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**Attention**

David Moore
Senior Environmental Analyst
PacifiCorp
825 NE Multnomah, suite 1500
Portland, OR 97232
Phone: 503-813-6945

Submitted By

Sea Reach Ltd.
146 NE Yamhill Street
Sheridan, OR 97378
Phone: 503-843-2005
Fax: 503-843-2744



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executive summary

In October 2006, PacifiCorp contracted with Sea Reach, Ltd. to develop an Interpretive and Education Plan for recreational sites at its hydroelectric projects along the Lewis River, Washington (FERC Project Nos. 935, 2071, and 2111).

This plan addresses section 11.2.5 of the relicensing Settlement Agreement: “Interpretation and Education Program”:

- The plan includes “sufficient details, specifications, and artwork for follow-on printing, production, constructing, and installation” of recommended materials. (*to be completed concurrent to this review*)
- The plan focuses on “recreation resources, hydro generation, natural resources and cultural resources.”
- The plan provides “for the continuation and expansion of the weekend campfire programs.”
- The plan includes a watchable wildlife component (education about prominent wildlife species, their habitats, and their habits).
- Meetings and documents pertaining to this plan have been open to participation and comment by PacifiCorp, Cowlitz County PUD, and all project stakeholders (see stakeholders list).

This plan also addresses section 5.7 of the Settlement Agreement: a directive to provide public education about bull trout through signage and flyers.

The purpose of this plan is to recommend an Interpretive and Educational (I&E) program that will:

Enhance the experience of visitors and residents by creating a sense of place

- Establish a PacifiCorp identity at all sites.
- Create anticipation of a positive experience.
- Foster safety through attractive and consistent signage.

Encourage participation in resource protection

- Build appreciation through education about this area’s value as a watershed and wildlife habitat. Share PacifiCorp’s efforts to manage habitat and minimize negative impacts, and encourage visitors to do the same.
- Build appreciation through education about this area’s rich cultural history. Encourage visitors to respect cultural resources.
- Inspire in visitors a sense of responsibility in having access to these sites, which are part of an important hydroelectric project

Promote cooperative, safe behaviors to benefit project resources and visitors

- Create a set of clear, approachable, safe-conduct rules
- Explain consequences

introduction

PacifiCorp is one of the West's leading utilities, serving more than 1.6 million customers in six western states: Washington, Oregon, California, Idaho, Utah, and Wyoming. PacifiCorp operates 68 power generating plants, including hydroelectric facilities, coal-fired plants, gas-fired plants, wind facilities, and geothermal facilities. 52 of the plants are hydropower facilities which generate approximately 11 percent of the company's annual power production. The Lewis River Project is one of these. Along the Lewis River, PacifiCorp operates 304 camping sites, 278 picnic sites, several boat ramps, swimming beaches, fishing access, and day use areas.

Privately owned or non federal hydroelectric projects [such as the Lewis River Project] generally operate under licenses issued by the Federal Energy Regulatory Commission (FERC). A hydroelectric license includes terms and conditions for project operations, as well as environmental protection, mitigation and enhancement measures to mitigate project impacts on the surrounding environment and natural resources.

At least five years before a license expires, an owner notifies FERC of its intent to seek a new operating license for the hydroelectric project. The project, its surrounding environment and related resources are extensively studied during this process, in consultation with state and federal agencies, tribes, non-governmental organizations and local community interests. The purpose of the licensing process, which can take several years, is to determine what new license conditions will most effectively balance developmental values (electric power, flood control and water supply) with nondevelopmental values (environmental resource protection and values) and best reflect the public interest.¹

PacifiCorp is currently involved in relicensing projects on the North Fork of the Lewis River (Merwin FERC No. 935, Yale FERC No. 2071, Swift No. 1, FERC No. 2111) in southwest Washington. As part of the requirement of the new license, PacifiCorp will be enhancing recreational facilities and implementing an interpretation and education plan.

This document summarizes the approach, research, rationale, recommendations, and products for an interpretive and education program for the recreation sites along Merwin, Yale, and Swift Reservoirs.

¹ PacifiCorp website: www.pacificorp.com, "Hydro Relicensing"

parameters

Parameters are the inherent set of circumstances within which a project must be developed—they represent conditions as they are, not as they ought to be. Identifying parameters is a necessary first step in the development of a realistic strategy. The following general parameters provide the framework for this Interpretive and Education Plan.

The Site

This interpretive effort encompasses a stretch of the North Fork Lewis River, in southwestern Washington, approximately thirty miles in length. There are three reservoirs in a row: beginning down-river, they are Merwin, Yale, and Swift. Visitors arrive via interstate 5 taking the Woodland exit and continuing on highway 503, or from Chelatchie Prairie area (Amboy). There is access upriver on forest service roads, but these roads are significantly less traveled. The primary “gateway” to the PacifiCorp set of recreation sites is at Merwin Dam, although not all users will stop here.

The PacifiCorp recreation sites are attractive, with good amenities. They offer outstanding recreational opportunities, including boating, swimming, picnicking, hiking, wildlife viewing, and exploration. Many are designed with innovative wildlife habitat elements.

It is currently somewhat difficult to distinguish the PacifiCorp sites from neighboring recreation sites administered by other entities; that is, the sites have no strong PacifiCorp “identity”. In addition, the dams that create the reservoirs are seldom visible from the sites, making it unclear that the recreation sites are part of a hydroelectric project.

Per a survey completed by PacifiCorp and summarized in the Lewis River Historic Properties Management Plan, there are archaeological sites within the project area. Due to the sensitive nature of these sites, their existence and locations should not be publicized, and interpretation of cultural resources should be general in nature.

The User

People visit PacifiCorp’s Lewis River recreation sites for many different reasons. Some are local residents, others have traveled from many miles away. Some arrive for water-based recreation, while others are in search of trails to hike or places to hunt. Some are “just passing through” on their way to Mt. St. Helens or the neighboring public lands.

- Local Residents—These visitors are very familiar with the sites, and return again and again to hike, camp, fish or get out on the water. They may be very well-informed about the history of the hydroelectric project and the surrounding natural history. Some have ties to

Lewis River Valley pioneers, and may even have memories of the valley before the dams were built. At times, such as on busy summer weekends, they may feel overwhelmed by crowds of “outsiders” arriving to recreate in what they consider their home.

- **Return Visitors**—These visitors, while they do not live along the river, return year after year to “favorite” sites to recreate. They may be very familiar with the sites, and may have a choice campsite that they reserve in advance each year for a special retreat. Return visitors include individuals, families, and even large groups.
- **New Visitors**—These visitors have never visited the Lewis River before. They may have stumbled upon the recreation sites on their way to or from Mt. St. Helens, or they may have discovered the sites on the Internet or by word of mouth. They may not spend much time at the sites on their first visit, but may well return for longer visits in the future.

Within these general categories of visitors there are special interest groups:

- **Boaters**—Power boats are the most common watercraft on the reservoirs, although sailboats, canoes, and kayaks are also used. Some boaters focus on water play (waterskiing, jet-skiing, speed boats, etc.) while others troll the lake for kokanee, trout, and other game fish. Regardless of their purpose on the lake, boaters require information on launch ramp and dock locations and protocols, restrooms, lake features, boating rules, and water safety.
- **Campers**—The four large campgrounds along the Lewis (Cresap Bay, Beaver Bay, Cougar Park, and Swift Forest) attract campers interested in hiking, fishing the creeks and lake shore, swimming, and socializing. These visitors require information on campsite and restroom locations, rules and regulations, lake access, and trail access.
- **Hikers**—Visitors who enjoy hiking require information on trail locations and rules.
- **School Groups**—On occasion school groups stop at Merwin Park. There is a Native American lodge nearby that offers workshops on native crafts and there are three active hatcheries.
- **Day Use**—in addition to fisherman and boaters, who are in many cases day use visitors, some folks may just like to stop for a picnic or swim.

Existing Interpretation and Visitor Information

There are existing interpretive signs (fish identification, wetland ecology) at some of the sites, though design standards are not consistent among them.

The US Forest Service administers a campfire program in the three largest campgrounds during the peak of tourist season. This program is subject to funding and the interpretation presented is determined by the speaker.

The Federal Energy Regulatory Commission (FERC) requires as part of its negotiations with PacifiCorp that specific information be posted at each recreation site:

- Project Name
- Company Name
- Statement that this project is licensed by the Commission
- The FERC project #
- Directions to/map of other project recreation sites
- Time of park opening/closing and available activities
- Use rules
- Contact information for further recreation information
- Statement of nondiscrimination

PacifiCorp has also chosen to address the bull trout public education requirement of the Settlement Agreement in its new Interpretive and Education Program. Currently, interpretive signs exist at boat launch ramps to educate anglers about bull trout status, identification, and conservation.

Operation and Staffing

Camping sites are a first-come, first-serve bases, except at Cresap Bay and Cougar campgrounds. For visitors reserving a camp site, PacifiCorp has a call in reservation system. Each person or party receives a package of information in the mail prior to their visit. This package includes a map of the site, rules and regulations, and other information pertaining to PacifiCorp sites. These sites are also staffed at the entrances with someone checking reservations and at the campground with a campground host. The camp hosts are not PacifiCorp employees.

All PacifiCorp Day-Use and Campgrounds have open and closed hours. Campgrounds are only open during the summer season and each one has slightly different days of operation. Day-Use sites are open year round. The “open” hours vary between the summer and winter season, opening later and closing early in the winter months. Hours are maintained on an honor basis. These sites are not staffed.

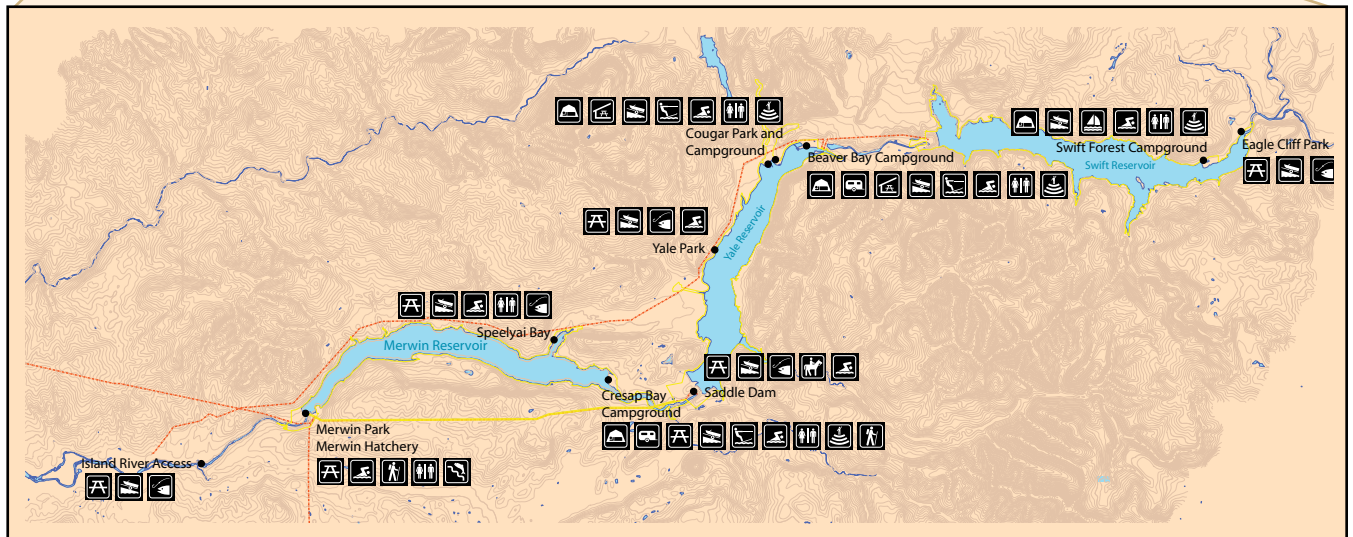
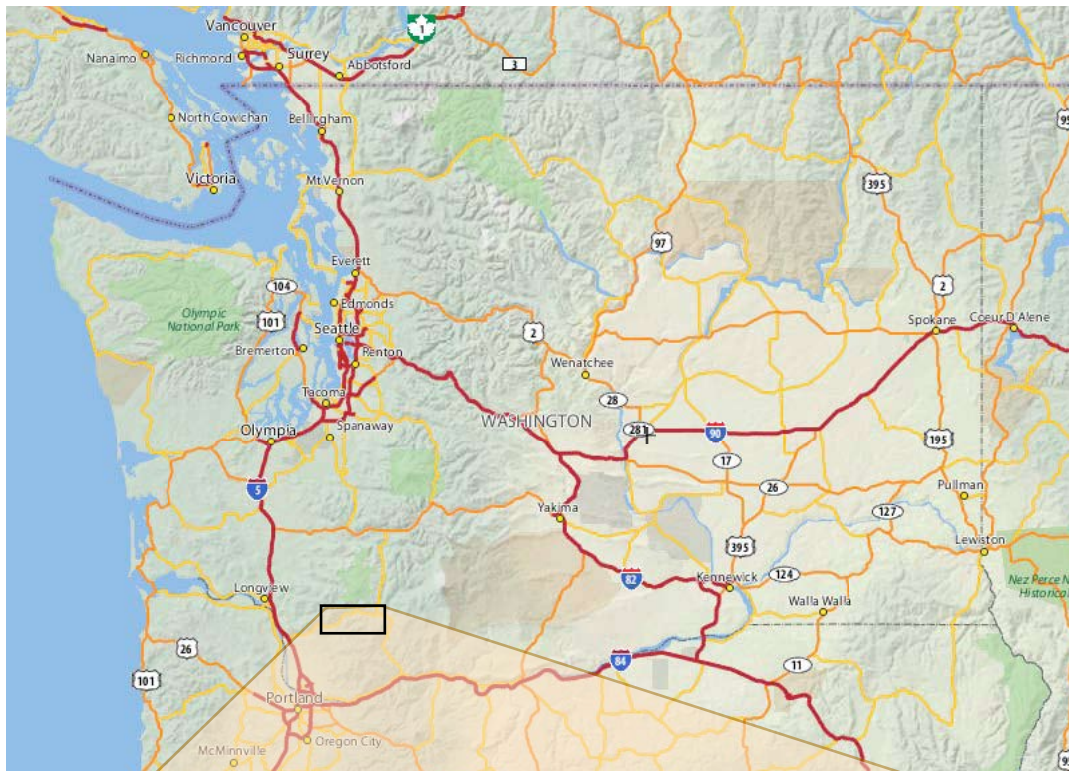
At all the sites, the interpretive program is intended to be a self-guided experience. The self-guided nature of the site, however, will not preclude guided tours, presentations, or “campfire” programs conducted by volunteers.

Vandalism and Maintenance

Irrespective of the setting, vandalism is a fact of life—any public display will eventually face the onslaught of graffiti, destruction, or simple deterioration over time. In an attempt to minimize the opportunities for vandalism, the location, placement, and materials recommended for this project are intended to mitigate damage.

Lewis River Interpretive & Education Plan

project map



Lewis River Reservoirs

Nestled within the Mt. St. Helens watershed basin, the PacifiCorp Hydro Project encompasses three reservoirs: Merwin, Yale, and Swift. The campgrounds and day-use sites on the map are the sites addressed in this plan.

approach

Successful interpretation is faithful to the site—it connects the visitor to the place with site-specific stories and images. The following describes the process Sea Reach undertook to get to know the location, the audience, and the stories of the PacifiCorp sites along the Lewis River.

Site Visits

Sea Reach staff visited the Lewis River several times, over the course of all four seasons, to observe recreation sites both during the height of visitation and without visitors. At least four of the visits were with PacifiCorp staff. Each site was walked, photographed, and general observations were recorded regarding the visitor profile and interpretive potential. In July, two staff members spent three days camping at Cresap Bay to get a sense of the visitor demographics, to interview the host, and to observe visitors interacting with the site.

Research

The interpretive storyline begins with an overview of the natural and cultural history of an area. Our goal is to identify what is factual and relevant about a particular site. What is significant about the Lewis River Watershed? How does this hydro project work? What is available to do and see? What animals are present? Who lived here before, and who lives here now? This research encompasses a variety of resources—beginning with PacifiCorp staff, internal documents, and library resources. As the topic areas become more and more precise or site specific, recognized experts are asked to comment and review sections of the storyline for accuracy. In this case, several PacifiCorp scientists were interviewed and asked to comment on content, and in depth interviews with several long term residents were conducted. They were also asked to review the material before it was incorporated into this document.

Interviews with Professionals

A large portion of the background information and storyline deals directly with the operations, management, and general workings of the hydroelectric project. Sea Reach's goal was to write an overview that can be shared with visitors to help them understand “what is a hydroelectric project, how does it work, how does it effect our lives?” For this information, we interviewed specialists from PacifiCorp:

- Kirk Naylor, wildlife biologist and environmental supervisor for PacifiCorp's hydroelectric projects. Kirk spoke with us at length on the phone, and then provided an extensive tour of habitat management projects along the Lewis.
- Frank Shrier and Erik Lesko, fish biologists, provided information on fish resources in the lakes and river, as well as fish habitat projects.

- Doug Bornemeier and Jennifer Kelly of the Water Resources Division provided information on flood management.
- Gene Scibelli took us on a tour of Merwin Dam and provided extensive information on dam operations.
- Roger Rayburn, engineer, discussed dam construction.
- Jane Hills provided background information on recreational use of the campgrounds and other recreation sites.

Interviews with the Tribes

There are two tribes involved in the Lewis River Valley. The Yakama Tribe, with tribal headquarters in Yakima, Washington and the Cowlitz Tribe with tribal headquarters in Longview, Washington. Sea Reach staff visited both headquarters and conducted several interviews with Tribal members. During both visits, tribal members were extremely generous with their time, answering endless questions, and also with their resources. In Yakima, Sea Reach staff was allowed to look through the photo archives for images that might be used for exhibits. The archive was impressive.

In an effort to give the tribes an opportunity to tell their history and relationship to the Lewis River in their own words, Sea Reach is attempting to engage members of both the Yakama and Cowlitz tribes in a subcontract to write a portion of the storyline. Later, in one of the interviews with Johnson Meninick, Cultural Resources, Yakama Nation, Johnson explained that it is not in the Tribe's best interest to "write it down." In a culture rich in oral tradition, the integrity and ownership of stories is sacred. It is not customary for a tribal member to write down their particular perspective of the history of the Tribe or share information relating to the traditions, life, and values of its people. This information belongs to the Tribe. Sea Reach respects this position. Unfortunately, it means that the portion of the storyline depicting Native American historic and contemporary relationship to the Lewis River Valley is relegated exclusively to *what has been written*, which is very general. One way to supplement the Native American interpretation might be to discuss the contemporary pressures and constraints that the Tribes face today—maintaining their heritage and cultural within a changing social landscape.

It is best if the interpretive materials relating to Tribes are passed through the Tribal Council.

Interviews were conducted with the following Tribal members:

- Clifford Casseseka, Elder, Yakama Nation
- George Lee, Yakama Nation
- Johnson Meninick, Cultural Resources, Yakama Nation

- Pamela Fabela, Heritage Center Director, Yakama Nation
- Marilyn Malatare, Curator, Yakama Nation
- Ed Arthur, Asst. Tribal Historic Preservation Officer, Cowlitz Indian Tribe
- Mike Iyall, Cowlitz Indian Tribe

Interviews with Local Residents

Several locally written books on the early settlement history of the Lewis River Valley were very helpful in developing the cultural history portion of the storyline. Publications such as *Fields of Flowers and Forests of Firs* (originally written by the Woodland History Committee in 1958) and *Pioneer Families of Yale Valley, Washington* by Mary Helen (Laughlin) Rice. Sea Reach also conducted interviews with local residents who grew up in the Valley. Residents interviewed in person include the following:

- Mrs. Margaret Colf Hepola, who was born on a homestead just above the site of Ariel Dam and who has written extensively about pioneer life in the valley.
- Mr. Thomas Frasier, whose family homestead was located near present-day Yale Dam (the Saddle Dam cuts across some of their farm fields).
- Mr. and Mrs. Leonard Reese, who operated a small general store at Yale in the 1930s.
- Mr. and Mrs. Ralph Bozorth, whose families homesteaded in the Lewis River Valley and Woodland area.
- Mr. Don Stuart, whose family settled in the Yale area in the 1930s and who worked both as a logger and soil engineer for the construction of Swift Dam.
- Mrs. Elva Dobbins, who was born in the valley and grew up on a homestead near Yale.

In addition, Sea Reach interviewed other locals with historical knowledge, and gathered photographic resources, during public meetings (see below).

Public Meetings

Sea Reach and PacifiCorp conducted a public meeting near the beginning of the project to gather local information, meet with and apprise interested parties of the progress of the Interpretive and Educational plan. The meeting was publicized several weeks prior to the meeting date, inviting people to attend and requesting information and historical photographs. The meeting was very well attended and lasted several hours. Two members of PacifiCorp staff, David Moore and Jane Hills, were available to answer questions and Sea Reach presented preliminary exhibit design. Most of the meeting was devoted to talking with the attendees and scanning historic photos. Several locals had so much information to share that Sea Reach made appointments for follow-up meetings and interviewed them at a

later date.

The following people attended the meeting:

- Flores Ledford Loy
- Charles Ferguson
- Noel Johnson
- Joann (Graham) Cummings
- Dennis Frasier
- Frannis (Hannah) Tangen
- Steve Tangen
- Tom Frasier
- George Thoeny
- Iris B. (Hannah) Jensen
- Eulakee G. Gilbert
- Janice Row
- Byron Ferguson
- Elva M. (Hannah) Dobbins
- Judy Wilkinson Ibbs
- Tsungani Smith
- Julia Stoll
- Lottie Stoll-Smith
- Barbara Karnis
- Erin Thoeny
- Peggy Thoeny
- Janice Fillman
- Margaret Colf Hepola
- Mary H. (Laughlin) Vannoy
- Mariah Reese
- Donnie Kelley
- Dottie Johnson
- Jerry Johnson
- Rod Hazen

Stakeholder Meetings

Two stakeholders meetings were conducted: one on March 6, 2007 and one on October 2, 2007. During the first meeting, Sea Reach presented our relevant experience on similar interpretive projects, presented the conceptual design, and discussed the approach. The stakeholders assisted Sea Reach in developing a list of professionals and locals who later all proved to be valuable resources for this project. During the second meeting, Sea Reach presented first draft design layouts on two exhibits: the big picture orientation and a site specific welcome panel.

audience

This section presents general guidelines regarding audience characteristics for interpretive and educational programs. Regardless of the specific parameters to an interpretive project, these audience characteristics are universal and need to be considered in the development of an effective program.

General Audience Characteristics

No matter how cleverly designed, aesthetically appealing, or accessible, interpretive experiences are meaningless unless they satisfy an audience's needs and interests.

- *Users need and expect orientation information.* The Lewis River recreation sites are spread along 30 miles of the Lewis River's valley. Several lie off of the primary travel routes along the river. Users will need and expect orientation information. Where are the sites that offer lake access? Where can they camp? Where can they park? Where can they hike? What are the fees?
- *Users will need and expect to find public restroom facilities.* Restroom use is obviously not the reason underlying the use of any outdoor recreation facility, but a recreation experience without access to restrooms, or without restrooms that are accessible, can create a maintenance nightmare.
- *Users will expect interpretation.* More and more trail users benefit from and even expect to find interpretive materials, in a variety of media, that address local natural and cultural history. It is part of the experience.
- *Visitors will want information about other recreation activities.* Surrounding public lands such as Gifford Pinchot National Forest/Mt. St. Helens National Volcanic Monument offer many outdoor recreation opportunities.

Irrespective of demographics, interpretive audiences—especially trail/park users— share at least two primary characteristics: they are a non-captive audience, and they will benefit directly from any and all measures that increase physical and programmatic accessibility.

The Audience is Non-Captive

Interpretively speaking, trail/parks audiences are generally regarded as non-captive. Non-captive audiences visit parks, campsites and trails of their own volition—they decide to visit, stay, and pay attention of their own free will. In contrast, visitors attending a lecture or live interpretive presentation are considered a captive audience. Captive audiences are generally compelled to stay and pay attention. Although there are many differences between these

two audience types, there is one overriding psychological difference: the captive audience has to pay attention, whereas the non-captive audience does not. The only reward non-captive audiences seek is internal—an intrinsic satisfaction with what they are experiencing. And, as long as the information they are receiving continues to be more interesting and entertaining than other things around them, non-captive audiences will pay attention. However, if the information is uninteresting or appears to have no entertainment value, it is too academic, or requires too much effort to understand, the non-captive audience will move on to something more gratifying.

Interpretive experiences that satisfy non-captive audiences always incorporate at least the following five basic qualities:

1. The experience is entertaining. Methods for achieving entertaining interpretive presentations vary depending upon the communication media. Static exhibits are, of course, the most challenging. Generally, the best interpretive experiences are those that are game-like, participatory, three-dimensional or that incorporate movement, changing scenes, or lively colors—all characteristics more commonly associated with entertainment. Interpretive experiences should elicit a “wow” reaction or a “chuckle” from the audience somewhere in the presentation, preferably as often as possible.
2. The experience is relevant. Early in the development of interpretation, Tilden (1957) captured the essence of relevancy’s importance to interpretation when he exclaimed, “Any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile.” Interpretation is only relevant to an audience when it is both meaningful and personal, that is, when concepts and messages are conveyed within a context that allows people to understand, appreciate, and care about something.
3. The experience is organized. Non-captive audiences are lazy—they will lose interest quickly if they have to work too hard. This audience will not expend the effort to follow a difficult presentation. They will decide quickly whether the benefits of paying attention are going to be worth the effort it will take to understand the information being presented—with non-captive audiences, this can happen in a matter of seconds. A major factor in this estimate is how well the message is organized and how many different ideas are presented simultaneously. Humans have definite limits in their ability to assimilate information, and if too much information is presented a non-captive audience will lose interest.

4. The experience accommodates diversity in learning styles through interactivity. People assimilate information in different ways. Some are “visual learners,” integrating information primarily through what they see, others rely primarily on audio input, and certain people rely on the written word. Any interpretive effort (whenever possible) should use a mix of media to convey themes and topics so that all people interacting with the materials have an equal opportunity to learn and gain insight. This approach is simply another aspect of making exhibits and displays fully accessible to all people irrespective of ability.
5. Interpretation is thematic. Interpretive presentations, regardless of media, should have the qualities of a story—they should have a beginning, an end, and most important of all, a message or moral. This message, to be distinguished from the topic or subject matter, is the presentation’s theme. Interpretative presentations without themes beg the question, “so what?”— they fail to offer a major point or convey a message.

The Audience is Disabled

The Americans with Disabilities Act (ADA; PL 101-336) defines a person with disabilities as anyone experiencing “a physical or mental impairment that substantially limits one or more of the major life activities “ (ATBCB 1990). This definition is rather vague, to say the least, and what is more, it makes it difficult to accurately identify the number of Americans with disabilities. The result is that statistical estimates vary widely. Some estimates argue that 32.5 million non-institutionalized people (14.1 percent of the U.S. population) experience varying degrees of limitation when performing “basic life activities”. (Krause and Stoddard 1989).

When disabilities are defined in terms of the ability to perform select physical functions, an even larger segment of the population can be considered disabled: 37.3 million non-institutionalized people age 15 and older. When all of these disabilities are considered in aggregate, an estimated 59.4 percent of the non-institutionalized U.S. population experiences a physical or mental functional limitation.

Taking an even broader perspective, many other groups not normally considered disabled can benefit directly from the removal of accessibility barriers: pregnant women, adults with infants, children, small people, obese people, and the 10 percent of the population considered temporarily disabled due to accidents or other medical problems. Finally, when these individuals are combined with the 59.4 percent discussed above, and when the friends and families of all are considered, virtually everyone is impacted by disability.

Physical accessibility is only part of the accessibility issue—programmatic or intellectual accessibility must also be considered. It does little good to provide physical access to a facility, if displays, brochures, artworks and other aspects of the interpretive program preclude participation. By considering the following categories of persons with disabilities, it is possible to accommodate a very broad range of people:

- People with impaired vision. Visitors, whose impairments may range from myopia to blindness, may be accommodated by presenting displays and other printed materials in larger print—fonts should be sans-serif or simple-serif. Appropriate color contrast is also important. In addition, tactile displays, Braille, and audio programs should be considered where appropriate.
- People with hearing and speech impairments. Accommodating this group of site users involves the presentation of printed materials.
- People with mobility impairments. Although wheelchair users are the most obvious mobility impaired group, it is important to recognize other mobility impairments—many people are elderly or overweight, may have difficulty breathing, or are simply not in good physical shape. Accommodating this group of visitors generally requires ensuring physical accessibility in compliance with ADAAG standards. Exhibits and other displays must allow physical access within appropriate space requirements and accepted reach ranges.
- People with learning impairments. People with learning impairments are the most difficult to accommodate. The range of learning disabilities is vast—from severe mental retardation to dyslexia.

It may be impossible to accommodate all individuals with learning impairments, but it is possible to serve a broad range of individuals by providing programs that cater to what many professional educators recognize as the four basic learning styles:

1. Innovative learners—people who want to know *why*; who need the “big picture, and who learn by observation and intuition
2. Analytical learners—people who want to know *what*; who need to analyze information, and who think through concepts in an organized fashion
3. Common sense learners—people who want to know *how*; who need practical applications of the information presented (how one thing influences another), and who need to use the information

-
4. Dynamic learners—people who want to know *if*; who prefer direct personal involvement when learning, and who prefer a lack of structure

For many interpretive specialists the audience analysis feels like “old news,” but the process of designing interpretive presentations—both the conceptual content and the physical structure on any project—require that planners and designers keep in mind the vast range of individuals we call the “visitor.”

interpretation

What is Interpretation?

Journalist, playwright and philosopher Freeman Tilden, considered by many to be the founder of modern interpretation, espoused the following principles:

- Any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile.
- Information, as such, is not interpretation. Interpretation is revelation based on information. But they are entirely different things. However, all interpretation includes information.
- Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical, or architectural.
- The chief aim of interpretation is not instruction, but provocation.
- Interpretation should aim to present a whole rather than a part, and must address itself to the whole man rather than any phase.
- Interpretation addressed to children (say, up to the age of twelve) should not be a dilution of that presented to adults, but should follow a fundamentally different approach. To be at its best, it will require separate programs.

Interpretive expert Sam Ham has defined interpretation as a distinct approach to communication that attempts to convey important messages or themes, rather than isolated facts and figures, through the use of original objects, first-hand experiences, and illustrative media.

The most effective interpretation is well organized and easy to follow. The larger and more spread-out the area targeted for interpretation, the more difficult it is to create a cohesive interpretive message. PacifiCorp's Lewis River recreation sites are spread out over a long distance. There are multiple entry points to the "system" of sites and there is no official "gateway" or starting point. Most visitors may only visit one or two of the sites. These factors, plus PacifiCorp's desire to clarify its presence, demand a strong interpretive theme or message.

Interpretive Theme

Interpretive themes embody the messages and impressions that people will take home from their interpretive experience. These messages may be simple or complex, but they should always be important—something that potentially challenges or confirms a person's world view, or at the very least provides food for thought.

PacifiCorp's hydroelectric projects fundamentally shape the Lewis River and the surrounding lands. As part of hydroelectric operations, the company is charged with managing the surrounding lands for the benefit of wildlife and the public. This suggests the following theme:

The hydroelectric projects along this stretch of the Lewis River form a key component in the power grid of the western United States. As steward of this critical resource, PacifiCorp works to balance electrical generation with protection of natural and cultural resources in the Lewis River Valley.

This “interpretive theme” will be used as a vehicle for telling stories at the various sites, such as the history of pioneer families in the valley, the structure and function of different types of dams, and the recovery of bald eagles along the river.

Interpretive Topics

Interpretive themes embody the essence or moral of a story—they convey specific messages. Examples of topics that support the above theme include:

Cultural History

- Site-specific stories of pioneer history
- Native American presence and travel along the river
- The construction of the dams

Hydroelectric Story

- How dams work
- Dam types and functions
- How electricity is distributed
- Dams and floods

Natural History

- Salmon and dams
- Hatcheries along the river
- Endangered/threatened species
- Forest management for wildlife

Inspiring Change

Perhaps the single most important challenge to an interpreter is to inspire change. Generally speaking, interpretation is about informing one another about changes over time, environmental concerns, accomplishments of admired individuals, changes in attitudes, life histories of people, animals, and plants, etc. Behind every story, explicit or implicit, is a message that we want the reader to “learn” or “grow to appreciate.” This education, in turn, affects the way we view the world around us, how we respond, and what we share with others. One of the overriding messages in the interpretation of the PacifiCorp sites (aside from making visitors aware that they are recreating within a hydroelectric project) is stewardship. The stewardship message is apparent in all the stories—protecting and enhancing elk habitat, the balance between preserving water for power and maintaining river flow for salmon, Native American subsistence, responsible recreation.

interpretive components

The objective of an interpretive program at PacifiCorp's Lewis River sites is to provide visitors with a better understanding and appreciation for the natural and cultural history of the area, recognition that these sites are owned and managed by PacifiCorp, and are part of an important hydroelectric project. To meet these objectives, and to address the diverse needs and learning styles of the audience, we recommend that information be presented in a multi-level system as follows.

Overview Exhibits

Overview exhibits will orient the user to the project as a whole. They will contain:

- A map of all four hydro projects on the Lewis, and associated recreation sites
- An introduction to PacifiCorp and its role on the river
- FERC-required postings: Project name and FERC number, contact information, and non-discrimination statement.

Welcome Exhibits

Welcome exhibit will orient the user to each specific site. They will contain:

- A map of the campgrounds, showing amenities such as parking restrooms, boat launch, recreational opportunities, etc.
- A list of park rules (FERC required)
- A sidebar with a piece of local history relevant to this site

Interpretive Exhibits

Interpretive exhibits will present in-depth interpretive information, chosen to suit each site:

- "Hydroelectric Story" panels will contain information on dam construction, power generation, dam operations, or other hydro-related topics.
- "Natural History" panels will contain information on local natural history and conservation topics—fish or wildlife biology, ecology, habitat management programs, etc.
- "Bull Trout" panels will present required information on bull trout natural history and conservation at all fishing access sites (boat launch ramps).

Discovery Elements

Secondary interpretive elements should extend the interpretive experience beyond the primary interpretive panels. They could include both "traditional" (interpretive panel) and non-traditional (sculptural, audio) elements. Several PacifiCorp sites offer excellent opportunities for discovery elements. For example, Cresap Bay Park could feature sandblast-etched stone relief images of local plant and wildlife species, placed near campsites, at the day-use area, or along the trail, providing tactile interpretation.

Docent Guide

A docent guide is a reference booklet, created for campground hosts and other site staff. It will serve as a quick reference for contact information, site rules and regulations, information on other sites along the river, and statistics such as generation capacity, lake size and depth, and common plant and animal species. It will also contain information on local history, PacifiCorp company history, natural history, and hydroelectric operations. It would provide background material for campfire programs, and could include program suggestions as well.

Brochures

A brochure guide to the recreation sites, using the same design standards as the physical signage, will provide “portable” interpretation and orientation information that further conveys PacifiCorp’s identity. Other brochures could target specific user groups—recreational boaters, fishermen, campers—with access, rules and regulations, and interpretation.

As part of its Settlement Agreement, PacifiCorp is required to provide public education about bull trout, including a brochure/flyer about bull trout conservation to be distributed to park staff and to WDFW and USFWS enforcement personnel. This brochure would be developed using the design standards of the Interpretive and Education Program.

Watchable Wildlife

Several state and federal agencies have some kind of formal or informal watchable wildlife program. Sites that are particularly good viewing are often indicated with a sign displaying a pair of binoculars. PacifiCorp may choose to mark some rewarding wildlife viewing sites with this “international symbol.”

Wildlife viewing is a pastime that can be enjoyed in any season, in any corner of the state, by any age group. Watchable wildlife includes a wide array of animals, some as common as a familiar bird at a backyard feeder and some rarely-seen species that provide the dedicated viewer with a reward for hours of patient waiting.

Along the Lewis River, reservoirs, and adjacent forestlands there is a plethora of wildlife to watch.

- Saddle Dam offers year round habitat for elk. Elk are more common in the off-season, but it is possible to see them in the summer in the early morning.
- Osprey can be seen throughout the Lewis River watershed. There are several nesting sites that could be labeled as watchable wildlife sites.
- The best place to see bald eagles is at Cougar Campground when the Kokanee salmon are spawning.

The wildlife near the campgrounds are more commonly seen when the sites are closed, but for recreationists who don't mind hiking, there is plenty to see all year round.

Campfire Programs

The Settlement Agreement stipulates that existing campfire programs should be continued and augmented. Campfire programs are an effective method for reaching a diverse group of campers with important interpretive messages. The programs can offer site-specific information, presentations can be varied to accommodate the interest or age of the group, and they provide an opportunity for visitors to ask questions about the area.

The campgrounds offer small amphitheaters for the programs. PacifiCorp currently contracts with a private organization, The Mt. St. Helens Institute, specializing in live interpretation to perform the presentations. Program topics are thematically-based involving the natural and cultural history of Mt. St. Helens' influences on the Lewis River Valley. Example topics are biology (The natural history of bats—they live in lava tubes), ecology (how streams affected by ash recover and flourish), geologic activities (what is happening with Mt. St. Helens).

Collage interns often lead in the programs. The programs are education and fun—they include educational props such as photos and displays. Some props show an analogy of a natural system, for example, to explain gas build-up inside a volcano, the program leader will shake a pop in can and threaten to open it in front of the crowd.

The programs are generally scheduled for Friday and Saturday nights. PacifiCorp advertises the campground programs at the site. Currently, Swift Forest Camp is the primary campground for these programs. It would be preferable if programs extended to include Beaver, Cougar, and Cresap Campgrounds at least for Saturday nights. These programs can be an effective system for delivering important messages—PacifiCorp may want to include a broader topic list to include educating visitors about the hydroelectric project and the existence of the reservoir or information on the local wildlife and habitat restoration.

Bull trout Regulatory Signage.

Bull trout (*Salvelinus confluentus*), a member of the char clan of the salmon family currently inhabit Merwin, Yale, and Swift Reservoirs. Bull Trout are listed as "Threatened" under the Endangered Species Act and are illegal to keep. Each PacifiCorp recreation site has a posted sign informing visitors and residents of the status of this fish. This sign has been redesigned to follow

the design standards developed as part of this planning process. In addition to the permanent signage at each site, a handout is enclosed in information packages distributed to campers and other visitors requesting information about PacifiCorp's sites. As part of the relicensing agreement, PacifiCorp is responsible for monitoring the bull trout population.

Fishing Opportunities

The North Fork of the Lewis River is known for the fishing. All the PacifiCorp day-use and campground sites are used heavily by fishermen and the ones that are open year round, are used year round. Fishing regulations and openings can vary year to year and between reservoirs, so it is important that fishermen seek the appropriate information prior to fishing.

Merwin (Lake) Reservoir (4,090 acres): Kokanee are the main target. Angling is best in early spring, with fish in the 10-inch class. Small northern pikeminnows are numerous and pesky; tiger muskies were planted in 1995 to help control their population. There is a 36-inch minimum size limit on the muskies. The lake is open to fishing year-round.

Yale Reservoir (3,802 acres): Kokanee fishing is the main attraction. Shallow fishing for kokanee is best in the spring and fall; in the summer, deep fishing is the rule. Some cutthroat trout are caught near the mouth of Siouxon Creek, and Yale also has a few bull trout. All bull trout and Dolly Varden must be released. Boat ramps are available at Saddle Dam, Yale, Cougar Camp and Beaver Bay. The lake is open to fishing year-round.

Swift Reservoir (4,590 acres): Swift Reservoir is a popular among anglers for rainbow trout, cutthroat trout, whitefish, and bull trout. The shoreline is very steep, so it is mostly a boat fishery with limited access from shore. The water level, affected by annual rainfall and snowmelt runoff can postpone the opening day. The boat ramp is not usable when the water is too low. Catchable rainbow trout are stocked each season.

North Fork Lewis River: The area above Eagle Cliff Bridge to the lower falls is open to catch-and-release, selective gear rules fishing with a standard June 1 opener. Including tributaries, this opens up 136 miles of potential blue-ribbon trout waters. The lower river has traditionally provided fishing opportunities for coho and chinook salmon, steelhead, and sea-run cutthroat trout, with lots of bank and boat access.

Cultural Resources

The protection and recording of important cultural resources is an important part of the management of the overall resources that make up the Lewis River watershed and properties associated with the hydroelectric project. This includes

archaeological sites, artifacts, historic buildings and structures, and traditional cultural properties such as the locations of religious ceremonies or gathering places. PacifiCorp works closely with the Yakama and Cowlitz Tribes to preserve and protect these sites.

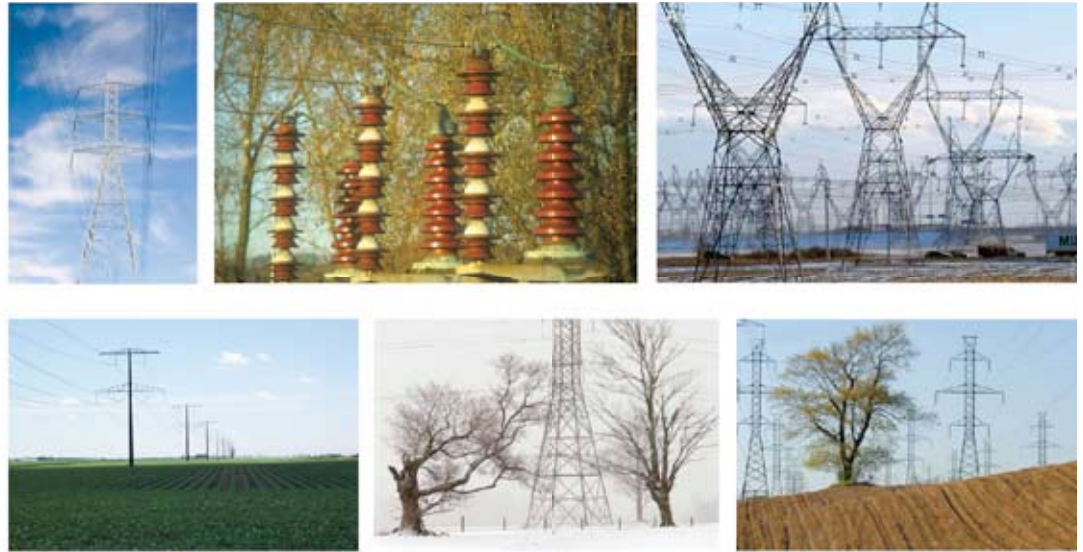
PacifiCorp staff, campground hosts, and other PacifiCorp representatives are required to follow a specific protocol when culturally sensitive sites are discovered. This information will be part of the interpretive docent guide, so that camp hosts in each of the campgrounds will also be aware of how to handle discoveries appropriately.

Sometimes interpretive displays and other signage post regulations and warnings regarding sensitive sites. However, this kind of posting also calls attention to the very thing that deserves to be protected. It is a delicate balance of providing the right information to the appropriate audience, and should really be discussed on a case by case basis with the stakeholders, particularly the Tribes.

Wayfinding

Wayfinding signage should be consistent throughout the sites. The design portion of this document features signage of various types to include wayfinding. The more consistent the signage is throughout a site, the clearer the message is to the visitor that this is a well-managed site.

conceptual design

**Interpretive Design**

Interpretive design involves a different process than pure graphic design. Interpretive design is about education, inspiration, and organization. Information must be presented in a way that captures the visitor's attention. It must be easy to follow, and it must sustain the visitor's interest long enough to deliver the most important messages. Finally, if possible, it should inspire a change in attitude, appreciation, and—ultimately—behavior.

Design Elements

Interpretation should be designed to fit the context. It should share a theme with the stories and the site. Sea Reach has developed a series of custom designs specific to this project.

Juxtaposition

This juxtaposition of industry and nature—a dam generating electricity in a natural environment—became the basis for the interpretive design. The contrast between the structure and geometric elements of an electrical tower and the natural, organic shape of a tree inspired the initial approach.

Setting the Stage

A large part of interpretation is creating a context in which to present a series of ideas that are designed to inform and educate the visitor, and in some cases alter his or her behavior. The PacifiCorp recreational sites are loved by resident and non-resident visitors alike. Visitors go to enjoy watersports, camping, fishing, picnicking, swimming, and even hunting. Generally speaking, visitors are either unaware or uninformed that the reservoirs on which they play are managed 24/7 for power production. One of the reasons for developing a design that

looks highly engineered and placing it in a natural setting is to set the stage for the interpretation. The themes and topics addressed at the PacifiCorps sites are designed to inform visitors that they are recreating within a hydroelectric project. The storyline presents information about why there are fluctuations in water levels throughout the year, the valley history before the lakes were there, how Native Americans and early homesteaders lived on the river and fished for salmon, why there are areas closed to preserve habitat for wildlife, . . . etc. The interpretation along the Lewis River is the story about the balance between power production, recreation, and the natural world.

Sustaining Interest

Once you have captured a visitor's attention, it is not always easy to sustain it. Once a visitor has satisfied that initial curiosity, the exhibit has to appeal to the person on a personal level. It has to be visually dynamic—presenting a mixture of elements: illustrations, photos, graphic elements, text and space. The balance between these elements is very important.

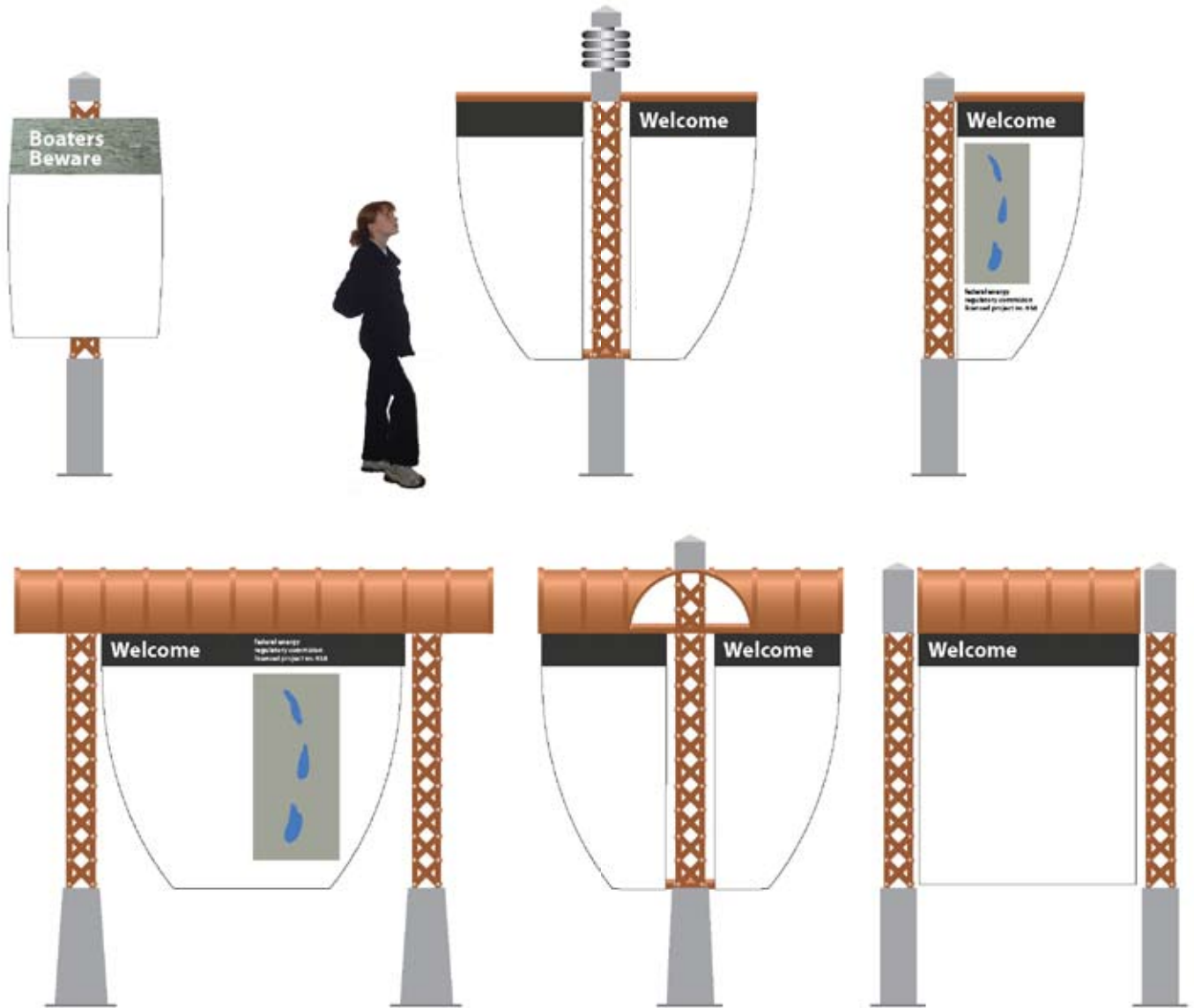


Exhibit Structures

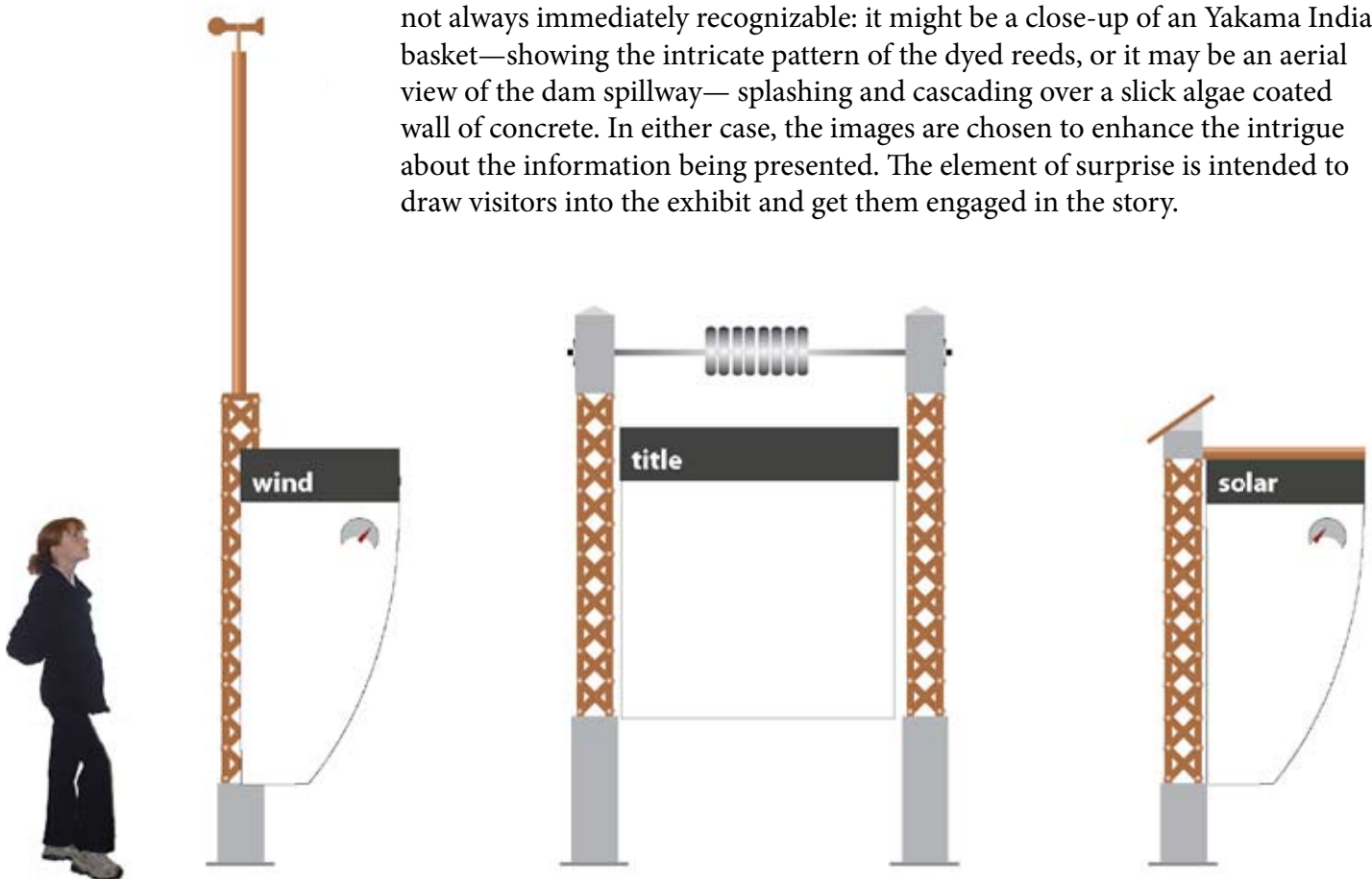
During the conceptual design phase, possibilities are explored without constraint: kiosks with roofs, without roofs, the use of found objects—insulators, parts of the generator, oversized hardware, Cor-ten steel, copper, etc.

The exhibits are representative of the shapes and materials found in and around a hydroelectric project. The upright structures are a combination of concrete, steel and/or aluminum that look similar to power line towers. The sign faces are straight at the top and bottom with a bowed or concave edge. This shape mimics the dynamic tension in a dam holding back the water. The curved edges also soften the exhibit's overall presence making it more compatible within the natural setting of the recreation sites.



An Element of Surprise

A classic response to material we have seen (or that we think we have already seen) is to pass it by. Visitors become programmed to ignore rules and regulations, the repetitive welcome panel, and sometimes even the standard interpretive exhibit. The PacifiCorp exhibits are designed with an element of surprise. On one side of the exhibit is a large photographic image. The image is not always immediately recognizable: it might be a close-up of an Yakama Indian basket—showing the intricate pattern of the dyed reeds, or it may be an aerial view of the dam spillway—splashing and cascading over a slick algae coated wall of concrete. In either case, the images are chosen to enhance the intrigue about the information being presented. The element of surprise is intended to draw visitors into the exhibit and get them engaged in the story.



Lewis River Interpretive & Education Plan



1 existing kiosk
nts



2 proposed kiosk
nts

Applied Design

Once the conceptual design begins to take shape, it has to be applied. PacifiCorp must display FERC-required postings: Project name and the FERC number, contact information, and non-discrimination statement at each site. Currently, this information is posted on a bulletin-style wooden kiosk. The kiosks are different at each site.

As part of this project, the FERC requirements will be become part of a permanent display designed to orient visitors to the three reservoirs, introduce them to PacifiCorp, and inform them that they are recreating within a hydroelectric project.

This exhibit will be combined at each location with a site-specific welcome panel. The welcome panel introduces the visitor to the site, posts the rules and regulations and encourages visitors to explore the many recreational opportunities.

Lewis River Interpretive & Education Plan



Logical Presentation

The other aspect of the design involves the layout of information. Photos, illustrations, text, maps, and other graphic elements comprise the exhibit panel itself. Presenting the information in a logical fashion is paramount in good interpretive design. The hierarchy of primary, secondary, and tertiary information needs to be immediately recognizable. The use of color, fonts, layout grids, and repeated graphic elements guide the visitor through information that can have varying levels of complexity. If the information is confusing or too difficult to understand, the exhibit is not effective.

Lewis River Interpretive & Education Plan



Saddle Dam Recreation Area is part of Yale Hydroelectric Project, which is licensed by the Federal Energy Regulatory Commission (project #2071). It is owned and operated by PacifiCorp, an electric

utility that operates the four major hydroelectric projects, and associated recreation sites, along the Lewis River.

The Lewis River Hydroelectric Projects



The Lewis River flows 90 miles from the glaciers of Mt. Adams to join the Columbia River near the town of Woodland, Washington. There are three major hydroelectric dams on the Lewis: Merwin Dam near Ariel, Yale Dam near Yale, and Swift Dam near Cougar. In addition, there is a power-generation canal between Swift Dam and upper Yale Lake.



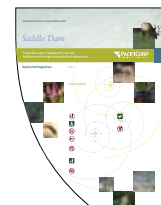
Annually, these four projects generate over 2 million megawatt-hours of electricity—enough to power over 250,000 homes. But PacifiCorp's work in the Lewis River Valley goes beyond power generation. As a requirement of its Federal hydropower license, the company acts as a steward to the reservoirs, the river itself, and many of the surrounding lands. PacifiCorp's goal is to balance power generation with the needs of the public and of the environment.

To achieve this goal, PacifiCorp

- Creates and maintains nine major (and several minor) recreation facilities, including campgrounds, picnic areas, swimming beaches, boat launches, and trails.
- Provides flood management services throughout the lower Lewis River.
- Operates fish hatcheries to keep Lewis River salmon runs strong and healthy and to provide for sport fishing in the reservoirs.
- Protects and enhances wildlife habitat in and around the river and reservoirs.

Many organizations watch over PacifiCorp's operations, including the Department of Energy's Federal Energy Regulatory Commission, the Environmental Protection Agency, the Forest Service, the Fish and Wildlife Service, and the Washington Department of Fish and Wildlife.

Visit the Lewis River's many other recreation sites. For more information, call (503)813-6666 or visit www.PacifiCorp.com.



Lewis River Interpretive & Education Plan

Welcome to Saddle Dam Park. This facility is owned and operated by the power company PacifiCorp, which provides public recreation opportunities along the reservoirs of the Lewis River.

Saddle Dam is an auxiliary dam that helps to form Yale Lake, which stretches some 7.5 miles northward through the scenic Lewis River Valley. The park features a boat launch, swimming access, picnic sites, restroom and shower facilities.

Saddle Dam



Summer Hours (April 1-September 30): 5 am-9 pm
PacifiCorp reserves the right to change the hours without notice.



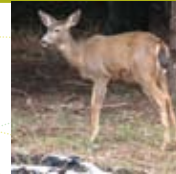
Day Use Park Regulations

Fees

Visitors entering day use sites with vehicles must pay applicable fees. Pass holders please check in with booth attendant (if staffed). Please display passes in car windows at all times. Fees are non-transferable.

Vehicles/parking

- Keep speed 10 mph or below
- Stay on designated roads and paths
- Park only in designated areas
- Do not use ORVs and snowmobiles in recreation areas



Please help us keep this park safe, clean, and enjoyable for everyone:



Do not use or possess alcohol at this site.



Keep fires confined to established fireplaces, or to manufactured grills.



Do not use fireworks or other explosive materials.



Do not discharge firearms or other projectile devices within or near the recreation area.



Respect wildlife, habitats, and other users: do not cut or otherwise damage trees or other vegetation. Do not disturb wildlife.



Keep a clean camp! Place bottles, cans, paper, garbage, and other refuse in trash receptacles.



Respect your neighbors. Do not use public address systems, loud music, or any other loud noise-producing devices in the day-use area.



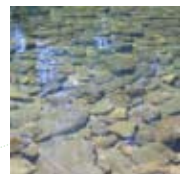
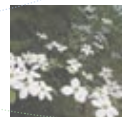
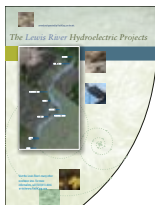
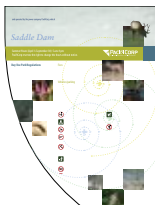
Restrain pets at all times, on leashes of not more than 6 feet in length. Put animal waste in plastic bags and take it with you or drop it in trash receptacles.



Do not use this site for commercial purposes (including vending, site rentals, equipment sales or rentals, and advertising) without prior written permission of PacifiCorp.

All applicable laws regarding public safety, illegal substances, sanitation, boating, and fires will be enforced. Violators of park rules are subject to removal and prosecution. Policies are subject to change without notice.

PacifiCorp does not accept responsibility for the safety or well-being of recreation area guests.



Lewis River Interpretive & Education Plan



Interpretive Exhibits

Each campground and day-use area will feature two interpretive panels, one featuring a topic related to the hydroelectric story and one relating to the natural and cultural history of that site. At Saddle Dam, the interpretation will feature the Frazier Farm.

PacifiCorp is required to post information regarding bull trout at many of the sites. This information will be incorporated into the interpretive program where needed.

All the interpretive materials are thematic in presentation and content.

The Frazier Farm



along a rough-and-tumble
mountain torrent



At the far end of the meadows below Saddle Dam is a large chestnut tree. In front of the tree is a carefully-tended sign that reads "Frasier Homestead chestnut planted by Charles in 1914." The grand old tree, the sign, and the surrounding meadows are reminders of a time when the Lewis River was still a rough-and-tumble mountain torrent, and when pioneers worked to build homes and communities along its banks.



Saddle Dam lies across lands originally homesteaded by John Frasier and his family in the 1880s. The Frasier's arrived at this site in 1888, paddling and poling up the Lewis in dugout canoes in search of land to settle. They liked the look of this area, with its fairly level land and easy access to good fishing at the "Slide" (a site now covered by Yale Dam). They soon established a successful cattle ranch, supplying meat to logging camps in the surrounding mountains.



Eventually, three generations of Frasier's lived and farmed here. They grew cash crops of corn and potatoes, boarded loggers, and even dabbled in gold mining. Some worked on logging crews.

In the early 1950s, the farm was sold to Pacific Power for the construction of Yale Dam and Saddle Dam. Today, elk graze the old Frasier family fields just below the dam, and remnant trees of the fruit orchard still feed elk, deer, and birds.



Lewis River Interpretive & Education Plan

existing signage

identification

interpretation

informational

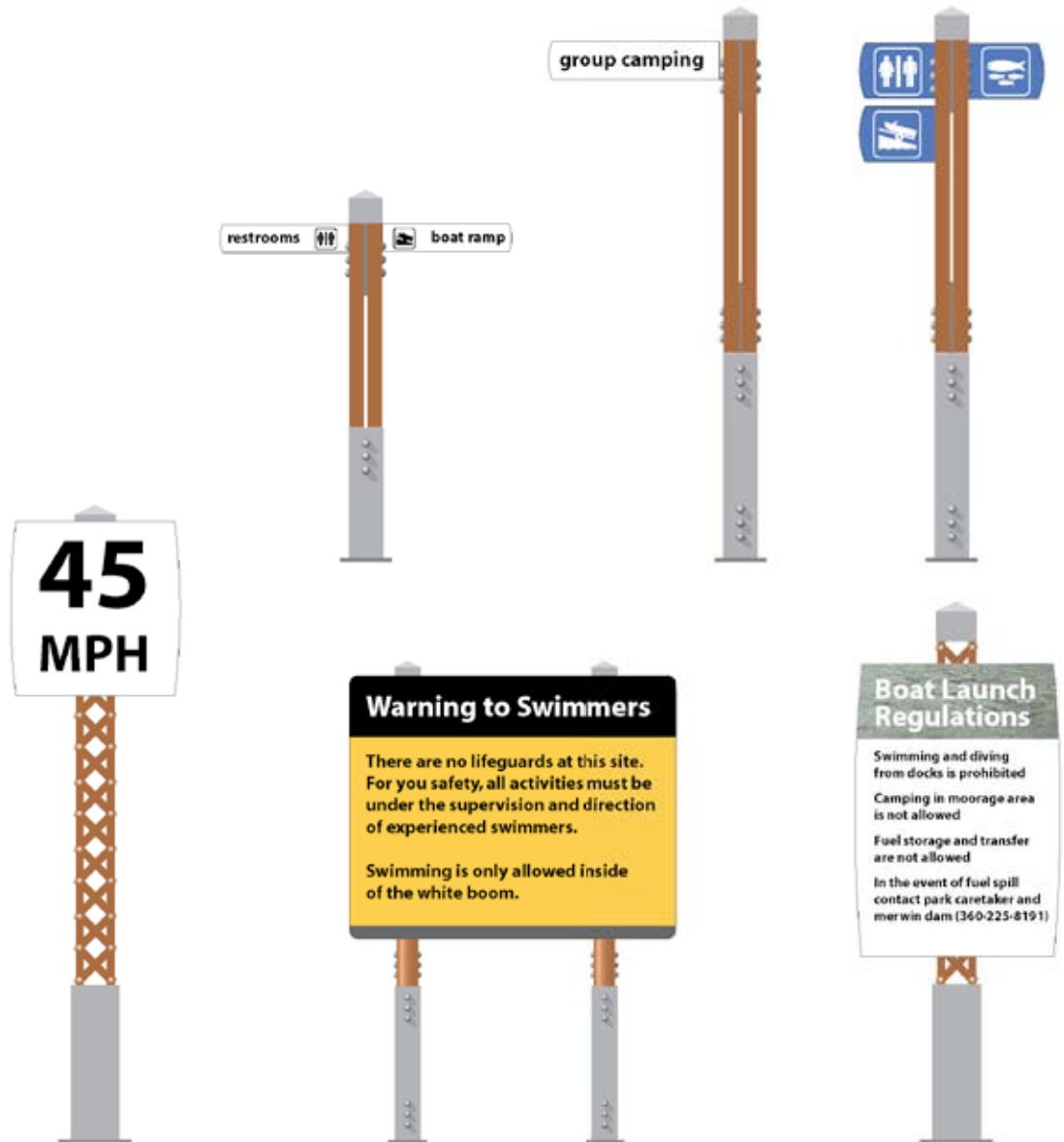
directional

regulatory

traffic

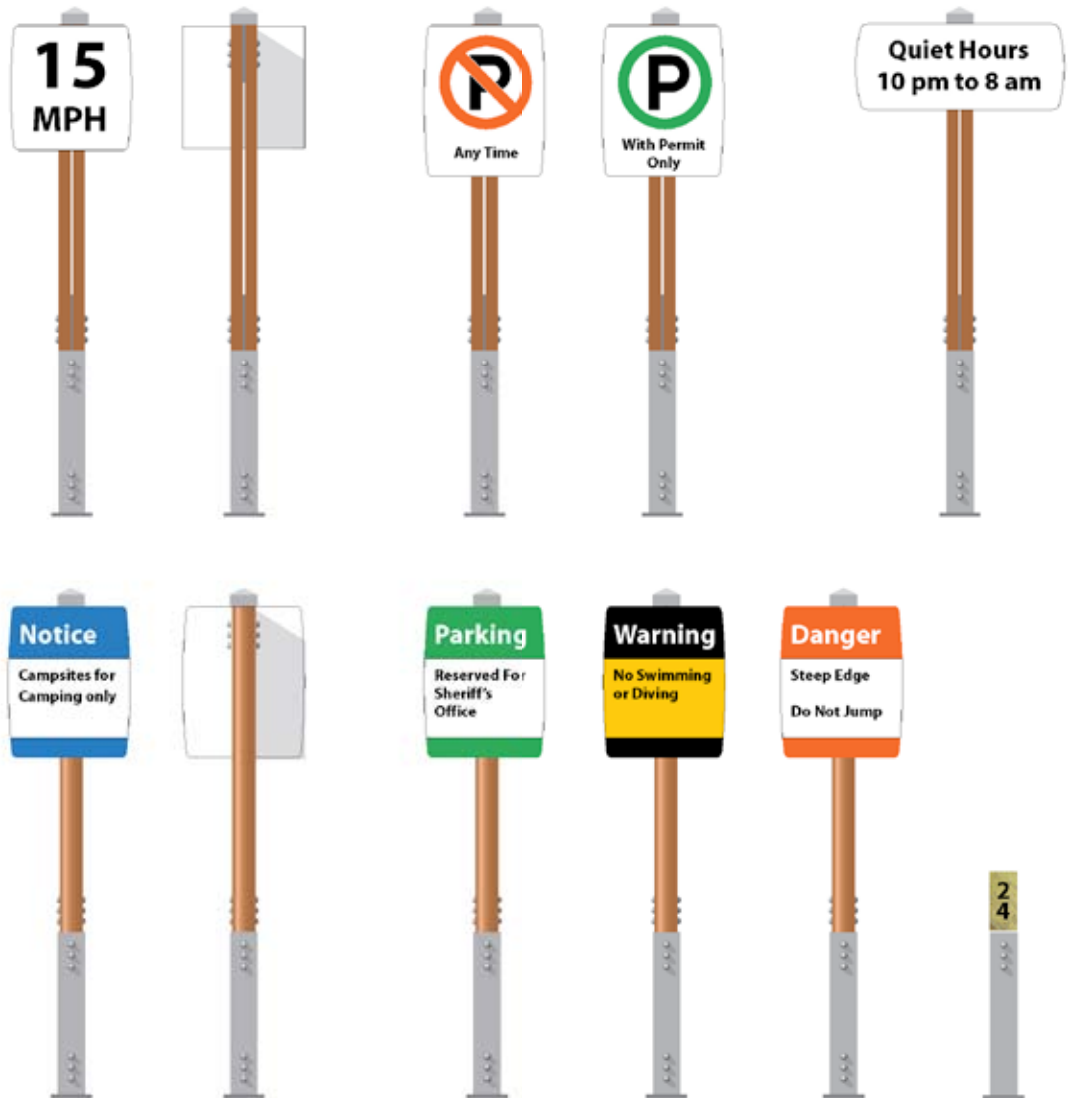
safety





Consistency in Signage

After a brief survey of existing signage, it became apparent that there is little to no consistency in the signage style. The general look and feel of the sites are very similar to other (non-PacifiCorp) recreational sites along the reservoirs, giving PacifiCorp sites no real identity other than the logo on the entrance sign. In a few cases, signage is no longer effective given its age, size, or location. Once a visitor is in the campground or using the boat ramp, the identity is diluted by signage that looks like generic and nondescript. Consistent signage establishes a sense of place. It reinforces the PacifiCorp presence at the site.



Design Standards

When applying design standards to a family of signs—identification, interpretation, informational, directional, regulatory, traffic, and safety signs—it is important to understand the use of color, contrast, fonts, sizing and symbols. These signs are based on MUTCD, OSHA, and ADA standards. The sign shape and upright reflect design elements consistent with the other signage and exhibits proposed for the sites.

The Pacificorp logo will be posted whenever it is applicable to help maintain a presence at each site.

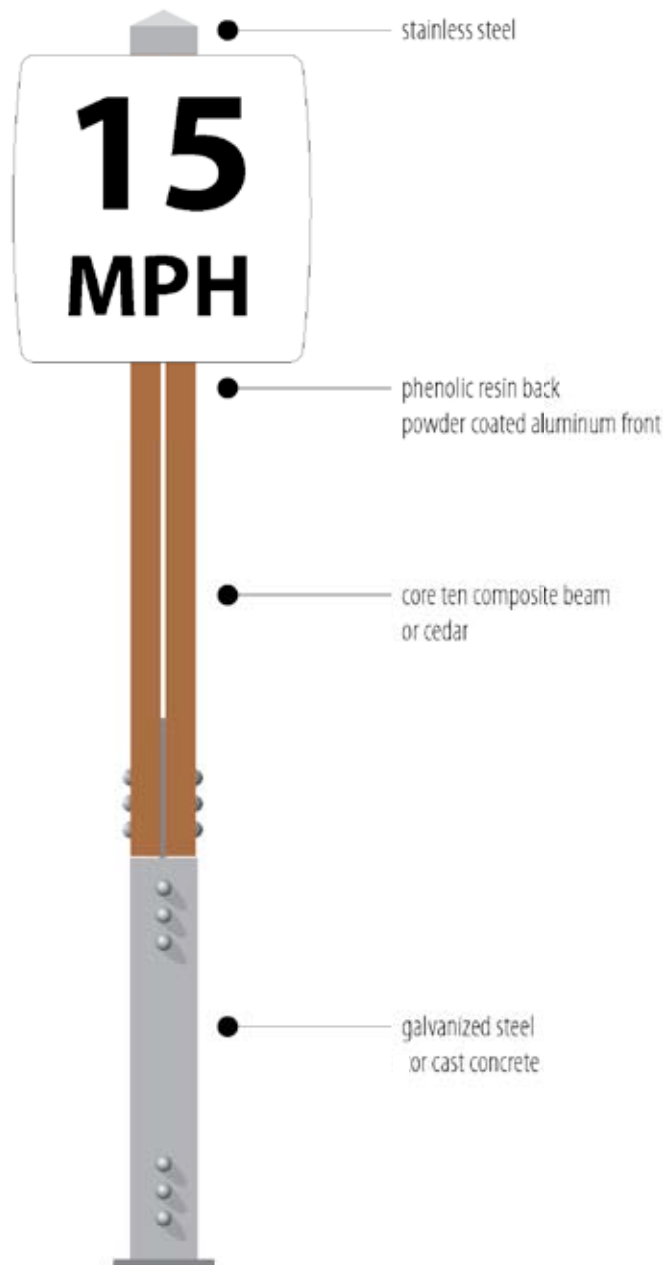
A PacifiCorp Recreation Area		
day use site only		
hours	summer	apr 1 - sep 30
		5 am - 9 am
	winter	oct 1 - mar 31
		7 am - 6 pm
extended hours	fridays	may 23 - sep 30
		5 am - 10 pm
fees	day use	\$0.00
	pass	\$35.00/year
fees non-transferable. display pass in window at all times.		

Applied Design

Design standards for a family of signs can include everything from the entry to the restroom signs. The broader the spectrum and the more consistent the signage, the easier it is to establish a sense of place. But design is more than just a set of standards, it is also about communication.

Good design can make complex messages more understandable. This is accomplished with a well-organized composition.

The example on this page depicts the hours of operation for a PacifiCorp day-use site. Reading from left to right and top to bottom—the information is presented in several layers: On the left—hours, extended hours, and fees. This area is accentuated with an abstract background, drawing a person's eye to that area first. After reading this column, a visitor is prepared for the range of dates and times to follow. The next column informs the visitor that hours of operation depend on the season (winter or summer). Fridays are also in this column to alert the visitor to the fact that they are treated differently than other days during the peak season. And finally, the right column presents specifics—the actual dates and hours of operation.



Materials

There are a variety of materials available for outdoor signage, but only a few can withstand the temperature extremes and wet climate of the Pacific Northwest. Powdercoated aluminum and high pressure laminates have a 10-15 year life for sign panels. The uprights can be constructed out of aluminum, steel, or cedar depending on the desired look—the metal, of course, will have a much longer life. The bases of the signs can be cast concrete or metal. These materials require little to no maintenance.

the sites

There are fourteen distinct recreation sites within the broad scope of this project area. These sites range in size from the 1000+ capacity Merwin Park to small, roadside Eagle Cliff Park. The following are brief overviews of these sites, with notes on users, facilities, and interpretive/educational opportunities. This section concludes with a summary matrix of interpretive/educational recommendations for all sites.

Some sites in this section are not owned or administered by PacifiCorp, but are included in this overview because of their proximity to PacifiCorp-managed sites or because of their pertinence to project sites or to the overall theme of the Interpretive and Education program.

eagle island



site: Eagle Island

recreation: Day use, primarily fishing.

description: Restroom facilities, gravel parking , informal boat launch/take out area.

notes: Eagle Island is 279-acres and is owned and managed by the Washington Department of Fish and Wildlife as prime habitat for the bald eagle. It is also significant salmon habitat for steelhead, Chinook, chum, and coho. PacifiCorp works with the Washington Department of Fish and Wildlife (WDFW) to provide for habitat enhancement in the Lewis River and tributaries to benefit salmon populations in the lower river. There are two hatcheries immediately upriver from this site.

recommendations: Traveling upriver, Eagle Island is the first recreation site associated with the licensing . Since PacifiCorp does not own and operate this site, we do not suggest adding any interpretive elements. There are two existing signs—an identity sign with the site name and cooperative agencies identified and an interpretive exhibit featuring fish and eagles.

interpretive elements: none.



Interpretive exhibit at Eagle Island.

Lewis River Interpretive & Education Plan

lewis river fish hatchery



- site:** Lewis River Hatchery
- recreation:** Day use, fishing.
- description:** A series of rearing tanks and a small visitor center
- notes:** Washington Department of Fish and Wildlife owns and operates this hatchery.
- recommendations:** PacifiCorp does not own and operate this site, but due PacifiCorp's active role in hatchery operations along the Reservoirs and the large number of visitors that visit this location, it may be important to add an exhibit at this location.
- interpretive elements:** Potential interpretive exhibit highlighting PacifiCorp's substantial role in hatchery operations.



Lewis River Hatchery Visitor Center.

merwin hatchery



- site:** Merwin Hatchery
- recreation:** Day use, education
- description:** A fairly large complex of indoor and outdoor facilities for raising salmon. The hatchery is next to Merwin Park.
- notes:** PacifiCorp owns the Merwin Hatchery and Washington Department of Fish and Wildlife operates it. It is a fairly large hatchery facility with an observation deck overlooking the rearing ponds. Existing interpretation is dated but adequate to explain the basic hatchery process.
- recommendations:** This facility provides visitors with the opportunity to see each aspect of hatchery operation. New interpretive exhibits would greatly enhance the visitors experience.
- interpretive elements:** none.



Interpretive exhibits at Merwin Hatchery.

Lewis River Interpretive & Education Plan

merwin park



site: Merwin Park

recreation: Day use—picnicking, swimming
April 1-Sept. 30, 5 a.m.-9 p.m.,
Oct. 1-Mar. 31, 7:30 a.m.-6 p.m.

description: The expansive, amphitheater-style picnic area at Merwin Park is the largest on the Lewis River, with a capacity for up to 1,500 people. There are 135 picnic tables. The site has a swimming area, a large restroom facility, and potable water. Along the north shore, there is a walking trail that parallels the reservoir for a short distance and ends near a waterfall. It is a easy walk on a hard dirt surface and is intended to be wheelchair accessible.

notes: The reservation system and visitor packages are managed and disseminated from the headquarters located in this park. School groups visiting the Lelooska Center use this as a lunch and restroom stop. Families congregate here in the summers to swim and recreate.

recommendations: Due to the size and capacity of this site, and its proximity to headquarters, this is an important location to display orientation and interpretative information. The walking trail provides a quieter ambience for more in depth interpretation.

interpretive elements: Orientation (FERC)
Welcome (site specific)
Interpretive Exhibits
Trail (Discovery) Exhibits



Trail at Merwin Park.

speelyai bay



- site:** Speelyai Bay Park
- recreation:** Day use—picnicking, swimming, fishing
April 1-through Thursday before Memorial Day, 5 a.m.-9 p.m.,
Friday before Memorial Day through Sept. 30, 5 a.m.-10 p.m.,
- description:** Speelyai Bay is a protected cove along the Merwin Reservoir. The site has a swimming area, restroom facility, and potable water. A newly constructed boat ramp features two-lanes. It has a moderately-sized picnic area with 25 tables. This site caters to fisherman during the week, and on the weekends—recreationists enjoying water sport activities, boating, swimming and picnicking.
- notes:** The facilities at Speelyai are undergoing renovation. The boat ramps are new and new restrooms are under construction. Across the bay from this site, large trees along the shoreline are often visited by eagles and osprey. There is a large bull trout interpretive panel for fishermen.
- recommendations:** Due to the transitory nature of the users at this site (most of them are intent on getting onto the water to fish or play), the interpretation will be site specific: the history of the site, and the natural history of bald eagles and osprey. Bull trout conservation information should be posted here.
- interpretive elements:** Orientation (FERC)
Welcome (site specific)
Interpretive Exhibits



Exhibit featuring bull trout at Speelyia Bay Park.

cresap bay



site: Cresap Bay Campground

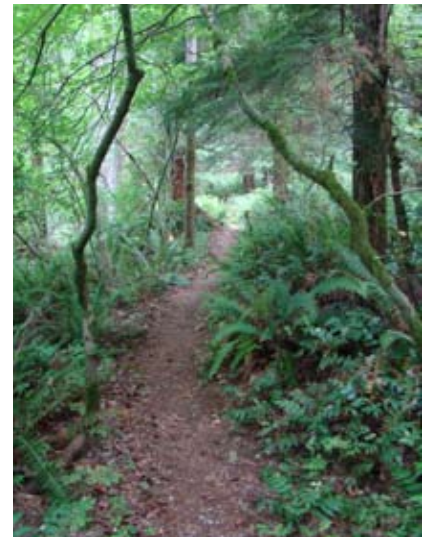
recreation: Campground and Day use—camping, picnicking, swimming, water sports
Friday before Memorial Day through Sept. 30, 6 a.m.-9 p.m.

description: Cresap Bay is the newest campground on the Lewis River. Located at the east end of Merwin Reservoir, it has 58 overnight campsites, 20 picnic tables, a swimming beach, restrooms with showers, recreational vehicle dump station, and a two lane boat ramp. There is a large group camp facility with a covered shelter (fireplace, sink, and electricity), restroom and 15 campsites. There is also a 23-slip marina available for overnight campground guests.

notes: This campground is important wildlife habitat, so off-season access is limited. During the summer season, it is well used. Demographics include users of all ages. The campground is nicely-designed, offering an intimate lakeshore experience. A 1.5 mile trail passes through several different plant communities.

recommendations: Interpretation should be varied in presentation and style to appeal to this site's diverse audience. The campground's habitat-friendly design is an important interpretive topic. Bull trout conservation information should be posted here.

interpretive elements: Orientation (FERC)
Welcome (site specific)
Interpretive Exhibits
Trail (Discovery) Exhibits.



Forest trail.

saddle dam



site: Saddle Dam

recreation: Day use—picnicking, swimming, water sports
Friday before Memorial Day through Labor Day, 5 a.m.-10 p.m.

description: Saddle Dam is at the lower end of the Yale Reservoir. It is the site of the old Frasier Farm. A very large earthen dam dominates the view here; this is one of the few places where visitors can clearly see both above and below a dam. Below the dam, fields, wetlands, and tree shelter-belts provide wildlife viewing opportunities.

notes: Trees and vegetation have been cultivated to encourage and protect elk that visit this site to forage. This is a popular site for both boat-based and shore-based recreation, with access to a launch ramp and to trails.

recommendations: The very visible dam suggests interpretation about dam construction. The view from the top of the dam presents an excellent opportunity to tell the story of Saddle Dam Farm. Bull trout conservation information should be posted here.

interpretive elements: Orientation (FERC)
Welcome (site specific)
Interpretive Exhibits



Two lane boat ramp at Saddle Dam

Lewis River Interpretive & Education Plan

yale park



site: Yale Park

recreation: Day use—fishing, picnicking, swimming, water sports
April 1-through Thursday before Memorial Day, 5 a.m.-9 p.m.,
Friday before Memorial Day through Sept. 30, 5 a.m.-10 p.m.,
Oct. 1-Mar. 31, 7 a.m.-6 p.m.

description: This large, open, day-use facility has 42 picnic tables, restrooms, water, a four-lane boat ramp, and swimming beaches.

notes: This is the site of an old homestead and orchard. Remnant fruit trees grow adjacent to the parking lot. A mill once operated near where the boat launch ramp is now.

recommendations: The expansive view of the lake, plus this site's popularity as a boat launch, suggests interpretation of two primary topics: fish species of the lake and shoreline recreation and stewardship. Bull trout conservation information should be posted here.

interpretive elements: Orientation (FERC)
Welcome (site specific)
Interpretive Exhibits



Water play is popular on the reservoirs.

Lewis River Interpretive & Education Plan

cougar community kiosk



- site:** Cougar Community Kiosk
- recreation:** Rest stop
- description:** This community site features restrooms and a large, covered kiosk.
- notes:** None
- recommendations:** Although this is not a PacifiCorp site, it does offer a very prominent, community-based location for orientation to the Lewis River hydro projects.
- interpretive elements:** Orientation

Forest trail.

cougar park



- site:** Cougar Park and Campground
- recreation:** Campground and Day use—camping, picnicking, swimming, water sports
Friday before Memorial Day through Sept. 30, 6 a.m.-9 p.m.
- description:** This small day-use and camping site has a picnic area, restrooms, water, 45 tent-only sites, a group camp site (15 tent sites and a community shelter with stove), a boat ramp, and swimming beaches.
- notes:** Nearby Cougar Creek hosts a run of kokanee each fall, which attracts bald eagles and other scavengers. This creates an outstanding wildlife viewing opportunity. The creek is also one of the few sites in this region suitable for spawning bull trout, a threatened species.

Cougar has long been a popular camping destination; even before Yale Dam was built, there was a tourist camp in this vicinity. There was also a sawmill nearby.

- recommendations:** Interpretation at this site should be varied in presentation and style to appeal to a diverse audience, with particular attention to tent campers and fishermen. Bull trout conservation information should be posted here.

- interpretive elements:** Orientation (FERC)
Welcome (site specific)
Interpretive Exhibits
Trail (Discovery) Exhibits
Campfire Programs

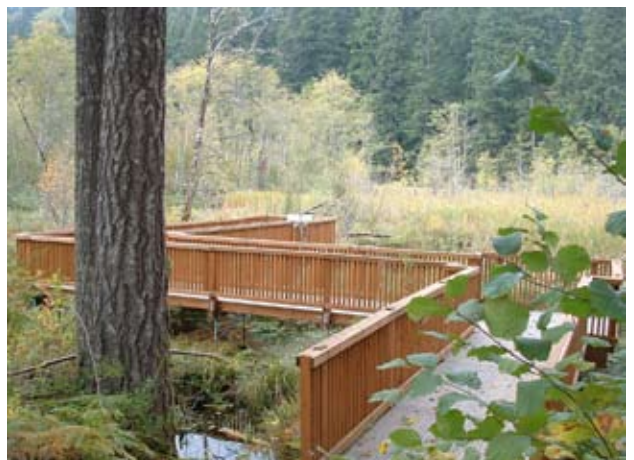


Group camp shelter.

beaver bay



- site:** Beaver Bay Campground and Day Use
- recreation:** Campground and Day use—camping, picnicking, swimming, water sports
Last Friday of April through Sept. 30, 6 a.m.-9 p.m.
- description:** This larger camping and day use site offers 63 individual camp sites, a group camp site with 15 tent sites and a shelter with stove, picnic area, restrooms, showers, water, a single-lane boat ramp, and a swimming beach. Individual campsites can not be reserved in advance. There is a short boardwalk trail, with interpretive signs, through an adjacent wetland.
- notes:** This site has a quieter, slightly more out-of-the-way feel than some of the other lake access sites. The wetland trail offers good wildlife viewing opportunities.
- recommendations:** The Swift #2 tailrace is visible from this site, suggesting interpretation of river dynamics and high water management. The site is also near the sites of some of the most remote pioneer homesteads in the valley. Bull trout conservation information should be posted here.
- interpretive elements:** Orientation (FERC)
Welcome (site specific)
Interpretive Exhibits
Trail (Discovery) Exhibits
Campfire programs



Wetland boardwalk at Beaver Bay Campground.

accessible fishing pier



- site:** Cowlitz PUD Accessible Fishing Pier
- recreation:** Available year-round, the accessible fishing pier provides easy access to the Lewis River below the Swift Dam.
- description:** The road cross over a portion of the spillway, a channel of river that feeds a small private utility company, Cowlitz PUD, powerhouse. Just after the road crosses the bridge, there is a small parking area to the left with a concrete platform that extends over the water.
- notes:** This site does not have much natural appeal aside from the platform, although this would be a great place to interpret the relationship between PacifiCorp and Cowlitz PUD within this hydroelectric project.
- recommendations:** This site is not an obvious fishing site. Accessible fishing platforms are a great recreational asset. This site should be signed.



- interpretive elements:** An interpretive display describing how the channel of water is part of a larger hydroelectric project. An interesting sidebar might feature the devastating “blowout” when water burst through a portion of the channel and knocked out the powerhouse.



Its hard to keep an avid fisherman from the water.

swift dam overlook



site: Swift Dam Overlook

recreation: N/A

description: This is a medium-sized gravel pullout, directly beside the highway. There is a chain-link fence directly below the pullout. From this site, the dam is prominent.

notes: This is one of the few overlooks along the Lewis River from which a dam can be directly viewed.

recommendations: None

interpretive elements: None

swift forest camp



- site:** Swift Forest Campground and Day Use
- recreation:** Campground and Day use—camping, picnicking, swimming, water sports
Last Friday of April through end of hunting season in November,
6 a.m.-9 p.m.
- description:** This is a large campground and day use site, providing 93 individual campsites, a picnic area, restrooms, water, a two-lane boat ramp, and swimming beaches. Campsites cannot be reserved in advance.
- notes:** Swift Forest Camp has expansive views of Swift Lake. Because it is the most remote of the PacifiCorp campgrounds, it is generally quieter, with less of a bustling feel than the others. There is currently a large interpretive panel, designed primarily for fishermen, on bull trout.
- recommendations:** Lake level fluctuations are particularly visible on Swift Reservoir. This suggests an interpretive topic of reservoir fluctuations and how the dams work together to generate power and to sustain habitat. Bull trout conservation information should be posted here.
- interpretive elements:** Orientation (FERC)
Welcome (site specific)
Interpretive Exhibits
Campfire Programs



weather station.

Lewis River Interpretive & Education Plan

eagle cliff park



site: Eagle Cliff Park

recreation: Day use
Year round, 24 hours

description: This small, riverside picnic area provides 10 picnic tables, and restrooms.

notes: Eagle Cliff Park is the first opportunity for a visitor traveling up-valley from Merwin dam to see the Lewis River un-dammed. Here, the river flows swiftly through boulders and cobbles. Picturesque cliffs rise just upstream.

recommendations: The un-dammed Lewis River, stretching from here up the slopes of Mt. Adams, suggests interpretation centered on watersheds and their importance. The site is also along the old Klickitat Trail, providing an opportunity to tell that story.

interpretive elements: Orientation (FERC)
Welcome (site specific)
Interpretive Exhibits



Eagle Cliff.

storyline

The storyline is the document that summarizes our interpretive research. This is the “story” of this project area, from the bedrock up. It may be used to create interpretive text, provide the foundation for a docent guide, or inspire discovery elements or campfire programs. This storyline has been reviewed by the following PacifiCorp personnel: Kendel Emerson, Jane Hills, Jennifer Kelly, Erik Lesko, Kim McCune, David Moore, Kirk Naylor, Todd Olson, Frank Schrier, and Gene Scibelli.

Natural History

- Geology
- Climate
- Vegetation
- Wildlife

Cultural History

- Native American History
- Early Euroamerican Explorations
- Prospectors
- Homesteaders
- Transportation
- Mail
- Communities
- The Timber Industry
- The CCC and the Forest Service
- Dams and Change

The Hydroelectric Story

- Hydro Projects of the Lewis River
- Types of Dams
- Electricity
- Electric Generation
- Hydroelectricity
- History of Hydroelectricity
- Inside a Hydroelectric Plant
- Hydroelectric Transmission
- The “Grid”
- Power Economics
- Operating the Three-Lake Systems

PacifiCorp

- Company History
- Recreation
- Wildlife Conservation
 - Forestry for Habitat
 - Wetland
 - Farm Fields and Orchards
 - Cresap Bay
 - Elk and Deer
 - Other Wildlife Conservation
- Fish Enhancement
- Cougar Creek

Major Tree and Shrub Species of the Project Area**Major Invasive Plants Being Monitored****Prominent Mammal Species of the Project Area****Prominent Fish Species of the Project Area****Flood Management**

Natural History

[note: The Lewis River is divided into the North Fork and East Fork regions, with the division occurring at Woodland. PacifiCorp's reservoirs, and all sites identified in this document, lie on the North Fork of the Lewis. In the interest of simplicity, for the purposes of this document, "Lewis River" will refer specifically to the North Fork].

Geology

The Lewis River flows from the Cascade Range—a north-south trending range of mountains that stretches from northern California to southern British Columbia. These rugged, geologically-rich mountains are part of the "Ring of Fire": a great arc of volcanic mountains that rim the Pacific Ocean. Like all Ring of Fire ranges, the Cascades are the product of the slow collision of the Pacific tectonic plate against a continental plate—in this case, the North American plate.

At the juncture between these two plates, the heavier Pacific plate creeps underneath the North American plate. As this happens, the sinking rocks of the oceanic plate melt under the intense heat and pressure of Earth's deep mantle. The molten rock flows upward through complex layers of volcanic, sedimentary, and metamorphic bedrock that were formed during previous plate action. Where the molten rock returns to the surface, it has formed tall, conical volcanoes that rise prominently above their non-volcanic neighbors. Mt. St. Helens, Mt. Shasta, Mt. Hood, and Mt. Rainier are just a few of these familiar, picturesque volcanoes.

The Cascades began their rise over 50 million years ago. During the Miocene epoch (13 to 25 million years ago), they reached a peak of volcanism; many of today's volcanoes emerged during that period. In subsequent millennia, eruptions throughout the range deposited complex strata of ash, basalt, clay, and mud. Meanwhile, the action of water—in the form of glaciers and rivers—carved deeply into the rising range, creating the region's steep valleys. The Lewis River flows through—and shapes—such a valley, working its way down through layers of volcanic rock, mud, and ash, carrying away and depositing this debris in downstream regions.

Although the Cascades may seem relatively quiet in our human timescale, they remain a work in progress. Eruptions continue today, with the most recent major events being the eruption of Mt. Lassen in 1914-1917 and the eruption of Mt. St. Helens in 1980. The latter eruption had a profound impact on the Lewis River Basin, as the upper portion of the basin lies on the slopes of Mt. St. Helens. Although much of the volcano's explosive power was vented to the north and west, lahars (mudflows) did extend to the upper waters of the Lewis, and impacts reached to Swift Reservoir, where lahars descended Pine Creek, Muddy River and Swift Creek and deposited a large amount of debris in the reservoir.

Today, the signs of the Lewis River's volcanic past are clearly visible, and volcanic bedrock and deposits play a large role in the valley's hydrology and biology. Basalt outcrops occur throughout the valley (many are prominent along route 503). Dense, light blue-gray embankments of volcanic mud and clay can be seen along the roadside and on hillsides. Some areas, such as the hillsides above Swift Reservoir, harbor lava tubes and channels that can create complex drainage patterns.

Climate

The Lewis River flows down the west slope of the Cascades, entering the Columbia River less than 100 miles from the Pacific. Moist air masses, pushing eastward from the ocean, encounter the wall of the Cascades and deflect upward. As the air rises, it cools, causing water vapor to condense into clouds that cloak the peaks—and rain and snow that inundate the valleys.

Nestling like an open baseball glove in the path of Pacific rainstorms, the Lewis River Basin scoops near-maximum potential precipitation from this air-land interaction. Higher elevations get the brunt of the orographic (mountain-induced) rain and snowfall. Near the mouth of the river, average annual precipitation is 37 inches, while at the higher elevations on Mt. Adams it can reach 140 inches. Most precipitation falls from November through March.

The abundance of high-elevation precipitation in the Lewis River Basin translates into a massive amount of winter snow (snowfall can exceed 200 inches at elevations over 3000 feet), which has a strong influence on the hydrology of the Lewis. Snowmelt sustains the river through the dry summers, providing water for fish habitat, wetlands and wildlife. Winter warm spells and spring thaws bring rain-on-snow events that can quickly raise river levels.

Temperatures in this moist land are mild. At lower elevations, average summer temperatures range from the 50s to the 70s, and average winter temperatures range from the 30s to the 40s. Temperatures are slightly cooler with increasing elevation.

Vegetation

Vegetation along the Lewis River varies greatly according to elevation, aspect, substrate and site history. Before the arrival of Euroamerican settlers, the valley was cloaked in dense forest of Douglas-fir, western red cedar, and western hemlock, with small “prairie” grasslands (possibly maintained by burning) and wetlands nestling in the river bottomlands. Today's vegetation differs significantly from this original state; it is the result of over 100 years of homesteading, timber harvest, and development.

Timber harvest has had an influence on the vegetation of the Lewis River Basin since the first logging companies were established in the 1890s. Today, nearly all of the forested lands along the river have been cut over at least once, and some,

twice. Many of these second- and third- generation forests are now at a stage where the canopy intercepts most of the light, suppressing understory growth.

A significant event in the Lewis River Valley history was the great wildfire of 1902: the Yacolt Burn. This huge blaze, one of the largest in Washington State history, burned thousands of acres of timber in the Yale area, destroying a number of homesteads and killing 14-17 people. Much of the logging in the early 20th century was salvage logging of Yacolt Burn wood.

Wildlife

The Lewis River Valley is home to a “typical” complement of northern Cascades mammals, including elk, black bear, black-tailed deer, mountain lion, bobcat, coyote, Douglas squirrel, mink, otter, bats, porcupines, shrews and small rodents such as deer mice. Prominent birds include bald eagle, osprey, herons, various woodpecker species, grouse, migratory songbirds such as thrushes, warblers and sparrows, some overwintering and nesting waterfowl such as hooded mergansers and wood ducks.

Cultural History

Native American History

The valley of the upper Lewis River has a strong Native American history. Like all salmon-bearing rivers in the Cascades, the Lewis was an important natural resource for people who relied on salmon as their lifeblood and as a central trade item in their Columbia River trade nexus.

Because of the fluid and complex nature of Native American societies, the large timescales involved, and an imperfect understanding by Euroamerican chroniclers of tribal relationships and land tenure, it is difficult to state specifics on the “boundaries” of any tribe’s homeland previous to and immediately following Euroamerican contact. The Lewis River drainage is known to have been occupied by three main ethnic groups: the Cathlapootles (upper Chinookan-speaking people), and the Taidnapam/Upper Cowlitz and the Klickitat (both of which groups spoke languages related to Yakama and Umatilla).

Today, the project area spans a region considered traditional territory by the Cowlitz Tribe and the Yakama Nation. Following are brief overviews of these groups, from their own public information resources:

Cowlitz

“The Cowlitz Indians were originally considered to be ‘a large and powerful Salishan tribe.’ Because they were an interior tribe (that is, their territory did not open onto a large body of water), they were more cohesive than other Salish groups on the coast and Columbia River . . . Conscious of social stratification,

they valued cooperation and had a desire for smooth relationships with neighbors. They have been called the blue bloods of southwest Washington, yet they were also known as warlike. One of the earliest accounts describes their swoop downriver to attack a Chinookan village at the mouth of the Cowlitz. Another account describes the unsuccessful effort of war chief Wieno and others to take slaves from a village on Vancouver Island.

“Today, though the Cowlitz are scattered, many still remain. Relatively few actually live near the Cowlitz River (perhaps 30 or so families). Most of the 1,400 who belong to the tribe live within the radius of a two-hour drive, a recent poll shows. The tribe’s business office, presently in Longview, keeps track of the network of Cowlitz individuals and families living, for the most part, in western Washington. Biennial meetings in June and November on Cowlitz Prairie, the tribal heartland, bring them together to renew themselves as Cowlitz as well as to carry on the important business of fighting for their fishing rights, federal recognition and for their own reservation and a Cowlitz tribal center.”

--by Judith W. Irwin, *The Columbian*, summer 1994

Yakama

The people today known as the Yakama Tribe are members of a number of historically-distinct tribes and bands that have lived in what is now known as the Cascade Mountains since “time immemorial”. These groups include the Palouse, Pisquose, Yakama, Wenatchapam, Klinquit, Oche Chotes, Kow way saye ee, Sk’in-pah, Kah-miltpah, Klickitat, Wish ham , See ap Cat, Li ay was and Shyiks. Before 1855, these bands and tribes were separate entities, united by trade relations, and some common language elements and life ways. Over the centuries, they developed highly-refined craft and construction techniques, including basketry, hide sewing, beadwork, mat-weaving, and lodge-building. They became master traders, exchanging such commodities as fish, oil, furs, jewelry, cosmetics, and horses with tribes along the Columbia and beyond. Salmon were (and, of course, still are) absolutely central to their lives and culture—both as food and as a trade item.

In 1855, leaders of the above tribes and bands signed the Yakama Treaty of 1855, which united them into the Yakama Nation (leaders signing the treaty were Kamaiaikin, Sklom, Owhi, Te-cole-kun, La-hoom, Koo-lat-toose, Sch-noo-a, Me-ni-nock, Shee-ah-cotte, Sla-kish, Elit Palmer, Tuck-quille, Wish-och-knipits and Ka-loo-as). As part of this treaty, the Yakama ceded some 9.5 million acres of their traditional lands to the US government, retaining a 1.3 million acre reservation. However, the treaty granted them use of their ceded lands for “Usual and Accustomary” fishing, hunting, and gathering—a very important right that keeps the Yakama involved in the health and welfare of fish and wildlife throughout the Cascades.

Today, the Yakama Nation consists of over 8,000 people. They are a sovereign traditional Treaty tribe, with a government that consists of 14 elected Tribal Council members. They operate a number of business enterprises, including a Cultural Center, a credit enterprise, an industrial park, a furniture factory, and an RV park.

The Yakama Nation is deeply involved in stewardship of both reservation and Usual and Accustomary lands. They have a well-developed fisheries program, and are represented in land-use and fisheries negotiations and decisions throughout the region. They consider the lands of south-central Washington their sacred trust, given to them by the Creator to hold and protect for future generations.

--from the Yakama Cultural Center and the Columbia Inter-tribal Fish Commission

Before the construction of Yale and Swift dams, Pacific Power contracted with archaeologists to research and catalog sites of archaeological interest in the area. No large-scale prehistoric evidence was found, but researchers discovered a number of significant sites, including scatters of stone tools and tool flakes, and sites with ground stone tools (indicating vegetable material processing) and what appeared to be the remains of pit houses. To protect their integrity, none of these sites should be publicized.

Further background on Native American use of this area and archaeological investigation of the sites of Yale and Swift Lakes is provided in PacifiCorp's Lewis River Historic Properties Management Plan. Due to the sensitive nature of archaeological sites, specific information on the location and nature of archaeological sites is not included in this storyline.

Early Euroamerican Explorations

The earliest documented travel by Euroamerican explorers through the Lewis River Valley occurred in the mid-1800s. These early explorers were primarily fur traders and entrepreneurs, and, after the discovery of gold on the Lewis (then called the "Cathlapoot'l") in the early 1850s, prospectors. Most probably traveled at least in part via the "Klickitat Trail"—a route that went from Fort Vancouver to the Yakama area, in part via the Lewis River. According to maps and notes from George B. McClellan's 1853 railway-survey expedition, the trail probably entered the Lewis drainage from Clehatchie Prairie and crossed the Lewis in the eastern third of what is now Lake Merwin, then ran up Speelyai Creek, rejoining the Lewis near the present-day site of Yale Dam. It then continued up the north side of the Lewis past present-day Swift Lake.

While forging his way up the river, McClellan noted flatly that “the valley of the Cathlapoot’l above and at our crossing is utterly worthless for any purpose.” His assessment proved prophetic, as it was many years before settlers ventured to create homesteads in the lower valley—and only a few ever tried to tame the upper parts of the valley into farms or pasture lands at all.

Prospectors

In the mid-1850s, discoveries of small amounts of gold in streams north of the Chelatchie Prairie ignited gold fever—and for decades afterwards, legends and rumors sustained it: Ole Peterson used his gold to buy those fancy cars he liked... “Indian George” always paid for groceries with nuggets from a heavy buckskin bag... For a handful of prospectors in the late 19th century, the possibility of a windfall of nuggets in some obscure Lewis River tributary was enough to drive years of exhausting exploration, hunger, cold, equipment trouble, and loneliness. But despite decades of slow but steady prospecting, and the establishment of several mining claims—including one that now lies beneath the Yale Dam—gold mining never really “panned out” along the Lewis.

Homesteaders

The mid-1800s saw increasingly rapid settlement of northern Oregon and western Washington by emigrants, with an increase in response to the Donation Land Act of 1850. As the prime agricultural lands of the Columbia and Willamette regions dwindled, however, new settlers were forced to choose more marginal lands for homesteads. But even as the lowlands of the Cascades were claimed and farmed, the rugged valleys and gorges above remained empty of settlers.

The first settlers within the project area arrived in the early 1860s, claiming land through pre-emption (for unsurveyed public land), or under the Homestead Act of 1862 (for surveyed public land). However, much of the settlement above present-day Merwin Dam (originally called Ariel Dam) followed in the wake of 1880s and 1890s logging operations that cleared the land of the huge timber that made the area so difficult for farming. After an area was logged, “stump farmers” could set up small fields and scrape by on subsistence crops. After the economic depression of the 1890s, there were several small farms in the valley. Most of these were in the Merwin and Yale Valley regions, with very few above the site of Yale Dam and none documented above the site of Swift Dam.

Homestead life along the Lewis River before the dams could be difficult, but those who experienced it often look back on their farm days as some of the best of their lives. Families lived in modest houses and farmed small plots, growing vegetables, fruits, hay, and sometimes grain. Most families had chickens and a cow or two for milk and meat; some raised pigs, some kept sheep. Meat, fruit and vegetables were preserved and stored for winter use, and excess was sold to markets in Woodland. Some families grew cash crops of potatoes, strawberries, and raspberries.

The harvest of wild foods and materials was also important to the homesteaders. Many fished in the Lewis River during the summer, and canned their catch for the winter. Coho and Chinook salmon, as well as smelt, were important subsistence fisheries. Most hunted deer for food, some trapped and sold furs. Wild huckleberries were popular for jams or pies. Some families made extra money cutting shake bolts or gathering medicinal plants.

What homesteaders couldn't grow, they had to buy. Flour, sugar, and cloth are examples. Some children bought their own school clothes, making money by picking strawberries (they were paid 1/4 cent per pound in the 1920s), collecting, drying and selling cascara bark (to pharmaceutical companies who packaged it as a laxative), or even picking and selling fungi (also to pharmaceutical companies).

Transportation

The earliest travel along the Lewis River was by foot, along the Klickitat Trail and subsequent local routes. The heavy timber made overland travel extremely difficult. As Euroamerican settlers—with their high demand for transportation—moved in, the river became increasingly important as a travel route.

Below present-day Merwin Dam lies “Shirt-Tail Canyon”—a narrow stretch of river named because as boaters descended it, “their shirt-tails were flying.” This natural feature formed a kind of gateway to the upper reaches of the Lewis River. Although a number of sternwheelers plied the waters below Shirt-Tail Canyon, only two ran above, to connect the Lewis River settlers with Woodland and Portland. These vessels were the Etna and the Speilei (sometimes spelled “Speillei”). Both vessels traveled as far upriver as Speelyai Creek, and occasionally higher. Low water presented challenges; at times the captain of the Etna would have to work his vessel through shallow riffles by tying off to trees on the bank. Both the boats served primarily the logging industry, carrying supplies, rails, and equipment, but both also carried passengers and local freight.

The Etna, which served from 1906 to 1919, was owned by Lurlie Gray. It was 60 feet long with a large cabin, and had a capacity of 13 tons. The Speilei, which began service in 1907 and continued to 1940, was a scow-type sternwheeler, flat and broad with a sloping bow, built specifically for the logging industry. Both the Etna and the Speilei burned cordwood for fuel. It could take several cords of wood—at a cost of \$2-3 per cord—to make the round trip from the Lewis to Portland. This wood demand made for a handy source of income for enterprising settlers along the river. In 1912, the Speillei was rebuilt, and an oil engine was installed.

The first wagon road into the valley led from the site of the present-day fish hatchery below Ariel Dam away from the river around Shirt-Tail Canyon,

then back to the river at Ariel (which was at the time upstream from its present location). From there it followed the river to Speelyai Prairie. Another road came in the “back way” from Vancouver/Battle Ground, connecting with the Lewis at Cresap Ferry. Both of these routes roughly correspond to today’s route 503.

These early wagon roads were incredibly rough. Muddy in winter, dusty in summer, fraught with fallen trees after storms, and sometimes impassible due to heavy snow, they made any wagon trip to town into a serious undertaking. In fact, even after the roads developed, most homes, farms, and camps faced the river.

For early homesteaders, a wagon trip downriver to Woodland or east toward Vancouver was a major journey. A family would load the wagon with any items they might want to sell or barter (eggs, butter, berries, fruits) and make the rough, bouncing journey in about a day. In “town” they bought or traded for the few staples they might need: flour, lard, sugar, coffee (and perhaps a piece of candy for the children). Then they headed back home—a journey that might take two days.

As logging and dam construction expanded in the valley, roads expanded as well, eventually extending to Cougar and branching off to various homesteads.

Mail

Postal service reached the communities of the lower part of the project area in the 1890s. Mail was brought by wagon, horseback, or, in particularly snowy winters, by snowshoes. Mail service began at once a week, and progressed to twice or three times a week. Popular postal items included mail-order clothing (at least one postal carrier was convinced by a pretty girl to return a mail-order dress she’d worn the night before at a dance).

Communities

There were several small communities along the river, both before and after the start of the dam era. These small towns centered around post offices, churches, and general stores. Below are short descriptions of the history of these communities.

Ariel

The community of Ariel was established in 1899, above where the Ariel Dam was eventually built. The post office was established, and the town named by Leander Chitty for his son, Ariel Chitty. In 1929, the town’s post office and store were moved downstream to near the dam site, and the old townsite was flooded when the dam was built. The new Ariel post office was established in 1931. The “new” Ariel was an important housing and supply center for dam workers. There was a school at Ariel.

Yale

The community of Yale was one of the larger towns along the river. It lies in a flat side valley, partially separated from the Lewis by a small ridge. Yale hosted one of only a handful of regional schools. Dances, magic shows, potlucks, and traveling ministers drew homesteaders from miles upriver and down to the Yale Community Hall, school, store, or churches. In the early 1930s, the town became host to the CCC Camp Speelyai, which was located just west of Harry Reese's general store.

Another landmark in the Yale area was Schmidt's store and boarding house, run by Steve Schmidt, a German immigrant, and his wife Caroline. The boarding house operated in the 1930s and 1940s and catered to loggers and construction workers, among others. Schmidt was famous for speaking seven languages. He was well-respected in the community, although people often complained about his cattle, which he allowed to run free. The Schmidt boarding house was a local meeting place—the site of community dances and “magic lantern” shows.

Although Ariel Dam was complete and generating electricity by the mid-1930s, Yale did not get electricity until 1940 and telephone service didn't arrive until the 1950s.

Cougar

The small town of Cougar is just east of Yale, and for many years residents of this area got their mail at Yale. In 1918, the post office was established, and Cougar became the last mail stop. Cougar was the site of a mill run by the Robbins family, who had homesteaded in the area beginning around 1880. In the 1910s, Edgar Robbins operated a “tourist camp” along Cougar Creek, catering to travelers on their way to Mt. St. Helens and other high-country adventures. A basket ferry helped adventurers cross the Lewis here, and there was a community dance hall that could get rowdy at times.

The Timber Industry

The timber industry has been a part of the Lewis River Valley since the 1880s, when small-scale operators began logging in the lower stretches of the river. These early operations cleared some areas—such as the Yale Valley and some of the regions now covered by Merwin Lake—of the huge trees that had hindered settlement, opening “prairies” (clearcuts) that could be (albeit with great difficulty) farmed, and facilitating settlement of the valley.

Early logging methods along the Lewis River relied solely on animal, human, and water power to muscle the big logs to mills. Trees were felled and “bucked” (divided into sections). The sections were hauled by ox team over greased skid roads to steep, muddy chutes. Down the chutes the logs rocketed, hitting the rivers below with tremendous splashes. Travelers on the wagon roads in this

region sometimes had to cross the log chutes, which could be hazardous—horses balked at the slippery, wet channels, and drivers had to listen carefully for the whistle signals that warned of the deadly missiles.

Once or twice a year, log drives would herd the wayward timber down the river on high flows. These drives were difficult and dangerous work, involving pike poles, peaveys and explosives for loosening logjams, taut cables, and much clambering over the unsteady timber. Log drive workers camped on shore or stayed at local farmhouses, sometimes contracting with local farm wives for home cooking—although cook shacks were also brought along on rafts. The logs were prodded, levered, blasted and cajoled down the length of the Lewis to mills at Woodland, or sometimes rafted from there to Portland.

Many different companies logged along the Lewis—companies had their own distinctive log brands to identify which trees were their own in the chaos of timber that sometimes piled up at the mills.

In 1881, the “steam donkey” or Dolbeer Logging Engine was invented. This simple machine—consisting of a steam engine connected to a winch—could be set up anywhere, hauling itself through the woods to a site by winching itself from tree to tree. The first steam donkey is said to have arrived on the Lewis River shortly after 1900, and donkeys slowly began to replace ox teams for hauling power.

A devastating fire in 1902 helped spur the timber industry in the Lewis River region. On September 12 of that year, a spark caught near the small town of Stevenson. The fire approached the Lewis via Chelatchie Prairie and raged across the valley, pushed by strong winds. In all, over a dozen people were killed, some 30 homesteads were destroyed, and as many as 230,000 acres of land were burned.

Where locals saw tragedy, logging operations saw opportunity to salvage the huge amount of fire-killed timber. Weyerhaeuser set up operations in nearby Yacolt, and soon modern logging railroads were snaking their way through the hillsides, providing even easier access to the wealth of wood. Other companies took advantage of the bounty of dead trees as well, and soon logging was the major industry on the Lewis. Local homesteaders mostly benefited from the new industry, selling produce and meat to the camps, boarding loggers, and working for the logging companies themselves.

By the 1920s, logging technology had advanced considerably from the old ox-team and skid road days. Perhaps the most significant advance was the development of “high lead” logging. In a high lead operation, a tall central tree (the spar tree) was de-limbed, topped, and rigged with a system of guy lines and

pulleys. From this central point, a network of aerial cables extended out into the surrounding forest. A steam-driven skidder was then used to winch logs back to the spar tree area via the cables, with the logs bouncing and swinging—partially or completely suspended from the cables—through the trees.

Combined with railroads, high lead logging made all but the most remote timberlands accessible to timber harvest. In the 1920s and 1930s, there were many logging operations—both large scale operations and small “gyppo” operations—working the slopes along the Lewis. Two railroad systems were in place: one connecting with the North Fork tie mill on Rock Creek (from which cants were railroaded down to the mouth of Speelyai Creek and sent downriver), and another connecting to a mill at Dubois.

Several sawmills were established to process the timber. There were mills at Cougar Creek, Rock Creek, Cresap Bay, and near present-day Yale Park. Much of the mill production was railroad ties, but the mills also produced shake bolts, and building and fencing lumber for local use and export. The river continued to be the primary means of export for lumber and logs until the building of the Ariel Dam (and the development of modern logging trucks) in the late 1920s and 1930s.

Logging continued to be an important industry in the valley until at least the 1960s. Today, logging occurs less frequently along the Lewis River Valley. Some logging occurs on PacifiCorp lands as part of wildlife management efforts. Approximate distribution of the watershed forested land is as follows: 26% is private industrial forestland, 11% is owned by the Department of Natural Resources, and 40% is USDA Forest Service.

The CCC and the US Forest Service

In the wake of the Yacolt burn and subsequent intense logging in the Lewis River Valley, national agencies were drawn to the area. Civilian Conservation Corps crews arrived in the Lewis River Valley in the early 1930s, and continued to serve in the region until the late 1950s. Camp Speelyai, at Yale, was established to provide workers to assist with the continuing salvage of burned timber from the 1902 Yacolt Burn and a Yale Valley fire in 1933. Another CCC camp was set up near the present-day Swift Dam in the 1950s, to provide support for the construction of Swift Dam.

In the 1910s, the newly-created US Forest Service did extensive work on and along the Lewis River Trail, establishing ranger stations for “forest guard” duties in the brand-new Columbia National Forest (later the Gifford Pinchot National Forest). The Lewis River Trail began at Cougar, where the wagon road from Woodland ended at that time. A ranger station at Cougar provided housing, storage, pasturage, and equipment supply services for more remote outposts.

The Forest Service used the Lewis River Trail as access to remote operations in the upper Lewis River and beyond. These operations included fire prevention, fire detection (the trail was a critical access line for regional fire lookouts), and recreation development.

Today, the Forest Service continues to be a player in the story of the Lewis River. Much of the river's upper watershed lies on National Forest lands, and many recreationists are drawn to the region by the nearby Mt. St. Helens National Volcanic Monument, administered by the Forest Service.

Dams and Change

Plans for creation of hydroelectric plants on the Lewis River began at the turn of the 20th century. In the 1920s, surveyors from Inland Light and Power (a predecessor of Pacific Power/PacifiCorp) began photographing the lands that would eventually be flooded by the Ariel Dam. Land agents worked to buy up the properties and homesteaders gradually moved out—some took up work on dam construction or supporting the new “town” that sprang up at Ariel, others to establish new farms or enterprises elsewhere.

The building of Ariel Dam (now Merwin Dam) was just the beginning of the “electrification” of the Lewis River. Construction of the Merwin Dam began in 1929 and was completed in 1931. Yale Dam was completed in 1953, and Swift Dam was completed in 1958. Plans for two other projects further upstream were never carried out.

The Hydroelectric Story

Hydro Projects of the Lewis River

The three lakes of the Lewis River: Merwin, Yale, and Swift (and their associated reservoirs) are focal points of the valley. To many people, the lakes may seem like natural landscape elements; there are few places on the main roads from which the dams can be seen. For many, the lakes are seen primarily as recreation sites: great places to go waterskiing, fishing, swimming, camping. But these lakes are actually working reservoirs. All three were constructed for the primary purpose of supplying electricity. They are all owned and operated (under a Federal Energy Regulatory Commission license) by PacifiCorp Energy, a power utility company. An additional hydroelectric facility, the Swift No. 2 Project canal between Swift Dam and Yale Lake, is owned by Cowlitz County PUD and operated by PacifiCorp.

Merwin (Ariel) Project

In the 1920s, Inland Light and Power (later to become Pacific Power and Light, and eventually PacifiCorp) began buying lands in the area above Shirt-tail Canyon, in the region that would eventually be flooded by Lake Merwin. This area had been settled at a medium density by homesteaders in the late 1800s;

several farms were purchased and their inhabitants moved to other locations. Some residents held out for several years, until the dam was nearly complete. Construction of the Ariel Dam (now called Merwin Dam) was begun in 1929. Trees were felled around the margins of what would become the lake, although the timber along the river was left standing (this was not the case with Yale and Swift Dams, where timber was harvested throughout much of the lake's footprint before flooding).

Although construction of the first unit of the Ariel Dam was not completed until 1932, the tunnel that diverted water around the dam was closed as early as 1930 and water began to fill the valley at that time.

The lake and dam were renamed by H.J. Campbell, publisher of the Vancouver Columbian, for L. T. Merwin of the Northwestern Electric Company.

Two additional projects, in 1949 and 1958, expanded the dam. Today, the Merwin Dam is a concrete-arch dam, with a total crest length of 1300 feet and a maximum height above its lowest foundation of 314 feet. Lake Merwin is about 14.5 miles long, with a surface area of approximately 4000 acres at full pool level. Its maximum storage capacity is approximately 406,500 acre-feet, which is equivalent to over 137 billion gallons. Its average annual generation is 517,812 Mwh, enough to power over 68,100 homes (based on an average household electric use of 7600 kwh for Pacific states).

Merwin Dam and the adjacent powerhouse are on the National Register of Historic Places. Both the dam and the powerhouse were built with Art Deco-style architectural elements such as lamp-posts and building corners.

Yale Project

Construction of the Yale Project began in 1951, and continued until 1953. This project includes two dams: a main embankment and an auxiliary "saddle" dam that prevents spillover through a neighboring declivity.

Yale Dam and Yale Lake were named for the nearby town of Yale, which, according to the Tacoma Public Library's Washington Place Names database, was given the name Yale over the second choice Spillel (or perhaps Spillei?) because of its brevity.

Unlike the Merwin Dam, the Yale dams are not concrete but constructed of rock fill, with material taken from the site. The Yale Dam is a "rolled earthfill embankment" type dam with a crest length of 1305 feet and a maximum height of 323 feet above its lowest foundation. The Saddle Dam is approximately 1600 feet long and 40 feet high. Yale Lake is approximately 10.5 miles long, with a surface area of approximately 3800 acres at full pool level. Its maximum storage

capacity is approximately 385,000 acre-feet, almost 131 billion gallons.

The Yale Project's average annual generation is 560,398 Mwh, enough to power over 73,700 homes.

Swift Project No. 1

The Swift Project No.1 (Swift Dam and reservoir) are the farthest-upstream of the Lewis River hydroelectric projects. Construction of the dam began in 1956 and was completed by 1958.

The dam and lake are named for nearby Swift Creek, which enters Swift Lake just above the dam.

The Swift Dam is yet another type of dam—an earthfill dam (when constructed, Swift Dam was the tallest earthfill dam in the world, it is currently the 3rd tallest). Its maximum height above its foundation is 512 feet, and it is 2100 feet long. Swift Lake is approximately 11.5 miles long with a surface area of approximately 4,680 acres at full pool. Its maximum storage capacity is approximately 692,000 acre-feet, or over 246 billion gallons. Swift Project No.1's average annual generation is 677,555 Mwh, enough to power over 89,100 homes.

Swift Project No. 2

Swift Project No. 2 (owned by Cowlitz County PUD and operated under contract by PacifiCorp) was built concurrently with Swift Project No. 1. It is not a dam/reservoir system but a 3.2-mile canal. Tailrace water from the Swift Dam enters the canal at the Swift No. 1 Powerhouse. The water travels via the canal to the Swift No. 2 powerhouse, located just above Yale Lake. Swift Project The canal surface area is approximately 100 acres, and it holds approximately 2,400 acre-feet (782 million gallons) of water. No.2's average annual generation is 277,750 Mwh, enough to power over 36,500 homes.

Types of Dams

A dam is fundamentally just a very heavy mass, placed in a waterway to keep the water from flowing. Dams store water for many different purposes: power generation, agriculture, municipal water supplies, etc. To some extent, a dam's construction is a reflection of its purpose, but to a greater extent it depends on the site, the conditions, and the materials available. The hydroelectric projects here on the Lewis River represent two primary types of dams: concrete arch and embankment dams.

Concrete arch dam

Concrete arch dams are constructed where bedrock abutments provide solid foundations between which the dam can be built—usually in narrow canyons. Their distinctive arch/wedge shape is dictated by the properties of concrete, a material with very high compression strength but low tensile strength

(stretching or bending forces break it much more easily than do compressing forces). Concrete arch dams are designed to direct the force of the water outward onto the walls of the canyon and downward to the dam's foundation.

The central part of Merwin Dam is a concrete arch, chosen for this location because of the narrowness of Shirt Tail Canyon, and the exposed rock on the canyon wall and in the streambed. There is also a small concrete arch dam included in the structure of Yale Dam.

Before a dam is built, the flow of the river must be diverted to allow for construction on the riverbed. In the case of the Merwin Dam, a tunnel diverted water around the dam site. Once the water was diverted, workers cleaned the “overburden” (surface deposits) from the bedrock at all points of contact with concrete. This meant washing the surface with high-powered hoses, then “vacuuming” debris from low areas. The concrete arch was poured in several stages, using a large wooden form that was moved across the span as each section was completed. Imprints from the boards of the concrete forms are still visible on the dam's surface.

Earthen embankment dam

In some dam sites, rock abutments and exposed rock streambeds are not available to support concrete arch dams. At these sites, earthen embankment dams are more appropriate. Basically, embankment dams are giant piles of earth and rock. Some are simple and homogeneous but the larger types such as Yale and Swift are quite complex—they are “zoned” dams with layers of materials within designed to impede or conduct water.

If you were to slice the top from Yale or Swift dam, you would see distinct bands representing a series of different types of material within: large boulders, coarse gravels, fine clay, and mixed dirt. These materials are arranged to provide strength, drainage, and impermeability to the structure: the heavier, more compact materials provide strength, more porous materials allow drainage, and clays form impervious barriers.

Most earthen dams are built from materials on site. In the case of Yale Dam, Saddle Dam, and Swift Dam, materials include riverbed boulders and gravels, rocks and soil excavated for the bases of the dams, and rocks quarried from the surrounding hillsides. The impervious layers in these dams are made of volcanic clay taken from ancient mudflows within the valley. Materials are placed in carefully engineered patterns: water is added or subtracted to create the correct density and cohesion, and some layers are compacted with heavy machinery such as sheep-foot rollers and special weighted containers.

The base of a concrete arch dam such as Merwin interfaces directly with the

bedrock of the streambed, allowing for a fairly water-tight seal. However, earthen dams are built on unconsolidated foundations—while the dams themselves can be built so that they are relatively impervious to water, the soils below may be much more porous. For earthen dams, provisions must be made to slow this sub-dam leakage. In many cases, the answer is cutoff walls: vertical “curtains” of concrete that extend from the base of the dam deep into the soil (the cutoff wall under Swift Dam is some 100 feet deep). These walls lengthen the distance that seeping water has to travel through the soil. If the distance is long, the pressure of water from behind the dam will not be great enough to push water through the soil quickly, and leakage is significantly slowed. Cutoff walls are formed by pumping concrete grout slurry deep underground through closely-spaced holes.

Electricity

All atoms have electrons, which are tiny charged particles that surround the atomic nuclei, held in place by forces of attraction between the electrons and the nuclei. Electrons further from the nuclei are held less strongly than those closer in. In some atoms (such as those of many metals), these distant electrons can slip from one atom to its neighbor, reversing their charge from negative to positive or visa versa. This movement of electrons is electric current.

An electric current is energy, which can be made to do work: heating up a filament in a light bulb or an element on a stove, running a fan motor, causing a speaker to vibrate and produce sound... and many other tasks we rely on every day.

Electric Generation

Electricity does occur in nature: lightning is a spectacular example. But the natural forms of electricity are difficult to tap into. So to get the power we need to run our electric lives, we use other forms of energy (water or wind movement, combustion or nuclear heat, or solar energy) to generate electricity.

Electric generation is conversion of another form of energy into electricity. For example, in a wind generation plant, the energy of the moving air turns the blades of a windmill, which spin a magnet inside a coil of wire. This process creates electric current in the wire. In a thermal generation plant, the heat of combustion of coal or oil creates pressurized steam, which is used to spin the magnet inside the wire coil for the same result. (The alternator in a car works similarly, only in reverse.)

Hydroelectricity

Hydroelectricity is electrical energy that is produced by converting the energy of moving water to the energy of moving electrons. The process begins with the sun: the sun’s radiation warms water in oceans, lakes, rivers, plants, and the soil, and evaporates it into the atmosphere. Eventually, this water vapor condenses, falls as precipitation, and makes its way downhill. Thus, like almost all energy on Earth, hydroelectricity can be traced directly back to the sun.

Hydroelectricity is a “renewable” energy source. Water is always being evaporated by the sun and carried by air currents into the Cascades; it is always condensing and raining down, re-filling the reservoirs. It has been said that in the world of hydroelectricity, “it rains fuel.”

History of Hydroelectricity

As early as the 1880s, just a few years after Thomas Edison demonstrated the incandescent light, hydroelectric facilities were operating in the eastern United States. As electric-generation technology improved—and more and more uses for electricity emerged—public electrification and hydropower operations began to appear across the continent. In 1889, the first commercial long-distance electric transmission lines in the world carried power from Willamette Falls to Portland. In 1891, Ellensburg, Washington inaugurated the first municipal electric system in the Northwest. By the first decade of the 20th century, plans were being made to harness the Lewis River to generate hydroelectric power.

Interestingly, at the beginning of the hydroelectric era, hydroelectric generation did not necessarily mean big dams. Many early hydroelectric plants worked via waterwheels, which used small dams, or none. But to produce electricity reliably, steadily, and on a large scale, some large-scale system of water storage is needed, so flow can be regulated. As dam technology developed, hydroelectric generation was increasingly incorporated into the structures of larger dams. However, some of the Northwest’s most massive dams, including the Grand Coulee (which has a greater generation capacity than any other dam in North America), were built primarily for agricultural, not hydroelectric, purposes.

Inside a Hydroelectric Plant

The story of hydroelectric generation begins with water poised above a dam, ready to flow downhill. This water has potential energy—which can be thought of as the potential to flow downward and to push against something. At the base of the dam is a generating facility. The capacity of the water to generate electricity is related to the height of its surface above the generator; this is called the hydroelectric head. Water from above the dam is sent to the generator through huge tubes called penstocks. As the water descends, its potential energy becomes kinetic energy, or energy of motion.

At the end of each penstock, the rushing water enters a turbine—a device that resembles a huge propeller or fan. Large louvers called wicket gates allow operators to closely regulate the rate at which water flows through the turbine. The water pushes against the blades of the turbine, spinning it at a high rate of speed and imparting kinetic energy to the turbine itself.

Via a shaft, the spinning turbine turns a rotor, containing an enormous mass of magnets, inside a stator that contains a stationary ring of tightly-packed copper coils. Because of the nature of magnetic fields and electrical conductors, the motion of the magnets creates a changing magnetic field that induces electrons to move within the copper coils. The motion of the electrons (switching back and forth from positive to negative) creates a moving electric field within the copper. This moving field is electrical energy.

Hydraulic turbine generator units are uniquely designed to take maximize advantage of the specific site where they will be installed. Considerations in their design include the volume of water available, the height of the dam (head produced) and the variability of both of these as they typically change from season to season throughout the year.

Hydroelectric Transmission

The amount of electricity generated in the copper wire of the generator stator can be quite large—enough to power hundreds of homes or businesses. To deliver that power efficiently, the hydroelectric plant first passes it through step-up transformers: systems of wound wires with central magnetic cores that allow the voltage, or electric potential, of the electric energy to be increased so that it can pass efficiently via conductive wires from where it's generated to where it's needed. These high-voltage lines are familiar features of many American landscapes, suspended from extremely tall steel towers, zig-zagging their way across mountainsides and plains.

At points where the electric power is needed, step-down transformers at electrical substations reduce the voltage of the electricity to levels suitable for everyday use. These smaller transformers are mounted on power poles.

The "Grid"

The Lewis River hydroelectric plants feed power into the "grid"—a system of interconnected power transmission and distribution lines and associated facilities throughout the American West (there is a similar grid in the East, but although the two grids are connected, they operate independently, with slightly different frequencies). Within the larger western grid there are smaller regional grids, and within these are smaller company grids.

Power is fed into the grid by generation facilities (such as the North Fork Lewis River Hydroelectric Project), and power is pulled from the grid by consumers. Many different power providers feed into the grid—including private companies (such as PacifiCorp) and public utilities (such as Cowlitz PUD). Many different methods of power generation are represented, including coal-fired and nuclear plants, and solar- and wind-driven facilities, and geothermal plants.

The grid does not store electricity. It is merely a transmission and distribution system—the supply meets the demand. Power must be continually fed in to meet continual power draw (load). The United States' electricity-distribution system is based on alternating current at a frequency of 60 hertz (60 cycles per second). The goal is to maintain this frequency in electrical output from the grid. If more electricity is flowing into the grid than is flowing out, the input must be decreased in frequency. If output exceeds input, more power is added to prevent the frequency from falling.

Power demand from the grid fluctuates constantly—primarily twice a day, in morning and afternoon peaks. This means that the rate of power input into the grid must change accordingly. Operators across the western states are constantly fine-tuning inputs into the grid, working to maintain the optimal 60 hertz. This is called “load-following” and is adjusted approximately every ten seconds.

Hydroelectric power plants are important tools for keeping the grid at a steady state. Unlike coal-fired plants (which take a considerable amount of time to come online), hydro plants can begin generating at full capacity within a very short time. When they are not generating power, many hydropower facilities maintain what are called “spinning reserves” where generators are kept in motion by (drawing power from the grid rather than from flowing water, so that the generators become motors), they are ready to be switched to back to hydro-driven (generator) operation at a moment's notice. This is particularly useful when the power demand suddenly changes or a big power plant at another site unexpectedly shuts down.

The Lewis River Project is capable of maintaining spinning reserves. These reserves are required by the Federal Energy Regulatory Commission (FERC) to be able to respond to a demand for power within 15 minutes. This capability comes in handy when a thermal plant trips offline; the spinning reserve can quickly fill in the gap in power input.

Power Economics

Electricity is a commodity, traded like other commodities, with prices fluctuating according to supply and demand. In Portland and other major cities, traders for utilities and power companies (overseen by FERC) meet in round-the-clock energy markets to buy and sell power for projects, municipalities, and companies. These markets set both daily and spot-market prices per unit of electricity. [Note: we may not want to discuss pricing in such specific terms on the signs; this information is included for completeness].

Operating the Three-Lake System

If power generation were the only consideration, operators would run all the water that enters the uppermost Lewis River reservoir through generators at all three dams, maximizing the total power output of the river.

However, power generation is not the only factor. Ultimately, the operation of the Lewis River Facilities is a complex choreography of water storage, power generation, and water release. The basic needs driving the system are:

- Electricity generation needs (this includes meeting the needs of the consumers via the grid, maintaining sufficient water behind the dams to support spinning reserves, and maximizing profit/minimizing loss based on fluctuating electricity costs).
- Environmental needs (PacifiCorp is required as part of its license to maintain at least a minimum flow rate in the Lewis River below Merwin Dam during all times of the year for fish spawning, incubation and rearing).
- Recreation needs (PacifiCorp provides recreation sites for the public, and minimum reservoir heights are required to make these recreation sites usable).
- Flood management needs (this consists primarily of maintaining “storage”, or reserve space, in the reservoirs to buffer high input or “runoff” during the winter).
- Maintenance needs (the company must take into account regular and unscheduled maintenance needs in planning water releases).

In addition to all these parameters, PacifiCorp water managers must also factor in the future, including weather forecasts and energy cost estimates to create daily water release schedules. These provide hour-by-hour plans for operation of the river system and generation.

Daily water release schedules are provided to the main control center (which controls facilities not only on the Lewis River but also on the Rogue, Klamath, and other rivers) which has the responsibility of operating the units to meet the schedule.

Working 8-hour shifts, 24 hours per day, control room operators implement the schedules (the actual control work is done by computers, but it can be done manually if necessary). Because of constantly changing conditions and electricity demands, schedules may need to be changed, with some generators brought online earlier or later than scheduled, or some plants run that were not scheduled at all. A typical workday for a control room operator includes multiple phone calls to and from site operators, adjustment of schedules, and constant monitoring of facility readouts.

It takes about 6-8 months to train a control room operator to the point where s/he can operate independently. Most operators have a background in dam operations.

Within the Lewis River system, the different reservoirs and dams operate under somewhat different constraints. Swift and Yale usually have the greatest fluctuations, as they are more demand-driven than Merwin is. Since Merwin reservoir is, in some ways, the “source” of the Lewis River, its level is dictated more by the need to maintain minimum flows on the river than power demands. Merwin is usually kept closer to full pool than the other reservoirs.

Although schedules change, there are some general patterns to operations. In winter (the wet season), the water is kept flowing and power is generated constantly (even though prices per MW may be low), so that the flood management storage requirement is maintained. The water level must be kept at least 17-feet below capacity across the three reservoirs (though in reality the system generally operates with much more storage than this). This area is designated as storage for excess run-off or unusually high precipitation.

When a large runoff is predicted, (usually winter months) more water may be released in anticipation of high input. When dry weather is predicted, (summer) water is held upstream, available to replenish Yale and then Merwin for minimum flow requirements.

PacifiCorp

Company History

PacifiCorp is one of the West’s leading utilities, serving more than 1.6 million customers in six western states. PacifiCorp was formed in 1984, when its electric utility, natural resource development and telecommunications businesses grew into full-fledged enterprises. In 1989, it merged with Utah Power & Light, and continued doing business as Pacific Power and Utah Power. The company was acquired by MidAmerican Energy Holdings Company in 2006.

Pacific Power is the division of PacifiCorp that distributes electricity, and it was Pacific Power (and its predecessor Inland Power and Light) that built the dams of the Lewis River. Established in 1910, just 30 years after Thomas Edison invented the light bulb, Pacific Power & Light Company (PP&L) started from several small electric companies and served just 7,000 customers in Astoria and Pendleton in Oregon, and Yakima and Walla Walla in Washington. Once established, PP&L acquired other companies, properties and service areas. It began building transmission systems and extensions to serve rural customers in Oregon and Washington, and later, Wyoming, Montana and Northern California.

Recreation

As part of its federal license to generate and sell power, PacifiCorp is required to provide public recreation opportunities on its Lewis River reservoirs. This isn't at all a new concept though. Long before the requirement, the company was operating campsites, picnic areas, and swimming beaches along the shores.

Today, PacifiCorp operates 15 recreation facilities along the Lewis River, below Merwin Dam and along the shores of Yale, Merwin and Swift reservoirs. Combined, these recreation areas provide the public with 304 campsites in four campgrounds, 270 picnic sites and nine boat launch locations. The facilities begin at Island Access, approximately two miles east of Woodland, Wash., on State Highway 503, and continue 45 miles upstream to Eagle Cliff Park at the east end of Swift Reservoir.

*Wildlife
Conservation*

PacifiCorp owns and manages more than 10,000 acres of forest, meadow, streams, and wetlands around Merwin, Yale, and Swift Lakes. One of the primary goals of this management is to sustain diverse and healthy wildlife habitat. In some cases, that means just leaving an area alone (such as leaving buffer zones along streams, rivers, and lakeshores). In other cases, it means taking a more active approach, including:

- Creating small clearcuts to encourage grasses and shrubs such as red huckleberry and hazel. These understory plants are important food and shelter for birds and mammals.
- Creating snags, which are important habitat for cavity-creating and -nesting birds such as pileated woodpeckers, and for secondary cavity nesters such as chickadees and flying squirrels. Snags are created by climbing some of the larger (>20" diameter) trees and cutting the uppermost portions off.
- Augmenting the forest floor with large downed logs (usually drift logs salvaged from the reservoirs), which provide nutrients to the soil and seedbeds for sprouting trees such as western hemlock.
- Using logs in wetlands as "loafing logs" for turtles or waterfowl. Many salvaged logs are laid or left in streams to shape the streambed and improve fish habitat, or in forests as drumming logs for grouse and "fungus farms" for small mammals.
- Creating nesting and roosting sites for bald eagles and ospreys by topping trees, or improving access to potential roosting sites.
- Placing nest boxes in and around wetlands, for species such as wood ducks, in places where there are few or no old conifer snags to serve as nest sites, and encouraging the growth of conifers around some wetlands for future habitat.

PacifiCorp acquired most of the lands around its reservoirs in large parcels. In general, because the land was going to be part of the hydroelectric project, the owners of the parcels logged their lands before selling them to the company, to get as much out of them as possible. Therefore, the forests that PacifiCorp inherited were very young, dense, dark, and poor habitat. Other purchased lands included old farms, orchards, and homesites. During relicensing of the Merwin project in the 1980s, the Merwin Wildlife Habitat Management Plan was created to help enhance this relatively poor habitat, thereby increasing and sustaining populations of local wildlife (particularly elk).

Forestry for Habitat

The forest lands around Lake Merwin are currently being managed under the Merwin Wildlife Habitat Management Plan. Lands around Yale and Swift are now being managed in similar patterns. A new management plan is being written for the current settlement agreement that will encompass all three reservoirs. The general thrust of the management plan is to manage the lands for the benefit of wildlife; species of particular interest include owls, elk, deer, bald eagles, osprey, wetland birds, and passerine birds. This goal means that unlike many private (and some public) lands, these lands include areas where wildlife really does come first, and certain human uses (such as ORV use in the backcountry) are precluded.

When the habitat programs were instigated, PacifiCorp lands were in a patchwork of conditions: older, second-generation forests, recent clearcuts, old farm fields and pastures, quarries, abandoned construction camps, etc. For the most part, however, these lands were not particularly good habitat for wildlife: some were barren, some were choked with invasive plants such as Scotch broom, and most were overgrown with dense, dark second-generation forests that had little or no understory vegetation.

In general, wild animals that rely on forests for some or all of their lives need diversity of forest structure, including multi-layered canopies, a diversity of plant species, thriving understory vegetation, and wetland/meadow openings.

These conditions are inherent to what we call “old growth” forests. But there are very few areas of the PacifiCorp lands along the Lewis River that could truly be called “old growth.” For habitat purposes, old growth does not mean old trees—it’s the structural and species diversity that’s important. Therefore, the main thrust of PacifiCorp’s habitat management plan is to impart structural and species diversity to forested lands.

This doesn’t mean that all the land is managed to achieve an old-growth-like state. It just means that the lands are managed to provide elements necessary to support healthy wildlife populations, and that those elements are the products of diversity.

About half of PacifiCorps' 10,000 acres of forest land around the reservoirs is basically left alone—management with a passive approach—allowing the forest to develop in its own time. But because it would take decades—or perhaps even longer—for natural succession processes to shape these forests to better support wildlife (and because, in some cases, the goal is to create even more enhanced habitat), wildlife managers for PacifiCorp practice “active management” on the other half. Active management involves many techniques of modern forestry, including:

Thinning

Thinning takes out some of the trees in a stand, allowing more light through the canopy to the forest floor. This promotes strong understory growth, essential for forage and cover. Several different styles of thinning are used on PacifiCorp lands, including traditional thinning where individual trees are selectively logged from older forests; pre-commercial thinning (where competing conifer seedlings are removed from young forest stands), pruning, where lower branches are removed just when young trees begin to close up ranks in a planted area, which extends the time that sun-favoring forage plants can grow underneath and between them; and selectively killing (herbicide) young trees just at the crown-closure stage.

Clearcuts

Clearcuts provide larger areas of well-lit, clear ground for early-successional plants to grow. Many of these plants are important forage species for deer and elk; they may also be important for some birds and small mammals. Small clearcuts (10 acres or less) are commonly used on PacifiCorp lands to provide these openings. (Clearcuts are also used where a section of forest has become infested with a disease such as root rot). Usually, some of the overstory trees are left standing. After the area is cut, it is planted with grass seed in the fall, and then in spring it is replanted with conifer seedlings (usually Douglas-fir, but sometimes western red cedar, hemlock, or ponderosa pine).

From an elk or deer's perspective, for the first 2-10 years the clearcut is a source of forage: grass and new early-successional growth. After 10-12 years the early-successional plants become less common and the area becomes more important for bedding and cover, while still providing forage on about 50% of the area. Habitat management on PacifiCorp lands seeks to maintain a patchwork of lands in various stages of development, a kind of mosaic in space and time, for diversity.

Snag Creation

One of the most visibly successful programs in terms of bird habitat is snag creation, in which live trees are topped and limbed, and the tops prepared so as to make them suitable for nest platforms. Snags are very important habitat for a

wide variety of wildlife, and they are rare in young, un-managed, post-clearcut forests. Someone exploring the Lewis River forest lands would have no trouble spotting these created snags; they are very distinctive. Several have osprey nests on top, and many show visible evidence of woodpecker use (holes). Bats and brown creepers roost and nest behind the flaking bark in the early stages of decomposition.

Wetlands

There are a number of significant wetland sites on PacifiCorp lands; many are near recreation sites. Like all wetlands, these areas are very important habitat for a variety of wildlife. They perform critical water storage and filtration functions. They may also provide excellent wildlife viewing opportunities. PacifiCorp monitors wetland habitats and conducts some wetland enhancement, including installing small impoundments to create wetlands, monitoring invasive species, and protecting some wetland plants from over-browsing by elk and beavers.

Farm Fields and Orchards

In several locations, PacifiCorp manages old farm fields and orchards for the benefit of elk, deer, and other wildlife. Fields are mowed annually to encourage good growth of grasses and legumes in early fall, when elk and deer are putting on fat for the winter. When nutrient values of the field plants fall too low, they are replanted with higher-nutrient varieties. Orchards are maintained to produce fruit for elk, deer, bears, birds and others.

Cresap Bay

Cresap Bay Campground and Day Use Area incorporates many design elements aimed at habitat enhancement. Playfields and grass parking lot provide winter forage (the site is closed in winter to protect elk). Tall hedges and islands of native shrubs separate parking lots, roads, and campsites, providing habitat for songbirds.

Elk and Deer

Elk did not begin to appear along this stretch of the Lewis River until the 1950s or so. The elk in this area are thought to be descended from transplants of Rocky Mountain Elk. The valley contains some resident elk which stay year-round, supplemented by others that move into the valley from higher elevations during the winter.

Habitat elements important to elk and deer include: sufficient nutritious summer and fall forage to send the animals into winter in good condition, winter forage to sustain them, and cover from predators. This can be a challenge to offer in the Lewis River Valley, where human presence is always nearby and human populations are growing. A number of PacifiCorp's habitat management programs, including small clearcuts that are seeded with grass, mowing established farm fields, and maintaining shelter belts, are conducted for the benefit of elk and deer.

*Other Wildlife
Conservation*

The face of Yale Dam has developed into a particularly interesting habitat. The moist, mossy boulders shelter several different species of reptiles and amphibians, including rubber boas, alligator lizards, western red-backed salamanders, and Larch Mountain Salamanders, a species of concern for conservation.

On one of PacifiCorp's power line right-of-ways above Swift Reservoir, there are some lava tubes that contain both a hibernaculum (a hibernation chamber) and a nursery cave for Townsend's big-eared bats—a sensitive species. The power line clearing appears to be helping the bats by keeping their nursery cave warm. PacifiCorp is cooperating with the Nature Conservancy to conserve this area; in the vicinity of the caves, ROW clearing is done after the young bats have finished rearing, and is done with only hand tools, to minimize disturbance.

Fish Enhancement

The Lewis River has always been a significant river for anadromous fish. Chinook, coho, pink and chum salmon are all known to have been historically present in this system. Prior to Euroamerican settlement and commercial fish harvest, the largest fish runs in the Lewis River were chum salmon sometimes exceeding 300,000 spawners. The construction of the Merwin Dam (and later the Yale and Swift dams) presented several challenges to these fish species.

All dams impede the passage of migratory fish (in the case of Merwin, the dam completely prevents salmon from migrating upstream—it is too tall for a fish ladder). Dam turbines cause mortality in outmigrating smolts. Dams slow the flow of water in the river, which can change the temperature and chemistry of the water, affecting fish. Dams also inundate former fish habitat.

Since the Lewis River dams were first built, the power company that has operated them (first Inland Power and Light, then Pacific Power and Light, now PacifiCorp) has held the responsibility of mitigating those effects by supporting the supplementation of wild runs and the easing of the passage of fish to their natural spawning grounds. The company does this by funding hatchery and stocking operations, and through habitat protection and enhancement.

Hatchery Operations

Early efforts to supplement wild runs consisted of hatcheries combined with fish-hauling operations to physically transport migrating fish over Merwin Dam and release them into the lake above. These efforts were not successful (escapement through dam turbines was very poor) and they were abandoned after a few years when the fish runs significantly diminished.

Today's programs concentrate on artificial rearing environments: hatchery-reared smolts are trucked below the dam and released, circumventing the dangers of the turbines. Future plans call for the reinstatement of programs to bring adult fish over the dam and release them to spawn naturally in the creeks above and around the hydroprojects, with facilities to reduce turbine mortality in outmigrating smolts.

The first steps toward that goal are currently being taken: annually about 2000 adult fish are captured in a fish trap at the base of Merwin Dam and released into Swift Reservoir to spawn. Although these fish will not be able to establish a self-sustaining population, their presence in the tributary streams (digging redds, and ultimately decomposing) will help fertilize the streams and prepare them for future runs.

Speelyai Fish Hatchery, owned and funded by PacifiCorp and Cowlitz PUD, is located on Speelyai Creek, along the road that leads to Speelyai Park. Water is supplied by springs in the lower part of Speelyai Creek (the waters of the upper creek have been diverted into Yale Lake). This clean, cold water provides excellent rearing habitat for salmonids. The Speelyai hatchery incubates and rears spring Chinook, coho, rainbow trout, and kokanee for distribution to a variety of sites, including further up the Lewis River.

Merwin Hatchery, owned and funded by PacifiCorp is located at the dam. Here, young winter and summer steelhead, and rainbow trout are reared in water which is temperature-regulated according to the depth from which it's drawn from Merwin Lake (deeper waters are colder, providing a better rearing environment for some fish life stages).

Each year, Chinook, steelhead and coho are trapped as adults as they arrive at Merwin dam and trucked to holding ponds at Speelyai or Merwin Hatchery. At Speelyai Hatchery, Chinook and coho are held there and spawned in the fall; the eggs are incubated in Speelyai Creek water and the young fish are reared first in raceways and then in net pens (which can be seen seasonally in the vicinity of Speelyai Bay). When they reach smolt stage, the young salmon are trucked below the dam and released into the Lewis River. At Merwin Hatchery, steelhead adults are kept in holding ponds until the late winter. Adults are spawned and eggs incubated until the young fish are big enough to be transferred to outside ponds for rearing to release size.

Kokanee are reared at the Speelyai Hatchery for release into Merwin Lake. These landlocked sockeye salmon are not native to the Lewis River drainage, but were introduced into the reservoirs to create a sport fishery in the early 1960s. There is no self-sustaining population of kokanee in Merwin (although neighboring Yale Lake has a self-sustaining population, there are not enough suitable

spawning sites for them in the streams around Merwin). In Merwin, adult fish are captured and spawned in October at Speelyai Hatchery, and the young fish are reared there and in net pens. They are released in late spring.

Some years, Speelyai hatchery rears rainbow trout. These fish are hatched at Merwin Hatchery, then, depending on space availability, may be reared in Speelyai raceways before they are trucked up the Lewis River to stock in Swift Reservoir.

Fish Habitat Enhancement

PacifiCorp operates an active fish habitat enhancement program. One of the most visible components of this program is the “roundup” of floating woody debris (logs and large branches) from Swift Reservoir. Large woody debris of this sort is a very important component of stream habitat for fish; the logs and branches shape and direct streamflow, providing in-stream habitat diversity and protecting against erosion. Much of the large debris gathered from Swift reservoir is used to help enhance in-stream habitat.

Fish Conservation (Bull Trout)

Bull trout (*Salvelinus conflentus*) are members of the char clan of the salmon family. They are a key conservation species in the Northwest, as their populations have been strongly affected by logging, dams, and other human impacts. They have very narrow spawning requirements, which are met at Cougar Creek and two other tributaries upstream of Swift Reservoir. Bull trout require cold (temps below 10 degrees C), fast moving water with a substrate of large gravel for spawning. For successful incubation, the eggs require temperatures of less than 7 degrees C (egg development is faster in colder water). Cougar Creek, a spring-fed creek, meets those requirements. Young bull trout spend their first two years in the stream, eating aquatic insects and small fish, before heading out to the lake. There, their primary prey are juvenile kokanee. Bull trout may live 12-15 years and may spawn several times during their lives.

Bull trout are a federally protected species, and fishing for them is illegal. Anglers who accidentally catch bull trout are required to release them immediately. Unfortunately, bull trout are somewhat similar in appearance to some other species in the reservoirs, so identification information is a key resource for anglers. The presence of light-colored spots on bull trout helps distinguish them from cutthroat and rainbow trout (which have dark spots). Bull trout can be distinguished from brook trout (another light-spotted salmonid) by the lack of black markings on their dorsal fins.

PacifiCorp works to conserve bull trout by protecting critical spawning habitat (such as Cougar Creek) and by providing public education to anglers who may catch bull trout.

Cougar Creek

Cougar Creek and the surrounding forest lands are protected by the Cougar Conservation Covenant, the result of PacifiCorp's agreement to purchase 800 acres of Weyerhaeuser lands around this rich stream system and protect them in perpetuity. The covenant includes a 500-foot buffer zone around the creek to maintain the integrity of the riparian corridor, and protects virtually the entire Cougar drainage. Even if the land is transferred from PacifiCorp to another entity, the conservation easement remains.

Cougar Creek is a nexus of wildlife on upper Yale Lake. It is one of several Yale Lake streams that, together, provide sufficient spawning habitat for the lake to host a self-sustaining population of kokanee (Lake Merwin kokanee populations are enhanced with hatchery fish but Yale Lake's are not). It is also the only known bull trout spawning stream on Yale Lake.

Major Tree and Shrub Species of the Project Area

Douglas-fir (*Pseudotsuga menziesii*)
western red cedar (*Thuja plicata*)
western hemlock (*Tsuga heterophylla*)
bigleaf maple (*Acer macrophyllum*)
red alder (*Alnus rubra*)
black cottonwood (*Populus trichocarpa*)
vine maple (*Acer circinatum*)
western hazel (*Corylus cornuata*)
ocean spray (*Holodiscus discolor*)
red elderberry (*Sambucus racemosa*)
red-osier dogwood (*Cornus sericea*)
red huckleberry (*Vaccinium parvifolium*)
willow (*Salix* spp.)
Oregon crabapple (*Malus fusca*)

Major Invasive Plants Being Monitored

Scotch broom (*Cytisus scoparius*)
Japanese knotweed (*Polygonum cuspidatum*)
tansy ragwort (*Senecio jacobaea*)
reed canary-grass (*Phalaris arundinacea*)
Himalayan blackberry (*Rubus discolor*)

**Prominent Mammal
Species of the Project Area**

Elk (*Cervus elaphus*)
black-tailed deer (*Odocoileus hemionus*)
black bear (*Ursus americanus*)
mountain lion (*Felis concolor*)
bobcat (*Lynx rufus*)
coyote (*Canis latrans*)
otter (*Lontra canadensis*)
mink (*Mustela vison*)
beaver (*Castor canadensis*)
Douglas' squirrel (*Tamiasciurus hudsonianus*)
deer mouse (*Peromyscus keeni*)

**Prominent Fish Species
of the Project Area**

Chinook Salmon (*Oncorhynchus tshawytscha*)
Coho Salmon (*Oncorhynchus kisutch*)
Chum Salmon (*Oncorhynchus keta*)
Steelhead (*Oncorhynchus mykiss*)
Cutthroat Trout (*Oncorhynchus clarkii*)
Kokanee (*Oncorhynchus nerka*)*
Bull Trout (*Salvelinus conflentus*)
Largescale Sucker (*Catostomus macrocheilus*)
Mountain Whitefish (*Prosopium williamsoni*)
Northern Pikeminnow (*Ptychocheilus oregonensis*)
Tiger Muskellunge (*Esox lucius* X *Esox masquinongy*)*
Threespine Stickleback (*Gasterosteus aculeatus*)
Sculpins (*Cottus* spp.)

* introduced

Flood Management

Rivers are not steady systems. Their flow changes seasonally, and in response to weather events such as droughts and heavy rains. Here in the Cascades, high water and flooding are a part of natural river cycles of flow. Winter (November through April) is the time of highest runoff, with frequent rains, and rain-on-snow events that can cause big surges in the Lewis River's flow.

Dams are a means to regulate the flow of a river. But dams can't change the rate at which water flows into the system, they can only regulate the water flowing out of the system. At best, dams can only dampen the natural oscillations of the river's flow—and they cannot prevent all floods.

As operator of the dams of the Lewis River hydroelectric projects, PacifiCorp has the responsibility to provide flood management (NOT flood control; see above) for the communities below Merwin Dam. Working out the most efficient pattern of storage, release, and drawdown to control river flow and buffer water fluctuations, while still generating electricity, requires a skillful dance of meteorology and hydrology.

To do this, meteorologists study precipitation patterns and weather forecasts to create “flow forecasts” to support decisions regarding water levels in the three reservoirs. Higher flows and energy demand prescribe higher water release rates through turbines or spillways. When a significantly higher flow is forecasted, the reservoirs may be drawn down to provide a buffer of space to store the incoming water.

In addition, as part of their flood management plan, PacifiCorp funds county agencies whose responsibility it is to provide emergency notification to property owners that may be affected by high water events. PacifiCorp also provides funds to these agencies for the dissemination of information about water levels in the reservoirs and flow rates at Merwin. This information is provided in several forms, including weather radio, Internet, and telephone lines with automated flow information.

The Christmas Flood of 1933

One dramatic example of the power of flooding on the Lewis is the Christmas Flood of 1933. At midnight, just three days before Christmas that year, inhabitants of the Lewis River floodplain at Woodland were awakened by the roar of water as a massive flood swept down the river to Woodland. The following Sunday’s Oregonian breathlessly trumpeted news of the flood: “The usually lazy north fork of the Lewis River suddenly became a snarly, boiling demon of destruction. Rearing four feet above its banks, it thundered down the broad valley to the fertile farm land above Woodland, tossing bridges and tractors, barns, sheds and trees before it, toppling houses, tossing them on its crest, smashing them with the impact of its advance, bowling them over, piling them in heaps, pushing through roads and railroads, ripping at piers and bursting dikes, drowning cattle and thousands of chickens, transporting tons of silt and boulders and trees on its turgid tide.”

The morning before, far up the Lewis, a CCC crew of 200 had been at work on forest projects when nearby Dry Creek began to rise. Sensing trouble, the commander had ordered an evacuation. The men toppled a few large trees across the now-raging torrent and 135 men teetered across to safety as the flood rose to engulf their makeshift bridge. Within 24 hours Dry Creek had grown to enormous proportions, and a neighboring stream was flooding as well. Their combined contributions to the Lewis River would eventually be estimated as six

times the Lewis River's normal flow.

The cause of the flood was discovered within two days. In a high mountain depression in the headwaters of Dry Creek (which enters the Lewis River almost within sight of the Beaver Bay boat launch), rain and snowmelt had accumulated, forming a lake. The lake rested in a bowl of basalt formed by a 100-year-old lava flow, which lay atop soft sediments, which in turn lay atop another basalt flow. Both lava flows were riddled with lava tubes that had been packed full of sediment. The water had worked its way through the lava, forcing sediment out of some of the tubes and causing faster and faster lake drainage as the blockages eroded away. Downstream, the increasing torrent ripped deep into the ground and surged into the Lewis River.

Before it abated, the flood scoured a 600-foot-deep canyon (Christmas Canyon) adjoining the Lewis River. The surge carried trees and other debris downstream, dumping it by the ton into the newly-formed Lake Merwin. Ariel Dam operators allowed the maximum amount of water to surge through the dam's structure, but water still rose, eventually overtopping the spillway. Flooding downstream at Woodland was extensive with flows exceeding 133,000 cfs. The island between Swift No. 2 powerhouse and Beaver Bay was created by this event.

The high lake continued to drain, creating a muddy flood through Christmas Canyon, for over a month after the initial breach.

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Lewis River Interpretive & Education Plan

stakeholders

Bill M. Bakke
The Native Fish Society
P.O. Box 19570
Portland, OR 97280

Bob Nelson
Rocky Mountain Elk Foundation, Inc.
24320 122nd Avenue East
Graham, WA 98338

Salley Sovey
Bureau of Land Management
915 Walla Walla Avenue
Wenatchee, WA 98801

Claire Lavendel
USDA Forest Service
10600 NE 51st Circle
Vancouver, WA 98682

Katheryn Miller
Trout Unlimited
213 SW Ash, Suite 205
Portland, OR 97204

Michelle Day
NMFS
1201 NE Lloyd Blvd., Suite 1100
Portland, OR 97232-2778

Brett Swift
American Rivers
320 SW Stark Street, Suite 412
Portland, OR 97204

Ken S. Berg
U. S. Fish and Wildlife Service
510 Desmond Drive SE, Suite 102
Lacey, WA 98503-1263

John Clapp
Lewis River Citizens-at-Large
9315 NE Etna Road
Woodland, WA 98674

Elaine Huber
City of Woodland
P.O. Box 9
Woodland, WA 98674

Clifford Casseseka
Yakama Nation
P.O. Box 151
Toppenish, WA 98948

Ryan Lopossa
Cowlitz County Dept. of Public Works
207 4th Ave. North
Kelso, WA 98626

Ilene L. Black
Cowlitz-Skamania Fire Dist. #7/
North County Emergency Med. Svc.
227 Frasier Road
Amboy, WA 98601

Darlene G. Johnson
Woodland Chamber of Commerce
P.O. Box 1808
Woodland, WA 98674

Mariah Stoll-Smith Reese
Lewis River Community Council
14900 Lewis River Road
Ariel, WA 98603
mariah_reese@excite.com
360-225-9522 work
360-231-4437 home

Jim Eychaner
WA Interagency Committee
for Outdoor Recreation
P.O. Box 40917
Olympia, WA 98504-0917

Susan Rosebrough
National Park Service
909 First Avenue
Seattle, WA 98104-1060

Curt Leigh
WA Dept. Fish and Wildlife
600 Capitol Way North
Olympia, WA 98504-0001

James Malinowski
Fish First
P.O. Box 127
Amboy, WA 98601

Al McKee
Skamania County
P.O. Box 790
Stevenson, WA 98648

Diana M. Gritten-MacDonald
Cowlitz PUD
P.O. Box 3007
Longview, WA 98632-0307

Noel Johnson
Lewis River Citizens-at-Large
6412 NW Amidon Road
Woodland, WA 98674
noel@lewisriver.com
360-225-9867

Betty Sue Morris, Chair
Clark County
1013 Franklin Street
P.O. Box 5000
Vancouver, WA 98666-5000

Don Stuart
Cowlitz-Skamania Fire Dist. #7
11670 Lewis River Road
Ariel, WA 98603

Patrick D. Spurgin, P.S.
411 North 2nd Street
Yakima, WA 98901

Broch Applegate
Local Biologist
360-902-2615

John Barnett
Cowlitz Indian Tribes
P.O. Box 2547
Longview, WA 98632

Jeff Breckel
The Lower Columbia River
Fish Recovery Board
2127 8th Avenue
Longview, WA 98632

APPENDICES

Lewis River Interpretive & Education Plan

interpretive topics

Sites	Native Americans	Hydro-electricity	Fishing	Bull Trout	Cultural History	Natural History	Restoration/Protect
Merwin Park FERC							
Merwin Park Local Welcome							
Water Babies							
Power from the River							
With Wildlife in Mind							
Speelyai Park FERC							
Speelyai Park Local Welcome							
Early Life on the River							
Fish and Dams							
The Eagle and the Osprey							
*Help Give Bull Trout a Fighting Chance							
Cresap Bay Park FERC							
Cresap Bay Park Local Welcome							
Cresap's Ferry							
Its Raining Fuel							
Wild Neighbors							
*Help Give Bull Trout a Fighting Chance							
Saddle Dam Park FERC							
Saddle Dam Park Local Welcome							
Fraisier Farm							
Dams Along the Lewis							
A Homestead for Wildlife							
*Help Give Bull Trout a Fighting Chance							
Yale Park FERC							
Yale Park Local Welcome							
Homestead Orchard							
Living Lakes							
*Help Give Bull Trout a Fighting Chance							
Cougar Park FERC							
Cougar Park Local Welcome							
Kingdom of Giant Trees							
Red Salmon, Rich Resource							
*Help Give Bull Trout a Fighting Chance							
Beaver Bay FERC							
Beaver Bay Local Welcome							
Self-Reliant Living							
Cycles of Flow							
Overflow							
*Help Give Bull Trout a Fighting Chance							
Swift Forest Camp FERC							
Swift Forest Camp Local Welcome							
Wild Backyard							
High Water, Low Water							
*Help Give Bull Trout a Fighting Chance							
Eagle Cliff Park FERC							
Eagle Cliff Park Local Welcome							
Trails Through Time							
In the Watershed							
*Help Give Bull Trout a Fighting Chance							

Appendix 1: Lewis River Recreation Sites Orientation and Interpretation Panel Profiles

This document consists of first draft “Panel Profiles” for nine PacifiCorp recreation sites along the Lewis River in southwestern Washington. These profiles present draft content for orientation and interpretive signs at each site.

The text within these profiles is not intended to be final exhibit text; it is the content from which exhibit text will be crafted. Most of it will undergo significant rewriting (shortening, rearranging) as we draft design layouts.

As of submission of this interpretive plan, this document is still in the review process. It is presented here as a working draft, to illustrate the interpretive approach.

Orientation Signs

Each site will have two panels whose objective is to orient the visitor. These panels will also serve to meet FERC posting requirements.

- An Overview panel introduces the visitor to the Lewis River reservoir system, provides an overview of PacifiCorp’s role in maintaining the reservoirs and operating the dams, and orients the visitor to other PacifiCorp recreation sites along the river. Note: except for site-specific information such as site name and FERC number, this panel will be the same for every site, so only one profile is presented in this document.
- A Local Welcome panel provides information on the recreation site at hand, including a map, a cultural history sidebar, an overview of activities / facilities, and a listing of park rules.

Interpretive Signs

Interpretive panels at each site will engage and inform visitors on two broad topics:

- Hydroelectric Story: These panels will provide an overview of how hydropower works in general, and how it is produced and distributed on the Lewis River. Topics will be site-specific when possible, or will be chosen according to features of the site—for example, because the Saddle Dam site presents the best view of an actual dam of all the sites, it will contain an introduction to the different types of dams and their construction.
- Natural History: These panels will highlight some feature of natural history in the reservoirs or in the surrounding habitats. Like the hydroelectric story panels, these will be site-specific. Some sites, such as Beaver Bay, have existing natural history interpretation.
- Bull Trout: will present required information on bull trout natural history and conservation at all fishing access sites (boat launch ramps).

PacifiCorp Lewis River Recreation Sites

Orientation and Interpretive Exhibit Profiles

Draft #2
May 2008

Submitted by:
Sea Reach Ltd.
146 NE Yamhill
Sheridan, OR 97368

Phone: 503-843-2005
Fax: 503-843-2744

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Local Welcome	
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Lewis River Sites—Topic Overview

Sites	Native Americans	Hydro-electricity	Fishing	Bull Trout	Cultural History	Natural History	Restoration/Protect
Merwin Park FERC							
Merwin Park Local Welcome							
Water Babies							
Power from the River							
With Wildlife in Mind							
Speelyai Park FERC							
Speelyai Park Local Welcome							
Early Life on the River							
Fish and Dams							
The Eagle and the Osprey							
*Help Give Bull Trout a Fighting Chance							
Cresap Bay Park FERC							
Cresap Bay Park Local Welcome							
Cresap's Ferry							
Its Raining Fuel							
Wild Neighbors							
*Help Give Bull Trout a Fighting Chance							
Saddle Dam Park FERC							
Saddle Dam Park Local Welcome							
Fraisier Farm							
Dams Along the Lewis							
A Homestead for Wildlife							
*Help Give Bull Trout a Fighting Chance							
Yale Park FERC							
Yale Park Local Welcome							
Homestead Orchard							
Living Lakes							
*Help Give Bull Trout a Fighting Chance							
Cougar Park FERC							
Cougar Park Local Welcome							
Kingdom of Giant Trees							
Red Salmon, Rich Resource							
*Help Give Bull Trout a Fighting Chance							
Beaver Bay FERC							
Beaver Bay Local Welcome							
Self-Reliant Living							
Cycles of Flow							
Overflow							
*Help Give Bull Trout a Fighting Chance							
Swift Forest Camp FERC							
Swift Forest Camp Local Welcome							
Wild Backyard							
High Water, Low Water							
*Help Give Bull Trout a Fighting Chance							
Eagle Cliff Park FERC							
Eagle Cliff Park Local Welcome							
Trails Through Time							
In the Watershed							
*Help Give Bull Trout a Fighting Chance							

Lewis River Sites—Overview Sign

Location:	Merwin Park, Speelyai Park, Cresap Bay Park, Saddle Dam Park, Yale Park, Cougar Park, Beaver Bay Camp, Swift Forest Camp, Eagle Cliff Park
Size:	TBD
Title:	The Lewis River Hydroelectric Projects—Hydropower and Much More
Content:	[Name of Site] is owned and operated by PacifiCorp, an electric utility that operates the four major hydroelectric projects, and associated recreation sites, along the Lewis River.

The Lewis River flows 90 miles from the glaciers of Mt. Adams to join the Columbia River near the town of Woodland, Washington. There are three major hydroelectric dams on the Lewis: Merwin Dam near Ariel, Yale Dam near Yale, and Swift Dam near Cougar. In addition, there is a power-generation canal between Swift Dam and upper Yale Lake.

Annually, these four projects generate over 2 million megawatt-hours of electricity—enough to power over 250,000 homes. But PacifiCorp’s work in the Lewis River Valley goes beyond power generation. As a requirement of its Federal hydropower license, the company acts as a steward to the reservoirs, the river itself, and many of the surrounding lands. PacifiCorp’s goal is to balance power generation with the needs of the public and of the environment.

To achieve this goal, PacifiCorp

- With Cowlitz PUD, creates and maintains 15 recreation facilities, including campgrounds, picnic areas, swimming beaches, boat launches, and trails.
- Provides flood management services throughout the lower Lewis River.
- Funds fish hatcheries to maintain Lewis River salmon runs and to provide for sport fishing in the reservoirs.
- Protects and enhances wildlife habitat in and around the river and reservoirs.

Many organizations watch over PacifiCorp’s operations, including the US Department of Energy’s Federal Energy Regulatory Commission, the US Environmental Protection Agency (through the Washington Department of Ecology), the Forest Service, the US Fish and Wildlife Service, the National Marine Fisheries Service, and the Washington Department of Fish and Wildlife.

Additional Content

[Sidebars]: Sharing these lands with the public is a particularly important commitment for PacifiCorp. Long before it was a federal requirement, Pacific Light and Power (now PacifiCorp) was operating a well-developed park system here along the Lewis River.

PacifiCorp is one of the lowest-cost electricity producers in the United States, providing more than 1.6 million customers with reliable, efficient energy. PacifiCorp has more than 10,400 megawatts of generation capacity from coal, hydro, wind power, gas-fired combustion turbines, solar, and geothermal plants.

Site ID: [Name of Site] is part of [****Merwin/Yale/Swift****] Hydroelectric Project, which is licensed by the Federal Energy Regulatory Commission (project #*******).

Contact Info: Visit the Lewis River's many other recreation sites. For more information, call (503)813-6666 or visit www.PacifiCorp.com.

Non-Discrim: PacifiCorp Recreation Facilities are for use to all members of the public without regard to race, color, religious creed, or national origin, or any other status protected under applicable local, state, or federal law.

Images: Map showing three reservoirs and recreation facilities. Scenic images from Lewis River and reservoirs, photos of recreation (fishing, camping, boating, etc) at Lewis River facilities, photos of wildlife, photos of dams, photos of PacifiCorp workers. Historic image of recreation facilities.

Interpretive Exhibit: Bull Trout

Locations: Boat launch ramps at Speelyai Bay, Cresap Bay, Saddle Dam, Yale Park, Cougar Park, Beaver Bay, Swift Forest Camp

Size: TBD

Title: Help Give Bull Trout a Fighting Chance

Main

Content: Bull trout (*Salvelinus conflentus*) are salmon-like fish of the Pacific Northwest and western Canada. Unfortunately, these native fish are struggling to survive due to habitat changes associated with human development. Bull trout are a federally protected species, and fishing for them is illegal.

There are bull trout in Merwin, Yale, and Swift reservoirs. You can help these threatened fish in the Lewis River. Don't target bull trout while fishing in the lakes or streams. Familiarize yourself with how to recognize them. If you do catch a bull trout, release it immediately so it can continue to grow and reproduce.

Sidebar: Bull trout are of the genus *Salvelinus* (char) and are members of the salmon family. They have very specific spawning requirements—they need streams with cold (below 10 degrees C), deep, fast moving water, and with clean gravel. For successful incubation, the eggs need temperatures of less than 7 degree Celsius or 44.6 degree Fahrenheit. This kind of consistently cold water (usually spring-fed) is relatively rare.

Young bull trout spend their first one to two years in their home streams, eating aquatic insects and small fish, before heading out to the lakes. There, their primary prey are juvenile kokanee and largescale suckers. Bull trout may live 12-15 years and may spawn several times during their lives.

Caption: Bull trout are similar in appearance to other species in the reservoirs, making identification (without a good reference) difficult. The presence of light-colored spots on bull trout helps distinguish them from cutthroat and rainbow trout (which have dark spots). Bull trout can be distinguished from brook trout (another light-spotted salmonid) by the lack of black markings on their dorsal fins.

Caption: *Photo of bull trout spawning habitat*
Only a handful of creeks along the offer appropriate spawning habitat for bull trout.

Photo of fisheries workers with bull trout?
PacifiCorp works to conserve bull trout by protecting critical spawning habitat and by providing public education to anglers who may catch bull trout.

Illustrations of bull trout compared with similar species

Bull trout are somewhat similar in appearance to some other species in the reservoirs, so learn to tell the difference! Bull trout have light colored spots on a dark background. They can be distinguished from brook trout (another light-spotted salmonid) by the lack of black markings on their dorsal fins.

Images: Photos and illustrations of bull trout, similar species, habitat. Photo of PacifiCorp workers studying bull trout?

Merwin Park—Local Welcome Sign

Location: Merwin Park

Size: TBD

Title: Merwin Park

Main Content: Welcome to Merwin Park. This facility is owned and operated by the power company PacifiCorp, which provides public recreation opportunities along the reservoirs of the Lewis River.

Merwin Dam is a concrete-arch dam that helps to form Lake Merwin, which stretches some 14.5 miles eastward through the scenic Lewis River Valley. Merwin Park features swimming access, picnic sites, and restroom facilities.

Sidebar: They call themselves the “Water Babies”—people who were born in the valley of the Lewis River before the dams were built, whose childhood homes now lie deep beneath reservoir waters. They are the descendants of the Lewis River Valley’s first homesteaders.

Pioneers began homesteading along the North Fork of the Lewis in the early 1860s, claiming land through pre-emption (for unsurveyed public land) or under the Homestead Act of 1862 (for surveyed public land). But the big timber and rugged slopes of the North Fork made settlement extremely difficult. Early logging in the 1880s and 1890s cleared some lands, encouraging more settlement. By the late 1920s, when Ariel (now Merwin) dam construction began, there were many small farms in the valley, between today’s Merwin Dam and Swift Creek.

Although homestead life could be difficult, most “water babies” look back on their farm days as some of the best of their lives. Families lived in modest houses and farmed small plots, growing vegetables, fruits, hay, and sometimes grain. Most families had chickens and a cow or two for milk and meat; some raised pigs or sheep. They preserved and stored meat, fruit and vegetables for winter use, sometimes selling the excess to markets in Woodland. Some families grew cash crops of potatoes, corn, strawberries, and raspberries.

Many homesteaders fished in the Lewis River during the summer, and canned their catch for the winter. Most hunted deer for food, and picked wild fruits such as huckleberries for jams or pies. Children earned money for school clothes and treats by collecting and selling cascara bark.

Caption: Margaret Colf Hepola, who grew up on a homestead established by her great-grandparents in 1870 just one mile above present-day Merwin Dam, recalls the valley as it once was: “Always, as I look at this beautiful, peaceful scene around Merwin Reservoir, I see so many other things of my past. I see another valley with old-growth trees, a great variety of wildlife, rich farm land, abandoned pioneer orchards with an abundance of fruit, weatherworn homes,

barns and outbuildings, rushing streams, and many waterfalls. This picture is gone forever beneath the waters of the lake.”

Park Rules: Day Use Park Regulations:

Hours: 5 am-9 pm

PacifiCorp reserves the right to change the hours without notice.

Fees: Visitors entering day use sites with vehicles must pay applicable fees. Pass holders please check in with booth attendant (if staffed). Please display passes in car windows at all times. Fees are non-transferable.

Vehicles/parking:

- Keep speed 10 mph or below
- Stay on designated roads and paths
- Park only in designated areas
- Do not use ORVs and snowmobiles in recreation areas

Please help us keep this park safe, clean, and enjoyable for everyone:

- Do not use or possess alcohol at this site.
- Keep fires confined to established fireplaces, or to manufactured grills.
- Do not use fireworks or other explosive materials.
- Do not discharge firearms or other projectile devices within or near the recreation area.
- Respect wildlife, habitats, and other users: do not cut or otherwise damage trees or other vegetation. Do not disturb wildlife.
- Keep a clean camp! Place bottles, cans, paper, garbage, and other refuse in trash or recycling receptacles.
- Respect your neighbors. Do not use public address systems, loud music, or any other loud noise-producing devices in the day-use area.
- Restrain pets at all times, on leashes of not more than 6 feet in length. Put animal waste in plastic bags and take it with you or drop it in trash receptacles.
- Do not use this site for commercial purposes (including vending, site rentals, equipment sales or rentals, and advertising) without prior written permission of PacifiCorp.

All applicable laws regarding public safety, illegal substances, sanitation, boating, fishing/hunting seasons, and fires will be enforced. Violators of park rules are subject to removal and prosecution. Policies are subject to change without notice.

PacifiCorp does not accept responsibility for the safety or well-being of recreation area guests.

Images: Map of Merwin Park, showing picnic sites, restrooms, boat launch, parking, and dam. Photos of recreation. Photos of homestead life before the dams.

Merwin Park—Interpretive sign #1 (Hydroelectric Story)

Location: Merwin Park

Size: TBD

Title: Power From the River

Main

Content: By the first decade of the 20th century, plans were being made to harness the Lewis River to generate hydroelectricity for a growing industrialized Pacific Northwest. The electricity was needed to power an explosion of new technology: lights, stoves, manufacturing equipment—even locomotives. With its favorable grade, heavy precipitation, and proximity to Vancouver, Tacoma, and Seattle the Lewis River was considered an excellent source of hydropower.

Between 1929 and 1958, four hydroelectric projects were constructed along the Lewis River, forming three large reservoirs. Today, the power of the Lewis River's flow provides electricity to the Pacific Northwest and beyond. The four Lewis River projects are an important part of a electrical distribution system that stretches across the American West.

Main

Captions: *Illustration of Thomas Edison and lightbulb*

Thomas Edison first demonstrated the incandescent light in the 1880s, marking the beginning of the era of public electrification. Hydropower was one of the first methods used for generating electricity on a large scale.

Period illustration of electrical equipment from turn of the century

In 1889, the first commercial long-distance electric transmission lines in the world carried power from Willamette Falls to Portland.

Old map showing historical location of Ariel and relocated site?

Merwin Dam was originally called Ariel Dam, for the nearby town of Ariel. Ariel was established in 1899, a short distance upriver. When dam construction began in 1929, Pacific Light and Power moved the Ariel post office and general store below the construction site.

Image of L.T. Merwin

In 1948, Ariel Dam was re-named Merwin Dam, for L.T. Merwin of the Northwestern Electric Company.

Sidebar:

In the 1920s, Inland Light and Power (later to become Pacific Power and Light, and eventually PacifiCorp) began surveying, then buying, lands in the area above Shirt-tail Canyon, in the region that would eventually be flooded by Merwin Reservoir. This area had been settled by several homesteaders in the late 1800s. As lands were purchased, the valley's inhabitants began to migrate to other locations.

Crews began preparing the site of Merwin Dam in 1929. The dam, a concrete arch, was poured in sections, within a huge wooden framework that was shifted across the river as each section cured. A bypass tunnel carried water around the site.

In 1930, workers shut off the bypass tunnel, allowing water to begin building up behind the dam. Slowly, over the course of many days, the water covered the homesteads and forests of the valley.

Sidebar

Caption:

Photos of architectural elements

Merwin Dam and its adjacent powerhouse are on the National Register of Historic Places. Both the dam and the powerhouse were built with Art Deco-style architectural elements.

Photo of dam construction workers

Many locals, as well as outsiders, found work with the dam construction crews, which included engineers, laborers, supervisors, clerks, and health care workers.

Hydro-stats: *Hydroelectric power icon*

Merwin Dam: Year completed—1932; Crest length—1300 feet; Maximum height—314 feet; Annual power generation: 517,812Mwh (enough to power over 68,000 homes).

Images:

Historic photos of dam construction. Photos/illustrations of Edison with lightbulb, period images of electrical equipment from the early 20th century. Map showing “relocated” town of Ariel. Photos of Art Deco architectural elements on power house and dam.

Merwin Park—Interpretive sign #2 (Natural History)

Location: Merwin Park

Size: TBD

Title: With Wildlife in Mind

Main

Content: PacifiCorp owns and manages more than 10,000 acres of forest, meadow, streams, and wetlands around Merwin, Yale, and Swift Reservoirs. These diverse habitats are home to many species of land animals and birds—from elk to eagles. Taking care of Lewis River lands so that wildlife can continue to thrive here is job that PacifiCorp takes very seriously. The lands are managed according to a carefully-researched plan, designed by wildlife biologists to sustain diverse and healthy habitat.

In some cases, that means just leaving an area alone (such as leaving buffer zones along streams, rivers, and shorelines). In other cases, it means taking a more active approach. As you travel along the Lewis River, look for evidence of this hands-on style of management with wildlife in mind.

Sidebar: PacifiCorp purchased most of the lands around its reservoirs in large parcels. Because the land was destined to be part of the hydro project, many sellers logged their properties before selling them to the company, to get as much out of them as possible. Over time, these logged lands grew over in dense, dark forest—poor habitat for wildlife. Other sites had been scoured by construction and were covered with invasive species such as Scotch broom.

Today, PacifiCorp’s land managers work to actively shape these lands into places that are more hospitable for wildlife. Some of the techniques include:

- Creating small clearcuts to allow light into the dark understory, encouraging grasses and shrubs such as red huckleberry and hazel. These understory plants are important food and shelter for birds and mammals.
- Creating snags (standing dead trees). These gray, rotting pillars are very important habitat for cavity-creating and cavity-nesting birds such as pileated woodpeckers, and for secondary cavity nesters such as chickadees and flying squirrels.
- Adding large downed logs (often drift logs from the reservoirs) to forest floors, to provide nutrients to the soil and seedbeds for young trees such as western hemlock.

Sidebar

Captions: During relicensing of the Merwin project in the 1980s, the Merwin Wildlife Habitat Management Plan was created to help guide land managers in enhancing habitat, thereby increasing and sustaining populations of local wildlife.

The face of Yale Dam, built in the 1950s, has developed into a unique wildlife habitat in its own right. The moist, mossy boulders shelter several different species of reptiles and amphibians, including rubber boas, alligator lizards, western red-backed salamanders, and Larch Mountain salamanders—a species of concern for conservation.

Images: Photos of local wildlife. Photos of foresters at work. Photos of the highlighted projects.

Speelyai Park—Local Welcome Sign

Location: Speelyai Park

Size: TBD

Title: Speelyai Park

Main Content: Welcome to Speelyai Bay. This day-use park, and the salmon hatchery next door, are owned and operated by the power company PacifiCorp, which provides public recreation opportunities and protects fish and wildlife along the reservoirs of the Lewis River.

This small cove is a great place to access Merwin Reservoir. Merwin stretches 14.5 miles through the scenic Lewis River Valley. Launch your boat here for a trip out on the lake, or stay at the park for a picnic or a swim.

Sidebar: The blast of a steamboat whistle... the roar of falling water... the shouts of eager fishermen... During pioneer days, Speelyai Creek was a busy place, where homesteaders, fishermen, and travelers converged.

Speelyai Bay is formed by a narrow canyon through which Speelyai Creek once flowed toward the Lewis River. The mouth of the bay marks the site of a tall waterfall—at the base of which Indian fishermen and pioneers alike congregated to fish for salmon and smelt. In the late 1800s and early 1900s, during salmon season, local homesteaders would sometimes bring their wagons to Speelyai Falls, pitch-forking hundreds of pounds of the valuable fish into the beds to be hauled home and canned for the winter.

Below Speelyai Falls, the creek joined the Lewis River. This point marked the farthest upstream extent of regular steamboat travel on the Lewis. Only two vessels ventured above narrow, rocky “Shirt-Tail Canyon”, which lies just below the present-day Merwin Dam, to land at Speelyai Creek. The *Etna*, which served from 1906 to 1919, and the *Speilei*, which served from 1907 to 1940, were wood-burning sternwheelers. Both served primarily the logging industry, carrying supplies for the camps, rails, and equipment—but both also carried passengers and local freight.

Sidebar Captions:

Image of Coyote

The name “Speelyai” is said to come from a Native American word for Coyote, the Trickster.

Illustration of basket

Salmon from the Lewis and its tributaries was an important trade item in the ancient Native American economy of the Columbia River. Because the bodies of salmon change as they make their way upriver, fish caught at different sites was valued for different purposes.

Photo or illustration

Low water on the Lewis presented challenges for sternwheelers. At times the captain of the *Etna* would have to work his vessel through shallow riffles by tying off to trees on the bank.

Park Rules: Day Use Park Regulations:
Summer Hours (April 1-September 30): 5 am-9 pm
PacifiCorp reserves the right to change the hours without notice.

Fees: Visitors entering day use sites with vehicles must pay applicable fees. Pass holders please check in with booth attendant (if staffed). Please display passes in car windows at all times. Fees are non-transferable.

Vehicles/parking:

- Keep speed 10 mph or below
- Stay on designated roads and paths
- Park only in designated areas
- Do not use ORVs and snowmobiles in recreation areas

Please help us keep this park safe, clean, and enjoyable for everyone:

- Do not use or possess alcohol at this site.
- Keep fires confined to established fireplaces, or to manufactured grills.
- Do not use fireworks or other explosive materials.
- Do not discharge firearms or other projectile devices within or near the recreation area.
- Respect wildlife, habitats, and other users: do not cut or otherwise damage trees or other vegetation. Do not disturb wildlife.
- Keep a clean camp! Place bottles, cans, paper, garbage, and other refuse in trash or recycling receptacles.
- Respect your neighbors. Do not use public address systems, loud music, or any other loud noise-producing devices in the day-use area.
- Restrain pets at all times, on leashes of not more than 6 feet in length. Put animal waste in plastic bags and take it with you or drop it in trash receptacles.
- Do not use this site for commercial purposes (including vending, site rentals, equipment sales or rentals, and advertising) without prior written permission of PacifiCorp.

All applicable laws regarding public safety, illegal substances, sanitation, boating, fishing/hunting seasons, and fires will be enforced. Violators of park rules are subject to removal and prosecution. Policies are subject to change without notice.

PacifiCorp does not accept responsibility for the safety or well-being of recreation area guests.

Images: Map of Speelyai Park, showing picnic sites, restrooms, boat launch, parking, and hatchery. Photos of recreation. Historical photos of steamboat travel. Illustration of homesteaders fishing at falls.

Speelyai Park—Interpretive sign #1 (Hydroelectric/Natural History)

Location: Speelyai Park

Size: TBD

Title: Fish and Dams

Main

Content: The Lewis River has always been a significant river for anadromous fish. Chinook, coho, pink and chum salmon are all known to have been historically present in this system. Prior to Euroamerican settlement and commercial fish harvest, the largest fish runs in the Lewis River were chum salmon sometimes exceeding 300,000 spawners. The construction of the Merwin Dam (and later the Yale and Swift dams) presented several challenges to these fish species.

All dams provide challenges to migratory fish. Many dams are too tall for fish ladders. Spinning turbines can kill young fish (smolts) as they migrate downriver. Dams slow the flow of water in the river, which can change the temperature and chemistry of the water, affecting fish. Dams also inundate former fish habitat.

But with careful planning and effort, fish populations can be sustained on dammed rivers. Since the Lewis River dams were first built, PacifiCorp has worked to provide ways in which fish and dams can coexist.

Main

Caption: *Photo of stocking operation*
Each year, PacifiCorp-funded hatcheries stock Merwin and Swift reservoirs with thousands of rainbow trout and kokanee.

Sidebar: One important way in which PacifiCorp supports fish runs on the Lewis is through funding hatchery programs at Merwin Dam and here at Speelyai Bay. Each year, spring Chinook, steelhead and coho salmon are trapped as adults as they arrive at Merwin dam and trucked to holding ponds at Speelyai or Merwin Hatchery. Here at Speelyai, Chinook and coho are spawned in the fall; the eggs are incubated in Speelyai Creek water and the young fish are reared first in raceways and then in net pens (watch for them in Speelyai Bay). When they reach smolt stage, the young salmon are trucked below the dam and released into the Lewis River.

Sidebar

Caption: The Merwin fish trap is located at the base of the dam. Imprinted on the scent of Speelyai Creek and Lewis River water flowing out from the dam, the fish cluster in a large well. From there, they are transferred by hand to a large tank and immediately put in special fish-transport trucks for their trip to the hatchery.

Because hatcheries are no substitute for self-sustaining runs of fish, PacifiCorp funds programs aimed at restoring natural populations of

salmon to the Lewis. In the future, spawning fish will be brought over the dams and released into the lakes to spawn naturally in the surrounding creeks. Dam facilities will be modified to reduce turbine mortality of smolts.

Images: Photos and illustrations of hatchery operations. Photos/illustrations of fish species.

Speelyai Park—Interpretive sign #2 (Natural History)

Location: Speelyai Park

Size: TBD

Title: The Eagle and the Osprey

Main

Content: If you spend a while watching Speelyai Bay, you stand a good chance of spotting an osprey. These large, white-breasted birds perch at the tops of trees around the bay, or dive to snatch fish from the water. And if you spot a big bird of prey that's darker than an osprey, with a flatter-winged style of flight, take a closer look—it might be a bald eagle.

Back in the 1970s and 1980s, it was rare to see an osprey or an eagle along the Lewis River. Decades of pesticide poisoning and habitat loss had reduced the populations of these magnificent fish-eating raptors to almost nothing throughout the continental US. By 1986, when PacifiCorp flew the first aerial surveys for eagles and ospreys along the Lewis, there were only seven osprey nests found between Woodland and upper Swift Reservoir—and there were no eagle nests at all.

Today, however, the great birds are back. In a given summer, as many as 30 osprey nests may be active along the river, and there may be as many as 11 active eagle territories.

What has changed? America's increasing awareness of the dangers of certain pesticides led to much stricter regulations, and fewer of the most noxious chemicals entering the birds' food. This led to the birds' recovery around the country. Here at the Lewis River, increased fish populations, partly due to enhancement programs, have provided better forage for the big birds. And PacifiCorp wildlife managers have worked to provide enhanced roosting, nesting, and perching sites.

Main

Captions: A bald eagle nest may be as big across as a king-size bed, and weigh as much as a car.

Ospreys and eagles in flight can be distinguished by their silhouettes. Ospreys fly with their wings bent in a slight crook, while eagles usually soar on flatter wings.

Sidebar:

How do you attract an osprey? Build it some furniture! One of PacifiCorp's most visible and successful habitat enhancement programs is the creation of snags and the protection of roosting trees for bird habitat.

Ospreys prefer to build their large nests on high places overlooking the water. They like dead-topped trees with commanding views. To provide ospreys with more suitable nest sites, foresters on PacifiCorp lands selectively top some tall trees, creating standing dead trees called

“snags.” Chainsaw cuts on the top surfaces of the snags provide the birds with crevices in which to stuff the foundation twigs for the nest.

Sidebar

Captions:

Photo of woodpecker at hole

Snags also provide important habitat for woodpeckers, chickadees, and other birds that make cavities in dead trees or rely on cavities for nesting.

Photo of snag with nest and/or holes

PacifiCorp has created hundreds of snags along Merwin, Yale, and Swift reservoirs. Watch for them (many are topped with osprey nests or riddled with holes) as you explore.

Photo of eagle at roost

Studies have shown that eagles prefer large, open-limbed trees for roosting and resting at night. PacifiCorp identifies, protects, and enhances eagle roost sites at many locations along the Lewis.

Images:

Photos or illustrations of eagles and osprey. Photos of foresters creating snags. Photo of eagle nest and osprey nest. Photos of snags. Photo of eagle at roost.

Cresap Bay Park—Local Welcome Sign

Location: Cresap Bay Park

Size: TBD

Title: Cresap Bay Park

Main

Content: Welcome to Cresap Bay Park. This facility is owned and operated by the power company PacifiCorp, which provides public recreation opportunities along the reservoirs of the Lewis River.

Cresap Bay is a great home base for exploring 14.5-mile Merwin Reservoir—for a day or a week. Launch your boat for a fishing trip—if you’re planning to stay overnight, you can berth it at the 23-slip marina. Cool off with the kids at the swimming beach. Pitch your tent in the shadow of stately Douglas-firs. Go for a stroll along the shoreline or on the nearby Roy Wold Trail.

Sidebar: Before bridges spanned the Lewis—and before the construction of Merwin Dam flooded this area with lake water—river ferries served as important transportation links for settlers along the river. Just west of today’s Cresap Bay campground, local homesteader Tom Cresap operated such a ferry, hauling passengers, livestock, and freight between the Vancouver road (today’s route 503) and the west bank of the river, where another road (roughly corresponding to today’s Lewis River Road) provided access downriver to Woodland.

Cresap’s ferry, which operated from 1902 until 1920, was a sturdy, flat-bottomed platform that could easily carry a loaded wagon, team, and passengers. Like most river ferries of that era, it used the river’s own power (and a dash of human muscle) to shift its loads from bank to bank. Overhead cables kept the vessel from drifting downstream, while skillful maneuvering of bow and stern cables set it at the correct angle for the current to push it across. The ferry operator (usually Cresap himself) used hand winches to maneuver and land the heavy vessel.

Sidebar

Captions:

Photo of Cresap Ferry

Cresap charged 20-50 cents per crossing, depending on how many passengers, wagons, or livestock were in the party.

Photo of basket ferry

For those traveling light, there were several “basket ferry” crossings over the Lewis River. To cross, passengers climbed a wooden tower on the riverbank and clambered into a small wooden “basket” that hung by pulleys from a cable, which stretched across the river to another tower. They then rode the basket on a swooping arc above the water, hauling themselves up to the other tower by hand when momentum failed.

Park Rules: Day Use Park Regulations:

Summer Hours (April 1-September 30): 5 am-9 pm

Cresap Bay is closed to the public in winter

PacifiCorp reserves the right to change the hours without notice.

Fees: Visitors entering day use sites with vehicles must pay applicable fees. Pass holders please check in with booth attendant (if staffed). Please display passes in car windows at all times. Fees are non-transferable.

Vehicles/parking:

- Keep speed 10 mph or below
- Stay on designated roads and paths
- Park only in designated areas
- Do not use ORVs and snowmobiles in recreation areas

Please help us keep this park safe, clean, and enjoyable for everyone:

- Do not use or possess alcohol at this site.
- Keep fires confined to established fireplaces, or to manufactured grills.
- Do not use fireworks or other explosive materials.
- Do not discharge firearms or other projectile devices within or near the recreation area.
- Respect wildlife, habitats, and other users: do not cut or otherwise damage trees or other vegetation. Do not disturb wildlife.
- Keep a clean camp! Place bottles, cans, paper, garbage, and other refuse in trash or recycling receptacles.
- Respect your neighbors. Do not use public address systems, loud music, or any other loud noise-producing devices in the day-use area.
- Restrain pets at all times, on leashes of not more than 6 feet in length. Put animal waste in plastic bags and take it with you or drop it in trash receptacles.
- Do not use this site for commercial purposes (including vending, site rentals, equipment sales or rentals, and advertising) without prior written permission of PacifiCorp.

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PacifiCorp does not accept responsibility for the safety or well-being of recreation area guests.

Images:

Map of Cresap Bay Park and campground, showing campsites, restrooms, boat launch, marina, and trails. Photos of recreation. Photos of Cresap Ferry and of basket ferries.

Cresap Bay Park—Interpretive sign #1 (Hydroelectric Story)

Location: Cresap Bay Park

Size: TBD

Title: It's Raining Fuel!

Main

Content: Merwin, and its neighbor reservoirs Yale and Swift, exist for the sake of electricity. From the four generating plants along this river comes hydroelectric energy that powers streetlights and traffic signals, bakes bread, runs computers, moves public transportation, and much more.

Hydroelectricity is electrical energy that is produced by converting the energy of moving water to the energy of moving electrons. The process begins with the sun: the sun's radiation warms water in oceans, lakes, rivers, plants, and the soil, and evaporates it into the atmosphere. Eventually, this water vapor condenses, falls as precipitation, and makes its way downhill. On its way down, the flowing water's energy can be used to generate electrical energy.

Hydroelectricity is a "renewable" energy source. Water is always being evaporated by the sun and carried by air currents into the Cascades; it is always condensing and raining down, re-filling the reservoirs. It has been said that in the world of hydroelectricity, "it rains fuel."

Sidebar:

How, exactly, does moving water translate into moving electrons? The story begins with water poised above a dam, ready to flow downhill. At the base of the dam is a generating facility. Water from above the dam is piped to the generator through huge tubes called *penstocks*.

At the end of each penstock, the rushing water enters a *turbine*—a device that resembles a huge propeller or fan. Large louvers called *wicket gates* allow operators to closely regulate the rate at which water flows through the turbine. The water pushes against the blades of the turbine, spinning it at a high rate of speed.

The spinning turbine turns a *rotor*, containing an enormous mass of magnets, inside a *stator* that contains a stationary ring of tightly-packed copper coils. Because of the nature of magnetic fields and electrical conductors, the motion of the magnets creates a changing magnetic field that *induces* electrons to change from a positive to negative charge (and visa versa) within the copper coils. The motion of the electrons creates a moving *electric field* within the copper. This moving field is electrical energy.

Sidebar

Captions: From the generators, electricity passes through *step-up transformers* which allow voltage to be increased so the power can pass efficiently through high-voltage transmission lines. These high-voltage lines, strung from tall

steel towers and zig-zagging across the land, are familiar features of the American landscape.

Electricity from the Lewis River enters the “grid”—a system of interconnected power distribution lines and facilities throughout the American West. Many companies (and even some private individuals) feed power into the grid, representing many different types of power generation, including nuclear and coal-fired, as well as hydroelectric, geothermal, wind and solar-driven facilities.

Images: Photo of dam. Diagram of dam and penstocks. Diagram of hydroelectric generator. Diagram of power transmission system (grid).

Cresap Bay Park—Interpretive sign #2 (Natural History)

Location: Cresap Bay Park

Size: TBD

Title: Wild Neighbors

Main Content: The Lewis River Valley has a long history of change. Over the past 150 years, homesteading, wildfires, logging, dam construction, and housing development have shaped this landscape into something quite different than it was before the first Euroamerican settlers arrived. Today, there is little left of the ancient evergreen forests that once thrived along the Lewis.

But despite the changes, many native species remain—and many thrive, helped by habitat programs, on PacifiCorp lands. Watch for these wild neighbors as you explore.

Douglas-fir

One of the most prominent tree species in the Cascades, Douglas-firs can grow over 200 feet high. A very important timber tree, they are also a key species for wildlife habitat. Douglas-firs are planted throughout PacifiCorp's lands as part of habitat programs.

Alder

On sites that have been heavily disturbed by humans, such as gravel pits and old clearcuts, alder can form thick stands that provide poor habitat. But in mixed stands, these fast-growing, vigorous trees can be important food and shelter for elk, deer, and many bird species.

Elk

Elk did not appear along this stretch of the Lewis River until around the 1950s. The elk in this valley are thought to be descended from transplanted Rocky Mountain elk. PacifiCorp maintains elk habitat throughout the valley, by planting grass in clearcuts and along old roads, and protecting key winter range.

Black bear

Black bears are not common in the Lewis River valley, but they are present here. Fruiting shrubs such as huckleberry and crabapple are very important foods.

Woodpeckers

Many species of woodpecker—from the big pileated woodpeckers to colorful red-breasted sapsuckers—seek snags (standing dead trees) in which to mine for beetle larvae and excavate their nest cavities.

Hawks

Many hawks and falcons, such as red-tailed hawks and kestrels, rely on open country to hunt their preferred prey of rodents, insects, and small

birds. Natural meadows, old farm fields, and wetlands provide habitat for these sharp-eyed birds of prey.

Sidebar: Although you might think Cresap Bay Park is here strictly for human use, it was actually created with wildlife in mind! The grass parking lot, the forested campsites, and many other features were designed to provide rich wildlife habitat, along with human recreation.

Before the campground was built, this site was identified as important winter range for elk, which rely on the milder climate of the valley floor when snow lies deep on the mountains above. In winter, when the campground is closed to the public, elk now graze on the large grass-covered parking area and playing field, stroll along the roads, and bed down near the forested campsites.

In the campground, islands of native shrubs such as elderberry, ocean spray, and vine maple provide refuge and food for perching birds such as towhees and warblers, while helping provide a sense of privacy among the campsites.

Skilled loggers selectively cut a minimal number of large trees to create the campsites and roadways, leaving tall forest habitat. Watch for birds such as woodpeckers and flycatchers, and for tree-dwelling mammals such as squirrels, as you explore the campground and trails.

Images: Illustrations or photos of “wild neighbors” profiled in text. Photos of forestry activities. Map or aerial photo of campground showing wildlife habitat features for sidebar.

Saddle Dam Park—Local Welcome Sign

Location: Saddle Dam

Size: TBD

Title: Saddle Dam Park

Main Content: Welcome to Saddle Dam Park. This facility is owned and operated by the power company PacifiCorp, which provides public recreation opportunities along the reservoirs of the Lewis River.

Saddle Dam is an auxiliary dam that helps to form Yale Reservoir, which stretches some 10.5 miles northward through the scenic Lewis River Valley. The park features a boat launch, swimming access, picnic sites, restroom and shower facilities.

Sidebar: At the far end of the meadows below Saddle Dam is a large chestnut tree. In front of the tree is a carefully-tended sign that reads “Frasier Homestead chestnut planted by Charles in 1914.” The grand old tree, the sign, and the surrounding meadows are reminders of a time when the Lewis River was still a rough-and-tumble mountain torrent, and when pioneers worked to build homes and communities along its banks.

Saddle Dam lies across lands originally homesteaded by John Frasier and his family in the 1880s. The Frasiers arrived at this site in 1888, paddling and poling up the Lewis in dugout canoes in search of land to settle. They liked the look of this area, with its fairly level land and easy access to good fishing at the “Slide” (a site now covered by Yale Dam). They soon established a successful cattle ranch, supplying meat to logging camps in the surrounding mountains.

Eventually, three generations of Frasiers lived and farmed here. They grew cash crops of corn and potatoes, boarded loggers, and even dabbled in gold mining. Some worked on logging crews.

In the early 1950s, the farm was sold to Pacific Power for the construction of Yale Dam and Saddle Dam. Today, elk graze the old Frasier family fields just below the dam, and remnant trees of the fruit orchard still feed elk, deer, and birds.

Park Rules: Day Use Park Regulations:
Summer Hours (April 1-September 30): 5 am-9 pm
Saddle Dam Park is closed to the public in winter
PacifiCorp reserves the right to change the hours without notice.

Fees: Visitors entering day use sites with vehicles must pay applicable fees. Pass holders please check in with booth attendant (if staffed). Please display passes in car windows at all times. Fees are non-transferable.

Vehicles/parking:

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Images: Map of Saddle Dam Park, showing picnic sites, boat launch, parking, and (if possible) dam and Frasier farm fields. Photos of recreation. Historical photos of Frasier Farm.

Saddle Dam Park—Interpretive sign #1 (Hydroelectric Story)

Location: Saddle Dam

Size: TBD

Title: Dams Along the Lewis

Main Content: The millions of kilowatt-hours of electricity produced by PacifiCorp's Lewis River projects are made possible by dams, which hold and control the flow of water, using it to generate power. But take a tour of the Lewis' four major dams and you'll see that they are quite different from each other in size, shape, and materials. Why is this so?

In general, dams are built to "suit the site": what a dam looks like and what it's made of depend on where it is built and the materials available to build it.

At sites where the river narrows and bedrock is close to the surface, such as canyons, *concrete arch dams* are the best fit. Their distinctive arch/wedge shapes take advantage of concrete's enormous compression strength (ability to withstand the pressure of large forces without breaking). Concrete arch dams direct the force of water outward onto the walls of the canyon and downward to the rock of the riverbed.

Where rock abutments and exposed bedrock streambeds aren't available to support concrete arch dams, *earthen embankment dams* are built. Embankment dams are usually made primarily from materials found on site, with great care taken to sort and apply the layers to provide maximum strength and impermeability.

Main Text Captions: *Photo of Merwin Dam construction* Merwin Dam, which forms Lake Merwin, is a concrete arch dam built at the top of narrow Shirt-Tail Canyon. It was created in stages, using an enormous wooden form that was moved across the span as each section was poured.

Photos of Yale and/or Swift Dam construction Yale Dam, Saddle Dam, and Swift Dam are all earthen embankment dams, built from riverbed boulders and gravels, rocks, clay, and soil excavated during site preparation, and rocks quarried from the surrounding hillsides.

Sidebar: Saddle Dam looks like a grassy hill—you might think it was built by simply piling up earth in a straight line. But like all Lewis River dams, it is actually a complex and specialized structure, engineered and constructed to withstand heavy water pressure.

If you could slice the top from Saddle Dam, you would see distinct bands or layers of material: large boulders, coarse gravels, fine clay, and mixed dirt. These materials are arranged to provide strength, drainage, and impermeability to the structure: big boulders and compacted earth

provide strength, porous gravels channel rainwater safely out of the dam, and dense clay forms impervious barriers.

Sidebar

Caption:

Aerial photo showing Yale and Saddle Dams together Saddle Dam is part of a two-dam system that creates Yale Lake. Just east of here is Yale Dam—the primary dam, which contains the hydroelectric facilities. Saddle Dam has no hydroelectric facilities. It acts as an auxiliary to Yale—preventing the lake from spilling out through this low area (“saddle”) between the hills.

Extra

Captions:

Photo of diversion tunnel While you’re building a dam, where do you put the river? Here at Yale Dam, workers diverted the river entirely around the dam site, through a 40-foot-diameter tunnel bored through the bedrock.

Photo of clay embankment along roadside The impermeable layers in the Lewis River’s embankment dams are made of locally-gathered blue-gray volcanic clay. Soil scientists supervised the collecting, sifting, and drying of this clay, to ensure that it was of a consistent high quality.

Hydro-stats: *Hydroelectric power icon* Yale Dam and Saddle Dam: Year completed—1953; Crest length—1305 feet (Yale), 1600 feet (Saddle); Maximum height—323 feet (Yale), 40 feet (Saddle); Annual power generation: 560,398 Mwh (enough to power over 70,000 homes).

Images: Diagrams and cutaways of concrete arch and embankment dams, showing differences (we can’t show specifics of Lewis River dams’ construction, but general diagrams should be fine). Photos of Saddle Dam construction, if available.

Saddle Dam Park—Interpretive Sign #2 (Natural History)

Location: Yale Park

Size: TBD

Title: A Homestead for Wildlife

Main

Content: The fields below Saddle Dam are part of the old Frasier homestead, established in the late 1800s. Over the years, they have been pastures and hayfields, and have grown crops such as potatoes and corn. Today, PacifiCorp maintains these fields as part of Saddle Dam Farm—a homestead for wildlife.

- Biologists keep the fields planted with a mixture of grasses and clover, and monitor their composition. Clover provides proteins and other nutrients that grass does not. When the percentage of clover in the fields dips too low, the fields are tilled and re-seeded.
- Every year, in mid-August, the fields are mowed to provide a burst of new growth just as the fall rains begin. This tender green growth is a banquet for elk, giving them a burst of nourishment to help them enter the lean months of winter in top condition.
- Three old orchards, maintained by PacifiCorp, provide fruit for elk, deer, bears, and birds.
- The long, straight hedgerows you can see from the top of the dam are not part of the original farm fields. These were planted by PacifiCorp to provide cover for wildlife and to break up the line of sight between pastures, allowing elk and deer to graze the fields without being completely exposed.
- Perches and nest boxes along the hedgerows attract kestrels, red-tailed hawks and other raptors, which hunt the fields for rodents and insects.

Sidebar: A small perennial creek that flows along the western edge of the fields is the site of a wetland-enhancement project. Several low dikes create a series of small ponds, in which water levels can be controlled by gates. These ponds help keep high-water events on the creek from eroding the banks away. They also provide havens for frogs, salamanders, fish, and waterfowl. Plantings of dogwood, willow, and other wetland shrubs provide cover for animals and stabilize the banks, and nest boxes offer shelter for wood ducks.

Sidebar

Caption: *Photo or illustration of fenced tree*

Beavers are present on this stream—and their voracious appetites for willow and cottonwood mean that plantings must sometimes be protected with wire fences!

Images: Photos of wildlife at Saddle Dam Farm. Map or diagram of farm fields showing bulleted features (orchards, hedgerows, etc). Illustration or photo of wetlands.

Yale Park—Local Welcome Sign

Location: Yale Park

Size: TBD

Title: Yale Park

Main Content: Welcome to Yale Park. This facility is owned and operated by the power company PacifiCorp, which provides public recreation opportunities along the reservoirs of the Lewis River.

This day-use park provides excellent access to fishing, swimming, and other water recreation in Yale Reservoir, which stretches some 10.5 miles northward through the scenic Lewis River Valley. The park features a boat launch, swimming access, picnic sites, and restroom facilities.

Sidebar: Today's Yale Park sits on what was once a flat bench high above the Lewis River. In the late 1800s, homesteaders established a small farm here, perhaps attracted by the relatively level land.

Across Highway 503, at the base of the hill, was the house site. Today's park area was field and pastureland. The remnants of the old homestead orchard—a cluster of apple trees—are just adjacent to the parking lot.

Sadly, this farm was the site of a tragedy. In September of 1902, one of the biggest wildfires in the region's history devastated much of the central Lewis River Valley, including this homestead.

The Yacolt Burn raged for only a day, but by the time it died, it had burned over 230,000 acres. Some 30 homesteads were destroyed, and more than a dozen people were killed. Among the dead were the Reed family (parents and two children), who lived here, at the homestead at what we now call Yale Park.

Sidebar

Caption: *Photo of fire aftermath or map of fire path*
The Yacolt Burn started near Stevenson, and spread to the Lewis River Valley through the Chelatchie Prairie.

Illustration

Warned of the approaching flames by smoke and flying cinders, many homesteaders fled with their valuables to clearings and creek bottoms, trying to put distance between themselves and the dry, fire-ready forest.

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Vehicles/parking:

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Images: Map of Saddle Dam Park, showing picnic sites, boat launch, parking, and (if possible) dam and Frasier farm fields. Photos of recreation. Historical photos of Frasier Farm.

Yale Park—Interpretive Sign #1 (Natural History)

Location: Yale Park

Size: TBD

Title: Living Lakes

Main

Content: Yale Reservoir, and its neighbors Swift and Merwin, are habitat for a variety of life: ducks bob on the waves and dive for food, otters and mink swim and patter along the banks. Aquatic plants thrive in some shallow areas, and microscopic animals and algae—plankton—drift in the water, bursting in numbers during spring and summer.

Perhaps the most prominent of the lake inhabitants are fish. Many species of fish swim these waters, from tiny sticklebacks to big bull trout. Some of these species are native to the Lewis River, while others are relative newcomers.

Kokanee (Onchorhynchus nerka)

A landlocked race of sockeye (red) salmon, kokanee are not native to the Lewis River reservoirs. They were introduced into Yale and Merwin reservoirs in 1957, and into Swift Lake in 1961. Today, they are stocked in Lake Merwin, from PacifiCorp-funded hatcheries. Although Merwin Reservoir does not have appropriate habitat for significant self-sustaining populations of kokanee, Yale Lake does. Yale Lake does not require hatchery stock to maintain a population of kokanee.

Bull trout (Salvelinus conflentus)

These large salmonid fish (they are actually not true trout, but members of the char family) are federally listed as threatened throughout the mountain west, as their populations have been strongly affected by logging, dams, fishing, and other human impacts. Bull trout are present in all three reservoirs, though they spawn only in a handful of creeks in Yale and Swift.

Cutthroat trout (Oncorhynchus clarkii)

True trout, cutthroats are present and common in all three reservoirs and their surrounding streams. There are three forms of cutthroat: resident, which live their lives in small streams and their tributaries, fluvial, which live in larger streams and rivers, and adfluvial, which live and grow in the lakes but hatch and spawn in tributary streams and rivers. There are cutthroat trout in the ocean as well. They can survive with or without access to the sea.

Northern Pikeminnow (Ptychocheilus oregonensis)

Though they are native to the Pacific Northwest, it's not likely that pikeminnow were ever abundant in the Lewis River before the dams were built. However, pikeminnows thrive in relatively still waters, and their populations have become quite large in Merwin Reservoir.

Aggressive, voracious feeders, they can grow quite large, and can be serious threats to juvenile salmon and trout.

Sculpins (Cottids)

Although rarely seen by anglers—or by casual observers of the reservoirs and tributaries—sculpins are very important food fish for trout, bull trout, and pikeminnow.

Caption:

Modern image of Native American fishing

The salmon of the Lewis River—and all other tributaries of the Columbia—are sacred to the Native American tribes of this region. As traditional stewards of these fish, tribal people are deeply involved in fisheries science and policy making. Tribe members fish for subsistence, commercial, and ceremonial purposes—sometimes using traditional techniques such as dip nets and spears in addition to more modern boat and line methods.

Sidebar:

Because shorelines are sensitive areas, PacifiCorp pays particular attention to their conservation. Forestry activities such as habitat clearcuts and thinning operations on PacifiCorp lands are designed so that a buffer of forest always remains between the cut and the lake. Regular shoreline monitoring helps identify areas that might be particularly vulnerable to overuse by boaters and campers, and to find sites that may be in need of restoration.

PacifiCorp encourages dispersed recreational use of the shorelines it manages. The goal is for people to enjoy the shorelines with a light touch, keeping impacts to a minimum.

Images:

Illustrations of the featured fish. Photos of shoreline conservation activities.

Cougar Park—Local Welcome Sign

Location: Cougar Park

Size: TBD

Title: Cougar Park

Main

Content: Welcome to Cougar Park. This facility is owned and operated by the power company PacifiCorp, which provides public recreation opportunities along the reservoirs of the Lewis River.

This campground and park is a great place to set out for a day on Yale Reservoir, or to pitch a tent and stay a while. Cougar Park features 45 campsites (tent only), picnic area, restrooms and showers, swimming beaches, and a boat launch ramp. In early fall, watch for spawning kokanee (red salmon) in the creek—you might even spot bald eagles feasting on the fish!

Sidebar: Before the late 1800s, the Lewis River Valley was a kingdom of giant trees. Vast stretches of ancient forest—dominated by enormous Douglas-fir, hemlock, cedar, and spruce—blanketed the land. For the latter part of the 19th century and most of the 20th century, logging this great forest was the biggest industry in the Lewis River Valley.

Early operations were small, relying solely on animal and human power to muscle the big logs out. After loggers felled and bucked the trees, ox teams hauled the sections over greased skid roads to steep, muddy chutes, where the logs were sent rocketing down to the river below.

Dolbeer Logging Engines—also known as “steam donkeys”—were introduced to the Lewis around 1900, and along with railroads, they opened up all but the most rugged slopes to logging. By the mid-20th century, the original forests were nearly all gone, and companies were at work cutting and processing the second generation of fast-growing timber.

By 1900, several sawmills had set up shop along the upper river, including one here at Cougar Creek. Most operations produced ties and cants (partially-milled logs) that were floated downriver to mills at Woodland or on to Portland.

Sidebar

Captions:

Photo of log drive

Once or twice a year, log drives herded timber down the river on high flows. Some of the most skilled and desirable drivers were a group of Indians who hailed from Woodland; these specialists were experts at their tremendously dangerous job: balancing on logs, using pike poles, and blasting apart jams to keep the wood moving downstream.

Photo of aftermath of Yacolt Burn

The Yacolt Burn of 1902—a devastating forest fire—proved a powerful stimulus to the timber industry along the Lewis River. The aftermath of the fire drew Weyerhaeuser Corporation and other large scale logging companies to the valley, to salvage the thousands of acres of dead wood.

Photo of Edgar Robbins family or of tourist camp

A prominent family along the upper river, the Robbins clan settled lands in and around the town of Cougar. Family members farmed, logged, and carried mail. Edgar Robbins opened a “tourist camp” here at Cougar Creek in the 1910s.

Park Rules: Day Use Park Regulations:
Summer Hours (April 1-September 30): 5 am-9 pm
Cougar Park is closed to the public in winter
PacifiCorp reserves the right to change the hours without notice.

Fees: Visitors entering day use sites with vehicles must pay applicable fees. Pass holders please check in with booth attendant (if staffed). Please display passes in car windows at all times. Fees are non-transferable.

Vehicles/parking:

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Images: Map of Cougar Park, showing picnic sites, boat launch, parking, facilities. Photos of recreation. Historical photos of logging.

Cougar Park—Interpretive Sign #1 (Natural History)

Location: Cougar Park

Size: TBD

Title: Red Salmon, Rich Resource

Main

Content: If you visit the mouth of Cougar Creek during the early fall, you may come across a scene that wouldn't be out of place along the coast of British Columbia or Alaska: in the shadows of tall evergreens, brick-red salmon with green heads push against the current, doggedly working their way upstream. Some pause in shallow riffles, scooping out bowl-shaped depressions known as "redds" with their tails.

Bald eagles perch streamside, watching the spawning fish with calculating eyes, and occasionally pouncing to drag a fish ashore and feast. Overhead, gulls wheel and cry, and descend to snatch scraps. Cutthroat trout shadow the red fish, darting in and eating wayward eggs.

It's spawning season for kokanee—a landlocked race of red salmon (*Onchorhynchus nerka*). Unlike their ocean-going cousins (sockeye), kokanee spend their whole lives in fresh water. They hatch in streams at lakeside, and the tiny larvae spend their first winter buried in gravel, living off of the nutrients stored in their yolk sacs. In early spring, the small fish leave the streams to swim the waters of the lake. There they spend about three (possibly up to seven) years feeding on plankton before returning to their home streams to spawn.

Kokanee are distributed throughout the Pacific Northwest and Alaska, and in northern Asia. Lewis River kokanee, however, are not native to this river. They were introduced in the late 1950s and early 1960s, from lakes in British Columbia.

Kokanee occur in all Merwin and Yale reservoirs—partly because of stocking programs and partly because fish "leak" downstream through Yale Dam into Merwin. But the only truly self-sustaining population occurs here in Yale Reservoir, where the fish find appropriate habitat for spawning in the surrounding creeks.

Caption: *Photo of bull trout*

In addition to providing spawning habitat for kokanee, Cougar Creek is also one of the few streams in the Lewis River watershed that supports spawning bull trout (*Salvelinus conflentus*). These large, trout-like char rely on extremely cold water and suitable gravels to spawn successfully. Bull trout are listed as a threatened species.

Sidebar: Cougar Creek and the surrounding forest lands are protected by the Cougar Conservation Covenant, the result of PacifiCorp's agreement to purchase 800 acres of Weyerhaeuser lands around this rich stream system and protect them in perpetuity. The covenant includes a 500-foot buffer

zone around the creek to maintain the integrity of the riparian corridor, and protects virtually the entire Cougar drainage. Even if the land should be transferred from PacifiCorp to another entity, the conservation easement would remain.

Images: Illustrations of kokanee, including life cycle. Illustration of kokanee spawning, showing other animals benefiting (eagles, gulls, cutthroat, etc). Illustration or photo of bull trout.

Beaver Bay—Local Welcome Sign

Location: Beaver Bay

Size: TBD

Title: Beaver Bay Park

Main Content: Welcome to Beaver Bay Park. This facility is owned and operated by the power company PacifiCorp, which provides public recreation opportunities along the reservoirs of the Lewis River.

This large campground and day-use site provides access to scenic Yale Reservoirs, nestled at the base of Mt. St. Helens. Launch your boat here to explore the quiet, remote shorelines of this mountain reservoir. Yale Lake provides great fishing opportunities for trout, kokanee, and other gamefish. Beaver Bay Park also features 63 campsites, a group campsite, a picnic area, a swimming beach, restrooms and showers.

Sidebar: The North Fork of the Lewis River tends to draw people who enjoy the idea of living self-reliantly in a wild and beautiful place. Even in the heady days of settlement, when homesteads sprang up in the lower valley, the upper Lewis River remained almost empty of permanent residents. There were notable exceptions, though—two of whom lived quite close to today's Beaver Bay Campground.

One of the first settlers on the upper Lewis, Joe Masters homesteaded here at what is now called Beaver Bay. He hailed from Arizona, where he had been an Indian scout for the US Army. It was said that he had recently lost his wife and children, though he rarely spoke of them.

Masters was well-known and well-loved throughout the valley, and especially famous among wide-eyed children for his exciting tales of Wild West adventure. He was a consummate woodsman and a popular companion for camping adventures in the mountains, where he entertained at evening campfires with jokes, songs, and tunes on his mouth harp. He died in 1926, and is buried at Yale Cemetery.

Ole Peterson arrived on the upper Lewis River around 1894. He settled about six miles east of here near Dry Creek, just downstream of today's Swift Dam. Peterson was an entrepreneur, hermit, photographer, and iconoclast. He ran cattle and had a small orchard, sold timber and did some small-scale farming. He died in 1953, at age 85, after being injured in a fire at his homestead.

Ole was well-known along the river. His colorful language, eccentricity, and staunch political views (he claimed to have thrown his radio out the window and sworn off trips to town after listening to a Roosevelt speech) made him a darling of local newspapers, and his curmudgeonly whiskered visage decorated many a story.

Sidebar**Captions:**

Photo of Ole at his caves

Ole developed a business guiding tourists into “Ole’s Caves”—a series of lava tubes he had discovered in the hillside above his homestead.

Photo of Ole Peterson

Peterson loved tall tales. He claimed to have once kept a cougar as a pet, and whittled the animal a wooden leg after it was injured in an epic battle with a huge bear.

Park Rules:

Day Use Park Regulations:

Summer Hours (April 1-September 30): 5 am-9 pm

Beaver Bay Park is closed to the public in winter

PacifiCorp reserves the right to change the hours without notice.

Fees: Visitors entering day use sites with vehicles must pay applicable fees. Pass holders please check in with booth attendant (if staffed). Please display passes in car windows at all times. Fees are non-transferable.

Vehicles/parking:

- Keep speed 10 mph or below
- Stay on designated roads and paths
- Park only in designated areas
- Do not use ORVs and snowmobiles in recreation areas

Please help us keep this park safe, clean, and enjoyable for everyone:

- Do not use or possess alcohol at this site.
- Keep fires confined to established fireplaces, or to manufactured grills.
- Do not use fireworks or other explosive materials.
- Do not discharge firearms or other projectile devices within or near the recreation area.
- Respect wildlife, habitats, and other users: do not cut or otherwise damage trees or other vegetation. Do not disturb wildlife.
- Keep a clean camp! Place bottles, cans, paper, garbage, and other refuse in trash or recycling receptacles.
- Respect your neighbors. Do not use public address systems, loud music, or any other loud noise-producing devices in the day-use area.
- Restrain pets at all times, on leashes of not more than 6 feet in length. Put animal waste in plastic bags and take it with you or drop it in trash receptacles.
- Do not use this site for commercial purposes (including vending, site rentals, equipment sales or rentals, and advertising) without prior written permission of PacifiCorp.

All applicable laws regarding public safety, illegal substances, sanitation, boating, fishing/hunting seasons, and fires will be enforced. Violators of park rules are subject to removal and prosecution. Policies are subject to change without notice.

PacifiCorp does not accept responsibility for the safety or well-being of recreation area guests.

Images: Map of Beaver Bay Park, showing picnic sites, boat launch, parking, swimming beach, facilities. Photos of recreation. Historical photos of Joe Masters and Ole Peterson.

Beaver Bay—Interpretive Sign #1 (Hydroelectric Story)

Location: Beaver Bay

Size: TBD

Title: Cycles of Flow

Main Content: Rivers are not steady systems. Their flow changes seasonally, and in response to weather events such as droughts and heavy rains. Here in the Cascades, floods are a part of natural river cycles of flow. Winter (November through April) is the time of highest runoff, with frequent rains, and rain-on-snow events that can cause big surges in the Lewis River's flow.

Dams are a means to regulate the flow of a river. But dams can't change the rate at which water flows into the system, they can only regulate the water flowing out of the system. At best, dams can only dampen the natural oscillations of the river's flow—and they cannot prevent floods.

As operator of the dams of the Lewis River hydroelectric projects, PacifiCorp has the responsibility to provide flood management—not flood control—for the communities below Merwin Dam. Working out the most efficient pattern of storage, release, and drawdown to control river flow and buffer water fluctuations, while still generating electricity, requires a skillful dance of meteorology and hydrology.

To do this, meteorologists study precipitation patterns and weather forecasts to create "flow forecasts" to help make decisions about water levels in the three reservoirs. Higher flows and higher energy demands prescribe higher water release rates through turbines or spillways. When a significantly higher flow is forecasted, the reservoirs may be drawn down to provide space to store the incoming water.

Main Text Caption: As part of its flood management plan, PacifiCorp funds county agencies responsible for notifying property owners of sudden high water events. PacifiCorp also provides funds to the county for the dissemination of information about water levels in the reservoirs and flow rates at Merwin. This information is provided in several forms, including weather radio, Internet, and telephone lines with automated flow information).

Sidebar: At midnight, just three days before Christmas of 1933, inhabitants of the Lewis River floodplain at Woodland were awakened by the roar of water as a massive flood swept down the river to Woodland. The following Sunday's *Oregonian* breathlessly trumpeted news of the flood: "The usually lazy north fork of the Lewis River suddenly became a snarly, boiling demon of destruction. Rearing four feet above its banks, it thundered down the broad valley to the fertile farm land above Woodland, tossing bridges and tractors, barns, sheds and trees before it, toppling houses, tossing them on its crest, smashing them with the

impact of its advance, bowling them over, piling them in heaps, pushing through roads and railroads, ripping at piers and bursting dikes, drowning cattle and thousands of chickens, transporting tons of silt and boulders and trees on its turgid tide.”

The cause of the flood was discovered within two days. In a high mountain depression in the headwaters of Dry Creek (which enters the Lewis River just upstream of the Beaver Bay boat launch), rain and snowmelt had accumulated, forming a lake. The lake rested in a bowl of basalt formed by a 100-year-old lava flow, which lay atop soft sediments, which in turn lay atop another basalt flow. Both lava flows were riddled with lava tubes that had been packed full of sediment. The water had worked its way through the lava, forcing sediment out of some of the tubes and causing faster and faster lake drainage as the blockages eroded away. Downstream, the increasing torrent ripped deep into the ground and surged into the Lewis River.

Before it abated, the flood scoured a 600-foot-deep canyon (Christmas Canyon) adjoining the Lewis River. The surge carried trees and other debris downstream, dumping it by the ton into the newly-formed Lake Merwin. Ariel Dam operators allowed the maximum amount of water to surge through the dam’s structure, but water still rose, eventually overtopping the spillway. Flooding downstream at Woodland was extensive with flows exceeding 133,000 cfs—more than six times normal flow.

The high lake continued to drain, creating a muddy flood through Christmas Canyon, for over a month after the initial breach.

Sidebar

Caption:

The morning before the flood, far up the Lewis, a CCC crew of 200 had been at work on forest projects when nearby Dry Creek began to rise. Sensing trouble, the commander had ordered an evacuation. The men toppled a few large trees across the now-raging torrent and 135 men teetered across to safety as the flood rose to engulf their makeshift bridge.

Hydro-stats: *Hydroelectric power icon*

Swift Dam: Year completed—1958; Crest length—2100 feet; Maximum height—512 feet; Annual power generation: 677,555 Mwh (enough to power over 89,000 homes).

Images:

Graph of flow oscillations, showing how dams can dampen oscillations but not prevent them. Images of high waters. Diagram of dam and reservoir, showing how a buffer of storage space is kept. Historic photos of the Dry Creek flood.

Swift Forest Camp—Local Welcome Sign

Location: Swift Forest Camp

Size: TBD

Title: Swift Forest Camp

Main Content: Welcome to Swift Forest Camp. This facility is owned and operated by the power company PacifiCorp, which provides public recreation opportunities along the reservoirs of the Lewis River.

This remote shoreline campground and day use area is a popular spot to launch boats for fishing on 11.5 mile-long Swift Reservoir. Swift Forest Camp also features 93 campsites, a picnic area, swimming beaches, and restrooms.

Sidebar: Even with all of the rough work of pioneer life, early Lewis River homesteaders still had time and energy for play. And although community dances, traveling lectures, magic shows and other indoor amusements were well-attended, some of the most popular forms of recreation took the pioneers outdoors, far afield of their already “wild” back yards.

Shouldering their bedrolls, rifles, cookpots, salt pork and beans, valley residents regularly set off for backcountry adventure. Some carried fishing rods, salt, and cans to pack their catch home. Others hunted deer or bear. Some were semi-serious gold prospectors, systematically investigating the hundreds of small mountain streams.

Lake Merrill, in a valley above Cougar, was a popular destination for families out for a weekend of fishing, and boy scouts testing their woods skills. A wagon road was a slight improvement over the old trail, but it still took the better part of a day for a family to get to the shoreline campsites.

Many early recreationists explored the slopes of Mt. St. Helens and Mt. Adams. One party of young men made their way halfway up the slopes of Mt. St. Helens completely barefoot, finally donning their boots when the lava got too sharp. Others enjoyed summer snowslides on the upper mountain slopes.

Sidebar Caption: *Photo of exploring party at lava tube*

One popular local expedition was a trip to explore one of the many lava tubes on the slopes of Mt. St. Helens in the upper valley. Ole’s Caves, discovered by local character Ole Peterson, and Ape Cave, discovered in 1950 and first explored by a troop of Boy Scouts under the leadership of Yale resident Harry Reese, were well-known. The scout troop called themselves “The Apes”—hence the name of the cove.

Park Rules: Day Use Park Regulations:
Summer Hours (April 1-September 30): 5 am-9 pm
Swift Forest Camp is closed to the public in winter
PacifiCorp reserves the right to change the hours without notice.

Fees: Visitors entering day use sites with vehicles must pay applicable fees. Pass holders please check in with booth attendant (if staffed). Please display passes in car windows at all times. Fees are non-transferable.

Vehicles/parking:

- Keep speed 10 mph or below
- Stay on designated roads and paths
- Park only in designated areas
- Do not use ORVs and snowmobiles in recreation areas

Please help us keep this park safe, clean, and enjoyable for everyone:

- Do not use or possess alcohol at this site.
- Keep fires confined to established fireplaces, or to manufactured grills.
- Do not use fireworks or other explosive materials.
- Do not discharge firearms or other projectile devices within or near the recreation area.
- Respect wildlife, habitats, and other users: do not cut or otherwise damage trees or other vegetation. Do not disturb wildlife.
- Keep a clean camp! Place bottles, cans, paper, garbage, and other refuse in trash or recycling receptacles.
- Respect your neighbors. Do not use public address systems, loud music, or any other loud noise-producing devices in the day-use area.
- Restrain pets at all times, on leashes of not more than 6 feet in length. Put animal waste in plastic bags and take it with you or drop it in trash receptacles.
- Do not use this site for commercial purposes (including vending, site rentals, equipment sales or rentals, and advertising) without prior written permission of PacifiCorp.

All applicable laws regarding public safety, illegal substances, sanitation, boating, fishing/hunting seasons, and fires will be enforced. Violators of park rules are subject to removal and prosecution. Policies are subject to change without notice.

PacifiCorp does not accept responsibility for the safety or well-being of recreation area guests.

Images: Map of Swift Forest Camp, showing campground, picnic sites, facilities, boat launch, parking. Photos of recreation. Historical photos or illustrations of recreation, including photo of explorers in lava tube.

Swift Forest Camp—Interpretive Sign #1 (Hydroelectric Story)

Location: Swift Forest Camp

Size: TBD

Title: High Water, Low Water

Main Content: Spend time along the shore of Swift Reservoir and you'll soon notice that the lake level is not constant. Over the course of a day, the lake may fall or rise several inches. Throughout the year, the water may fluctuate many feet. These constant changes maintain a bare zone around the shoreline—a bit like a beach at the ocean, where rising and falling reservoir levels create a unique shoreline landscape.

But unlike tides, the water fluctuations on Swift Reservoir (and neighboring Yale and Merwin reservoirs) are caused by human actions. Swift is a reservoir, contained by a hydroelectric dam. Water in the reservoirs used to turn turbines at the base of the dam, which generate electricity. When more water is released than flows into the reservoir, the lake level drops. When more water flows in than is released, the reservoir rises.

If power generation were the only consideration in determining how much water to release, PacifiCorp would run all the water that enters Swift through generators at all three dams, maximizing the total power output of the river.

However, power generation is not the only factor. Sometimes operators must release more water than can be run through generators, or must store water when it could be used to turn the turbines. This is part of the company's stewardship of the river and surrounding lands. Ultimately, the operation of the Lewis River dams is a complex choreography of water storage, power generation, and water release. The basic needs driving the system are:

- *Electricity generation needs* –This includes meeting the needs of the consumers via the grid, maintaining sufficient water behind the dams to support spinning reserves, and maximizing profit/ minimizing loss based on fluctuating electricity costs.
- *Environmental needs* –PacifiCorp is required as part of its FERC license to maintain at least a minimum flow rate in the Lewis River below Merwin Dam during all times of the year for fish spawning, incubation and rearing.
- *Recreation needs* –PacifiCorp provides recreation sites for the public, and minimum reservoir heights are required to make these recreation sites usable.

- *Flood management needs* –PacifiCorp must maintain “storage”, or reserve space, in the reservoirs to buffer high input or runoff during the winter.
- *Maintenance needs* –The company must take into account regular and unscheduled maintenance needs in planning water releases.

In addition to all these parameters, PacifiCorp water managers must also factor in the future, including weather forecasts and energy cost estimates to create daily water release schedules. These provide hour-by-hour plans for operation of the river system and generation.

Images: Diagram of the three reservoirs, showing how levels might fluctuate over the course of a day, week, season. Photos of dam operations. Icons representing bullet points.

Eagle Cliff Park—Local Welcome Sign

Location: Eagle Cliff Park

Size: TBD

Title: Eagle Cliff Park

Main Content: Welcome to Eagle Cliff Park. This facility is owned and operated by the power company PacifiCorp, which provides public recreation opportunities along the reservoirs of the Lewis River.

This park and day use area provides access to the Lewis River above the uppermost hydroelectric reservoir, Swift Reservoir. You're in the shadow of Mt. St. Helens here, with many opportunities for backcountry recreation.

Sidebar: One of the oldest known travel routes through this region—the Klickitat Trail—passed close by Eagle Cliff, following the North Fork of the Lewis River from Chelatchie Prairie to Yakama country. This ancient trail provided access to and from the high valleys of the Cascades for local Indian tribes, and had been a long-established trade route by the time railway surveyor George B. McClellan passed this way in 1853, noting flatly that "...the valley of the Cathlapoot'l [Lewis]...is utterly worthless for any purpose."

McClellan's dour description notwithstanding, the next century saw increased use of the Lewis River route through the Cascades. Indians on their way to and from trading fairs and horse races in the Indian Heaven region... prospectors chasing rumors of gold in the mountain streams... Homesteaders from the lower valley headed upriver to camp, hunt, and fish... through the decades, travelers of all sorts passed by here on what was then a dusty, muddy, and rugged trail.

By the 1910s, a wagon road from Woodland had reached the Cougar region—but beyond that point, only bootprints and hoofprints marked the way. The route (then called the Lewis River Trail) became the responsibility of the newly-created US Forest Service. The agency expanded, improved, and maintained the trail as access to remote operations in the upper Lewis River and beyond. These operations included fire prevention, fire detection (the trail was a critical access line for regional fire lookouts), and recreational structures such as trail shelters.

Sidebar Caption: *Forest Service logo, or photo of Forest Service at work; map of FS sites upriver*
Today, the Forest Service continues to be a player in the story of the Lewis River. Much of the river's upper watershed lies on National Forest lands, and many recreationists are drawn to the region by the nearby Mt. St. Helens National Volcanic Monument, administered by the Forest Service.

Park Rules: Day Use Park Regulations:
Summer Hours (April 1-September 30): 5 am-9 pm
PacifiCorp reserves the right to change the hours without notice.

Fees: Visitors entering day use sites with vehicles must pay applicable fees. Pass holders please check in with booth attendant (if staffed). Please display passes in car windows at all times. Fees are non-transferable.

Vehicles/parking:

- Keep speed 10 mph or below
- Stay on designated roads and paths
- Park only in designated areas
- Do not use ORVs and snowmobiles in recreation areas

Please help us keep this park safe, clean, and enjoyable for everyone:

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- Do not use fireworks or other explosive materials.
- Do not discharge firearms or other projectile devices within or near the recreation area.
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PacifiCorp does not accept responsibility for the safety or well-being of recreation area guests.

Images: Map of Eagle Cliff Park and this region of the Lewis River, showing picnic sites and facilities. Photos of recreation. Illustrations/photos showing Klickitat Trail. Historic photo of Forest Service operations along Lewis River Trail. Forest Service logo or other modern FS image.

Eagle Cliff Park—Interpretive Sign #1 (Natural History)

Location: Eagle Cliff Park

Size: TBD

Title: Watershed

Main

Content: The western slope of the Cascade Range is a land of rain. Here, westward-facing valleys nestle like open baseball gloves in the path of Pacific rainstorms, scooping rain and snow from the sky in staggering amounts. Tumbling through waterfalls, trickling down countless tiny tributaries, or oozing steadily downhill through the soil, all of that water gradually makes its way downhill, funneled by slopes and valleys into rivers such as the Lewis.

The “funnel” of land that directs water into the North Fork of the Lewis River is called its watershed. It covers some 847 square miles, extending from Woodland to the peak of Mt. Adams. Its boundaries snake their way along ridgetops including Mt. St. Helens, tracing high ground to the banks of the Columbia. A map of streams in this watershed, from the highest ridgetop streamlets to bustling torrents such as Swift Creek, looks like a map of blood vessels, branching to supply the body.

Scientists gage the health of a watershed by the health of its interconnecting streams and the habitats through which they flow. In a watershed, effects move along stream pathways: a poorly-built road can wash out, choking the downstream reach with sediment. A blocked channel can close off access to an upper stream, depriving that area of fish.

For the most part, the tributaries of the Lewis flow through forested land (much of the watershed is part of the Gifford Pinchot National Forest) and are quite healthy. However, increasing development along the Lewis River, poor timber harvest practices, and other human activities will always pose challenges to the health of the Lewis watershed.

Sidebar: The watershed of the Lewis River’s north fork is dominated by volcanic activity. Millions of years of lava flows and violent eruptions have formed the ridges and peaks, as the Lewis has tumbled through the valley below. Repeated lahars, or volcanic mudslides, have changed the course of the Lewis and its tributaries.

The most recent volcanic episode occurred in 1980, with the eruption of Mt. St. Helens. This huge explosion denuded 30 square miles of the North Fork’s watershed, sending millions of tons of ash, mud, and shattered trees down into the river. Sediments pouring into Swift Lake reduced the water’s depth at the upper end of the reservoir, and for over ten years afterwards, the reservoirs were kept at lower levels in anticipation of more mudslides.

- Caption:** Near the Lewis's mouth, average annual precipitation is 37 inches, while at higher elevations it can reach 140 inches. Most of this falls between November and March, which translates at high elevation to massive amounts of snow (exceeding 200 inches in many places). Snowmelt sustains the river through the dry summers, providing water for fish habitat, wetlands and wildlife. Winter warm spells and spring thaws bring rain-on-snow events that can quickly raise river levels.
- Caption:** The health of our watersheds is critical to our health. But it's not always easy to see (or act) from a watershed perspective. To do so, we need to look beyond our own artificial boundaries to the natural boundaries of our watersheds. What watershed do you live in? What watersheds do you work or play in? How do your actions affect those watersheds? How can you work to keep those watersheds healthy, or to make them healthier?
- Images:** Map of North Fork Lewis watershed. Images from St. Helens eruption. Scenics of small mountain streams, larger streams. Icons for watershed stewardship caption.