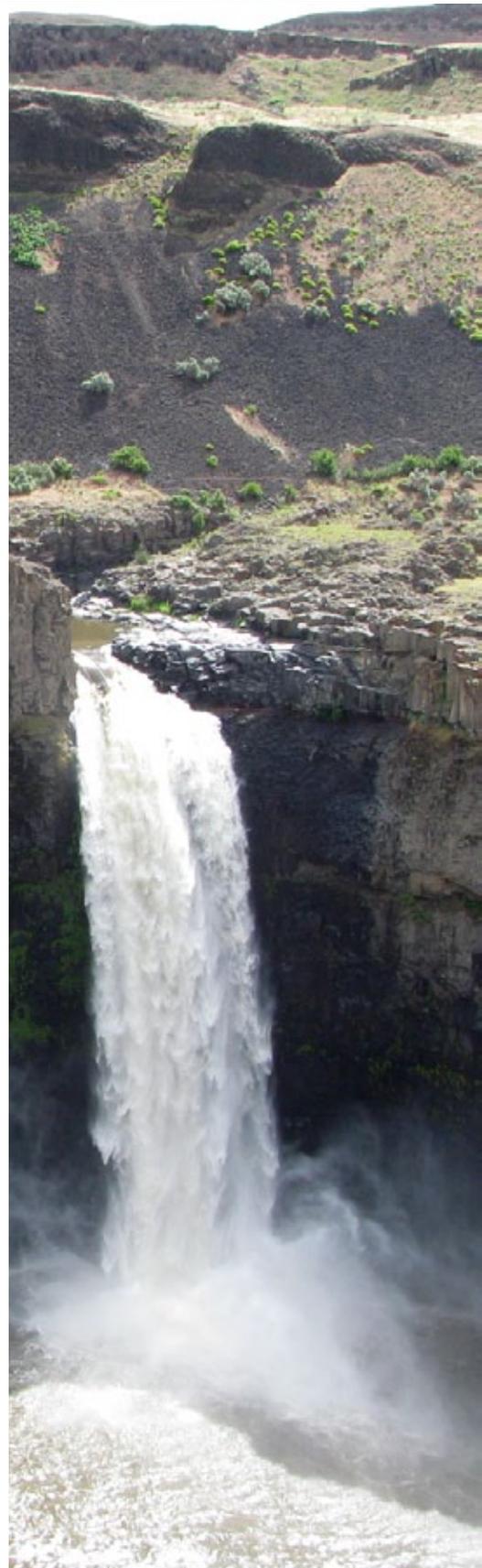


# Ice Age Floods National Geologic Trail

DRAFT Foundation Statement

September 2011





Cover (left to right):  
Lake Pend Oreille, Farragut State Park, Idaho, *NPS Photo*;  
Moses Coulee, Washington, *NPS Photo*;  
Palouse Falls, Washington, *NPS Photo*

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# Introduction

## **PURPOSE OF THIS FOUNDATION STATEMENT**

The foundation planning process confirms the purpose and significance statements of Ice Age Floods National Geologic Trail, identifies fundamental and other important resources and values, and establishes primary interpretive themes. The foundation document therefore helps to ensure that future planning and management activities focus on these priorities by ensuring that staff and shareholders have a mutual understanding of the priorities and objectives required to protect the highly significant trail resources and values.

Congress established Ice Age Floods National Geologic Trail in 2009, under Public Law 111-11. This draft foundation statement provides the opportunity to integrate all previous planning and decision-making efforts into a single focused vision of what is most important about Ice Age Floods National Geologic Trail. This understanding is grounded in the legislation that established the trail and in the knowledge of floods features held by the public agencies and other organizations that manage the trail in partnership.

Every national trail, similar to every national park system unit, needs a formal statement of its core mission to provide basic guidance for all the management decisions to be made—a “foundation for planning and management.” This document will help ensure that the most important objectives will be prioritized before other, less important tasks not directly related to the trail’s mission.

Managers and stakeholders need to know why Ice Age Floods National Geologic Trail was established, why the floods and associated resources are important within a wider context, and what legal and policy requirements apply to the trail’s management. This draft foundation statement offers an opportunity to coordinate all types and levels of planning and decision making from this common understanding.

## **DEVELOPMENT OF THIS FOUNDATION STATEMENT**

The National Park Service prepared this draft foundation statement in cooperation with partners including: the Bureau of Land Management (BLM), Bureau of Reclamation (BOR), U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service (USFS), U.S. Geological Survey (USGS), Washington State Parks, and the nonprofit Ice Age Floods Institute (IAFI). Initial input was gathered during a three-day workshop that took place during the spring of 2011 and the foundation statement was developed collaboratively over the next several months. In the future, new legislation, public comment, or other new information may lead to revisions to the trail foundation statement.

## ELEMENTS OF THE FOUNDATION STATEMENT

This foundation statement includes the following elements:

### Trail Purpose

*A statement of purpose identifies why Congress established the Ice Age Floods National Geologic Trail.* It is based on the trail's enabling legislation. Trail purpose provides the baseline for determining the appropriateness of all planning recommendations and operational decisions.

### Significance

*Significance statements define what is most important about the trail's resources and values.* They express why the trail and its resources are significant within a regional, national, and global context—focusing attention on those exceptional qualities that Congress felt were important to preserve and interpret.

### Fundamental Resources and Values

*Fundamental resources and values are* those features, systems, processes, experiences, stories, scenes, sounds, smells, or other attributes that are *critical to achieving purpose and maintaining significance.* That which is most important about the trail could be jeopardized if these resources and values are allowed to degrade.

The national geologic trail also features *other resources and values* that are not fundamental to purpose and significance, but are nevertheless important considerations for planning and management.

### Primary Interpretive Themes

*Primary interpretive themes are the key stories or concepts to be communicated to visitors* in order for them to understand and appreciate the purpose and significance of the national geologic trail. The primary interpretive themes are the basis for all future educational and interpretive efforts.

### Special Mandates and Administrative Commitments

Special mandates are legal requirements that apply specifically to the national geologic trail. Administrative commitments are agreements that have been reached through a formal, documented process, such as a memorandum of understanding among agencies. This section summarizes applicable mandates and commitments to ensure their consideration in planning and decision making.

# Trail Description

## TRAIL DESCRIPTION

*“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.”*

Public Law 111-11, March 30, 2009

This is the opening paragraph used by Congress in establishing the Ice Age Floods National Geologic Trail. The federal trail system already includes national historic, recreational, and scenic trails; however, this national geologic trail is the first of its kind. While in some ways similar to a historic trail, the geologic trail commemorates our nation’s

natural history rather than historic people or events. In 2001, the National Park Service, in collaboration with public landowners and the nonprofit Ice Age Floods Institute, completed a study recommending federal recognition of the area in order to tell the comprehensive story of the Ice Age floods. Since then, momentum has built within the communities of the floods region, culminating in Public Law 111-11, which designated the national geologic trail.

The national geologic trail commemorates a dramatic series of events. Toward the end of the last Ice Age, a lobe of the Cordilleran ice sheet formed a dam that blocked the Clark Fork River, creating a massive lake 200 miles long and up to 2,000 feet deep. The ice dam broke catastrophically, and Glacial Lake



Grand Coulee, Washington, Photo by Joe Rocchio

Missoula, which contained more than 500 cubic miles of water, drained within a matter of days. An enormous flood of water, ice, and debris charged westward along established drainages and across dry land, covering 16,000 square miles. Eventually, the flood waters reached the Pacific Ocean and continued hundreds of miles beyond the shoreline. This process happened many times, each time carving and reshaping the land.

Today, evidence of the immense floods remains in many forms including: high water lines, huge current dunes, boulders transported hundreds of miles, giant coulees and dry falls, and enormous gravel bars. These reminders of the floods exist on public and private lands across the four states of Montana, Idaho, Washington, and Oregon. Many of the most dramatic features are managed by federal, tribal, state, and local governments.

The national geologic trail will consist of a network of marked touring routes with interpretive opportunities distributed across this vast area. Existing roadways will link many of the region's superb geologic resources by way of a long, central pathway and designated loops and spurs. In places, other types of foot and vehicle trails may also be a part of this network. Today, the trail is in its earliest stages of planning. Proposed routes are represented on the map included in this foundation statement. Development of the trail will take place in the future, following subsequent phases of planning.

The National Park Service will not manage any additional lands as part of this new designation. Rather, the role of the National Park Service will be to coordinate planning and development of the trail and interpretation of the floods among the many public and private partners. In this way, the trail may be likened to a necklace, with the many public landowners continuing to manage the "gems" or geologic resources, and the National Park Service coordinating the string that holds the necklace together. In addition to public landowners, there are many other public and private organizations working to bring the story of the floods to visitors.

#### **ONGOING COLLABORATION**

Collaboration will be essential to planning and implementing the national geologic trail. **Congress has required that planning for the trail include consultation with state, local, and tribal governments, the Ice Age Floods Institute, private property owners, and other interested parties.**

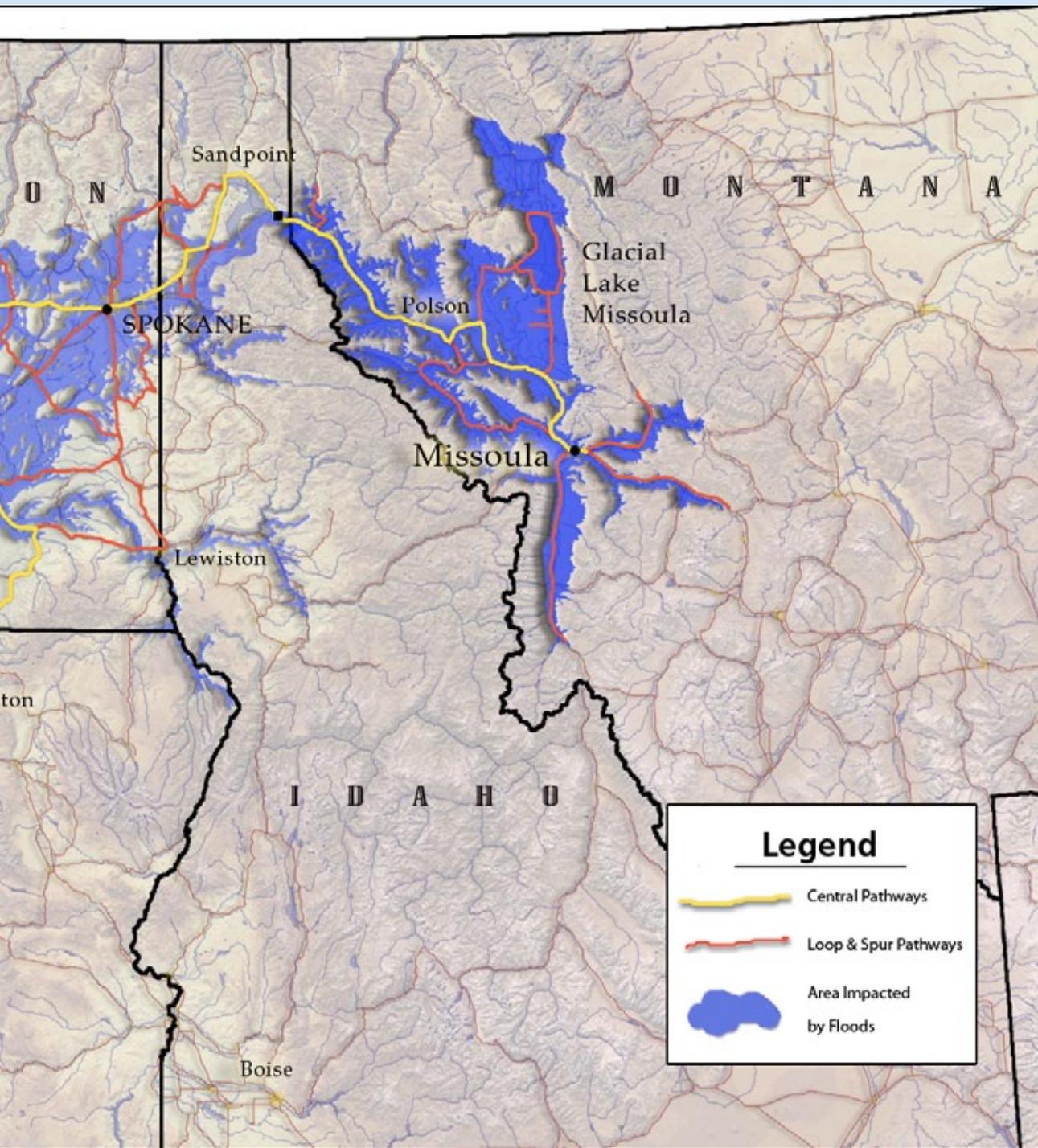
Partners will fulfill multiple roles, including:

- providing educational programs,
- preserving geologic resources,
- enabling access for visitors and for scientific research,
- developing interpretive sites and media,
- and otherwise offering diverse recreational opportunities for public enjoyment and appreciation of floods features.

# Map

## ICE AGE FLOODS NATIONAL GEOLOGIC TRAIL





Map adapted from *Ice Age Floods Study of Alternatives and Environmental Assessment*, February 2001, prepared for the National Park Service by Jones & Jones Architects and Landscape Architects

# *Trail Purpose*

*The 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.*



Palouse Falls, Washington, *NPS Photo*

# Trail Significance

## TRAIL SIGNIFICANCE

### 1: Cataclysmic Ice Age Floods

Ice Age Floods National Geologic Trail represents 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.

### 2: Distinctive Geologic Resources

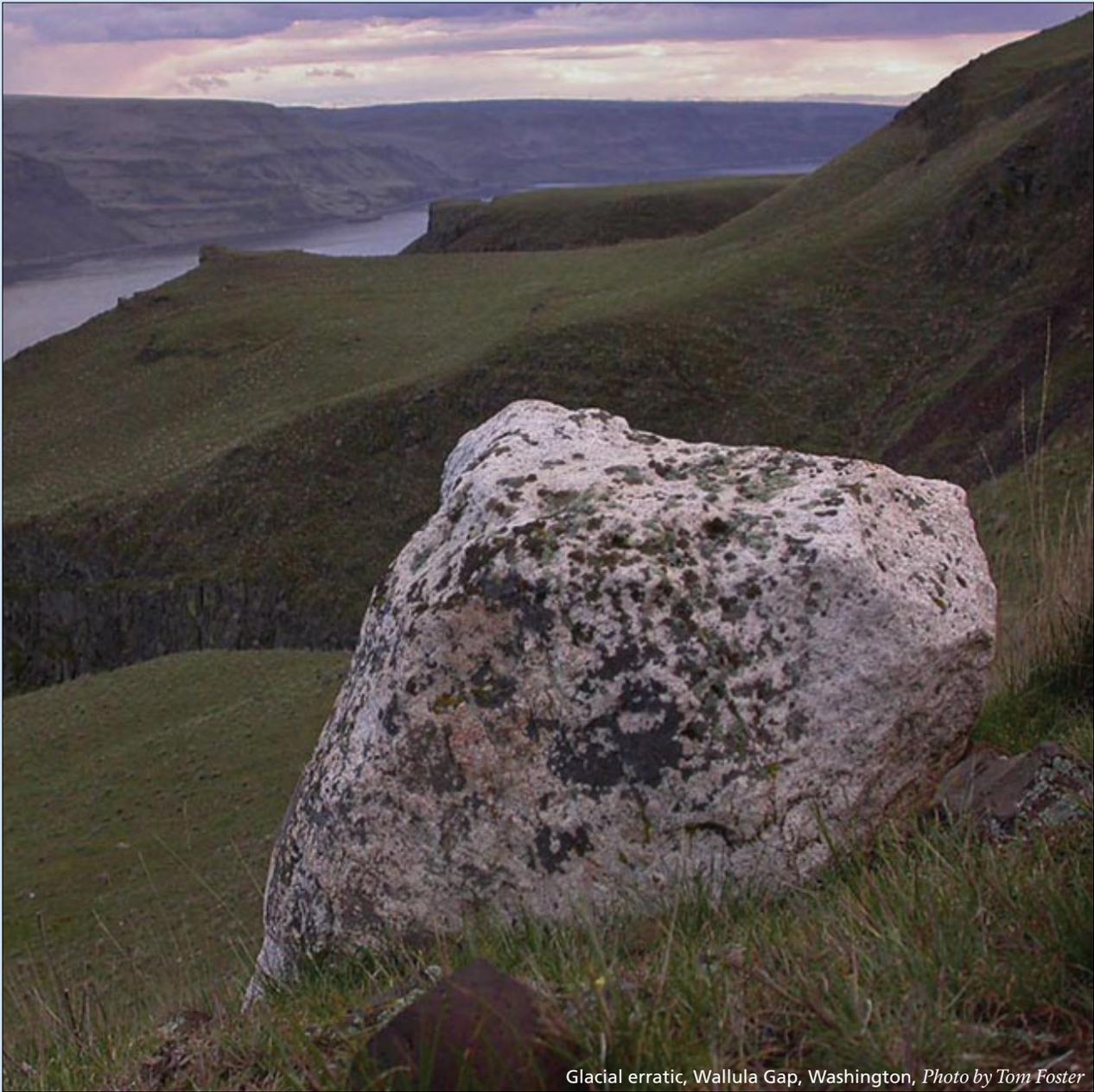
The Ice Age floods sculpted extraordinary landscapes and left behind a variety of distinctive geologic features across a vast area of the northwestern United States. Gigantic basalt coulees, enormous dry falls, and flood ripples of immense proportion are just a few examples of the evidence that survives to illustrate the scale and power of the floods.

### 3: 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.

### 4: 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.



Glacial erratic, Wallula Gap, Washington, *Photo by Tom Foster*

# *Fundamental Resources and Values*

## **FUNDAMENTAL RESOURCES AND VALUES**

The preeminent responsibility of trail managers is to ensure the conservation and public enjoyment of those qualities that are critical to achieving the trail's purpose and maintaining its significance. These qualities are called fundamental resources and values.

In addition, the trail pathway contains resources that are not critical to purpose and significance but are nonetheless important considerations for planning and management. These are referred to as other important resources and values.

A variety of geologic, cultural, scenic, and recreational resources are associated with the floods. Trail planners have identified obvious examples that directly support the trail's purpose and different aspects of significance and are therefore fundamental. Yet at this stage many resources have not been fully documented. Additional work would be required to fully inventory and catalog floods resources and definitively identify those that are fundamental versus those that are not.

The fundamental resources and values for the Ice Age Floods National Geologic Trail are:

1. Outstanding Floods-Related Geologic Resources
2. Exceptional Scenery and Views
3. Scientific Knowledge and Research

Other resources and values that are important for planning and management include:

- Floods-Related Cultural Resources
- Access to Diverse Recreational and Educational Opportunities

## 1 – Outstanding Floods-Related Geologic Resources

Numerous floods-related geologic features exist within this four-state area, but not all have been inventoried. Certain examples possess outstanding potential for interpretation and public enjoyment and may be considered fundamental resources in their own right. In other instances, individual features are not unique or rare, but nonetheless illustrate the extent and scale of floods events, especially in combination with other examples. It is important, therefore, that a large and diverse collection of floods-related geologic resources be highlighted and made available to the public. This collection should be representative of the entire spectrum of floods features and types found within this area.

Below is a list of such resources, organized by seven geologic feature types. Outstanding examples of these types are included, where known. This list will continue to be refined during future planning and management.

**Bedrock features** include basalt flows and dikes.

- *Colonnades and Entablatures:*  
Frenchman Coulee basalt columns, basalt at Palouse Falls and in Grand Coulee

**Terrain features pre-existent to the floods** include hydraulic constrictions such as water gaps through a ridge.



Wallula Gap, Washington and Oregon, Photo by John Clement

- *Hydraulic constrictions:* Sentinel Gap, the narrows at Grand Coulee dam, Wallula Gap, Columbia Gorge, Kalama Gap

**Erosional landforms created by rivers and streams** include coulees, dry falls, and scablands, among others.

- *Scablands:* the Channeled Scabland, Cheney-Palouse Tract, Grand Coulee, Moses Coulee, Telford Tract, Drumheller Channels
- *Coulees:* Grand Coulee, Frenchman Coulee, Moses Coulee, Wilson Creek coulee

- *Cataracts:* Dry Falls, Potholes Cataract, Palouse Falls, Three Devils Cataract, Chain of Lakes Cataract (in Cheney-Palouse), Staircase Rapids

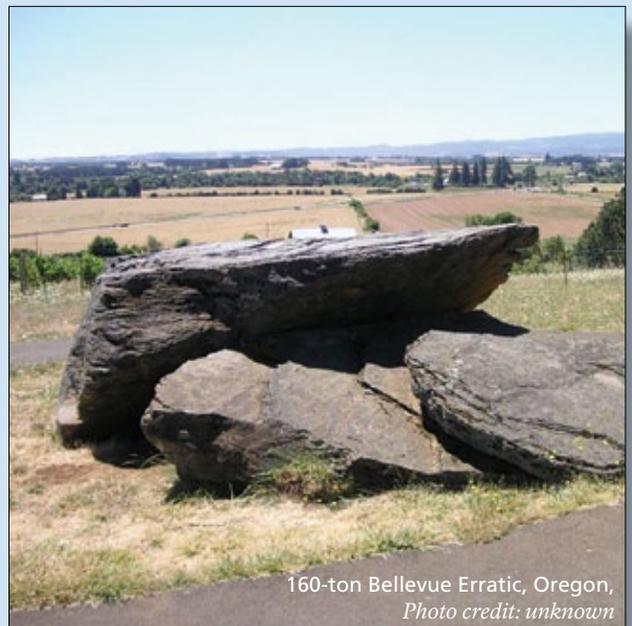
- Drumheller Channels
- *Streamline loess hills:* many parts of the Cheney-Palouse scabland

**Depositional landforms created by rivers and streams** include current dunes and gravel bars, among others.

- *Gravel bars:* Pangborn-Wenatchee bar, Moses Coulee bar, great Athol bar, Midcanyon bar (Snake River)
- *Fan Deposits:* Near Ephrata, WA



Frenchman Coulee, Washington, NPS Photo



160-ton Bellevue Erratic, Oregon, Photo credit: unknown

- *Current dunes:* Camas Prairie, Ramsey Road current dunes
- *Stratified deposits (“rhythmites”) in backflooded valleys:* Walla Walla Valley, Yakima Valley, Willamette Valley
- *Lake Rhythmite deposits:* Ninemile Creek
- *Submarine deposits in the Pacific Ocean*

**Glacial features** include moraines, eskers, erratics, and bergmounds.

- *Erratics:* Belleview erratic, Frenchman Hills erratics (Quincy Basin), many others

- *Glaciated basin:* Lake Pend Oreille basin, Lake Chelan basin

**Lake features** include shorelines (or strandlines) and lake-bottom beds.

- *Strandlines:* Cabinet Gorge strandlines, strandlines on Mount Jumbo and Mount Sentinel

**Features deposited by wind** include dunes and dune fields (sand), and loess hills (silt).

- Sand dunes enclosing the “Potholes” of Moses Lake



Varves, Montana, NPS Photo



Wave-cut strandlines of Glacial Lake Missoula, Montana, NPS Photo

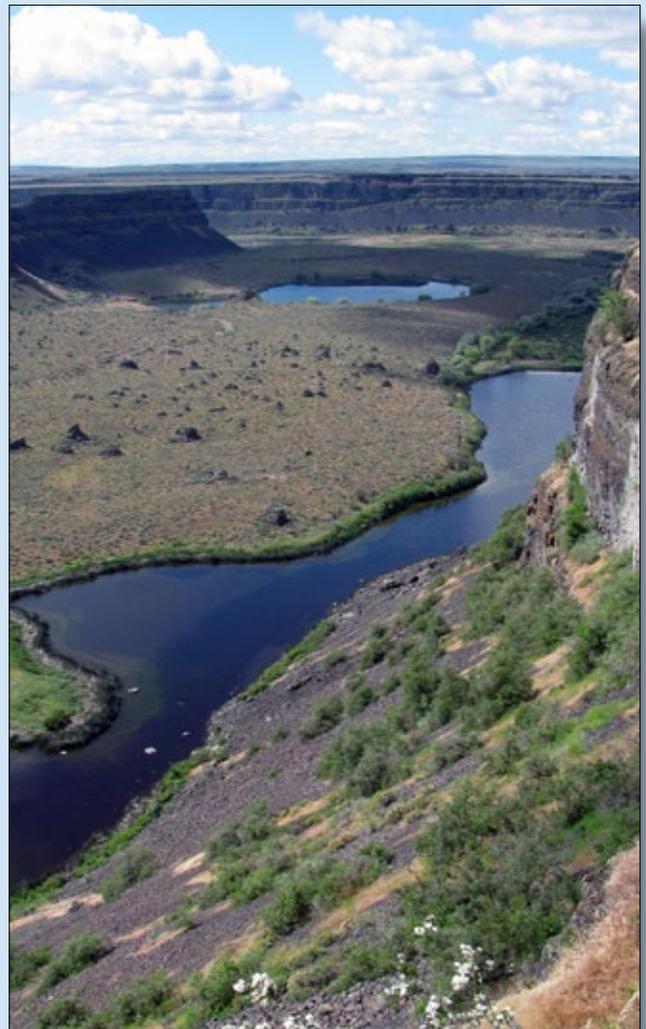
## 2 – Exceptional Scenery and Views

Vast landscapes and stunning scenery created by the floods are present at many places along the proposed trail routes. Views of natural and human-influenced scenery enable visitors to comprehend the scale of the floods, to appreciate the grandeur that the floods created, and to understand the impact of the floods on human settlement and on the natural world.

Scenery varies across the floods region. Local variations in topography, climate, vegetation, types and levels of use, and other factors combine to establish distinct landscapes that exhibit different qualities of visual character. In many places, the route offers dramatic views of natural areas scarcely touched by people. In other places, human activity is very noticeable, for instance in agricultural areas that exhibit a rural, pastoral character.

Portions of the trail route that are already federally recognized for exceptional scenic quality include the Coulee Corridor National Scenic Byway and the Columbia River Gorge National Scenic Area. Segments of state scenic byways also exist within the floods area.

Seven designated national natural landmarks (NNLs) feature floods resources as their primary component. In some cases, dramatic scenery was a factor in the listing of sites in this registry. One example is Crown Point in Oregon. Perched 700 feet above the Columbia River, Crown Point offers outstanding views of the surrounding Columbia River Gorge.



Sun Lakes-Dry Falls State Park, Washington, NPS Photo

Other important viewpoints and scenic corridors may be identified during future stages of planning.

***Major Viewpoints include:***

- Views to Green Monarch Mountains (evidence of glacial lobe), Idaho
- Steamboat Rock, Washington
- Dry Falls Interpretive Center, Sun Lakes State Park, Washington
- Drumheller Channels National Natural Area, Washington
- Rowena Crest, Mayer State Park, Oregon
- Crown Point, Oregon
- Pacific Ocean from Lewis and Clark Interpretive Center, Cape Disappointment State Park, Washington

***Scenic Corridors include:***

- Pend Oreille Scenic Byway, Idaho
- Coulee Corridor National Scenic Byway, Washington
- Columbia River Gorge National Scenic Area, Washington and Oregon
- Historic Columbia River Highway, Oregon
- Lewis and Clark Trail State Scenic Byway, Washington



Crown Point, Oregon, *Photo by Justin Miller*

### 3 – Scientific Knowledge and Research

Investigation of the Ice Age Floods has greatly contributed—and continues to contribute—to the body of scientific knowledge. In bringing to light the story of the floods, J Harlen Bretz, Joseph Pardee, and other geologists yielded a new theory for the origin of many landforms in the northwest. Aided by new technologies, subsequent researchers built upon these early discoveries and further advanced our knowledge of the floods and its features.

Ongoing research, at home and abroad, continues to shape our understanding of our world. Contemporary scientists are now applying lessons that were acquired through investigation of the Ice Age floods to landscapes under study in other parts of the world—and even on other planets.

Within the trail corridor, sites and features directly associated with scientific discovery include: Dry Falls, the Camas Prairie current dunes, and rhythmites in the Walla Walla Valley, among many others. Documents,



Camas Prairie ripple marks, Montana, *Photo by Tom Foster*

observations, and other types of information that have contributed to scientific knowledge range from early accounts of floods-related geologic resources, to contemporary programs being conducted in the area by NASA and by other organizations, and ongoing geologic research in other countries.

***Places and Features Associated with Science and Research include:***

- Dry Falls – tied to early investigation of the Ice Age floods
- Potholes Cataract – tied to early investigation of the Ice Age floods
- Camas Prairie current dunes – related to the discovery of the source of the floods
- Rhythmites – evidence for a repeated series of floods
- Willamette Valley – evidence for a repeated series of floods
- Area south of Soap Lake – site of NASA research

***Other Values Associated with Science and Research***

- Historical research and writings
- Ongoing research – the continuing accumulation of scientific knowledge



Rhythmites in the Walla Walla Valley, Washington,  
*Photo by Ted Wood*

## OTHER IMPORTANT RESOURCES AND VALUES

The identification of certain resources and values as fundamental is not meant to imply that other resources are not important. The National Park Service draws this distinction because it can help trails and other national park system units set priorities among competing management concerns.

### Floods-Related Cultural Resources

Although geological resources are the primary focus of the national geologic trail, the human history of the region adds another dimension to the floods' story. The federal and state partners responsible for managing the trail also manage cultural resources in accordance with laws and regulations that mandate their protection.

Cultural resources along the trail corridor convey thousands of years of human history and patterns of settlement across the numerous, varied landscapes shaped by the Ice Age floods. These resources express the continuum of human adaptation to diverse landscapes and settings ranging from lush, fertile valleys well-suited for agriculture, to scoured, barren lands devoid of settlement. Although the entire trail corridor has not been surveyed for cultural resources; significant archeological sites, ethnographic resources, historic structures, and cultural landscapes that have been identified indicate that many more cultural resources are likely to be present.

Archeological and ethnographic resources associated with the Ice Age Floods' landscape include prehistoric campsites, elaborately made stone and bone carvings, rock art, plant gathering areas, legends, traditional fisheries, and other sites important to American Indian cultures. Prehistoric and historic trade and travel routes weave throughout the region, often overlapping with geographical features that were created or shaped by the floods. Within this transportation network, natural cataracts were important nodes where fishing and trade activities were concentrated. Two such examples are Willamette Falls and Celilo Falls—the latter now submerged by a reservoir.

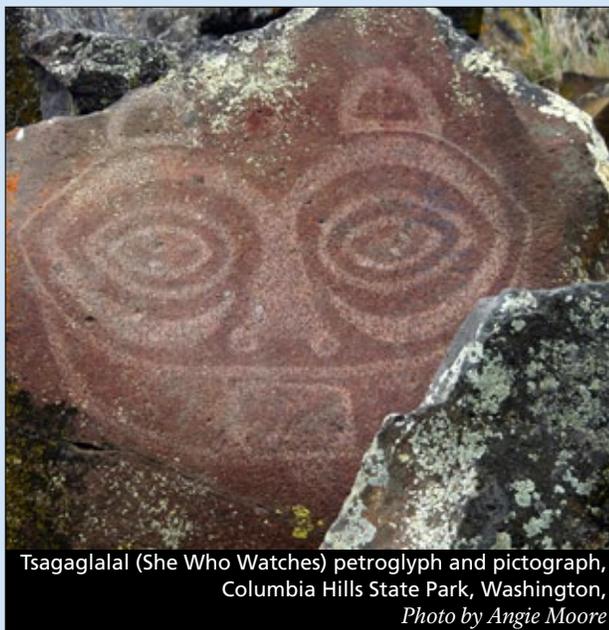
More recently, the Ice Age Floods landscape became the backdrop for increased agriculture, transportation, and hydropower development. Valleys and basins once inundated by the floods have become productive farmlands. These conditions were made possible both by the Ice Age Floods' depositing great quantities of soil in certain areas, and also by construction of huge dams and irrigation networks. Massive hydropower, irrigation, and navigation projects have become significant historic resources in their own right. One example is the Bonneville Lock and Dam on the Columbia River. Its designation as a national historic landmark recognizes the exceptional significance of this project.

## Access to Diverse Recreational and Educational Opportunities

Providing for enjoyment and understanding of resources is central to the mission of the National Park Service and to every park unit or trail that the agency administers. Through partnerships, the national geologic trail offers access to a variety of recreational and educational opportunities that enable visitors to learn about, appreciate, and experience the floods features.

Owing to the diversity of landscapes and scenery created by the floods, and to the differing—but complementary—missions of its partners, visitors to the trail will find opportunities ranging from solitary to group activities, and from contemplative to inspirational experiences. Many such recreational and educational opportunities are already available on lands managed by trail partners. These run the gamut from organized tours to rock climbing at Frenchman Coulee to fishing, which is popular at various state parks. A variety of new opportunities may be envisioned for the future.

The national geologic trail will link together and facilitate these activities and experiences through a network of designated touring routes and a coordinated system of wayfinding and interpretation. Enhancing access to resources and to the o s they present will be a major consideration.



# Primary Interpretive Themes

## PRIMARY INTERPRETIVE THEMES

### THEME A – 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.

### THEME B – 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.



Beginning in 1922, J Harlen Bretz spent summers exploring central and eastern Washington with his family and students

*Photo credit: unknown*

### **THEME C – 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 – readily visible from space; others are subtle—only revealed and appreciated through close observation.

### **THEME D - 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.

### **THEME E – 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.



Current dunes, Montana, *Photo by Steve Corrick*

# Special Mandates & Administrative Commitments

## SPECIAL MANDATES AND ADMINISTRATIVE COMMITMENTS

The following text summarizes applicable requirements from two sources: the legislation establishing the Ice Age Floods National Geologic Trail (P.L. 111-11, Sec. 5203) and a memorandum of understanding (MOU) among the seven federal agency partners. These documents require the National Park Service to develop and manage the national geologic trail through collaboration with other parties.

### **PUBLIC LAW 111-11, SEC. 5203**

Section (f) (5) of the legislation requires the Secretary of the Interior to prepare a cooperative management and interpretive plan for the trail within three years of funding being made available for this purpose. The legislation mandates that the secretary prepare this plan in consultation with:

- (i) state, local, and tribal governments
- (ii) the Ice Age Floods Institute
- (iii) private property owners
- (iv) other interested parties (Public Law 111-11, Section 5203, (f)(5))

It is noteworthy that the legislation specifically mentions the nonprofit Ice Age Floods Institute as one of the partners to engage. Subsequent lines in the legislation outline the primary objectives of the cooperative management and interpretive plan.

The enabling legislation also provides the Secretary of the Interior broad authority to enter into agreements with government officials, private entities, and with the general public for the purposes of trail development and management:

*...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(1))*

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

### **NATIONAL PARK SERVICE AGREEMENT – IAFL # G9003-10-0001**

National Park Service Agreement – IAFL # G9003-10-0001 is a memorandum of understanding among the following seven federal agency partners regarding planning, development, and management of the trail:

#### ***U.S. Department of the Interior***

- National Park Service, Pacific West Region

- U.S. Geological Survey, Western Region
- Bureau of Land Management, Idaho, Montana, and Oregon/Washington State Offices
- Bureau of Reclamation, Pacific Northwest Region
- U.S. Fish and Wildlife Service, Region 1

***U.S. Department of Defense***

- U.S. Army Corps of Engineers, Northwestern Division

***U.S. Department of Agriculture***

- U.S. Forest Service, Northern and Pacific Northwest Regions

Agency officials signed the memorandum in 2010 and it remains in effect through August 23, 2020.

The purpose of the memorandum is “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.” In signing this memorandum, the agencies acknowledged 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.”

Partner agencies commit to responsibilities, including:

- representing and participating in an Interagency Coordination Committee to collaborate and oversee the activities that will enhance interpretation of the Ice Age Floods story and features
- voluntarily consulting with the Coordination Committee to review site development plans and interpretive messages associated with the Ice Age Floods National Geologic Trail and the Ice Age Floods story
- leveraging personnel, equipment, and services (at agency discretion) to carry out their respective responsibilities under the memorandum

Terms of the memorandum are subject to modification provided that all parties demonstrate mutual consent by signing. Any party may, at any time before the memorandum’s expiration, terminate their participation in the memorandum in writing.

# National Natural Landmarks

## NATIONAL NATURAL LANDMARKS

There are seven national natural landmarks (NNLs) with Ice Age Floods features as a principal component. A national natural landmark is a nationally significant area in public or private ownership that has been designated by the Secretary of the Interior. To be nationally significant, a site must be one of the best examples of a biological or geological resource in its physiographic province. The significance of the Ice Age Floods National Geologic Trail relates to the exceptional qualities of these national natural landmarks and other floods-related resources.



Wigeon Lake, Drumheller Channels, Washington,  
Copyright © 2000 Teri J. Pieper, [www.byways.org](http://www.byways.org)

The following brief descriptions are adapted from the National Registry of Natural Landmarks. Some additional information is also provided:

**Crown Point, Oregon** — Crown Point is a promontory rising nearly vertically about 725 feet above the Columbia River. It provides a strategic vantage point for observing a classic illustration of riverine processes. Designated: 1971. Ownership: State.

**Drumheller Channels, Washington** — Drumheller Channels are the most spectacular example in the Columbia Plateau biophysiological province of “butte-and-basin” scabland; an erosional landscape characterized by hundreds of isolated, steep-sided hills surrounded by a braided network of underfit channels. It illustrates the dramatic modification of the Columbia Plateau volcanic terrain by late Pleistocene catastrophic glacial outburst floods. These floods occurred at a scale remaining unparalleled on earth, either in the geologic record or in historical account. Designated: 1986. Ownership: Federal, State, private.

**Glacial Lake Missoula, Montana** — Glacial Lake Missoula was the largest of several lakes impounded by the Cordilleran Ice Sheet during the Quaternary Period. Located 12 miles north of Perma, Montana, this site contains the best examples of giant flood ripples in North America. Ripples appear as ridges 15 to 20 feet high, 100 to 250 feet wide, and from 300 feet to one-half mile long. It is believed that these giant ripples could only have been formed by water at least 800 feet deep, flowing at velocities up to 55 miles per hour. Designated: 1966. Ownership: Private.

**Grand Coulee, Washington** — Grand Coulee is an illustration of a series of geological events including outpourings of lava, advance and recession of glacial ice, retreat of waterfalls, and the cutting of the Columbia River channel. Designated: 1965. Ownership: federal, state, private.

**The Great Gravel Bar of Moses Coulee, Washington** — The Great Gravel Bar of Moses Coulee is a very large example of a pendent river bar formed by the catastrophic glacial outburst floods that swept across the Columbia Plateau prior to the last Pleistocene glaciation. The impressive scale of this feature, deposited

in Moses Coulee, provides dramatic evidence for the violent flood waters that formed and once filled the coulee. As a constructional landform, it thus serves as a complement to Drumheller Channels, which were eroded during the same flood events farther downstream. Designated: 1986. Ownership: state, private.



Willamette Valley, Oregon,  
Photo by Melissa Rosin

**Wallula Gap, Washington** — Wallula Gap is the largest, most spectacular, and most significant of the several large water gaps through basalt anticlines in the Columbia River basin. Designated: 1980. Ownership: federal, municipal, private.

**Willamette Floodplain, Oregon** — The Ice Age Floods stripped enormous quantities of soil from certain areas (predominantly in eastern Washington), and re-deposited it in other areas downstream, such as the Willamette Valley. This deposition is a major factor in creating the Willamette Valley's fertile soils. The

Willamette floodplain represents the largest remaining native unplowed example of bottomland interior valley grassland in the North Pacific Border biophysiological province. These grassland and shrubland communities have become exceedingly rare because most have been cultivated or converted to pastureland. Designated: 1987. Ownership: federal.

# Appendix A: Enabling Legislation

## PUBLIC LAW 111-11, SECTION 5203

### SEC. 5203. ICE AGE FLOODS NATIONAL GEOLOGIC TRAIL.

16 USC 1244  
note.

(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.

(2) 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.

State listing.

(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.

Federal Register,  
publication.  
Notice.

Deadline.

## (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;

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

(iii) 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

(iv) 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.

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

(8) 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.



Rainbow Lake scabland, Montana, *NPS Photo*

# Appendix B: Participants

Participant	Title	Organization	Division/Region
<b>Federal Interagency Coordination Committee Representatives</b>			
<b>Joseph Maxwell</b>	Natural Resource Manager	U.S. Army Corps of Engineers	Lower Granite Natural Resource Office
<b>Bonnie Lippitt</b>	Interpretive Specialist	USDA-Forest Service	Region 6, Pacific Northwest Region
<b>Melody Holm</b>	Geologist	USDA-U.S. Forest Service	Minerals and Geology Management Centralized National Operations
<b>Brent Cunderla</b>	Geologist	USDI-Bureau of Land Management	Wenatchee Field Office
<b>Mindy Mason</b>	Geologist	USDI-Bureau of Land Management	Missoula Field Office
<b>Scott Sanner</b>	Mining Engineer	USDI-Bureau of Land Management	Coeur d'Alene Field Office
<b>Richard Honey</b>	Water Resources Supervisor	USDI-Bureau of Reclamation	Upper Columbia Area Office
<b>Marsha Davis</b>	Geologist	USDI-National Park Service	Pacific West Region
<b>Jorie Clark</b>	Archaeologist / Geologist	USDI-U.S. Fish & Wildlife Service	Region 1, Pacific Region
<b>Alex Schwartz</b>	Landscape Architect	USDI-U.S. Fish & Wildlife Service	Region 1, Pacific Region
<b>Richard Waitt</b>	Geologist	USDI-U.S. Geological Survey	Cascades Volcano Observatory
<b>Other Representatives</b>			
<b>Mark Buser</b>	President	Ice Age Floods Institute	Ice Age Floods Institute
<b>Dave Daugharty</b>	IAFI Board Member	Ice Age Floods Institute	Cheney / Spokane Chapter
<b>Lynne Brougher</b>	Public Affairs Officer	USDI-Bureau of Reclamation	Grand Coulee Dam
<b>Terry Darby</b>	Superintendent	USDI-National Park Service	Whitman Mission National Historic Site; Acting Superintendent Ice Age Floods National Geologic Trail
<b>Jon Riedel</b>	Geologist	USDI-National Park Service	North Cascades NPS Complex
<b>Erv Gasser</b>	Natural Resource Specialist	USDI-National Park Service	Pacific West Region
<b>Cheryl Teague</b>	Landscape Architect	USDI-National Park Service	Pacific West Region
<b>Sarah Bodo</b>	Community Planner	USDI-National Park Service	Denver Service Center
<b>Tom Gibney</b>	Planner / Landscape Architect	USDI-National Park Service	Denver Service Center
<b>Debbie Bird</b>	Superintendent	USDI-National Park Service	Lake Roosevelt NRA
<b>Ken Hyde</b>	Integrated Resources	USDI-National Park Service	Lake Roosevelt NRA
<b>Murray Shoemaker</b>	Interpretive Specialist	USDI-National Park Service	Lake Roosevelt NRA
<b>Keith Dunbar</b>	NPS-VIP-Planner	USDI-National Park Service	Volunteer
<b>Reed Jarvis</b>	NPS-VIP-Planner	USDI-National Park Service	Volunteer
<b>Rhonda Terry</b>	NPS-VIP-Interpretive Planner	USDI-National Park Service	Volunteer
<b>Jack Epstein</b>	Geologist Emeritus	USDI-U.S. Geological Survey	Eastern Geology and Paleoclimate Science Center
<b>Christine Parsons</b>	Capital Program Manager	Washington State Parks	Eastern Region Headquarters
<b>Bill Fraser</b>	Regional Park Planner	Washington State Parks	Eastern Region Headquarters
<b>Ryan Karlson</b>	Interpretive Services Program Manager	Washington State Parks	Resource Stewardship (statewide)



Glacial grooves and striations, Lake Pend Oreille, Idaho. *NPS Photo*

# Appendix C: Future Planning Needs

## Future Planning Needs

Planning for the Ice Age Floods National Geologic Trail is at a very early stage. Though the trail was established in 2009, no operational dollars for development of the trail have been forthcoming. In addition, the NPS National Planning Program has placed a hold on starting any new long-term planning efforts at this time.

Development of the trail would take place in the future, guided by enabling legislation, and following subsequent phases of planning. As described in the “Special Mandates and Administrative Commitments” section of this foundation statement, Public Law 111-11 Section 5203 directs the Secretary of the Interior to prepare a cooperative management and interpretation plan for the Ice Age Floods National Geologic Trail. This plan would “describe strategies for the coordinated development of the Trail, including an interpretive plan for facilities, waysides, roadside turnouts, exhibits, media and programs that present the story of the floods to the public effectively.” The legislation outlines additional objectives that correspond to future planning needs, which are summarized below. The National Park Service has been identified as the lead agency.

Legislation directs that the cooperative management plan would, “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.” This would involve locating floods-related features more accurately and improving upon the description of these floods features. Analysis would also identify sites for interpretation and visitation. In addition to interpretive potential, this analysis would consider critical factors such as land ownership and access. The resulting product is envisioned as an accessible inventory database.

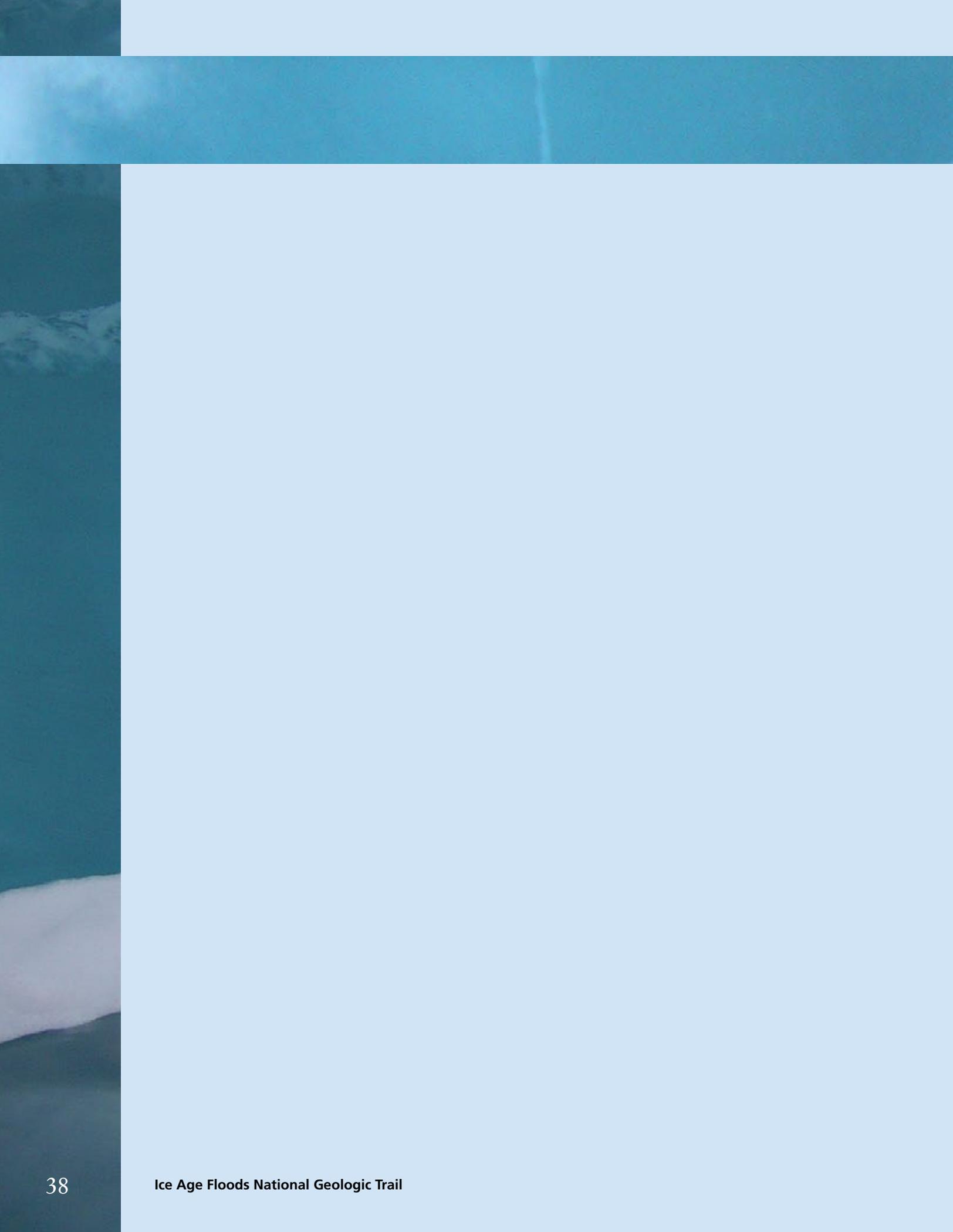
The legislation also directs that the future plan would “review, and if appropriate, modify the map of the trail.” One step would be to analyze the proposed routes depicted in the Ice Age Floods Study of Alternatives and Environmental Assessment to determine whether refinements to proposed routes are needed.

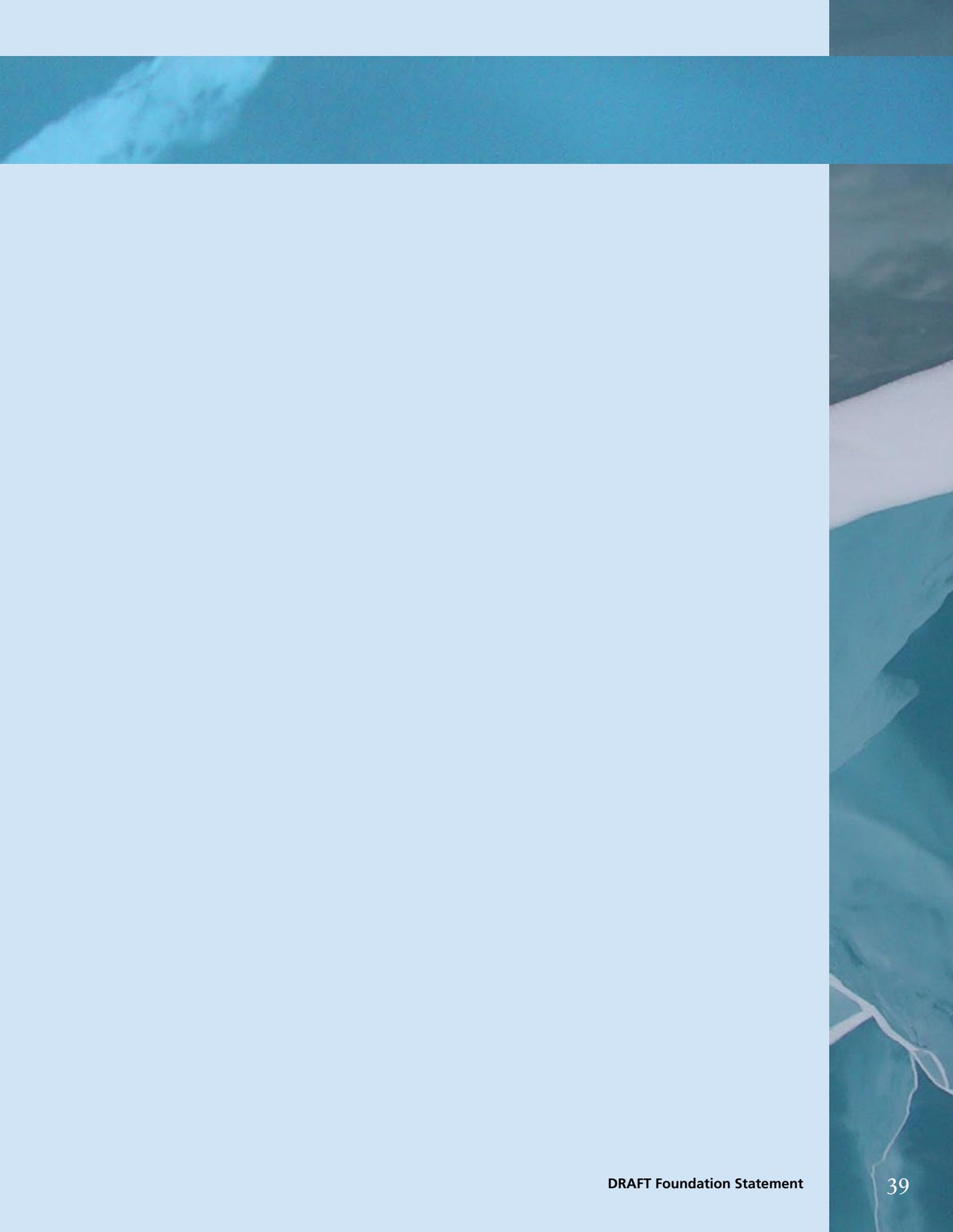
Additionally, legislation recognizes a need to “identify potential partnering opportunities in the development of interpretive facilities and educational programs.” Although seven federal agencies have been identified in a memorandum of understanding, planners may choose to engage additional partners in their efforts to identify areas of mutual interest and strategies to advance future operation and public use of the trail. This would include partner commitments for research, resource protection, visitor protection, visitor services, and interpretation.

There is also a need to promote awareness of the new national geologic trail—both among the general public and also internally within the agencies that signed the memorandum of understanding. Increased public and agency support will be critical to ensuring that the trail is realized. To facilitate this public awareness, the development of a public foundation statement newsletter would be recommended.



Frenchman Coulee, Washington, *Photo by Tom Foster*





# Ice Age Floods National Geologic Trail

DRAFT Foundation Statement

September 2011

