is designed, care should be taken to include elements representing the entire length of the trail and all four states.
- Plan to launch the Junior Ranger program for the trail on Junior Ranger Day of National Park Week in April.
- The online Junior Ranger template can also be used as a template for creating other participatory programs for youth and adults interested in becoming trail stewards or citizen scientists.

(3) Engage Youth Groups.

- Reach out to community youth groups such as Boys and Girls Clubs and scout troops as audiences for youth-oriented trail activities and programs.
 - Develop day hikes with programming and hands-on activities.
 - Develop weekend and summer overnight programs using state park cabins or campsites as home base.
 - Seek to establish these connections as annual events to help build multigenerational stewardship for the trail.
- Consider starting a youth or families chapter of the Ice Age Floods Institute.

(4) Develop Youth-Oriented Programs.

- Promote the “Be a Landscape Detective” concept for self-guided exploration.
- Design a template for geocaching or geocache trail activities throughout the trail. Include best practices guidelines for cache management for trail and hub site managers. For sites already doing geocaching, seek ways to add trail-related elements to the geocaching activities.
- Propose scavenger-hunt sheets, word puzzles, and similar activities on floods features as handouts or downloads at popular sites.
- Create digital resources with which trail sites, hubs, schools, and gateway communities can create their own “traveling trunks.” This resource would include a shopping-list of materials needed for various activities.

MID-RANGE FOCUS TWO:

Personal Services and Visitor Engagement

(1) Offer Short Programs at every hub.

- Develop at least two alternating short programs of 15 to 20 minutes each to be delivered by partner staff on a regular schedule each week at each hub.

- Develop a series of very short “pocket programs” (2 minutes or so) on different aspects of the floods for interpreters’ use while roving their sites.

(2) Expand Tours from every trail hub.

- Continue staging and supporting guided tours of the trail led by members of the Ice Age Floods Institute.
- Develop and launch new tours led by the Institute in additional areas where tours have not been developed.
- Engage recreationists with the trail by offering specialized interpretive programs by activity, such as:
 - Bicycle tours
 - Equestrian tours
 - Programs/interpretive materials for climbers
 - Guided boat tours
 - Site-specific immersion programs such as day camps or scientific explorations

(3) Continue Training.

- Continue to offer interpreters’ training workshops and support materials annually, both for new staff and volunteers and as refresher or extension activities for experienced trail supporters.
- Continue to engage more experienced interpreters as instructors in the training process.

(4) Seek Visitors’ Opinions.

- Look for ways to build in visitor responses and active participation in all interpretive programming, including personal services and exhibits/indoor activities.
 - Visitor response can be simple: a bulletin board with “Question of the Day” and sticky-note answers; a Rate Us handout, a reminder to visit the trail Facebook page, or even designated areas for “selfies” with a photo-friendly sign and background in view promoting the trail.



The spectacular overlook at Sun Lake-Dry Falls State Park already attracts more than 100,000 visitors a year, with more visitors likely if a proposed new interpretive center is completed in the next few years. This popular, centrally located park can be one of several designated “trail hubs” where visitors can not only explore a unique floods-related site, but also find in-depth information about the entire trail. *Photo: NPS/Dunbar*

MID-RANGE FOCUS THREE: Staffing

At present, NPS staffing for Ice Age Floods National Geologic Trail consists of three people: a superintendent, a chief of interpretation and education, and an education specialist, all of whom also hold the same positions with Lake Roosevelt National Recreation Area. Their support of Ice Age Floods National Geologic Trail is a responsibility added to their duties as part of the staff at Lake Roosevelt National Recreation Area. Therefore, to build a top-notch interpretive and educational program that can meet the demands of this complex new earth sciences-focused trail, additional interpretive and educational staff will be required to augment the existing NPS staff duty stationed at Lake Roosevelt NRA.

This plan recommends the addition of at least three full-time NPS staff additions for the trail over the next ten years. Given the uncertainties of funding new positions, the timing of these staff additions cannot be guaranteed; however, this plan recommends the following priorities:

- A management assistant to the trail superintendent;
- An education specialist; and
- An interpretive ranger, preferably with an academic background in geology.

At least one of these positions should have digital media capability.

Partners should also seek annual assignments of seasonal employees, student interns

through local colleges and the Student Conservation Association, Teacher-Ranger Teachers, and temporary workers supported by the Geological Society of America and other organizations. Project-specific grants or a strong fundraising effort by volunteers could also provide stipends to graduate students, interns, and other temporary staff.

MID-RANGE FOCUS FOUR: Expanding Interpretive Media

Once the NPS website and baseline print publications are in place, the trail interpretive team can begin providing more in-depth materials targeted to different audiences.

(1) Print Publications

- The NPS unigrid brochure should be completed and distributed to key locations within the likely zones of visitation across the four states.
- NPS rack cards should be readily available throughout the Ice Age floods pathways in brochure racks in all partner sites, public lands, regional tourism and visitor centers, popular tourist sites, state parks, interstate rest stops, hotels, museums, and public lands.
- Produce four to six additional NPS site bulletins offering more in-depth interpretation on some of the themes, topics, or stories appearing in the master site bulletin. These topical bulletins could address specific flood events or features, provide an overall glossary of flood terms, or present engaging stories built upon selected topics or storylines attached to primary themes.
- Provide materials and assistance for print publications to support visitor experience at Dry Falls State Park visitor center.

(2) Audiovisual/Web Materials

- Create a set of downloadable, self-guided audio tours/itineraries – simple audio

recordings by experienced Institute volunteers – for visitors accessing the trail from each of the designated hubs or portals. These may be informal, personal presentations and do not require professional actors or media talent.

Assign a staff member to maintain the trail's NPS.gov website and keep it up to date. Continue to upgrade and fine-tune the site, adding video components, image collections, virtual tours, etc. Monitor usage statistics (metrics), make adjustments, and use social media strategically to help drive more page views for primary stories.

- Continue to expand the use of social media for communication with and among trail enthusiasts across the four states and around the world. Choose new social media tools selectively as new applications are introduced.
- Assess the varied collections of video, film, and computer-generated graphics (CGI) for allowable use in sites along the trail for interpretive and educational programming or on the trail's NPS.gov website. (Although there are many video clips available, many have copyright restrictions.) For example, video clips and animations from online sites created by several different Ice Age Floods Institute members could be enjoyable for visitors at trail hubs.
- Evaluate the feasibility of expanding or creating additional trail travel apps based on the prototype proposed by the public history department at Eastern Washington University.
- Provide materials and assistance for electronic components at Sun Lake-Dry Falls State Park visitor center.

(3) Wayside Exhibits

Mid-range recommendations for waysides (see Section 4) include the following:

- (1) New wayside installations
 - Coeur d'Alene Parkway, ID
 - Downtown Lewiston, ID
 - Spokane Riverfront, WA
 - Great Bar Overlook, Quincy, WA
 - Hanford Reach National Monument, WA
 - Downtown Pendleton, OR

- (2) Additions to existing wayside installations
 - Camas Prairie Road/Highway 382, MT
 - National Bison Range, Polson, MT
 - Cabinet Gorge Dam, ID
 - Fort Spokane Visitor Center, WA
 - Drumheller Channels, WA
 - Sun Lakes-Dry Falls State Park, WA
 - Badger Mountain, WA

For further details, see Section 4. Depending on funding, installation of new signs or additions to existing signs may occur on varying schedules independent of this priority list. Regardless of the timing, however, the goal remains: to use wayside exhibits effectively to provide reliable, consistent visitor interpretation across the length of the trail. Partners should evaluate existing wayside sign condition and age as well as potential new signs and determine their priorities in relation to this plan.

(4) Interior Exhibits

- Work with gateway communities to develop exhibits featuring the trail or, alternately, develop portable exhibits to share among sites. These installations may be in local museums, chamber or city visitor centers, or both.
- Update/refresh hub sites' existing Ice Age floods exhibits to incorporate the trail. Depending on partner preferences and budgets, any of the following approaches might be used:
- Prepare a trail-specific panel for use with the partner's existing exhibits. This panel could be as simple as one freestanding

vertical blade with the logo and a link (either by QR code or other technology) enabling visitors to access a trail overview and map.

- As partner sites build or replace permanent interior exhibits, a section on Ice Age Floods National Geologic Trail should be a prominent component of any treatment of the floods.
- Work in partnership to aid development of a comprehensive visitor experience at the Sun Lake-Dry Falls Visitor Center, as well as other partnership sites.

MID-RANGE FOCUS FIVE: Special Events

- Have a birthday party! Ice Age Floods National Geologic Trail will be ten years old in 2019.
 - Trail partners can mark the occasion with "Happy Birthday" events such as festivals, special programs, guest speakers, open house community events, overnight programs, etc.
- Provide materials and assistance for special events commemorating the interpretive facilities, programs, and exhibits within the new Dry Falls State Park visitor center.
- Have another birthday party! The Ice Age Floods Institute will be 25 years old in 2020. Trail partners across all four states should plan events in honor of this extraordinary volunteer organization that played and continues to play a critical role in preserving, studying, and interpreting the sites along the trail.
 - Partner sites and the NPS team should consult with the Institute and follow its lead in planning events for this "Silver Anniversary."
- Continue to provide trail representation and participation – and look for new opportunities – at other special events at

sites and communities along the trail.

- Create a calendar of special events and potential special events for the trail. Special events are a very effective way to generate publicity and recognition for the trail and its sites while also attracting large audiences of newcomers to the venue. Co-sponsors, volunteers, and collaborators can help make a variety of events affordable and manageable, even for limited staff.

MID-RANGE FOCUS SIX: Funding and Capacity Building

Adequate funding and interpretive capacity are critical to the viability of the trail over the decades.

- Work with the Ice Age Floods Institute board and membership to continue expanding and sustaining the group's

capacity to provide interpretation along the trail. This work should include providing interpretive training opportunities and networking, providing support materials, and providing administrative support as needed for trail-based activities and events sponsored by the Institute.

- If possible, make funding assistance available to the Institute (possibly through the Friends group for fundraising) for production of trail guides, subsidy of trail trips and speakers, etc.
- Support volunteers' efforts to build a viable Friends funding organization to support interpretive programs along the trail.



An aerial camera captured this stunning photo of the lower portion of Moses Coulee. Can you imagine the gigantic Ice Age floods that carved this broad valley? *Photo: Bruce Bjornstad*

Long-range Recommendations

In seven to ten years, Ice Age Floods National Geologic Trail will be more fully integrated into interpretive and educational programming across all the partner sites and their communities. At this stage, the interpretive staff can shift somewhat from building an interpretive program to maintaining and improving existing networks.

LONG-RANGE FOCUS ONE: Staffing

As the trail's highway signage is fully installed and new waysides highlight the trail across all four states, additional NPS interpretive staff will be needed to continue managing a solid interpretive and education program.

By this stage of its development, the trail will need a full complement of interpretive staff, ideally five full-time individuals:

- A management assistant to the trail superintendent,
- A chief of interpretation and education,
- An education specialist,
- An interpretive ranger, and
- A visual information specialist

Some of these positions may require regular travel.

In addition, the NPS staff may require assistance in collections and archives.

Among trail partners, as noted earlier, this plan recommends committing to assignment of one specific interpreter or volunteer at each trail hub as the responsible party for Ice Age floods and trail interpretation, including

providing or arranging programs and maintaining materials and displays.

LONG-RANGE FOCUS TWO: Personal Services and Visitor Engagement

- Continue to offer an annual training workshop on the Ice Age floods and the trail for new interpretive partners. Continue to engage more experienced interpreters in the process as instructors.
 - Investigate awarding continuing education credits for professional training or other recognitions as appropriate.

LONG-RANGE FOCUS THREE: Youth and Educational Programming

- As detailed in the Education Plan, educational programming should be extended in years 7 through 10 to encompass curriculum development for the remaining K-12 age groups: students in grades 3-5 and high school.
- The trail education specialist should also focus on extending the reach of Ice Age Floods National Geologic Trail curriculum-based programs to an everbroadening list of schools within a day's drive of the trail.
- Partners, NPS staff, and local colleges/universities should begin seeking ways to offer K-12 curriculum-based distance learning about the trail. Through interactive distance learning programs, students across the nation (and the world) could learn about and share their discoveries along the trail.

LONG-RANGE FOCUS FOUR: Defining and Mapping the Trail

- Add Ice Age Floods National Geologic Trail data onto topo maps produced by the U.S. Geological Survey (USGS). In 2015, only six of the nation’s national trails are featured on USGS topo maps, but the USGS intends to add all national trails in its national map products over the next few years.
- Explore ways to augment the motor route of the trail with walking and water routes.
 - Several hiking routes and short interpretive trails already exist alongside some parts of the trail, and the Columbia River runs parallel to the motor route through the Columbia Gorge.
 - Designated hiking trails could augment visitors’ experiences along the trail.
 - A Columbia River trail guide could highlight the many dramatic Ice Age floods features visible from the river.
- Commission a substantive guidebook with itineraries, interpretation, and comprehensive travelers’ information about Ice Age Floods National Geologic Trail.
- Take steps to get the trail included in popular guidebooks and websites produced by the American Automobile Association (AAA), Fodor’s, Lonely Planet Guides, and others.

LONG-RANGE FOCUS FIVE: Interpretive Media

(1) Digital/Audiovisual

- Commission or sponsor a short documentary movie (10 to 15 minutes maximum) featuring contemporary adventures along America’s first National Geologic Trail. The trail covers an abstract event for most people, and a film is one of the best ways to tell the big story of what happened across four states in a consistent manner and in a way that will build a foundation for visitors when they go out on the trail. Include a series of professionally developed visual simulations that show the changes that occurred on a large scale across the entire trail and also for each of the key hubs and trail sites. Elements of this documentary can be delivered in a range of other electronic formats. This movie can be used in a variety of settings along the trail and also as a part of the trail’s media/ publicity materials, pre-visit educational package, and traveling trunks.
- Consider installing audio listening posts whenever new waysides are installed. Newer versions of these sturdy, unobtrusive devices are solar-powered, inexpensive, and low-maintenance; used creatively (with “live” quotes, sound effects, and quality narration), they provide an extra layer of interpretation for all visitors while also meeting ADA requirements.
- Streamline the trail social media presence, focusing on those that generate the most engagement with targeted audiences for the time expended; eliminate those that are too difficult or time-consuming for low-level results.

(2) Wayside Exhibits

Long-range recommendations for waysides (see Section 4) include the following new signs requiring roadside pull-out construction:

- Frenchman Coulee/the Feathers (new roadside pull-out, new signs)
- Wallula Gap (new roadside pull-out, new signs)
- Crescent Bar Overlook/Quincy, WA (paved roadside pull-out, new signs)

Sites needing trail information added to existing outdoor interpretation include:

- Gingko Petrified Forest State Park
- Lyons Ferry State Park
- Palouse Falls State Park
- Sacajawea State Park
- Yakima Sportsman State Park

With regard to the above lists, funding and cost-efficiency will inevitably affect the timing of installations; ultimately, however, following this plan will enable the trail to provide engaging and consistent wayside interpretation from beginning to end. In addition to these sites, trail partners may wish to add signs in other, more outlying locations. Trail staff should work with these partners as needed to provide guidance on wayside standards and interpretive content.

(3) Other Outdoor Exhibits

- Explore opportunities to create interpretive playscapes that introduce younger visitors to features of the Ice Age floods. A playscape experience could also be integrated into Junior Ranger programs for younger children.
- Explore ways to use trail traveling trunks or simple outdoor activities such as a hose and sand on-site at trail hubs.

(4) Interior Exhibits

- Refresh/replace traveling temporary exhibits as needed.
- Assist partners in refreshing existing exhibits or developing new trail-focused segments as needed.

LONG-RANGE FOCUS SIX: Funding and Capacity Building

Funding and capacity-building must remain top priorities for trail leadership.

- Introduce fundraising partners to partners across the length of the trail. The trail fundraising group should be presented not as a competitor, but as an additional resource for the trail.
 - Consider providing training aimed to help trail supporters seek and prepare grant proposals for trail interpretation needs.
- Develop a transparent, simple system for evaluating and awarding funds through the trail's fundraising group.
- Continue working with the Ice Age Floods Institute to support its organizational structure and capacity for trailwide interpretive services.

Other Recommendations

In addition to the grouping of recommendations in three-year intervals, this Long-range Interpretive Plan recognizes other needs to be provided by other NPS units and partners in support of trail interpretation. These activities should continue through the life of the plan and beyond.

Research Needs in Support of Interpretation

- Work with the regional bookstore cooperating association (Discover Your Northwest) and private vendors to develop a "scope of sales" for desirable books and other interpretive materials to sell at partners' retail outlets along the trail.
- Update the comprehensive inventory of floods features begun as part of the 2001 Jones report and maintain this database as part of the trail's collections.
- Work with the Interagency Technical

Committee and the Geologic Resources and Research working group to compile and maintain a comprehensive database of original research on Ice Age floods held in universities and other institutions around the world. This trail database should include locations of existing LIDAR and maps, aerial images, digital elevation models (DEMS), satellite imagery, a bibliography of published and unpublished (i.e., theses and dissertations) scholarly research, and special collections pertaining to the floods or the trail. Notably, these collections include:

- The papers of the Ice Age Floods Institute at Eastern Washington University in Cheney, WA.
- The papers of J. Harlan Bretz at the University of Chicago.
- The papers of Joseph T. Pardee, presented to the Montana Natural History Center in 2015.
- Consider co-sponsoring a conference (perhaps rotating among state universities) every ten years to highlight new/contemporary research on the Ice Age floods, with the first conference to be held in 2019, the tenth anniversary of the creation of the trail.
- Begin collecting oral histories (preferably audio or video recordings) of individuals and groups associated with the founding of the trail. These histories will be invaluable later for uses such as a trail administrative history, new exhibits and web programs, etc.
 - Interviewees might include numerous members of the Ice Age Floods Institute, academics, and agency personnel active in the trail's formation.
 - An Institute member is already at work on oral histories for the organization.

- Interviewees might also include tribal elders willing to share their tribes' stories about giant floods.

Archival and Artifact Needs in Support of Interpretation

- Contract with the archivist team at Nez Perce National Historical Park to catalog and archive relevant materials associated with the establishment of Ice Age Floods National Geologic Trail.
- Contract with the archivist team at Nez Perce NHP to create and maintain an interpretive media reference library to be available to all trail partners for developing interpretive materials. Suggested collections include:
 - Photographic resources: historic, site-specific flood features, events. Wherever possible, photographs should high-resolution, public domain images that can be used at no charge. Copyrighted photographs should be clearly identified with instructions for obtaining permissions.
 - Audio resources: oral histories, broadcast media, podcasts, recorded lectures
 - Video and film resources: archival quality DVD copies of all known professional television documentaries about the floods, partner-produced videos, computer-generated imaging (CGI) depicting the floods, etc.
 - Print resources: trail logos, reproductions of historic documents, large-format maps

Recommendations, Themes, and Visitor Experience Goals Matrix

This table provides examples for how the plan’s recommendations address the various interpretive themes and visitor experience goals for Ice Age Floods National Geologic Trail. More specific descriptions of the interpretive themes and visitor experience goals can be found in Section 1: Foundation for Planning.

Items in red indicate recommendations that should be specifically structured to

provide quality experiences for people with disabilities.

Items in blue indicate recommendations that should provide experiences through other languages in addition to English.

Italicized items refer to projects for which partners can take the lead.

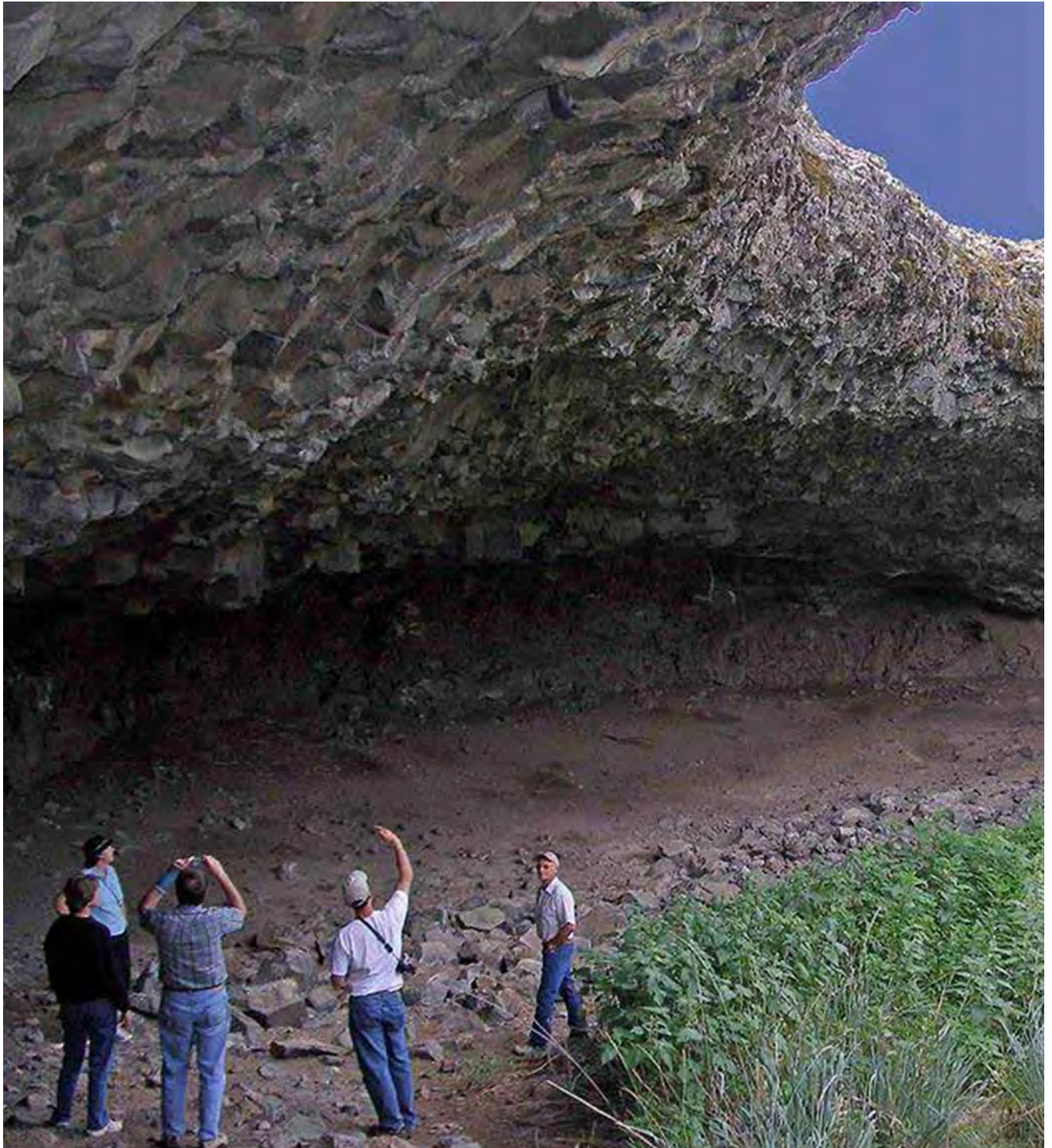
	Theme Titles				
	Geologic Setting	Cataclysmic versus Incremental	Evidence That Remains	In Search of Truth	Lives and Livelihoods
	Introduce Junior Rangers	<i>Expand Interior Exhibits</i>	Start the Wayside Exhibit Plan	Train Interpreters about the Trail	<i>“Open the Gateways” to the Trail</i>
	<i>Offer Short Programs at every hub</i>	<i>Special Events</i>	<i>Engage Youth Groups</i>	Increase Staffing	Train Other Visitor Contact Personnel about the Trail
	<i>Expand Tours from every trail hub</i>	<i>Other Outdoor Exhibits</i>	<i>Develop Youth Oriented Programs</i>	Personal Services and Visitor Engagement	<i>Funding and Capacity Building</i>

	Theme Titles				
	Geologic Setting	Cataclysmic versus Incremental	Evidence That Remains	In Search of Truth	Lives and Livelihoods
	Brand the Trail	Produce Essential Publications	Define and Map the Trail	<i>Deliver Fact Sheets</i>	<i>Expand Interior Exhibits</i>
	Lay Groundwork for a Trail Education Program	<i>Expand Wayside Exhibits</i>	<i>Start a Photo Bank</i>	Develop an NPS Website	
	Build an Educational Program			<i>Expand Print Publications</i>	

	Theme Titles				
	Geologic Setting	Cataclysmic versus Incremental	Evidence That Remains	In Search of Truth	Lives and Livelihoods
		<i>Expand Audiovisual/Web Materials</i>		<i>Seek Visitors' Opinions</i>	<i>Explore Starting a Friends Group or Foundation</i>

	Theme Titles				
	Geologic Setting	Cataclysmic versus Incremental	Evidence That Remains	In Search of Truth	Lives and Livelihoods
	Join the Partnership for the National Trails System		<i>Go Digital</i>	Choose Trail Hubs	<i>Enable More Partner-to-Partner Communication</i>
				<i>Continue Social Media</i>	<i>Support Capacity Building for the Ice Age Floods Institute</i>
					<i>Log Volunteer Hours</i>

Opposite: Trail explorers stand beneath a huge overhang as they investigate the floor of a pothole carved by Ice Age floods. *Photo:* Bruce Bjornstad



Education Plan

Section 3: Education Plan

Ice Age Floods National Geologic Trail offers a remarkable range of opportunities for curriculum-based educational programming, especially in “STEAM” fields of science, technology, engineering, art, and mathematics. College-level geology and other earth sciences departments have long used trail routes and sites as field study destinations across the region.

With assistance from trail interpreters, education specialists, and volunteers, thousands of K-12 students in Montana, Idaho, Washington, and Oregon – and indeed, around the world – can explore and learn from the trail.

This plan offers the following strategies to make consistent, high-quality curriculum-based programming to aid teachers and school systems in tapping into the trail’s resources.

- Short-range recommendations can begin immediately, with leadership from the NPS education specialist currently assigned to Ice Age Floods National Geologic Trail (a position currently shared, like the trail’s chief of interpretation, with similar duties for Lake Roosevelt National Recreation Area).
- Mid-range recommendations are proposed for implementation after the trail acquires additional staffing, specifically a full-time NPS educational specialist.
- Long-term recommendations are proposed for implementation after Ice Age Floods National Geologic Trail acquires appropriate staffing.

EDUCATION RECOMMENDATIONS: Short-range

(1) Build Awareness.

In creating a trailwide educational program, trail leaders must first gain recognition for

the trail as a vital educational resource within communities and schools along its routes.

- Prepare short fact sheets describing the Ice Age floods and Ice Age Floods National Geologic Trail and linking its themes to K-12 learning goals and educational standards, specifically (1) the Next Generation Science Standards (www.nextgenscience.org) used nationally by a majority of K-12 teachers of the sciences, and (2) the inquiry-based learning standards reflected in the Common Core State Standards Initiative (www.corestandards.org).
 - Distribute these fact sheets widely via electronic media, printed flyers/handouts, and presentations in communities and schools.
 - This information should also include a link to the NPS national website for teachers (www.nps.gov/teachers).
- Introduce Ice Age Floods National Geologic Trail and its educational potential at state teacher conferences across all four states.
- Begin an online networking forum for educators interested in Ice Age floods and the trail.
- Establish a multi-state advisory committee of partners and educators who can help plan, advise, and review curriculum development.
- Explore the expanding universe of online science education tools and curricula to determine potential uses with Ice Age floods curricula. Among these are Foss Science Kits (www.fossweb.com), a project of the University of California/ Berkeley,

and classroom activities and curriculum materials from the National Nanotechnology Infrastructure Network (www.nnin.org), a consortium of 14 universities.

(2) Review Existing Curricula. •

Review existing curriculum-based educational programs on the Ice Age floods, as developed by the Cheney-Spokane chapter of the Ice Age Floods Institute, the REACH, Washington State Parks, and other entities.

- Share best practices, user data, student and teacher evaluations, and other information as appropriate.

(3) Seek Funding for the Future

- Begin seeking funding for a full-time education specialist for Ice Age Floods National Geologic Trail. Given the trail's vast terrain, complex science, and multistate school systems, a dedicated education specialist is necessary to guide and develop long-term educational programming.
- Explore options for grants to assist in developing educational programming, materials, curricula, and school bus/site visit funding.

EDUCATIONAL RECOMMENDATIONS: Mid-term

(1) Hire and Train Educational Personnel

- Hire an NPS education specialist devoted exclusively to Ice Age Floods National Geologic Trail.
- Introduce an annual training workshop (perhaps conducted online) for interpreters and volunteers charged with delivering on-site programs for youth and K-12 educational groups.

(2) Promote New Curricula.

- Produce and distribute NPS-style site bulletins on the trail at four grade

levels: K-2, 3-5, middle , and high school.

- Arrange for trail interpreters and volunteers to visit classrooms across the region to introduce the trail and available curricula.

(3) Develop Curriculum for Middle School (Grades 6-8)

- Develop an Ice Age floods curriculum based on Next Generation Science Standards for the middle school grade levels. This curriculum should be designed to span several weeks of classroom study incorporating hands-on, inquiry-based activities, interactive components using online mapping tools such as ArcGIS (www.arcgis.com) or Google Earth, guest presentations by trail/park staff or Ice Age Floods Institute volunteers when possible, and a culminating day-long or multi-day visit to an Ice Age Floods National Geologic Trail site.
- Make all aspects of the curriculum available online, including downloading materials, scheduling guest speakers, and making reservations to bring classroom groups/buses to preferred trail sites.
- Wherever possible, the curriculum should use creative approaches such as puzzles, trailblazing, orienteering, geocaching, outdoor activities with a water hose and sand, etc.
- Work with partners across the four-state area to develop and stock "traveling trunks" for local check-out to be used to support the curriculum.

(4) Develop Curriculum for K-2.

- Develop an Ice Age floods curriculum based on Next Generation Science Standards for grade levels K-2. This curriculum, geared for young readers and pre-readers, should focus on age-appropriate hands-on activities and

interactive components, perhaps including music, art, dance, or playacting; guest presentations by trail/park staff or Ice Age Floods Institute volunteers when possible; and a culminating day trip to an Ice Age Floods National Geologic Trail site.

- Make all aspects of the curriculum available online, including downloading materials, scheduling guest speakers, and making reservations to bring classroom groups/buses to the preferred trail sites.
- Work with partners across the four-state area to develop and stock “traveling trunks” for local check-out to be used to support the curriculum.

EDUCATIONAL RECOMMENDATIONS: Long-term

(1) Continue Educational Training.

- Develop a short online teacher workshop to aid teachers in using the existing curricula and trail resources.
- Expand the reach/enrollment in training workshops for interpreters and volunteers delivering on-site programs for youth and K-12 educational groups.

(2) Develop Curriculum for Elementary School (Grades 3-5)

- Develop an Ice Age floods curriculum based on Next Generation Science Standards for students in grades 3 through 5. This curriculum should be designed to span several weeks of classroom study incorporating hands-on, inquiry-based activities, interactive components using online mapping tools such as ArcGIS (www.arcgis.com) or Google Earth, guest presentations by trail/park staff or Ice Age Floods Institute volunteers when possible, and a day- or multi-day visit to an Ice Age Floods National Geologic Trail site.

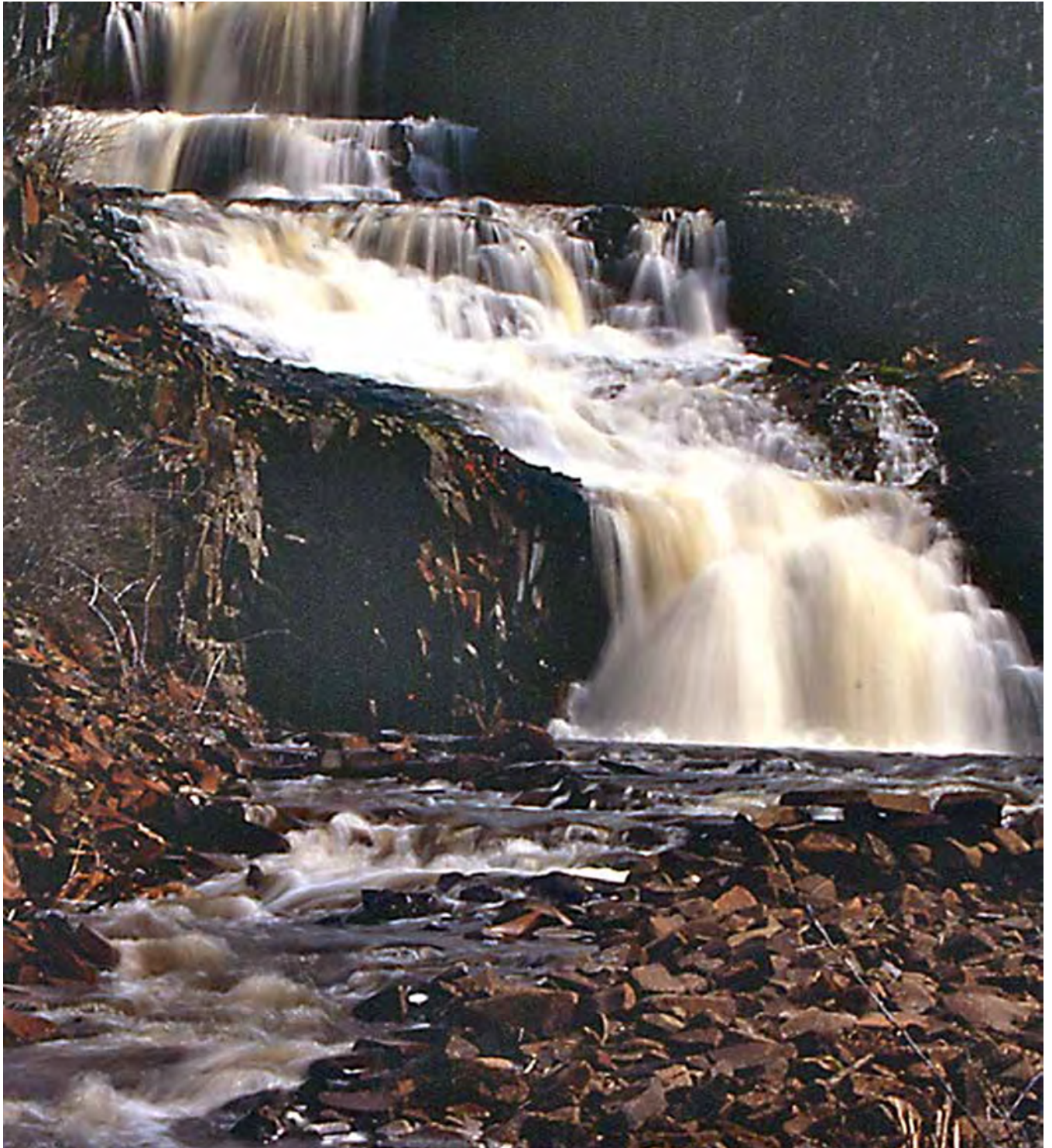
- Make all aspects of the curriculum available online, including downloading materials, scheduling guest speakers, and making reservations to bring classroom groups/buses to the preferred trail sites.
- Wherever possible, the curriculum should use creative approaches such as puzzles, trailblazing, orienteering, geocaching, outdoor activities with a water hose and sand, etc.

(3) Develop Curriculum for High School (Grades 9-12)

- Develop an Ice Age floods curriculum based on Next Generation Science Standards for high school students. This curriculum should be designed to span several weeks of classroom study incorporating hands-on, inquiry-based activities, interactive components using online mapping tools such as ArcGIS (www.arcgis.com) or Google Earth, guest presentations by trail/park staff or Ice Age Floods Institute volunteers when possible, and a culminating day-long or multi-day visit to an Ice Age Floods National Geologic Trail site.
- Make all aspects of the curriculum available online, including downloading materials, scheduling guest speakers, and making reservations to bring classroom groups/buses to the preferred trail sites.
- Integrate contemporary online tools from sources such as the Full Option Science System (www.fossweb.com) and the National Nanotechnology Infrastructure Network (www.nnin.org) to supplement and expand trail curricula.

Opposite: Hog Canyon Falls is a lesser-known waterfall along the floods route. Find it on BLM-managed public land about 30 miles southwest of Spokane.

Photo: Eugene Kiver/IAFI



Wayside Exhibits



A striking basalt formation called Twin Sisters gets its name from a Cayuse legend. These giant pillars tower above the Columbia River at Wallula Gap, just off a busy highway.
Photo: Williamborg/Creative Commons.

Section 4: Wayside Exhibits

Reliable interpretation can greatly enhance visitors' experiences as they explore Ice Age Floods National Geologic Trail. Wayside interpretive signs – lowtech, long-lasting, and always available – continue to be one of the best ways to provide accurate, consistent interpretation, especially in areas where digital or personal (ranger/volunteer) services are impractical. Low-profile interpretive signs are typically designed and positioned so that visitors can gaze out over the sign to the landscape being described. Ideally, their placement on roadside pullouts or park vistas does not intrude upon the natural landscape.

Partners have installed a variety of wayside interpretive signs across the four-state trail route. Some of these signs provide excellent interpretation of various aspects of the Ice Age floods. For example, Washington State Parks has sets of relatively recent, well-designed Ice Age floods-related signs installed at many state parks within the floods pathways. Among the multi-site signs are these:

- Explore Massive Floodscapes!
- Overwhelming Proof for an “Outrageous” Theory
- In the Path of Cataclysmic Floods

However, because these signs were created before the trail was authorized, none includes specific information about the routes that make up Ice Age Floods National Geologic Trail.

Washington State Parks has anticipated the need for inclusion of the official map on existing waysides. Once the official map is approved, a wayside exhibit

update will provide visitors with trailwide and regional wayfinding elements.

Therefore, this wayside plan addresses the need for both updated and/or additional signs to provide visitors with specific information and interpretation about Ice Age Floods National Geologic Trail.

The following points apply to all future wayside signs for the trail:

- Wayside signs should be designed and placed so as to meet ADA standards for accessibility. (See www.nps.gov/hfc/accessibility.)
- For durability and excellent graphics, the vast majority of outdoor wayside interpretive signs for NPS sites, state parks, and other public lands are manufactured in either porcelain enamel or phenolic resin, also known as highpressure laminate or HPL. Most installations are mounted (with or without frames) on aluminum posts.
- The total cost of wayside signs typically ranges from \$3000 to \$5500 per sign, including creative services (research, writing, graphic design, images or illustrations), sign fabrication and posts, and shipping.

- Wayside signs are most effective with high-quality, interesting images and short text that is non-technical and easy to read. For an excellent guide to creating wayside interpretive signs, see the Anza Trail Wayside Exhibit Style Guide prepared for Juan Bautista de Anza National Historic Trail partners at www.nps.gov/juba/learn/management/upload/JUBA-WaysideStyle-Guide-2014.pdf.
- Consideration should also be given to installation of audio listening posts at high-use locations to provide another layer of accessibility to trail information.

Small, vertical audio listening posts emblazoned with the trail logo (and perhaps an embedded link) could expand accessibility for non-readers and people with visual impairments and also offer the option of web links translating into different languages.

This plan proposes a hierarchy of wayside signs with a consistent design template and two levels of information, preferably conveyed in two separate, paired signs: (1) a trail overview with the master map, and (2) interpretive details about flood features or concepts relevant to the specific site.



Where's the trail? Travelers along the west wall of the Grand Coulee had a rough ride in the 1890s.
Photo by U.S. Geological Survey, Bulletin 108, 1893.

Interpretive Waysides Recommendations

** Locations where audio listening posts might be added.

Short-Range/High Priority		Topics	Theme	Status/Priority	Land Owner
1	Bitterroot National Forest/ Lake Como Near Hamilton, MT	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map Extent and depth of Glacial Lake Missoula 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains 	<p>New signs Priority: High</p> <p>Trail spur near gateway community</p>	USDA Forest Service
2	Montana Natural History Center, Missoula, MT	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map Glacial Lake Missoula/ visible strand lines Bretz and Pardee (papers archived at MNHC) 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth 	<p>New signs/Trail Hub Priority: High**</p>	Montana Natural History Center
3	Camas Prairie (Hwy 200/382), near Perma, Sanders County, MT	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map Giant current ripples 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth 	<p>Add trail info to existing interpretation Priority: High</p>	Sanders County, Montana DOT
4	Sandpoint, ID	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map Details about the ice dam that formed near here 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains 	<p>New signs Priority: High</p> <p>Trail spur near gateway community</p>	City of Sandpoint
5	Lake Pend Oreille, ID	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map Details about the ice dam that formed near here; formation of Lake Pend Oreille as a result of Ice Age floods 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains 	<p>Priority: High</p> <p>Replace existing old-style sign</p>	Idaho State Parks or City of Sandpoint

6	Farragut State Park, ID	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map Features showing evidence of ice dam 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth 	Add trail info to existing interpretation Priority: High** Trail Hub	Idaho State Parks
7	Turnbull National Wildlife Refuge, near Spokane, WA	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	New signs/Trail Hub Priority: High**	US Fish & Wildlife Service
8	Centennial Trail State Park	<ul style="list-style-type: none"> Overview of trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	Add trail info to existing sign set Priority: High	Washington State Parks
9	Grand Coulee Dam Visitor Center, WA	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains 	Priority: High** Add trail info to existing interpretation; Trail Hub	U.S. Bureau of Reclamation
10	Bridgeport State Park, WA	<ul style="list-style-type: none"> Overview of trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	Add trail info to existing sign set Priority: High	Washington State Parks
11	Lincoln Rock State Park, WA	<ul style="list-style-type: none"> Overview of trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	Add trail info to existing sign set Priority: High	Washington State Parks
12	Steamboat Rock State Park	<ul style="list-style-type: none"> Overview of trail with map 	<ul style="list-style-type: none"> Geologic Setting Evidence That Remains 	Add trail info to existing sign set Priority: High	Washington State Parks

13	Sun Lake-Dry Falls State Park	<ul style="list-style-type: none"> Overview of trail with map 	<ul style="list-style-type: none"> Geologic Setting Evidence That Remains 	Add trail info to existing sign set Priority: High; Trail Hub**	Washington State Parks
14	Ginkgo Petrified Forest State Park	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Evidence That Remains 	Add trail info to existing interpretation Priority: High	Washington State Parks
15	Columbia Plateau Trail State Park	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	Add trail info to existing interpretation Priority: High	Washington State Parks
16	Palouse Falls State Park	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains 	Add trail info to existing interpretation Priority: High	Washington State Parks
17	Yakima Sportsman State Park	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains 	Add trail info to existing interpretation Priority: High	Washington State Parks
18	Hanford Reach Interpretive Center (The REACH), Richland, WA	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	New signs/Trail Hub Priority: High	The REACH
19	Maryhill State Park, WA	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	Add trail info to existing interpretation Priority: High	Washington State Parks

20	Columbia Hills State Park, WA	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	Add trail info to existing interpretation Priority: High	Washington State Parks
21	Columbia Gorge Discovery Center, The Dalles, WA	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	Add trail info/ exterior signs to existing interpretation Priority: High; Trail Hub	Columbia Gorge Discovery Center
22	Beacon Rock State Park, WA	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	Add trail info to existing interpretation Priority: High	Washington State Parks
23	Portland Women's Forum, Crown Point, OR	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	New signs/Trail Hub (shared with Vista House) Priority: High	Oregon State Parks
24	Lewis & Clark Interpretive Center, Cape Disappointment State Park, near Ilwaco, WA	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map This site as trail's end Floods' impact under the ocean beyond today's coastline 	<ul style="list-style-type: none"> Geologic setting Evidence that Remains 	New signs/Trail Hub Priority: High	Washington State Parks

Mid-Range Priority

	Location	Topics	Theme	Status/Priority	Land Owner
1	National Bison Range, Flathead Indian Reservation near Polson, MT	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains 	Add trail info to existing interpretation Priority: Mid-range	US Fish & Wildlife Service
2	Cabinet Gorge Dam near Lake Pend Oreille, ID	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map Details about the ice dam that formed near here 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains 	Add trail info to existing interpretation Priority: Mid-range	Avista Power
3	Coeur d'Alene Parkway, ID	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map Interpretation of Lake Coeur d'Alene's formation during the Ice Age Floods 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains 	New signs Priority: Mid-range	Idaho State Parks
4	Lewiston, ID	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth 	Priority: Mid-range; Hub and Gateway Community	City of Lewiston
5	Riverfront, Spokane, WA	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map Overview of how floods shaped landscapes in Washington and Oregon (wine country, coulees, gorge, exposed basalt, etc.) 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for Truth Lives and Livelihoods 	Priority: Mid-range** Hub and Gateway Community	City of Spokane
6	Fort Spokane Visitor Center, Lake Roosevelt National Recreation Area, WA	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	Add trail info to existing interpretation Priority: Mid-range**	NPS

7	Sun Lake-Dry Falls Interpretive Center, WA	<ul style="list-style-type: none"> Overview of Ice Age Floods, trail map, and discussion of how the floods left the present-day "dry falls" 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth 	New waysides to complement the new interpretive center Priority: Mid-range (depending on Interpretive Center construction)	Washington State Parks
8	Drumheller Channels, Columbia National Wildlife Refuge, WA	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map Butte-and-basin channeled scablands 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth 	Add trail info to existing interpretation Priority: Mid-range	US Fish & Wildlife Service
9	West Bar Overlook, Crescent Bar Rd. Quincy, WA	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map Giant current ripples Bretz and Pardee 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth 	New signs Priority: Mid-range	City of Quincy
10	Lyons Ferry State Park	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map Columbia River Gorge and the floods (for cruise ship travelers) 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	Add trail info to existing interpretation Priority: Mid-range	Washington State Parks
11	Badger Mountain	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map Mountaintop as highest reach of Glacial Lake Lewis 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains 	Add trail info to existing interpretation Priority: Mid-range	Friends of Badger Mountain
12	Hanford Reach National Monument, Richland, WA	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map Rhythmites at White Bluffs 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	Add trail info to existing interpretation Priority: Mid-range	US Fish & Wildlife Service
13	Riverside State Park	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	New signs Priority: Mid-range	Washington State Parks

14	Sacajawea State Park, Tri-Cities area, WA	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	New signs Priority: Mid-range	Washington State Parks
15	Pendleton, OR	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	Priority: Mid-range Hub and Gateway Community	City of Pendleton, OR
16	Columbia Gorge Interpretive Center, OR	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	Add trail info/ exterior signs to existing interpretation Priority: Mid-range	Columbia Gorge Interpretive Center
17	Bonneville Dam	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	Add trail info to existing interpretation Priority: Mid-range	U.S. Army Corps of Engineers
18	Erratic Rock State Natural Site (the Bellevue Erratic), Sheridan, OR	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map Definition of erratics Story of the Bellevue Erratic 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains 	Add trail info to existing interpretation Priority: Mid-range	Oregon State Parks
19	Mt. Spokane State Park	<ul style="list-style-type: none"> Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> Geologic Setting Cataclysmic vs Incremental Evidence That Remains Search for the Truth Lives and Livelihoods 	New signs Priority: Mid-range	Washington State Parks

Long-Range Priority		Topics	Theme	Status/Priority	Land Owner
	Location				
1	Ephrata Fan, near Ephrata, WA	<ul style="list-style-type: none"> • Overview of Ice Age Floods and the trail with map • Erratics and boulder field 	<ul style="list-style-type: none"> • Geologic Setting • Evidence That Remains 	New signs Priority: Long-range	Private
2	Frenchman Coulee/The Feathers	<ul style="list-style-type: none"> • Overview of Ice Age Floods and the trail with map • Explanation of coulees and exposed basalt columns called "The Feathers" 	<ul style="list-style-type: none"> • Geologic Setting • Cataclysmic vs Incremental Evidence That Remains 	Site requires roadside pull-out and access improvements. Priority: Long-range	Multiple jurisdictions
3	Wallula Gap	<ul style="list-style-type: none"> • Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> • Geologic Setting • Cataclysmic vs Incremental Evidence That Remains • Search for the Truth • Lives and Livelihoods 	New signs Priority: Long-range Best view via hiking; roadway needs upgraded pull-off.	Walla Walla and Benton counties, federal, private
4	Whitman Mission National Historic Site, Walla Walla, WA	<ul style="list-style-type: none"> • Overview of Ice Age Floods and the trail with map 	<ul style="list-style-type: none"> • Geologic Setting • Cataclysmic vs Incremental Evidence That Remains • Search for the Truth • Lives and Livelihoods 	New signs Priority: Long-range	NPS
5	Field's Bridge Park, Tualatin, OR	<ul style="list-style-type: none"> • Overview of the trail with map 	<ul style="list-style-type: none"> • Geologic Setting • Cataclysmic vs Incremental Evidence That Remains • Search for the Truth • Lives and Livelihoods 	Add trail info to existing interpretation Priority: Long-range	City of West Linn, OR

Notes:

For comparison, the following is the prioritized list from the 2006 Washington State Parks interpretive plan for the Ice Age floods. Several samples of the Ice Age floods-related wayside signs resulting from the 2006 plan are shown on the following pages. The modular, multiple-use approach adopted by Washington State Parks is a good model for future signs interpreting the trail across many far-flung locations. The trail team will need to determine how best to integrate the NPS and National Trail logos with the symbols of the host sites. Park sites highlighted in red below have existing Ice Age floods waysides already; map updates can be done when available.

<p><i>Highest Priority</i></p> <ul style="list-style-type: none"> • Dry Falls Interpretive Center • Sun Lakes State Park • Steamboat Rock State Park • Palouse Falls State Park • Ginkgo Petrified Forest State Park • Columbia Hills State Park • Beacon Rock State Park 	<p><i>Moderate Priority</i></p> <ul style="list-style-type: none"> • Wenatchee Confluence State Park • Riverside State Park • Frenchman Coulee • Crown Point State Heritage Area • Cape Disappointment State Park • Columbia Plateau Trail State Park • Lincoln Rock State Park • Wanapum Recreation Area • Lyons Ferry State Park 	<p><i>Low Priority</i></p> <ul style="list-style-type: none"> • Bridgeport State Park • Centennial Trail State Park • Daroga State Park • Lake Lenore Caves • Maryhill State Park • Mount Spokane State Park • Potholes State Park • Sacajawea State Park • Yakima Sportsman State Park
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Signs interpreting the Ice Age floods vary widely across the four-state region. This imaginative example appears in a plaza outside the Oregon Museum of Science (OMSI) in Portland. Photo: Rick Thompson/IAFL

Interpretive Wayside Examples from Washington State Parks



IN THE PATH OF CATAclySMIC FLOODS

You are standing in the pathway of some of the largest floods ever known. They carved steep-walled canyons, sculpted immense waterfalls, and left behind landscapes found nowhere else on earth.

Massive Glacial Dams and Lakes

During the last Ice Age, a lobe of ice at least a halfmile high blocked the Clark Fork River in Idaho, creating an enormous lake called Glacial Lake Missoula. This ice dam failed - over and over - sending billions of tons of water rampaging across the land.

Raging Journey to the Pacific

The thundering torrent of water, icebergs, and mud raced at speeds up to 60 mph, stripping away tons of soil and rock. The floodwaters raged across eastern Washington, through the Columbia River Gorge, and to the ocean.

How Many Floods Were There?

No one knows for sure, but geologists discovered evidence that the Lake Missoula and other glacial lakes filled and emptied many times during the last Ice Age.

(Photo Caption)

At times, the ice dam was more than two miles wide and 30 miles long.

(Photo Caption)

Pressure from rising water caused the ice dam to leak and crack. Over time, water began pouring from large fractures beneath the surface, eroding the dam from below until it suddenly failed.

(Photo Caption)

You can visit many of the remarkable features created by the Ice Age floods, including Dry Falls, Steamboat Rock, and Beacon Rock.



EXPLORE MASSIVE FLOODSCAPES

Raging Ice Age floodwaters carved spectacular features throughout eastern Washington, creating unique landscapes. Follow the path of the floods and discover more about this amazing story.

Path of Least Resistance

As floodwaters rushed across eastern Washington, they followed existing rivers and streams until they overwhelmed them. They then found their own way toward the ocean, going over or around large obstacles and carving new routes wherever they could.

Are You a Landscape Detective?

Landscape features provide us with many clues about the Ice Age floods. What do the shapes of the Palouse Hills across Highway 261 tell us?

(Photo Caption)

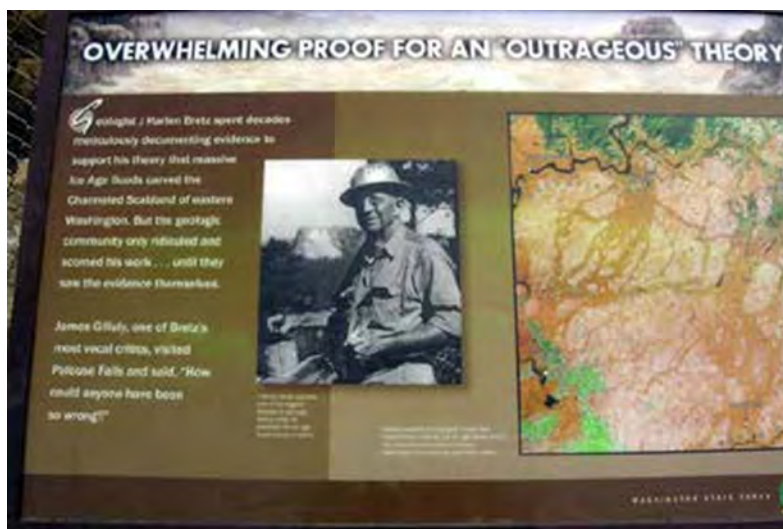
When temporary Lake Lewis pooled behind Wallula Gap, most of the Pasco Basin region, including the Tri-Cities and Sacajawea State Park, was under hundreds of feet of water.

(Photo Caption)

Lyons Ferry Park, located at the confluence of the Snake and Palouse rivers, provides opportunities to see more Ice Age floods features, including great view of Palouse River Canyon.

(Photo Caption)

These streamlined hills were sculpted by Ice Age floods. Although not obvious at ground level, their tear-drop shape points in the direction of the floodwaters.



OVERWHELMING PROOF FOR AN “OUTRAGEOUS” THEORY

Geologist J Harlen Bretz spent decades meticulously documenting evidence to support his theory that massive Ice Age floods carved the Channeled Scabland of eastern Washington. But the geologic community only ridiculed and scorned his work... until they saw the evidence themselves.

James Gilluly, one of Bretz’s most vocal critics, visited Palouse Falls and said, “How could anyone have been so wrong?”

(Photo Caption)

J Harlen Bretz sparked one of the biggest debates in geologic history when he proposed his Ice Age floods theory in 1923.

(Satellite Image Caption)

Modern satellite photography would have helped Bretz illustrate his Ice Age floods theory. The Channelized Scabland of eastern Washington can easily be seen from space.

Opposite: A coating of snow and ice only enhances the beauty (and the geology) of Palouse Falls. Photo: Lloyd Stoess/IAFI



Implementation Plan

Section 5: Implementation Plan

Short, Medium, and Long-term Implementation Guide

Implementing the recommendations in this Long-range Interpretive Plan will be a gradual process. Trail decision makers should review this implementation plan at least once a year to ensure it is in line with changing circumstances and funding opportunities. This implementation guide is designed to help the trail and trail partners set priorities and make concrete, measurable progress in building its interpretive and educational program over the next seven to ten years.

The chart below presents step-by-step sequences for each major focus and category of recommendations. Recommendations appear in three categories:

- 1) Short-range recommendations are proposed for action within the next three years.
- 2) Mid-range recommendations are proposed for action within the next four to six years.
- 3) Long-term recommendations are proposed for action within the next seven to ten years.

A fourth category of recommendations, listed last, addresses activities outside the interpretive and educational division to be carried on throughout the life of the plan.

The cost projection column provides a rough estimate of the projected costs of each recommendation. “Staff” denotes activities completed without outside expenditures. The symbol \$ estimates a moderate annual cost (under \$50,000); the \$\$ indicates annual expenditures estimated between \$50,000 and \$100,000; and the \$\$\$ indicates major expenditures, usually capital expenditures such as facilities remodeling, exhibit installations, visitor transportation vehicles, etc.

Chart One: Short-range Recommendations for Calendar years 2016, 2017, 2018

Action Item	Trail Team Members	Timing	Cost
Focus One: Defining the Trail			
Map It.			
Finalize a public, visitor-oriented map for the whole trail.	NPS, with approvals by Inter-agency Technical Committee and Institute	Launch by National Trails Day, June 2016	Staff
Create regional itinerary maps for use at hubs and online.	Local Institute chapters with assistance from NPS	2016	Staff
Choose Trail Hubs.	NPS and Interagency Technical Committee		
Seek buy-in from each proposed hub.	NPS and partner sites	Hubs may be chosen one- by-one over time.	Staff
Form liaison with designated staff member or volunteer.	NPS interpretive staff, designated individual	Ongoing	Staff
Assess interpretive materials needs at site.	NPS and hub interpreters	Ongoing	Staff
Announce/promote each site as trail hub.	NPS and hub management	Launch at least 4 hub sites in 2016	Staff
Open the Gateways.			
Reach out to gateway communities.	NPS and partners	Start when Fact Sheets are ready; ongoing	Staff

Focus Two: Partner-to-Partner Communication				
Enable More Partner-to-Partner Communication				
Start an informal, online interpreters' working group for networking and sharing ideas.	All partners	As soon as possible, building on momentum of the 2015 workshops	Free online discussion group	Staff
Explore ways to collaborate on high-dollar, high-impact interpretive projects.	All partners	As needed when new projects arise		Staff
Reassess the current "chapter versus trailwide" structure/focus of Ice Age Floods Institute.	Ice Age Floods Institute executive board and partners	2016-17	Volunteer hours only	
Brand the Trail.				
Complete, approve, and introduce the trail logo.	NPS and Interagency Technical Committee	Launch in 2016	N/A; underway	
Develop/compile guidelines for logo use.	NPS with help from NPS region and HFC	Launch in 2016	Staff	
Launch the logo to partners and the public on National Trails Day during the 7 th anniversary year of the trail.	NPS, partners	Launch in 2016	Events planning costs	
Make the logo available to state DOTs as part of trail transportation plan; continue to seek funding and state DOT commitments on signing the trail.	NPS management	Ongoing	Staff	
Keep partners informed of progress/milestones on this important matter.				
Deliver Fact Sheets				
Complete and distribute fact sheets with consistent information on the trail.	NPS and Interagency Technical Committee	Ongoing in 2016	Staff (USGS)	
Start a Photo Bank with All Rights				

Obtain professional feature-specific photographs that will be for full public use.	NPS, all partners	2016-17	\$ (\$1,000/day and up)
Explore/price aerial photos.	NPS, with advice from Institute and other partners	2016-17	\$
Seek rights to selected photos from Institute and/or other supporters.	NPS	Ongoing	Staff
Put collection online in high-resolution files for download.	NPS	Ongoing	Staff
Focus Three:			
Prioritizing Interpretive Media			
Launch the NPS.gov Website.			
Follow latest NPS web standards to develop a robust, rich site.	NPS	Launched in first quarter 2016	Staff
Link the NPS site to social media and partner sites.	NPS	Mid-2016	Staff
Add the trail to the National Trails System website.	NPS and Institute	2017-18	Staff and volunteers
Produce essential publications.			
Complete an NPS master site bulletin for the trail.	NPS with support/review from Institute and Interagency Technical Committee	Mid-2016	Staff
Create an NPS rack card.	NPS with support/review from Institute and Interagency Technical Committee	Creative working 2016; seek printing in 2017	Creative by HFC and IAFL staff; printing by HFC
Create an NPS unigrid brochure with map.	NPS with support/review from Institute and Interagency Technical Committee	Creative work in 2017; seek printing in 2018	Creative by HFC and IAFL staff; printing by HFC
Go Digital.			
Put all print publications on the website.	NPS	2016	Staff
Look into adding Institute contributions to the NPS website.	NPS and Institute	2016-17	Staff

Support development of trail app.	NPS and Eastern Washington University	2016	Seek grant and EWU funding
Continue Social Media.			
Get all partners to join in.	Everyone!	Now	Staff and volunteers
Develop a trail social media policy.	NPS	2016-17	Staff
Update trail entries all over the web.	Interagency Technical Committee and interns	Ongoing	Staff and volunteers
Start the Wayside Exhibit Plan.			
Consider sites with no interpretation at all first (although it may not be practical to produce in isolation).	Partners in consultation with NPS and Institute	2016-2019	~\$3500 to \$5500 per sign
Prioritize hub sites for adding outdoor trail information.	Partners in consultation with NPS and Institute	2016-2019	Staff
Expand Interior Exhibits.			
Create portable exhibits for community and event use.	NPS, Interagency Technical Committee	2017	\$
Integrate trail materials in forthcoming Farragut State Park exhibits.	Idaho State Parks, NPS	2016-17	\$
Discuss trail/Ice Age floods exhibits at OMSI in Portland	NPS, OMSI, Portland-area Institute members	2017	\$
Discuss trail/Ice Age floods exhibits at Museum of Natural and Cultural History in Eugene.	NPS, MNCH, Eugene-area Institute members	2017	\$
Focus Four: Building Capacity			
Train Interpreters.			
Launch an annual training workshop.	NPS, partners	2017	\$\$
Ask trained interpreters to share with their sites.	Partners	2017	\$
Encourage training through NAI, Eppley, and other sources.	Partners	Ongoing	\$
Participate in the 2017 National Trials Conference.	NPS, partners	2017	\$
Train Other Visitor Contact Personnel.			
Host tourism, hospitality, and service-sector event on sites.	All partners	2017	\$

Reach out to engage front-line staff in these industries.	All partners	2017	\$
Lay Groundwork for a Trail Education Program. (See Section 3)			
Build awareness of the trail as a resource for educators.	NPS, partners	2017	Staff
Review existing K-12 curricula about the floods and the trail.	NPS, partners	2017	Staff
Seek funding and staff for future programming.	All partners	2017	Staff
Support Capacity Building for the Ice Age Floods Institute			
Strengthen the main/central chapter for trailwide needs.	Institute	Ongoing	Staff, volunteers
Expand active volunteers.	NPS, Institute	Ongoing	Staff, volunteers
Ensure chain of succession.	NPS, Institute	Ongoing	Staff, volunteers
Clarify sharing and copyrights.	NPS, Institute	Ongoing	Staff, volunteers
Provide technological bandwidth for online repository.	NPS	Ongoing	Staff, volunteers
Inform Institute of specific trail needs.	All partners	Ongoing	Staff, volunteers
Develop additional funding resources.	Institute	Ongoing	Staff, volunteers
Focus Five: Funding			
Explore starting a Friends group or trail foundation.	All partners	Ongoing	Staff
Log volunteer hours.	All partners with volunteers; Institute	Ongoing	N/A
Join the Partnership for the National Trails System.	NPS	After trail is signed with DOT signs	\$

Chart Two: Mid-range Recommendations for Calendar years 2019, 2020, and 2021

Focus One:			
Youth and Educational Programming			
Build an Education Program.			
Hire and train educational personnel.	All appropriate partners	2019	\$\$
Promote new Next Generation Science Standards-based curricula.	NPS, partners, teachers committee	Ongoing	\$
Develop curricula for middle school.	NPS, teachers committee	2020	\$
Develop curricula for K-2.	NPS, teachers committee	2021	\$
Introduce Junior Rangers.			
Collaborate among partners to create Junior Ranger activities for different sites, using online, downloadable materials.	NPS and partners	Launch the Junior Ranger program on multiple sites on Junior Ranger Day during National Park Week in April.	Staff; possible outside design and printing costs
Engage Youth Groups.			
Reach out to community youth groups: Girl and Boy Scouts, etc.	All partners	Ongoing	Staff
Develop day hikes, weekend overnights, etc., preferably as annual events that become established in communities.	All partners	Ongoing	Staff
Consider youth or families units within the Institute.	Institute	Ongoing	Staff
Develop Youth-Oriented Programs			
Introduce geocaching.	All partners	Ongoing	Staff
Introduce scavenger hunts, etc.	All partners	Ongoing	Staff
Create traveling trunks for sites.	All partners	Ongoing	\$
Focus Two: Personal Services and Visitor Engagement			
Offer Short Programs.			

Develop at least two short alternating programs per hub.	Partners at individual sites	Ongoing	Staff
Develop pocket programs for roving.	NPS and partners	Ongoing	Staff
Expand Tours			
Continue day tours.	Partners, Institute volunteers	Ongoing	Staff, Volunteers
Launch new tours in new areas.	Partners, Institute volunteers	2019	Staff, Volunteers
Engage recreationists in tours in areas of interest, such as bicycling, horseback riding, climbing, boating.	Partners, Institute volunteers; possibly tourism operators or concessionaires	Ongoing	Staff, Volunteers Possibly \$\$
Continue Training			
Offer training for new staff and refresher courses for experienced staff	All partners	Ongoing	Staff
Seek Visitors' Opinions.			
Develop methods to solicit/accommodate visitor input on site and during tours.	All partners	Ongoing	Staff
Focus Three: Staffing			
Seek funds for adding an education specialist for the trail.	NPS	2019	\$\$
Seek funds for adding a management assistant.	NPS	2019	\$
Continue to seek funding and recruit seasonal employees, interns, and other temporary positions.	NPS and partners	Ongoing	\$\$
Focus Four: Expanding Interpretive Media			
Print Publications			
Distribute the NPS unigrid brochure to key locations.	NPS and partners	Ongoing	Staff
Distribute NPS rack cards widely throughout the region.	NPS and partners	Ongoing	Staff

Audiovisual/Web Materials				
Create self-guided audio tours/itineraries for download.	Partners, Institute volunteers	2019		\$
Maintain the NPS website well and keep it up to date.	NPS	Ongoing		Staff
Use social media to promote the trail and drive traffic to the main website.	All partners	Ongoing		Staff
Assess the abundance of visual media about the trail with consideration of rights and usage.	NPS and partners	Ongoing		Staff
Consider creating additional travel apps.	NPS and partners	2019		\$\$
Wayside Exhibits (See Section 4)				
Add to wayside installations as funds become available.	Partners	Ongoing		\$\$
Interior Exhibits				
Develop exhibits as needed for gateway communities.	Partners	Ongoing		\$\$
Update hub sites' exhibits to incorporate the trail.	Partners	Ongoing		\$\$
Prepare trail panels for use in existing exhibits.	Partners	Ongoing		\$\$
Collaborate on future exhibits to incorporate information about the trail.	All partners	Ongoing		Staff
Focus Five: Special Events				
Celebrate the trail's 10 th birthday.	All partners	Ongoing		Staff
Celebrate the Ice Age Floods Institute's 25 th birthday.	Institute	Ongoing		Staff
Look for other opportunities for special events to gain visibility for the trail.	All partners	Ongoing		Staff
Focus Six: Funding and Capacity Building				
Keep the spotlight on these concerns throughout the lifetime of the plan.	NPS and partners	Ongoing		Staff

Chart Three: Long-range Recommendations for Calendar years 2022, 2023, 2024, and beyond

Focus One: Staffing					
Seek funding to add an interpretive ranger for the trail.	NPS		2022		\$\$
Focus Two: Personal Services and Visitor Engagement					
Continue to offer interpreter and volunteer training.	All partners		Ongoing		Staff
Coordinate regular NPS visits to sites and communities across the trail.	NPS		Ongoing		\$
Introduce NPS Passport Stamps at trail hubs.	NPS		2022		\$
Collect visitor feedback on the trail.	All partners		Ongoing		Staff
Focus Three: Youth and Educational Programming					
Extend the reach of curriculum-based programs to other school systems along the trail.	NPS and partners		Ongoing		Staff
Create curriculum for Grades 3-5.	NPS and teacher committee		Ongoing		Staff
Create curriculum for High School.	NPS and teacher committee		Ongoing		Staff
Explore possibilities for distance learning.	NPS and teacher committee		Ongoing		Staff
Focus Four: Defining and Mapping the Trail.					
Add the trail to USGS topo maps.	All partners		Ongoing		Staff
Consider augmenting the motor route with walking and water routes.	All partners		Ongoing		Staff
Commission a comprehensive guidebook for the trail.	All partners		2023		\$\$

Add the trail to popular guidebooks and travel sites, such as AAA, Fodor's, Lonely Planet, etc.	NPS and partners	2023	Staff
Focus Five: Interpretive Media			
Commission a short documentary movie about traveling the trail.	NPS and partners	2024	\$\$
Look at installing audio listening posts with next-generation waysides to improve accessibility of trail interpretation.	Partners	2024	\$\$
Continue to work on self-guided touring materials, preferably in digital formats.	Partners	Ongoing	\$
Streamline social media; be strategic in choosing the most effective outlets.	NPS	Ongoing	Staff
Wayside Exhibits			
Explore options for difficult sites (i.e., without road pull-offs) at exemplary floods features; work with DOTs, etc.	Partners, DOTs, NPS management	Ongoing	\$\$\$
Move forward with adding the trail to existing wayside installations as needed.	Partners	Ongoing	\$\$
Other Outdoor Exhibits			
Consider designed playscapes that interpret trail features.	Partners	2024-26	\$\$\$
Incorporate traveling trunks into outdoor interpretation whenever possible.	All partners	2024-onward	\$
Interior Exhibits			
Refresh traveling/temporary exhibits.	Partners	As needed	\$\$
Collaborate with partners as needed on new exhibits and potential adaptation for trailwide use.	Partners	As needed	Staff
Funding and Capacity Building			
Promote successful fundraising as a need across the trail.	All partners	Ongoing	Staff and volunteers
Be transparent in awarding funds.	All partners	Ongoing	Staff

Chart Four: Additional Recommendations through the Life of the Trail

Research Needs in Support of Interpretation			
Develop a scope of sales for bookstores along the trail.	NPS and vendors	Yearly or as needed	\$
Update the inventory of flood features begun in 2001.	NPS, Interagency Technical Committee	Ongoing	\$
Compile and maintain a comprehensive database of original research on the Ice Age floods.	NPS, Institute	Ongoing	\$\$
Consider launching/hosting a regular scholarly conference on the floods.	NPS, Institute	Five-year intervals	\$\$
Archival and Artifact Needs in Support of Interpretation			
Catalog and archive materials related to the founding of the trail.	NPS	Ongoing	\$\$
Create and maintain a media reference library for all partners, containing such items as historic photographs, oral histories, large-format maps, etc., for use in interpretive exhibits and programs.	NPS	Ongoing	\$\$



Appendices

Appendix A: Abbreviations

Abbreviations used in this document and in discussions of Ice Age Floods National Geologic Trail may include the following:

BLM: Bureau of Land Management
(U.S. Department of the Interior)

BOR: Bureau of Reclamation
(U.S. Department of the Interior)

DOI: U.S. Department of the Interior

DOT: Department of Transportation
(state or local)

EWU: Eastern Washington University

HFC: Harpers Ferry Center
National Park Service
(U.S. Department of the Interior)

IAFI: Ice Age Floods Institute

IAFL: Ice Age Floods National Geologic
Trail

IDPR: Idaho Department of Parks and
Recreation

MNCH: Museum of Natural and
Cultural History (Eugene, OR)

NAI: National Association for
Interpretation

NPS: National Park Service
(U.S. Department of the Interior)

OMSI: Oregon Museum of Science
and Industry (Portland, OR)

OPRD: Oregon Parks and Recreation
Department

The REACH: Hanford Reach Interpretive
Center

USACE: U.S. Army Corps of Engineers
(U.S. Department of Defense)

USFWS: U.S. Fish & Wildlife Service
(U.S. Department of the Interior)

USFS: U.S. Forest Service
(U.S. Department of Agriculture)

WSPRC: Washington State Parks and
Recreation Commission

Opposite: How many of the 2 million annual visitors to Oregon's beautiful Multnomah Falls know of its connection to the Ice Age floods?

Photo: Allie Goolrick/GIG

Appendix B: Legislation

SEC. 5203. ICE AGE FLOODS NATIONAL GEOLOGIC TRAIL.

(a) FINDINGS; PURPOSE.—

(1) FINDINGS.—Congress finds that—

(A) at the end of the last Ice Age, some 12,000 to 17,000 years ago, a series of cataclysmic floods occurred in what is now the northwest region of the United States, leaving a lasting mark of dramatic and distinguishing features on the landscape of parts of the States of Montana, Idaho, Washington and Oregon;

(B) geological features that have exceptional value and quality to illustrate and interpret this extraordinary natural phenomenon are present on Federal, State, tribal, county, municipal, and private land in the region; and

(C) in 2001, a joint study team headed by the National Park Service that included about 70 members from public and private entities completed a study endorsing the establishment of an Ice Age Floods National Geologic Trail—

(i) to recognize the national significance of this phenomenon; and

(ii) to coordinate public and private sector entities in the presentation of the story of the Ice Age floods.

(1) PURPOSE.—The purpose of this section is to designate the Ice Age Floods National Geologic Trail in the States of Montana, Idaho, Washington, and Oregon, enabling the public to view, experience, and learn about the features and story of the Ice Age floods through the collaborative efforts of public and private entities.

(b) DEFINITIONS.—In this section:

(1) ICE AGE FLOODS; FLOODS.—The term “Ice Age floods” or “floods” means the cataclysmic floods that occurred in what is now the northwestern United States during the last Ice Age from massive, rapid and recurring drainage of Glacial Lake Missoula.

(2) PLAN.—The term “plan” means the cooperative management and interpretation plan authorized under subsection (f)(5).

(3) SECRETARY.—The term “Secretary” means the Secretary of the Interior.

(4) TRAIL.—The term “Trail” means the Ice Age Floods National Geologic Trail designated by subsection (c).

(c) DESIGNATION.—In order to provide for public appreciation, understanding, and enjoyment of the nationally significant natural and cultural features of the Ice Age floods and to promote collaborative efforts for interpretation and education among public and private entities located along the pathways of the floods, there is designated the Ice Age Floods National Geologic Trail.

(d) LOCATION.—

(1) MAP.—The route of the Trail shall be as generally depicted on the map entitled “Ice Age Floods National Geologic Trail,” numbered P43/80,000 and dated June 2004.

(2) ROUTE.—The route shall generally follow public roads and highways.

(3) REVISION.—The Secretary may revise the map by publication in the Federal Register of a notice of availability of a new map as part of the plan.

(e) MAP AVAILABILITY.—The map referred to in subsection (d)(1) shall be on file and available for public inspection in the appropriate offices of the National Park Service.

(f) ADMINISTRATION.—

(1) IN GENERAL.—The Secretary, acting through the Director of the National Park Service, shall administer the Trail in accordance with this section.

(2) LIMITATION.—Except as provided in paragraph (6)(B), the Trail shall not be considered to be a unit of the National Park System.

(3) TRAIL MANAGEMENT OFFICE.—To improve management of the Trail and coordinate Trail activities with other public agencies and private entities, the Secretary may establish and operate a trail management office at a central location within the vicinity of the Trail.

(4) INTERPRETIVE FACILITIES.—The Secretary may plan, design, and construct interpretive facilities for sites associated with the Trail if the facilities are constructed in partnership with State, local, tribal, or non-profit entities and are consistent with the plan.

(5) MANAGEMENT PLAN.—

(A) IN GENERAL.—Not later than 3 years after funds are made available to carry out this section, the Secretary shall prepare a cooperative management and interpretation plan for the Trail.

(B) CONSULTATION.—The Secretary shall prepare the plan in consultation with—

(i) State, local, and tribal governments;

(ii) the Ice Age Floods Institute;

(iii) private property owners; and

(iv) other interested parties.

(C) CONTENTS.—The plan shall—

(i) confirm and, if appropriate, expand on the inventory of features of the floods contained in the National Park Service study entitled “Ice Age Floods, Study of Alternatives and Environmental Assessment” (February 2001) by—

(I) locating features more accurately;

(II) improving the description of features; and

(III) reevaluating the features in terms of their interpretive potential;

(i) review and, if appropriate, modify the map of the Trail referred to in subsection (d)(1);

(ii) describe strategies for the coordinated development of the Trail, including an interpretive plan for facilities, waysides, roadside pullouts, exhibits, media, and programs that present the story of the floods to the public effectively; and

(iii) identify potential partnering opportunities in the development of interpretive facilities and educational programs to educate the public about the story of the floods.

(6) COOPERATIVE MANAGEMENT.—

(A) IN GENERAL.—In order to facilitate the development of coordinated interpretation, education, resource stewardship, visitor facility development and operation, and scientific research associated with the Trail and to promote more efficient administration of the sites associated with the Trail, the Secretary may enter into cooperative management agreements with appropriate officials in the States of Montana, Idaho, Washington, and Oregon in accordance with the authority provided for units of the National Park System under section 3(l) of Public Law 91–383 (16 U.S.C. 1a–2(l)).

(B) AUTHORITY.—For purposes of this paragraph only, the Trail shall be considered a unit of the National Park System.

(6) COOPERATIVE AGREEMENTS.—The Secretary may enter into cooperative agreements with public or private entities to carry out this section.

(7) EFFECT ON PRIVATE PROPERTY RIGHTS.—Nothing in this section—

(A) requires any private property owner to allow public access (including Federal, State, or local government access) to private property; or

(B) modifies any provision of Federal, State, or local law with respect to public access to or use of private land.

(9) LIABILITY.—Designation of the Trail by subsection (c) does not create any liability for, or affect any liability under any law of, any private property owner with respect to any person injured on the private property.

(g) AUTHORIZATION OF APPROPRIATIONS.—There are authorized to be appropriated such sums as are necessary to carry out this section, of which not more than \$12,000,000 may be used for development of the Trail.

Appendix C: Participants in the Long-range Interpretive Planning Process

Yvonne Addington, Tualatin Historical Society

John Ashley, Manager, Coulee Corridor, Washington State Parks and Recreation Commission

Errin R. Bair, Idaho Department of Parks and Recreation

Pat Baird, Tribal Historic Preservation Officer, Nez Perce Tribe

Denise Bausch, Chief of Interpretation and Education, Lake Roosevelt National Recreation Area, National Park Service

Debra Berg, Science Teacher

Nathan Blackburn, Idaho Department of Parks and Recreation

Melanie Joy Moore Bell, Ice Age Floods Institute

Colin Bloom, Geoscientist in the Park, Transportation Plan, Ice Age Floods National Geologic Park, National Park Service

Lynne Brougher, Public Affairs Officer, Bureau of Reclamation

Stephanie Button, Curator, Hanford Reach Interpretive Center (The REACH)

Larry Cebula, Eastern Washington University

Brent Cunderla, Geologist, Bureau of Land Management

Jorie Clark, Geologist and Archaeologist, US Fish & Wildlife Service

Marsha Davis, Geologist, Pacific West Regional Office, National Park Service

Lloyd DeKay, Ice Age Floods Institute

Andy Dunau, Executive Director, Lake Roosevelt Forum

Keith Dunbar, Volunteer

Janice Elvidge, Education Specialist, Lake Roosevelt National Recreation Area, National Park Service

Kristine Komar, Bitter Root Cultural Heritage Trust, MT

Jennifer Karson Engum, Anthropologist and Administrator, Tamástslikt Cultural Institute (Cayuse/Umatilla/Walla Walla: the Confederated Tribes of the Umatilla Indian Reservation)

Gary Ford, Ice Age Floods Institute

Dan Foster, Superintendent, Lake Roosevelt National Recreation Area and Ice Age Floods National Geologic Trail, National Park Service

Valerie Glowinski, Park Ranger, U.S. Forest Service

Ron Hall, The Funny Farm

Paul Hennon, City of Tualatin

Richard Honey, Geologist, Bureau of Reclamation

Terry Hurd, Ice Age Floods Institute
Jeff Jones, Geologist, U.S. Forest Service
Ryan Karlson, Interpretive Program Manager, Washington State Parks and Recreation Commission

Gary Kleinknecht, Ice Age Floods Institute
Steve Kruger, Supervisory Park Ranger, Oregon Parks and Recreation

George Last, Ice Age Floods Institute

Tony Lewis, Ice Age Floods Institute

Bonnie Lippitt, Regional/State Interpretive Specialist, U.S. Forest Service Region 6; Bureau of Land Management OR/WA State Office

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Keep with and share news, events, and your own experiences along Ice Age Floods National Geologic Trail on Facebook, Instagram, and the NPS trail website at www.nps.gov/iafl.

Back Cover: An aerial view of Lake Lenoir accents its islands: hogback ridges of tilted basalt. Photo: Bruce Bjornstad

Ice Age Floods National Geologic Trail

U.S. Department of the Interior



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