

Nisqually-Mashel State Park Site Management Plan

DRAFT



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WASHINGTON STATE
PARKS AND RECREATION COMMISSION



CAMP

Washington State Parks
Classification and Management Planning Project

ACKNOWLEDGMENTS AND CONTACTS

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PREFACE

The Washington State Parks and Recreation Commission (Commission) manages a diverse array of over 100 parks located throughout the state.

The Commission adopted the Centennial 2013 Plan in October, 2003, thereby creating a focus intended to energize and bring together the agency, state leadership and the public, to work toward a parks system all can celebrate as it turns 100 years old and prepares for a second century of service. The Centennial 2013 Plan blends public and private funding, engages more partnerships and creates greater public ownership of the system.

The Centennial 2013 Plan calls for the agency to work toward opening new parks, including one at the Nisqually-Mashel State Park site, in order to ensure a parks and recreation legacy for future generations. Completion of this plan will take us one step closer to achieving an important goal for the Centennial 2013 Plan – that all parks have land-use plans supported by the public and the Commission.

These land-use plans follow a process that has been used by the Commission since 1996, called the CAMP Project. CAMP is an acronym for Classification and Management Plan. One of the most important elements is the classification of lands. In 1995, the Commission adopted a land classification system. Application of the system creates zones, or land classifications, within a park (see Appendix A) Six distinct classifications determine what recreational uses and types of developments are appropriate in different areas of a park. In general, sensitive areas are classified restrictively and allow only low-intensity uses and development of minor facilities. Less sensitive areas are classified to allow higher-intensity uses and more extensive facilities development.

A CAMP brings together park users, nearby community, stakeholders and State Parks staff in a public process that forges a common vision of what the state park should become. This plan is intended to focus efforts to balance resource protection with recreational opportunities in a park. For State Parks staff, this document represents policy approval and a means to create a state park that meets the Centennial 2013 Vision:

In 2013, Washington's state parks will be premier destinations of uncommon quality, including state and regionally significant natural, cultural, historical and recreational resources that are outstanding for the experience, health, enjoyment and learning of all people.

SUMMARY

In 1987, the Washington State Legislature approved the Nisqually River Management Plan, which called for a major destination area park/put-in site at the confluence of the Nisqually and Mashel Rivers, together with trails up the Mashel River. Since that time, the Washington State Parks and Recreation Commission has worked on assembling a land base suitable for such a destination state park. In the 2005-2007 biennium, the Washington State Legislature funded a master plan for the new park.

The development of the Nisqually-Mashel State Park Site Classification and Management Plan (CAMP) began in November 2005 with the assembly of an internal State Parks planning team comprised of park, region and other specialized staff. In October 2007, State Parks hired a consultant team, led by The Portico Group, to assist with developing the park's master plan. A master plan is a more detailed planning document than a CAMP. The master plan for the Nisqually-Mashel state park site includes a land use plan, as well as an interpretive plan, a stewardship plan, a business plan, and design guidelines. It also includes more detailed site analysis than is usually completed for CAMP. The master plan does not replace the CAMP because the master plan does not include land classifications, but the master plan does inform the CAMP. For this reason, the CAMP process was rolled into the master planning process, and the two plans were developed together. Public outreach in this planning process was extensive. An Exploratory Committee was formed, consisting of members from Mount Rainier National Park, the Town of Eatonville, The University of Washington Center for Sustainable Forestry at Pack Forest, Tacoma Power, the Washington Department of Fish and Wildlife, Pierce County Parks, the Nisqually River Council, and local citizens representing park user groups. In addition, the Nisqually Indian Tribe formed a State Park Committee to determine the Tribe's desired level of involvement in the park, and to give input on the park's planning process. The planning team met regularly with the Exploratory Committee and with the tribal State Park Committee as the CAMP and the master plan were being developed. Public input was also solicited at a series of four public meetings in the Eatonville area, at a meeting of the Eatonville Chamber of Commerce, and at a Nisqually Tribe community meeting. Finally, public input was solicited through a page on the State Parks website, and through email.

PURPOSE

The purpose of this document is to: 1) orient readers to the park and the agency's park management planning system; 2) identify park-level natural, cultural, and recreation and facility management issues; and 3) provide initial direction to park staff (suggested management approaches) to address these issues (see **Table 1**). The ultimate purpose of this document is to describe how the agency intends to balance recreational use with measures that protect natural and cultural resources.

This plan is divided into five sections, with several appendices, and is organized as follows:

Section 1: Provides a brief overview of the Nisqually-Mashel State Park Site, including its geography, historical background, major attributes, and public use.

- Section 2: Describes the public process that led to this Classification and Management Plan (CAMP).
- Section 3: Outlines management objectives established for the park.
- Section 4: Describes the park's land classification (management zoning) and long-term park boundary.
- Section 5: Lists natural, cultural, and recreational/facility resource issues identified through the public planning process and outlines general approaches toward addressing them.

Appendices contain additional supporting documentation pertinent to this resource management planning process and the future management of the Nisqually-Mashel State Park Site.

Table 1: Summary of Nisqually-Mashel State Park Site Issues

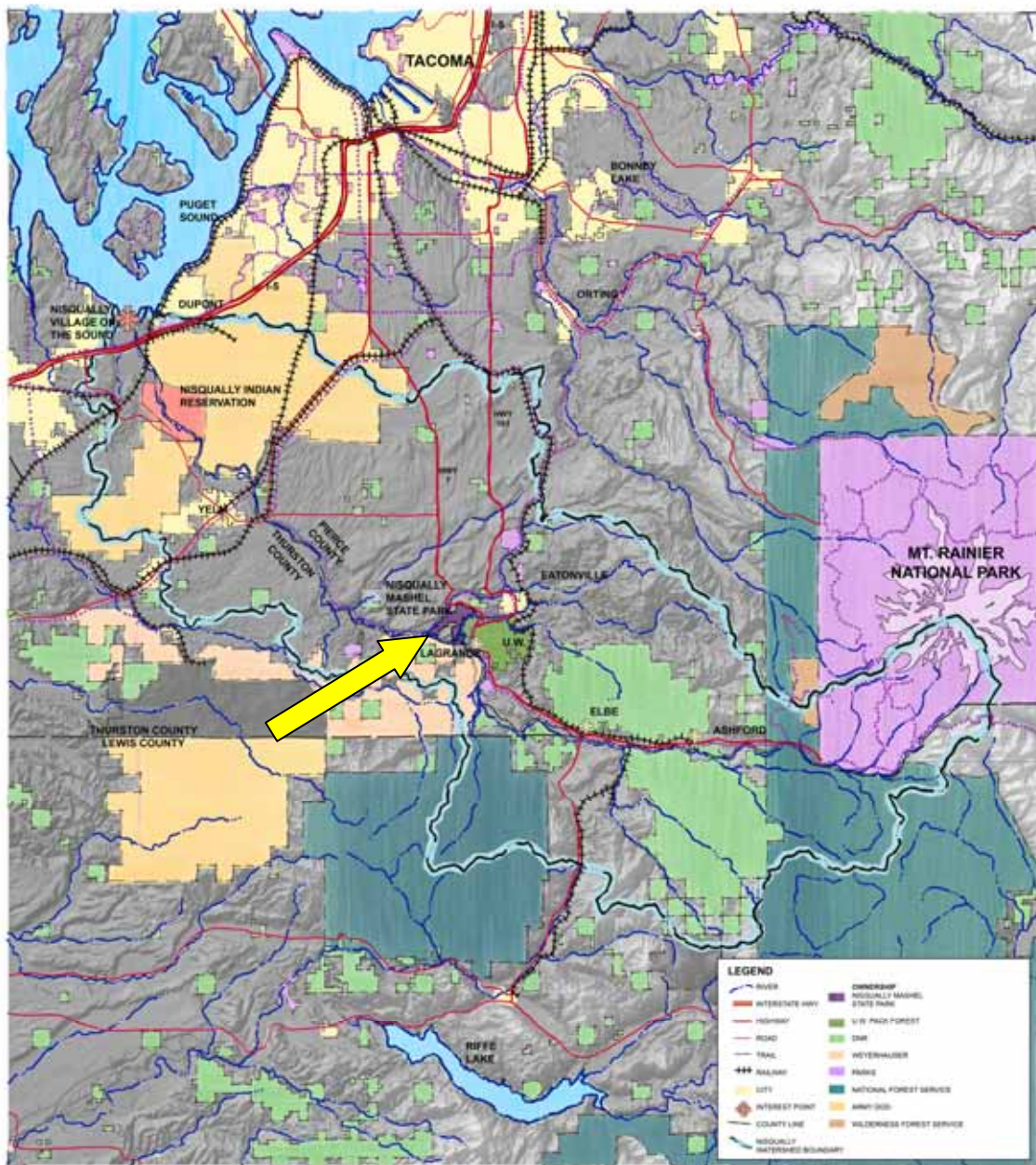
Natural Resource Issues
• Protection of natural plant and animal communities • Riparian area management—Ohop Creek, Mashel River, Nisqually River • Protection of wetlands • Green and sustainable development • Protection of scenic resources
Cultural Resource Issues
• Protection of cultural sites • Management of historic structures • Education and interpretation of cultural sites
Recreational Resource and Facility Issues
• Property acquisition • Boundary management and trespass • Connections to the region • Traffic management • Law enforcement • Public safety • Park fees • Volunteers • Staff housing • Park enterprise • Trails • Dogs • Barrier free access • Development of day-use facilities • Sports and active recreation facilities • Rafting • Access to the south side of the Nisqually River • Special events • Development of equestrian facilities • Development of overnight facilities • Interpretation and education

SECTION 1: PARK DESCRIPTION

The Nisqually-Mashel State Park Site is located along the Nisqually River, roughly halfway between Mount Rainier and the Puget Sound, within Pierce and Thurston counties. (See **Figure 1**)

Location: Three miles southwest of Eatonville along State Route 7 (Sections 16, 17, 19, 20, 21, 29, and 30, Township 16 North, Range 4 East; and Section 25, Township 16 North, Range 3 East).

Figure 1: Nisqually-Mashel State Park Site vicinity map



REGIONAL AREA MAP
MASTER PLAN FOR
NISQUALLY MASHEL STATE PARK



Land Area: The current ownership includes 1,230 acres, and 29,000 linear feet of freshwater shoreline.

Jurisdiction: Most of the Nisqually-Mashel State Park site is within unincorporated Pierce County, but the 140-acre parcel south of the Nisqually River is within unincorporated Thurston County.

Park Name: The Nisqually-Mashel State Park Site has not been named by the Washington State Parks and Recreation Commission. The Commission will be asked to name the park at the same time as they consider the CAMP. The public and the Nisqually Tribe have been asked to give input on the park's name. A large number of naming options were given to the Nisqually Tribe's State Park Committee for consideration. The options included a number of names that were envisioned to be translated into the Nisqually Tribe's language, Lushootseed, but the actual translations were not completed. The tribe's State Park committee took the naming issue to a meeting of the complete tribal membership. At that meeting, the Nisqually Tribe voted to support the name "Nisqually State Park." Then a shorter list of potential park names, including Nisqually State Park, Leschi State Park, and 3 Rivers State Park (or its Lushootseed translation) was sent to the members of the public who were on the park's email list for consideration. Of the responses, Nisqually State Park again got the most support.

Current Staffing: The Federation Forest Area staff is responsible for the operation of Federation Forest State Park and the Nisqually-Mashel State Park site. The area is staffed by a Park Ranger 3, who is the Area Manager, and a Park Ranger 2, both of which are year-round positions. The area is also staffed by 5 seasonal Park Aides. The Park Aide positions together total 18 months per year.

Acquisition History: The current Parks ownership was purchased in five parcels, the first in 1991 and the most recent in 2003, for a total of approximately \$6 million.

Historical Background: This area of the Nisqually River watershed has been used by Native Americans for millennia. It is believed that the Nisqually Tribe had a winter village site near the mouth of the Mashel River. The park is the site of the 1856 Mashel Massacre, which happened during the Indian Wars of Western Washington. There is also a privately-owned Shaker cemetery on the Mashel Prairie that is thought to contain the grave of So-To-Lick, also known as Indian Henry. So-To-Lick owned a farm on the Mashel Prairie, and served as a guide to at least one group who attempted to climb Mount Rainier.

The Ohop Valley was settled by European and U.S. settlers in the 1800s, after which agriculture and timber harvesting became the dominant land uses in the area. By 1915, the Weyerhaeuser Company had purchased much of the land within the existing park boundary, and they continued to conduct logging operations on the property until it was purchased by Washington State Parks.

A Cultural Resources Survey was completed for the park in 2008. This study includes more detailed historical background.

Facilities: The only developed facilities within the Nisqually-Mashel State Park site are logging roads and bridges constructed by Weyerhaeuser. There are currently no park facilities, but the logging roads are used as trails by park visitors.

Water: The park is bordered on the east by the Mashel River, on the south by the Nisqually River, and on the west by Ohop Creek, except for 140 acres south of the Nisqually River on the east side of the park. According to the U.S. Fish and Wildlife Service National Wetland Inventory (NWI) data, a significant portion of the park's wetlands are concentrated in the riparian corridors associated with the three streams. A large palustrine forested wetland is found in the western portion of the property near the Ohop Valley. Another large wetland complex is near the base of the east, south, and west sides of the hill in the center of the property, near the private inholdings. Most other mapped wetlands on the property are smaller. It is known that there are wetlands within the park that are not shown on either the NWI or Pierce County's wetland maps, so further reconnaissance will be necessary in association with park developments¹.

Plants: Based on a 2006 field survey², 280 individual plant species were identified in the park, 89 of which were non-native, accounting for 32% of the total. Although no rare or protected plants were observed in the park during the surveys, several unique plant associations were observed. LYRA Biological also searched the Washington National Heritage Program (WNHP) database, and identified 16 WNHP species with a moderate to high likelihood of occurring in the park. The park's floodplain terraces and steep river canyon slopes have likely never been logged, and are characterized by mature, coniferous, riparian forests, dominated by Douglas fir, western hemlock, and western red cedar, and immature floodplain communities dominated by red alder. The upland plateau areas represent varying stages of plantation forest regeneration. Wetland areas are characterized by flood-tolerant deciduous species like Oregon ash and red alder and emergent sedges and rushes³.

Wildlife: State priority wildlife species occur in all the riparian corridors within and adjacent to the park. Species include the bald eagle, osprey, turkey vulture, and Pacific Townsend's big-eared bat.⁴ Other terrestrial species include cougar, beaver, black bear, deer, and elk. The park's streams provide habitat for five species of Pacific salmon: Chinook, coho, pink, chum, and steelhead. Sea-run cutthroat trout are also found. Of these, Chinook and steelhead are federally listed threatened species.⁵

Environmental Health: The Eatonville Landfill, a 2.25-acre solid waste landfill that stopped accepting waste in 1980, is owned by the Weyerhaeuser Company, but surrounded by the Nisqually-Mashel State Park site. The landfill was leased from Weyerhaeuser by the Town of Eatonville. Remediation has been recommended for the site, consisting of capping it with two feet of soil, revegetating it with native plant species, and diverting a spring away from the landfill. That remediation has not been completed.

Zoning: Pierce County = Rural 10 (one unit per ten acres);
Thurston County = Long-term Forestry

Shoreline Master Program Designation: Pierce County = Currently the shoreline designation for the Mashel River and the Nisqually River is Natural, and the designation for Ohop Creek is Rural. The county is currently updating its Shoreline Master Program, and the proposed designation for all three streams is natural.

¹ Herrera Environmental Consultants, "Environmental Constraints Report: Nisqually-Mashel Property," 2008.

² LYRA Biological, "Nisqually-Mashel State Park Rare Plant and Vegetation Survey," 2006.

³ Herrera Environmental Consultants, "Nisqually-Mashel State Park Site Stewardship Plan," 2009.

⁴ Washington Department of Fish and Wildlife Priority Habitat and Species GIS dataset, 2008.

⁵ Herrera Environmental Consultants, "Nisqually-Mashel State Park Site Stewardship Plan," 2009.

Thurston County = Conservancy. Thurston County is also working on a Shoreline Master Program update.

Historical and Cultural Preservation: There are three archaeological sites within the state park site, and another within one mile⁶. No historic sites or structures are registered on the national or state historic registers.

Utilities: There are currently no utilities serving the park. The park site has no water rights. Ohop Mutual Light Company is currently constructing a substation adjacent to the park; this substation will provide power to local residents, and to the park when it is developed.

Business Development: No business development activities are currently happening in the park, but a business plan was developed as part of the park's master plan.

Interpretation: No interpretation is currently taking place in the park, but an interpretive plan was developed as part of the park's master plan.

⁶ Emerson and Ives, "Cultural Resources Survey of the Proposed Nisqually-Mashel State Park, Pierce and Thurston Counties, Washington," 2008.

SECTION 2: PARK PLANNING PROCESS

The development of the Nisqually-Mashel State Park Site Classification and Management Plan (CAMP) began in November 2005 with the assembly of key agency staff to act as a core planning team. This team consisted of the park manager, the region director and assistant director, the region planner, and the region stewardship manager. The planning team also consulted with other agency technical specialists as needed.

To begin getting public input on the project, an Exploratory Committee was formed, consisting of members from Mount Rainier National Park, the Town of Eatonville, The University of Washington Center for Sustainable Forestry at Pack Forest, Tacoma Power, the Washington Department of Fish and Wildlife, Pierce County Parks, the Nisqually River Council, and local citizens representing park user groups. In addition, the Nisqually Indian Tribe formed a State Park Committee to determine the Tribe's desired level of involvement in the park, and to give input on the park's planning process. Meetings with the Exploratory Committee and the Nisqually Tribal State Park Committee were held at each project stage.

Starting in April 2006, the core planning team held a series of public meetings and posted planning information on the project's website. The workshops were designed to be open-ended forums to allow the public to actively participate in the future plans for the Nisqually-Mashel State Park site. The planning team took all concerns into consideration and responded to any issues that arose during the planning process. The project has followed a four-stage process, which will be complete when the Commission provides its policy direction.

Stage 1: Identify hopes and concerns of the community and park users

To gather hopes and concerns, the planning team held a public workshop on April 27, 2006 at the Eatonville Community Center. The team sent invitations to nearby landowners, elected officials, and interest groups. *The Dispatch* and the *Tacoma News Tribune* published articles on the planning project, and the Eatonville Chamber of Commerce helped get the word out to locals. Responses from users and workshop attendees were posted on State Parks' planning webpage.

Stage 2: Explore alternative approaches to address community and user issues

In response to the community and user comments in the first stage, the planning team developed alternative approaches that might meet peoples' needs. In order to gather comments on the alternatives, the team invited people to a second workshop and offered to send them the alternatives. The contact list grew as people expressed interest. A second workshop took place on July 15, 2006 at the University of Washington Center for Sustainable Forestry at Pack Forest in Eatonville. The meeting included a park tour and lunch. The planning team took comments at the workshop and provided an option for written comments. Responses were posted on State Parks' planning webpage.

On March 8, 2007, the planning team presented a report to the Washington State Parks and Recreation Commission on the project's progress and the public's response to date. The Commission meeting was open to the public.

After the second CAMP meeting, it was determined that the master plan and the CAMP should be completed in concert. In October 2007, State Parks hired a consultant team to assist with the master plan. On February 22, 2008, the consultant team presented the results of their site

analysis work to the Eatonville Chamber of Commerce. On March 6, 2008, the planning team attended a community meeting held by the Nisqually Tribe, described the project to date, and answered questions and took comments from the Tribe.

On April 16, 2008, a second alternatives workshop was held at the Eatonville Lion's Club to present the site analysis and three master plan alternatives. The planning team took comments on the alternatives at the workshop, and posted the planning materials to the project web page to allow for written comments.

On April 23, 2008, the planning team attended a Parks and Recreation Commission workshop to describe the master plan alternatives and the project's progress. The Commission workshop was open to the public, and the chair of the Nisqually Tribal State Park Committee attended and spoke to the Commission about the importance of the park to the Nisqually Tribe.

Stage 3: Prepare preliminary recommendations to address issues

The planning team considered the comments received to date and developed preliminary staff recommendations based on the best available information for both the CAMP and the master plan. Staff shared its preliminary recommendations with the public at a fourth workshop on September 30, 2008 at the Eatonville Community Center. Responses were posted on State Parks' planning webpage.

Stage 4: Propose final recommendations for formal agency and Commission adoption

The planning team will make its final recommendations to the Commission on March 11, 2010 in Tacoma. The Commission meeting is open to the public. Public comments are invited at the Commission meeting.

SECTION 3: MANAGEMENT OBJECTIVES

Management objectives serve to define the vision and purpose of each state park. They must be consistent with laws, policy and the mission statement of the Washington State Parks and Recreation Commission (Commission):

The Washington State Parks and Recreation Commission acquires, operates, enhances, and protects a diverse system of recreational, cultural, historical, and natural sites.

The Commission fosters outdoor recreation and education statewide to provide enjoyment and enrichment for all and a valued legacy to future generations.

Likewise, the Centennial 2013 Plan gives guidance to what state parks should be as the Washington State Parks and Recreation Commission begins its second century of service.

In 2013, Washington's State Parks will be premier destinations of uncommon quality, including state and regionally significant natural, cultural, historical and recreational resources that are outstanding for the experience, health, enjoyment and learning of all people.

The park's management objectives are presented below in **Table 2** to provide management direction for the Nisqually-Mashel State Park Site.

Table 2: Nisqually-Mashel State Park Site Management Objectives

Natural Resources • In coordination with local, state, federal, and tribal governments and interested groups, identify, monitor, protect, and interpret native plant and animal communities and the ecological functions they perform. • Manage the park's forests to support a diversity of wildlife, with an emphasis on advancing forest vegetation diversity and structure that favors old-growth dependent species. • Identify, maintain, protect, and interpret geologic and watershed systems associated with the park's streams and wetlands.
Cultural Resources • Identify, monitor, and protect archeological sites and traditional cultural practice areas. • Model responsible stewardship in the management of historical and cultural landscapes and resources. • In coordination with tribal governments, interpret the past, present, and future uses of the Nisqually watershed by Native American people.
Recreational Resources • Provide an array of day-use and overnight facilities and services that are compatible with the park's natural and cultural resource management objectives. • Provide a full range of accessible park experiences and opportunities.
Sustainability • Identify and implement green practices and actions that protect the environment and meet the needs of the present without compromising the needs of future generations. • Promote and demonstrate the wise use of natural resources. • Take actions to increase the ability of the park's infrastructure and ecosystems to adapt to the effects of climate change.
Interpretation and Environmental Education • Use interpretation as a tool to enhance visitor experience, understanding, and stewardship of cultural resources, natural resources, and spiritual experiences. • Provide year-round, interpretive programming and opportunities. • Collect, record, and interpret the cultural and natural heritage of the Nisqually watershed.
Community Partnerships • Work with the Nisqually Tribe and other interested tribes to develop a partnership to acquire, develop, and manage the park. • Work with local and state governments, tribal groups, and non-profit organizations to support regional open space, biodiversity, and watershed conservation efforts. • Recruit and manage a volunteer corps of park neighbors, users, and resource stewards to assist staff in outreach, public service, and maintenance needs.
Concessions and Park Enterprise • Forge alliances with partners and concessionaires that will facilitate the park development process, establish a progressive operational capacity, and create revenue centers. • Provide visitor services through public/private partnerships and other entrepreneurial programs that are clearly compatible with other park management objectives.

SECTION 4: PARK LAND CLASSIFICATIONS AND LONG-TERM BOUNDARY

Land Classification

An important part of the planning for the Nisqually-Mashel State Park site involves the zoning or classification of park lands. State Parks has developed a system of six land classifications. When assigned to a specific area within a park, each classification sets an appropriate intensity for recreational activity and development of facilities. Classifications are aligned along a spectrum ranging from low to high-intensity recreational uses and developments. By classifying park lands, the agency is able to strike a balance between protecting park resources and providing an appropriate variety of recreational opportunities to park visitors.

The agency's land classification system includes six classifications: Natural Area Preserves, Natural Areas, Natural forest Areas, Resource Recreation Areas, Recreation Areas, and Heritage Areas. Detailed definitions of each land classification are in the appendix. Through critical analysis of natural and cultural resource inventories and evaluation of future recreational facilities needs, staff recommends park lands be classified as shown in **Error! Reference source not found.**

Long-Term Boundary

Delineation of long-term park boundaries is an often misunderstood aspect of park planning. In short, the purpose of a long-term boundary is to take a big-picture look at what lands, independent of ownership, might advance the conservation and recreation mission of the park. This process not only considers whether an adjoining property would make a suitable addition, but also considers whether agency-owned property should be retained or might appropriately be considered surplus to park needs. Including a privately-owned property in a long-term boundary does not necessarily mean the agency wants to purchase it. It simply means that it would be in the park's best interest if the property were managed and maintained in a condition that complements development and operation of the park. Any of the following possibilities could apply:

The agency might:

- Seek to formalize an agreement with an adjacent property owner to advance a shared property management goal;
- Solicit a conservation easement from an adjacent property owner to protect certain natural or cultural features;
- Readily accept a donation of all or part of a private property;
- Consider exchanging agency-owned property for a private property; or
- Consider purchase of a private property in fee.

Note: The following land classification and long-term boundary designations are subject to Commission approval.

Nisqually-Mashel State Park Site Land Classification and Long-Term Boundary

In order to maintain the park experience as a natural setting, which balances increasing demands for outdoor recreation and public river access with the protection of native plant and animal communities and cultural resources, the following land classifications are proposed (see **Figure 2**):

- Classify approximately 492 acres within the 3,487-acre long-term boundary as Recreation areas, allowing for medium- to high-intensity uses. The Recreation areas in the Nisqually-Mashel State Park Site will be primarily in the parts of the park that are closest to Highway 7 and outside of known critical areas.
- Classify an approximately 321-acre area encompassing the steep slopes on both sides of the Mashel River as a Natural Forest area, allowing low-intensity uses. The area meets the criteria for designation by the Washington Natural Heritage Program and is proposed because the area includes some of the oldest forest in the park. Such old forest is a priority for conservation efforts through the Washington Natural Heritage Program.
- Classify approximately 284 acres as Natural areas, which allow for low-intensity uses. They include most of the remaining steep slopes along the Nisqually and Mashel rivers as well as known wetland areas near Highway 7. The objective of the Natural land classification is to maintain ecological integrity in sensitive natural areas while allowing appropriate public access.
- Classify a 0.56-acre area in the Mashel Prairie as a Heritage area. The area, which includes the Indian Henry cemetery, is not currently owned by State Parks. The Heritage designation is proposed to appropriately protect and preserve this cultural resource. The Heritage classification allows for prescriptions and design guidelines consistent with protecting the cultural landscape. Additional Heritage designations may be pursued as evidence is obtained from on-site cultural resource surveys – required prior to any park development.
- Classify the remainder of land within the proposed long-term boundary, approximately 2,389 acres, as a Resource Recreation area, which allows for low- to medium-intensity uses.

The long-term boundary includes the existing 1,230-acre state park site, as well as undeveloped and select developed lands adjacent to the boundary. The proposed long-term boundary is bounded in the west by Kjelstad Road East and the western margin of the Ohop Creek Valley. The eastern boundary is 300 feet east of State Route 7 (SR 7), and the northern boundary is 300 feet north of SR 7. In the south, the long-term boundary is a line running east-west from the southwest corner of the current southernmost State Park property line, with a 600-foot adjustment southward to encompass an existing logging road. The Long-term boundary properties provide a variety of potential park benefits, including natural resource protection, open space preservation, viewshed protection, staff housing, and expanded recreation development. Specific areas of interest/concern include:

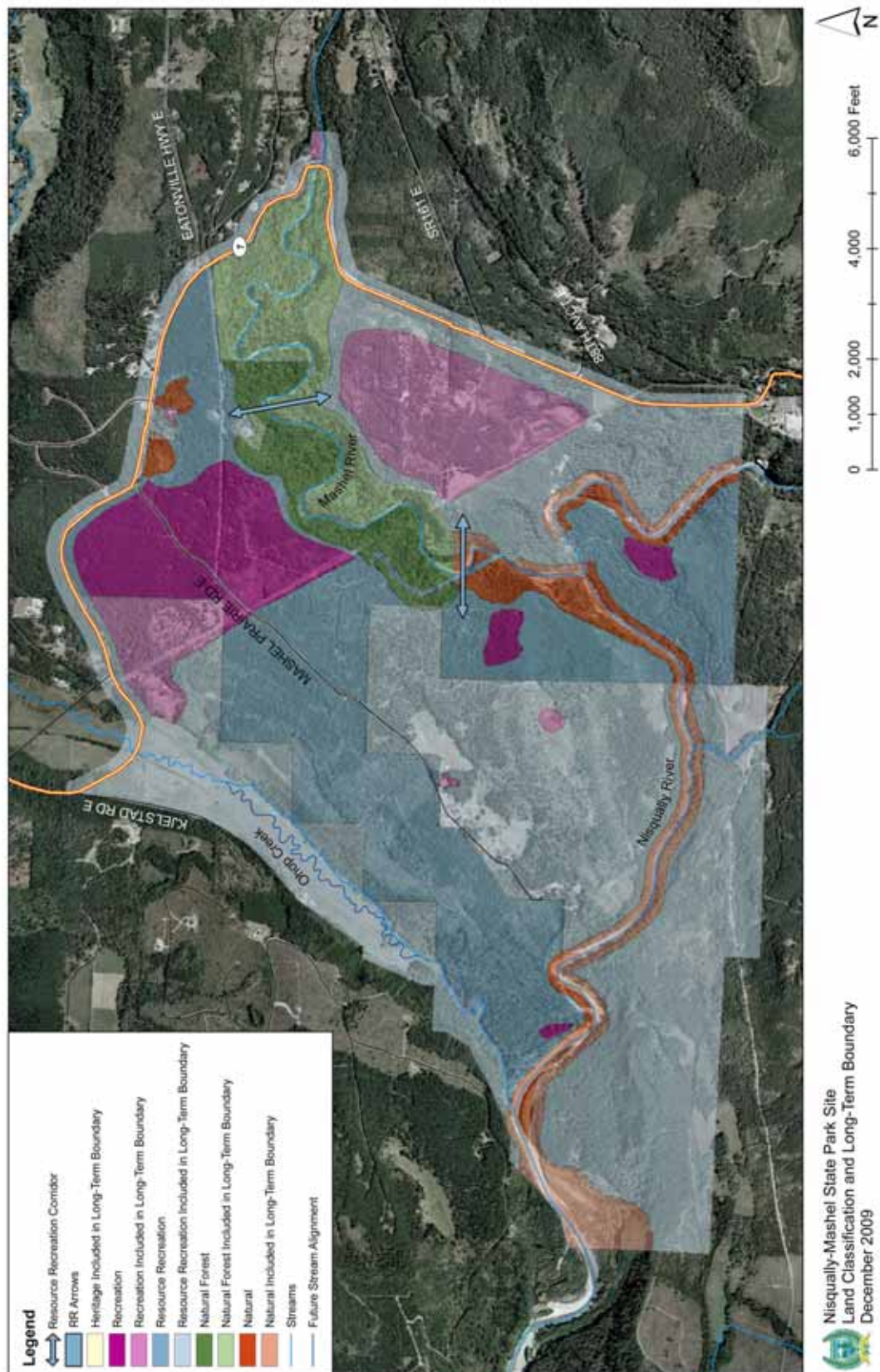
- Acquisition of the large inholding owned by the Manke Timber Company. This parcel is necessary for access and connectivity between the parcels that State parks currently owns,

and also for the development of the People's Center and its supporting facilities. The People's Center is the focus of cultural interpretation in the park's master plan.

- Acquisition of the privately-owned parcels along Mashel Prairie Road. Acquisition of these parcels from willing sellers will ensure park security, as well as allow for restoration and interpretation of the culturally and naturally significant Mashel Prairie. It will also allow State Parks' Native American partners to develop a re-creation of a seasonal village site.
- Acquisition of conservation easements for the area 300 feet north of SR 7 to ensure a parkway feel while driving along SR7 past the park.
- Purchase, trade, or develop a cooperative agreement for the portion of the University of Washington Center for Sustainable Forestry at Pack Forest that is west of SR 7. This will allow for access to the culturally-significant Mashel River confluence, as well as providing developable land for group camping, horse camping, and a mountain bike challenge course. It also provides for trail connectivity between the State Park trail system and that in Pack Forest.
- Acquisition of the Weyerhaeuser land south of the Nisqually River between the current State Parks ownership and Ohop Creek. This parcel will allow for backcountry hiking and camping, and for a connection to a future Thurston County trail system.
- Acquisition of or management agreement for the parcels owned by the Nisqually Land Trust. The Land Trust has significant ownership along the Nisqually and the Mashel Rivers, and within the Ohop Valley.
- Management agreement with Tacoma Power to allow for trail access across their land south of the Nisqually River.

Error! Reference source not found. delineates the park long-term boundary where darker shaded colors indicate properties already in agency ownership and lighter shaded colors indicate properties not in agency ownership, but desirable for long-term boundary inclusion. The lighter and darker shaded areas together represent the long-term park boundary.

Figure 2: Land Classification and Long-Term Boundary



SECTION 5: PARK ISSUES AND MANAGEMENT APPROACHES

This section of the document outlines the principle natural, cultural, and recreation/facility resource issues identified by the public and staff during the CAMP process, and suggested management approaches to address them. As in any real world situation, some issues do not neatly fit into any one of these three categories, while others may span more than one. Some license has been taken for the sake of consistent presentation. Addressing these issues will in almost all cases involve park staff working with Regional Stewardship, Environmental, and Planning staff. Additional stakeholder involvement is anticipated. All management actions will be consistent with the laws and policies⁷ governing the agency, in addition to all federal, state, and local regulations. As the issues and their management approaches are addressed in the future, associated materials (e.g., inventories, plans, monitoring records) will be added as appendices to this document.

Readers should note that the issues presented below represent a significant staff workload and may also create very high expectations among agency staff and park stakeholders. Clearly, completing or even beginning all the suggested management approaches in the short-term is not realistic. This is a long-range planning document; therefore, the following issue responses should be seen as a "to do" list where items will be prioritized as staff and financial resources permit.

⁷ Specifically, for natural resources: Protecting Washington State Parks' Natural Resources – A Comprehensive Natural Resource Management Policy (Commission Agenda Item F-11, December 2004); and for cultural resources: Cultural Resources Management Policy (Commission Agenda Item E-1, October 1998 + three amendments).

Natural Resource Issues

Nisqually-Mashel State Park Site Natural Resource Issues	
Issue	Management Approach
Protection of natural plant and animal communities	As per the Commission's Natural Resource Management Policy (73-04-1), emphasize management to conserve existing natural plant and animal communities and undeveloped open space. Specific recommendations include: • Implement the management recommendations found in the Nisqually-Mashel State Park Forest Health Plan (Ettle and Emmons, 2008). • Develop staff, volunteer, and outdoor learning opportunities to further develop inventories and observation records of natural plant and animal populations. Use the inventories as a baseline for developing adaptive management indicators for each resource. • Establish a volunteer coordination program to monitor and control invasive species. • Before development, conduct thorough plant inventories to verify the absence of sensitive and rare plant species in areas planned for development, and to inventory for invasive species. Remove the invasives as part of the development. • Prevent unnecessary fragmentation of riparian corridors, floodplains, and contiguous upland habitat blocks.
Protection of wetlands	• Work with interested agencies and stakeholder groups to delineate and assess all wetlands within the long-term boundary. • Work with wetland specialists and interested outdoor learning groups to develop reproducible monitoring protocols and adaptive management indicators⁸ to assess wetland function and integrity over time. • As per the Commission's Natural Resource Management Policy (73-03-1), "new park facility developments shall not be built in critical areas except where the theme, character, quality or other park planning provides overriding justification for development in such areas, and appropriate mitigation can be provided".

⁸ For a description of adaptive management, please see the park's Stewardship Plan.

Nisqually-Mashel State Park Site Natural Resource Issues	
Issue	Management Approach
Riparian area management—Ohop Creek, Mashel River, Nisqually River	• Manage river access by allowing motorized road access only for staff, people with disabilities, or approved special events. • Manage river access by crossing streams on high bridges that span the top of the river valleys, where feasible and where indicated in the park's master plan. • Ensure that activities planned for the riparian areas are consistent with local salmon and steelhead recovery plans. • Control public access to the shorelines during Chinook salmon and steelhead spawning seasons. • Evaluate and implement an erosion control measure at the road wash-out near the Mashel River bridge. • When improvements are planned for the Mashel River bridge, evaluate the bridge's impact on the river's channel migration zone and on fish habitat, and mitigate to the extent possible. If mitigation will not prevent significant natural resource damage, consider removing the bridge. • Leave tree fall material where it falls in the river and creek valleys, except where it crosses approved trails or poses a visitor safety hazard.

Nisqually-Mashel State Park Site Natural Resource Issues	
Issue	Management Approach
Green and sustainable development	In August of 2007, the Commission directed staff to develop a plan to make the agency a leader in the country for sustainability and being green. In June of 2008, the Commission adopted the following Sustainability and “Being Green” Policy, and a Sustainability Plan was adopted in December 2009: <i>“It is the policy of the Washington State Parks and Recreation Commission that the ethic of sustainability and the practice and actions of “being green” be integrated into every aspect of agency operation so that Washington State Parks will be the sustainability leader among state parks nationwide.”</i> Specific recommendations for the Nisqually-Mashel State Park site are in the master plan’s Design Guidelines. They include: • Apply Low Impact Development strategies for managing stormwater in relation to site, infrastructure, and building facilities. • Design all new buildings to perform equivalent to a LEED silver compliant structure. • Incorporate passive approaches to heating, cooling, ventilation, and lighting. • Capture rainwater runoff from roofs to eliminate use of potable water for irrigation. • Provide recycling and composting facilities, but implement a “pack it out” policy for other solid waste.
Protection of scenic resources	• Plant or retain screening vegetation to limit views of developed areas from park roads and trails, except where needed for orientation. • Trees may be removed and native grasses and low shrubs or herbaceous species planted in areas near roads, trails, and overlooks where views of natural or cultural features should be retained. Specific views to retain include: - o Views to Mount Rainier or other landscape features from the camping area meadows and the Village Center - o Views from trail overlooks to the Cascades, Mount Rainier, and the river valleys - o Views from the Observatory

Cultural Resources Issues

Nisqually-Mashel State Park Site Cultural Resource Issues	
Issue	Management Approach
Protection of cultural sites	• State Parks will continue to consult with interested Native American tribes to ensure archaeological resources are accurately identified and recorded, as well as adequately protected. • In all future actions, State Parks will comply with direction from the Commission's Cultural Resources Policy 12-98-1. • Prepare a detailed cultural resource protection plan. Cultural resource management planning outcomes will provide long-term protection of cultural resources, including the establishment of monitoring and reporting protocols. • Complete site-specific cultural resource surveys before development for the areas that will be disturbed.
Education and interpretation of cultural sites	• In coordination with the Nisqually and other interested Native American tribes, determine which cultural sites are appropriate for interpretation. Implement the park's Interpretive Plan, which includes: • Developing the People's Center, an interpretive center focused on telling the park's Native American cultural story • Using Lushootseed language on signs and interpretive panels throughout the park • Telling the story of the Mashel Massacre • Telling the story of the park's role in the reconciliation of the native and non-native peoples and the rejuvenation of the land and its people An area south of the Nisqually River is classified as a Recreation Area to allow for the development of the Traditional Knowledge Camp, which is envisioned as a place for tribal elders to pass on knowledge and skills to younger generations of tribal members. The Recreation Area shown on the classification map is conceptual. The exact location will be determined at a later time, based on site suitability analysis and a completed partnership agreement with the Nisqually Tribe and other interested tribal partners.

Nisqually-Mashel State Park Site Cultural Resource Issues	
Issue	Management Approach
Management of historic structures	• As additional property with historic structures is acquired, such as the Old Milk Barn, prepare Historic Structures Reports to make recommendations for rehabilitation and reuse prior to any modification of the structures. • All rehabilitation of historic structures will adhere to the Secretary of the Interior's Standards for the Treatment of Historic Properties.

Recreational Resource and Facility Issues

Nisqually-Mashel State Park Site Recreational Resource and Facility Issues	
Issue	Management Approach
Boundary management and trespass	Design the park's road and trail system consistent with the Transportation and Circulation Plan, to maintain access to private inholdings while discouraging trespass into them.
Connections to the region	Seek partnerships with park neighbors to enhance recreational and educational activities. Partnerships may include: • Partnership with the Nisqually Tribe and other interested tribes to acquire, develop, and manage the park, and to interpret the story of the land and its people • Trail connections to the Town of Eatonville • Trail connections and a forest management partnership with the University of Washington Center for Sustainable Forestry at Pack Forest • Local area transit to the State Park, Mount Rainier National Park, Northwest Trek, and other local attractions • Trail maintenance and education by the Backcountry Horsemen of Washington, the Evergreen Mountain Bike Alliance, or other user groups • Educational partnership with the Pioneer Farm Museum • Partnership with the Tahoma Audubon to determine placement, design, and construction of bird viewing blinds in appropriate places off the park's trail system
Traffic management	Implement the park's Transportation and Circulation Plan and the recommendations of the Traffic Study (Tilghman, 2009). Specific recommendations include: • Relocate the park entry drive to a location east of Mashel Prairie Road • Monitor traffic volumes and consider a right turn pocket or taper at the new park entrance • When a trail connection to Eatonville is developed, design a pedestrian crossing of SR 7 southeast of the intersection with Eatonville Highway East.
Law enforcement	• Coordinate Park Ranger staffing on site with park development to minimize the risk of crime and vandalism of the new park facilities. • Lock gates to the day-use areas of the park at dusk.
Public safety	• In coordination with local fire districts, develop an emergency fire plan for the park. • Develop a lahar early warning and evacuation plan for the park • Adhere to the draft WSPRC Tree Risk Management Policy to identify, prioritize, and remove high-risk trees. • Include river safety information on informational kiosks near river access points.

Nisqually-Mashel State Park Site Recreational Resource and Facility Issues	
Issue	Management Approach
Park fees	Park user fees are set by the Washington State Parks and Recreation Commission and cannot be modified on a park-by-park basis. Fees are expected to be charged to offset special services in the park, such as camping.
Volunteers	The following strategies should be explored by staff to develop and enhance outreach and volunteer networks: • Develop and coordinate opportunities for community outreach, including facilitating regular open house forums and community events. • Develop and maintain a visible volunteer outreach campaign with a focus on the recruitment of community-based volunteers. • Identify needs and opportunities for outreach and volunteer activities and programs, and review on an annual basis. • Develop annual landscaping and maintenance work plans to identify a range of projects and service needs suitable for volunteers of varying ability. • Establish and maintain community-based invasive species removal programs for the park.
Staff housing	In order to recruit and retain high-quality staff, the agency should develop 3-5 staff housing units. Preference should be given to purchasing suitable existing homes within the long-term boundary, versus building new homes, and preference should be given to homes near the periphery of the long-term boundary, versus in the center of the park, but flexibility should be maintained on both counts in case the preferred conditions do not align in time with the housing need. Three potential staff housing locations are designated as Recreation Areas within the long-term boundary of the park. One is at the northeast corner of the long-term boundary, one is near SR 7, east of the Mashel Prairie Road intersection, and one is on Mashel Prairie Road, near the center of the long-term boundary. These three locations are conceptual only at this time; the final locations of these sites will be determined later, based on the availability of suitable housing sites.
Park enterprise	• Forge alliances with partners and concessionaires that will facilitate the park development process, establish a progressive operational capacity, and create revenue centers. • Enterprise activities should support the park's primary missions of recreation and resource protection • Provide visitor services through public/private partnerships and other entrepreneurial programs that are clearly compatible with other park management objectives.

Nisqually-Mashel State Park Site Recreational Resource and Facility Issues	
Issue	Management Approach
Trails	Implement the park's Transportation and Circulation Plan, which includes: • Paved, multi-use pedestrian and bicycle trails • Unpaved hiking trails • Equestrian trails that sometimes parallel the multi-use trails • Mountain bike trails and challenge course • Trail connections to Eatonville, UW's Pack Forest, and Thurston and Pierce County trail systems
Dogs	Allow leashed pets on developed trails.
Barrier-free access	• Strive for universal access to park facilities. • Implement the park's Transportation and Circulation Plan, which calls for the park's primary trail systems to be barrier-free.
Development of day-use facilities	Implement the park's Land-Use Plan, which includes: • A Village Center, with a park office and store, and a gathering space for events and program activities • A stormwater-fed fishing pond • Picnic shelters and uncovered picnic tables • A woodland-themed playground • An interpretive center, called the People's Center, and an associated "observatory" at the highest point in the park. The locations of these facilities are all classified as Recreation Areas. In addition, a site near the confluence of the Nisqually River with Ohop Creek is also classified as a Recreation Area to allow for an enhanced trailhead, potentially including a flush toilet and a picnic shelter.
Sports and active recreation	Develop playgrounds and open play spaces in the Village Center and in the campground loops.
Rafting	• Provide river access for rafts, kayaks, and canoes at the Mashel confluence and near the Ohop Creek confluence with the Nisqually River. • Limit vehicular access to both locations to people with disabilities and approved groups or special events. • Work with downstream land managers to determine appropriate egress sites, and educate river users about these sites.

Nisqually-Mashel State Park Site Recreational Resource and Facility Issues	
Issue	Management Approach
Access to the south side of the Nisqually River	Implement the park's Transportation and Circulation Plan, which includes: • Rebuilding a bridge across the Nisqually River near the Mashel confluence • Building a high bridge across the Nisqually River near the Ohop Creek confluence • Developing a management agreement with Tacoma Power to allow trail use across their property south of the Nisqually • Developing hiking trails and backcountry campsites south of the Nisqually River
Special events	• Implement the park's Land Use Plan, which calls for an amphitheater for gatherings and special events in the Village Center. • Encourage educational, interpretive, or recreational special events to the extent that they do not adversely affect the park's natural or cultural resources.
Development of equestrian facilities	Implement the park's Land Use Plan, which includes: • An equestrian center in the Old Milk Barn. This facility would be run by a concessionaire, and would provide horses for use by beginning equestrians and other people who do not own a horse. • A horse camping area on the East Mashel Plateau. • Horse trailer parking near equestrian trailheads.
Development of overnight facilities	Implement the park's Land Use Plan, which includes up to 500 campsites, including: • Three camp loops near the Village Center, which include loops for recreational vehicle camping, tent camping, and cabins • Two camp loops on the East Mashel Plateau, which include group camping and horse camping • Backcountry campsites south of the Nisqually River
Interpretation and education	Implement the park's Interpretive Plan, which includes interpretation on three main themes: • A Culture theme that focuses on the Native American life-ways related to this site • A Conservation theme that focuses on the historic and current uses of the land and the desired outcomes of current management practices • A Renewal theme that focuses on the emotional and experiential facets of the park

APPENDIX A: WASHINGTON STATE PARKS LAND CLASSIFICATION SYSTEM

WAC 352-16-020 Land classification system. State park areas are of statewide natural, cultural, and/or recreational significance and/or outstanding scenic beauty. They provide varied facilities serving low-intensity, medium intensity, and high intensity outdoor recreation activities, areas reserved for preservation, scientific research, education, public assembly, and/or environmental interpretation, and support facilities. They may be classified in whole or part as follows:

- (1) Recreational areas are suited and/or developed for high-intensity outdoor recreational use, conference, cultural and/or educational centers, or other uses serving large numbers of people.
- (2) Resource recreation areas are suited and/or developed for natural and/or cultural resource-based medium-intensity and low-intensity outdoor recreational use.
- (3) Natural areas are designated for preservation, restoration, and interpretation of natural processes and/or features of significant ecological, geological or paleontological value while providing for low-intensity outdoor recreation activities as subordinate uses.
- (4) Heritage areas are designated for preservation, restoration, and interpretation of unique or unusual archaeological, historical, scientific, and/or cultural features, and traditional cultural properties, which are of statewide or national significance.
- (5) Natural forest areas are designated for preservation, restoration, and interpretation of natural forest processes while providing for low-intensity outdoor recreation activities as subordinate uses, and which contain:
 - (a) Old-growth forest communities that have developed for one hundred fifty years or longer and have the following structural characteristics: Large old-growth trees, large snags, large logs on land, and large logs in streams; or
 - (b) Mature forest communities that have developed for ninety years or longer; or
 - (c) Unusual forest communities and/or interrelated vegetative communities of significant ecological value.
- (6) Natural area preserves are designated for preservation of rare or vanishing flora, fauna, geological, natural historical or similar features of scientific or educational value and which are registered and committed as a natural area preserve through a cooperative agreement with an appropriate natural resource agency pursuant to chapter 79.70 RCW and chapter 332-60 WAC.

WAC 352-16-030 Management within land classifications. (1) The director shall develop management guidelines for each land classification listed in WAC 352-16-020. The guidelines shall provide specific direction for each classification, outlining the philosophy of each classification, its appropriate physical features, location, allowed and prohibited activities, and allowed and prohibited developments. (2) Nothing in this section shall be construed to allow uses that are otherwise prohibited, nor prohibit uses that are otherwise expressly allowed, by the commission, this code, or by statute.

Land Classification Management Guidelines Recreation Areas

TITLE	DEFINITION	PHILOSOPHY	PHYSICAL FEATURES	LOCATION	ACTIVITIES	DEVELOPMENTS
Washington State Parks Recreation Areas	<u>State Parks Recreation Areas</u> are suited and/or developed for high-intensity outdoor recreational use, conference, cultural and/or educational centers, or other uses serving large numbers of people.	<u>State Parks Recreation Areas</u> are to respond to the human needs for readily available areas for outdoor recreation and facilities to congregate for education, artistic expression and other ennobling pursuits. They are to provide a variety of outdoor recreational, educational, artistic, and cultural opportunities to large numbers of participants. Primary emphasis is on the provision of quality recreational services and facilities with secondary recognition given to protection of the areas natural qualities.	<u>State Parks Recreation Areas</u> physiographic features such as topography, soil type, drainage, etc., shall be adaptable to varied types of intensive uses and development. An attractive natural setting is desirable, however, human-made settings are acceptable. There are no specific size criteria.	<u>State Parks Recreation Areas</u> generally are made, not found. They shall be located throughout the state with primary emphasis to service major centers of urban populations and/or outstanding recreational tourist attractions. Scenic and inspirational values shall be considered but are secondary to the site adaptability and population criteria. When part of a large diverse park, recreation areas should be sited in proximity to public roads and utilities.	<u>State Parks Recreation Areas</u> may allow and provide for a wide variety of indoor and outdoor day, weekend and vacation activities. Provision may be made for high intensity participation in camping, picnicking, trail use, water sports, winter sports, group field games, and other activities for many people Off-trail equestrian and/or bicycle use may be appropriate in selected areas if approved by the commission. Activities requiring high levels of social interaction are encouraged.	<u>State Parks Recreation Areas</u> shall provide appropriate facilities and services for the participation and enjoyment of high concentrations of outdoor recreationists and/or participants in indoor educational, cultural and artistic activities. A high degree of development is anticipated. Facilities may include road and parking networks, swimming beaches, full service marinas, trails, bathhouses, artificial lakes and pools, play fields, large sanitary and eating facilities; standard and utility campgrounds, stores, picnic grounds, group shelters, conference centers, environmental learning centers, hostels, and administrative support facilities.

Land Classification Management Guidelines

Resource Recreation Areas

TITLE	DEFINITION	PHILOSOPHY	PHYSICAL FEATURES	LOCATION	ACTIVITIES	DEVELOPMENTS
Washington State Parks Resource Recreation Areas	<u>State Parks Resource Recreation Areas</u> are suited and/or developed for natural and/or cultural resource-based medium- and low-intensity recreational use.	<u>State Parks Resource Recreation Areas</u> are sites where the high quality of a particular natural or cultural resource or set of such resources is the lure for human recreation. Thus, the rationale for recreation is based on the value of attractive natural or cultural resources. Management of these areas must stress the centrality of preserving the quality of the natural and cultural resources while allowing appropriate and sustainable levels of human use and enjoyment.	<u>State Parks Resource Recreation Areas</u> have a variety of physiographic features. While they may contain areas of environmental sensitivity, most portions of each area will be able to withstand low- to medium-intensity recreation use without significant environmental degradation.	<u>State Parks Resource Recreation Areas</u> may be located anywhere in the state where natural or cultural factors produce land and water sites particularly suited for recreation in a natural setting. Access to these sites should be reasonably proximate to major urban centers, but some access restriction may be necessary to avoid overuse of resources. Within large diverse parks, these areas should be located at least a moderate distance from public roads and high use intensity areas, while still maintaining reasonable public access for their intended use.	<u>State Parks Resource Recreation Areas</u> provide opportunities for low- and medium-intensity recreational experiences including, but not limited to, picnicking, primitive camping, a variety of recreational trail experiences, interpretive facilities, historic/cultural exhibits, nature observation, photography, orienteering, kayaking, canoeing, floating, and fishing. Off-trail equestrian and/or bicycle use may be appropriate in selected areas if approved by the commission. Basketball, tennis, organized group sporting activities requiring formal sports fields, commercial-sized piers and docks, standard and utility camping, indoor accommodations and centers, developed swimming areas, and other similarly intense uses are not appropriate. Scientific research is permitted.	<u>State Parks Resource Recreation Areas</u> development shall be permitted to the extent necessary to serve allowed activities. Parking, sanitary facilities, and other ancillary developments and support facilities should be constructed in a manner that is consistent with the site's ability to manage environmental change.

Land Classification Management Guidelines Natural Areas

TITLE	DEFINITION	PHILOSOPHY	PHYSICAL FEATURES	LOCATION	ACTIVITIES	DEVELOPMENTS
Washington State Parks Natural Areas	<u>State Parks Natural Areas</u> are designated for preservation, restoration, and interpretation of natural processes and/or features of significant ecological, geological or paleontological value while providing for low-intensity outdoor recreation activities as subordinate uses.	<u>State Parks Natural Areas</u> are to respond to the human need for readily available "conservatories" of nature and open spaces. Emphasis is directed toward nature and the conservation of native flora and fauna, special geologic or paleontologic resources, and the natural amenities of the area. Human wants for other than naturally existing educational and recreational opportunities are considered secondary to nature's requirement for the sustained maintenance of its natural balances, or the preservation of special geologic or paleontologic features.	<u>State Parks Natural Areas</u> have a variety of topography and features to provide a diversified natural environment with interesting but not necessarily unique flora and fauna, or geologic or paleontologic features. Where classification is based on biological considerations, sites should consist of land areas large enough to maintain natural biological processes in a nearly undeveloped state and provide users with a feeling of solitude and tranquility, and an opportunity to view nature in its "uncontrolled" form. They may be partially or wholly on land, subterranean, or part of the marine environment.	<u>State Parks Natural Areas</u> are not "made", but rather currently exist due to historical circumstances that have resulted in little or no human interference in the natural environment. Those areas most desirable in terms of physical features and size usually are "found" and "held" against creeping encroachments and raising land values. They often become over used and "lost" as populations spread around them. As a part of the overall system, these areas should be geographically spread throughout the state. When classifying specific park areas, consideration must be given to the ability to adequately manage the areas against undesirable human encroachment.	<u>State Parks Natural Areas</u> provide opportunities for outdoor recreation on designated trails. Those trails may be developed and used only to the extent that they do not significantly degrade the system of natural processes in a classified area. Hiking, non-groomed cross-country skiing, snowshoeing, or other trail uses of similar impact to natural systems and providing a compatible recreational opportunity, may be permitted, after consultation with appropriate local, state, federal and tribal resource management agencies, and upon a finding by the agency that such trails are not likely to significantly degrade natural processes. Relocation of existing equestrian, bicycle, nordic track or other similar trails into a natural area may be permitted upon a finding by the director that such relocation is for the purpose of reducing overall resource impacts. All trails may be moved, redesigned, closed and/or removed upon a finding that their use is causing significant degradation to the system of natural processes. Technical rock climbing requires authorization by the commission. Off-trail use for nature observation, photography, cross-country skiing, harvesting of mushrooms and berries and similar uses are permitted to the degree that they do not significantly degrade natural processes. Scientific research is permitted.	<u>State Parks Natural Area</u> development shall be limited to facilities required for health, safety and protection of users and features consistent with allowed activities. Facilities to enhance public enjoyment shall be limited to primitive items such as trails, trail structures and minor interpretive exhibits. All improvements shall harmonize with, and not detract from, the natural setting. Parking and other trailhead facilities should be located outside of a classified area.

Land Classification Management Guidelines Heritage Areas

TITLE	DEFINITION	PHILOSOPHY	PHYSICAL FEATURES	LOCATION	ACTIVITIES	DEVELOPMENTS
Washington State Parks Heritage Areas	<u>State Parks Heritage Areas</u> are designated for preservation, restoration, and interpretation of outstanding, unique or unusual archaeological, historical, scientific, and/or cultural features, and traditional cultural properties, which are of statewide or national significance.	<u>State Parks Heritage Areas</u> are designated to preserve and/or interpret selected areas or features for the education and enjoyment of the public, an area's intrinsic cultural value, and/or for scientific research.	<u>State Parks Heritage Areas</u> vary in size and physiographic makeup according to their location and reason for existence. Historic landscapes may require relatively large acreage while archaeological sites may be measured in square feet.	<u>State Parks Heritage Areas</u> usually are located where they are found or the feature exists. However, in some instances relocation or re-creation of artifacts, resources or facilities is possible. In these situations they may be located in appropriate settings and concentrated near major population centers and along primary travel routes.	<u>State Parks Heritage Area</u> activities shall generally be limited to those directly associated with the interpretation of the area or feature, and the education of the patrons. Picnicking, recreational trails, and other low- to medium-intensity recreation uses may be allowed if they do not detract from the principal purpose of the area, its setting, structures, sites and objects.	<u>State Parks Heritage Area</u> development shall generally be limited to that necessary for the protection and interpretation of the area or feature, and the education and safety of the patrons. Sanitary facilities, recreation trails, and picnicking facilities may be provided in a manner which does not detract from the aesthetic, educational or environmental quality of the area, its setting, structures, sites or objects, or, if applicable, its value for scientific research.

Land Classification Management Guidelines

Natural Forest Areas

TITLE	DEFINITION	PHILOSOPHY	PHYSICAL FEATURES	LOCATION	ACTIVITIES	DEVELOPMENTS
Washington State Parks Natural Forest Areas	<u>State Parks Natural Forest Areas</u> are designated for preservation, restoration, and interpretation of natural forest processes while providing for low-intensity outdoor recreation activities as subordinate uses, and which contain: (a) Old-growth forest communities that have developed for 150 years or longer and have the following structural characteristics: Large old-growth trees, large snags, large logs on land, and large logs in streams; or (b) Mature forest communities that have developed for 90 years or longer; or ☐ Unusual forest communities and/or interrelated vegetative communities of significant ecological value.	<u>State Parks Natural Forest Areas</u> are places where human access to and interpretation and enjoyment of natural forest processes are limited to those activities and facilities that do not significantly degrade natural forest processes. Public access into these areas emphasizes appreciation of nature through experiencing nature. The principal function of these areas is to assist in maintaining the state's bio-diversity while expanding human understanding and appreciation of natural values.	<u>State Parks Natural Forest Areas</u> have a variety of topographic and vegetative conditions. They are generally large enough (300 or more acres) to contain one or more distinct and relatively intact vegetative communities. Smaller areas may be appropriate if representative of a unique or unusual forest community. Desirably, they are part of a large system of open space, wildlife habitat, and vegetative communities that provide a good opportunity for long-term ecosystem sustainability.	<u>State Parks Natural Forest Areas</u> may be located anywhere in the state where natural factors produce forest vegetative cover. These areas are not "made", but rather currently exist due to historical circumstances that have resulted in little or no human interference in natural forest progression. As a part of an overall system, these areas should be geographically spread throughout the state, recognizing that maintenance of bio-diversity is one of the primary functions of their classification. When classifying specific park areas, consideration must be given to the ability to adequately manage the areas against undesirable human encroachment.	<u>State Parks Natural Forest Areas</u> provide opportunities for outdoor recreation on designated recreation trails. Those trails may be developed and used only to the extent that they do not significantly degrade the system of natural forest processes in a classified area. Careful design of recreation trails should match intended uses, to maintain consistency with the purpose and philosophy of the classification. Hiking, non-groomed cross-country skiing, snowshoeing, or other trail uses of similar impact to natural systems and providing a compatible recreational opportunity, may be permitted, after consultation with appropriate local, state, federal and tribal resource management agencies, and upon a finding by the agency that such trails are not likely to significantly degrade natural forest processes. Relocation of existing equestrian, bicycle, nordic track or other similar trails into a natural forest area may be permitted upon a finding by the director that such relocation is for the purpose of reducing overall resource impacts. All trails may be moved, redesigned, closed and/or removed upon a finding that they are causing significant degradation to the system of natural forest processes. Technical rock climbing requires authorization by the commission. Off-trail use for nature observation, cross-country skiing, photography, harvesting of mushrooms and berries and similar uses are permitted to the degree that they do not significantly degrade natural forest processes. Scientific research is permitted.	<u>State Parks Natural Forest Areas</u> development shall be limited to facilities required for health, safety and protection of users and features consistent with allowed activities. Facilities to enhance public enjoyment shall be limited to trails, trail structures, and minor interpretive exhibits. All improvements shall harmonize with, and not detract from, the natural setting. Parking and other trailhead facilities should be located outside of a classified area.

Land Classification Management Guidelines Natural Area Preserves

TITLE	DEFINITION	PHILOSOPHY	PHYSICAL FEATURES	LOCATION	ACTIVITIES	DEVELOPMENTS
Washington State Parks Natural Area Preserves	<u>State Parks Natural Area Preserves</u> are designated for preservation of rare or vanishing flora, fauna, geological, natural historical or similar features of scientific or educational value and which are registered and committed as a natural area preserve through a cooperative agreement with an appropriate natural resource agency pursuant to chapter 79.70 RCW and chapter 332-60 WAC.	<u>State Parks Natural Area Preserves</u> are sites where human access is limited to educational and scientific purposes. The principal function of these areas is to preserve natural ecosystems or geologic features of statewide significance. Public access for recreation must be subordinate to the principal function of the classification.	<u>State Parks Natural Area Preserves</u> have a variety of topographic and vegetative conditions. They are generally large enough (300 or more acres) to contain one or more distinct and intact ecological communities. Smaller areas may be appropriate if representative of a unique or unusual ecological community or geologic feature. They may be partially or wholly on land, subterranean, or part of the marine environment. Desirably, they are part of a large system of open space, wildlife habitat, and vegetative communities that provide a good opportunity for long-term ecosystem sustainability.	<u>State Parks Natural Area Preserves</u> may be located anywhere in the state where natural ecological systems or significant geologic features exist. These areas are not "made", but rather exist due to historical circumstances that have resulted in little or no human interference in the natural system. As a part of an overall system, these areas should be geographically spread throughout the state.	<u>State Parks Natural Area Preserves</u> provide opportunities for scientific research and education about natural systems, geologic features, sensitive, rare, threatened or endangered species or communities. Recreational use of existing or relocated trails may be permitted, provided that it can be clearly demonstrated that such use does not degrade the system of natural processes occurring in the preserve. Otherwise, trails are limited to administrative, scientific and organized educational activities and uses. No other activities are permitted.	<u>State Parks Natural Area Preserves</u> development shall be limited to access facilities for permitted activities and structures to inhibit general public access. No other facilities or structures are permitted.

Land Use and Land Classification Compatibility Matrix – Facilities

	Recreation	Resource Recreation	Heritage	Natural/Natural Forest Area	Natural Area Preserve*
Amphitheater	P	C	C	N	N
Archery/Target Range	C	C	N	N	N
Camping - Std and Util	P	N	N	N	N
Camping - Primitive	P	P	C	N	N
Camping - Adirondack	P	C	N	N	N
Camping - Horse-oriented	C	C	N	N	N
Camping - Water Trail	P	P	C	N	N
Children's Play Area	P	C	C	N	N
Day Use Picnic - Tables	P	P	C	N	N
Day Use Picnic - Group Shelter	P	N	C	N	N
Day Use Lodges/Centers	P	N	C	N	N
Environmental Learning Centers	C	N	C	N	N
Equestrian Facilities	C	C	C	N	N
Fields - Informal Play/Mowed	P	C	C	N	N
Indoor Accommodations	P	N	C	N	N
Interpretive - Centers	P	N	P	N	N
Interpretive - Kiosks	P	P	P	C	N
Interpretive Trail	P	P	P	P	C
Interpretive - Signs	P	P	P	P	C
Parking - Vehicles	P	P	C	N	N
Roads	P	P	C	N	N

Land Use and Land Classification Compatibility Matrix – Facilities (Continued)

	Recreation	Resource Recreation	Heritage	Natural/Natural Forest Area	Natural Area Preserve*
Sanitary: Comfort Stations	P	N	C	N	N
Sanitary: Composting/Vault	P	P	C	C	N
Sports Fields	C	N	N	N	N
Skiing - Alpine Facilities	C	C	N	N	N
Swimming Facilities	P	N	C	N	N
Trails - Hiking	P	P	P	P	C
Trails - Mountain Biking	P	C	C	N**	N
Trails - Equestrian	C	C	C	N**	N
Trails - Nordic Track Skiing	P	P	C	N**	N
Trails - C-C skiing	P	P	P	P	C
Trails - Snowmobile	P	C	C	N**	N
Trails - Paved non-motor	P	C	C	C	N
Water: Docks/Piers $\geq$ 10 boats	P	N	C	N	N
Water: Docks/Piers - < 10 boats	P	P	C	C	N
Water: Launch Ramps	P	C	N	N	N
Water: Hand Launch Areas	P	P	C	C	N
Water: Mooring Buoys	P	P	C	C	N

P (Permitted) - Use permitted with normal agency design review

C (Conditional) - Use may be permitted, but conditioned to assure design is compatible w/purpose of land classification and abutting classification objectives.

N (Not Permitted)- Use not permitted.

NA - Not Applicable

* All uses in a Natural Area Preserve must be specifically approved by the Park and Recreation Commission as part of a management plan.

**Relocation of existing trails into a natural or natural forest area is permitted per WAC 352-32-070(3) and WAC 352-32-075(2)(b).

Land Use and Land Classification Compatibility Matrix – Activities

	Recreation	Resource Recreation	Heritage	Natural/Natural Forest Area	Natural Area Preserve*
Farming/Orchards	C	C	C	N	N
Filming/Special Events	P	P	P	C	N
Grazing	C	C	C	N	N
Harvesting - Edible Fruiting Bodies	P	P	P	P	N
Harvesting - Mushrooms	P	P	P	P	N
Harvesting - Shellfish	P	P	P	P	N
Harvesting - Fish	P	P	P	P	N
Harvesting - Algae, etc.	P	P	P	P	N
Haying	P	P	P	N	N
Metal Detecting	P	P	C	N	N
Orienteering	P	P	C	N	N
Ocean Beach Driving	P	C	N	N	N
Off-Trail: Equestrian	C	C	C	N	N
Off-Trail: Hiking	P	P	P	P	N
Off-trail biking	C	C	C	N	N
Paragliding	P	P	C	N	N
Technical Rock Climbing	P	P	C	C	N

Land Use and Land Classification Compatibility Matrix – Activities (Continued)

	Recreation	Resource Recreation	Heritage	Natural/Natural Forest Area	Natural Area Preserve*
Water: Jet Skiing	P	C	N	N	N
Water: Kayak/Canoeing	P	P	P	C	N
Water: Power Boating	P	C	N	C	N
Water: White Water Boating	P	P	C	C	N
Water: Sailing	P	P	P	C	N
Water: Skiing	P	C	N	N	N
Water: Swimming	P	P	P	P	N
Water: Wind Surfing	P	C	C	N	N
Winter: Alpine Skiing	C	C	N	N	N
Winter: C-C Skiing (off-trail)	P	P	P	P	C
Winter: Mushing/Sled Dogs	C	C	C	N	N
Winter: Snowshoeing	P	P	P	P	C
Winter: Snowmobiling (off-trail)	P	P	C	N	N
Wood Debris Collection	P	P	P	N	N

P (Permitted) - Use permitted with normal agency design review

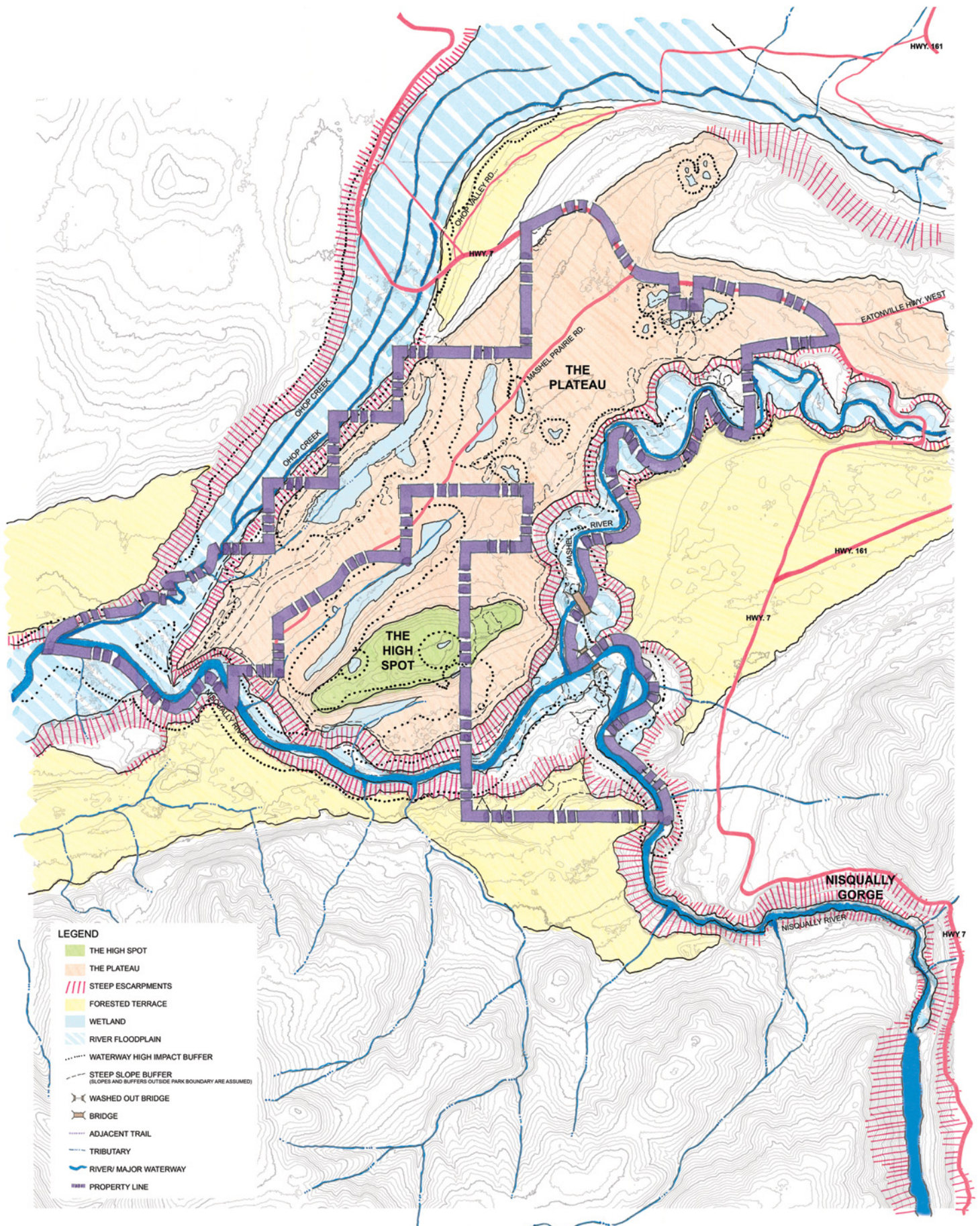
C (Conditional) - Use may be permitted with Commission concurrence, but conditioned to assure compatibility w/purpose of land classification and abutting classifications.

N (Not Permitted)- Use not permitted.

NA - Not Applicable

* All uses in a Natural Area Preserve must be specifically approved by the Park and Recreation Commission as part of a management plan.

** Relocation of existing trails into a natural or natural forest area is permitted per WAC 352-32-070(3) and WAC 352-32-075(2)(b).

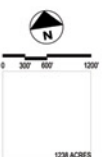


NATURAL RESOURCES SITE ANALYSIS MASTER PLAN FOR NISQUALLY MASHEL STATE PARK

Data derived from: Pierce County, Thurston County, Lewis County.

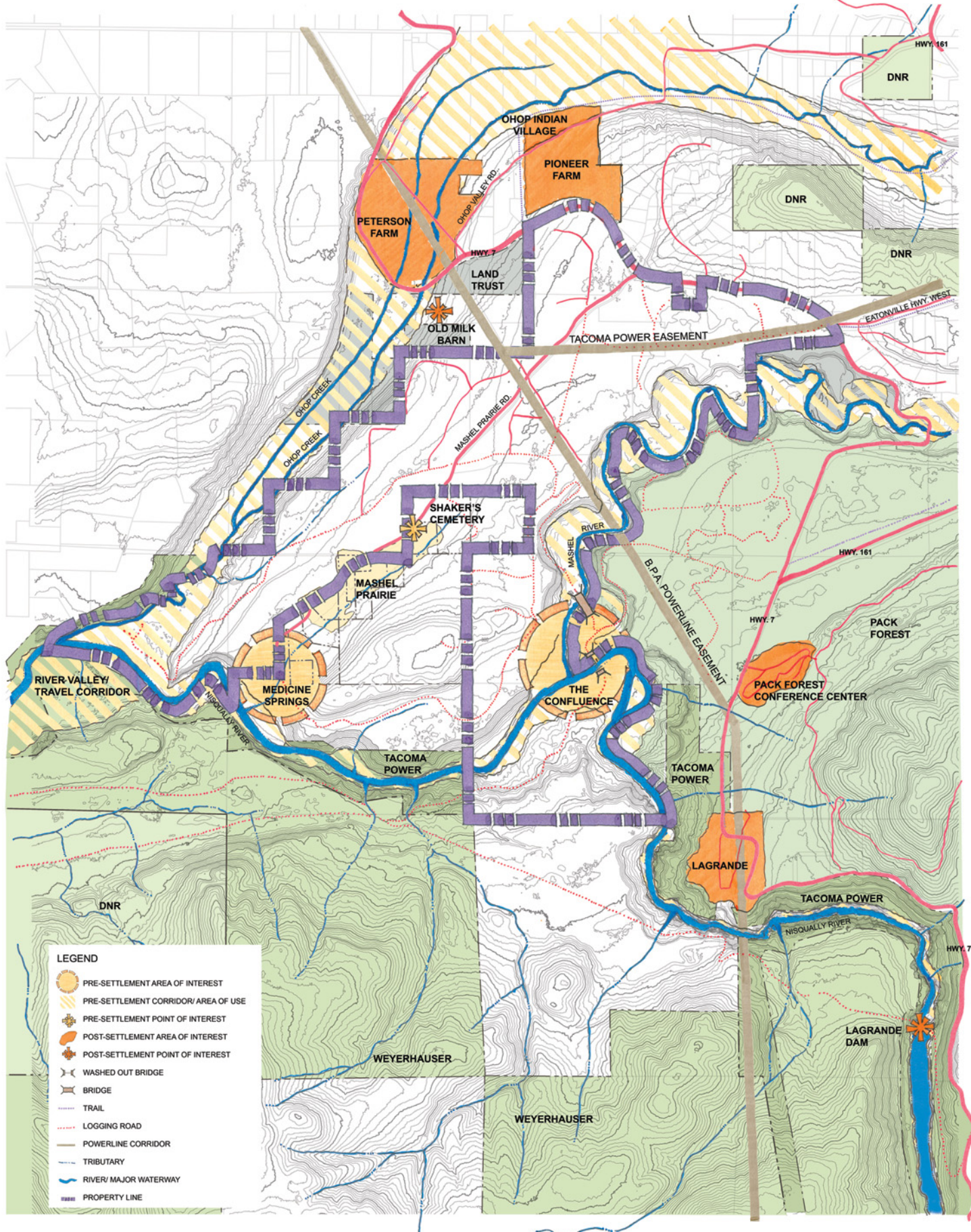
Critical Areas: Critical area boundaries and buffers depicted on this map are approximate. They have not been formally delineated or surveyed and are intended for planning purposes only. Additional site-specific evaluation may be needed to confirm survey information shown on this map.

Buffers: Pierce County Critical Area buffers are from Section 18E of Pierce County Code. Thurston County Critical Area buffers are from Chapter 17 of Thurston County Code.



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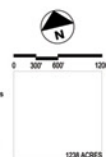
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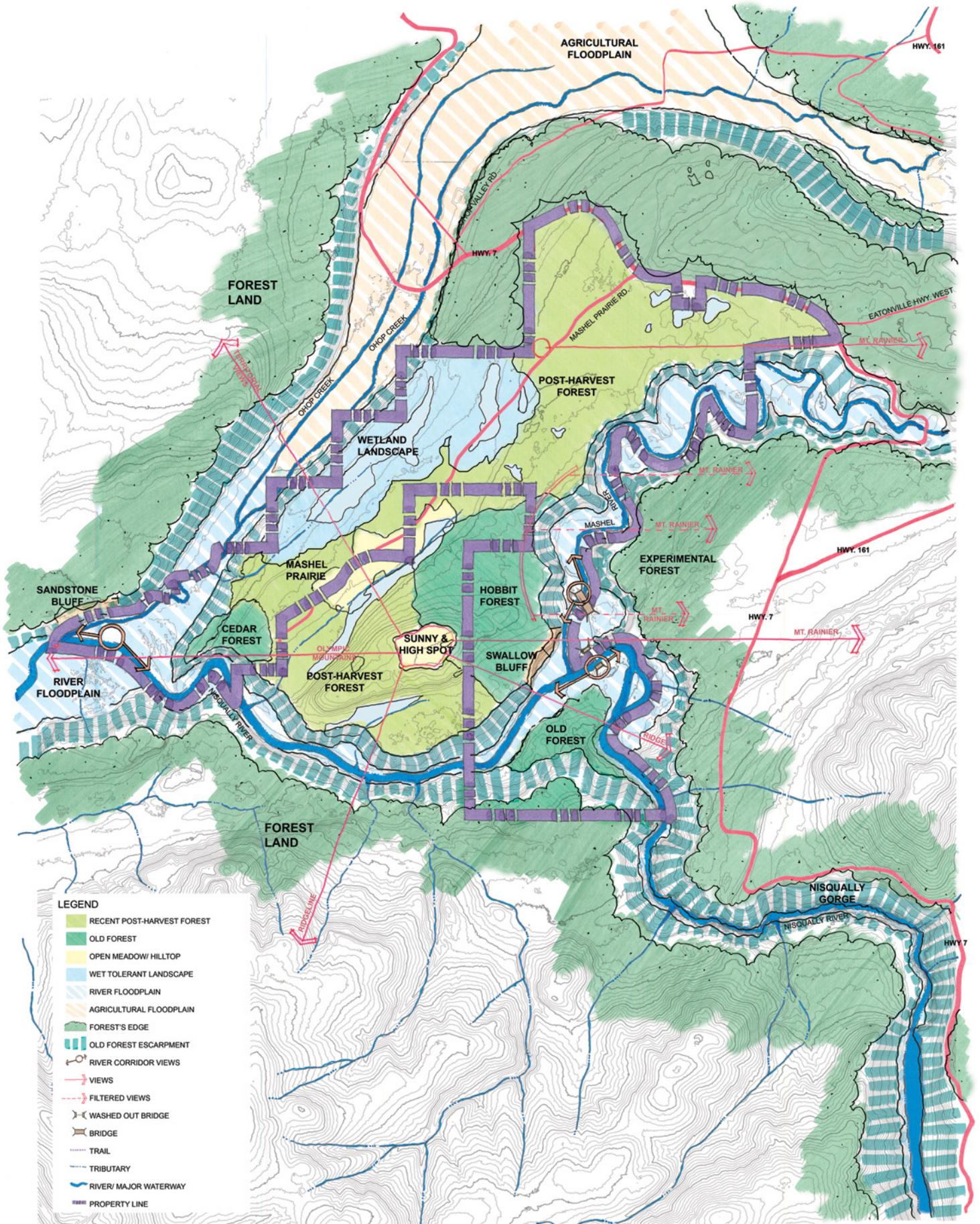


CULTURAL FEATURES SITE ANALYSIS MASTER PLAN FOR NISQUALLY MASHEL STATE PARK

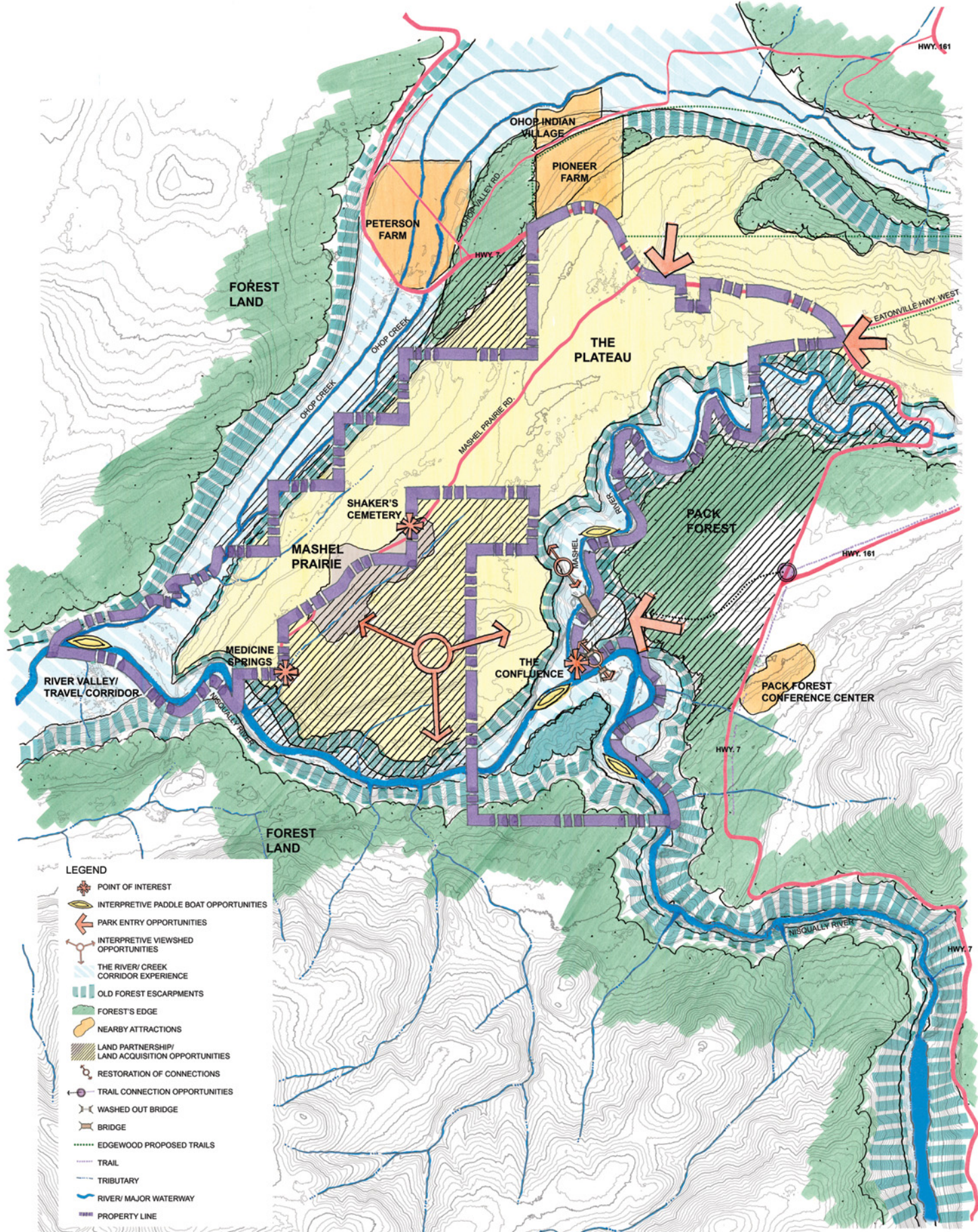
Data derived from: Pierce County, Thurston County, Lewis County, Nisqually Shaker State Park and Surrounding Land Ownership (June 2007), and Parks and Trails Underdeveloped Land (October 2007).

MARCH 2008





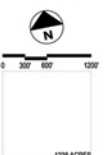
EXPERIENTIAL FEATURES SITE ANALYSIS MASTER PLAN FOR NISQUALLY MASHEL STATE PARK



OPPORTUNITIES AND CONSTRAINTS MAP- SITE ANALYSIS MASTER PLAN FOR NISQUALLY MASHEL STATE PARK

Data derived from: Pierce County, Thurston County, Lewis County, and Parks and Trails Underdeveloped Land (OF Eatonville, October 2007).

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Nisqually-Mashel State Park Master Plan and Phase I Design

Washington State Parks and Recreation Commission

Site Analysis Descriptions

March 21, 2008
The Portico Group
Audrey Stout

I. BASE MAPPING

A. Regional Map

The regional map of the Nisqually Mashel State Park provides an understanding of the site's location relative to regional railways, roads, trails, land uses, the Nisqually Tribe Reservation, and the park's position within the Nisqually River Watershed.

1. Transportation Connections
 - a. Railways connect Seattle/ Tacoma to nearby town of Eatonville and onto Ashford
 - b. Roads connect to Mt. Rainier National Park and to larger Western and Eastern Washington region
 - c. Park connects to regional trail systems via proposed Eatonville trails.
2. Nisqually River Watershed
 - a. Park located at geographic center along Nisqually River stretch
 - b. The Mountain due East of park
 - c. Puget Sound to the Northwest of Park
 - d. Watershed transects Pierce, Thurston, and Lewis counties.

B. Local Map

Neighbors to the Nisqually Mashel State Park include Eatonville, LaGrande, and Pack Forest including their proposed and existing trail systems, community gathering spaces, attractions, parks, sites of historical value or historic re-creation, and their associated land uses. The Park is also located along the topographic transition from steep foothills to the more gentle terrain of the Nisqually River watershed plateaus.

1. Neighboring Towns
 - a. Eatonville
 - b. LaGrande
 - c. Elbe
 - d. Ashford
1. Community Gathering Spaces
 - a. Weyerhauser Elementary School
 - b. Eatonville High School
 - c. Eatonville Middle School

2. Local Parks and Attractions
 - a. Philip Burdick Memorial
 - b. Northwest Trek Wildlife Park
 - c. Rimrock park
 - d. Anderson/ Mashel River park
 - e. George Smallwood Park
 - f. Ohop Corridor Witt Marshall Park
 - g. Alder Lake Park
3. Surrounding Land Ownership
 - a. DNR
 - b. Weyerhauser
 - c. Pack Forest
 - d. National Forest Service
 - e. Tacoma Power
 - f. Land Trust

I. SITE ANALYSIS

A. Cultural Features

Sites of pre-settlement and post-settlement historical value are numerous in and around the Park. The Nisqually Tribe has a longstanding relationship with the land of the Nisqually River Corridor, particularly at the Nisqually Mashel Confluence. The result is a rich heritage at the park of Native American influence. Post-settlement influence is also evident within and outside of park boundaries with historical representations of pioneer living, restoration of agricultural floodplain land, utility right of ways.

1. Pre-settlement areas of historical value
 - a. Medicine Springs
 - b. Nisqually River/ Mashel River Confluence
 - c. Shaker's Cemetery
 - d. Mashel Prairie
 - e. River Corridors
 - f. Ohop Indian Village (Re-creation of Indian Village by Pioneer Farm)
 - g. Leschi Village believed to be 1 mile upstream of Nisqually Mashel Confluence on the Mashel River
2. Post-settlement areas
 - a. Pioneer Farm
 - b. Peterson Farm
 - c. Pack Forest
 - d. LaGrande
 - e. Mashel Prairie (Currently comprised of several private in holdings, home to several Pierce County Residents)
 - f. Bridge from Pack Forest to Park Site
 - g. Bridge from Pack Forest to South of Nisqually River

- h. Logging Roads in and surrounding Park land
- 3. Utility Right of Ways running through Park
 - a. Tacoma Power Easement
 - b. BPA Easement

B. Natural Resources

The dominant landform of Nisqually Mashel is a plateau composed of wetlands, a high spot, and defined by its edges of steep escarpments which slope down to the floodplains of three separate and distinct waterways – Ohop Creek, Nisqually River, and Mashel River. Ohop Creek has a broad agricultural floodplain character and surrounds the plateau’s North-Western edge. The Nisqually River, along the Southern edge of the plateau, runs within a narrow gorge-like corridor. The Mashel River, running below the plateau’s Eastern edge, meanders within a wide floodplain lined by steep escarpments on both sides. Across the rivers from the plateau are several forested terraces consisting of flat terrain often bordered on one or two sides by steep slopes.

- 1. Landforms
 - a. Plateau
 - b. Escarpments
 - c. Floodplains
 - d. High Spot
 - e. Forested Terraces
- 2. Waterways
 - a. Ohop Creek
 - b. Nisqually River
 - c. Mashel River
- 3. Jurisdictional Boundaries
 - a. Wetlands Buffers - Up to 300ft.
 - b. Steep Slope Buffers – 50ft.
 - c. Stream Buffer – 150ft

C. Site Character and Experiential Features

Filtered and expansive views, post-harvested forests, prairies, and adjacent floodplains shape the character and experiential factors found within the Nisqually Mashel State Park. The high spot of the plateau offers 360° views to the Mountain, the Olympics, possibly the Puget Sound, and to nearby ridges. The plateau edge above the Mashel River offers filtered views of the Mountain. Three out of four edges of the plateau are surrounded by floodplains, each with a unique character.

- 1. View Opportunities
 - a. The High Spot
 - b. Edge of plateau along Mashel River
 - c. Powerline Easements
 - d. At River Confluences/ Bridges over rivers
- 2. Forest Character Areas

- a. Post-Harvest Forest
 - b. “The Hobbit Forest” – a 15 to 20 year post-harvested forest densely planted, allowing little light to penetrate the forest under-story.
 - c. Wetland Landscape
 - d. Mashel Prairie
 - e. Old Forest – typically found where steep slopes prohibited logging practices
3. Rivers Floodplains
- e. Ohop Creek – broad, straight, and agricultural
 - f. Nisqually River – Gorge-like river corridor
 - g. Mashel River – meandering floodplain edged by steep escarpments

D. Planning Constraints and Opportunities Map

Nisqually Mashel State Park, with its rich cultural history, has a unique opportunity to celebrate its pre-settlement and post-settlement past in a landscape where three rivers join. Opportunities abound to create safer, more intriguing entryways to the park, reconnect across the Nisqually and Mashel Rivers to Pack Forest, create water access, highlight views of The Mountain, and connect to the history of the area’s early pioneers and the Nisqually Tribe. Through land acquisition and partnerships, the state park can expand its planning boundaries to include spectacular views, slope restoration areas, and conservation partnerships with Pack Forest. Wetlands throughout the site and steep slopes require buffers and will limit the developable land on the plateau, however these buffers will serve to sensitively develop the site’s “sense of place” – serving to conserve both natural and cultural features.

- 1. Land Acquisition/ Partnership Opportunities
 - a. Manke Property
 - i. The High Spot
 - ii. Easement along most Easterly Edge of Manke property will enable access through State Park Land.
 - b. Pack Forest
 - i. West of Highway 7
 - c. Fill in Northwest “stair-step” of State Park’s property boundary.
 - d. Land Trust land between Park’s property boundary and river corridor
 - e. Planning opportunities can extend up to adjacent ridgelines for management visual impact within park.
- 2. Entry/ Exit Points
 - a. Highway 7 from Park’s Northern property boundary
 - b. At Highway 7 and end of Tacoma Powerline Easement
 - i. Potential connection to Eatonville Hwy. West
 - c. From Pack Forest

3. Reconnection Opportunities
 - a. Bridge from Pack Forest to Park Site – restore trail
 - b. Bridge from Pack Forest to South of Nisqually River – restore bridge
4. Cultural Connections
 - a. Medicine Springs
 - b. Shakers Cemetery
 - c. Mashel Prairie
 - d. The Confluence
 - e. Pioneer Farm/ Ohop Indian Village
 - f. Peterson Farm
 - g. Local and regional trail connections

Park Master Planning Concepts

Defining the “Spirit of Place;” *what do we see when we look at a landscape...geology—geography—an environment that encompasses culture.*

As landscape architects we are always looking to the “land” to inform the thematic design concept; a theme that will direct the form and function of the project’s layout, activities and the look of physical elements. This theme articulates “the spirit of place.”

PEOPLE’S PLACE

Theme

For over 10,000 years we have lived here—as we do now, a part of the land.

Changing with the season, from camp to camp—adapting to the environment around us.

The spirit of place theme for this concept is the Squalli Absch; the people of the river, the people of the grass. This park becomes one of a group of “camps” that tell the larger story of these peoples. All aspects of its primary design will serve to reinforce this theme.

Potential Concept Activities/Program/Topics

Interpretive: Squalli Absch (The Peoples Center) as living continuum – past, today and tomorrow

Presented as “Camp” at the heart of the Nisqually Nation

Mashel Massacre Memorial and Story Site

Traditional Knowledge Camp

Living History

Lashootseed – Siwash (Primary PNW Tribes Language)

Fishing/Hunting

Water

River

Salmon/Cedar

Whulge – Tacobet (Sound to Mountain)

Center of the watershed

Land / Sky

Pre contact life

Leschi Village

Respectful contact with cemetery, Medical Springs and other cultural sites

Be a “one of a kind” State Park; a destination

Restoring and protecting the land and resources

Practice cultural traditions with healing outcomes

Tribal support for active educational programs

Identify and manage important cultural, natural and recreational sites on and off park property

Connections to other recreational and cultural resources in the area

Involve youth/people in building facilities

Unique Concept Elements

Squalli Absch – Peoples Camp/Interpretive Center

Celestial Observatory Story Circle

Concentration of park services and camping to North of Park site and

Woodland/Meadow Journey to Peoples Camp at South end of Plateau/High Point

Southside of River Traditional Knowledge Camp and Environment

Mashel Confluence Story Place

Leschi Village

Geographic Areas for Planning

Current State Park property

Plateau properties infill

Adjacent properties

UW Pack Forest

South Side of Nisqually to ridgeline

Ohop Creek Valley (valley floor and western ridgeline)

North of Highway 7 to ridgeline

Park Master Planning Concepts

Defining the “Spirit of Place;” *what do we see when we look at a landscape...geology—geography— an environment that encompasses culture.?*

As landscape architects we are always looking to the “land” to inform the thematic design concept; a theme that will direct the form and function of the project’s layout, activities and the look of physical elements. This theme articulates “the spirit of place.”

CONSERVATION CONNECTIONS

Theme

*For 100 years this land has provided resources to a growing community...
Through research and study the structure of this forest is being recreated.
In 100 years it will be different.*

The spirit of place theme for this concept is the recreation of a forest structure and conservation (logged landscapes and Pack Forest research) as defined as: “management for maximum benefit over a sustained period of time.” All aspects of its primary design will serve to reinforce the theme.

Potential Concept Activities/Program/Topics

- Conservation Education Center
- Conservation Content Columns interpretive elements throughout the park
- Forest succession and river restoration explanations and demonstrations
- Salmon Habitat Restoration
 - Geology
 - Agriculture
 - Logging
 - Mining
 - Suburban Growth
 - Promote Conservation
 - Role of Managed Forest
- Property Partnerships
 - Nisqually Land Trust
 - Tacoma Power
 - Pack Forest, University of Washington
 - Weyerhaeuser Timber Company

Unique Concept Elements

- Conservation Education Center
- Concentration of park service and camping areas on Eastern Plateau of Pack Forest
- Access and use of Pack Forest
- Remote Camping
- Remote Horse Camp/Center
- Mashel River Crossing

Geographic Areas for Planning

- Current State Park property
- Plateau property infill
- Adjacent properties
 - UW Pack Forest
 - South Side of Nisqually to ridgeline
 - Ohop Creek Valley (valley floor and western ridgeline)
 - North of Highway 7 to ridgeline

Park Master Planning Concepts
Defining the “Spirit of Place;” *what do we see when we look at a landscape...geology—geography— an environment that encompasses culture.*

As landscape architects we are always looking to the “land” to inform the thematic design concept; a theme that will direct the form and function of the project’s layout, activities and the look of physical elements. This theme articulates “the spirit of place.”

WOODLAND EXPERIENCE

Theme
Meadow—wooded edge—glade with shaft of light, Alone in a group...
Imagination formed by the
senses— sight-sound-touch—Odor of Damp;
memories hard wired to become natural experiences

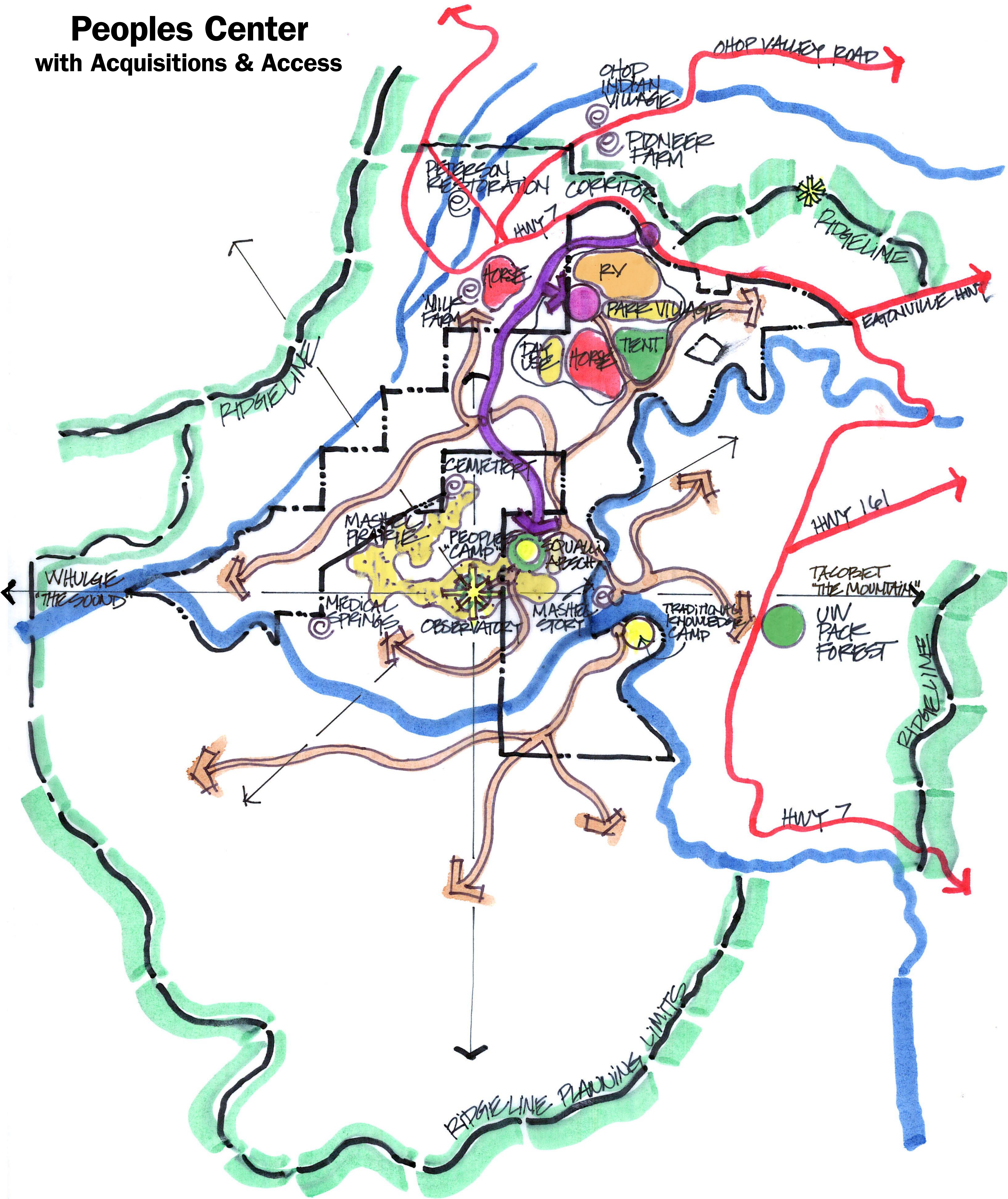
The spirit of place theme for this concept is the best camping experience...stories around the campfire, hikes in the woods, the desire each camper has to be an explorer and imagine that they are the first to be there. All aspects of its primary design will serve to reinforce the theme.

Potential Concept Activities/Program/Topics
Woodland centric experiences, the Woods Canopy Center
Walks in the woods, Re-creation, Rejuvenation, Refuge, Play
 Hobbit Forest
 Slide down the Hill
 Eagles soaring
 Feet in the Creek
 Walk on water
 On the edge of the glade and meadow
 In the tree canopy
 “Fly” through the trees over the water
 Getting to the summit
Revealing Views, unfolding, sequenced
 Mt. Rainier
 Olympic Mountains
 River
 Bluff
 Dam

Unique Concept Elements
Canopy Bridge(s) and walk from woods to water
High and Low Ropes Course
Dispersed facilities and activity areas
Mashel River Crossing (Sky/Canopy Pedestrian/Bike Bridge)
Camping, trails and overall access to all parts of Park and surrounding area
Replace Nisqually River Bridge (at Mashel Confluence to access Southside area)

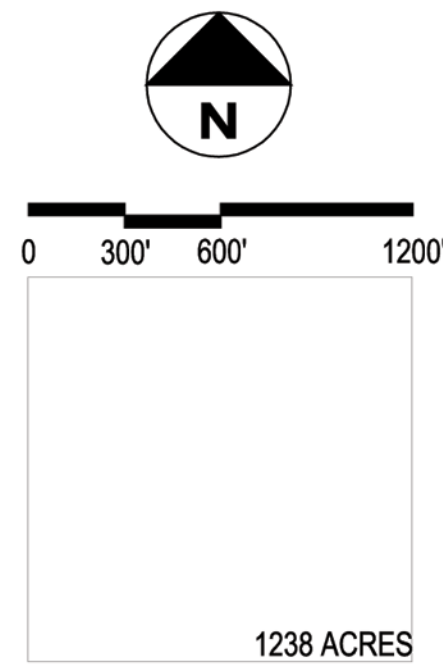
Geographic Areas for Planning
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 South Side of Nisqually to ridgeline
 Ohop Creek Valley (valley floor and western ridgeline)
 North of Highway 7 to ridgeline

Peoples Center with Acquisitions & Access



NATURAL RESOURCES SITE ANALYSIS MASTER PLAN FOR NISQUALLY MASHU STATE PARK

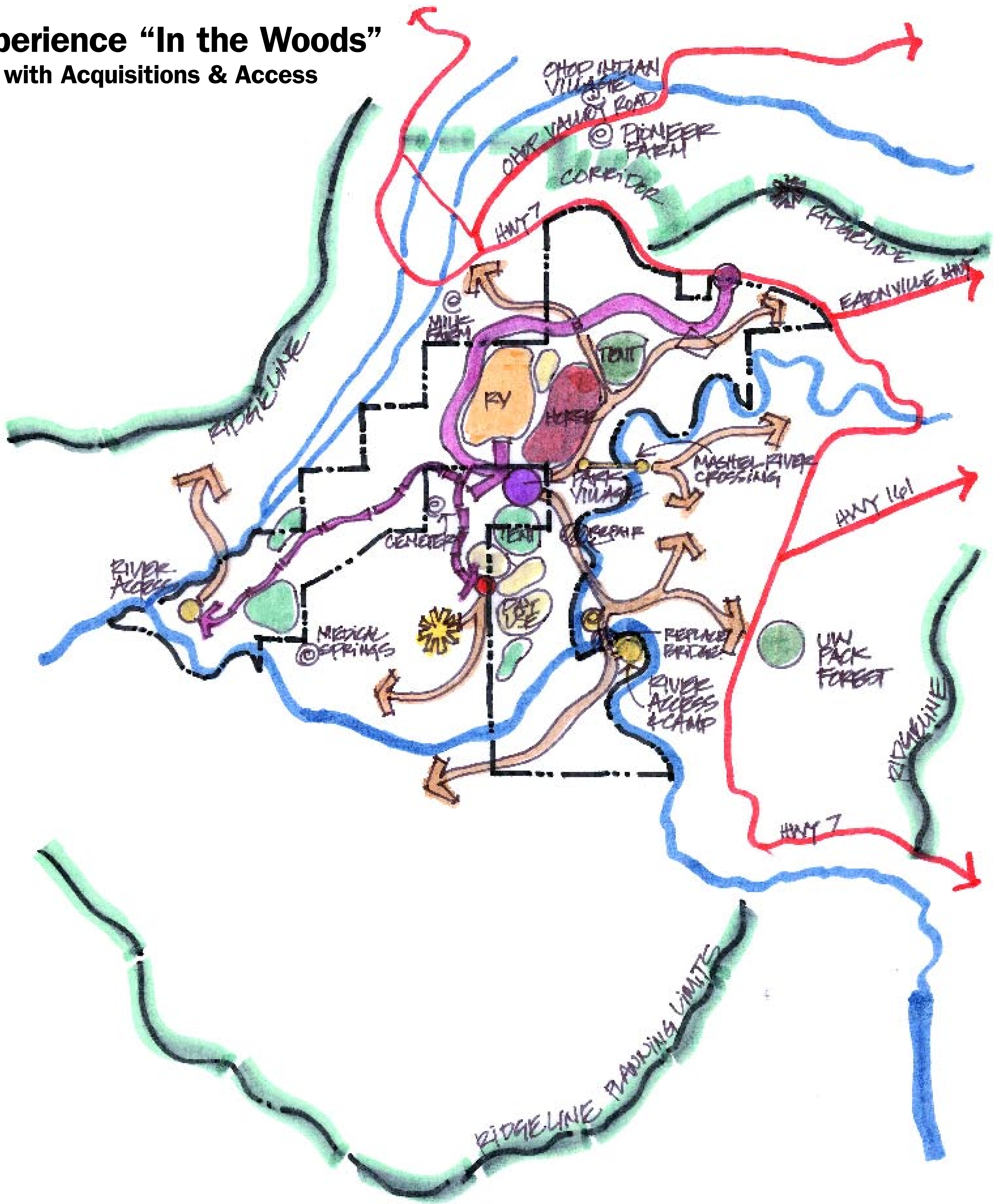
March 2008



JANUARY 2008

1238 ACRES

Experience “In the Woods” with Acquisitions & Access



**THE
PORTICO
GROUP**



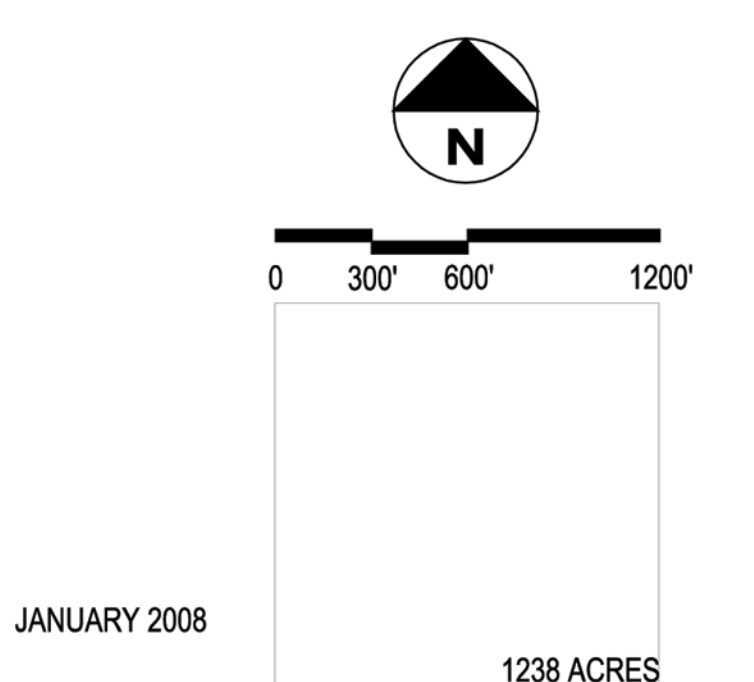
1500 4th Avenue, Third Floor
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www.porticogroup.com
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F:206.821.2199

NATURAL RESOURCES SITE ANALYSIS

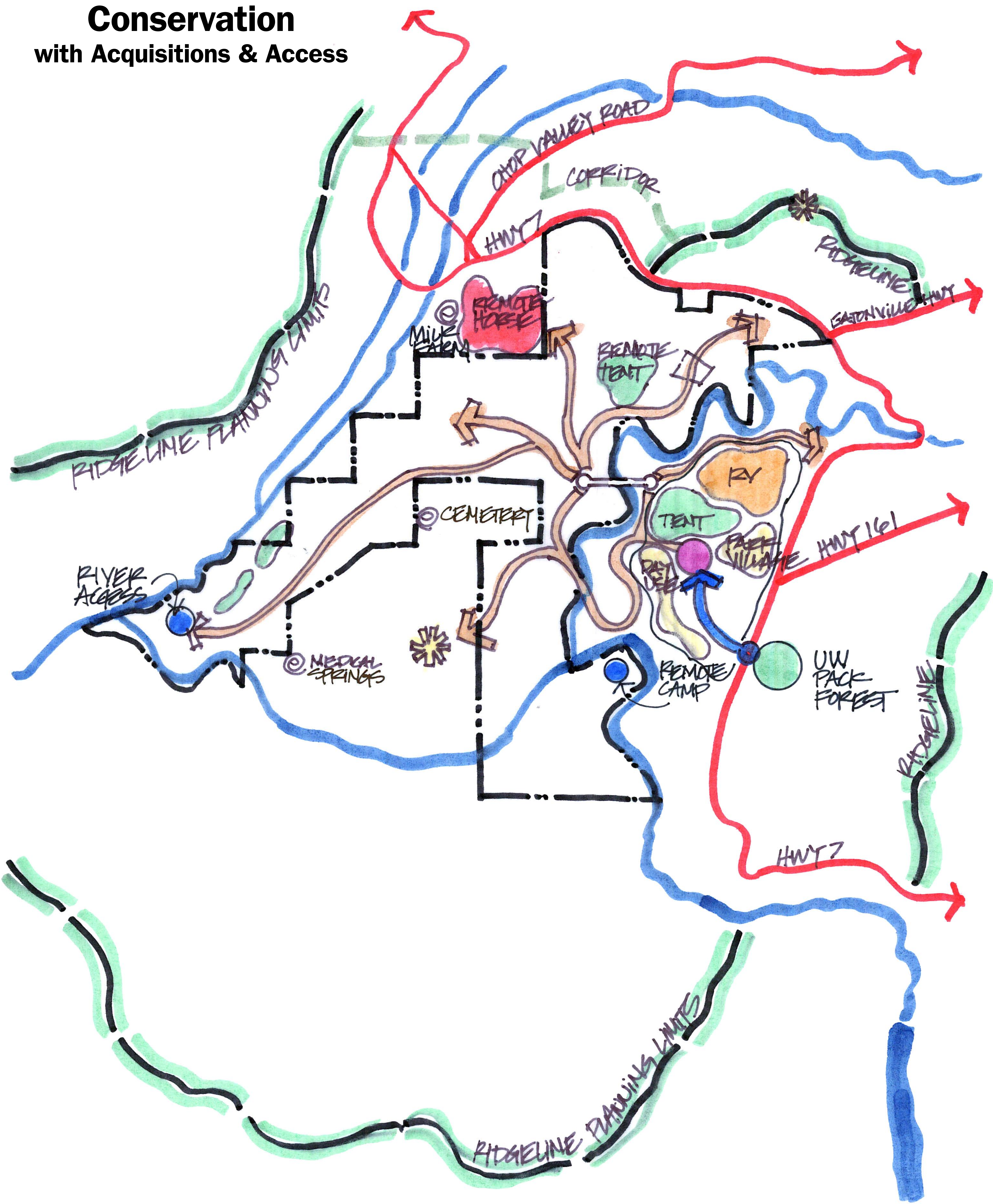
MASTER PLAN FOR

NISQUALLY MASHEL STATE PARK

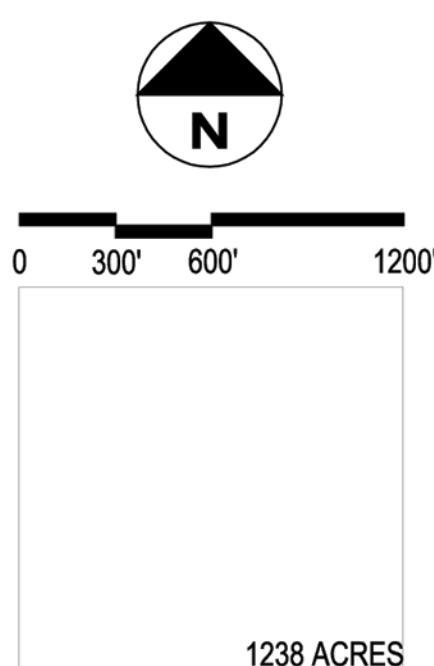
March 2008



Conservation
with Acquisitions & Access



NATURAL RESOURCES SITE ANALYSIS
MASTER PLAN FOR
NISQUALLY MASHEL STATE PARK
March 2008



Volcanic Hazard Areas

- Case I Inundation Level (Debris Flow & Debris Avalanche Zone) –500 to 1,000 Year Frequency
- Sub-Case of Case I Inundation Level (Debris Flow & Debris Avalanche Zone)
- Case II Inundation Level (Debris Flow & Debris Avalanche Zone) –100 to 500 Year Frequency
- 0.5 ELTT Estimated Lahar Travel Time (in hours) from when the AFM Warning System sounds the alarm for lahars approaching the Case I Lahar in magnitude
- 0.5 ELTT Estimated Lahar Travel Time (in hours) from the source of the event for lahars approaching the Case I Lahar in magnitude

Pierce County Code Title 18E regulates activities within Volcanic Hazard Areas.

The boundaries of volcanic hazard areas are approximate and are intended only to provide an indication of the presence of said areas. Additional volcanic hazard areas that have not been mapped may be present.

- Sources:
- 1) Digital data set of Volcano Hazards for Active Cascade Volcanoes, Washington; Steven P Schilling, US Geological Survey Open- File Report 96- 178, Version 1.0, 1996.
 - 2) "Map Showing Debris Flows and Debris Avalanches at Mount Rainier, Washington, Historical and Potential Future Inundation Areas," Hydrogeologic Investigations Atlas HA-729, U.S. Department of Interior, Geologic Survey, 1995, as amended by Kevin Scott, USGS, on Nov. 10, 1997, to be consistent with the reports listed as 3) and 4) below.
 - 3) Volcano Hazards from Mount Rainier, Washington by Hoblitt, Walder, Driedger, Scott, Pringle and Valance, U.S. Geological Survey Open File Report 95-273, 1995.
 - 4) Sedimentology, Behavior, and Hazards of Debris Flows at Mount Rainier, Washington, U.S. Geological Survey Professional Paper 1547, 1995.
 - 5) Emergency Action Plan for Nisqually Hydroelectric Project, Federal Energy Regulatory Commission (FERC) Project No. 1862, December 13, 1996, City of Tacoma, Department of Public Utilities, Light Division.
 - 6) An Empirical Method For Estimating Travel Times For Wet Volcanic Mass Flows, Bulletin of Volcanology, V. 60, P. 98-109, T.C. Pierson, 1998.

- Notes:
- 1) Boundaries do not mark a distinct change between hazard and non-hazard areas. The degree of hazard decreases with increase of distance or elevation outside the boundary.
 - 2) Case III inundation levels are completely contained within the boundaries of Mount Rainier National Park, and are not shown on this map.
 - 3) Travel times are estimated from actual travel times of lahars from 10,000,000 to 100,000,000 cubic meters in volume. Fastest, rather than mean, travel times are used. No data exists for lahars having about 200,000,000 cubic meters volume (the designated Case I magnitude). If a substantially larger volume of material in a lahar is involved, travel times could be faster than shown.

Adopted _____, 2002 - Ordinance No. _____
Effective _____, 2002

Note on lower Puyallup River:
Case II inundation area in lower Puyallup River includes the entire area possibly subject to inundation by such a flow. Actual inundation areas will probably be more limited and will be strongly influenced by the existing and future network of levees, road and rail embankments.

Note: There is no AFM Warning System on the White River.

Time Travel Zones

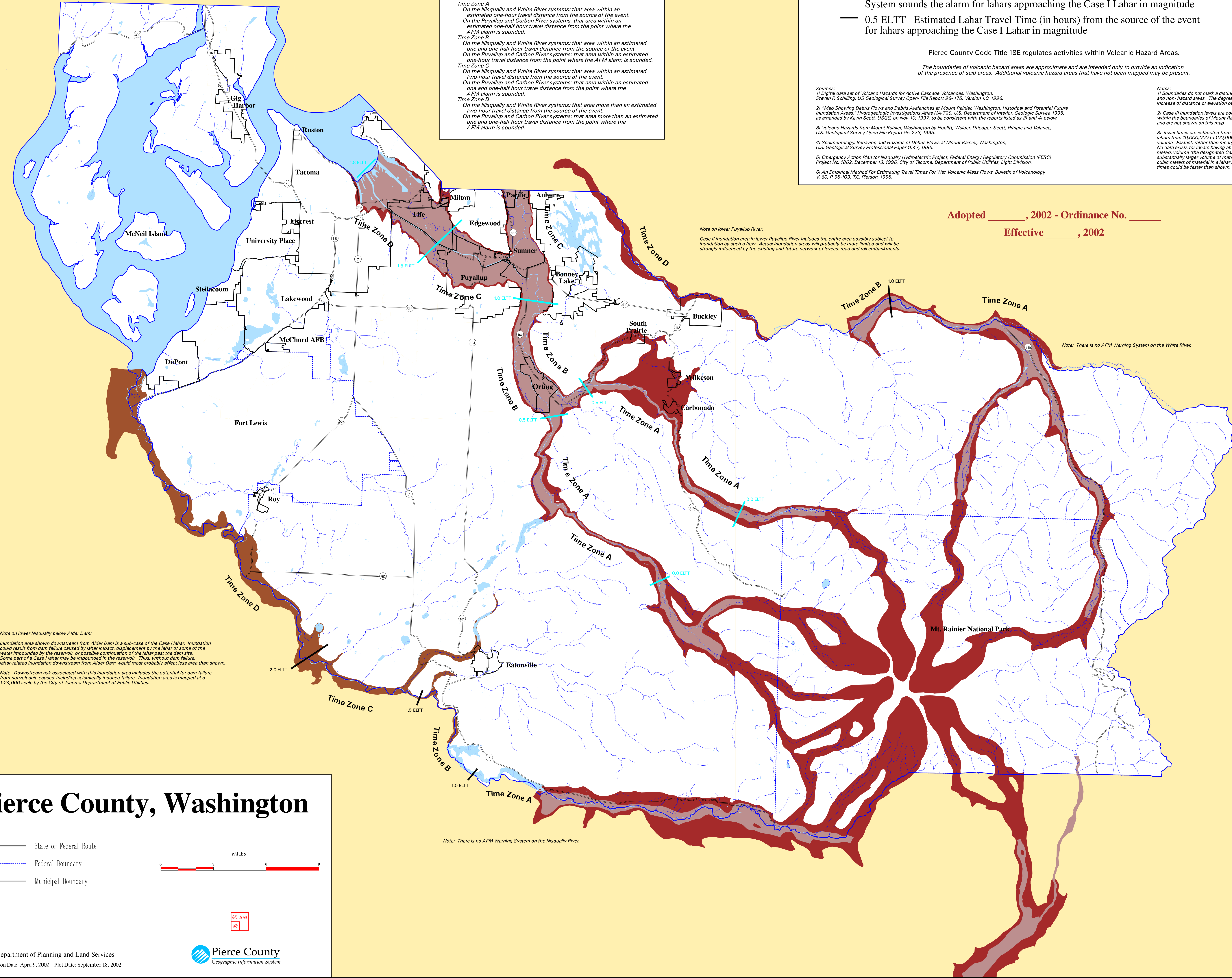
The ability to evacuate people from within a volcanic hazard area correlates to the distance from the source of an event (i.e., those areas closest to the event will have less time to evacuate than those areas farther away from the source of an event) and the amount of time for evacuation from the public notification (via a warning alarm system) that a lahar event has occurred. The amount of time that is anticipated for a debris flow, lahar, flood, or avalanche (estimated at 100,000,000 cubic feet of volume) to travel geographically from either the source of the event or the point where the AFM alarm is sounded is classified into the following time travel zones:

Time Zone A
On the Nisqually and White River systems: that area within an estimated one-hour travel distance from the source of the event.
On the Puyallup and Carbon River systems: that area within an estimated one-half hour travel distance from the point where the AFM alarm is sounded.

Time Zone B
On the Nisqually and White River systems: that area within an estimated one and one-half hour travel distance from the source of the event.
On the Puyallup and Carbon River systems: that area within an estimated one-hour travel distance from the point where the AFM alarm is sounded.

Time Zone C
On the Nisqually and White River systems: that area within an estimated two-hour travel distance from the source of the event.
On the Puyallup and Carbon River systems: that area more than an estimated one and one-half hour travel distance from the point where the AFM alarm is sounded.

Time Zone D
On the Nisqually and White River systems: that area more than an estimated two-hour travel distance from the source of the event.
On the Puyallup and Carbon River systems: that area more than an estimated one and one-half hour travel distance from the point where the AFM alarm is sounded.



Pierce County, Washington

- State or Federal Route
- Federal Boundary
- Municipal Boundary



540 Acres
180

Department of Planning and Land Services
Revision Date: April 9, 2002 Plot Date: September 18, 2002

Pierce County
Geographic Information System

ENVIRONMENTAL CONSTRAINTS REPORT

Nisqually-Mashel Property

Prepared for

The Portico Group



October 2008

ENVIRONMENTAL CONSTRAINTS REPORT

Nisqually-Mashel Property

Prepared for

The Portico Group
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Seattle, Washington 98101

Prepared by

Herrera Environmental Consultants
2200 Sixth Avenue, Suite 1100
Seattle, Washington 98121
Telephone: 206/441-9080

October 21, 2008

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Introduction

This report documents environmental constraints considered during development planning for the Nisqually-Mashel Property. Environmental constraints include regulated environmental features and important or unique vegetation communities.

Most of Nisqually-Mashel Property, encompassing all land north of the Nisqually River, is in Pierce County and is subject to Pierce County regulations. South of the Nisqually River, the property is in Thurston County and subject to Thurston County regulations. Both Pierce and Thurston counties regulate specific environmental features which are classified as critical areas. Critical areas in both counties include wetlands, streams, fish and wildlife habitat conservation areas, and geologic/landslide hazards which include steep slopes and lahars. These areas, with the exception of volcanic hazards, are depicted in Figure 1 (see inset map in report back pocket).

In addition to regulated critical areas, there are other important or unique vegetation communities that should be considered for protection in the park planning process. These are shown in Figure 2 (see inset map in report back pocket).

The mechanism for protecting regulated critical areas is to limit development within the critical area and to provide a protective buffer of sufficient width to protect the ecosystem functions of the critical area, or in the case of geologic hazards, to protect public safety. Buffer requirements for critical areas can vary significantly depending on the critical area, quality of habitat, nature of proposed impact, and degree of hazard (for steep slopes), in addition to other criteria. Efforts were made to include the most accurate estimate of maximum buffer widths based on the available information on proposed park uses and environmental conditions. This report was developed to provide an overview of the maximum constraints that may face development at the park. The following sections describe activities allowed in critical area buffers, identify and describe the critical areas found within the Nisqually-Mashel Property, and provide estimates of likely buffer requirements. Explanations of buffer width adjustments and the criteria for making these determinations are also included.

The recommendations provided in this document should be reviewed considering the following:

- All efforts were made to provide the most thorough estimates of environmental constraints within the Nisqually-Mashel Property boundary; however, the information provided is not exhaustive, and in-depth on-site assessments would be required to confirm estimates prior to finalizing development that may impact a critical area or its buffer.
- All information provided on buffer requirements is based on “Title 18E – Development Regulations – Critical Areas” of the Pierce County Code (PCC), and “Chapter 17.15 – Critical Areas” of the Thurston County Code (TCC). Buffer widths may be subject to adjustments per the reviewing authority in each county.

- All information provided is an estimate based on data current for the date of this report and available on the County websites:
 - Pierce County
(<http://www.co.pierce.wa.us/pc/abtus/ourorg/council/code/Index.htm>). While confirmed to be accurate at the time of research (Long 2008), the Code Reviser should be consulted prior to finalizing a development plan.
 - Thurston County (<http://ordlink.com/codes/thurston/index.htm>). While confirmed to be accurate at the time of research (Bowmar 2008), the on-line Thurston County Code information is not maintained by Thurston County and may not be up to date. Thurston County Planning and Environmental Section of Development Services should be consulted prior to finalizing a development plan.

Activities Allowed in Critical Areas and Buffers

Critical areas and their buffers are intended to remain undeveloped in order to protect the values and functions of the critical area or to protect public safety. Nevertheless, some uses are allowed within buffers of critical areas, and other uses may be permitted within critical areas or their buffers under certain conditions. The following list is intended to summarize guidance on the potential for certain uses to be allowed, however the county with jurisdiction over any activities proposed for critical areas or buffers should be consulted prior to commencing any development activities.

Trails

Within Pierce County:

Construction of pedestrian trails of 12 foot maximum width may be allowed within the buffer of a wetland or a buffer of a stream subject to the following criteria:

- The trail is constructed within the outer 10 percent of the standard (i.e. not averaged or reduced) buffer.
- The trail is constructed of pervious material.
- The trail results in less than 6,000 square feet of disturbance.
- The trail requires less than 50 cubic yards of fill.
- The trail does not cross or alter any regulated drainage features or natural waters.
- The trail is located outside of any fish and wildlife habitat conservation areas and their associated buffers (some exceptions apply).
- The trail is a component of a pedestrian-only public trail system approved by the County Council.
- Mitigation for impacts is provided through the standard review process.

Within Thurston County:

Public and private trails and trail-related facilities, such as picnic tables, benches, interpretive centers and signs, viewing platforms, and campsites, may be allowed within buffers, wetlands or streams. Trails and trail related facilities may only be authorized within wetlands and streams when the review authority determines that there is no practicable or reasonable upland

alternative. Trail planning, construction, and maintenance will adhere to the following additional criteria:

- Trails and related facilities will, to the extent feasible, be placed on existing levies, road grades, utility corridors, or any other previously disturbed areas.
- Trails and related facilities will be planned to minimize removal of trees, shrubs, snags and important wildlife habitat.
- Trail construction and maintenance should utilize the U.S. Forest Service "Trails Management Handbook" (FSH 2309.18, June 1987) and "Standard Specifications for Construction of Trails" (EM-7720-102, June 1984) or similar standards.
- Viewing platforms, interpretive centers, campsites, picnic areas, benches and access to them will be designed and located to minimize disturbance.
- Trails and related facilities will provide water quality protection measures to assure that runoff from them does not directly discharge to wetlands or streams.
- Within the buffer, trails and trail related facilities will be aligned and constructed to minimize disturbance to stream and wetland functions and values, and
- Native vegetation disturbed by trail construction will be salvaged and replanted along the trail and other disturbed areas to the extent possible.

Maintenance or Reconstruction

Both counties allow for the following maintenance and reconstruction activities in buffers with some limitations.

- Maintenance or reconstruction of existing, lawfully established public facilities provided that reconstruction does not involve expansion of the facility including roads, paths, bicycle ways, trails, bridges, and associated storm drainage facilities or other public rights-of-way.
- Maintenance or reconstruction of existing private roads, driveways, onsite septic systems, and wells, provided that reconstruction does not involve expansion of facilities, widening, or relocation.

Habitat and Forest Management

Within Pierce County:

- Removal by hand of manmade litter and control of noxious weeds that are included on the State noxious weed list (WAC 16-750) or invasive plant species as identified by Pierce County is allowed within critical areas and buffers. Control may be conducted by clipping, pulling, over-shading with native tree and shrub species, or non-mechanized digging. Alternative methods such as mechanical excavation, barrier installation, or herbicide use may be allowed upon approval by the Department and acquisition of any necessary permits.
- Enhancement actions that do not involve clearing, grading, or construction activities (e.g., revegetation with native plants and installation of nest boxes). Enhancement activity proposals will be reviewed by the Department.
- Forest practices that are conducted in accordance with a ten-year forest management plan approved by the Washington State Department of Natural Resources (DNR).

Within Thurston County:

No native vegetation may be removed along streams, within wetlands, and the buffers of both except as provided in the following:

- Maintenance activities needed to promote native vegetation;
- Removal of vegetation for the purpose of maintaining or enhancing a wetland or buffer area is limited to removal of invasive plant species only and is allowed provided that the removal does not adversely affect the function of the wetland. The goal of invasive species control must be to enhance the diversity of the native plant species in the wetland or buffer area. It will be allowed for all nonnative species and the following native species: Common cattail (*Typha latifolia*) and Douglas spirea (*Spirea douglasii*).

The method of removal will be approved in writing by Thurston County development services department.

- Woody vegetation may also be removed from the wetland and or buffer areas for use in approved on-site or off-site wetland or riparian restoration of enhancement projects. The harvest of these materials may be conducted provided that the removal will not be more than twenty percent

of any single plant and that the species harvested comprises forty percent or more of the vegetation in the wetland or buffer area. Harvested material consists of woody stems and twigs. No root material will be harvested. Salvage of whole plants both woody and herbaceous may be allowed in wetland areas that will be filled in the course of an approved development proposal.

- Wetland tree cutting is only allowed when for the personal use of the property owner on the property which the wetland is located and not for a sale or resale; provided that the removal does not adversely affect the functioning of the wetland.
- Harvesting of trees with an approved Class II or Class III forest practices permit is allowed.

Other Allowed Activities

Within Pierce County:

- Passive recreation such as hunting, hiking, fishing, and wildlife viewing that does not involve the construction of trails is allowed within critical area buffers.
- Existing agricultural activities established prior to February 2, 1992; that after that date, do not cause permanent conversion of a critical area through actions such as filling, ditching, draining, clearing, or grading.
- Emergency action necessary to prevent imminent threat or danger to public health or safety, or to public or private property, or serious environmental degradation.

Within Thurston County:

- Underground utility transmission lines may be allowed within critical areas, if the review authority determines that there are no practicable upland alternatives. The no practicable alternative requirement will be waived when the utility line is consolidated with a road crossing or parallels another utility's existing crossing.
- Emergency action necessary to prevent imminent threat or danger to public health or safety, or to public or private property, or serious environmental degradation are also allowed in Thurston County.

Wetlands

Wetland mapping for the Nisqually-Mashel Property was based on U.S. Fish and Wildlife Service National Wetland Inventory (NWI) data, Pierce County and Thurston County wetland survey data, and National Resources Conservation Service hydric soil survey data. However, we estimate that the combined information from these data sources only accurately documents approximately 50 to 60 percent of the actual wetland coverage of the park, meaning that there is a high possibility that there are other wetlands on the property and the effective constraint will be greater than displayed on Figure 1. A thorough wetland reconnaissance would be required to obtain a higher confidence level for wetland locations and extent in areas where development is planned.

A significant portion of the park's wetlands are concentrated in the riparian corridors associated with the Nisqually River, the Mashel River, and Ohop Creek. These forested riverine wetlands are high quality (Category/Class I), providing significant habitat value and ecosystem functions. A large palustrine forested wetland complex (Category/Class I and II) with associated drainages conveying to Ohop Creek is found in the western extent of the property near the Ohop Valley. Another large wetland complex (rated a Category/Class II) lies near the base of the hill characterizing the "high point" of the property in the vicinity of the private inholdings, encompassing an area known as the Mashel Prairie. Most other wetlands on the property are smaller and are rated as Category/Class III wetlands. As an example of a previously unmapped wetland, during a site visit on February 8, 2008, a wetland at least 0.25 acres in size was observed perched on a plateau above the Mashel River in the northeast extent of the park. This feature is not captured by either the NWI or Pierce County Wetland maps; a finding that emphasizes the need for further reconnaissance to provide an accurate portrayal of wetland distribution in the park.

Wetland ratings are generally based on quality of habitat, wetland functions, and wetland size, and each jurisdiction specifies a system for rating wetlands. Wetland buffers widths are determined from the rating and are subsequently adjusted based on the level of disturbance from proposed uses and habitat function scores obtained from Washington State Department of Ecology's (Ecology) rating system (Hruby 2004). NWI, Pierce County, and Thurston County wetland rating assignments, when available in the inventory data, were used to determine buffer widths. In instances where no rating was assigned, an estimate was made based on the ratings of other wetlands in the immediate vicinity with similar attributes (such as size, orientation on the landscape, and topography). In addition, in order to provide a maximum estimate of wetland distribution, wetland extents were increased to include abutting areas of hydric soil, and isolated areas of hydric soil were included as wetlands and assigned a rating based on the characteristics of nearby wetlands. Table 1 shows number and acres of wetlands by rating within the Nisqually-Mashel Property, separated by location in Pierce and Thurston counties.

Table 1. The number and acres of wetlands by rating for areas of Pierce and Thurston counties within Nisqually-Mashel Property.

County	Wetland Rating	Number of Wetlands	Total Acres
Pierce	Category I	16	49.6
	Category II	4	48.9
	Category III	9	13.9
Thurston	Class I	21	18.0
Total for Property		50	130.4

Buffer widths for wetland rating categories or classes within each county vary in how they are calculated; however, both counties use a base buffer width and adjust the buffer wider or narrower based on the impact of the proposed land use and how high the wetland scores in terms of habitat functions. The following sections describe how buffer widths were obtained for each county. Figure 1 illustrates the locations and potential range of buffers for the wetlands found within Nisqually-Mashel Property.

Pierce County Wetland Buffers (based on Chapter 18E.30 of the PCC)

Base buffer widths for each wetland rating are provided in Table 2 for Pierce County (from PCC 18E.30.060, Buffer Requirements). Adjustments to the base buffer width shown are allowed based on the wetland rating and numerical score for habitat functions, the impact of the proposed use (low, medium, or high), and whether the wetland is a Natural Heritage Site, bog, forested wetland, or an estuary.

Table 2. Estimated wetland buffer widths for each level of land use impact in Pierce County.

Wetland Category	Base Buffer Widths (feet)	Adjusted Buffer Widths Based on Impact of Land Use (feet) (see Notes)		
		Low	Moderate	High
I	150	150	225	300
II	100	150	225	300
III	50	75	110	150

Notes:

Estimates assume all property wetlands have the highest habitat function scores possible for their rating (29 to 36 points).

Buffer widths are estimates and are subject to change based on review by Pierce County Department of Planning and Land Services. Buffer widths may be decreased in certain instances through averaging or mitigation, and may be increased per Department requirements based on sensitivity of adjacent habitat (see 18E.30.060-B, Modification of Buffer Widths).

Preliminary park plans indicate a range of infrastructure needs; from a visitor center with relatively large parking areas (qualifying as high land use impact) to remote/backcountry camping access (considered low land use impact). Buffer width estimates for each wetland rating were calculated based on the full range of potential adjustments for land use impact. Buffer adjustments assumed each wetland would have the highest habitat function score possible for its wetland rating so the adjusted buffers are conservatively wide (Table 2). This assumption is appropriate because most of the wetlands observed were associated with valuable riparian areas or otherwise provided high quality habitat.

Thurston County Wetland Buffers (based on Chapter 17.15.900 of Thurston County Code)

Wetland ratings in Thurston County are based on a modified version of Washington State Wetland Rating System for Western Washington (Ecology 1993) that uses three wetland classes and combines Ecology's definition of Category III and Category IV wetlands into one Class III rating. The only wetlands found through this preliminary search in the Thurston County portion of Nisqually-Mashel Property are Category I riparian wetlands associated with the Nisqually River (see Figure 1).

Thurston County also allows for buffer widths to be adjusted based on the wetland rating and whether the proposed use is classified as high or low intensity land use. Thurston County's required buffer widths for Category I wetlands are shown in Table 3 (adapted from Table 10 in Chapter 17.15.900).

Table 3. Buffer widths for Class I wetlands based on land use intensity in Thurston County.

Wetland Class	Buffer Width Requirement	
	High Intensity Land Use	Low Intensity Land Use
	• Active recreation • Commercial • Industrial • Residential (any zone permitting a density greater than 1 unit/5 acres)	• Agriculture • Forestry • Passive parks and preserves • Residential (density equal to or less than 1 unit/5 acres including clustered lots and their density bonus)
Class I	300 feet	200 feet

Streams

The level of regulatory protection and the width of buffers required for streams found in Nisqually-Mashel Property are based largely on existing use by critical fish species, and the potential for the stream to provide habitat, or to contribute to the quality of habitat for critical fish species. The Nisqually River, the Mashel River, and the Ohop Creek all provide critical habitat for ESA-listed salmonids including fall Chinook (threatened) and winter steelhead (threatened), and receive the highest level of regulatory protection possible (and the largest buffers) imposed by Pierce and Thurston Counties.

The Mashel River is noted by local Washington Department of Fish and Wildlife (WDFW) fish biologists (Phillips 2008) as exhibiting an exceptionally high density of documented spawning areas. Jeannette Dorner, Nisqually Tribe Salmon Recovery Program Manager, also conveyed that both Ohop Creek and the Mashel River are the two most important tributaries in the Nisqually River watershed in terms of salmon habitat (Dorner 2008). Coho and pink salmon also utilize these areas extensively (Dorner 2008). The section of the Mashel River adjacent to the logging road wash-out near its confluence with the Nisqually River was noted as an especially critical reach of spawning habitat. Potential use of this area may affect spawning habitat and is a concern of the Nisqually Tribe (Dorner 2008). The Nisqually Tribe has also executed a riparian restoration project in this reach (restoration planting and an engineered log jam installation) to ameliorate effects of eroding sediment caused by road runoff impacting redds in that area.

In addition, salmon use occurs essentially year-round within the property including both spawning and rearing activities (Dorner 2008). Consequently, temporal windows of no fish presence are brief, making management of visitor use of the area an extreme challenge during any time of year. Spawning steelhead are especially sensitive to human presence and slight disturbances during critical spawning activities will deter fish return to a given area for several subsequent years or more. Therefore use of this area, and other spawning areas, would need to be carefully managed to prevent fish disturbance (Dorner 2008; Phillips 2008).

The Ohop Creek confluence is also characterized by a relic channel connecting to the Nisqually River that was discovered through the Tribe's analysis of LIDAR (light detection and ranging) data. Investigations of the channel substrate revealed that previously deposited gravel beds still exhibited extremely high quality spawning habitat (Dorner 2008). For this reason, park planning should consider disallowing any development that might preclude or adversely impact the eventual natural migration of the river back into this relic channel.

Some reaches of tributaries to the three aforementioned waterways in Pierce County also provide fish habitat and therefore also receive the maximum level of regulatory protection and wider stream buffers. Other streams may not contain fish habitat but drain directly or indirectly into fish-bearing streams, thereby contributing to downstream fish habitat and are therefore subject to associated buffer protection requirements.

Washington Department of Natural Resources (DNR) Hydrography for Washington State was utilized to determine water types for Nisqually-Mashel Property streams. In cases where the data

indicated that the water type of a stream was unknown, an estimate was made based on the water type for streams of similar characteristics in the immediate vicinity.

Pierce and Thurston County water types (with associated regulation and buffer widths) only partially correspond with DNR water types. Explanations of buffer requirements for each county and differences between DNR water type categories are provided in the following sections specific to each county.

Stream buffers were measured from the edge of the ordinary high water mark (OHWM) or the channel migration zone (CMZ) where identified, whichever was greater; the only water body within the project area that has an identified CMZ is the Nisqually River. Required buffers for streams were also extended to include any adjacent regulated wetland(s), landslide hazard areas, and/or erosion hazard areas.

OHWM for the Nisqually River was determined by identifying the NWI wetlands with the classification of R3UBH or R3USC, which the NWI database identifies as mountainous riverine systems associated with the location of the mean ordinary high water mark. The OHWM for the Mashel River and Ohop Creek were determined by measuring the width of the streams at various points, averaging the width and drawing the width equally on either side of the centerline of each stream.

Pierce County Streams (based on Chapter 18E.40 of Pierce County Code)

Buffer widths for streams within Pierce County are determined based on water type. All documented critical fish-bearing streams, which includes the Nisqually River, the Mashel River, and Ohop Creek, are required to have a buffer of 150 feet. All non-fish bearing streams with segments located within one-quarter mile of a confluence with a fish-bearing stream must have a buffer of 115 feet. All streams with unknown fish-bearing status are provided a protective buffer of 115 feet. Although, Pierce County code does not specify a buffer for streams with an unknown water type, we assumed that most likely all streams with an unknown water type would be classified, at a minimum, as non-fish bearing located within one-quarter mile of a confluence with a fish bearing stream and would require a 115-foot buffer.

Water type categories for non-fish bearing streams in Pierce County differ from DNR's in that Pierce County distinguishes these streams by distance from a confluence with a fish-bearing water and DNR distinguishes them by whether they are perennial or seasonal.

Figure 1 shows the streams found within Nisqually-Mashel Property and their buffers based on known or estimated water type. Table 4 shows the number and name of water types and their required buffers found within Nisqually-Mashel Property within Pierce County.

Pierce County allows stream buffers to be modified through buffer averaging, or buffers may be increased or reduced based on findings from a habitat assessment report.

Table 4. Required buffers in Pierce County (adopted from Table 18E.40.060 in Pierce County Code).

Water Type	Water Body Criteria	Water Body Names	Buffer Width (all distances given are landward from the OHWM) ^a
F1: Streams greater than 2 feet wide and less than 20 percent grade and considered fish bearing by Federal or State agencies or Tribes.	All segments of natural waters within the bankfull widths of defined channels or within lakes, ponds, or impoundments which provide habitat for or support any portion of the lifecycle of a critical fish species. Waters that are diverted for use by federal, state, tribal, or private fish hatcheries will be considered to be Type F1 waters upstream from the point of diversion for 1,500 feet and tributaries if highly significant for protection of downstream water quality. Also includes those areas inventoried as Shorelines of the State with critical salmon habitat.	Nisqually River Mashel River Ohop Creek	150
N1: Streams less than 2 feet wide and greater than 20 percent grade and considered non-fish bearing by Federal or State agencies or Tribes.	Perennial or seasonal non-fish bearing natural waters within the bankfull widths of defined channels that are not known fish-bearing waters but are located within one-quarter mile of the confluence with a known fish-bearing water.	44 percent (30 out of 68) of the tributaries (unnamed) to the Nisqually River, Mashel River, and Ohop Creek, and other streams are located within one-quarter mile of the confluence with these water bodies.	115
U: Stream conditions are unknown.	Fish-bearing status is unknown or has not yet been verified.	56 percent (38 out of 68) of the tributaries (unnamed) to the Nisqually River, Mashel River, and Ohop Creek.	115 (estimated regulatory requirement; requires field verification)

^a There may be wetlands associated with water types that are regulated and which may have a required buffer greater than those listed in Table 18E.40.060, e.g., a lake with a 35-foot buffer requirement may have associated wetlands with 25-300 foot buffers.

Thurston County Streams (based on Chapter 17.15.900 of Thurston County Code)

Thurston County also regulates buffer widths for streams based on water type. The water type and required buffers for streams located in Thurston County are listed in Table 5. In summary, all “shorelines of the State” and critical fish-bearing streams (Type 1 – corresponding to DNR Permanent Water Typing Type “S”; and Types 2 and 3 – corresponding to DNR water type “F”), which includes the Nisqually River, receive a buffer of 100 feet. All perennial non-fish bearing streams (Type 4 - corresponding to DNR water type “Np”) receive a buffer of 50 feet. All seasonal non-fish bearing streams (Type 5 – corresponding to DNR water type “Ns”) receive a buffer of 25 feet.

Buffer widths were measured as described above in the Pierce County streams section.

Table 5. Required stream buffers in Thurston County (from Chapter 17.15.900 in Thurston County Code).

Water Type (Washington DNR water typing is given in parentheses)	Water Body Criteria	Water Body Names	Buffer Width (all distances given are landward from the OHWM)
Types 1, 2, and 3 (S & F)	All critical fish-bearing streams	Nisqually River and unnamed tributaries	100
Type 4 (Np)	Perennial non-fish-bearing streams	Unnamed tributaries to the Nisqually River	50

Other Important Habitats and Wildlife Conservation Areas

In addition to streams and wetlands, other important and unique habitat areas contribute to the health and preservation of Nisqually-Mashel Property ecosystems and should be considered during park development planning. These include, but are not limited to, mature forests, cliffs, riparian zones, prairies, areas with a high density of snags, and areas utilized by important wildlife species. Protection for these areas is discussed in Section 18E.40 of the Pierce County Code and in Section 17.15.700 of the Thurston County Code.

In Pierce County, the Department of Planning and Land Services and WDFW coordinate to determine buffer widths for important habitats on a case-by-case basis (with the exception of wetlands and streams, which have already been discussed). In Thurston County, buffers are determined on a case-by-case basis through coordination with Thurston County Development Services and the development of a habitat management plan.

The Pierce County Biodiversity Network conducted an extensive assessment of wildlife use in Pierce County in 2004, including classifying habitats based on analysis of remote sensing data augmented by field verification (Brooks et al. 2004). They identify the riparian corridor of the Nisqually River in the Nisqually-Mashel Property as falling into the Nisqually Delta Biodiversity Management Area (BMA) and classify it under “10C – Riparian Corridor along the Nisqually River”. This study has determined that area 10C is “perhaps the longest riparian corridor in Pierce County and one that continues to provide expansive undeveloped riparian vegetation dominated by deciduous trees and shrubs” (Brooks et al. 2004). The state and federally protected fauna predicted to occur in the 10C area, as well as species that may be present in the upland habitats of the property, are listed in Table 6.

In addition, Washington Department of Fish and Wildlife Priority Habitats and Species (PHS) information was obtained by Herrera and screened for the area of Nisqually-Mashel Property (Kunz 2008; Tirhi 2008). Note that this dataset is referenced as the primary source of wildlife habitat distribution information in the Pierce and Thurston County codes. The dataset was also recommended by the local district WDFW Habitat Program Biologist and district WDFW Wildlife Biologist for identifying the locations of important wildlife habitat within the park.

State priority species occur in all major riparian corridors adjacent to the project area, including the Nisqually River, Mashel River, and Ohop Creek. These species include bald eagle, osprey, turkey vulture, and Pacific Townsend’s big-eared bat (WDFW 2008). In addition, there are waterfowl concentrations in wetlands and riparian zones within and adjacent to the project area. All riparian corridors are designated as “Urban Natural Open Space” or “Riparian Zones” in the PHS dataset.

Table 6. Fauna predicted to be present at the Nisqually- Mashel Property and their state and federal status.

Species	Scientific Name	Status
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Federal Species of Concern, State Sensitive
Canada Lynx	<i>Lynx canadensis</i>	Federal Threatened, State Threatened
Golden Eagle	<i>Aquila chrysaetos</i>	State Candidate
Gray Wolf	<i>Canis Lupus</i>	Federal Endangered, State Threatened
Great Blue Heron	<i>Ardea herodias</i>	State Monitor
Green Heron	<i>Butorides virescens</i>	State Monitor
Grizzly Bear	<i>Ursus arctos=U. a. horribilis</i>	Federal Threatened, State Threatened
Long-eared Myotis	<i>Myotis evotis</i>	Federal Species of Concern, State Monitor
Long-legged Myotis	<i>Myotis volans</i>	Federal Species of Concern, State Monitor
Marbled Murrelet	<i>Brachyramphus marmoratus</i>	Federal Threatened, State Threatened
Mazama (Western/Roy), Pocket Gopher	<i>Thomomys mazama</i>	Federal Candidate, State Threatened
Northern Goshawk	<i>Accipiter gentilis</i>	Federal Species of Concern, State Candidate
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Federal Species of Concern
Osprey	<i>Pandion haliaetus</i>	State Monitor
Pacific Townsend's Big-eared Bat	<i>Corynorhinus townsendii townsendii</i>	Federal Species of Concern, State Candidate
Pacific Water Shrew	<i>Sorex bendirii</i>	State Monitor
Peregrine Falcon	<i>Falco peregrinus</i>	Federal Species of Concern, State Sensitive
Pileated Woodpecker	<i>Dryocopus pileatus</i>	State Candidate
Purple Martin	<i>Progne subis</i>	State Candidate
Turkey Vulture	<i>Cathartes aura</i>	State Monitor
Vaux's Swift	<i>Chaetura vauxi</i>	State Candidate
Western Bluebird	<i>Sialia mexicana</i>	State Monitor
Western Gray Squirrel	<i>Sciurus griseus</i>	Federal Species of Concern, State Candidate
Western Toad	<i>Bufo boreas</i>	Federal Species of Concern, State Candidate

Source: Brooks et al. (2004), WDFW (2008).

The known locations used by protected species are available to State Parks staff but this information is considered sensitive and cannot be published. The distribution of vegetation types (both unique/important and common) indicates the location of intact riparian forest and habitat types utilized by these species and is shown on the existing vegetation types map (Figure 2). Additional information may also be found in LYRA Biological (2006).

Thorough wildlife inventories should be conducted to verify the presence or absence of priority wildlife species in areas planned for development. It is recommended that all high quality habitats be managed as if priority species are utilizing them until their absence is confirmed through inventories (Tirhi 2008). Preservation of intact, mature, riparian forest corridors is highly important because, among other reasons, overwintering elk herds are known to utilize these areas of the property for migration and forage (Tirhi 2008). A number of other large mammals, such as deer and bear, also utilize these corridors as well as other habitat features in the property (Kunz 2008; Tirhi 2008).

The *Rare Plant and Vegetation Survey of Nisqually-Mashel State Park* (LYRA Biological 2006) identified a total of 283 vascular plant taxa during the 2006 surveys at the Nisqually-Mashel Property (280 species, with 3 of these species represented by two subspecies). Of these, 89 were non-native, accounting for 32% of the total. No rare or protected plants in the project area were observed during the surveys.

As part of their preparation for survey, Lyra Biological conducted a search of the Washington Natural Heritage Program's (WNHP) GIS database (which tracks rare plant taxa in the state, including endangered and threatened species) and thoroughly combed WNHP's other off-line maps and habitat descriptions (WNHP 2005). They identified 16 WNHP species with a moderate to high likelihood of occurring in the park, but found only one "watch" (not formally tracked) species, Sierra marsh fern, occurring on ravine slopes adjacent to the Mashel River (LYRA Biological 2006). The ravine slopes where Sierra marsh fern was found are included in the "Riparian Forest" classification, which has been identified already as an important and unique habitat for a multitude of aforementioned reasons.

The *Rare Plant and Vegetation Survey of Nisqually-Mashel State Park* documented a considerable amount of potential habitat within the property for several listed rare species. Historical occurrences of tall bugbane (*Acaea elata*, formerly *Cimicifuga elata*), a state and federally listed rare plant, have been recorded at several locations in Pierce County, one within three miles of the property boundary. Western burning bush (*Euonymus occidentalis*), was another potential occurrence at the Nisqually-Mashel Property. Western burning bush is a threatened species with only seven detections in Washington, all in forests within shaded draws and ravines in the Puget Trough. However, no occurrences were observed in similar habitats at the Nisqually-Mashel Property.

Many wetlands within the Nisqually- Mashel Property are open-canopied and suitable habitat for a variety of sedge species. Two listed sedges were identified in the pre-field review, Buxbaum's sedge (*C. buxbaumii*) and bristly sedge (*C. comosa*, with a known occurrence less than 5 miles from the park). However, despite repeated visits to these wetland areas neither of these species

was observed. Several other rare species that may inhabit the property include northern bog aster (*Aster borealis*), bulb-bearing water-hemlock (*Cicuta bulbifera*), water howellia (*Howellia aquatilis*), floating water pennywort (*Hydrocotyle ranunculoides*), and Nuttall's quillwort (*Isoetes nuttallii*). All of these species have been observed in similar wetland habitats, within 3 to 7 miles of the property but were not observed within it.

Also notable by its absence was small-flowered trillium (*Trillium parviflorum*), a state sensitive species endemic to the southern Puget Trough and with several nearby populations in Pierce and Thurston Counties. A complete list of the plants observed in the *Rare Plant and Vegetation Survey of Nisqually-Mashel State Park* is provided in Appendix A

Thorough plant inventories should be conducted to verify the absence of sensitive and rare plant species in areas planned for development. It is recommended that all high quality habitats be managed as if sensitive plants are present until absence is confirmed through inventories.

In summary, property areas characterized by unique vegetation types, and meeting the criteria for habitat conservation areas would be difficult to replace (including mature riparian areas, prairie, bluffs, and wetlands). Therefore impacts to such areas should be minimized. Thorough wildlife, habitat, and plant assessments are recommended for areas where development is proposed, especially in high quality habitats. Many property areas contain vegetation types that commonly occur throughout Western Washington (e.g., recently harvested, young coniferous forest), and development of these areas would have less effect on the property and regional vegetation resources.

Geologic/Landslide Hazards and Lahars

Steep slopes and potential lahar inundation areas are regulated as critical areas under the Landslide Hazard Areas section of the Pierce County code and under the Geologic Hazard Area section of the Thurston County code. Landslide hazard areas also include slopes that may not be steep, but exhibit characteristics that may cause soil instability, such as seeps or a situation where permeable soil overlies a non-permeable substrate (such as bedrock).

Steep slopes were determined for the areas within Nisqually-Mashel Property using Spatial Analyst tools in ArcGIS 9.2. Areas with slopes greater than 20 percent and areas with a slope of greater than 40 percent were identified based on a 10 meter Digital Elevation Model of the area. A buffer of 150 feet was applied to the 20 percent and the 40 percent slopes.

Lahars that could affect the Nisqually- Mashel Property were identified based on mapping completed by Pierce County Department of Planning and Land Services in September 2002.

Pierce County Steep Slopes (from Chapter 18E.80 of Pierce County Code, Landslide Hazard Areas)

Most of the steep slope and landslide hazard areas within the Pierce County portions of Nisqually-Mashel Property are associated with the cliffs and ravines that are found within the riparian corridors of the Nisqually River, Mashel River, and Ohop Creek. Other steep slope areas falling into this category are located around the “high point” plateau and to the southeast of the Mashel Prairie.

Table 7 provides a synopsis of slope types and associated buffers that would be regulated as critical areas in Pierce County.

Table 7. Slopes considered landslide hazards in Pierce County with their required buffers.

Slope Type	Criteria	Buffer
Landslide Hazard Areas (steep slopes)	≥40 percent slope with a vertical relief of 15 feet or more	50 foot minimum
Landslide Hazard Areas (slopes characterized by instability indicators; requires geological assessment to confirm classification)	≥20 percent slope with a vertical relief of 20 feet or more	50 foot minimum

Thurston County Steep Slopes (from Chapter 17.15.620 of Thurston County Code, Geologic Hazard Areas)

Table 8 shows slope types that are considered landslide hazards and regulated as critical areas in Thurston County and also shows their required buffers. There are some regulated slopes of limited extent near the southern property boundary adjacent to the Nisqually River that are located in Thurston County.

Table 8. Slopes considered landslide hazards in Thurston County with their required buffers.

Slope Type	Criteria	Buffer
Landslide Hazard Areas (steep slopes)	≥50 percent slope with a vertical height of 15 feet or more	50 feet from top of slope, 25 feet from toe
Landslide Hazard Areas (slopes characterized by instability indicators; requires geological assessment to confirm classification)	≥30 percent slope with a vertical height of 15 feet or more	50 feet from top of slope, 25 feet from toe

The geologic hazardous area within the Thurston County portion of the Nisqually-Mashel Property is comprised of 25.3 acres of Baldhill very stony loam located on 30 to 60 percent slopes. This soil type is found in an approximately 500-foot-wide horizontal band that follows contours starting just above the access road and spans from the southeastern property boundary to the Nisqually River. The area is classified as hazardous due to the steepness of the slope these soils are found on.

Potential Lahar Inundation Areas

Lahars are flowing mixtures of water and sediment that contain such a high concentration of rock debris that they look and behave like flowing wet concrete. They are capable of destroying buildings, bridges, and other man-made structures by battering, dislodgement, and burial. Careful study of the deposits in the large valleys that drain Mount Rainier shows that, over the past 10,000 years, Mount Rainier has been the source of numerous lahars (volcanic debris flows) that buried now densely populated areas as far as 60 miles from the volcano (USGS. 2000).

Prehistoric lahars originated on the steep flanks of the Mt. Rainier and were channeled into the big valleys that carry water and sediment westward to Puget Sound including the Nisqually River Valley. Evidence from their deposits combined with observations of modern debris flows suggest that past lahars traveled at speeds as fast as 40 to 50 miles/hr at depths of 100 feet or more in the confined parts of the valleys but slowed and thinned in the more distant, wider parts. During the past few thousand years, lahars that spanned valley floors well into the now densely populated Puget lowland have recurred, on average, at least every 500 to 1,000 years. There is every reason to expect that future lahars from Mount Rainier will be similar in behavior and frequency of occurrence to past lahars (USGS 2000).

The portions of the Nisqually-Mashel Property within the potential lahar inundation zone include all areas within the Nisqually River valley, the lower reaches of Ohop Creek and the Mashel River, near their confluence with the Nisqually River, and including the adjacent river valleys.

Lahars seek valley bottoms, thus people can quickly climb or drive to safety in many cases by evacuating the floor of a well-defined valley to higher ground before the lahar arrives. Pierce County has estimated the travel time for a large lahar from Mount Rainier to be approximately 1.5 hours from detection of a large lahar to its arrival in the river valleys of the Nisqually-Mashel property (see map of volcanic hazard areas developed by Pierce County located in Appendix B). Successful evacuation will depend on early detection of an approaching lahar, a clear warning system, and public understanding of the hazard and how to respond.

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FIGURES

Figure 1. Environmental constraints and considerations for Nisqually-Mashel Property.

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Figure 2. Existing vegetation types in Nisqually-Mashel Property.

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APPENDIX A

List of Vascular Plants Encountered in Nisqually-Mashel Property (from LYRA Biological 2006)

Table 3. Vascular plant taxa encountered in Nisqually-Mashel State Park (refer to key page 48).

#	Ab	Symbol	Accepted Scientific Name	Common Name	Family	Habit	Exotic?	Hitchcock & Cronquist Synonym	Status
1	2	ACCI	<i>Acer circinatum</i>	vine maple	Aceraceae	s			
2	2	ACMA3	<i>Acer macrophyllum</i>	bigleaf maple	Aceraceae	t			
3	3	ACMI2	<i>Achillea millefolium</i>	common yarrow	Asteraceae	f/h			
4	3	ACTR	<i>Achlys triphylla</i>	sweet after death	Berberidaceae	f/h			
5	3	ADAL	<i>Adiantum aleuticum</i>	Aleutian maidenhair	Pteridaceae	f/h		<i>Adiantum pedatum</i> ssp. <i>aleuticum</i>	
6	2	AGCA5	<i>Agrostis capillaris</i>	colonial bentgrass	Poaceae	g	Y	<i>Agrostis tenuis</i>	
7	4	AGOR	<i>Agrostis oregonensis</i>	Oregon bentgrass	Poaceae	g			
8	3	AICA	<i>Aira caryophylla</i>	silver hairgrass	Poaceae	g	Y		
9	3	ALTR7	<i>Alisma triviale</i>	northern water plantain	Alismataceae	f/h		<i>Alisma plantago-aquatica</i> var. <i>americanum</i>	
10	2	ALRU2	<i>Alnus rubra</i>	red alder	Betulaceae	t			
11	4	ALGE2	<i>Alopecurus geniculatus</i>	water foxtail	Poaceae	g	Y		
12	2	ANMA	<i>Anaphalis margaritacea</i>	western pearly everlasting	Asteraceae	f/h			
13	3	ANDE3	<i>Anemone deltoidea</i>	Columbian windflower	Ranunculaceae	f/h			
14	4	ANOD	<i>Anthoxanthum odoratum</i>	sweet vernalgrass	Poaceae	g	Y		
15	5	ARTH	<i>Arabis thaliana</i>	mouseear cress	Brassicaceae	f/h	Y		
16	4	ARME	<i>Arbutus menziesii</i>	Pacific madrone	Ericaceae	t			
17	4	ARSU4	<i>Artemisia suksdorfii</i>	coastal wormwood	Asteraceae	f/h			
18	4	ARDIA	<i>Aruncus dioicus</i> var. <i>acuminatus</i>	bride's feathers	Rosaceae	f/h		<i>Aruncus sylvestris</i>	
19	3	ASCA2	<i>Asarum caudatum</i>	British Columbia wildginger	Aristolochiaceae	f/h			
20	3	ATFI	<i>Athyrium filix-femina</i>	common ladyfern	Dryopteridaceae	f/h			
21	3	BAVU	<i>Barbarea vulgaris</i>	garden yellowrocket	Brassicaceae	f/h	Y		
22	5	BESY	<i>Beckmannia syzigachne</i>	American sloughgrass	Poaceae	g			
23	3	BLSP	<i>Blechnum spicant</i>	deer fern	Blechnaceae	f/h			
24	3	BRPA3	<i>Bromus pacificus</i>	Pacific brome	Poaceae	g			
25	3	BRRA2	<i>Bromus racemosus</i>	bald brome	Poaceae	g	Y	<i>Bromus commutatus</i>	
26	3	BRSI	<i>Bromus sitchensis</i>	Alaska brome	Poaceae	g		<i>Bromus sitchensis</i> var. <i>sitchensis</i>	
27	4	BRST2	<i>Bromus sterilis</i>	poverty brome	Poaceae	g	Y		
28	3	BRTE	<i>Bromus tectorum</i>	cheatgrass	Poaceae	g	Y		
29	4	BRVU	<i>Bromus vulgaris</i>	Columbia brome	Poaceae	g		<i>Bromus vulgaris</i> var. <i>vulgaris</i>	

#	Ab	Symbol	Accepted Scientific Name	Common Name	Family	Habit	Exotic?	Hitchcock & Cronquist Synonym	Status
30	4	BUDA2	<i>Buddleja davidii</i>	orange eye butterflybush	Buddlejaceae	s	Y		Class C Noxious
31	4	CAAN5	<i>Cardamine angulata</i>	seaside bittercress	Brassicaceae	f/h			
32	4	CACAS4	<i>Cardamine californica</i> var. <i>sinuata</i>	milkmaids	Brassicaceae	f/h		<i>Cardamine integrifolia</i> var. <i>sinuata</i>	
33	3	CAOLO	<i>Cardamine oligosperma</i> var. <i>oligosperma</i>	little western bittercress	Brassicaceae	f/h			
34	3	CAPE3	<i>Cardamine pensylvanica</i>	Pennsylvania bittercress	Brassicaceae	f/h			
35	4	CAAR2	<i>Carex arcta</i>	northern cluster sedge	Cyperaceae	g			
36	3	CADE9	<i>Carex deweyana</i>	Dewey sedge	Cyperaceae	g			
37	5	CAFR2	<i>Carex fraxa</i>	fragile sheath sedge	Cyperaceae	g			
38	3	CALE8	<i>Carex lenticularis</i>	lakeshore sedge	Cyperaceae	g			
39	4	CAMI7	<i>Carex microptera</i>	smallwing sedge	Cyperaceae	g			
40	3	CAOB3	<i>Carex obnupta</i>	slough sedge	Cyperaceae	g			
41	3	CAST5	<i>Carex stipata</i>	owlfruit sedge	Cyperaceae	g			
42	4	CAVE6	<i>Carex vesicaria</i>	blister sedge	Cyperaceae	g			
43	3	CESA	<i>Ceanothus sanguineus</i>	redstem ceanothus	Rhamnaceae	s			
44	4	CECY2	<i>Centaurea cyanus</i>	garden cornflower	Asteraceae	f/h	Y		
45	4	CEJA	<i>Centaurea jacea</i>	brownray knapweed	Asteraceae	f/h	Y		Class B Noxious
46	5	CESTM	<i>Centaurea stoebe</i> ssp. <i>micranthos</i>	spotted knapweed	Asteraceae	f/h	Y	<i>Centaurea maculosa</i>	
47	4	CEFOV2	<i>Cerastium fontanum</i> ssp. <i>vulgare</i>	big chickweed	Caryophyllaceae	f/h	Y	<i>Cerastium vulgatum</i>	
48	2	CEGL2	<i>Cerastium glomeratum</i>	sticky chickweed	Caryophyllaceae	f/h	Y	<i>Cerastium viscosum</i>	
49	2	CHANA2	<i>Chamerion angustifolium</i> ssp. <i>angustifolium</i>	fireweed	Onagraceae	f/h		<i>Epilobium angustifolium</i>	
50	3	CHUM	<i>Chimaphila umbellata</i>	pipsissewa	Pyrolaceae	ss			
51	3	CIDO	<i>Cicuta douglasii</i>	western water hemlock	Apiaceae	f/h			
52	2	CIAL	<i>Circaea alpina</i>	small enchanter's nightshade	Onagraceae	f/h			
53	3	CIAR4	<i>Cirsium arvense</i>	Canada thistle	Asteraceae	f/h	Y		Class C Noxious
54	4	CIVU	<i>Cirsium vulgare</i>	bull thistle	Asteraceae	f/h	Y		(Class C Noxious)
55	2	CLPEP	<i>Claytonia perfoliata</i> ssp. <i>perfoliata</i>	miner's lettuce	Portulacaceae	f/h		<i>Montia perfoliata</i>	
56	3	CLSIS	<i>Claytonia sibirica</i> var. <i>sibirica</i>	Siberian springbeauty	Portulacaceae	f/h		<i>Montia sibirica</i> var. <i>sibirica</i>	
57	4	COHE2	<i>Collomia heterophylla</i>	variableleaf collomia	Polemoniaceae	f/h			
58	3	COCA5	<i>Conyza canadensis</i>	Canadian horseweed	Asteraceae	f/h			
59	4	COMA25	<i>Coralorhiza maculata</i>	summer coralroot	Orchidaceae	f/h			

#	Ab	Symbol	Accepted Scientific Name	Common Name	Family	Habit	Exotic?	Hitchcock & Cronquist Synonym	Status
60	3	COSES	<i>Cornus sericea</i> ssp. <i>sericea</i>	redosier dogwood	Cornaceae	t, s		<i>Cornus stolonifera</i>	
61	4	COSC4	<i>Corydalis scouleri</i>	Scouler's fumewort	Fumariaceae	f/h			
62	2	COCO6	<i>Corylus cornuta</i>	beaked hazelnut	Betulaceae	t, s			
63	3	CRCA3	<i>Crepis capillaris</i>	smooth hawksbeard	Asteraceae	f/h	Y		
64	5	CYCR	<i>Cynosurus cristatus</i>	crested dogtail grass	Poaceae	g	Y		
65	3	CYFR2	<i>Cystopteris fragilis</i>	brittle bladderfern	Dryopteridaceae	f/h			
66	2	CYSC4	<i>Cytisus scoparius</i>	Scotch broom	Fabaceae	s	Y		Class B Noxious
67	2	DAGL	<i>Dactylis glomerata</i>	orchardgrass	Poaceae	g	Y		
68	2	DACA6	<i>Daucus carota</i>	Queen Anne's lace	Apiaceae	f/h	Y		(Class B Noxious)
69	3	DAPU3	<i>Daucus pusillus</i>	American wild carrot	Apiaceae	f/h			
70	5	DEEL	<i>Deschampsia elongata</i>	slender hairgrass	Poaceae	g			
71	4	DIAR	<i>Dianthus armeria</i>	Deptford pink	Caryophyllaceae	f/h	Y		
72	3	DIFO	<i>Dicentra formosa</i>	Pacific bleeding heart	Fumariaceae	f/h			
73	3	DIPU	<i>Digitalis purpurea</i>	purple foxglove	Scrophulariaceae	f/h	Y		
74	4	DRVE2	<i>Draba verna</i>	spring draba	Brassicaceae	f/h	Y		
75	3	DREX2	<i>Dryopteris expansa</i>	spreading woodfern	Dryopteridaceae	f/h			
76	4	ECCR	<i>Echinochloa crus-galli</i>	barnyardgrass	Poaceae	g	Y		
77	4	ELOV	<i>Eleocharis ovata</i>	ovate spikerush	Cyperaceae	g			
78	3	ELPA3	<i>Eleocharis palustris</i>	common spikerush	Cyperaceae	g			
79	2	ELGLG	<i>Elymus glaucus</i> ssp. <i>glaucus</i>	blue wildrye	Poaceae	g		<i>Elymus glaucus</i> var. <i>glaucus</i>	
80	3	ELGLJ2	<i>Elymus glaucus</i> ssp. <i>jepsonii</i>	Jepson's blue wildrye	Poaceae	g		<i>Elymus glaucus</i> var. <i>jepsonii</i>	
81	2	ELRE4	<i>Elymus repens</i>	quackgrass	Poaceae	g	Y	<i>Agropyron repens</i>	
82	4	ELTRT	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	slender wheatgrass	Poaceae	g		<i>Agropyron caninum</i> ssp. <i>majus</i>	
83	3	EPCIC	<i>Epilobium ciliatum</i> ssp. <i>ciliatum</i>	fringed willowherb	Onagraceae	f/h		<i>Epilobium glandulosum</i> var. <i>macounii</i>	
84	5	EPDE4	<i>Epilobium densiflorum</i>	denseflower willowherb	Onagraceae	f/h		<i>Boisduvalia densiflora</i>	
85	3	EPMI	<i>Epilobium minutum</i>	chaparral willowherb	Onagraceae	f/h			
86	2	EQAR	<i>Equisetum arvense</i>	field horsetail	Equisetaceae	f/h			
87	3	EQHY	<i>Equisetum hyemale</i>	scouringrush horsetail	Equisetaceae	f/h			
88	3	EQLA	<i>Equisetum laevigatum</i>	smooth horsetail	Equisetaceae	f/h			
89	3	EQTE	<i>Equisetum telmateia</i>	giant horsetail	Equisetaceae	f/h			

#	Ab	Symbol	Accepted Scientific Name	Common Name	Family	Habit	Exotic?	Hitchcock & Cronquist Synonym	Status
90	3	ERPH	<i>Erigeron philadelphicus</i>	Philadelphia fleabane	Asteraceae	f/h			
91	4	ERST2	<i>Erigeron strigosus</i> var. <i>strigosus</i>	prairie fleabane	Asteraceae	f/h		<i>Erigeron annuus</i> ssp. <i>strigosus</i>	
92	3	EUNE3	<i>Euphrasia nemorosa</i>	common eyebright	Scrophulariaceae	f/h		<i>Euphrasia officinalis</i>	
93	3	EUOC4	<i>Euthamia occidentalis</i>	western goldentop	Asteraceae	f/h		<i>Solidago occidentalis</i>	
94	4	FERUR2	<i>Festuca rubra</i> ssp. <i>rubra</i>	red fescue	Poaceae	g			
95	4	FESU	<i>Festuca subulata</i>	bearded fescue	Poaceae	g			
96	4	FESU2	<i>Festuca subuliflora</i>	crinkleawn fescue	Poaceae	g			
97	3	FRVEB2	<i>Fragaria vesca</i> ssp. <i>bracteata</i>	woodland strawberry	Rosaceae	f/h		<i>Fragaria vesca</i> var. <i>crinita</i>	
98	3	FRPU7	<i>Frangula purshiana</i>	Cascara buckthorn	Rhamnaceae	t, s		<i>Rhamnus purshiana</i>	
99	3	FRLA	<i>Fraxinus latifolia</i>	Oregon ash	Oleaceae	t			
100	1	GAAP2	<i>Galium aparine</i>	stickywilly	Rubiaceae	f/h			
101	3	GATR2	<i>Galium trifidum</i>	threepetal bedstraw	Rubiaceae	f/h			
102	3	GATR3	<i>Galium triflorum</i>	fragrant bedstraw	Rubiaceae	f/h			
103	4	GAOV2	<i>Gaultheria ovatifolia</i>	western teaberry	Ericaceae	s			
104	1	GASH	<i>Gaultheria shallon</i>	salal	Ericaceae	s			
105	3	GEDI	<i>Geranium dissectum</i>	cutleaf geranium	Geraniaceae	f/h	Y		
106	3	GEMO	<i>Geranium molle</i>	dovefoot geranium	Geraniaceae	f/h	Y		
107	2	GERO	<i>Geranium robertianum</i>	Herb Robert	Geraniaceae	f/h	Y		(Class B Noxious)
108	3	GEMAM	<i>Geum macrophyllum</i> var. <i>macrophyllum</i>	largeleaf avens	Rosaceae	f/h			
109	3	GLHE2	<i>Glechoma hederacea</i>	ground ivy	Lamiaceae	f/h	Y		
110	3	GLST	<i>Glyceria striata</i>	fowl mannagrass	Poaceae	g		<i>Glyceria elata</i>	
111	3	GNUL	<i>Gnaphalium uliginosum</i>	marsh cudweed	Asteraceae	f/h	Y		
112	5	GOOB2	<i>Goodyera oblongifolia</i>	western rattlesnake plantain	Orchidaceae	f/h			
113	3	GYDR	<i>Gymnocarpium dryopteris</i>	western oakfern	Dryopteridaceae	f/h			
114	4	HEHE	<i>Hedera helix</i>	English ivy	Araliaceae	v	Y		(Class C Noxious)
115	3	HEMA80	<i>Heracleum maximum</i>	common cowparsnip	Apiaceae	f/h		<i>Heracleum lanatum</i>	
116	3	HAL2	<i>Hieracium albiflorum</i>	white hawkweed	Asteraceae	f/h			
117	3	HOLA	<i>Holcus lanatus</i>	common velvetgrass	Poaceae	g	Y		
118	2	HODI	<i>Holodiscus discolor</i>	oceanspray	Rosaceae	s			
119	2	HYTE	<i>Hydrophyllum tenuipes</i>	Pacific waterleaf	Hydrophyllaceae	f/h			

#	Ab	Symbol	Accepted Scientific Name	Common Name	Family	Habit	Exotic?	Hitchcock & Cronquist Synonym	Status
120	3	HYPE	<i>Hypericum perforatum</i>	common St. Johnswort	Clusiaceae	f/h	Y		(Class C Noxious)
121	2	HYRA3	<i>Hypochaeris radicata</i>	hairy catsear	Asteraceae	f/h	Y		(Class C Noxious)
122	4	ILAQ80	<i>Ilex aquifolium</i>	English holly	Aquifoliaceae	t, s	Y		
123	3	JUAC	<i>Juncus acuminatus</i>	tapertip rush	Juncaceae	g			
124	3	JUBU	<i>Juncus bufonius</i>	toad rush	Juncaceae	g			
125	2	JUEFC2	<i>Juncus effusus</i> var. <i>conglomeratus</i>	common rush	Juncaceae	g		<i>Juncus effusus</i> var. <i>compactus</i>	
126	2	LACC3	<i>Lapsana communis</i>	common nipplewort	Asteraceae	f/h	Y		
127	2	LAP03	<i>Lathyrus polyphyllus</i>	leafy pea	Fabaceae	f/h			
128	3	LASY	<i>Lathyrus sylvestris</i>	flat pea	Fabaceae	f/h	Y		
129	2	LEVU	<i>Leucanthemum vulgare</i>	oxeye daisy	Asteraceae	f/h	Y	<i>Chrysanthemum leucanthemum</i>	(Class B Noxious)
130	4	LICO	<i>Lilium columbianum</i>	Columbia lily	Liliaceae	f/h			
131	3	LIBO3	<i>Linnaea borealis</i>	twinline	Caprifoliaceae	f/h			
132	3	LOPE	<i>Lolium perenne</i>	perennial ryegrass	Poaceae	g	Y		
133	4	LOCI3	<i>Lonicera ciliosa</i>	orange honeysuckle	Caprifoliaceae	v			
134	3	LOIN5	<i>Lonicera involucrata</i>	twinline honeysuckle	Caprifoliaceae	s			
135	3	LOCO6	<i>Lotus corniculatus</i>	bird's-foot trefoil	Fabaceae	f/h	Y		
136	3	LOMI	<i>Lotus micranthus</i>	desert deervetch	Fabaceae	f/h			
137	3	LUMUM2	<i>Luzula multiflora</i> ssp. <i>multiflora</i> var. <i>multiflora</i>	common woodrush	Juncaceae	g		<i>Luzula campestris</i> var. <i>multiflora</i>	
138	4	LUPA4	<i>Luzula parviflora</i>	smallflowered woodrush	Juncaceae	g			
139	4	LYCO	<i>Lychnis coronaria</i>	rose campion	Caryophyllaceae	f/h	Y		
140	4	LYUN	<i>Lycopus uniflorus</i>	northern bugleweed	Lamiaceae	f/h			
141	3	LYAM3	<i>Lysichiton americanus</i>	American skunkcabbage	Araceae	f/h		<i>Lysichiton americanum</i>	
142	5	LYSA2	<i>Lythrum salicaria</i>	Purple loosestrife	Lythraceae	f/h	Y		Class B Noxious
143	3	MAGR3	<i>Medicago gracilis</i>	grassy tarweed	Asteraceae	f/h			
144	3	MASA	<i>Medicago sativa</i>	coast tarweed	Asteraceae	f/h		<i>Medicago sativa</i> var. <i>sativa</i>	
145	3	MAAQ2	<i>Mehonia aquifolium</i>	hollyleaved barberry	Berberidaceae	s		<i>Berberis aquifolium</i>	
146	1	MANE2	<i>Mehonia nervosa</i>	Cascade barberry	Berberidaceae	s		<i>Berberis nervosa</i>	
147	3	MADI	<i>Maianthemum dilatatum</i>	false lily of the valley	Liliaceae	f/h			
148	2	MARAA	<i>Maianthemum racemosum</i> ssp. <i>amplexicaule</i>	feathery false lily of the valley	Liliaceae	f/h		<i>Smilacina racemosa</i>	
149	2	MAST4	<i>Maianthemum stellatum</i>	starry false lily of the valley	Liliaceae	f/h		<i>Smilacina stellata</i>	

#	Ab	Symbol	Accepted Scientific Name	Common Name	Family	Habit	Exotic?	Hitchcock & Cronquist Synonym	Status
150	3	MADI6	<i>Matricaria discoidea</i>	disc mayweed	Asteraceae	f/h	Y	<i>Matricaria matricarioides</i>	
151	4	MEOF	<i>Melilotus officinalis</i>	yellow sweetclover	Fabaceae	f/h	Y	<i>Melilotus alba</i>	
152	3	MEAR4	<i>Mentha arvensis</i>	wild mint	Lamiaceae	f/h			
153	4	MEPAP	<i>Mertensia paniculata</i> var. <i>paniculata</i>	tall bluebells	Boraginaceae	f/h			
154	4	MIDE3	<i>Mimulus dentatus</i>	coastal monkeyflower	Scrophulariaceae	f/h			
155	3	MIGU	<i>Mimulus guttatus</i>	seep monkeyflower	Scrophulariaceae	f/h			
156	3	MOMA3	<i>Moehringia macrophylla</i>	largeleaf sandwort	Caryophyllaceae	f/h		<i>Arenaria macrophylla</i>	
157	5	MOUN3	<i>Monotropa uniflora</i>	Indianpipe	Monotropaceae	f/h			
158	4	MOPAF	<i>Montia parvifolia</i> ssp. <i>flagellaris</i>	littleleaf minerslettuce	Portulacaceae	f/h		<i>Montia parvifolia</i> var. <i>flagellaris</i>	
159	3	MOPAP	<i>Montia parvifolia</i> ssp. <i>parvifolia</i>	littleleaf minerslettuce	Portulacaceae	f/h		<i>Montia parvifolia</i> var. <i>parvifolia</i>	
160	3	MYMU	<i>Mycelis muralis</i>	wall-lettuce	Asteraceae	f/h	Y	<i>Lactuca muralis</i>	
161	3	MYAR	<i>Myosotis arvensis</i>	field forget-me-not	Boraginaceae	f/h	Y		
162	4	MYDI	<i>Myosotis discolor</i>	changing forget-me-not	Boraginaceae	f/h	Y		
163	4	MYLA	<i>Myosotis laxa</i>	bay forget-me-not	Boraginaceae	f/h			
164	3	MYGA	<i>Myrica gale</i>	sweetgale	Myricaceae	s			
165	5	NAOF	<i>Nasturtium officinale</i>	watercress	Brassicaceae	f/h	Y	<i>Rorippa nasturtium-aquaticum</i>	
166	3	NEPAP	<i>Nemophila parviflora</i> var. <i>parviflora</i>	smallflower nemophila	Hydrophyllaceae	f/h			
167	2	OECE	<i>Oemleria cerasiformis</i>	Indian plum	Rosaceae	t, s			
168	3	OESA	<i>Oenanthe sarmentosa</i>	water parsely	Apiaceae	f/h			
169	3	OPHO	<i>Oplopanax horridus</i>	devilsclub	Araliaceae	s			
170	2	OSBE	<i>Osmorhiza berteroi</i>	sweetcicely	Apiaceae	f/h		<i>Osmorhiza chilensis</i>	
171	2	OXOR	<i>Oxalis oregana</i>	redwood-sorrel	Oxalidaceae	f/h			
172	4	OXTR	<i>Oxalis trillifolia</i>	threeleaf woodsorrel	Oxalidaceae	f/h			
173	4	PAVI3	<i>Parentucellia viscosa</i>	yellow glandweed	Scrophulariaceae	f/h	Y		
174	4	PAMY	<i>Paxistima myrsinites</i>	Oregon boxleaf	Celastraceae	s		<i>Pachystima myrsinites</i>	
175	3	PEFRP	<i>Petasites frigidus</i> var. <i>palmaris</i>	arctic sweet coltsfoot	Asteraceae	f/h			
176	2	PHAR3	<i>Phalaris arundinacea</i>	reed canarygrass	Poaceae	g			(Class C Noxious)
177	3	PHLE4	<i>Philadelphus lewisii</i>	Lewis' mock orange	Hydrangeaceae	s			
178	2	PHCA1	<i>Physocarpus capitatus</i>	Pacific ninebark	Rosaceae	s			
179	3	PICOC2	<i>Pinus contorta</i> var. <i>contorta</i>	lodgepole pine	Pinaceae	t			

#	Ab	Symbol	Accepted Scientific Name	Common Name	Family	Habit	Exotic?	Hitchcock & Cronquist Synonym	Status
180	3	PLLA	<i>Plantago lanceolata</i>	narrowleaf plantain	Plantaginaceae	f/h	Y		
181	3	PLMA2	<i>Plantago major</i>	common plantain	Plantaginaceae	f/h			
182	3	POAN	<i>Poa annua</i>	annual bluegrass	Poaceae	g	Y		
183	3	POCO	<i>Poa compressa</i>	Canada bluegrass	Poaceae	g	Y		
184	4	POPA2	<i>Poa palustris</i>	fowl bluegrass	Poaceae	g			
185	4	Pole2	<i>Poa leptocoma</i>	marsh bluegrass	Poaceae	g		<i>Poa leptocoma</i> var. <i>leptocoma</i>	
186	3	POAV	<i>Polygonum aviculare</i>	prostrate knotweed	Polygonaceae	f/h	Y		
187	4	POHY	<i>Polygonum hydropiper</i>	marshpepper knotweed	Polygonaceae	f/h	Y		
188	4	POPE3	<i>Polygonum persicaria</i>	spotted ladythumb	Polygonaceae	f/h	Y		
189	3	POGL8	<i>Polypodium glycyrrhiza</i>	licorice fern	Polypodiaceae	f/h			
190	4	POHE3	<i>Polypodium hesperium</i>	western polypody	Polypodiaceae	f/h			
191	4	POLO4	<i>Polystichum lonchitis</i>	northern hollyfern	Dryopteridaceae	f/h			
192	1	POMU	<i>Polystichum munitum</i>	western swordfern	Dryopteridaceae	f/h			
193	2	POBAT	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood	Salicaceae	t		<i>Populus trichocarpa</i>	
194	4	POTR5	<i>Populus tremuloides</i>	quaking aspen	Salicaceae	t			
195	4	PODI2	<i>Potentilla diversifolia</i>	varleaf cinquefoil	Rosaceae	f/h			
196	3	PRHO0	<i>Prosartes hookeri</i> var. <i>oregana</i>	Oregon drops of gold	Liliaceae	f/h		<i>Disporum hookeri</i> var. <i>oreganum</i>	
197	3	PRVU	<i>Prunella vulgaris</i>	common selfheal	Lamiaceae	f/h			
198	3	PREM	<i>Prunus emarginata</i>	bitter cherry	Rosaceae	t, s			
199	1	PSME	<i>Pseudotsuga menziesii</i>	Douglas-fir	Pinaceae	t			
200	1	PTAQ	<i>Pteridium aquilinum</i>	western brackenfern	Dennstaedtiaceae	f/h			
201	4	PYASA	<i>Pyrola asarifolia</i> ssp. <i>asarifolia</i>	liverleaf wintergreen	Pyrolaceae	ss			
202	4	PYPU	<i>Pyrus pumila</i>	domestic apple	Rosaceae	t	Y	<i>Pyrus malus</i>	
203	5	QUGA4	<i>Quercus garryana</i>	Oregon white oak	Fagaceae	t, s			
204	3	RAFL2	<i>Ranunculus flammula</i>	greater creeping spearwort	Ranunculaceae	f/h			
205	2	RARE3	<i>Ranunculus repens</i>	creeping buttercup	Ranunculaceae	f/h	Y		
206	2	RAUNP	<i>Ranunculus uncinatus</i> var. <i>parviflorus</i>	Idaho buttercup	Ranunculaceae	f/h			
207	4	RIDI	<i>Ribes divaricatum</i>	spreading gooseberry	Grossulariaceae	s			
208	3	RISA	<i>Ribes sanguineum</i>	redflower currant	Grossulariaceae	s			
209	4	ROPA0	<i>Rorippa palustris</i> ssp. <i>occidentalis</i>	western bog yellowcress	Brassicaceae	f/h		<i>Rorippa islandica</i> var. <i>occidentale</i>	

#	Ab	Symbol	Accepted Scientific Name	Common Name	Family	Habit	Exotic?	Hitchcock & Cronquist Synonym	Status
270	3	VASC2	<i>Valeriana scouleri</i>	Scouler's valerian	Valerianaceae	f/h			
271	4	VALO	<i>Valerianella locusta</i>	Lewiston cornsalad	Valerianaceae	f/h	Y		
272	2	VAHE	<i>Vancouveria hexandra</i>	white insideout flower	Berberidaceae	f/h			
273	4	VECA2	<i>Veratrum californicum</i>	California false hellebore	Liliaceae	f/h			
274	3	VEAM2	<i>Veronica americana</i>	American speedwell	Scrophulariaceae	f/h			
275	3	VEAR	<i>Veronica arvensis</i>	corn speedwell	Scrophulariaceae	f/h	Y		
276	3	VEOF2	<i>Veronica officinalis</i>	common gypsyweed	Scrophulariaceae	f/h	Y		
277	4	VESC2	<i>Veronica scutellata</i>	skullcap speedwell	Scrophulariaceae	f/h			
278	3	VESEH2	<i>Veronica serpyllifolia</i> ssp. <i>humifusa</i>	brightblue speedwell	Scrophulariaceae	f/h			
279	5	VESES	<i>Veronica serpyllifolia</i> ssp. <i>serpyllifolia</i>	thymeleaf speedwell	Scrophulariaceae	f/h	Y		
280	3	VIH1	<i>Vicia hirsuta</i>	tiny vetch	Fabaceae	f/h	Y		
281	3	VISAN2	<i>Vicia sativa</i> ssp. <i>nigra</i>	garden vetch	Fabaceae	f/h	Y	<i>Vicia sativa</i> var. <i>angustifolia</i>	
282	3	VUBR	<i>Vulpia bromoides</i>	brome fescue	Poaceae	g	Y	<i>Festuca bromoides</i>	
283	3	VUMY	<i>Vulpia myuros</i>	rat-tail fescue	Poaceae	g	Y	<i>Festuca myuros</i>	

Key to Codes Used

Ab: Abundance. An abundance rating system indicates how common each species is in the park. The 5 rating levels are:

- 1—Abundant in multiple plant communities
- 2—Common in multiple plant communities
- 3—Common in specific plant communities
- 4—Uncommon in specific plant associations
- 5—Rare, five or fewer sightings in the park.

Code: Four-six digit alphanumeric species code as shown on the USDA PLANTS database (USDA, NRCS. 2006).

Habit: Growth habit:

- t = tree
- ss = subshrub
- s = shrub
- f/h = forb/herb
- g = graminoid

Exotic?: Species that are not native to the park are indicated with a "Y"

Hitchcock & Cronquist Synonym: Indicates previous nomenclature, when different from current, as used in Hitchcock and Cronquist (1973).

Status: Any species classified by the WNHP as "endangered", "threatened," "sensitive" or "watch." Also species listed as noxious by the Washington State Noxious Weed Control Board (<http://www.nwcb.wa.gov>) are identified by class. "()" indicates noxious weed listing at state level but not in Pierce or Thurston Counties.

APPENDIX B

Map of Volcanic Hazard Areas for Pierce County, Washington

This is an oversized figure. See separate figure pdf.

Nisqually Mashel State Park Master Plan Transportation Analysis

Prepared for:

The Portico Group

Prepared by:

Tilghman Group

March 6, 2009

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INTRODUCTION

This report describes the likely changes in traffic volume and operations with development of the proposed Nisqually Mashel State Park Master Plan. Located on SR-7, near Eatonville, Washington, this new park would be developed in phases over a 30-50 year period. The park's first phase would guide the first 20 years of operation, with subsequent phases to be defined following initial development. Accordingly, this report addresses traffic for the first 20 years of park operation.

Existing Conditions

The proposed park's site is located in Pierce County approximately 23 miles south of Tacoma, Washington and 2.5 miles west of Eatonville, Washington. The site is served by SR-7, also known as Mountain Highway East. Presently, the majority of the site is undeveloped. Fifteen single-family residences exist with access to Mashel Prairie Road.

Street System

Figure 1 illustrates the street system in vicinity of the proposed park's site. Area roads include:

- SR-7 (Mountain Highway East) – a state highway linking Tacoma (I-5) to Elbe (for access to Mount Rainier) and to Morton (US 12). The highway is classified as a rural minor arterial. SR-7 has two lanes and is 22 to 24 feet wide. Posted speed limit near the site is 50 m.p.h., although advisory limits of 25, 35 and 40 m.p.h. are posted on curves in the area.
- Eatonville Highway East – a two-lane County road connecting SR-7 to Eatonville. Pierce County classifies this road as a secondary arterial. It has a 35 m.p.h. speed limit and is approximately 22 feet wide.
- SR-161 – a two-lane state highway beginning at SR-7 south of Eatonville and running north to SR-18 in Federal Way. It is classified as a rural minor arterial. South of Eatonville, the highway is 22 feet wide with a 50 m.p.h. speed limit.
- Mashel Prairie Road (also known as Medical Springs Road). A two-lane road providing access to existing uses in and near the site. It is classified as a Local Road. It is approximately 24 feet wide and has a posted speed limit of 25 m.p.h.

Intersections on these roads are unsignalized. Traffic control consists of stop-signs on roads intersecting SR-7.

Traffic Volumes

Figure 2 shows existing summer peak traffic volumes on area roads. Summer volumes are shown since park traffic will be most active during summer months. Summer volumes have been extrapolated from existing counts, as described below.

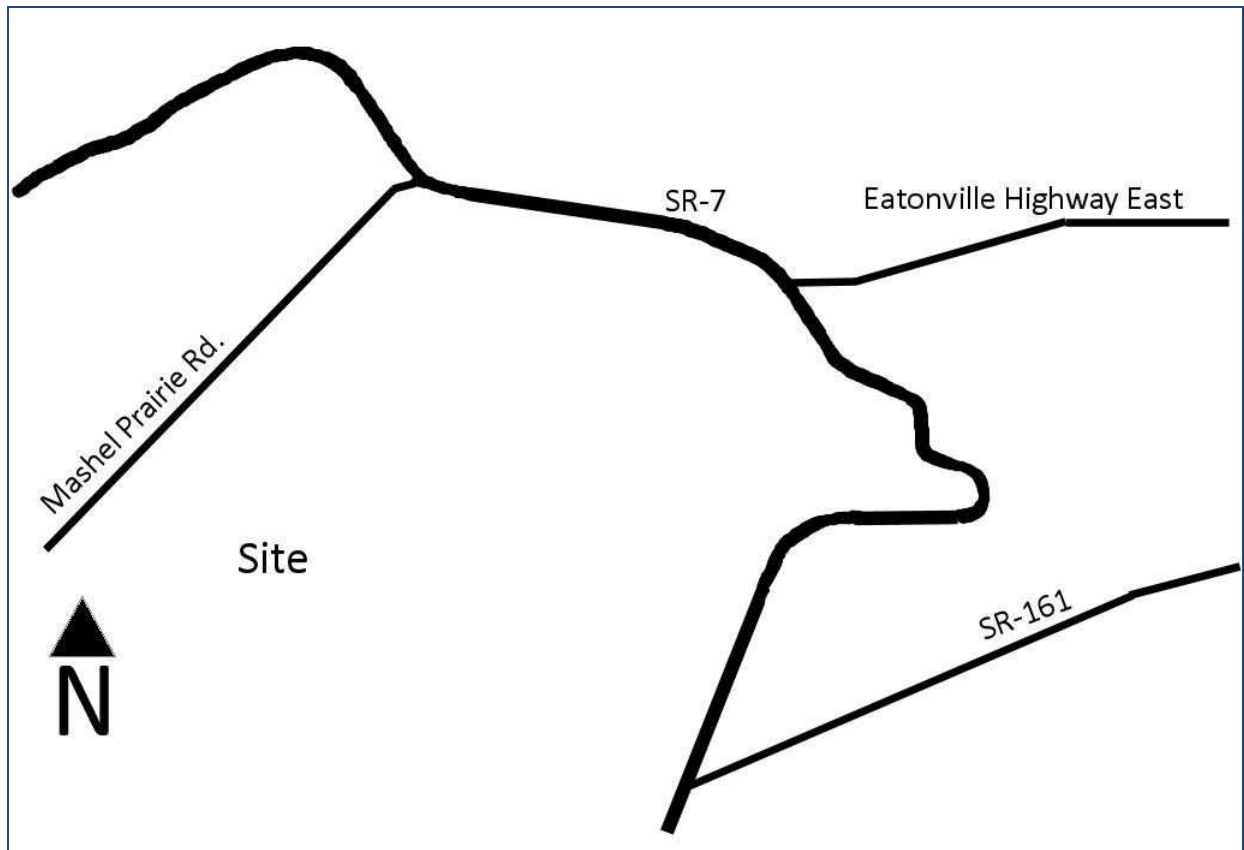
SR-7 is subject to large variations in volume over the seasons of the year. While not designated a recreational route, the highway is a key link for access to Mount Rainier National Park and experiences higher traffic volumes in summer months than in winter months. According to WSDOT, traffic peaks in August (33% higher than average) and hits a low in February (31% below average).

Daily volumes reported by WSDOT and Pierce County were last counted in 2007 and reflect Annual Average Daily (AADT) volumes. To obtain summer peak volumes, AADT volumes were multiplied by 1.33.

Turning movements at intersections were counted from 4:00 – 6:00 p.m. on Thursday, February 12, 2009 to determine the time of the peak hour and directional traffic patterns. (The counts are included in the Appendix). The peak volume occurred between 4:45 and 5:45 p.m. Recognizing that these volumes

were recorded during the lowest volume month of the year, they have also been factored up to reflect peak summer volumes.

Figure 1. Site Location and Road Network



Intersection Levels of Service

Table 1 shows intersection levels of service for current, summer traffic volumes at area intersections. Level of service is a measure of operating quality ranging from LOS A (free flowing traffic with little or no delay) to LOS F (interrupted flow and long delay).

Table 1. Intersection Level of Service – Summer PM Peak Hour (Unsignalized)	
Intersection	Existing 2009
Mashel Prairie Rd/SR-7 NB Left-turn WB Movements	B A
Eatonville Highway East/SR-7 SB Movements WB Left-turn WB Right-Turn	A B A
SR-161/SR-7 EB Movements WB Movements NB Movements SB Movements	B A A A

Source: Tilghman Group

Summer traffic operations are currently very good due in part to fairly low volumes and few conflicting movements that would incur delay. What minimal delay occurs in the peak summer month would be even less during other months of the year as volumes decrease from the summer peak.

Sight Distance

Mashel Prairie Road intersects SR-7 on a curve. Accordingly, existing sight-distance was checked to determine whether the intersection meets minimum requirements for traffic to stop safely should the need arise. Table 2 provides the results of those measurements.

Table 2. Intersection Sight Distance			
Mashel Prairie Rd/SR-7	Stopping Distance Required (feet)*	Stopping Distance Measured (feet)	Difference (feet)
View to Northwest (based on 55 mph design speed and 6% downgrade)	553	550	-3
View to Southeast (based on 55 mph design speed and level grade)	495	>800	>305

*Per WSDOT Design Manual, Figure 650-1 and 650-3.

Source: Tilghman Group

Stopping distance from the northwest is slightly (3 feet) below the minimum requirement. This deficiency occurs due to tree branches on the inside of the curve blocking drivers' views. Trimming the branches would increase sight distance beyond the minimum required distance.

Sight distance to the southeast far exceeds minimum requirements.

Future Background Conditions

Traffic will occur independently of the park's development. That growth and its influence on traffic operations is described below.

Changes to Road Network

No changes to the existing roadways in the area have been identified according to WSDOT and Pierce County. This analysis assumes that the current network and its roadway configurations remain unchanged in future years.

Growth in Traffic Volumes

While no other specific projects were identified in the park's vicinity, traffic is expected to increase over time due to general population growth. Volume growth assumptions used in this analysis include:

- 1% annual growth is assumed from existing 2009 to year 2010 volumes. Although traffic volumes may currently be declining due to the economic recession, a modest rate of growth has nonetheless been applied.
- 1.5% annual growth from 2010 to 2013. This reflects some improvement in the regional economy.
- 2.5% annual growth from 2013 to 2018. A higher level of activity is assumed in this period.
- 3.0% annual growth from 2018 to 2028. This assumption represents a fairly high rate of traffic growth in the second half of the planning period. Combined, these rates of growth average 2.5% annually over twenty-years.

Figures 2, 3, 4 and 5, present PM peak hour traffic volumes for background years 2010, 2013, 2018 and 2028, respectively.

Intersection Levels of Service

Future background levels of service are shown in Table 3.

Table 3. Intersection Level of Service – Summer PM Peak Hour (Unsignalized)					
	Existin g	Future Background			
Intersection	2009	2010	2013	2018	2028
Mashel Prairie Rd/SR-7 NB Left-turn WB Movements	B A	B A	B A	B A	B A
Eatonville Highway East/SR-7 SB Movements WB Left-turn WB Right-Turn	A B A	A B A	A B A	A B A	A B B
SR-161/SR-7 EB Movements WB Movements NB Movements SB Movements	B A A A	B A A A	B A A A	B A A A	B B A A

Very little change in operating quality occurs due to background traffic growth. At the Eatonville Highway East/SR-7 intersection, the westbound right turn falls to LOS B in 2028. Similarly, at the SR-161/SR-7 intersection, the westbound movements fall to LOS B in 2028.

Figure 2.

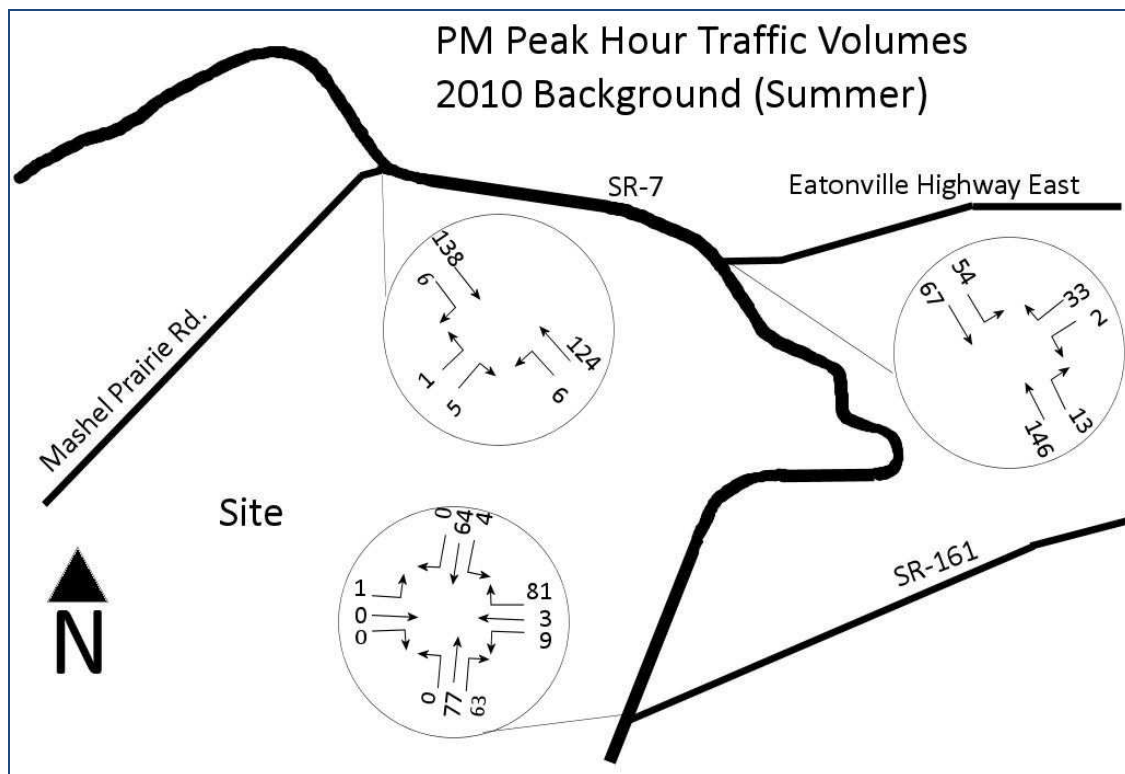


Figure 3

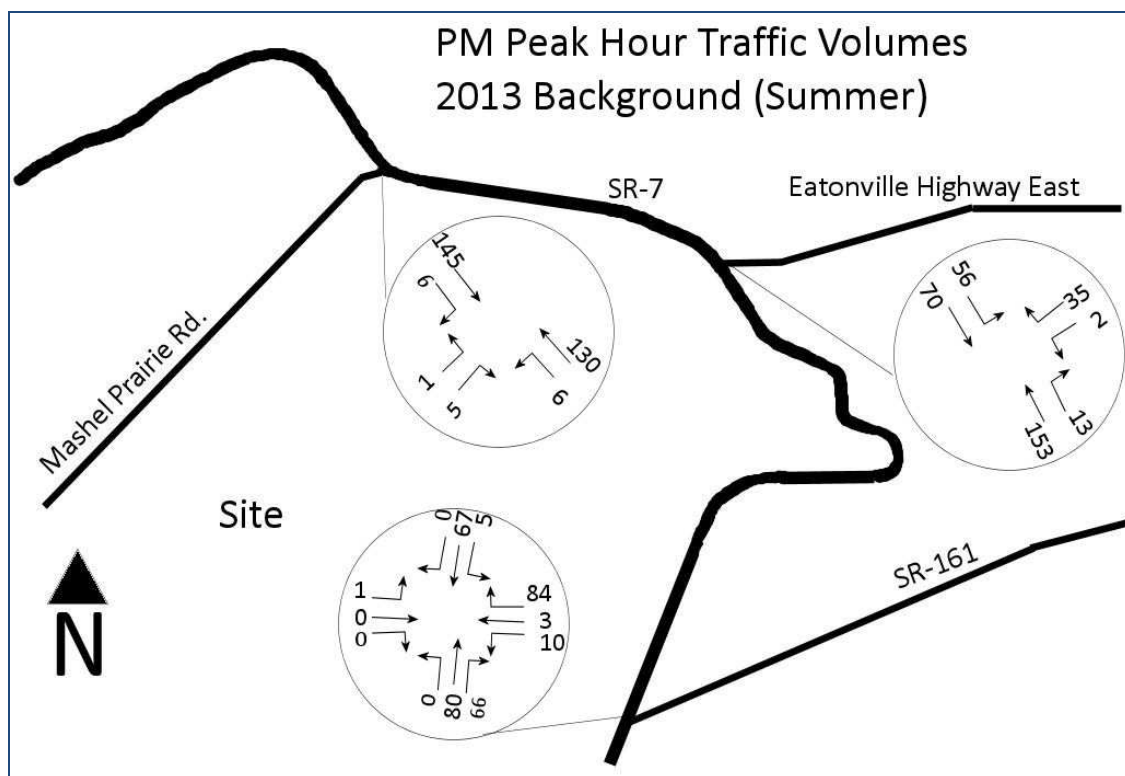


Figure 4

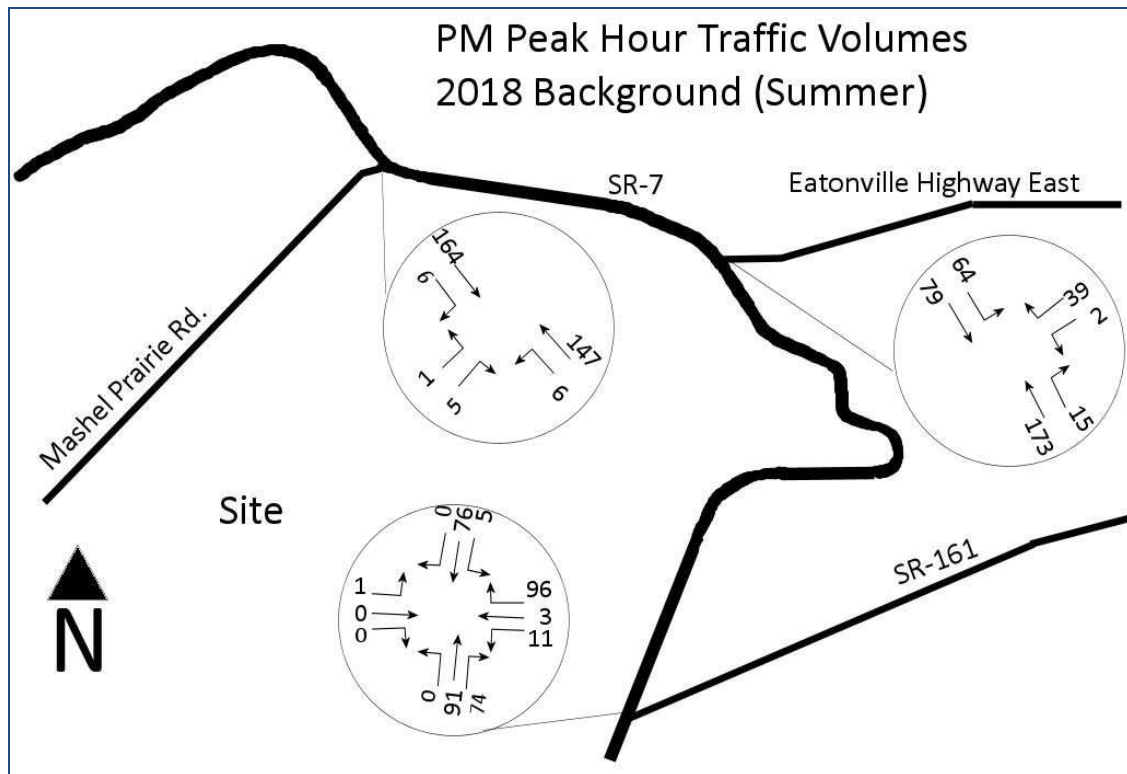
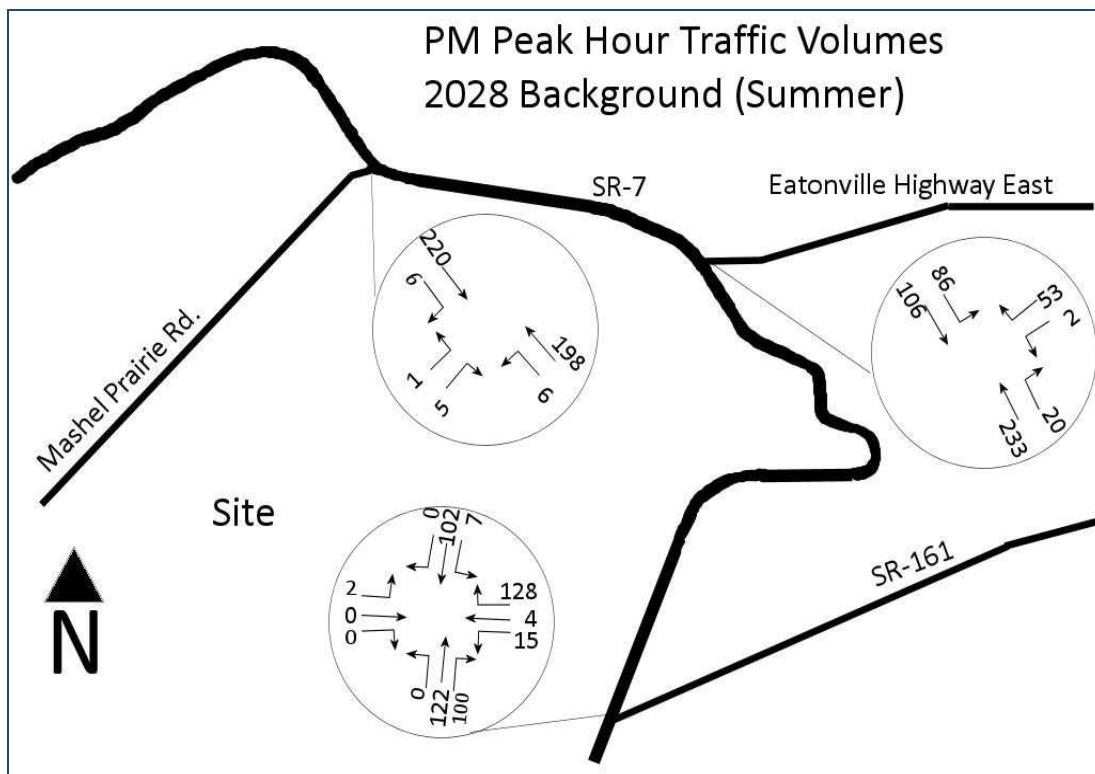


Figure 5



Future Conditions with the Project

The amount of traffic added by the proposed park and its affect on area traffic operations are described in this section.

Proposed Uses and Phasing

Table 4 lists the park's planned uses by phase of development.

Table 4. Proposed Uses in Park	
Uses by Phase	Floor Area or No. of Units Added
Phase 1a 2009 – 2010 Day Use Area Trail to Mashel River Valley Overlook	
Phase 1b 2010 – 2013 Mashel River High Bridge Peoples' Center – Initial Development Trail Extensions	10,000 sq. ft.
Phase 1c 2013 – 2018 Entry & Welcome Center Village Center Offices Stores Camping Trail Extensions SR-7 Undercrossing Peoples' Center – completion Leschi Village Shaker Church Cemetary and Springs	1,800 sq. ft. 800 sq. ft. 50 sites
Phase 1d 2018 – 2028 Camping Equestrian Center	135 sites

Source: The Portico Group

Park Entrance Location

Mashel Prairie Road would serve as the park's entrance and exit, at least in the early years of park development. As previously noted, however, its location achieves only minimum sight distance standards. While it can meet sight distance requirements an alternate driveway located approximately 1,500 feet to the east on SR-7 would eliminate sight distance concerns. Over time, this alternate driveway would better serve those visitors less familiar with the area's roads and those who drive recreational vehicles. The Master Plan anticipates using that driveway, possibly by Phase 1c and most

likely by Phase 1d. The timing depends in part on the need to acquire additional land to connect the driveway to the park.

Trip Generation

Vehicle trips have been calculated for a peak summer day based on the anticipated numbers of visitors and staff by phase. Table 5 shows the projected peak day population.

Table 5. Projected Peak Day Population				
	Phase 1a	Phase 1b	Phase 1c	Phase 1d
Staff	11	17	28	50
Visitors	60	200	300	400
Campers			50	110
Event Visitors		100	500	1,500
Totals	71	317	878	2,060

Events include programmed activities at selected gathering spots within the park. Larger events would occur only a few times each year. The peak day includes two large events at the Village Center and two smaller events at the Peoples' Center. (See Appendix A for an illustration of visitor arrivals by time of day).

Table 6. Vehicle Trip Generation by Phase				
Use	PM Peak Hour (5-6 p.m.)			Daily
	In	Out	Total	
Phase 1a				
Day Use Area	1	5	6	64
People's Center	0	2	2	15
Village Center	0	2	2	15
Camping	0	0	0	0
Equestrian Center	0	0	0	0
	1	10	11	94
Phase 1b				
Day Use Area	2	6	8	93
People's Center	4	7	10	158
Village Center	0	0	0	0
Camping	0	0	0	0
Equestrian Center	0	0	0	0
	5	13	18	251
Phase 1c				
Day Use Area	2	6	8	93
People's Center	4	8	12	384
Village Center	4	7	10	158
Camping	12	6	18	180
Equestrian Center	0	0	0	0
	21	27	48	815
Phase 1d				
Day Use Area	2	7	9	99
People's Center	4	91	95	473
Village Center	7	14	21	892
Camping	44	22	67	666
Equestrian Center	0	8	8	59
	57	143	199	2,188

Source: Tilghman Group

Visitors are all assumed to arrive by car. Each vehicle is assumed to carry an average of 2.8 persons, a figure slightly less than has been recorded at Mount Rainier National Park where 2.9 persons per vehicle has been observed over the last ten years.

Traffic Distribution

Based on the regional distribution of population, with the Olympia, Tacoma and Seattle metropolitan areas located north of the site, the majority of park traffic is expected to arrive from and return to the north on SR-7. Some shift in emphasis to and from the south is expected as the park continues to develop and becomes more of a statewide attraction. Table 7 lists the expected distribution of traffic by phase.

Table 7. Regional Traffic Distribution			
Phase	To/From the North on SR-7	To/From the South on SR-7	To/From Eatonville and SR-161
1a	80%	15%	5%
1b	80%	15%	5%
1c	75%	20%	5%
1d	70%	23%	7%

Source: Tilghman Group

Figures 6, 7, 8 and 9 show future volumes with the addition of park traffic.

Figure 6.

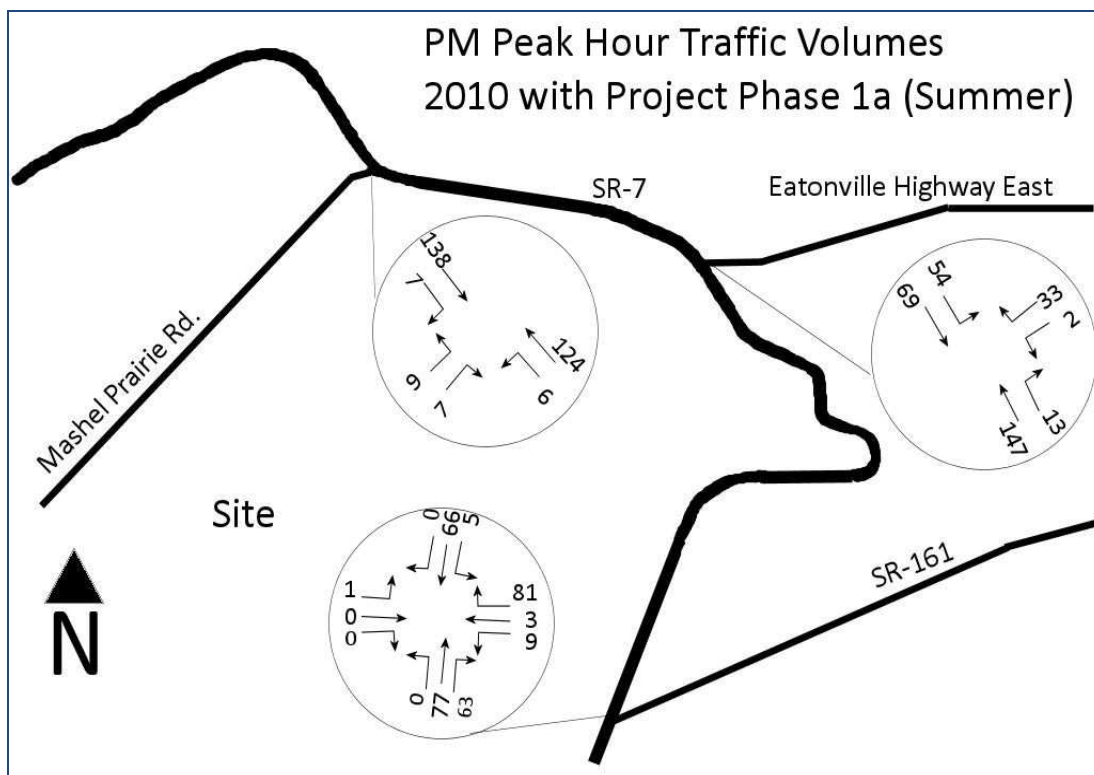


Figure 7.

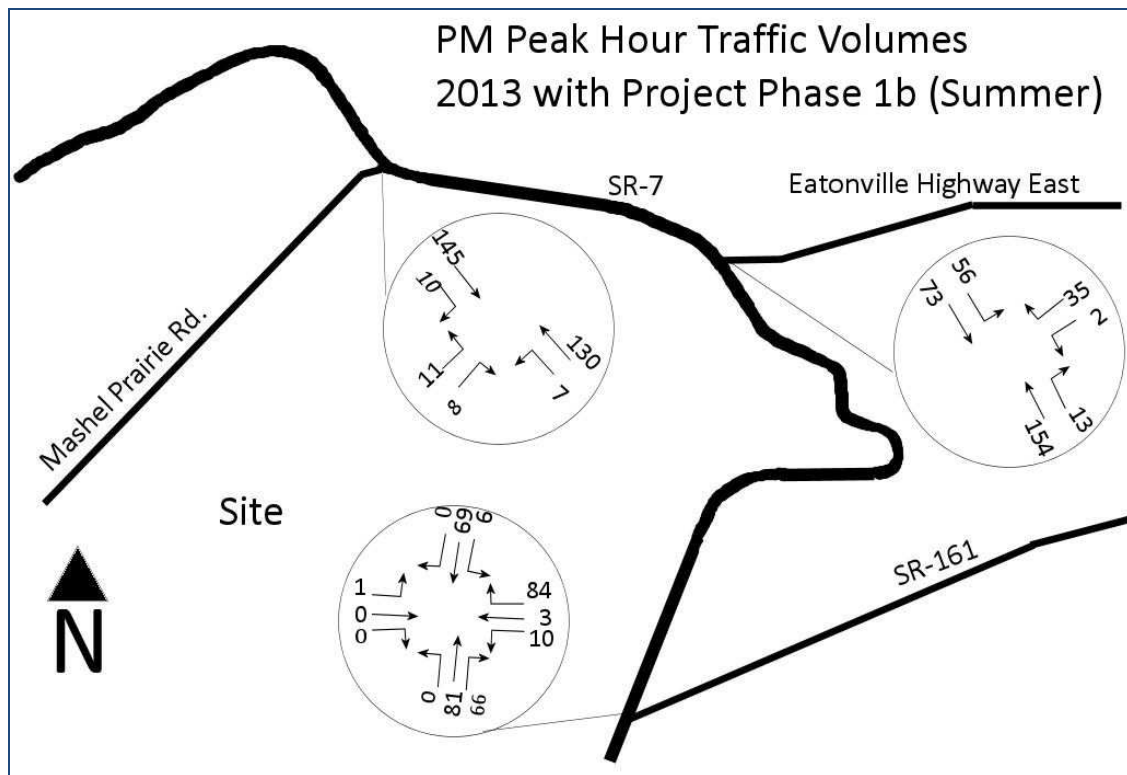


Figure 8.

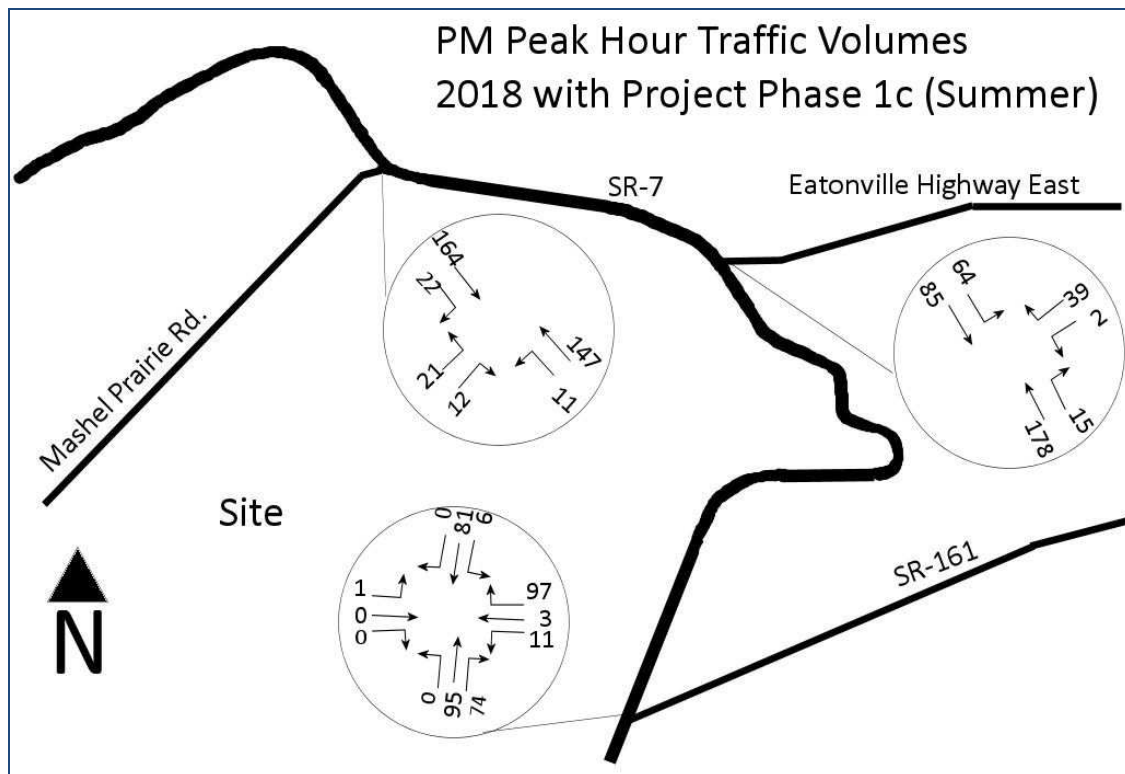
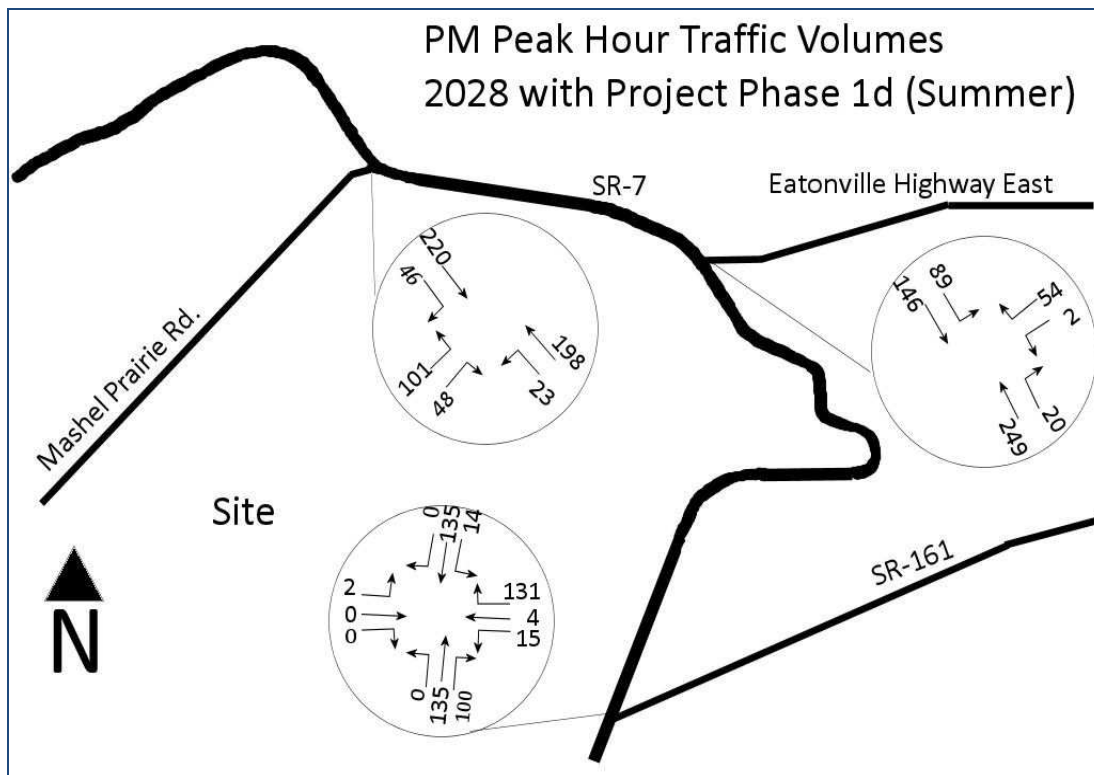


Figure 9.



Intersection Levels of Service

Table 8 shows levels of service when park traffic is added to area intersections. The analysis is for the summer peak month during the afternoon peak hour.

Table 8. Intersection Level of Service – Summer PM Peak Hour (Unsignalized)									
Intersection	Existing	Future Background				Future With Project			
	2009	2010	2013	2018	2028	2010	2013	2018	2028
Mashel Prairie Rd/SR-7*									
NB Left-turn	B	B	B	B	B	B	B	B	B
WB Movements	A	A	A	A	A	A	A	A	A
Eatonville Highway East/SR-7									
SB Movements	A	A	A	A	A	A	A	A	A
WB Left-turn	B	B	B	B	B	B	B	B	B
WB Right-Turn	A	A	A	A	B	A	A	A	B
SR-161/SR-7									
EB Movements	B	B	B	B	B	B	B	B	B
WB Movements	A	A	A	A	B	A	A	A	B
NB Movements	A	A	A	A	A	A	A	A	A
SB Movements	A	A	A	A	A	A	A	A	A

*Or at alternate driveway 1,500 east on SR-7. Volumes are identical for either driveway location.

Source: Tilghman Group

All locations continue to operate at LOS A or LOS B with the addition of peak day park traffic. Existing traffic controls and intersection configurations would adequately serve the projected volumes with park traffic at buildout.

Configuration of Park Entrance

By Phase 1d, entering volumes come close to warranting a right-turn pocket or taper. Such a feature would help separate vehicles slowing to enter the park from through traffic and would apply either to the existing Mashel Prairie Road entrance or to the alternate entrance east of that intersection. According to WSDOT Design Manual guidelines (Figure 910-15), the projected 2028 volumes indicate only that such lane treatments may need to be considered. The actual need for any right-turn lane additions will be addressed as the park develops and as subsequent traffic analyses are prepared for each phase.

Additionally, more positive channelization of the exit lane on Mashel Prairie Road could assist in positioning drivers to achieve optimal sight-distance. The current intersection flares broadly at SR-7 with a total width of 146 feet. Exiting vehicles could benefit from clearly striped lane lines that would direct them to the most appropriate approach to the intersection.

Pedestrian Facilities

The park's numerous internal trails would eventually be linked to external trails for access to nearby communities and the region. At least two crossings of SR-7 are contemplated, one an undercrossing and one a surface crossing. For access to Eatonville, a surface crossing of SR-7 is necessary. It is anticipated that a crossing near the intersection of SR-7/Eatonville Highway East would be provided. Given traffic patterns, a crossing located immediately southeast of that intersection would face fewer vehicles than if located on the northwest side. This would reduce the number of conflicts that pedestrians and cyclists would experience crossing the highway. The future timing of this crossing, its potential level of use and configuration are not known at this time and would need to be identified in subsequent analyses.

Parking

Parking would be provided at key destinations within the park. These destinations include the Day Use area, the Village Center and the Peoples' Center. Both permanent, hard surface and temporary, permeable surface parking would be provided as necessary to meet demand. Special events occurring on select days during the summer would typically use temporary parking on grass or similar surfaces, so as to minimize storm water runoff areas and the appearance of excessive pavement during other lower attendance days.

Table 9 shows parking demand by use and by phase for the peak day. Figure _ illustrates the variation in demand across the day for the peak summer day.

Use	Phase 1a	Phase 1b	Phase 1c	Phase 1d
Day Use Area	16	19	19	22
Peoples' Center	6	38	157	110
Village Center	n/a	n/a	37	252
Camping	n/a	n/a	60	222
Equestrian Center	n/a	n/a	n/a	17

n/a = not applicable

Source: Tilghman Group

Figure 10. Phase 1a Peak Day Parking Demand

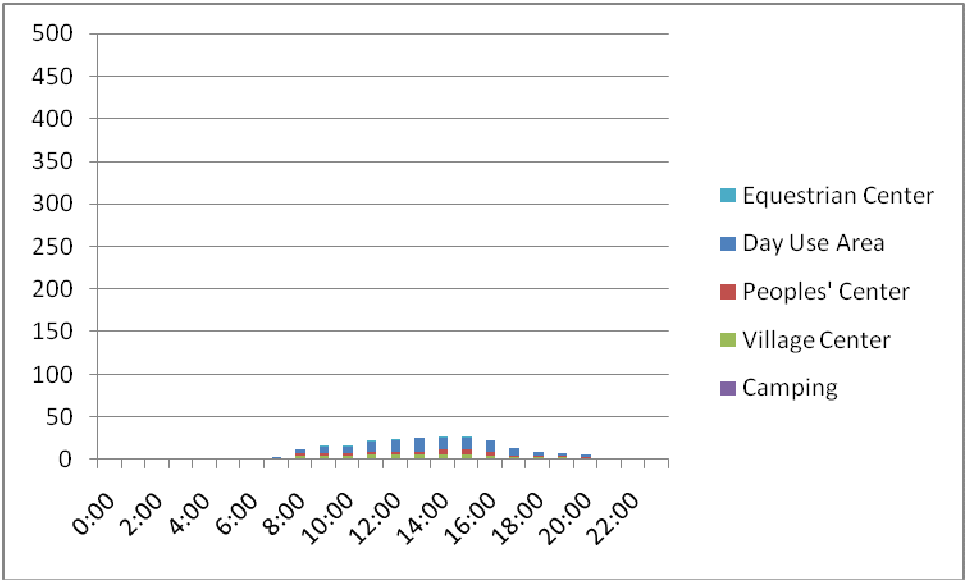


Figure 11. Phase 1b Peak Day Parking Demand

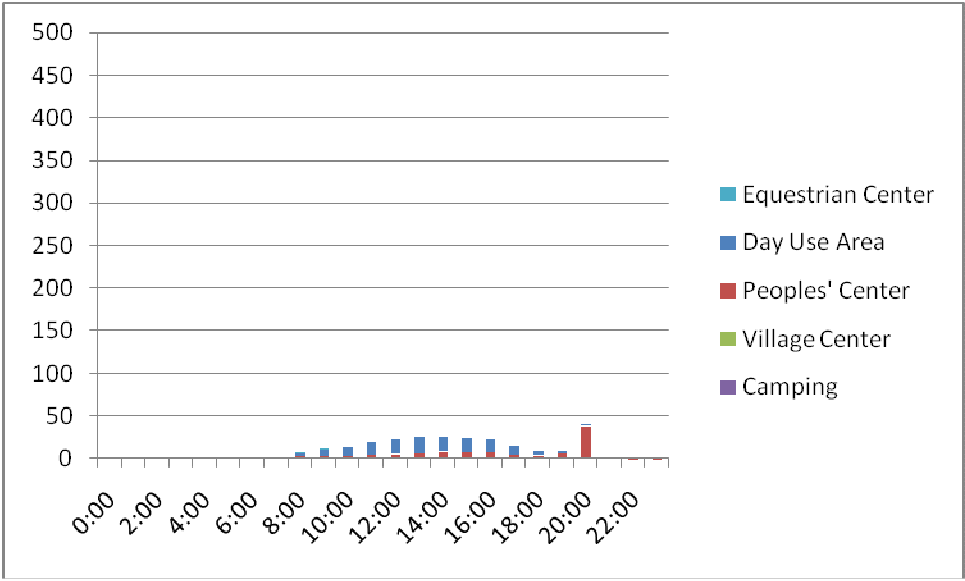


Figure 12. Phase 1c Peak Day Parking Demand

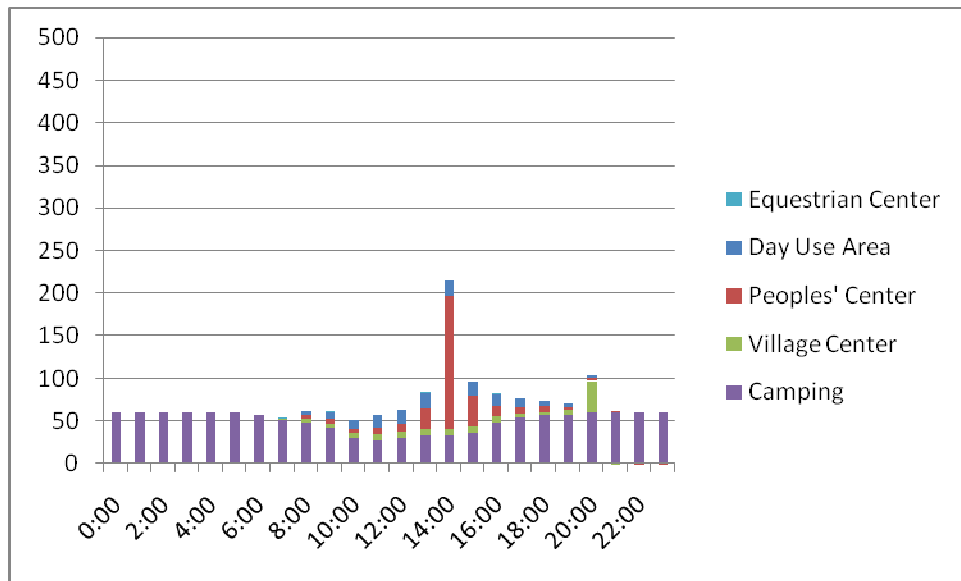
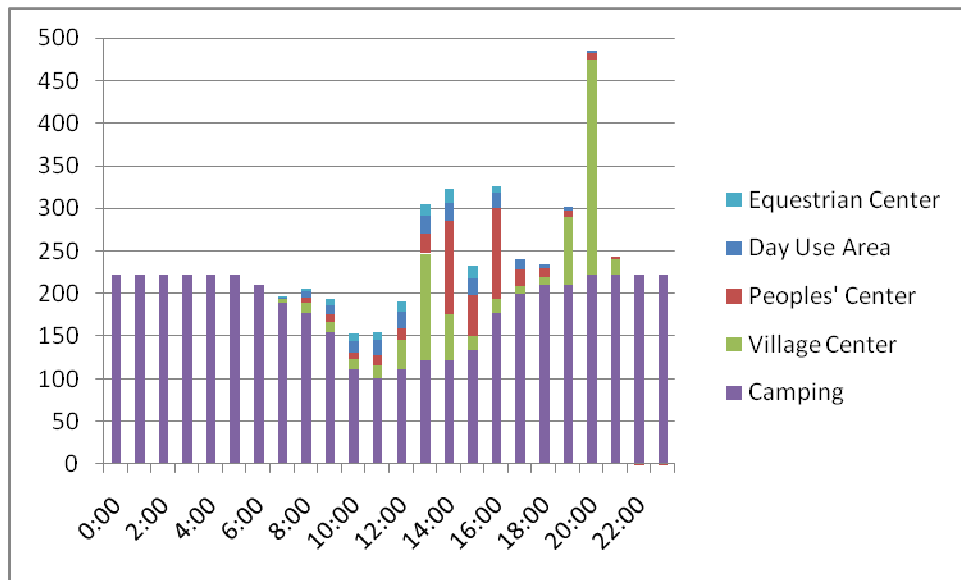


Figure 13. Phase 1d Peak Day Parking Demand



Conclusions and Recommendations

Based on this analysis, the proposed Nisqually Mashel State Park would not create transportation impacts requiring mitigation. Future intersection levels of service remain well above acceptable minimum performance, and sufficient traffic capacity exists to accommodate new park traffic.

In any case, these actions are recommended to improve existing transportation conditions and monitor future conditions:

1. Trim trees on inside of curve to correct the existing sight distance deficiency at Mashel Prairie Rd/SR-7.
2. Stripe approach on Mashel Prairie Road to SR-7 to reduce intersection flare and to align vehicles for best sight distance.
3. Relocate park's driveway to an existing private driveway on SR-7 approximately 1,500 east of Mashel Prairie Road to provide a superior entrance. This relocation is recommended by Phase 1d.
4. Monitor traffic volumes and consider a right-turn pocket or taper on SR-7 at entrance to park for Phase 1d.
5. Refine location for and configuration of a pedestrian crossing of SR-7 southeast of the intersection with Eatonville Highway East.

Appendix

Nisqually Mashel State Park Master Plan

Summary of Population and Operating Assumptions

Phase 1a		Number of persons arriving in hour beginning:																Peak Day
		6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	Persons
Day Use Area				1	2	6	7	9	12	9	6	3	3	2				60

Phase 1b																		
Day Use Area			2	4	10	12	15	20	15	10	5	5	2					100
Peoples' Center				5	10	10	15	15	8	10	10	10	7					100

Phase 1c																		
Day Use Area			2	4	10	12	15	20	15	10	5	5	2					100
Village Center			2	4	8	10	12	14	6	8	10	10	8	6	2			100
Event at Village Center																	100	
Peoples' Center				5	10	10	15	15	8	10	10	10	7				100	
Event at Peoples' Center									400								400	

Phase 1d																		
Day Use Area			2	4	10	12	15	20	15	10	5	5	2					100
Village Center			4	8	20	24	30	40	30	20	10	10	4					200
Event at Village Center								300									700	1000
Peoples' Center				5	10	10	15	15	8	10	10	10	7					100
Event at Peoples' Center									250		250							500
Equestrian Center				5	10	5	10	10	10									50

Colored bars represent hours of operation.

6-Feb-09
Tilghman Group

WAC 197-11-960 Environmental Checklist.

ENVIRONMENTAL CHECKLIST

Purpose of checklist:

The State Environmental Policy Act (SEPA), chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write "do not know" or "does not apply." Complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the governmental agencies can assist you.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that would help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Use of checklist for nonproject proposals:

Complete this checklist for nonproject proposals, even though questions may be answered "does not apply." IN ADDITION, complete the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D.)

For nonproject actions, the references in the checklist to the words "project," "applicant," and "property or site" should be read as "proposal," "proposer," and "affected geographic area," respectively.

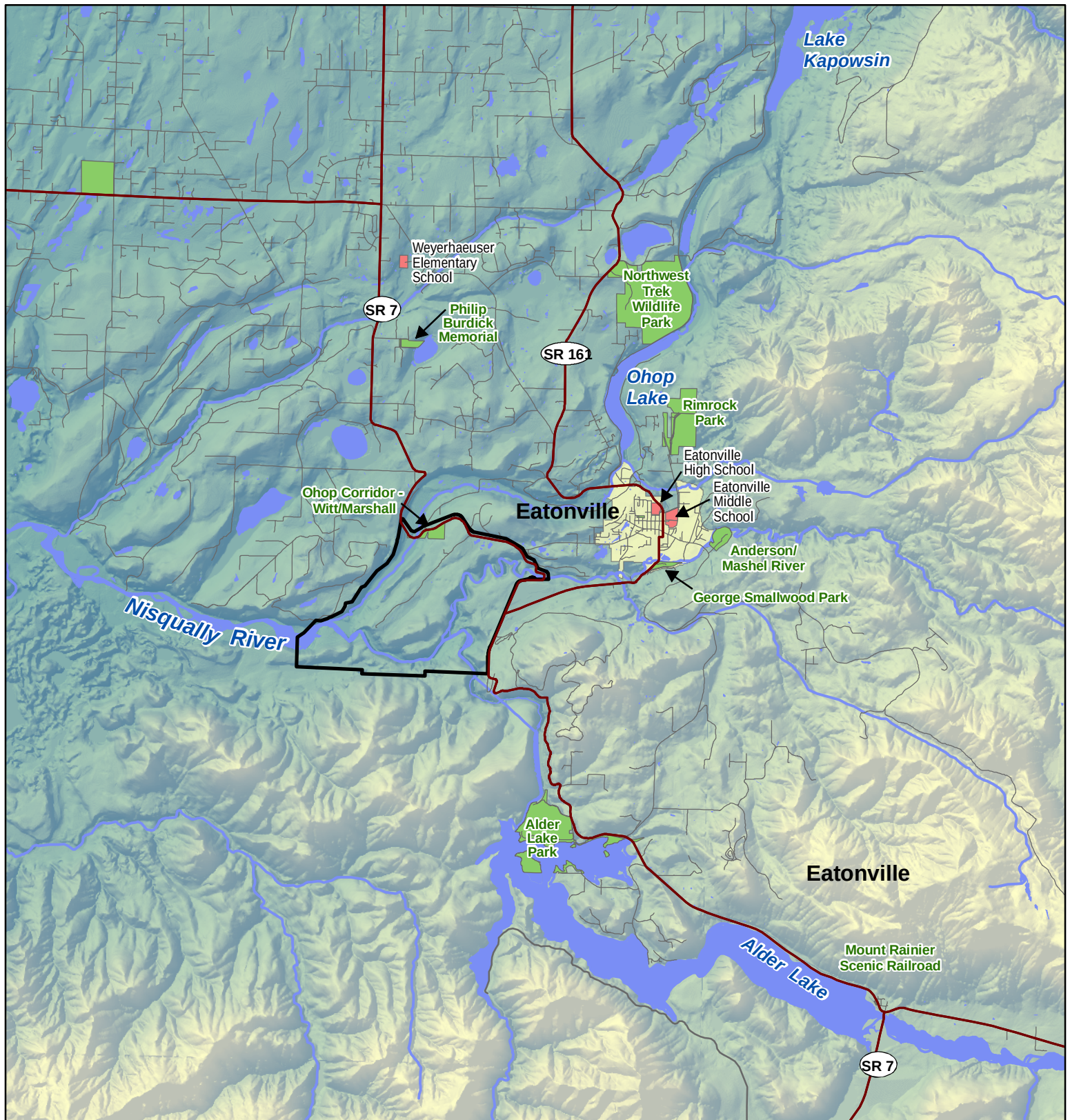
A. BACKGROUND

1. Name of proposed project, if applicable:

Nisqually-Mashel State Park Site Master Plan (See Figure 1.)

2. Name of applicant:

Washington State Parks and Recreation Commission

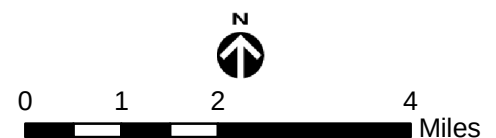


Legend

- Highway
- Road
- Long Term Park Boundary
- School
- Park
- City



Figure 1. Vicinity map for Nisqually-Mashel State Park in Pierce and Thurston counties, Washington.



HERRERA
ENVIRONMENTAL CONSULTANTS

K:\Projects\07-03750-000\Project\Vicinity_update.mxd

3. Address and phone number of applicant and contact person:

Nikki Fields
Parks Planner
Washington State Parks and Recreation Commission
1111 Israel Road SW, PO Box 42650
Olympia, Washington 98504-2650
(360) 902-8658
Nikki.Fields@parks.wa.gov

4. Date checklist prepared:

November 19, 2009

5. Agency requesting checklist:

Washington State Parks and Recreation Commission (WSPRC)

6. Proposed timing or schedule (including phasing, if applicable):

The proposed Nisqually-Mashel State Park Site Master Plan¹ is a general long-term vision for the property owned by WSPRC near the confluence of the Mashel and Nisqually rivers. The master plan includes an interpretive plan, land use plan, transportation and circulation plan, design guidelines, a stewardship plan, a business plan and a capital development plan. This SEPA Checklist describes impacts from Phases 1 through 4 of the master plan, which are proposed for development over a 20-year period, with construction anticipated to begin in the 2011 – 2013 biennial time period. The first four phases of development would be focused within the central plateau of the site and within much of the existing Washington State Parks property. It is only those first four phases of the Master Plan that are addressed in detail in this environmental analysis. Future Park phases are included in portions of the checklist where describing the general proposed activities might inform cumulative impacts. However, because future phases are highly conceptual, and far out in the future, extensive environmental analysis cannot be reasonably accomplished.

Phase 1, the first stage of Park development, would entail minimal improvements to the existing Park entry, construction of a day use area in the northern portion of the Park (day use picnic area, information kiosk, composting toilet, and parking area), and a 2,000-foot-long “out & back” trail to an overlook of the Mashel River (see Figure 2a.)

Phase 2 would include installation of utilities, construction of a new Park entry and extensive road improvements (both in-park roads and at the SR 7 Park entry), expansion of existing day use facilities including expanded parking, installation of one “high” bridge over the Mashel River, construction of a 10,000-square-foot interpretive center at the People’s Center in the central area of the Park, and establishment of a more extensive trail network (including a trail to the confluence of the Mashel and Nisqually rivers) (see Figure 2b.)

¹ Throughout this document, the subject property will be described as the Nisqually-Mashel State Park Site. The property has not been officially named by the Washington State Parks and Recreation Commission, which has singular responsibility for the naming of state parks areas. Until official naming, agency protocol is to label a property “... state park site.” Where

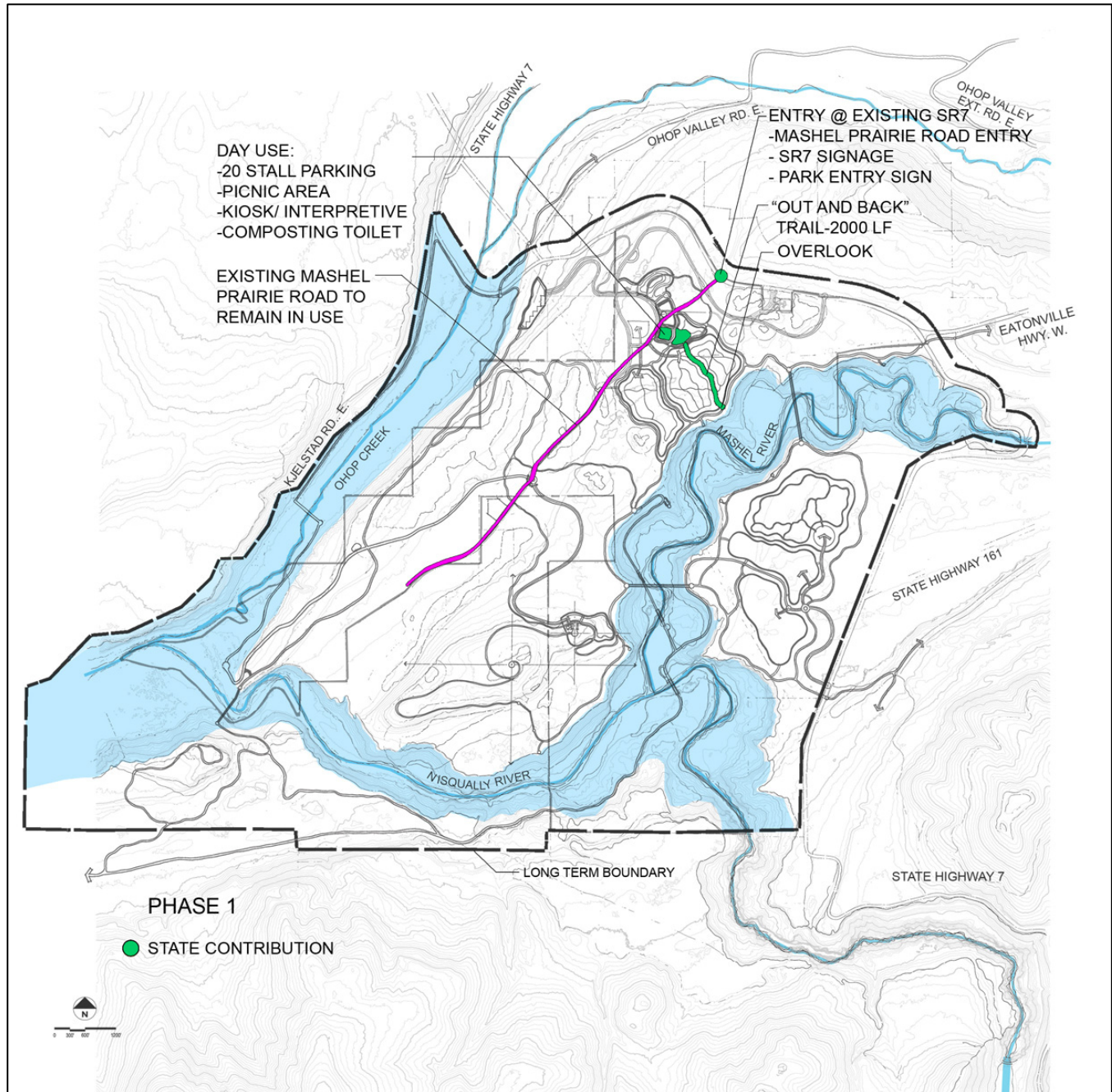


Figure 2a. Phasing Plan – Phase 1.

referenced documents include the name "Nisqually-Mashel State Park," that name is retained in this document.

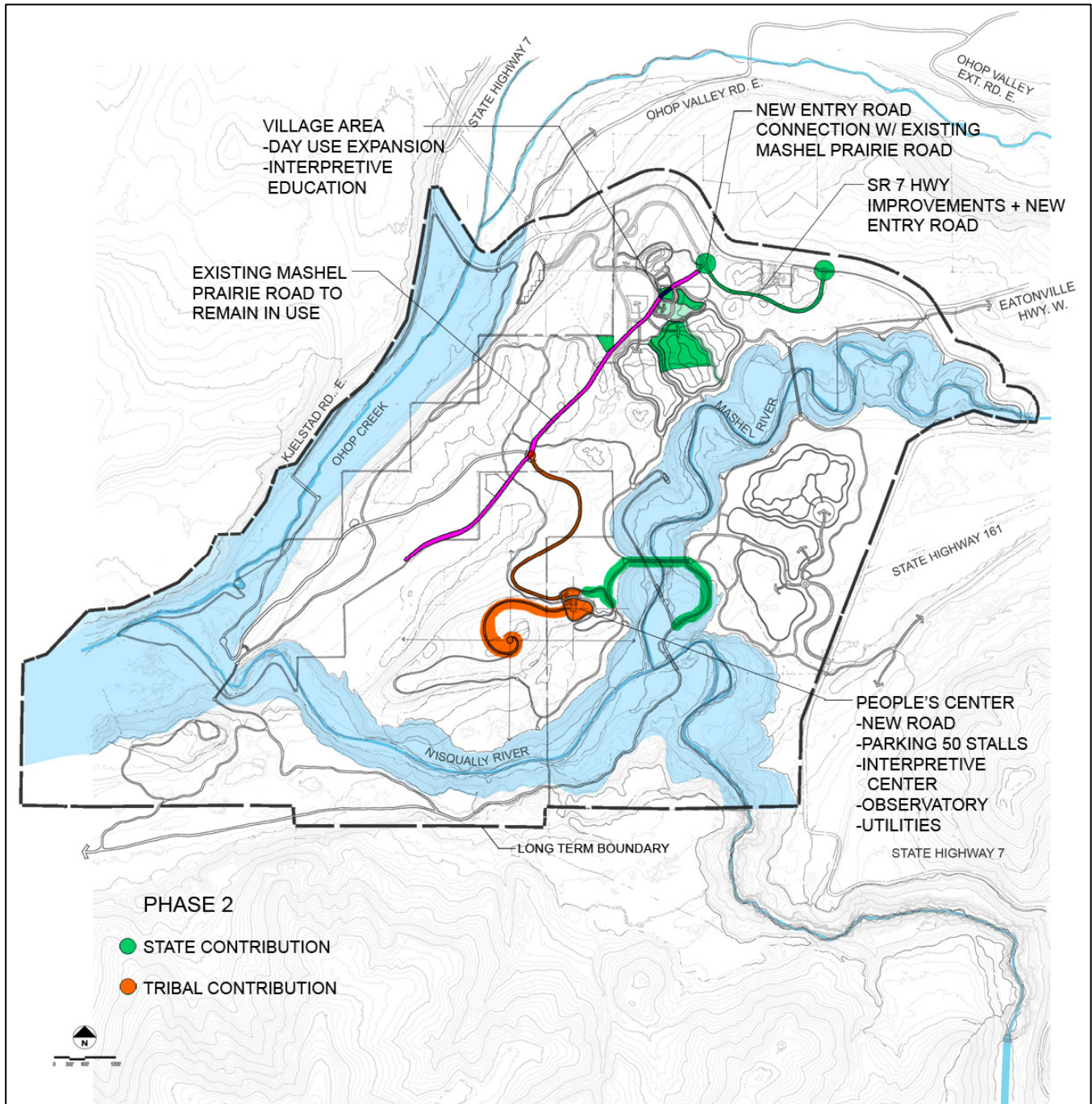


Figure 2b. Phasing Plan – Phase 2.

Phase 3 would involve further improvements to the Park entry and development of the Park Welcome Center (which is a visitor check-in station) and the Village Center area (which includes development of additional parking, camping, park maintenance/management facilities, a new park headquarters, store facilities and event gathering and outdoor theater areas), installation of additional utilities, completion of the People's Center (which includes a facility for tribal activities and programs, equipment and storage area, and day use area), and additional tribal programs development facilities, including the Observatory (a viewpoint and education platform to be located at the top of the central plateau hill) (see Figure 2c.)

Phase 4 would include expansion of camping facilities and trail networks, construction of equestrian center/trails, installation of two bridges over Ohop Creek and one over the Nisqually River (to provide access to the Traditional Knowledge Camp), and further development of the Traditional Knowledge Camp (see Figure 2d.)

Several key property acquisitions and use agreements would be required to complete Park development. Acquisition of the Manke Timber Company's central plateau properties would be needed for portions of Phase 1 through 4 developments. The UW Center for Sustainable Forestry Eastern Mashel Plateau property would be needed for portions of Phases 2 and 3. Tacoma Power and BPA easements through the Central Plateau would be needed for portions of Phases 1 through 4. The Weyerhaeuser Company parcel located adjacent to Highway 7 would be needed for the new Park entry.

Official Park naming, land classification, and long-term Park boundary determination would be the final agency actions under SEPA. Those action items would be taken for consideration by the Washington State Parks and Recreation Commission (Commission) at its December 2009 meeting. At that time, the Commission would also be asked to consider delegating authority to the agency Director to enter into negotiations with the Nisqually Indian Tribe to establish a partnership for development and operation of Park facilities consistent with the proposed Master Plan. All references to the Master Plan in this document also include the land classifications and long-term Park boundary, for the purposes of analyzing potential environmental impacts of this proposed non-project action.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

Yes. This checklist identifies the anticipated impacts of the first 20 years (Phases 1 through 4) of development. There are some elements of the Nisqually-Mashel State Park Site Master Plan that are not included within the first four phases of the plan covered by this SEPA checklist. These elements include:

1. additional day-use facilities in the Village Center
2. group camping, horse camping, a mountain bike course, and trails on the East Mashel Plateau
3. trails south of the Nisqually River
4. additional bridges over the Mashel and Nisqually Rivers to create loop trail systems

The additional day-use facilities in the Village Center are not included in the first four phases because capital funding to construct them will not be available until well into the future. The remaining facilities are not included in the first four phases because they will require significant land acquisitions and will also require funding that will not be available until well into the future.

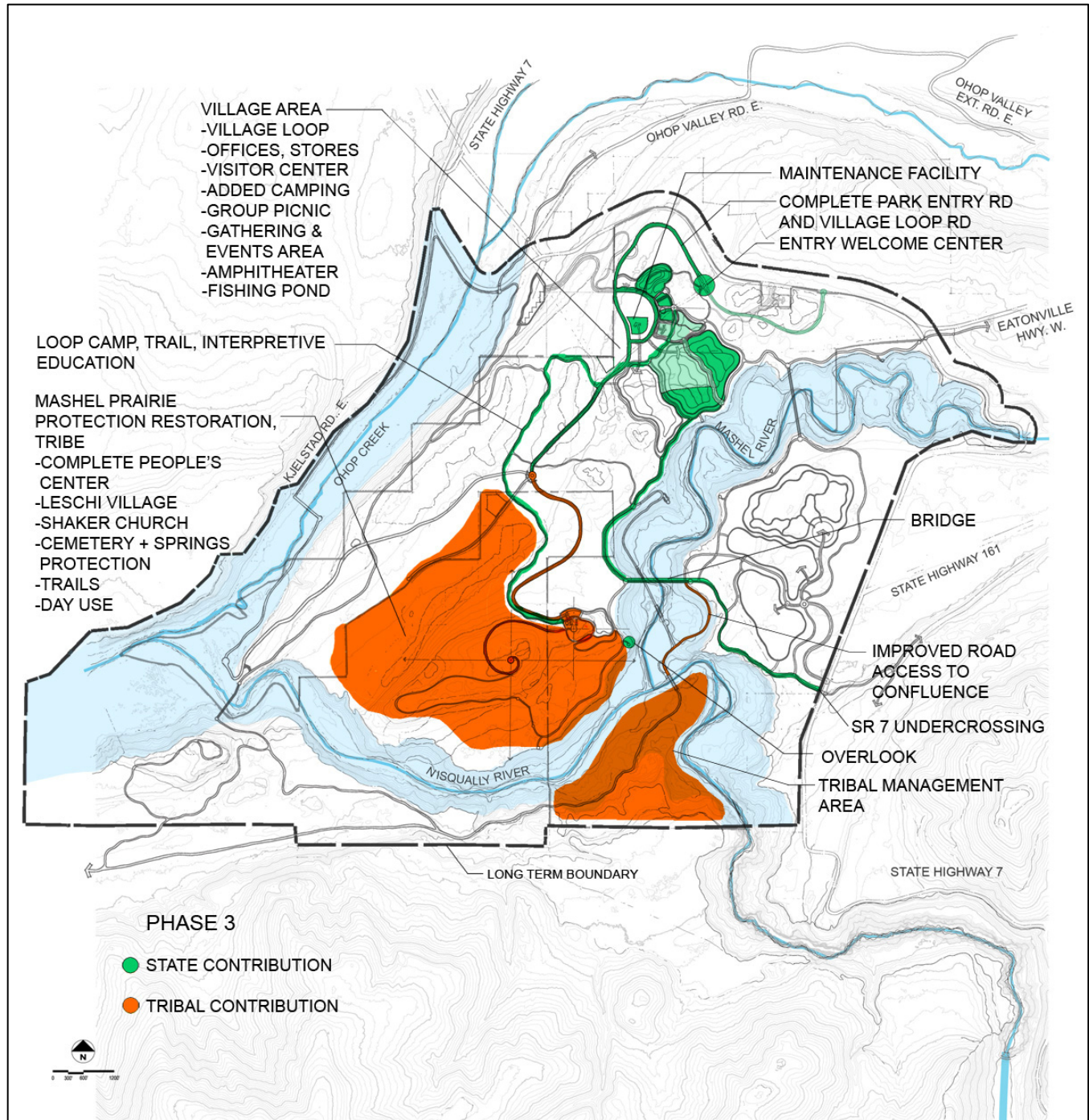


Figure 2c. Phasing Plan – Phase 3.

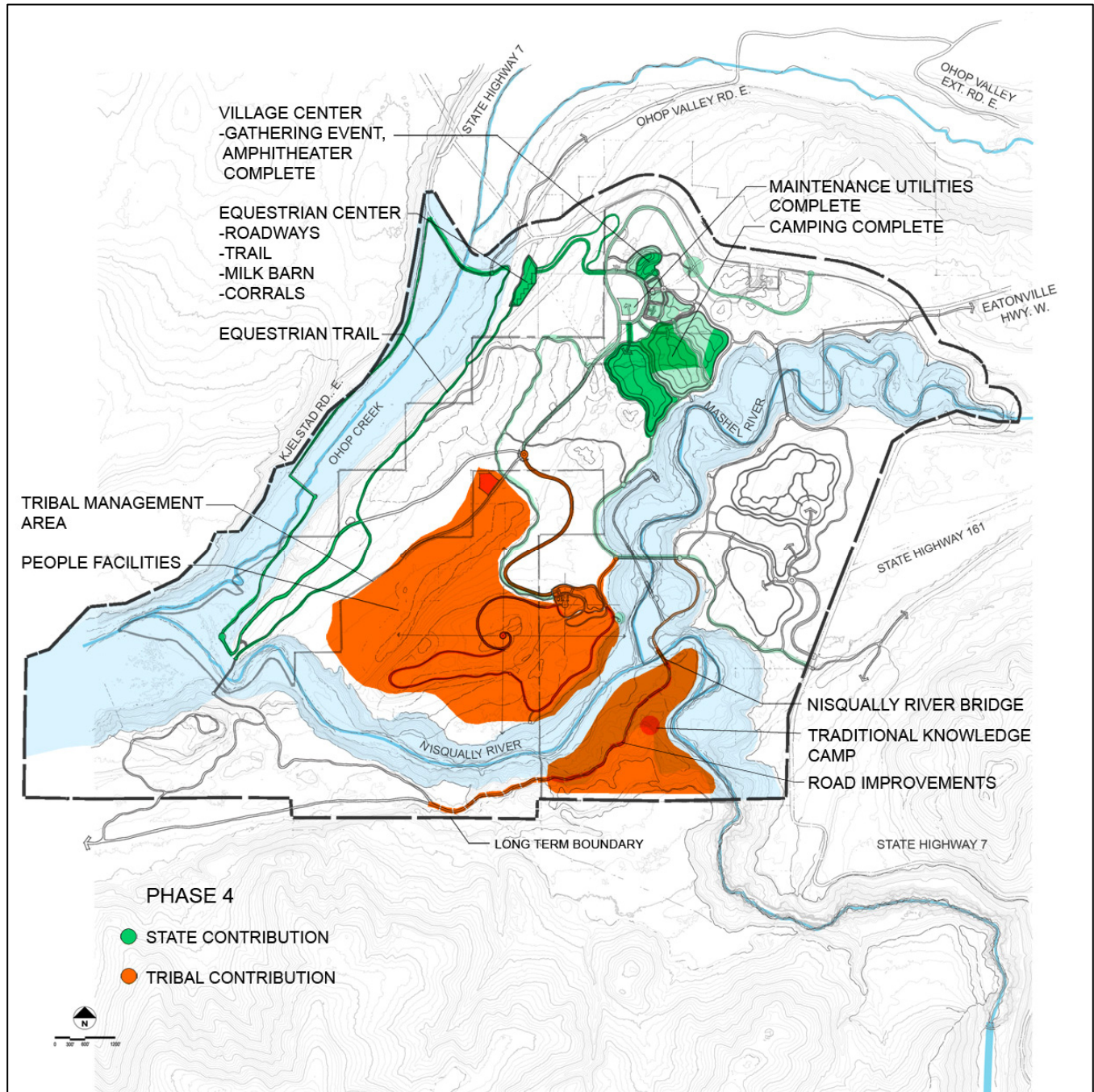


Figure 2d. Phasing Plan – Phase 4.

Because these future projects will be so far out, their environmental impacts cannot be accurately assessed at this time. Although site design guidelines included in the Master Plan will mitigate some impacts associated with these additional facilities, they would nevertheless have some environmental impacts that would be more thoroughly evaluated at a later time closer to development.

The proposed Nisqually-Mashel State Park Site boundary shown in the Master Plan (see Figure 3) is a long-term boundary and includes proposed properties to be managed consistent with state parks purposes. However, not every property identified in the long-term boundary would necessarily be acquired. Cooperative management or use agreements may be developed in lieu of actual acquisitions.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

The following list includes environmental studies, plans, and data sets prepared by local agencies, consultants, and researchers for the Nisqually-Mashel State Park Site Master Plan and also includes specific data requests to agencies for information on resources within the proposed Park boundary.

Emerson, S. and R. Ives. 2008. Cultural Resources Survey of the Proposed Nisqually-Mashel State Park, Pierce and Thurston Counties, Washington. Short Report 993. Archeological and Historical Services, Eastern Washington University. November 2008.

[This document contains the results of a cultural resources investigation of the proposed Nisqually-Mashel State Park Site.]

Ettl, G.J. and D. Emmons. 2008. Nisqually-Mashel State Park Forest Health Plan. Center for Sustainable Forestry at Pack Forest, University of Washington.

[In 2008, the Center for Sustainable Forestry at Pack Forest, University of Washington, completed the Nisqually-Mashel State Park Forest Health Plan, which encompassed a forest health assessment and subsequent creation of a forest management plan for the Park.]

Herrera Environmental Consultants. 2008. Environmental Constraints Report - Nisqually-Mashel Property. Prepared for The Portico Group by Herrera Environmental Consultants, Inc. October 2008.

[This report documents environmental constraints considered during development planning for the Nisqually-Mashel Property. Environmental constraints include regulated environmental features and important or unique vegetation communities.]

LYRA Biological. 2006. Rare Plant and Vegetation Survey of Nisqually-Mashel State Park. Prepared for Washington State Parks and Recreation Commission. December 2006.

[LYRA Biological completed a rare plant and vegetation survey for the Nisqually-Mashel State Park Site that characterizes various vegetation communities within the Park and documents their efforts to locate any rare plant taxa occurring on the property.]

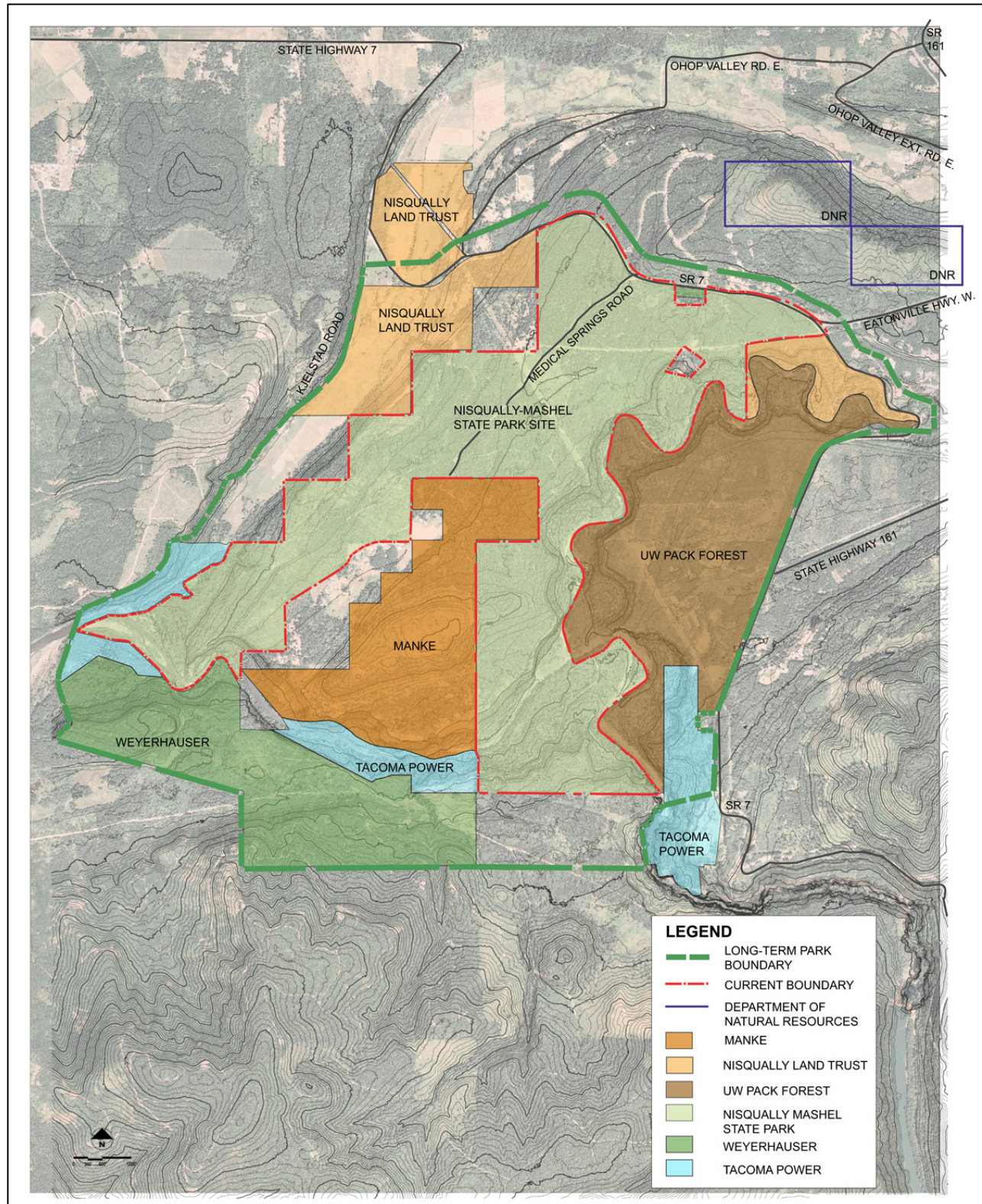


Figure 3. Long-term boundary.

Tilghman Group. 2009. Nisqually-Mashel State Park Traffic Analysis. February 2009.

[This document contains the results of a traffic analysis prepared for the proposed Nisqually-Mashel State Park Site Master Plan.]

Washington Department of Fish and Wildlife (WDFW.) 2008. Priority Habitat and Species GIS dataset. Provided by Washington Department of Fish and Wildlife to Herrera Environmental Consultants, Inc. on May 2, 2008.

[This data set contains information on federal and state endangered and threatened animal species distribution for the Nisqually-Mashel State Park Site and the source is referenced as a primary source of wildlife habitat distribution information in the Pierce County and Thurston County codes. The dataset was also recommended by the local district WDFW Habitat Program Biologist and district WDFW Wildlife Biologist for identifying the locations of important wildlife habitat within the Nisqually-Mashel State Park Site (Kuntz 2008, Tirhi 2008.)]

Washington Department of Natural Resources (WDNR.) 1996. Hydrography data layer for Pierce County, Washington. May 1996. Washington State Department of Natural Resources. Obtained August 1, 2004, from agency website:
<<http://www.dnr.wa.gov/dataandmaps/index.html>>.

[This data set contains WDNR water typing information for all streams for the Nisqually-Mashel State Park Site, including their fish status.]

Washington Natural Heritage Program (WNHP.) 2008. Washington Natural Heritage Program Geographic Information System Spatial Data Set, September 2008:
<<http://www.dnr.wa.gov/nhp/refdesk/gis/wnhpgis.html>>.

[This data set contains information on federal and state endangered and threatened plant species distribution for the Nisqually-Mashel State Park Site, and it is acknowledged as an authoritative reference on this topic in the Pierce County and Thurston County codes.]

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

There are no pending applications for government approvals of other proposals affecting the property covered by the proposed Nisqually-Mashel State Park Site Master Plan.

10. List any government approvals or permits that will be needed for your proposal, if known.

A SEPA Review and Threshold Determination are required for consideration of the Nisqually-Mashel State Park Site Master Plan by the Commission. The SEPA analysis will aid in the review and approval of the proposed master plan by WSPRC. No further government approvals and permits are required for the proposed non-project action. Developments constructed under the proposed Nisqually-Mashel State Park Site Master Plan may require the following county, state, and federal approvals:

- Section 404 (U.S. Army Corps of Engineers)
- Section 401 (Washington State Department of Ecology)

- Hydraulic Project Approval (HPA) (Washington Department of Fish and Wildlife)
- National Pollutant Discharge Elimination System (NPDES) permit (Washington State Department of Ecology)
- SEPA Review and Threshold Determination (Washington State Parks and Recreation Commission)
- Shoreline Substantial Development Permit (Pierce County and Thurston County)
- Clearing and Grading Permit (Pierce County and Thurston County)
- Critical Areas review (Pierce County and Thurston County)
- Building Permit (Pierce County; no buildings are planned for the Thurston County portion of the Park site.)

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The proposed action is adoption and implementation of the Nisqually-Mashel State Park Site Master Plan by the Washington State Parks and Recreation Commission (Commission). The Master Plan was created by Washington State Parks and Recreation Commission, with contractual assistance from The Portico Group and a group of sub-consultants, to guide development of a proposed state park near Eatonville, Washington, at the confluences of the Mashel River and Ohop Creek with the Nisqually River. (See Figure 1.) The Master Plan was developed with extensive public involvement and consultation, including partner, stakeholder, and community meetings and workshops. The plan seeks to balance resource protection and visitor use at the proposed park, which currently occupies 1,230 acres and is proposed to occupy 3,434 acres within its long-term boundary, on lands revered for their environmental and cultural significance.

The Master Plan for Nisqually-Mashel State Park Site envisions an exceptional park that vividly expresses its unique geological, ecological, historical and cultural history. According to the Stewardship Plan, as the park develops, previously logged forests would mature to become old-growth stands, while meadows, prairies and wetlands would continue to provide vital habitat, and salmon and steelhead would still migrate and spawn in the healthy waterways of the Nisqually River, Mashel River, and Ohop Creek. At Nisqually-Mashel State Park, the human relationship with the land would be evident not only in the history of past events but as an evolving, ongoing expression of the vital and living culture of the Nisqually Tribe. Local residents, citizens of Washington state and visitors from afar would enjoy rich and varied recreational experiences, learn about the history of this unique region, understand the present and future nature of culture and stewardship in the park, and create everlasting memories.

The Master Plan seeks to develop a park that is “a premier destination of uncommon quality, including state and regionally significant natural, cultural, and recreational resources.”

The Nisqually-Mashel State Park Site Master Plan includes the following sections:

1. **Classification and Management Plan (CAMP):** This plan includes a land classification map, a long-term park boundary, and a park management plan. The land classification map is similar to a park zoning map, using land classifications developed by State Parks.
2. **Land Use and Capital Development Plan:** The Land Use and Capital Development Plan identifies the park's facilities and amenities, and includes a conceptual site plan and a capital development plan.
3. **Transportation and Circulation Plan:** This transportation and circulation plan delineates park entry(s), roads, campground circulation, service and emergency access, trails (hiking, bicycle, equestrian), river access, and parking. Typical sections and guidelines for design and accessibility are also documented.
4. **Stewardship Plan:** The Stewardship Plan includes plans for protecting, preserving, and enhancing both natural and cultural resources in the park.
5. **Design Guidelines:** The Design Guidelines lay out the materials and architectural character of park facilities consistent with, and more detailed than, relevant guidelines established in the Nisqually River Council's guide, "Low Impact Development and Architectural Guidelines for the Nisqually Watershed."
6. **Interpretive Plan:** The Interpretive Plan defines education and interpretation opportunities in the park, and includes interpretive themes, components, strategies, and media.
7. **Business Plan:** The Business Plan includes research into the area's existing recreational marketplace, and explores a range of models to finance and operate the park.

Land Classification

Within the proposed long-term boundary, staff have developed recommendations for land classification, which designates land uses within the park. Land classification is regulated by WAC 352-16-020. Although all land classifications were considered for the park, as described in WAC-16-020, the classifications proposed in the Nisqually-Mashel State Park Site Master Plan include:

1. **Recreational areas**, which are suited and/or developed for high-intensity outdoor recreational use; conference, cultural and/or educational centers; or other uses serving large numbers of people.
2. **Resource Recreation areas**, which are suited and/or developed for natural and/or cultural resource-based, medium-intensity and low-intensity, outdoor recreation use.
3. **Natural areas, which** are designated for preservation, restoration, and interpretation of natural processes and/or features of significant ecological, geological, or paleontological value while providing for low-intensity, outdoor recreation activities as subordinate uses.
4. **Natural Forest areas**, which are designated for preservation, restoration, and interpretation of natural forest processes while providing for low-intensity, outdoor recreation activities as subordinate uses, and which contain:
 - a. Old-growth forest communities that have developed for one hundred fifty years or longer and have the following structural characteristics: large old-growth trees, large snags, large logs on land, and large logs in streams; or
 - b. Mature forest communities that have developed for ninety years or longer; or

- c. Unusual forest communities and/or interrelated vegetative communities of significant ecological value.
- 5. **Heritage areas**, which are designated for preservation, restoration, and interpretation of unique or unusual archaeological, historical, scientific, and/or cultural features, and traditional cultural properties, which are of statewide or national significance.

Appropriate land classifications were identified by State Parks staff with assistance from the public planning process. The preliminary recommendations for the park were chosen to provide a high level of protection for the park's natural and cultural resources while considering current and future recreational uses and opportunities.

Land classifications were developed for land owned by State Parks, as well as adjacent public and private holdings identified as potential additions to the proposed State Park. **Important note:** Proposed land classifications and long-term boundaries are for State Parks policy direction only.

Those land classifications have never been, and should not be, used as a basis for local government decisions on private land holdings in the proposed long-term boundaries.

Figure 4 is a map showing the preliminary recommendations for land classifications within the long-term boundary for the Nisqually-Mashel State Park Site. On Figure 4, the colors representing the land classifications are: pink = Recreation, blue = Resource Recreation, orange = Natural, and yellow = Heritage. The half tones of those colors represent the land classifications for lands that are not owned by State Parks but that would be included in the final staff recommendation to the Commission on the park boundary and, therefore, are included in the Master Plan.

In the preliminary recommendation, approximately 472 acres within the 3,434-acre long-term boundary would be designated Recreation areas, allowing for medium- to high-intensity uses. The Recreation areas in the Nisqually-Mashel State Park Site would be primarily in the parts of the park that are closest to Highway 7 and outside of known critical areas.

An approximately 328-acre area encompassing the steep slopes on both sides of the Mashel River would be designated a Natural Forest area, allowing low-intensity uses. The area meets the criteria for designation by the Washington Natural Heritage Program and is proposed because the area includes some of the oldest forest in the park. Such old forest is a priority for conservation efforts through the Washington Natural Heritage Program.

Approximately 191 acres would be designated Natural areas, which allow for low-intensity uses. They include most of the remaining steep slopes along the Nisqually and Mashel rivers as well as known wetland areas near Highway 7. The wetland area is described further in section B.3 of the checklist. The objective of the Natural land classification is to maintain ecological integrity in sensitive natural areas.

A 0.56-acre area in the Mashel Prairie would be designated a Heritage area. The area, which includes the Indian Henry cemetery, is not currently owned by State Parks. The Heritage designation is proposed to appropriately protect and preserve this cultural resource. The Heritage classification would allow for prescriptions and design guidelines consistent with protecting the cultural landscape. Additional Heritage designations may be pursued as evidence is obtained from on-site cultural resource surveys – required prior to any park development.

The remainder of land within the proposed long-term boundary, approximately 2,442 acres, would be designated as a Resource Recreation area, which allows for low- to medium-intensity uses.

Land Use and Capital Development Plan

The physical development of the park is organized around two primary nodes; the Village Center and the People's Center, both on the Central Plateau. Secondary and tertiary nodes include the Ohop Equestrian Center on the Ohop Valley settlement terrace above Ohop Creek, camping, biking and backcountry horse facilities on the East Mashel Plateau, river access points, and high bridges that serve both as river crossings and as destinations. Uses and developments proposed in the Nisqually-Mashel State Park Site Master Plan include camping and day-use facilities, an interpretive People's Center, Village Center, mixed-use trails, eight bridges (including seven proposed and one existing), utilities, minimal road infrastructure, and miscellaneous amenities throughout the park to support visitor use (e.g., restrooms and parking lots). A summary of proposed park developments is provided in Table 1.

Transportation and Circulation Plan

The park's road system and most of its primary developments are concentrated in the northern part of the East Mashel Plateau, with a focus on keeping higher-impact developments as far as possible from the park's streams and their associated habitat corridors. A new park entrance will be developed off of Highway 7, east of Mashel Prairie Road, in an area that maximizes site distance for both eastbound and westbound traffic. The road system links to the Village Center, the campgrounds, the Ohop Equestrian Center, and to the People's Center. Existing unpaved roads will provide controlled access to the Nisqually River near Ohop Creek, and to the Nisqually River/Mashel River confluence.

The Village Center, People's Center and Ohop Equestrian Center are linked by a paved multi-use loop trail that serves both pedestrians and bicyclists. A network of secondary loops, including some dedicated equestrian and bicycle trails, provides access to other destinations and allows for trips of varying length and experience (See Figure 5).

Stewardship Plan

The stewardship program for the park will use resource specialists, park staff, park users, and volunteers to balance the complex, and often conflicting, demands of environmental protection, cultural preservation, and outdoor recreation. Prescriptions for park stewardship include:

1. Seasonal or permanent closures of park trails, camping areas, or other use areas for restoration or protection of park resources;
2. Exclusion of the public from sensitive areas, such as wildlife corridors, migration corridors, spawning reaches of the streams, nest sites, fragile vegetative communities, and sensitive cultural resources;
3. Restoration to retain or improve ecological functions and cultural resources; and
4. Adaptive management to address issues before they become problems, and to ensure a high level of protection for park resources including existing high-quality habitats, places of cultural significance, and park infrastructure.

Design Guidelines

The Design Guidelines meet the spirit and intent of the master plan by establishing standards for

quality, aesthetics, environmental accessibility, and safety. For all park design elements, the following principles apply:

1. Maintain consistent character and quality throughout the park, resulting in exceptional character, quality, and identity for all park elements;
2. Coordinate design guidelines with park development partners, with specific attention to the Nisqually or other Native American Tribes;
3. Apply Low Impact Development strategies for site, infrastructure, and building facilities; and
4. Apply green environmental and energy technologies and strategies.

Interpretive Plan

The focus of the park's interpretation is on cultural and ecological restoration and renewal. At this site, State Parks and Native American peoples join to demonstrate and honor the story of these restored landscapes and cultures. Through the act of restoration, they reconcile past differences with new understandings, and with respect for both the land and the people. This reconciliation is the purpose of this state park, and the message it will convey to its visitors. The story will be told through the park's site and facility design, and through a series of interpretive story poles and stone cairns throughout the park.

Business Plan

The park's Business Plan focuses on integrating enterprise recreation into the park's facilities and activities. Specific enterprise recreation elements include RV camping, a store and merchandising in the Village Center, special events, and an equestrian center. Using this model, it is projected that park revenues could offset park operating expenses by 50% or more at the end of Phase 4 development.

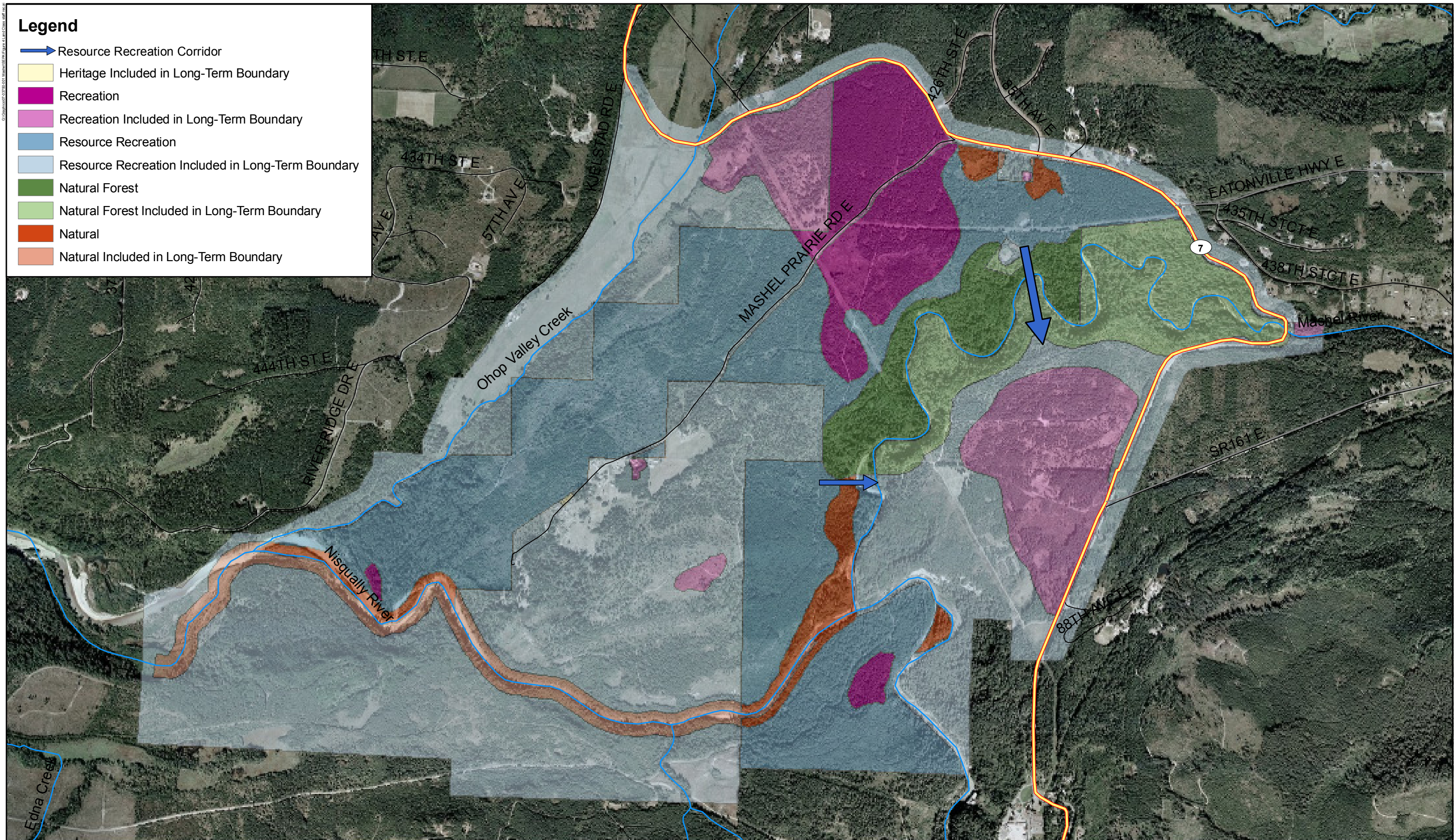
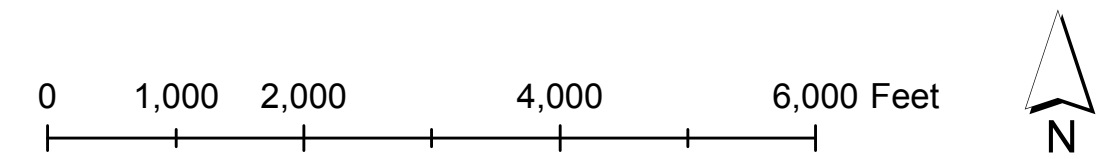


FIGURE 4
 Land Classification Within Existing Park Site and Long-Term Boundary
 June 2009



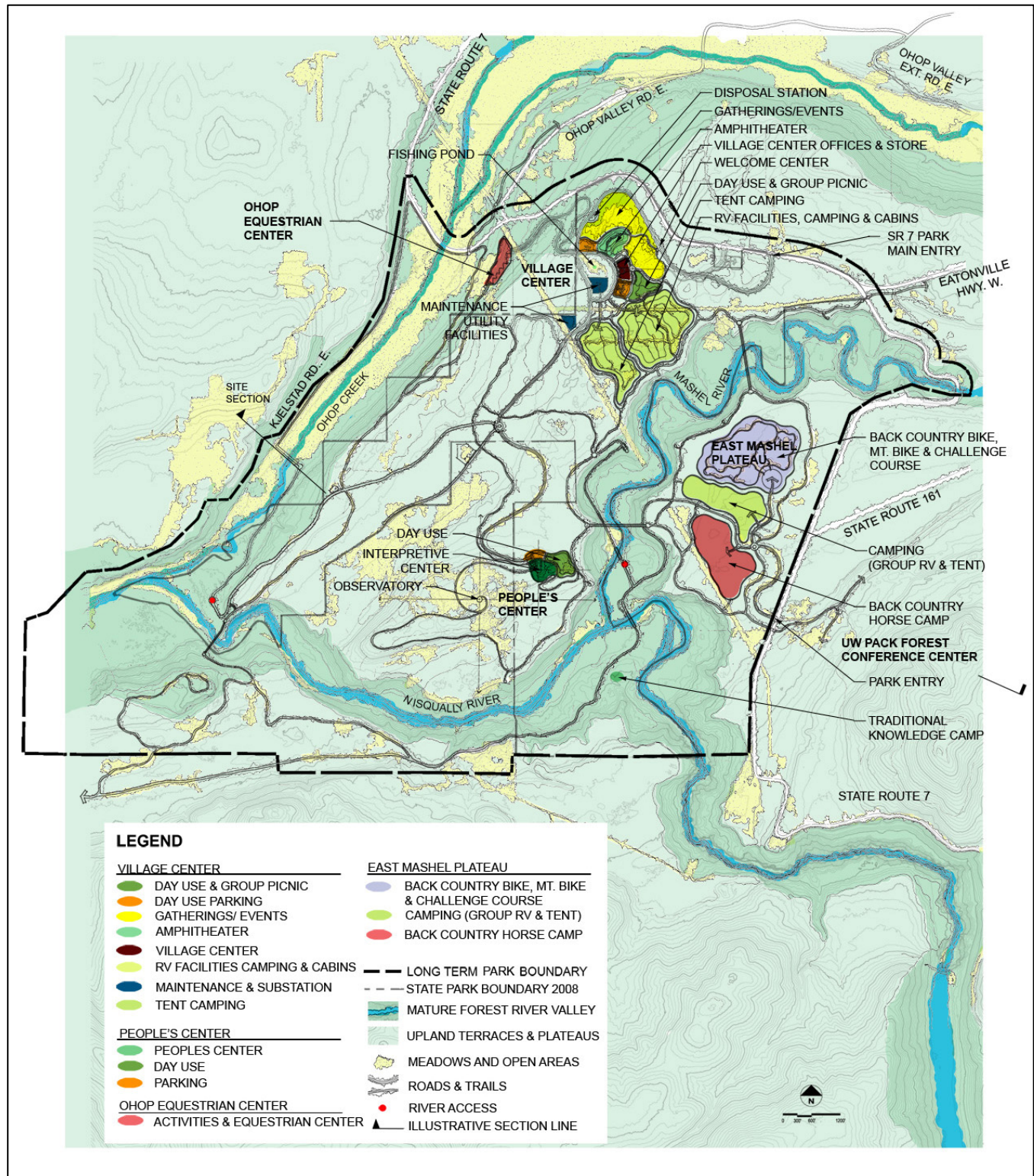


Figure 5. Site plan for proposed Nisqually-Mashel State Park Site.

Table 1. Summary table of development proposed in the Nisqually-Mashel State Park Site Master Plan.

Park Development Area/Element	Central Plateau and Ohop Creek Valley	Description and Development Phasing ¹	East Mashel Plateau	Description and Development Phasing ¹	South Bank of the Nisqually	Description
Vehicle Entry and Access	New Entry Along SR 7 Interim Entry at Existing Mashel Prairie Road & SR 7	1 Entry with Primary Park Sign 1 Acre Phase 2	New Entry along SR 7 @ UW Center for Sustainable Forestry – Pack Forest Conference Center	1 Entry with NMSP Eastern Mashel Plateau Camp Sign 1 Acre Later Phase	Vehicle Access via Thurston County – Logging Roads (Not Currently Permitted)	2 Access Points Via Bridge and Overland Logging Road Later Phase
Welcome Center	Park Welcome Center: Check-in Station Orientation	1 Welcome Center 1 Acre Phase 3	Park Welcome Center: Check-in Station Orientation	1 Welcome center 1 Acre Later Phase		
Visitor Services	Village Center: Village Commons Headquarters Store Day use area	1 Facilities Cluster 5.1 Acres 6.5 Acres Phases 3 & 4				
Camping	RV Group/Individual Vehicle/Tent Cabins	70 Acres 130 Sites 20 Cabins Phases 3 & 4	Backcountry Horse Vehicle/Tent RV Group/Individual	40 Acres – 50-100 Sites 36 acres – 150 sites Later Phase	Remote Camping	1 Acre – 4 Sites Later Phase
Specialty Recreation	Outdoor Gathering Meadow – Amphitheater Event Space Fishing Pond and Associated Meadow Equestrian Center @ Ohop Valley: Milk Barn Events Center Training Corrals	20 Acres Phase 4 5 Acres Phase 4 4.3 Acres Phase 4	Mountain/Backcountry Bicycle Challenge Course and Event Area Mashel River Confluence	60.5 Acres Later Phase		
Destinations & Attractions	People's Center Observatory / Clearing Leschi's Village Shaker Church Reconstruction Cemetery Med. Springs (Protect/Manage)	6.1 Acres -Phase 2 80.0 Acres -Phase 2 5.0 Acres -Phase 3 1.0 Acres -Phase 3 1.0 Acres -Phase 3 10.0 Acres -Phase 3	Access to UW Center for Sustainable Forestry – Pack Forest Conference Center, Museum, Trails Mashel River Confluence	Phases 2 & 3	Traditional Knowledge Camp Native American Management Area	5 Acres 80 Acres Phase 4

Table 1 (continued). Summary table of development proposed in the Nisqually-Mashel State Park Site Master Plan.

Park Development Area/Element	Central Plateau and Ohop Creek Valley	Description and Development Phasing ¹	East Mashel Plateau	Description and Development Phasing ¹	South Bank of the Nisqually	Description
Roadways	Use of existing Mashel Prairie Road (Including In-holder Portion) and Logging Roads New Park Roadway from Highway to Visitor Center & Camping Areas & Mashel Prairie Road to People's Center	6,425 LF 17,550 LF 12 Acres Phase 2	Use of Existing Logging Roads New Park Roadway from Highway to Visitor Center & Camping Areas	5,400 LF 5,000 LF 4 Acre Corridor Later Phase	Use of Existing Logging Roads (Not Currently Permitted)	Later Phase
Parking	Welcome Center Village Center Day Use Gathering Event Camping Equestrian Center People's Center Ohop Creek - Controlled Tribal Areas - Controlled	10 stalls -Phase 3 50 stalls -Phases 3&4 100 stalls -Phases 1-4 400 stalls -Phase 4 30 stalls -Phases 3&4 50 stalls -Phase 4 200 stalls -Phase 2 10 stalls -Later Phase 10 stalls -Phase 4	Welcome Center Day Use Camping Mashel River – Controlled	10 stalls -Later Phase 30 stalls -Later Phase 20 stalls -Later Phase 10 stalls -Later Phase	Tribal Areas – Controlled	6 stalls Phase 4 or Later
Trails	Multi-use (Pedestrian & Bike) Pedestrian Equestrian	21,700 LF –Phases 1-4 11 Acre Corridor 29,500 LF –Phases 1-4 10.8 Acre corridor 28,050 LF –Phase 4 10.3 Acre Corridor	Multi-use Pedestrian Equestrian	4,100 LF -Phases 2, 3, & Later 2 Acre Corridor 17,675 LF -Phases 2, 3, & Later 8.9 Acre Corridor 13,000 LF -Later Phase 6.6 Acre Corridor	Pedestrian – 1/2 on Existing Logging Roads and Trails	19,300 LF 6.6 Acres Later Phase
Bridges, Crossings & Overlooks	Two bridges over Ohop Creek Two Highway 7 Crossing River Valley Overlooks	2 Low Bridges Phase 4 1 Grade Separated Undercrossing –Later Phase 1 at Grade –Later Phase 5 Overlooks –Phases 1, 3, & Later	Four bridges over the Mashel River One Highway Crossing River Valley Overlooks	2 High Bridges –Phase 2 & Later 2 low (One Existing and One New) –Later Phase 1 Grade Separated Undercrossing -Phase 3 2 Overlooks -Later Phase	Two Bridges over the Nisqually River River Valley Overlooks	1 High Bridge 1 Low Bridge Phases 4 & Later 1 Overlook Later Phase

Table 1 (continued). Summary table of development proposed in the Nisqually-Mashel State Park Site Master Plan.

Park Development Area/Element	Central Plateau and Ohop Creek Valley	Description and Development Phasing ¹	East Mashel Plateau	Description and Development Phasing ¹	South Bank of the Nisqually	Description
Utilities and Maintenance Infrastructure	Water well(s)	Potential for 2 wells 1 @ Village Center 1 @ People's Center 1 - 2 Acres –Phase 2	One well	1 Well 1/2 Acre Later Phase	Potential for 1 Well	1 Well 1/4 Acre Phase 4 or Later
	Drainage System	Each Development Area –All Phases	Drainage System	Each Development Area	Drainage System	Each Development Area
	Wastewater System (s): Localized Compost Toilets Near-term and Centralized/Package Treatment Facility Long-term	2 Compost Phase 1 & Later 1 Central Facility 1 Acre Phase 2	Wastewater System: Localized Compost Toilets Near-term and Centralized/Package Treatment Facility Long-term	2 Compost Later Phases 1 Central Facility 1 Acre Later Phase	Localized Compost	1 Compost Phase 4 or Later
	Power: Ohop Mutual Light Co. Substation	Power Distribution Alternative Energy Underground along Road and Trail Corridors	Power Phases 2 & Later	Power Distribution Alternative Energy Underground along Road and Trail Corridors	Alternative Energy	Phase 4 or Later
	Communication	Telephone, Wi-Fi Phases 2-4	Communication	Telephone, Wi-Fi Later Phase	Communication	Telephone, Wi-Fi Phase 4 or Later
	Dump Station	1.5 Acres	Dump Station – Phase 3	1.5 Acres		
	Maintenance/Shop Facilities	1 Compound 3 Acres	Phase 3 & 4	1 Small facility 1 Acre –Later Phase		
Long Term Park Boundary 3,434 Acres Current State Park 1,230 Acres		Acquisition potentially in all Phases		Acquisition potentially in all Phases		Acquisition potentially in all Phases
Total Park Development Area = 525.20 Acres		265 Acres		165 Acres		94.6 Acres
Estimated Cleared Area Required – All Park Areas = 234 Acres		148 Acres		76 Acres		10 Acres
Total Roads Paved/Unpaved = 40,375 LF 7.65 Miles		23,975 LF 4.54 Miles		10,400 LF 1.97 Miles		6,000 LF 1.14 Miles
Total Trails Paved /Unpaved = 133,325 LF 25.25 Miles		79,250 LF 15 Acres		34,775 LF 6.59 Miles		19,300 LF 3.66 Miles

¹Note: Development phasing is described as “Phase 1,” “Phase 2,” “Phase 3,” “Phase 4,” or “Later Phase.” Later Phase developments are planned for 20 or more years in the future.

- 12. Location of the proposal.** Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The Nisqually-Mashel State Park Site comprises portions of Pierce and Thurston counties and is within the Nisqually River watershed approximately 2 miles west of Eatonville, Washington (see Figure 1, for project vicinity.) It encompasses the confluences of the Mashel River and Ohop Creek with the Nisqually River, and is characterized by highly variable topography (see Figure 6 for site topography.) Most development would occur in the northern portion of the Park site (see Figure 7 for site plan.) Currently 1,230 acres of the Park site's proposed long-term boundary are owned by Washington State Parks. The proposed Nisqually-Mashel State Park Site Master Plan's long-term boundary would encompass a total of 3,434 acres (see Figure 3.)

The proposed Nisqually-Mashel State Park Site Master Plan boundary includes all or portions of the following land survey units:

- Sections 24 and 24, Township 16 North, Range 3 East
- Sections 16, 17, 18, 19, 20, 21, 28, 29, and 30, Township 16 North, Range 4 East

B. ENVIRONMENTAL ELEMENTS

1. Earth

- a. General description of the site (circle one):** Flat, rolling, hilly, steep slopes, mountainous, **other: see more detailed description below:**

The Park site is located predominantly on glacial outwash terraces in the foothills of Mount Rainier, incised by erosive action of the rivers and streams in the area. Along the riparian corridors, river terraces of the Nisqually and Mashel rivers, and Ohop Creek are the dominant landform. In the uplands, topography in the Park site varies from gently rolling hills to steep river canyons characterized by unstable bluffs.

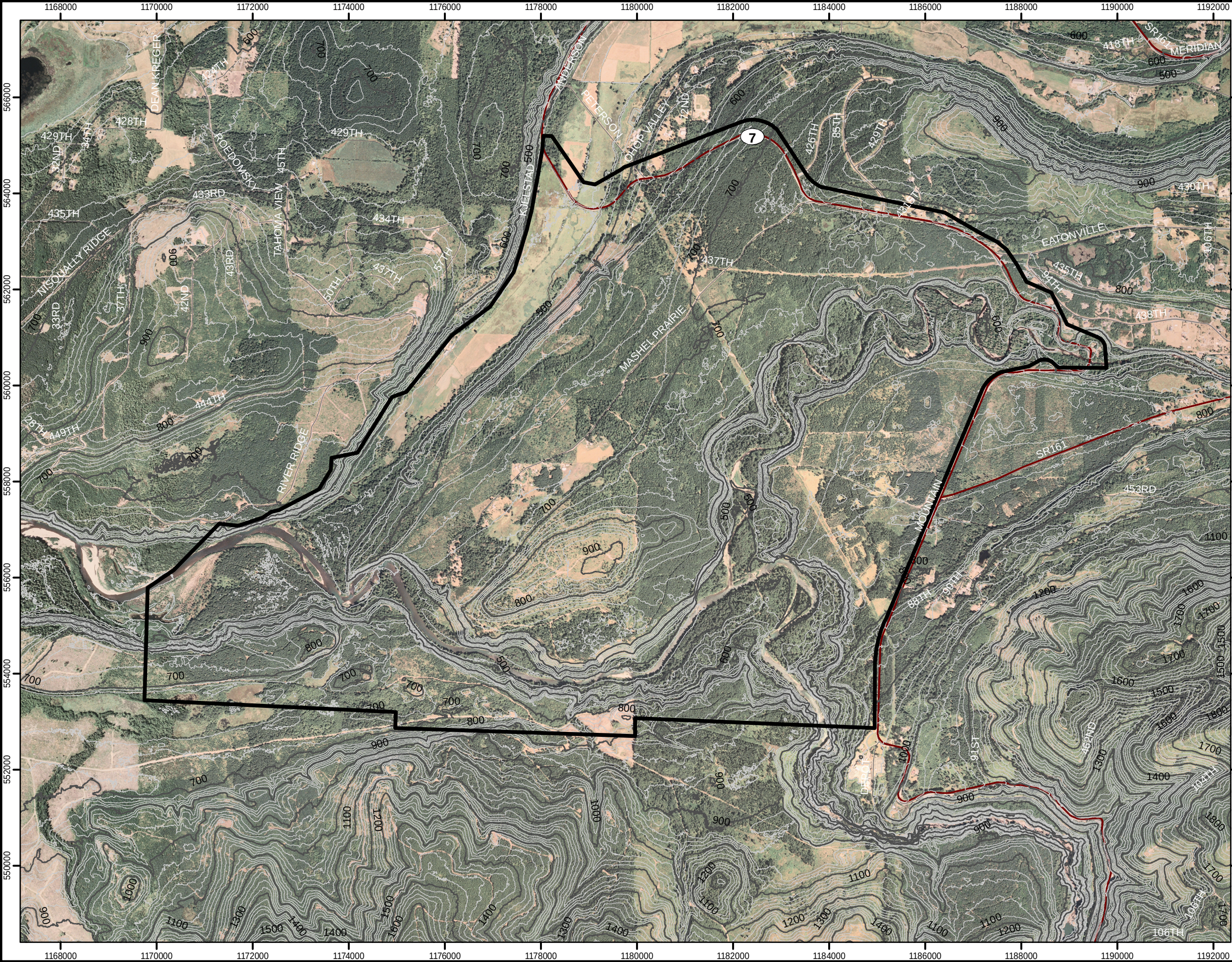
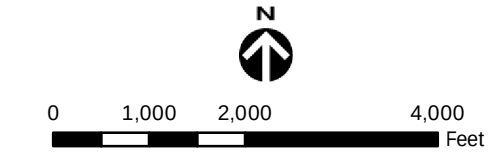


Figure 6.
Topography map of proposed
Nisqually-Mashel State Park.

Legend

- Long Term Park Boundary
- 100-foot contour
- 20-foot contour
- Highway
- Road



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Coordinates: NAD 83 HARN StatePlane Washington_South (Feet)

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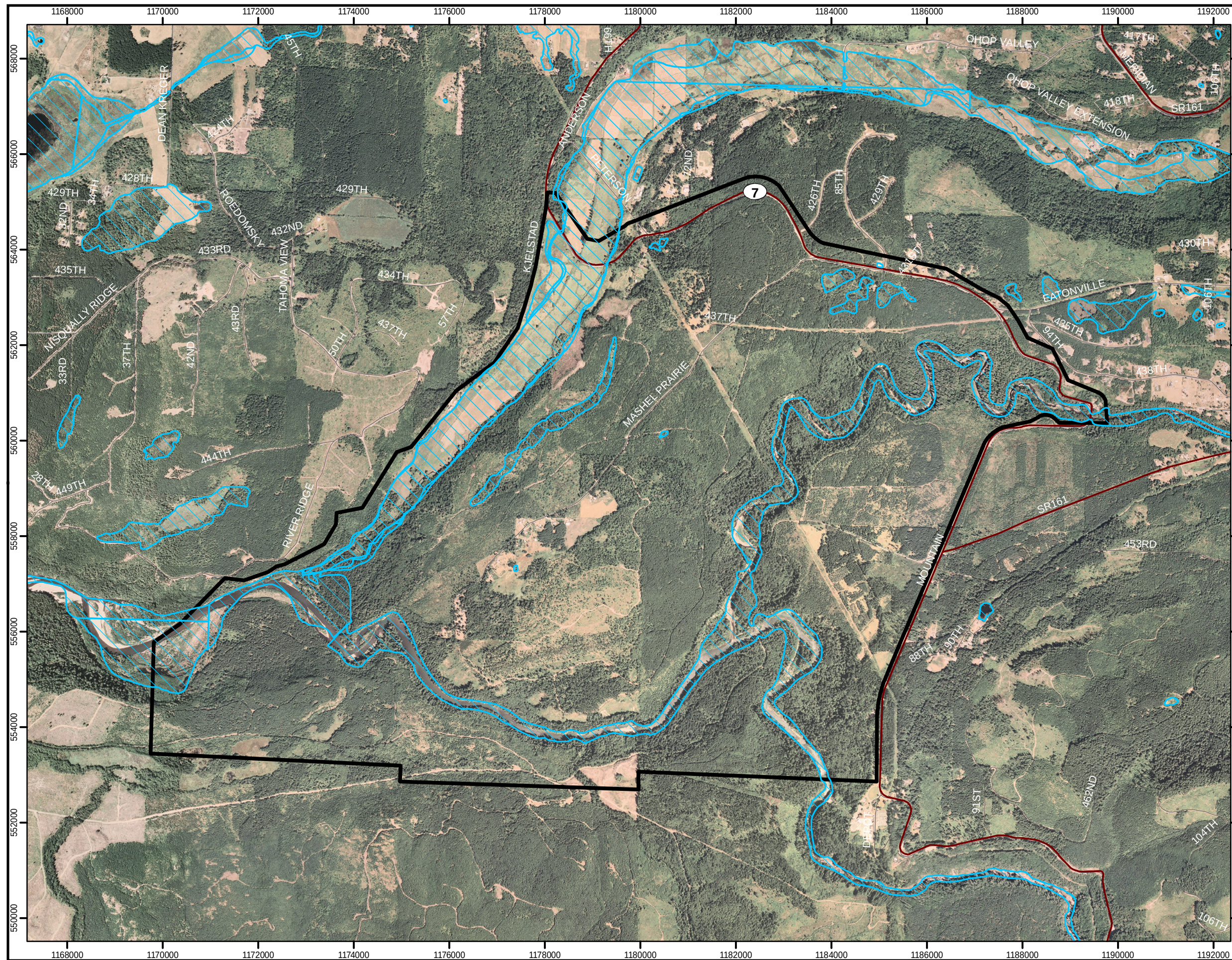


Figure 7.
Floodplains within the proposed
Nisqually-Mashel State Park.

Legend

-  Floodplain
-  Long Term Park Boundary
-  Highway
-  Road



0 1,000 2,000 4,000
Feet

HERRERA
ENVIRONMENTAL CONSULTANTS

Coordinates: NAD 83 HARN StatePlane Washington_South (Feet)

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b. What is the steepest slope on the site (approximate percent slope)?

86 percent.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

Soils in the Park site are derived from glacial outwash and are in places characterized by a volcanic ash component that was deposited in the cycles of eruptions of Mount Rainier, Mount Saint Helens, and other volcanoes (Zulauf 1979.) The Kapowsin, Barneston, and Everett soil series are found within much of the proposed Park site, and all are coarse and well-drained. Canyons and other steep banks are dominated by the Kapowsin gravelly loams. Upland sites in the Park site form the Mashel plateau, which is underlain by a combination of the Kapowsin gravelly loams and the Barneston gravelly coarse sandy loams. The Barneston and Everett series are generally poor soils that are found in some areas of the proposed Park site and are associated with lower forest stand densities and slower forest stand development. Moister soils within the proposed Park site are clayey loam Bellingham series. There are no prime farmland soils within the proposed long-term Park site boundary.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

Pierce County and Thurston County critical areas ordinances have classified certain slope angles and soil types (or combinations thereof) as Landslide or Geologic Hazard Areas.

Pierce County

Most of the Landslide Hazard Areas within the Pierce County portions of the Nisqually-Mashel State Park Site are associated with the cliffs and ravines within the riparian corridors of the Nisqually River and the Mashel River in the central and southern portions of the Park site. Actively retreating bluffs lining the river canyons are regulated because they exhibit continued sloughing and are characterized by a virtually ubiquitous lack of vegetation. Other steep slope areas falling into this category are located around the high plateau and to the southeast of the Mashel Prairie.

Thurston County

The portion of the Nisqually-Mashel State Park Site located in Thurston County is limited to the area south of the Nisqually River. The area is characterized by moderately steep slopes and some areas of unstable soil types. Both of these features trigger classification as a Geologic or Landslide Hazard Area.

This landslide hazard area is composed of 25.3 acres of Baldhill very stony loam located on 30 to 60 percent slopes, which are regulated as steep slopes in Thurston County. This soil type is found in an approximately 500-foot-wide horizontal band that extends from the southeastern property boundary to the Nisqually River. The area is classified as hazardous due to the steepness of the slope on which these soils are found.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

Development proposed in the Nisqually-Mashel State Park Site Master Plan would require filling, excavation, and grading during all four phases of Park development. Such activities would occur for road improvements, development of parking lots, construction of visitor facilities, installation of utilities, installation of public restroom facilities, construction of trails, and construction of bridges. More than 5,000 cubic yards of material would be graded for Park development including all four phases. All graded material not used for development on-site would be disposed of on-site in an approved location. Sources of fill required for Park development would either be located on the site or at off-site approved facilities. The final filling and grading quantities needed for specific proposed development activities would be addressed by SEPA reviews of future phases of construction.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Development proposed in the Nisqually-Mashel State Park Site Master Plan would require clearing, construction, and/or activities that could cause erosion. In particular, trail and bridge construction in and around geologic or landslide hazard areas would increase the likelihood and impact of erosion.

The proposed land classifications incorporated the consideration of steep slopes and geological hazard areas in order to prevent high intensity uses in most of these areas of the Park. The Master Plan proposes most of its higher intensity facilities and uses outside of such areas.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Development activities proposed in the Nisqually-Mashel State Park Site Master Plan would add new impervious surfaces estimated to cover less than 35 acres (about 1 percent of the proposed long-term Park boundary.) Proposed impervious surfaces include two new Park roadways, roofs, and parking lots. Pervious paving or other mitigation techniques are proposed for hard use areas such as parking lots to reduce impacts from new impervious surfaces, and the Design Guidelines found in the Master Plan call for pervious surfaces to be minimized in the Park. Impervious surface areas associated with actual construction activities would be addressed by subsequent phased SEPA review of project actions.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

The Master Plan proposes to site primary Park development areas distant from known erosion and landslide hazard areas. Where trails and bridges are necessary to cross, enter, or otherwise intrude upon such sensitive areas, the Master Plan proposes facilities designed to have minimal impacts on such areas.

All future development plans in Pierce County would include erosion and sedimentation control plans in accordance with the Pierce County Stormwater Management and Site Development Manual (or similar future publication) and would comply with the appropriate provisions in the Pierce County Code (PCC 17A.30.) All future development plans in Thurston County would include erosion control plans in accordance with the Thurston County Drainage Design and Erosion Control Manual (or similar future publication) and would comply with the appropriate provisions in the Thurston County

Code (TCC 15.05.) Both counties have adopted erosion control requirements based on Washington Department of Ecology's Stormwater Management Manual for the Puget Sound Basin (revised 2005.) The potential for erosion impacts from proposed activities would be evaluated by subsequent SEPA reviews of future phases of construction.

2. Air

- a. **What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.**

Construction activities resulting in soil disturbance, dust emissions and combustion pollutants from onsite construction equipment and from offsite trucks hauling soil, cement or building materials, would temporarily add pollutants and odors to the local air shed during the phased construction period. Construction activities would produce a range of air emissions, including particulates (PM), dust, carbon monoxide (CO) and nitrogen oxides (NO_x.) It is expected that construction activities would be intermittent and phased over time and would be conducted in compliance with typical air quality control measures required by federal, state and local regulations. Therefore, it is anticipated that construction activities would not result in onsite or offsite adverse air quality impacts or significant risks to or on offsite sensitive receptors (such as adjacent residential uses.) Moreover, as Park development would be phased over 20 years and would be temporary in nature, only short-term air quality impacts would result during construction; and such impacts are not anticipated to be significant.

Park operation emission sources would primarily include vehicles and trucks. Development of the Park would increase vehicle trips and associated emissions within this historically forest harvest area but would provide for a relatively small contribution to the regional concentrations of criteria pollutants (PM, CO, and ozone.) These emissions would not be expected to pose significant air quality impacts to existing sensitive receptors within the area due mainly to ambient air quality conditions in the area (Thurston County and Pierce County are currently in attainment for all air quality criteria pollutants) and the distance of the majority of onsite roadways to nearby sensitive receptors. Further, the potential for air quality impacts from on-road sources throughout the region, as well as with the proposed Park area, is expected to be offset by an increase in the efficiency of future vehicles and the availability of cleaner fuels over the long term.

Other Park operation emission sources would be from wood smoke and gases from campfires, grills, and camp stoves in the Park's campgrounds and picnic areas. These emission sources would begin with the implementation of Phase 3 development where camping facilities would be constructed for visitor use and number between 135 and 150 at the completion of Phase 4 development.

Climate change impacts resulting from greenhouse gas emissions (GHG) are of growing concern in Washington State and are therefore considered here. Emissions of CO₂ would increase commensurate with phased development of the Park. Emissions were estimated for each phase to include both project construction and Park operations which would frequently be concurrent. Based on the expected construction activities and related traffic, and the number of visitors and their activities, emissions are estimated to be approximately 100 metric tons (MT) of CO₂ per year during construction and when Phase 1 is complete, 300 MT of CO₂ per year during construction and after completion of Phase 2, 900 MT of CO₂ per year during construction and after completion of Phase 3,

and 2500 MT of CO² per year during construction and after completion of Phase 4. There are currently no regulated thresholds for production of GHG emissions for evaluation of environmental impacts. Future SEPA reviews of specific development activities would identify threshold impacts based on the air quality control measures required by federal, state and local regulations at that time.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

There are no known off-site sources of emissions or odors that would affect this proposal.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

Construction and operation resulting from implementation of the Nisqually-Mashel State Park Site Master Plan would abide by all local, state, and federal regulations addressing air quality during construction and Park operations. The Master Plan would provide transit shuttle service with convenient parking to minimize emissions from Park traffic that would be implemented after Phase 4 development is completed and would, at minimum, serve the Village Center and People's Center. In-Park transit needs would be coordinated through Pierce Transit. In addition, pedestrian and bicycle trails as well as secure bicycle storage facilities are planned to connect to local and regional trail systems to encourage walking and biking in lieu of driving to the Park.

3. Water

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

Three major streams are found in the Nisqually-Mashel State Park Site: the Nisqually River, the Mashel River, and Ohop Creek. In addition, numerous seasonal and intermittent small streams flow from the high terraces down into the canyons and ravine areas of those major drainages.

Wetlands are common within the area proposed for the Nisqually-Mashel State Park Site; a significant portion of the Park site's wetlands are concentrated in the riparian corridors associated with the three major streams described above (Pierce County 2006) (PRTC 2002) (USFWS 2008). In addition, a large forested wetland complex with associated drainages conveying to Ohop Creek is in the western extent of the property near the Ohop Valley. Another large wetland complex lies near the base of the hill slated to be the location of the People's Center in an area known as the Mashel Prairie.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

The Nisqually-Mashel Park Master Plan proposes to construct seven new bridges: two crossing Ohop Creek, three crossing the Mashel River (two high bridges that would be 200 to 250 feet above the water surface and one low bridge), and two crossing the Nisqually (one near its confluence with the Mashel River (a low bridge) and one near its confluence with Ohop Creek (a high bridge that would be 200 to 250 feet above the water surface.)) One existing low bridge

over the Mashel River would remain and would be restored after studying it to ascertain its impact on Mashel River hydrogeomorphic functions and potential existing and future impacts on fish populations and health. The recommendations from this study may alter plans for retaining and restoring use of this bridge.

Trail placement is proposed in some areas within 200 feet of the Park site's main streams: along the Mashel River, near the Nisqually-Mashel confluence, and in the Ohop Valley. Eight river and creek overlooks would be constructed in areas that would not affect river hydraulics and would minimally impact riparian vegetation. The overlooks would be 200 to 250 feet above the water surface.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

Future development activities proposed by the Nisqually-Mashel State Park Site Master Plan would not include fill or dredging in wetlands. There may be fill in surface waters associated with construction of some of the proposed bridges. Of the seven new bridges proposed in the Nisqually-Mashel State Park Site Master Plan, the two high bridges would not involve fill in surface waters, and the low bridges would be designed and constructed to limit fill in surface waters to the extent feasible.

All fill for bridge construction would be from on site or an approved facility. The quantity of fill in surface waters that may be required for bridge construction is not known at this time.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

Future development activities proposed by the Nisqually-Mashel State Park Site Master Plan would include the development of ground water wells to provide potable water. No withdrawals or diversions of surface waters are proposed.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

Portions of the proposed Nisqually-Mashel State Park Site located adjacent to the Nisqually River, Mashel River, and Ohop Creek are within the 100-year floodplain. Those areas are shown on Figure 7

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No discharge of waste materials to surface waters is proposed by the Nisqually-Mashel State Park Site Master Plan. During construction activities, the potential exists for fuel or oil spills from construction equipment; however, the contractors would be required to follow an approved spill prevention and remediation plan to minimize impacts of any accidental spills on surface waters. Park operations, with the exception of trail and roadway use, would generally occur outside of the regulated buffers of wetlands and streams where accidental spills from camp stoves or private vehicles would not impact surface waters. Park staff would be trained to implement emergency

spill prevention and remediation procedures in the event of an accidental spill to minimize impacts of any accidental spills on surface waters.

b. Ground:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

Two wells with storage tanks and distribution piping would serve the Park. It is assumed that on site chlorine generation would be used to disinfect the distribution system. The two wells would be located to serve the Village center and the East Mashel Plateau and adjacent areas. The number and size of the wells would be confirmed based on regulatory requirements, test borings, test well pumping rates, peak use, and fire flow requirements. At a minimum the systems would include a well, well pump, storage tank, and distribution piping would be included in the potable water system. The amount of water withdrawn from ground water for the potable water system and other on-site uses is not known at this time but would be expected to approach 200,000 gallons per day at the completion of Phase 4 during the peak operating season. In general, the waterlines would follow the main roadways, and in many areas also follow the power and telephone systems. Where practical the utilities would be installed in a common trench. Residual monitoring and disinfection would be included as part of the onsite generation system.

Discharges to ground water would occur from stormwater management design that would emphasize the use of infiltration where possible. The approximate quantities of stormwater that would be discharged to ground water are not known at this time.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

Only wastewater treatment discharge is proposed to be discharged to the ground. The Nisqually-Mashel State Park Site Master Plan proposes to use composting toilets to handle sewage waste from some planned public bathroom facilities and in up to four on-site residences in the near term. However, future development activities proposed by the Nisqually-Mashel State Park Site Master Plan would implement wastewater treatment using packaged onsite treatments systems. The packaged on-site treatment systems would include sedimentation tanks at the restroom source location to hold solids, and then the effluent would be pumped to a centralized treatment facility. Electrical feeds would serve pumps and the centralized treatment facility. These systems would meet regulatory requirements and typically require smaller leachate fields due to improved effluent quality over traditional septic tanks. The collection pipelines would follow the roadways and trails. Restrooms would be constructed to serve all proposed buildings (including the Welcome Centers, Village Center buildings, Ohop Equestrian Center, and People's Center), gathering places (such as day use and group picnic areas), and camping areas, and effluent would be piped to the nearest centralized treatment center.

c. Water runoff (including stormwater):

- 1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.**

Future development activities proposed by the Nisqually-Mashel State Park Site Master Plan would produce stormwater runoff during construction activities and from new impervious surfaces that would include facility roofs, roads, some trails, bridge footings, and parking lots. Temporary sedimentation and erosion controls that meet best management practices standards would be used to manage and treat stormwater runoff during construction activities and all work would be in compliance with the National Pollutant Discharge Elimination System (NPDES) permit that would be required for Park development. The permanent stormwater management system would be designed to minimize runoff by using low impact development techniques, such as pervious pavement and rain gardens, and maximizing infiltration opportunities wherever possible. Water runoff, not infiltrated to groundwater, would flow overland and within stormwater management systems that would treat runoff before discharging to drainages, creeks, and streams within the Nisqually, Mashel and Ohop drainage basins.

- 2) Could waste materials enter ground or surface waters? If so, generally describe.**

Future development activities proposed by the Nisqually-Mashel State Park Site Master Plan are not expected to result in waste materials entering ground or surface waters because, as described above, runoff would be limited by low impact development techniques and infiltrated or treated.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

The proposed Nisqually-Mashel State Park Site Master Plan developments located in Pierce County would include stormwater management plans based on the Pierce County Stormwater Management and Site Development Manual (or similar future publication) and would comply with the appropriate provisions in the Pierce County Code (PCC 17A.30.) All future development plans in Thurston County would include stormwater management plans based on the Thurston County Drainage Design and Erosion Control Manual (or similar future publication) and would comply with the appropriate provisions in the Thurston County Code (TCC 15.05.) Both counties have adopted stormwater requirements based on Washington Department of Ecology's Stormwater Management Manual for the Puget Sound Basin (revised 2005.)

The Nisqually-Mashel State Park Site Master Plan provides recommendations for minimizing stormwater and wastewater impacts that include the potential use of innovative stormwater and waste water treatment facilities such as rain gardens, green roof technology, native plant landscaping, rainwater catchment systems, bioswales, engineered water quality treatment wetlands, pervious pavement, and composting toilets.

4. Plants**a. Check, circle or bold types of vegetation found on the site:**

X deciduous tree: **red alder, bigleaf maple, black cottonwood**, other **Oregon ash, Madrone**

☒ evergreen tree: **fir, cedar, pine**, other **Douglas-fir, Western red cedar, Western hemlock, grand fir, lodgepole pine**
☒ shrubs: **salal, snowberry, salmonberry, Scotch broom, blackberry**
☒ grass
☒ pasture
☐ crop or grain
☒ wet soil plants: **cattail, buttercup, bullrush, skunk cabbage**, other **slough sedge, common rush**
☒ water plants: water lily, eelgrass, milfoil, other: **northern water plantain, western bog yellowcress**
☒ other types of vegetation: **herbs, forbs, ferns: sword fern, bracken,**

b. What kind and amount of vegetation will be removed or altered?

Future development activities proposed by the Nisqually-Mashel State Park Site Master Plan would require vegetation removal in approximately 234 acres of the Park (about 7 percent of the proposed long-term Park boundary.) Approximately 35 acres of removal would occur to develop public facilities, roads, and parking lots. The remaining cleared areas would be revegetated with landscaping appropriate to the area's use. The kind and amount of vegetation impacts from these activities would be evaluated by subsequent SEPA reviews.

In addition to clearing for development activities, implementation of the forest health plan prepared for the proposed Nisqually-Mashel State Park Site would thin existing forested areas to reduce closed canopy conditions, open light to the understory, improve stand health, and improve wildlife habitat value. The forest health plan for the Nisqually-Mashel State Park Site Master Plan calls for approximately 444 acres of Park forestland (about 13 percent of the proposed long-term boundary) to be thinned to either 50 or 100 trees per acre (Ettle and Emmons 2008) within two time frames. Forest thinning is recommended to begin immediately, and would occur again in about 2012 to 2013 or about 5 years after the first thinning. Lower stand density would produce greater overall biodiversity, advance stand development toward more old-growth structural features, and provide easier access for multiple recreation objectives. The plan also calls for the planting of other areas to produce greater species diversity (Ettl and Emmons 2008.)

A mixed treatment approach would be used to focus thinning on the most highly stocked portions of stands across the Park landscape. Thinnings would be undertaken using a variable thinning approach, which would allow on-the-ground, site-by-site decisions as to what should be thinned and what should be retained. The mixed treatments would produce increased within-site diversity, protection of sensitive sites, and a greater number of options for future managers.

In general, the Nisqually-Mashel State Park Site Master Plan proposes development activities in areas of recently harvested forest and already disturbed areas, such as roadways, roadsides, and utility easements. Some activities are proposed in more mature (90-200 years old) diverse, coniferous forest, characterized by mixed-aged stands comprising Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), and western red cedar (*Thuja plicata*.) Early-successional floodplain communities characterized by red alder (*Alnus rubra*) and black cottonwood (*Populus trichocarpa* ssp. *balsamifera*) may be impacted as well as some floodplain habitat in the Ohop Valley, which is characterized by a diverse array of native herbaceous and shrub species, and agricultural grasses and weeds.

c. List threatened or endangered species known to be on or near the site.

Although no rare plant species have been documented within Nisqually-Mashel State Park Site, Table 2 shows state and federal threatened or endangered plant species that have been documented to be near the Park site. Most have known populations (current or historic) within 5 miles of the site, and all have been observed within Pierce County (LYRA Biological 2006.)

Table 2. State and federal threatened or endangered plant species documented to be near the proposed Nisqually-Mashel State Park Site.

Species	Status*
<i>Arenaria paludicola</i> (marsh sandwort)	Federally Endangered; State Potentially Extirpated
<i>Aster borealis</i> (northern bog aster)	State Threatened
<i>Euonymus occidentalis</i> (western burning bush)	State Threatened
<i>Isoetes nuttallii</i> (Nuttall's quillwort)	State Sensitive
<i>Lathyrus torreyi</i> (Torrey's peavine)	Federal Species of Concern; State Threatened
<i>Polystichum californicum</i> (California swordfern)	State Threatened

*Status information was gathered on November 25, 2008 from the Washington Department of Natural Resources Washington Natural Heritage Program (WNHP) website: <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

A rare plant survey (LYRA Biological 2006) and an environmental constraints report (Herrera 2008) were prepared in order to identify important and sensitive Park site resources that should be protected during Park planning and subsequent development. The Nisqually-Mashel State Park Site Master Plan used these studies to identify and protect existing sensitive and unique habitats and avoid high quality habitat wherever possible. Additional rare plant surveys would be completed prior to any Park development to ensure long-term protection of rare species. All disturbed areas would be restored or enhanced with landscaping. All proposed landscaping would consist of native species. The Park site's proposed land classifications take into consideration the condition and extent of existing vegetation. More sensitive areas are classified in a more protective class, such as Resource Recreation, Natural Forest, or Natural. Those designations provide a high level of protection for the vegetation communities and natural resources, while restricting high-intensity recreational use.

The Nisqually-Mashel State Park Site would also pursue certification under the Forest Stewardship Council's (FSC) Pacific Coast Standard. The benefit of forest certification would be to assure that forestry practices planned to improve the health and wildlife value of forests within the proposed Park site are sustainable, as the FSC standard is broadly accepted as a means of demonstrating sustainable forestry.

Invasive plant species may pose a significant threat to the integrity of native plant ecosystems in the proposed Nisqually-Mashel State Park Site; therefore the Master Plan includes guidance for combating current and future on-site infestations by employing an Integrated Pest Management (IPM) approach. This technique embodies effective planning, monitoring, and prioritization of adaptive management techniques, with the required level of control being dictated by the species present and the severity of the infestation. Initial inventory of invasive species populations would be followed by strategic

development and implementation of treatment prescriptions (which are based on the most effective eradication techniques for the invasive species present, population characteristics, and site conditions), in combination with thorough monitoring and invasive plant population-tracking efforts.

5. Animals

- a. **Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:** (species observed are in bold text)

birds: **hawk, heron, eagle, songbirds**, other:
mammals: **deer, bear, elk, beaver**, other: **cougar**,
fish: **bass, salmon, trout**, herring, shellfish, other:

- b. **List any threatened or endangered species known to be on or near the site.**

Table 3 shows the state and federal threatened or endangered animal species that are documented to be near the site (WDFW 2008):

Table 3. State and federal threatened or endangered animal species documented to be near the proposed Nisqually-Mashel State Park Site.

Species	Scientific Name	Status
Bull Trout	<i>Salvelinus confluentus</i>	Federal Threatened, State Candidate
Canada Lynx	<i>Lynx canadensis</i>	Federal Threatened, State Threatened
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	Federal Threatened, State Candidate
Gray Wolf	<i>Canis lupus</i>	Federal Endangered, State Threatened
Grizzly Bear	<i>Ursus arctos</i> = <i>U. a. horribilis</i>	Federal Threatened, State Threatened
Marbled Murrelet	<i>Brachyramphus marmoratus</i>	Federal Threatened, State Threatened
Mazama (Western/Roy), Pocket Gopher	<i>Thomomys mazama</i>	Federal Candidate, State Threatened
Steelhead	<i>Oncorhynchus mykiss</i>	Federal Threatened, State Candidate

Source: WDFW 2008.

Information from WDFW suggests that the current potential for Canada lynx, gray wolf, or grizzly bear occurring within the proposed Park site is highly unlikely. In Washington, lynx are primarily found in high-elevation forests of the north-central and northeast parts of the state. (See WDFW's Washington State Recovery Plan for the Lynx. June 2001. Accessed online at: <http://wdfw.wa.gov/wlm/diversty/soc/recovery/lynx/finallynx.pdf>.)

The gray wolf, which is the subject of an intensive recovery program in several western states, is currently found in Washington in low numbers in the north-central, northeast, and southeast portions of the state. (See WDFW's Fact Sheet on Wolves in Washington, accessed online at: http://wdfw.wa.gov/wlm/diversty/soc/gray_wolf/fact_sheet.htm.)

The grizzly bear is believed to occur in low numbers (up to about 20) in the North Cascades and also in the northeast portion of Washington. (See Grizzly Bear Outreach Project, accessed online at: <<http://www.bearinfo.org/observations.htm>>).

Individuals of all three species may wander widely and could occur in areas far from those described above. In addition, as all three species are involved in ongoing conservation efforts, their ranges are expected to shift and perhaps expand over time.

c. Is the site part of a migration route? If so, explain.

Roosevelt elk (*Cervus canadensis roosevelti*) herds are known to utilize on-site riparian corridors for migration, in addition to overwintering and forage (Tirhi 2008.) A number of other large mammals, such as deer and bear, also use these intact, forested corridors for seasonal transit (Kunz 2008; Tirhi 2008.) Marbled murrelets may utilize mature and old growth trees on the property for nesting, while making daily trips to the ocean and nearshore areas to gather food.

Bull trout, steelhead, and Chinook, coho, and pink salmon utilize the Nisqually River, the Mashel River, and Ohop Creek as migration corridors and/or for spawning and rearing habitat including sections located within the proposed Park. The Nisqually River is considered critically important to steelhead and Chinook rearing.

According to the results of the Pierce County Biodiversity Assessment and GAP Analysis (Brooks et al. 2004) based on site-specific assessments of the habitat types in Nisqually-Mashel State Park Site, the area is extremely critical to regional wildlife conservation, locally and across the Puget Lowland ecoregion. Establishment of the proposed Park would result in the (1) protection of the prairie habitat in the Mashel Prairie, (2) maintenance of relatively undeveloped riparian corridors, and (3) conservation of large (more than 150 acres) tracts of relatively contiguous evergreen forests (Brooks et al. 2004.) Although the region is encountering increasing pressures from agricultural and residential development downstream, the Park site can be viewed as part of a larger corridor that would provide near continuous forest cover from the Cascade Mountains to the South Puget Sound (Ettl and Emmons 2008.)

d. Proposed measures to preserve or enhance wildlife, if any:

The Nisqually-Mashel State Park Site Master Plan outlines Park elements and management practices that seek to enhance wildlife habitat through a variety of mechanisms. All proposed land classifications and development concepts are the product of comprehensive planning efforts that focused on preservation of existing sensitive and unique wildlife habitats, such as riparian areas, migration corridors, nesting areas, wetlands, and floodplains. Such sensitive areas are classified in the Master Plan in more protective classifications, such as Resource Recreation, Natural Forest, or Natural. Those classifications provide a high level of protection for the wildlife communities and natural resources, while restricting high-intensity recreational use and, thereby, limiting the amount and types of human/wildlife interaction. The Master Plan is based on the objective of avoiding construction of Park infrastructure in high quality wildlife habitats whenever possible. To reduce and minimize conflicts between wildlife and human activities, Washington State Parks would use signage to encourage Park users to stay on designated trails, and to implement seasonal closures to reduce human disturbance of wildlife in critical use areas, such as in areas used by elk during calving season. In addition Park waste would be managed to avoid wildlife attractants.

Prescribed silvicultural thinnings and plantings (as described in Ettl and Emmons [2008]) to target the development of old growth conditions in certain areas of the proposed Park would be used to enhance on-site habitat diversity (for additional detail see 4.b above.) The preservation of existing old-growth and the measures taken to facilitate the transition of other areas toward structural old-growth would benefit marbled murrelet as well as other species over the long-term. Low impact development features utilized in Park infrastructure would reduce stormwater and wastewater impacts to on-site streams, wetlands, and vegetation communities. Native plant landscaping and restoration (including invasive plant species management) would further increase foraging and habitat potential for on-site wildlife. Protective wildlife corridors would be established throughout the Park. Park development and operations would also coordinate with the Nisqually Indian Tribe, and Pierce County and Thurston County salmon recovery planning efforts to ensure long-term protection for important fish habitat within the Park.

6. Energy and natural resources

- a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.**

Once developed, facilities within the proposed Nisqually-Mashel State Park Site would likely use hydroelectric power from the Ohop Power Company augmented by solar power. Electricity would be used for lighting and other domestic uses in facilities such as the Welcome Center, restrooms, Village Center, and administrative offices. Park visitors in campgrounds and picnic areas would use campfires for cooking and heating, as well as camp stoves for cooking. No manufacturing uses are proposed. All future projects would be consistent with the Sustainability Plan for the Washington State Parks and Recreation Commission, which prescribes measures to be used in state park facilities to maximize the efficiency of energy use, and limit the use of fossil fuels.

- b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.**

The project would not affect the potential use of solar energy by adjacent properties.

- c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:**

The proposed Nisqually-Mashel State Park Site Master Plan specifies the integration of green and sustainable building techniques into Park infrastructure development, and Park structures would be designed to meet or exceed sustainable standards for energy and environmental design (including materials, heating and cooling systems, insulation, power generation, etc.) These would include energy conservation features and low impact development components such as passive solar heating, high-efficiency insulation, and energy-efficient lighting.

7. Environmental health

- a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.**

No activities are proposed by the Nisqually-Mashel State Park Site Master Plan that would pose environmental health hazards.

1) Describe special emergency services that might be required.

Once the Nisqually-Mashel State Park Site is developed, emergency services would be required and would include fire protection, police protection, and emergency medical services. Portions of the proposed Park also lie within a lahar inundation zone; therefore an emergency evacuation plan and associated emergency services would be required. Emergency services requirements would increase as each phase of Park development is completed. When all four phases of Park development are complete, daily visitation at peak use is expected to be up to 4,000 persons and would require commensurate emergency response services for fire, police, and emergency medical services.

2) Proposed measures to reduce or control environmental health hazards, if any:

The proposed Nisqually-Mashel State Park Site Master Plan provides for operational and maintenance procedures that include measures to reduce or control environmental health hazards, including development of a hazardous material spill prevention response plan. All proposed future activities and development would comply with environmental health requirements provided in Title 8 of the Pierce County code (and other applicable regulations.)

b. Noise

- 1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?**

There are no noise sources in the area that would affect the proposed Nisqually-Mashel State Park Site Master Plan or the implementation of the Master Plan.

- 2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.**

Future Park development activities would have associated temporary construction noise primarily from traffic, and operating equipment that would occur during normal work hours, and would comply with the requirements of Pierce County's Noise Pollution Control ordinance (PCC Chapter 8.76) and Thurston County's Public Disturbance Noise Ordinance (TCC Chapter 10.36.) As the Park is developed, Park visitor use (including increased traffic) would permanently increase ambient noise, particularly in and near developed recreation facilities, such as campgrounds, parking lots, picnic areas, and visitor centers. Most noise associated with visitor use would be from moving vehicles, people conversing, special events, and use of generators at recreational vehicle campsites. Machinery to maintain Park infrastructure and manage on-site vegetation would

generate noise when in use. Most noise would occur during daytime hours, from 7:00 a.m. to 10:00 p.m.

3) Proposed measures to reduce or control noise impacts, if any:

Noise impacts on adjacent and nearby properties are expected to be minimal because of the lack of nearby off-site residents, gathering facilities, hospitals, schools or other noise-sensitive receptors that would be in proximity to noise-producing Park activities. Within the Park, the effect of noise on users and wildlife would depend on the levels of noise generated by the use, ambient noise from wind and flowing water, and the dampening effects of intervening terrain. Activities and construction proposed by the Nisqually-Mashel State Park Site Master Plan would be required to comply with the Pierce County noise control ordinance (PCC Section 8.76) and Thurston County's Public Disturbance Noise Ordinance (TCC Chapter 10.36.) Except for emergencies, noise associated with Park construction, operations, maintenance, and management activities would occur intermittently, during normal work hours, and would comply with the requirements of both Pierce and Thurston county's noise control ordinances (cited above.) Potential noise impacts from Park development and operational activities on wildlife and other sensitive receptors would be evaluated by subsequent SEPA reviews.

8. Land and shoreline use

a. What is the current use of the site and adjacent properties?

The properties included in the proposed Nisqually-Mashel State Park Site Master Plan are currently primarily used for public recreation and timber harvesting, but also include forestry research and single-family housing. Adjacent land uses include timber harvesting, education, and single-family housing. A large portion of the site identified within the master plan was purchased by Washington State Parks in the 1990s. The land is adjacent to the University of Washington Center for Sustainable Forestry at Pack Forest and the Pioneer Farm Museum.

b. Has the site been used for agriculture? If so, describe.

Land within the 1,230-acre proposed Park site currently owned by Washington State Parks is not known to have been used for agriculture. However, some of the land proposed for inclusion in the proposed Park's long-term boundary was historically used for agriculture. According to the Cultural Resources Survey prepared for the Nisqually-Mashel State Park Site (Emerson and Ives 2008), land in the Mashel Prairie and Ohop Valley was farmed from the late 19th century through the early to mid 20th century.

c. Describe any structures on the site.

There are no structures on the 1,230-acre proposed Park site currently owned by Washington State Parks. However, a few structures exist on lands proposed for inclusion in the long-term boundary. They include an historic barn, up to 18 single-family houses, and two bridges.

d. Will any structures be demolished? If so, what?

Depending upon which lands are ultimately brought into the proposed Park boundary, all single-family houses could be demolished, however between three and five existing houses may be retained for use by Washington State Parks (e.g., for staff housing.) The historic barn would remain in place. One existing low bridge over the Mashel River would remain and would be restored contingent on the outcome of a study that would evaluate its environmental impact on river geomorphological processes and fish habitat.

e. What is the current zoning classification of the site?

The portion of the site north of the Nisqually River, within Pierce County, is currently zoned Rural 10 or R10 (rural land use with one dwelling per 10 acres) with the exception of a small area on the eastern edge of the long-term boundary which is zoned agricultural resource land and also allows for one dwelling per 10 acres.

The portions of the site south of the Nisqually River, within Thurston County, are currently zoned for public parks, trails and preserves and long-term forestry.

f. What is the current comprehensive plan designation of the site?

The Pierce County comprehensive plan designates tax parcels within the proposed Park as rural residential (specifically R10), which allows for residential and resource use (see PCC section 18A.17.010.)

The Thurston County portion of the proposed Park is designated by the Thurston County comprehensive plan as public parks, trails, and preserves (PP) and long-term forestry (LTF) (Chapter 2 of the Thurston County Comprehensive Plan.)

g. If applicable, what is the current shoreline master program designation of the site?

Within the area comprising the proposed Nisqually-Mashel State Park Site Master Plan, the Nisqually River is the only water body designated as a shoreline of the state. Both Pierce and Thurston county Shoreline Management plans designate the Nisqually River shoreline located within the long-term Park boundary as "Conservancy." The Conservancy designation is intended to protect, conserve, and manage existing natural resources, and valuable historic and cultural areas.

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

Three major streams are found in Nisqually-Mashel State Park Site: the Nisqually River, the Mashel River, and Ohop Creek. In addition, there are numerous seasonal and intermittent small streams.

A description of known wetlands from USFWS National Wetlands Inventory and county datasets is provided in the Nisqually-Mashel Property Environmental Constraints Report (Herrera 2008.) A substantial portion of the Park's wetlands are concentrated in the riparian corridors associated with the three major streams described above. In addition, a large forested wetland complex with associated drainages conveying to Ohop Creek is in the western extent of the property near the Ohop Valley. Another large wetland complex lies near the Mashel Prairie.

Some sections of Nisqually-Mashel State Park Site are characterized by landslide and geologic hazard area. (See response to question B.1.d.)

Some portions of the proposed Nisqually-Mashel State Park Site are within the lahar inundation zone. These include all areas within the Nisqually River valley, and the lower reaches of Ohop Creek and the Mashel River at their confluence with the Nisqually River and northward in the adjacent river valleys (USGS 2000.)

More comprehensive descriptions of all environmentally sensitive areas are provided in the Nisqually-Mashel Property Environmental Constraints Report (Herrera 2008) available from Washington State Parks.

i. Approximately how many people would reside or work in the completed project?

Because adoption of the Nisqually-Mashel State Park Site Master Plan is a non-project action, no residents or employees are directly associated with the proposal. Future facilities and residences proposed by the Nisqually-Mashel State Park Site Master Plan would result in approximately 50 people working and/or living on-site during the peak visitor season at the completion of Phase 4.

j. Approximately how many people would the completed project displace?

The proposed long-term Park boundary includes property not currently owned by Washington State Parks. Willing sellers could have their property purchased, after which the property's use and development would be guided by the proposed Park Master Plan. Depending upon the properties ultimately brought into the proposed Park's boundary, up to 18 single-family residences may be displaced through property purchases. Of those, most would be demolished, however three to five of the residences may be used for Washington State Parks (e.g., for employee housing.) Assuming 2.5 occupants per residence, the project would displace approximately 45 people. However, if State Parks uses three to five houses for employee housing, approximately 8 to 13 people (at 2.5 persons per residence) would live in the proposed Park, resulting in a net loss of 37 to 32 residents within the long-term boundary.

k. Proposed measures to avoid or reduce displacement impacts, if any:

Properties would be acquired only from willing sellers, who would be paid fair market value for their properties.

1) Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

The Nisqually-Mashel State Park Site Master Plan was developed with the objective of continuing low-intensity uses on the site, while improving habitat for wildlife, and facilitating visitor connection with the natural and cultural resources of the area. All proposed future actions associated with the Nisqually-Mashel State Park Site Master Plan are consistent with existing zoning laws and the Pierce County and Thurston County comprehensive plans. (See responses to questions B.8.e. and B.8.f.) In addition Parks staff would work with the Nisqually Indian Tribe, and the counties to ensure that land classifications are reflected in local land use planning.

9. Housing

- a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.**

Future Park development may involve the development of new housing or the conversion of up to five existing homes to provide affordable residential units to house Park staff.

- b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.**

Depending upon the properties ultimately brought into the proposed Park's boundary, up to 18 single-family residences may be purchased. Properties would be acquired only from willing sellers. Most of the houses would be eliminated: however up to five may be used by Washington State Parks (e.g., for employee housing.)

- c. Proposed measures to reduce or control housing impacts, if any:**

As described in the response to questions B.8.j. and B.9.a., properties would be acquired only from willing sellers, who would be paid fair market value for their properties, allowing them to purchase or rent housing elsewhere. Of the houses that would be acquired, some would likely remain in use as housing—for Park staff.

10. Aesthetics

- a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?**

The tallest proposed future Park structures would be the high bridges, which would be cable-stay structures with support pillars reaching 80 to 100 feet at each bridge end. Bridges would be constructed of steel cable, with concrete footings or anchors, steel support towers, and a structural metal or wood decking system. A one-story visitor center is proposed and would be less than 40 feet tall. The exterior building material has not been determined at this time, but it would likely be wood, or other natural or sustainable materials siding.

- b. What views in the immediate vicinity would be altered or obstructed?**

Proposed future Park development is not expected to alter or obstruct any views from outside of the proposed Park because there would be no residents within close enough proximity to have views affected by the proposed Park developments. Views from within the Park would be altered by development of proposed Park facilities.

- c. Proposed measures to reduce or control aesthetic impacts, if any:**

In accordance with the proposed Master Plan, facilities would be sited and vegetation would be managed to retain and enhance views from within the proposed Park. All Park design and development would be based on the Nisqually River Council's 2006 *Low Impact Development and Architectural Guidelines (LIDAG) for the Nisqually Watershed*.

11. Light and glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Proposed future Park development would include some limited lighting to improve safety on road entries, at the village center, campgrounds, People's Center facilities, and in some high-use parking areas. Lighting would be required primarily at night, early morning, and late afternoon depending on the time of year.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

Lighting associated with implementation of the proposed Master Plan would not be a safety hazard and would not interfere with views because there are no residents in close enough proximity to the proposed lighted areas to be affected by the proposal.

c. What existing off-site sources of light or glare may affect your proposal?

No existing off-site sources of light or glare that may affect the proposal are known at this time.

d. Proposed measures to reduce or control light and glare impacts, if any:

To reduce light pollution, Washington Parks would use down-lighting and night-sky-friendly light fixtures. In addition, Washington Parks intends to use the least lumens necessary to meet the given lighting needs for each facility.

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

Recreational opportunities (both designated and informal) within approximately five miles of the site include rafting and fishing on the Nisqually River; boating, sightseeing, picnicking, and camping on Alder Lake; hiking along the Mashel River (trail access near Eatonville); horseback riding on local trails; University of Washington recreational activities, trails, and conference facilities in the Pack Forest; road biking; wildlife viewing and education at Northwest Trek; and activities at the Pioneer Farm. Mount Rainier is approximately 25 miles away, and activities there include hiking, biking, skiing, naturalizing, climbing, natural resource education, and camping.

b. Would the proposed project displace any existing recreational uses? If so, describe.

Implementation of the Nisqually-Mashel State Park Site Master Plan would not displace existing recreational uses in the vicinity. It may enhance existing recreational uses, for example, by providing trail connections between the proposed Park trails and existing local and regional trails.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

Because the proposal is a non-project action and would not displace any existing recreational uses, no measures to reduce or control impacts on recreation are necessary. Since the purpose of the proposed

Nisqually-Mashel State Park Site Master Plan is to guide the development of a new state park, many recreation opportunities would be provided by the proposed Park facilities. Those opportunities may include hiking, biking, horseback riding, camping, picnicking, birding, fishing, cultural resources education, and rafting.

13. Historic and cultural preservation

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.

A thorough analysis of all internal cultural resources reports and all records maintained by the Department of Archaeology and Historic Preservation indicated there are no places or objects listed or proposed for national, state, or local preservation registers within or next to the proposed Nisqually-Mashel State Park Site boundaries. However, historical accounts suggest the importance of the area to indigenous people and early Euro-American settlement.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

To aid State Parks in planning for the Nisqually-Mashel State Park site, State Parks conducted a cultural resources survey. The survey investigated ten 10-acre cultural resources survey parcels distributed through the site in areas with potential for Park development. The survey included a thorough analysis of historical records and discussions with people with local knowledge of the property and its history. Although no cultural resource sites were previously recorded at the site, the survey identified and recorded three prehistoric archaeological sites within the proposed Nisqually-Mashel State Park Site (Emerson and Ives 2008.) An additional prehistoric site and numerous historic cultural resources are previously identified within one mile of the proposed Park. The majority of land in the proposed Park appears to have a low and medium probability to contain unrecorded cultural resources; however, riverine settings and the Mashel Prairie are considered high probability areas.

c. Proposed measures to reduce or control impacts, if any:

As described above, to reduce and control impacts to cultural and historic resources through the planning process, State Parks contracted an extensive cultural resources survey in areas of the Park site likely to contain cultural resources. To ensure impacts to cultural resources are avoided, results of the survey were recorded with DAHP, a cultural resources probability map was generated to aid planning, and the presence of cultural resources modified design considerations for the Park master plan. State Parks archaeologists led the cultural resources investigations and facilitated discussions between stakeholders to ensure the cultural resources assessment was adequate for planning purposes. Furthermore, the master planning process resulted in recommendations that any future ground disturbing work would include more thorough archaeological surveys to be conducted in areas slated for development prior to construction. Future potential impacts on areas of historic, archaeological, scientific, or cultural importance from developments proposed by the Nisqually-Mashel State Park Site Master Plan would be evaluated by subsequent SEPA reviews. In the event that cultural resources are identified during any construction activities associated with the master plan, work in the immediate vicinity of the find would be halted and a professional archeologist would be notified to assess the resources in more detail.

14. Transportation

- a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.**

Access to land proposed for the Nisqually-Mashel State Park Site Master Plan includes partially-paved, dirt, and gravel roadways, associated mainly with previous logging operations. The primary access to the proposed Park would be from SR 7, which is located along the northern Park boundary (see Figure 5.)

- b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?**

The site is not currently served by public transit. The approximate distance to the nearest Pierce County Transit stop is approximately 15 miles to the north in Graham.

- c. How many parking spaces would the completed project have? How many would the project eliminate?**

Future development proposed by the Nisqually-Mashel State Park Site Master Plan would include visitor and employee parking that would provide parking for approximately 400 vehicles. There would be no loss of parking spaces.

- d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).**

Future development within the Park would require improvements to existing public streets, particularly 48th Street East and a private access road from the proposed Day Use Area to the People's Center. In addition, new roads would be constructed. Upon completion of Phase 4 of the Master Plan, approximately 5.3 total miles of new road would be in place.

- e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.**

Proposed Park developments would not use (or occur in the immediate vicinity of) water, rail, or air transportation.

- f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.**

Future Park development and subsequent visitor use would increase the amount of vehicular trips occurring in the area. Traffic impacts of proposed future development would be evaluated in subsequent SEPA reviews.

Site-generated traffic projections for the proposed Nisqually-Mashel State Park Site are based on the anticipated activities and visitation for the peak day of the year. Peak day volumes would likely occur on a summer holiday, such as 4th of July, and would exceed volumes on all other days of the year. The highest hour would occur mid-afternoon, approximately 2-3 PM. Timing of peak volumes would be

influenced by special event programming. New peak day vehicular trips anticipated to occur from future development are summarized in Table 4.

Table 4. Estimated total vehicle trips for the peak day of the year.

Phase	PM Peak Hour Inbound	PM Peak Hour Outbound	PM Peak Hour Total	Daily
Phase 1 – 2013	1	10	11	95
Phase 2 – 2018	5	13	18	250
Phase 3 – 2023	21	27	48	815
Phase 4 – 2028	57	143	200	2,200

g. Proposed measures to reduce or control transportation impacts, if any:

The Nisqually-Mashel State Park Site Master Plan recommends that transit shuttle service be provided to minimize emissions from Park traffic. In addition, the Master Plan identifies space for a transit stop within the proposed Park. If public transit is extended to the Park, Washington State Parks would encourage visitors to use transit to reduce vehicle trips. Park pedestrian and bicycle trails are planned to connect to local and regional trail systems to encourage walking and biking in lieu of driving to the Park. Analysis of future traffic operations with development of the Park indicate acceptable levels of service (LOS B) with existing traffic controls to handle the peak day's PM peak hour at the Park entrance and at nearby highway intersections including SR 7/Eatonville Highway East, and SR 7/SR 161. With completion of Phase 4, a right-turn taper on SR 7 at the Park's entrance may be a potential action to separate turning traffic from through traffic. Specific actions to manage traffic flow and to confirm sight-distance requirements at individual intersections would be evaluated in subsequent SEPA reviews.

15. Public services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

Future Park visitor use as proposed by the Nisqually-Mashel State Park Site Master Plan would increase the need for fire and police protection, and emergency services. At the completion of Phase 4, up to 4000 visitors and 2200 vehicles are anticipated to be present in the Park. In addition there would be 50 Park staff including administrative staff, park rangers, maintenance workers, specialists, and equipment operators. Some staff would reside at the Park.

b. Proposed measures to reduce or control direct impacts on public services, if any.

Washington Parks would have rangers on staff in the Park. As park rangers are law enforcement officers, they would address most of the future need for police protection by providing active law enforcement and patrol activities within the Park. Park staff would also coordinate emergency response with local fire, police, and emergency medical service providers.

16. Utilities

- a. **Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.**

No utilities are currently available at the proposed Park site.

- b. **Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.**

Future proposed utilities include telephone service, refuse service, and electricity. The current telephone provider for the area is Rainier Connect, and current refuse service provider for the area is LeMay Enterprises (Pierce County Refuse.) Electricity is proposed to be provided by existing utilities and solar power. The Park site has a Bonneville Power Administration (BPA) high voltage power line bisecting the site running northwest. Branching off this transmission line is a Tacoma Power overhead transmission line that supplies power east to Eatonville via a substation on Lynch Creek. The local electrical utility is Ohop Mutual Light Company. Ohop Mutual is planning to build a substation where the Tacoma Power transmission line ties to the BPA transmission line. Ohop Mutual has an existing power distribution line (overhead) that supplies power to local residences along Mashel Prairie Road. Electrical power for the Nisqually-Mashel State Park Site can be supplied via this existing distribution line. Utility installation activities for electrical and telephone service would involve clearing, trenching, grading, and installation of facilities. Utility installations would generally follow the planned roadways and trails. Water would be provided by wells.

During Phase 1 and Phase 2, restroom facilities would consist of composting toilets. However, Phase 3 and 4 development activities proposed by the Nisqually-Mashel State Park Site Master Plan would implement wastewater treatment using packaged onsite treatments systems. The packaged on-site treatment systems would include sedimentation tanks at the restroom source location to hold solids, and then the effluent would be pumped to a centralized treatment facility. The collection pipelines would generally follow the roadways and trails.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature:

Date Submitted:

D. SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS

(do not use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

While adoption of the Nisqually-Mashel State Park Site Master Plan would not have any direct environmental impacts, development proposed in the Master Plan would have impacts on water, air, and noise. Development would increase impervious surface within the proposed Park, resulting in more stormwater runoff and discharges to surface and ground water. See Sections B.3.a. and B.4.d. for more detailed information. The proposed development would increase emissions to air and ambient noise due primarily to increased traffic and visitor use, including camping. (See Section B.2.a, B.3.a, B.3.b., and B.7.b.2.) The proposal is not expected to increase the production, storage, or release of toxic or hazardous substances (see Section B.7.a.)

Proposed measures to avoid or reduce such increases are:

Measures to avoid or reduce water impacts are described in the responses to questions B.3.a.3), B.3.a.6), B.3.b.2), B.3.c.1), and B.3.d. Measures to avoid or reduce air impacts are described in the response to question B.2.c. Measures to address potential hazardous substance releases are described under question B.7.a.2.) Noise abatement measures are described under question B.7.b.3.)

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

The future developments proposed by the Master Plan would result in temporary and permanent clearing of vegetation; approximately 234 acres of vegetated areas would be converted to developed areas (approximately 7 percent of the proposed long-term Park boundary.) In addition, a forest health plan prepared for the Nisqually-Mashel State Park Site would be implemented that would include forest thinning and planting. (See Section B.4. for more information on vegetation altering activities.) Construction activities would have temporary impacts on wildlife and fish, although activities would be timed to avoid impacts during critical use seasons and construction site management would implement best management practices to manage and treat stormwater runoff. Increased human activity within the proposed Park would also have some effect on wildlife because of increased noise, traffic dangers, and other forms of disturbance that could affect breeding, feeding and migratory behaviors. (See Section B.5. for more information on wildlife resources found at the Park site.) The proposal would not affect marine life.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

The future developments proposed by the Master Plan would be designed to avoid and protect important natural resources, and any unavoidable impacts would be mitigated, consistent with all local, state, and federal laws protecting plant, animal, and fish species. The Master Plan is based on an ecosystem health approach to site design where impacts on natural resources are minimized through sensitive site design. A Stewardship Plan, developed to guide Washington State Parks in conserving and preserving natural resources, would be adopted as part of the Master Plan.

The Master Plan clusters buildings and other development to reduce building envelopes to the extent feasible. Natural features including high quality or rare native habitats, wetlands, creeks, rivers and their associated buffers would be protected both during construction and Park operations by limiting construction staging and materials storage stockpiling areas. Care would be taken to prevent soil compaction and prevent the spread of noxious weeds. Intensive uses would be located apart from regulated critical areas. All areas disturbed during construction and Park operations would be rehabilitated.

The Nisqually-Mashel State Park Site Master Plan outlines Park elements and management practices that seek to enhance vegetation and wildlife habitat through a variety of mechanisms. All proposed land classifications and development concepts are the product of comprehensive planning efforts that focused on preservation of existing sensitive and unique wildlife habitats, such as riparian areas, migration corridors, nesting areas, wetlands, and floodplains. Such sensitive areas are classified in the Master Plan in more protective classifications, such as Resource Recreation, Natural Forest, or Natural. Those classifications provide a high level of protection for the wildlife communities and natural resources, while restricting high-intensity recreational use and, thereby, limiting the amount and types of human/wildlife interaction. The Master Plan is based on the objective of avoiding construction of Park infrastructure in high quality wildlife habitats whenever possible. Washington State Parks would also implement seasonal closures to reduce human disturbance of wildlife in critical use areas, such as areas used by elk during calving season.

Prescribed silvicultural thinnings and plantings (as described in Etzl and Emmons [2008]) to target the development of old-growth conditions in certain areas of the proposed Park would be used to enhance on-site habitat diversity to encourage diverse wildlife use. Low impact development features utilized in Park infrastructure would reduce stormwater and wastewater impacts to on-site streams, wetlands, and vegetation communities. Native plant landscaping and restoration (including invasive plant species management) would further increase foraging and habitat potential for on-site wildlife.

3. How would the proposal be likely to deplete energy or natural resources?

Development and activities proposed in the Nisqually-Mashel State Park Site Master Plan would consume electricity, water, and fossil fuels (primarily for vehicles.) Energy and natural resources would be used during construction and by Parks staff and visitors after construction is completed. The expected construction and use of the Park would not deplete available electricity, water, and fossil fuels.

Proposed measures to protect or conserve energy and natural resources are:

The proposed Nisqually-Mashel State Park Site Master Plan specifies the integration of green and sustainable building techniques into Park infrastructure development, and Park structures would be designed to meet or exceed sustainable standards for energy and environmental design (including materials, heating and cooling systems, insulation, power generation, etc.) such as those found in Leadership in Environmental and Energy Design (LEED) from the U. S. Green Building Council. Low impact Development (LID) strategies would be used for site design, and infrastructure and building facilities. These would include use of existing buildings, on-site materials, and recycled materials when feasible, energy conservation design features for facilities such as passive solar heating, high-efficiency insulation, energy efficient lighting, and low-flow fixtures, and low impact development components for Park infrastructure such as green and water retaining roofing systems, raingardens, cisterns for rainwater collection, dry wells, and pervious pavement for hard use areas.

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

The proposed Nisqually-Mashel State Park Site Master Plan was developed through a proactive approach that seeks to avoid sensitive habitats—such as wetlands, streams, steep slopes, endangered species habitats, floodplains and prime farmland—and to protect cultural and archeological resources. Public involvement, published databases, plans, and specialized studies (including a cultural resources survey, environmental constraints report, rare plants and habitats survey, and forest health plan specific to the site) were used to identify important natural and cultural resources at the Nisqually-Mashel State Park Site in order to avoid or minimize impacts on them from planned Park development. Impacts on environmentally sensitive areas would be minimized to the extent feasible. All required local, state, and federal avoidance and compensation measures would be employed. Any proposed impacts to these resources would be evaluated by subsequent SEPA reviews.

Proposed measures to protect such resources or to avoid or reduce impacts are:

The Nisqually-Mashel State Park Site Master Plan recommendations for development emphasize the need to protect and enhance the integrity of the environmentally sensitive areas in the Park by minimizing impacts to these areas to the extent possible and by abiding strictly to the Pierce and Thurston County critical areas ordinances. This would be accomplished because development is focused in less sensitive and previously disturbed areas, the Master Plan utilizes low impact development techniques, visitor use is managed to protect sensitive habitats, archeological sites and cultural resources are protected with measures such as fencing and strategic trail placement, and by providing educational opportunities to showcase the benefits of cultural, archeological, and natural resource protection. While general surveys were completed to support this Master Plan, further field assessments would be conducted in advance of detailed site planning prior to all future development proposals to determine the specific locations and extent of natural and cultural resources and to avoid impacts on them to the extent feasible.

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

The Nisqually-Mashel State Park Site Master Plan proposes to continue low intensity recreational use on the property, but the focus of activities on the property would shift from informal recreational use and timber harvesting to planned recreational use that includes camping facilities, developed trails, and a visitor's center. This would likely increase human use intensity in specific areas such as day use areas, campgrounds, trail corridors, and some locations along riparian corridors where trails and overlooks are planned. No incompatible land uses are proposed for the Park or the shoreline area within the Park. (See Sections B.8.f. and B.8.g. for land use designations.)

Proposed measures to avoid or reduce shoreline and land use impacts are:

The Nisqually-Mashel State Park Site Master Plan was drafted with the objective of minimizing impacts on property resources, while increasing opportunities for recreation and education. All Park activities would be guided by these principles. The proposed Nisqually-Mashel State Park Site Master Plan is consistent with current land use designations and would not impact shoreline uses. The proposal would likely decrease overall impacts on land due to the elimination of conventional timber harvesting on the property. Road, facilities and bridge construction would be undertaken using the lowest impact techniques practicable, and all development activities would comply with local, state, and federal regulations as they exist at the time development occurs.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

Development of the Park would increase traffic volumes on area roadways. Initial analysis indicates that existing roads have sufficient capacity to accommodate new Park traffic during the Park's peak day. Analysis of future traffic operations with development of the Park indicates acceptable levels of service (LOS B) with existing traffic controls for the peak day's PM peak hour at the Park entrance and at nearby highway intersections including SR 7/Eatonville Highway East, and SR 7/SR 161. With completion of Phase 4, a right-turn taper on SR 7 at the Park's entrance may be a potential action to separate turning traffic from through traffic. Specific actions to manage traffic flow and to confirm sight-distance requirements at individual intersections would be evaluated in subsequent SEPA reviews.

Park use would also create demand for solid waste removal and electricity, and would increase the need for fire, police, and emergency medical services.

Proposed measures to reduce or respond to such demand(s) are:

The Nisqually-Mashel State Park Site Master Plan recommends that transit shuttle service be provided to minimize emissions from Park traffic. In addition, the Master Plan identifies space for a transit stop within the proposed Park. If public transit is extended to the Park, Washington State Parks would encourage visitors to use transit to reduce vehicle trips. Park pedestrian and bicycle trails are planned to connect to local and regional trail systems to encourage walking and biking in lieu of driving to the Park.

Measures to reduce energy/electricity use are described above under Section D.3.

Washington Parks would have rangers on staff in the Park. As park rangers are law enforcement officers, they would address most of the future need for police protection by providing active law enforcement and patrol activities within the Park. Park staff would also coordinate emergency response with local fire, police, and emergency medical service providers.

Subsequent SEPA reviews would evaluate specific impacts of proposed development and means to reduce them.

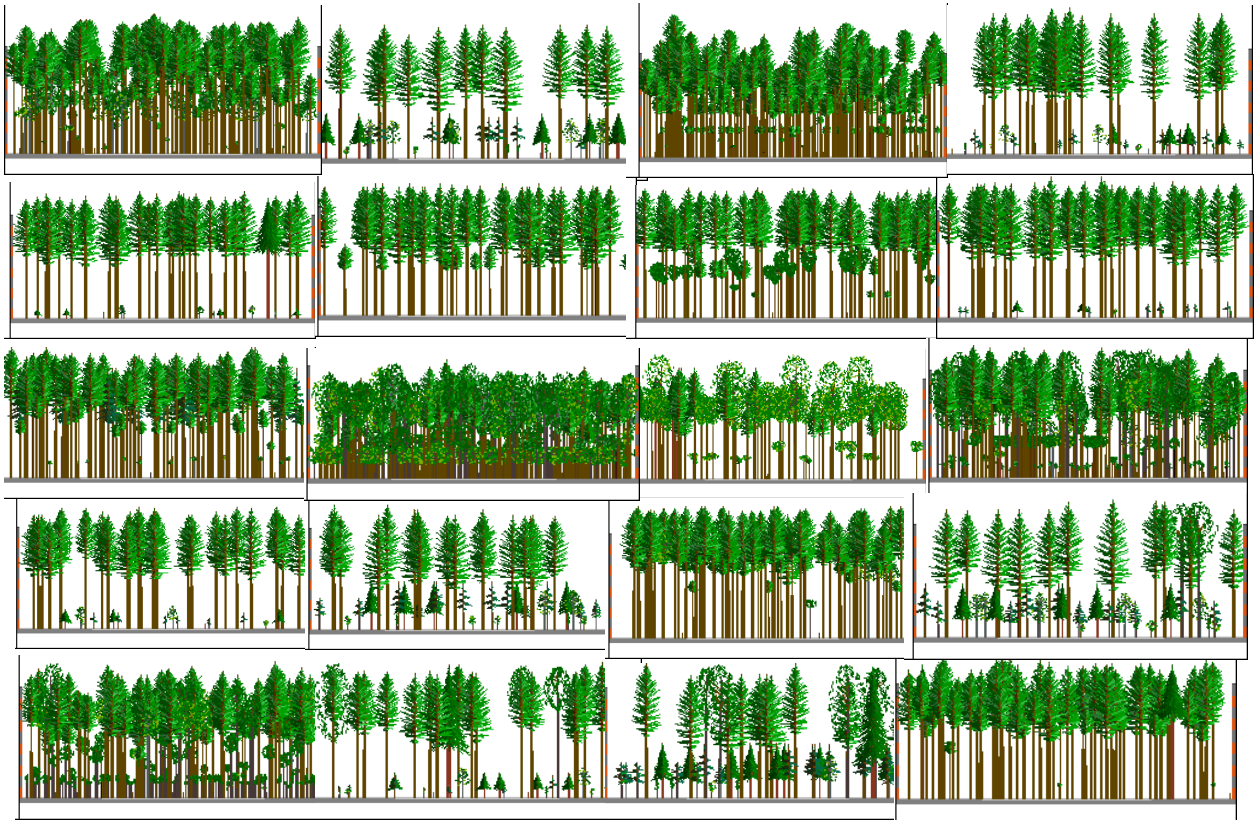
7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

The proposed Nisqually-Mashel State Park Site Master Plan development would comply with all applicable local, state, and federal laws. The proposal is consistent with all local, state, and federal laws and requirements for the protection of the environment.

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NISQUALLY MASHEL STATE PARK FOREST HEALTH PLAN



Gregory J. Ettl and Duane Emmons
Center for sustainable forestry at Pack Forest,
University of Washington
2008

EXECUTIVE SUMMARY

The Center for Sustainable Forestry at Pack Forest conducted a field survey of plantation-dominated stands in the Nisqually Mashel State Park for purposes of developing this management plan. In general, this plan seeks to promote the maturation of diverse, “natural vegetation” in the park. To achieve this condition, a series of silvicultural thinnings are recommended to reduce closed canopy conditions, opening light to the understory. Lower stand density should foster greater overall biodiversity, advance stand development toward more old-growth structural features, and provide easy access for multiple recreation objectives.

The forest modeling program Landscape Management System (LMS) was applied to field data, allowing us to examine the possible outcome of a number of silvicultural prescriptions. For simplicity we narrowed our focus to three treatments, reducing stand density to either 50 or 100 trees per ac over the next 5 years, or no treatment. We examined model outputs on a stand-by-stand basis and we recommend thinning stands (20, 25, 26, 43, & 44) in 2008 and another set of stands (3, 4, 14, 16, 21, 27, 29, & 34) in 2013 for a total of 444 treated acres. Our analyses indicate thinned stands will produce larger trees than unthinned stands, but typically only two or three canopy layers. Untreated stands often project a greater number of canopy layers, but smaller trees than do model outputs of our treated stands. Hence, we recommend a mixed treatment approach that will focus on thinning the most highly stocked portions of stands across the park landscape. Thinnings are to be undertaken using a variable thinning approach, which will allow on-the-ground, site-by-site decisions as to what should be thinned and retained. The mixed treatments should allow for increased within site diversity, protection of sensitive sites, and a greater number of options for future managers. The need for follow-up treatments should be apparent by the year 2035 and future managers will need to create a new management plan by that time.

The forest operations associated with the thinning will require a considerable amount of management oversight and we describe options to address these. The proposed logging will require someone to file applications, communicate with loggers and oversee their

work, and conduct follow-up management (especially if Forest Stewardship Council [FSC] certification is pursued). We believe that much of the management work could be hired out for contract and revenue generated from harvests could help pay for these expenses. Logging activities may be viewed poorly by the general public at first, however, the aesthetic gains of the thinning prescriptions and benefits to both wildlife and recreation within 5 years, should help to increase the public's level of comfort with forest health treatments of this nature.

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PREFACE

In 2006 LYRA Biological conducted a comprehensive vegetation survey of the 1230 acre Nisqually Mashel State Park (Luginbuhl and Darrach 2006). The Center for Sustainable Forestry at Pack Forest was hired in 2007 by the Washington State Parks and Recreation Commission for purposes of conducting a forest health assessment and creating a forest management plan for the park. This document represents the melding of field surveys, computer analyses, discussions with WA State Park personnel and an integration of stakeholder desires, with the science and art of silviculture. The park was divided into two structural groups for purposes of conducting the forest health assessment: 1) mature or maturing forest types associated with steep canyon and riparian areas along the Nisqually and Mashel rivers that escaped 20th century harvesting, and 2) the sites upland of the rivers that have been harvested and planted with Douglas-fir for industrial timber production. The forest survey and associated management plan focuses on the latter, plantation sites with goals of preventing stand stagnation, increasing species diversity, increasing horizontal variation, and facilitating stand development. In short, we¹ seek a means of increasing the quality of wildlife habitat associated with the entire forest with an eye towards speeding up stand development where possible.

Project Goals

The goal of this project is to enhance the short- and long-term potential of the park to support a diversity of wildlife, with an emphasis on advancing forest vegetation diversity and structure that favor old-growth dependent species. Specifically, this project seeks to:

- reduce closed canopy conditions associated with recent plantations.
- increase structural and vegetation diversity.
- consider landscape-level stand arrangements to maximize habitat for interior habitat dependent species.
- plan for continuous vegetation diversity through time.
- protect rare vegetation types and enhance rare vegetation habitats.

¹ The word “we” (our “our”) refers to the work of the Pack Forest staff (including Duane Emmons who supervised the field crew, ran LMS models, etc.) with input /guidance by State Parks staff. Occasionally the word “I” is used in the document, and it reflects Gregory Ettl’s personal / professional thoughts on a topic.

- provide a safe and aesthetically pleasing environment for visitors, including consideration of viewsheds and experiences in common use areas.
- reduce wildfire risk, especially in relation to buildings and infrastructure.
- reduce the abundance of exotic vegetation and increase native vegetation through either silviculture or restoration projects.
- develop a plan that is compatible with Forest Stewardship Council (FSC) certification requirements.

In general, this plan seeks to promote the maturation of diverse, “natural vegetation” (and the habitat and recreational attributes it creates) in the park. The definition of natural for this document includes the influence of native people on the park prior to logging and land conversion in the late 1800’s. A first step in discerning what vegetation is “natural”, and therefore the desired future condition, is to understand the typical environment and associated vegetation for the region. In this document, we first describe the natural history of the park, and summarize forest ecology and management literature that addresses the issue of recreating “natural vegetation”. Next I use our survey results to describe stand-by-stand forest health both now and by projecting stands into the future. The silvicultural prescriptions that follow from this information form the basis of a management plan that aims to treat 444 ac (about 1/3 of the park acreage) by 2013.

INTRODUCTION

Natural History of the Park

The Nisqually Mashel State Park (NMSP) is located near the confluence of the Nisqually and Mashel Rivers in Pierce and Thurston Counties (Figure 1). The property is adjacent to the University of Washington's Pack Forest on the east, with a mixture of private timberlands to the south and west, low density rural housing to the north, and agriculture in close proximity to the west (e.g., Ohop valley). The park is situated at a transition point in the Nisqually basin. Upstream from the park is the Alder dam, with most stretches of the Nisqually River protected to its origins in Mt. Rainier National Park.

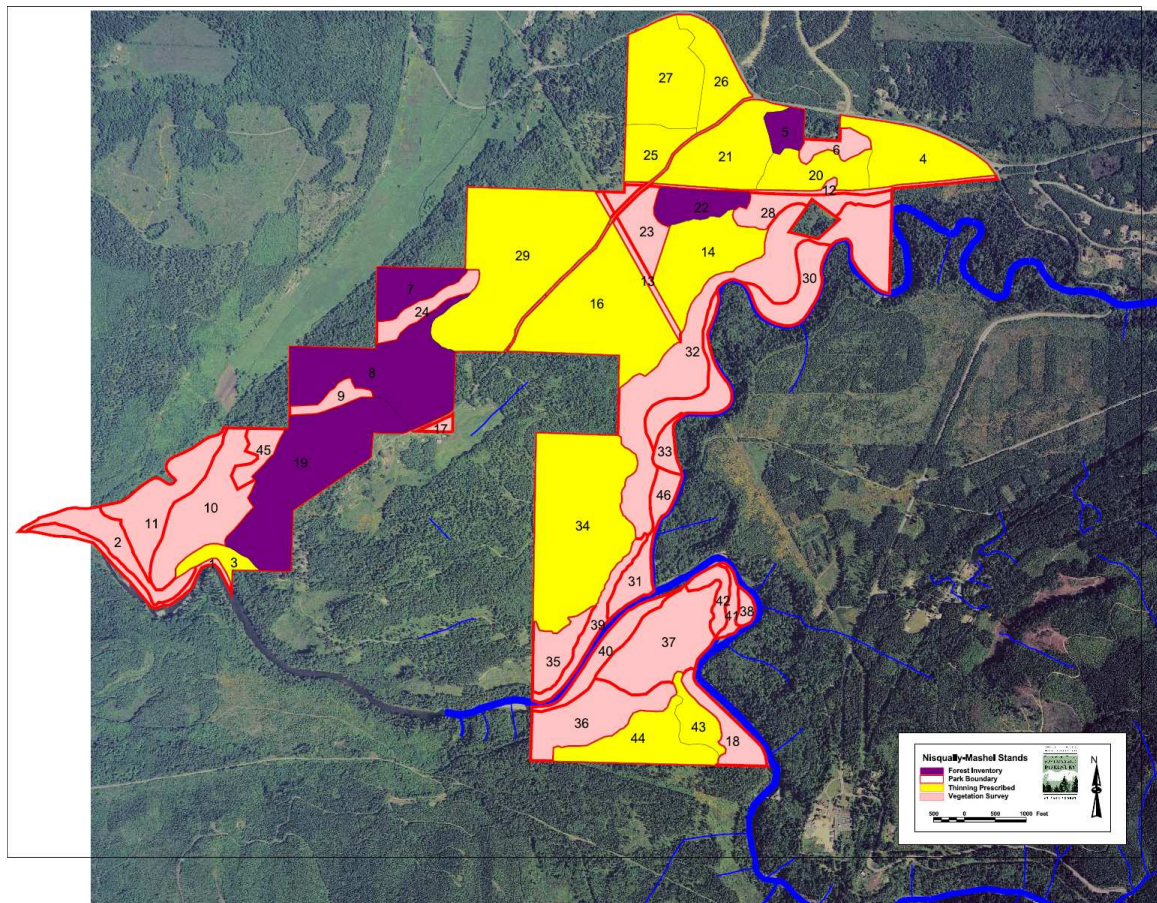


Figure 1. The purple and yellow numbered stands represent the 18 stands surveyed where silvicultural prescriptions were considered. We recommend thinning treatments for all stands highlighted in yellow. The unnumbered pink areas represent park stands that were not surveyed for this project. Some of these stands might also benefit from treatment, however their origin, age, composition and/or location makes entry undesirable at this time.

Downstream the Nisqually River encounters increasing pressures from agricultural and residential development. The park can be viewed as part of a larger corridor that provides near continuous forest cover from the Cascade Mountains to south Puget Sound; perhaps providing a regional corridor allowing wildlife to pass between the Olympic and Cascade ranges. The park is also located in close proximity to Eatonville and is therefore near the edge of an advancing urban-wildland complex. It appears likely that development pressures will increase the importance of the park as wildlife habitat through time.

Climate

Cool, wet winters and warm, dry summers with an extended summer drought (Franklin and Dyrness 1988) describe the climate in the Puget Lowlands of western Washington. Swanson (2006) used Western Regional Climate Center data to characterize the climate for adjacent Pack Forest. The mean annual temperature is 51.3° F; average January and July temperatures are 39 and 64.9° F, respectively. Temperatures only exceed 95° F 2.3 days a year on average, and the frost-free period is 315 days. Annual precipitation averages 38.5 inches, with 88% of this falling between September and May. Annual snowfall averages only 4.2 inches, and in most years there's no extended snowpack.

Geology and Soils

The park is located predominantly on river terraces of the Nisqually and Mashel rivers. Erosion-deposition cycles caused mid-upper Miocene continental sedimentary deposits, the Mashel Formation, to move to lowland sites including the study area (Bretz 1913). This base-rich material is the parent material of the flats to the west of Highway 7, and is also found underlying glacial deposits along the length of the Mashel River (Swanson 2006). The park was probably associated with the Nisqually Glacier as alpine glaciers extended to the vicinity; their retreat left behind glacial drift known as the Wingate Hill Drift as the dominant parent material (Swanson 2006).

Glacially derived soils dominate the park landscape although Mashel Formation derived soils may also be present. The poorly developed glacial soils are classified as Aquic Xerofluvents (Anderson 1955). The Kapowsin, Barneston, and Everett soil series are described from this classification and all of the soils are coarse and well-drained, enhancing the effects of summer droughts (Anderson 1955). Canyons and other steep banks areas are dominated by the Kapowsin gravelly loams. Upland sites in the park form the Mashel plateau that is comprised of a combination of the Kapowsin gravelly loams and the Barneston gravelly coarse sandy loams. The Spana series is present in the Mashel Flats just outside the park boundaries and these soils may be coincident with the Mashel Prairie. The Barneston and Everett series are generally poor soils that are associated with lower stand densities and slower stand development. Moister soils are often associated with the clayey loam Bellingham series (Figure 2).

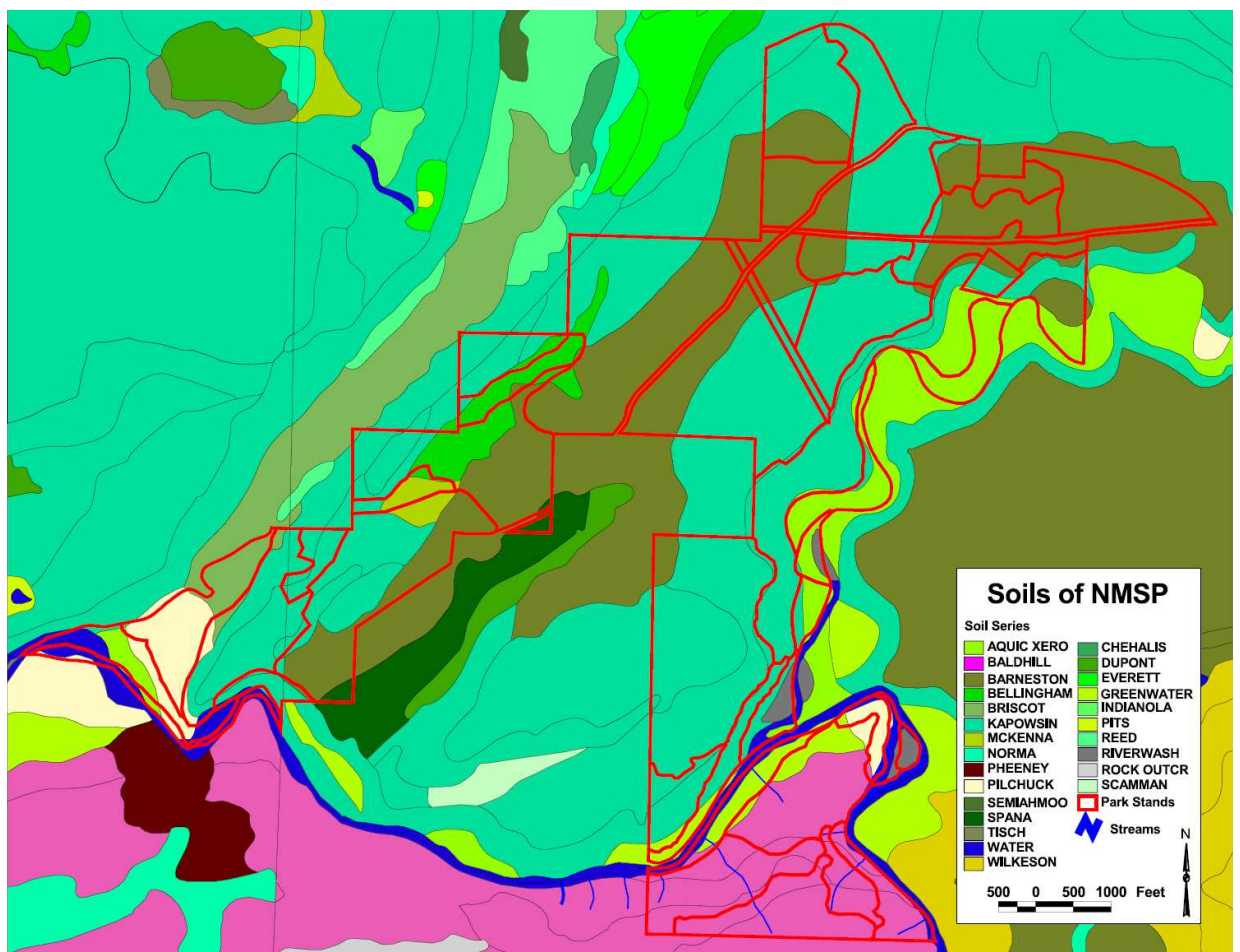


Figure 2. Soil map of the Nisqually-Mashel State Park area. The red outline indicates the park and stand boundaries (stands are numbered in Figure 1 for reference).

Vegetation

The park is located in the *Tsuga heterophylla* Zone² (Franklin and Dyrness 1988).

Douglas-fir, red alder, bigleaf maple, and black cottonwood are common shade intolerant species, while western hemlock and western redcedar are dominant shade-tolerant, late-successional species; western redcedar is associated with all stages of stand succession (Minore 1990). Grand fir and madrone are rare but also present. Oregon ash is common on moist and poorly drained sites, in combination with black cottonwood, red alder, and western red cedar. Bigleaf maple is common on sites with well drained soils within the park.

This work focused on the most heavily disturbed forest types of the park, and we restrict our discussion to the upland areas, however it is important to note that much of the park vegetation along the canyons bordering the Nisqually and Mashel rivers are typical associations for the region. The majority of the stands are best described as Douglas-fir dominated with salal, snowberry understory (Luginbuhl and Darrach, 2006). One stand (23) was described as lodgepole pine (*Pinus contorta*)/Douglas-fir dominant (salal understory) which would classify the site as a critically imperiled vegetation type and a target for preservation (Luginbuhl and Darrach, 2006). The stand was excluded from our survey for this reason. While the site is in fact a mixed lodgepole pine/Douglas-fir stand, it appears to have initiated from intentional planting, lowering its initial habitat value in our opinion. Nevertheless, this site may serve similar functions to naturally rare stands of this species composition.

Disturbance history

Charcoal records indicate fire was present in the Pacific Northwest soon after glacial recession (Agee 1993). Seasonal burning by native people may have been important in creating and maintaining Puget Lowland prairies and Oregon oak/Douglas-fir woodlands (Leopold and Boyd 1999). The extent of low intensity seasonal burning that would have shaped the vegetation within the park is unknown. Nevertheless, the Mashel Prairie and

² Appendix 4 includes species Latin names, common names, and species abbreviation codes for reference.

nearby sites (e.g., along HWY 161, Pack Forest) are consistent with this disturbance regime. It seems likely that many stands in the area would have originated from infrequent large fires as occurred multiple times in the early 1900's in this area (e.g., Eatonville Fire, Nisqually Canyon Fire, and Bushy and Long fire—Bigley 1933). Most large fires would have been essentially stand replacing, although some stands were probably shaped by several lower intensity fires (e.g., west Hugo Ridge, in nearby Pack Forest). Summer droughts exacerbate the risk of fires, and given that historic records indicate high intensity fires, it would appear that preventing ignition sources will be important in shaping the long-term vegetation dynamics of the park. Numerous fire breaks exist from powerline corridors and existing roads, and consideration should be given to maintaining these features in a proactive fire response plan.

A major Nisqually settlement was located near the Mashel River (Nisqually Tribe 2007) and therefore fire ignitions in the area probably exceeded background (lightning ignited) levels. In fact, the nearby Mashel Prairie may be associated with low intensity, frequent fires set by the Nisqually Tribe. Ugolini and Schlicte (1973) suggest that the Spanaway soil series owe their origin in part to human burning and contain charcoal. It is unknown how widespread the influence of native-set fires was in the region and the Nisqually and Mashel Rivers may have prevented their spread. The use of fire by humans in the area raises the question as to whether fire should be used as a management tool in the park. The multiple-use objectives of the park would appear inconsistent with prescribed fire, as smoke from burning would interfere with other uses. Prescribed burning to restore native prairie or open woodland habitat may be desirable, but the restoration process is complex and beyond the scope of this management plan.

Wind is also an important component of forest development in the region, with low intensity storms providing an important dynamic in shaping stand development as individual or small groups of trees are killed by common events (Lutz and Halpern 2006). The majority of wind events occur during the fall and winter as high energy systems move in from the coast. Storms typically bring winds from the southwest, and in many years more than one storm will be of sufficient strength to cause gap-level windthrow.

The potential for winds that cause stand-level blowdown exist, but is likely lower than the risk of catastrophic wildfire. Sharp boundaries such as road edges, powerline corridors, and areas adjacent to recently harvested stands, are most likely to be subjected to large-scale blowdowns. Much of the park is in river valleys and other protected sites and therefore generally at low risk of catastrophic blowdown. Clear-felling of trees should be avoided to minimize this risk. Thinning activities increase the risk of blowdown in the short-term, and this risk needs to be weighed against the higher risk associated with high-density unthinned stands as they mature. In general, the risk of blowdown for mature, overstocked plantation sites should exceed the risk from thinning those stands early in stand development, though the window of time where thinning should take place is probably narrow³ (Wilson and Oliver 2000).

Native Pests and Diseases

Native trees of the western Cascades are susceptible to numerous pathogens that interact with environmental stresses, eventually leading to mortality. High stand density is often associated with a greater proportion of low vigor individuals within the stand and therefore increased mortality. The end result of mortality, whether through density-dependence or pests/disease, is windthrow and increased risk of wildfire propagation and severity as fuels accumulate on the forest floor. One objective of this work is to lower the risk of catastrophic mortality from all causes over the 50-year planning period. In contrast, mortality agents that kill individual trees or small groups of trees may serve a general stand objective of creating horizontal diversity in the park. That is, small-scale disturbance serve to increase the diversity within otherwise uniform stands.

A list of potential forests pests is beyond the scope of this work and so we list notable pests we've encountered managing Pack Forest. The most important native mortality agent for mature trees at Pack Forest (excluding physical disturbances caused by wind

³ High initial planting densities make thinning difficult. Specifically, high density stands put a lot of energy into height growth as they compete for light, resulting in tall, small diameter trees that are sensitive to windthrow. Narrow timing refers to the tendency for densely stocked stands to show increasing height:diameter ratios (measured inches:inches) at stocking levels > 350 trees/ac after trees reach 30' in height. Thinning should occur before height:diameter ratios reach 70. Stands with height:diameter ratios > 100 should be thinned lightly and with caution.

and fire) is laminated root rot (*Phellinus weirii*). *Phellinus*' primary hosts include Douglas-fir, grand fir, and to a lesser extent western hemlock, spreading from tree-to-tree through the soil roots (Edmonds et al. 2000, p 298). Western redcedar is resistant, and hardwoods are essentially immune to *Phellinus* (Thies and Sturrock 1995). Root rot pockets were absent from field surveys, although we sampled at a coarse scale (1 plot/ 10 ac) and it is likely that some pockets will become more visible as stands mature. Laminated root rot shouldn't interfere greatly with park objectives because the spread is typically slow leaving snags for wildlife in the process. One potential management conflict is the creation of hazard trees near facilities.

Wildlife is also an important mortality agent in Pack Forest with the greatest threat to mature trees coming from black bear damage. Bears strip the bark off of trees in the spring, going through 60-70 trees/day (Ziegltrum 2004). At Pack Forest Douglas-fir is their main target. Pack Forest has suffered significant losses as bears target pole size trees, thereby setting back areas of plantation by decades. Bear activity in the NMSP could become a major mortality agent as plantations are currently at a size that bear prefer, but this activity may also serve an important role in opening up dense Douglas-fir stands. Bear feeding stations could be used to reduce damage if mortality should become problematic in some areas (Ziegltrum 2004); Pack Forest has received adequate protection through feeding stations. Browsing damage from deer and elk are likely to be common throughout the park and may provide challenges for establishing a second cohort (especially western redcedar) in the understory of thinned stands (Brandeis et al. 2002, Maas-Hebner et al 2005).

Non-native Pests and Anthropogenic Threats

The health of the park's forest is likely under greater pressure from anthropogenic forces, than native diseases. The park currently has invasive plant species competing with native plants in many areas (Luginbuhl and Darrach 2006). Along roadside edges and partially failed plantations Scot's broom (*Cytisus scoparius*) and non-native blackberries (e.g., *Rubus laciniatus*, *Rubus armeniacus*) predominate. The invasive species can slow or prevent forest regeneration, and also pose a serious threat to native understory

composition as sections of the forest may become dominated by a near monoculture--lowering plant diversity. Densely stocked Douglas-fir sites will eventually produce closed canopies that reduce invasive plant species. One fundamental management goal is to prevent large areas of forest from being converted to brushy thickets of invasive species. It should be noted that attempts to reduce forest density through thinning increases the risk of encouraging invasive species (Bailey et al. 1998) and likely necessitates control of invasive species to maintain native plant communities. The current threat of invasive species is minor-moderate on most sites, but I am confident the threat to native vegetation will increase through time.

The park is also likely to receive heavy public use. There is evidence of off-road all terrain vehicles (ATVs) throughout the park. The establishment of permanent facilities and patrols in the park will probably reduce this problem as ATV users shift their use to other locations. The park is also likely to be attractive to mountain bikers, and this use will likely increase as the park gains greater visibility. Both motorized and non-motorized off-road vehicles can be damaging to native vegetation and provide a vector for the further spread of invasive species. Forest management that promotes open structure will favor unauthorized off-trail use.

Exogenous human influences from such sources as anthropogenic air pollution and climate change are also likely. Climate change is probably the greater of these threats. Climate projections are uncertain but there is a general consensus that temperatures will be warmer, with increased winter precipitation, and a general increase in climate variability (Mote et al. 2005). Increased storm events and subsequent river flow is one important consideration for forest health, and because both the Nisqually and Mashel rivers are restricted to canyons within the park, the largest changes may be associated with increased slope failure. Greater variability in summer temperatures will likely lead to increased frequency of summer drought with the most troubling consequence being increased fire risk.

Forest Management

Managing Forests for Natural Processes

Forest management is changing rapidly in the Pacific Northwest with increasing valuation of ecosystem services including recreation, aesthetics, and wildlife requirements. Increasing urbanization, population growth, and suburban sprawl have shifted attention to managing forests for both timber production and recreational needs. One expression of these new social forces is forest certification. The importance of forest certification is reflected in one goal of this forest plan, the ability to achieve FSC certification. A review of the FSC Pacific Coast Standard (2005) reveals no forestry-based limitations⁴ to obtaining FSC certification if this plan is implemented. FSC restricts clearcuts, but none are planned. In fact, the thinning operations we recommend are consistent with FSC standard objectives (15.5.c) to convert plantations to native vegetation as soon as possible. Ecosystem-based forest management is a goal of this plan as we attempt to restore old-growth-like habitats by recreating natural stand development. The question that arises is what is considered natural stand development?

Stand Development

Natural stand development in the park was driven primarily by a complex of fire, wind, and succession, prior to the 20th Century. Native human influence on the park was probably significant as the site has historical significance for the Nisqually Tribe (2007). The fire return interval for the park is unknown but is generally 100-300 years in the western Cascades (Agee 1993, pp 13-21)⁵. In the absence of stand replacing fire, succession would favor shade tolerant species such as western hemlock, western red cedar, grand fir, and vine maple. However, early seral species for the region are all very long-lived (maximum ages: Douglas-fir 750+, big-leaf maple 300+, black cottonwood 200+, and red alder 100 years; Franklin and Dyrness 1988) and therefore most primary

⁴ The FSC standards include a number of social and economic criteria. Some of the social goals of FSC certification, for example maintaining a steady flow of wood products, may not be met by this plan. That is, the plan calls for two harvest periods and then preservation—perhaps harvesting too little timber may disqualify the park from FSC certification?

⁵ I speculate that fire would have been closer to the more frequent end of that spectrum due to the historic presence of the Nisqually tribe in the area.

forests⁶ have a significant component of individuals that were present from the stand's inception. If we presume the frequency of catastrophic wildfire for the area to be 100-300 years, then a shift to 60 year plantation-oriented silviculture is a significant departure from natural stand development.

Stand replacing fires, even of high intensity typically leave some larger living trees on the landscape (especially fire resistant Douglas-fir) and large amounts of coarse woody debris, although complete stand replacing fires are well documented (Morrison and Swanson 1990). The post-fire landscape would be expected to regenerate from remnant seed trees (i.e., biological legacies Franklin and MacMahon 2000), sometimes over decades. Post-fire stocking was typically low and spatially and temporally variable, leading to sparse-moderate mixed species stocking (20-50 trees/ac) and large variability in the age of large trees (100-420 yr; Tappeiner et al. 1997); stands with what we now describe as old-growth forest structure. For the purposes of this plan, we characterize natural stand development in the park as follows (based largely from Franklin et al. 2002, and to a lesser extent Spies 1997):

- 1) Disturbance and Legacy Creation—stands begin with a disturbance that leaves standing and downed coarse woody debris (CWD) and living legacies.
- 2) Cohort Establishment—distance to seed limits establishment in patches across the landscape and while some stands initiate with high stocking, many establish over much longer periods of time.
- 3) Canopy Closure—rate of closure depends on initial density, with low density or unevenly regenerated stands requiring decades to reach a closed canopy condition.
- 4) Biomass Accumulation/Competitive Exclusion—from canopy closure to 80-100 year-old stands. Dominant trees continue to add volume and occupy more growing space at the exclusion of subordinate neighbors.

⁶ Defined here as stands that were not subjected to post-European settlement logging practices.

- 5) Maturation—begins around 80-100 years and persists to 150 years, understory re-establishes, development of decadence in overstory, and a shift from density-dependent to density-independent mortality.
- 6) Vertical and horizontal diversity in canopy structure—growth of next cohort, filling in of crowns through epicormic branches, and spatially variable gap-phase mortality. These processes take place between 200-350 years resulting in the stands typically categorized as old-growth.

The process of natural stand development (Franklin et al. 2002) is in contrast to the development of stands from monocultures of high density Douglas-fir plantations. Douglas-fir plantations are designed to maximize wood production over shorter time periods and typically have much higher stocking (up to 1400 trees/ac—Wilson and Oliver 2000), including thinned stands (~80 trees/ac⁷; Tappeiner et al. 1997), compared to stands establishing through natural processes.

The development of plantations more closely follows Oliver and Larson (1996)⁸, with my interpretation.

- 1) Stand initiation phase—stands beginning from a uniform establishment of Douglas-fir. Initial stages of plantations contain competing woody and herbaceous vegetation which may or may not be eliminated with treatments.
- 2) Canopy closure—crowns in the stand ideally fill all growing space, shading the understory below. This stage results in low to no ground vegetation cover and has in general been associated with lower overall plant and wildlife diversity.
- 3) Stand reinitiation phase—stands that are allowed to proceed to this stage (the goal of many plantations is to harvest before this point), experience increasing mortality of canopy subordinates and the stand opens as some trees die. Gaps created by this density-dependent mortality lead to establishment of a new cohort, which is likely to be dominated by more shade tolerant species.

⁷ I took the average of eight thinned stands; range 60-105 trees/ac

⁸ It should be noted that Oliver and Larson describe the establishment of a numerous stands including old-growth development in this context. Some would argue for the merits of Oliver and Larson's approach to describing old-growth development.

- 4a) Old-growth phase—stands that initiated from high stocking densities could progress toward old-growth structure as stands continue to experience density-dependent mortality with succession in expanding gaps. The period required for this type of stand development may be similar to that described by Franklin et al. (2002).
- 4b) Stagnation—stand development slows or halts with widespread mortality and initiation of a new cohort, or disclimax with dominate shrub cover. Densely stocked stands require careful thinning as height/diameter ratios of overstocked stands are very susceptible to windthrow; the window for providing thinning treatments is narrow (Wilson and Oliver, 2000).

Silvicultural Approaches to Forest Management

Stand replacing fire was likely the most common pre-settlement stand initiating process in the park. Some stands may also have established following major blow-down events, or from a mixture of these two disturbances, probably through multiple disturbance events. A primary goal of this project is to explore options for increasing diversity, speeding stand development, and increasing horizontal diversity by designing a silviculture that will return the park's forests to historical, mixed species, non-plantation conditions (Figure 3).

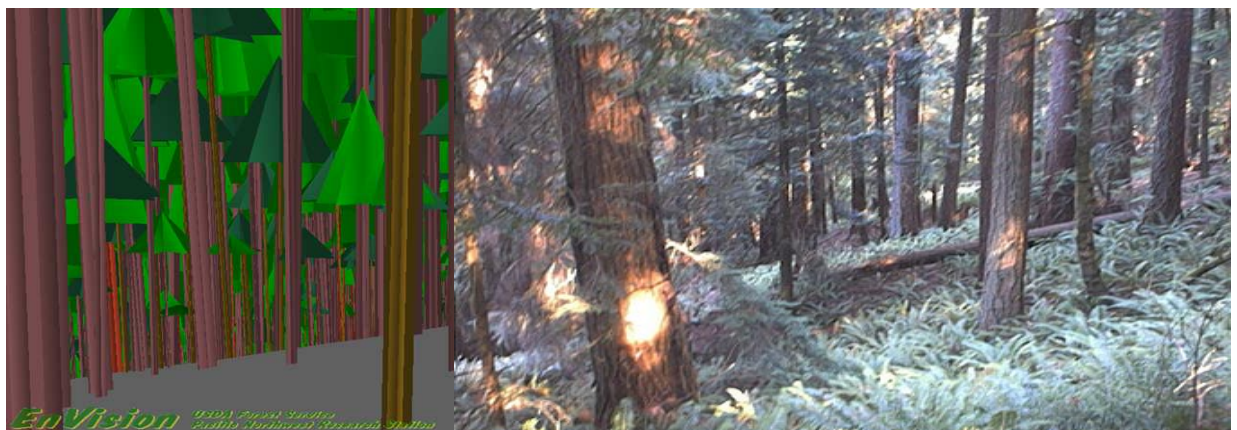


Figure 3. A comparison of an old-growth stand from the trail of the giants in Pack Forest, and an LMS generated image of the same stand. A long-term goal of this work is to create similar old-growth habitat. Note that the simulated stand does have a multi-layered canopy but that trees appear more closely spaced than in the actual stand. The

simulated stand lacks coarse woody debris. LMS visualizes stands by randomly placing trees in the stand inventory across the plot.

A number of approaches have been proposed to convert young Douglas-fir plantations to more natural development trajectories (e.g., Curtis et al. 2004), including clearcuts with replanting at lower stocking, two-cohort stands through thinning and extended rotations, or even group selection treatments. A recent review of attempts to “accelerate” development of old-growth structures through density management (Wilson and Puettman 2007) indicate thinning of even modest intensity will result in an understory response⁹. The concept of variable retention thinning has been advocated as a means of mimicking the horizontal diversity found in old-growth forests (Franklin et al. 1997), and this approach is often discussed as a suitable approach for achieving these objectives. Operationally, patches of forest are thinned to reduce the overstory to different residual stocking levels, thereby allowing the forest to obtain a spatial array of stand structures. A variable treatment approach should provide for a number of wildlife needs as understory vegetation provides habitat for arthropods, songbirds, and browse-dependent ungulates, while also providing closed-canopy habitat for less mobile amphibian and mollusk species that may be harmed by thinning operations (Wilson and Puettmann 2007).

Creating an aesthetically pleasing park is of equal importance to enhancing or advancing stand development for wildlife habitat. There is considerable research examining human responses to both managed and unmanaged forest systems with people in general showing a preference for mature trees, diverse vegetation, and increasing vegetation cover (Schroder and Daniel 1981, Vodak et al. 1985); people are usually opposed to logging activities (Magill 1994). Bradley and Kearney (2007) used a photographic survey to determine people’s relative preference for various forest management practices. Respondents favored less intensive management practices with unharvested stands scored more favorably than any harvested units, demonstrating a consistency in the public’s preference for no or low-intensity forest management. Thinned stands fared better than

⁹ Understory response includes expansion of existing vegetation and recruitment of new individuals.

stands where clearcuts or patch cuts¹⁰ were employed and these preferences were consistent across groups: forest professionals, environmentalists, urban public, rural public, recreationists, and educators.

The process of thinning to lower canopy cover should therefore increase both the potential for accelerating old-growth structure and for providing a pleasing aesthetic. Thinned stands are sometimes viewed of equal quality to natural stands but this can be complicated by a number of factors including the presence of roads, stumps, or other signs of recent activity. Therefore thinning treatments designed to speed stand development are also likely to be viewed negatively by the public until green-up covers evidence of past logging activity. Light commercial thinning where downed logs are removed may be visually more appealing than precommercial activities that leave the slash behind. Management of the NMSP must consider the aesthetic needs of a broad-based recreational community as well as the needs of wildlife, both now and over the next 50-100 years. In the absence of management, densely packed plantations are likely to show high levels of mortality and these dead and dying trees are likely to be viewed unfavorably by the general public. It is important to note that foresters are more likely to prefer the aesthetics of heavy silviculture treatments than is the general public (Bradley and Kearney 2007) and the need for creating open stand structures with larger trees in the future needs to be balanced with a need for a pleasing recreation-oriented forest environment in the near-term. A mixture of treated and untreated stands across the NMSP landscape holds the promise of simultaneously meeting a number of the park objectives.

METHODOLOGY

We used field surveys to initiate computer-based simulated stands in Landscape Management System (LMS-McCarter, 2001). First, stand level fixed and variable radius plot data were summarized in Excel spreadsheets (see data files CD) and then imported into Landscape Management System (LMS) v 3.0. LMS was developed at the University

¹⁰ Patch cuts were either 1.5 ac group selection units in an unharvested matrix or 1.5-5.0 ac dispersed tree retention within a lightly thinned matrix.

of Washington and uses stand-level data, and well established growth models (either ORGANON or the Forest Vegetation Simulator--FVS) to project stand conditions into the future. LMS allows for specific silvicultural prescriptions to be applied on a stand-by-stand basis and the harvest volumes, remaining stand structure, and growth of newly planted trees are maintained in the database as trees are grown through time. The LMS program has been used extensively on the UW's Pack Forest and growth models have been calibrated to match observed growth, increasing our confidence in model output for the stands in the adjacent Nisqually-Mashel state park. One of the unique features of the LMS program is the ease with which output data, including Johnson and O'Neil's wildlife habitat structures (after O'Neil et al. 2001), snags, coarse woody debris, and timber volumes, can be viewed and summarized. Stands can be visualized with the Stand Visualization System (SVS), and landscapes can be viewed with EnVision (McGaughey 2005) allowing for cartoon-like trees drawn to represent both data inputs and future stand conditions following treatments and subsequent growth and mortality.

LMS was then used to simulate stands 50-100 years¹¹ into the future, both with and without silvicultural treatments, as a means of assessing the efficacy of improving forest health through management. LMS outputs are used to provide summaries of potential timber revenue and wildlife habitat; stand-level visualizations were used to help demonstrate future stand conditions.

Forest Survey

The project was initiated with a combination of fixed and variable radius plots to survey forest stands at a density of one plot per ten acres. Stands were divided into two categories: 1) stands where treatments are to be avoided due to stand age, species composition, or proximity to riparian zones (Appendix 1), and 2) upland plantation sites that are likely to hold younger, dense stands that would benefit from treatment (Appendix 2). A sampling grid was established on 18 upland, plantation dominated stands by State

¹¹ Projections become less reliable further into the future, and outputs serve as a means of comparing treatments.

Parks with the assistance of the Washington Department of Natural Resources (surveyed stands are identified and numbered in Figure 1).

At each plot center the following information was recorded:

- 1) Physical Attributes (% slope, aspect, GPS location and plot number)
- 2) Overstory Characteristics (Variable density plots)
 - Standing live trees: species, diameter at breast height (DBH) in inches, dominance (D, CD, I, S), average crown ratio by dominance (0.1-1.0)
 - Snags: species, height (of snags > 6'), DBH (of snags > 4"), decay class (based on WDNR 2004. Natural Resources Field Procedures: Forest Resource Inventory System. FIRS Ver. 1.41. Feb. 04)
 - Average height of canopy
 - Basal area (ft²/acre) and trees/acre
 - % canopy closure (densiometer)
- 3) Middle and understory characteristics within a 0.05 ac fixed radius plot (26.33' radius)
 - Shrubs
 - Estimate % cover of the 3 most abundant understory and shrub species
 - Estimate the number of shrub species
 - Estimate the maximum height for the 3 most common understory and shrub species
 - Saplings (<10 inches DBH)
 - Species
 - Diameter at breast height (DBH in inches)
 - Coarse woody debris (CWD)
 - Record the number pieces (when >6" end falls inside plot)
 - Record decay class (based on WDNR 2004. Natural Resources Field Procedures: Forest Resource Inventory System. FIRS Ver. 1.41. Feb. 04.)

Developing a Silviculture to Enhance Forest Health

An important goal of this project is develop a silviculture that will facilitate the development of old-growth habitat. At a minimum, management is aimed at reducing competition-related tree mortality in densely stocked plantations, with resulting widely spaced large trees ultimately providing northern spotted owl *Strix occidentalis caurina* and marbled murrelet (*Brachyramphus marmoratus*) habitat. We first used LMS to project stand conditions under a number of silvicultural prescriptions to seek preliminary stand visualizations and habitat classifications (after O'Neil et al. 2001¹²). Preliminary silvicultural treatments were applied to stand data in LMS and projected 100 years into the future (to 2107) as a means of providing a range of treatments for park personnel at a meeting held on October 6, 2007.

Preliminary Silvicultural Treatments

- 1) No Treatment
- 2) Reduce overstory density through thinning to 100 Trees per acre (TPA),
 - leaving the largest trees (i.e., thinning from below)
 - planting 50 trees: *PSME, THPL, TSHE, ABGR, ABPR, PIPO, PIMO, PICO, ACMA, ALRU* (Park mix)
- 3) Reduce overstory density through thinning to 50 Trees per acre (TPA),
 - leaving the largest trees (i.e., thinning from below)
 - planting 100 TPA of the park mix
- 4) Reduce overstory density through thinning in two steps.
 - First thinning 2007: leave 100 TPA (from below); plant 50 TPA park mix
 - Second thinning in 2027 to 50 TPA, by removing proportionally 5-14" diameter trees
- 5) Thinning triggered by age with trees removed at ages 25, 40, and 55 years that reduces stocking in 3 successive steps (age estimates derived from LYRA Biological 2006 survey)
 - Age 25, thin to 80 TPA and plant 50 TPA of the park mix

¹² Referred to as Johnson and O'Neil habitat types throughout based on editors who brought the ideas together with publication of Structural Conditions and Habitat Elements of Oregon and Washington.

- Age 40 thin to 50 TPA proportionally (evenly from all size classes) and plant 50 TPA of the park mix
- Age 55 thin to 25 TPA proportionally and plant 50 park mix
- 6) Thinning from below now, in 2027, and a third time in 2057 leaving 30% of the basal area behind in the last two thinning
 - 2007 thin to 140 TPA
 - 2027 thin below reducing relative density by 30%
 - 2057 thin below reducing relative density by 30%

In a meeting held on October 26, 2007 we highlighted preliminary results including the following points. First, stands allowed to grow without any treatments showed “large” trees (20-29” DBH-- Johnson and O’Neil large tree size category—see Appendix 3 for definitions) with closed canopies (70-100% canopy cover) across the majority of sites. Second, all treatments projected a majority of “giant” trees (>30” DBH –Johnson and O’Neil), with no more than one half of the sites projecting to closed canopy conditions. In short, thinned stands projected to produce larger trees with less closed canopy condition, a condition that appears to accelerate old-growth structural development.

Park staff unanimously supported early treatment scenarios that minimize later entry as a means of 1) minimizing logging-recreation conflicts after the park is established, and 2) speeding up stand development as soon as possible. Two prescriptions that emphasize early entry were selected to explore in greater depth: an initial reduction to either 50 or 100 TPA. Park staff also requested that the thinning be modeled in 2007 and then in a separate analysis in 2012 to better assess cost reductions (or conversely gains in timber revenue) that may be obtained with a short delay in treatment. Increased timber revenue was viewed as a means of paying for the treatments. The five treatments, including a control, are briefly summarized below:

Selected Silvicultural Treatments

- 1) No Treatment
- 2) Reduce overstory density in 2007 through thinning to 100 Trees per acre (TPA),

- leaving the largest trees (i.e., thinning from below)
 - plant 50 trees: *PSME, THPL, TSHE, ABGR, ABPR, PIPO, PIMO, PICO, ACMA, ALRU* (Park mix). See Appendix 4 for species codes.
- 3) Reduce overstory density in 2012 through thinning to 100 Trees per acre (TPA),
- leaving the largest trees (i.e., thinning from below)
 - plant 50 trees: *PSME, THPL, TSHE, ABGR, ABPR, PIPO, PIMO, PICO, ACMA, ALRU* (Park mix)
- 4) Reduce overstory density in 2007 through thinning to 50 Trees per acre (TPA),
- leaving the largest trees (i.e., thinning from below)
 - plant 100 TPA of the park mix
- 5) Reduce overstory density in 2012 through thinning to 50 Trees per acre (TPA),
- leaving the largest trees (i.e., thinning from below)
 - plant 100 TPA of the park mix

Using LMS to Assess Timber Volumes and Prospective Income

Many stands in the Nisqually Mashel State Park are young Douglas-fir plantations (Table 1). The majority of timber removed would be Douglas-fir and the relatively small size of these trees probably will result in them being sold as #4 sawlogs, “chip and saw” or pulp logs. The occasional larger logs are more likely to be sold as #3 sawlog sorts.

All sawlogs, regardless of quality, must be of a sufficient diameter and board foot volume to be classified as #2 and #3 sawlogs, and therefore the majority of younger stands provide little income if harvested in 2007 (i.e., they are below that size class). It is unlikely that many trees will reach higher value log sorts until 2012 or later.

We instructed the Landscape Management System software to use the following bucking parameters to manufacture logs¹³:

- Stump Height = 1 foot
- Top Diameter = 6 inches
- Log Trim = 1 foot
- Min Log Length = 16 feet

¹³ These bucking parameters are standard to the industry in western Washington and are the log sizes accepted by most sawlog mills in the region.

- Max Log Length = 40 feet

Table 1. Forest Characteristics in study area of NMSP. Summary of field data for upland plantation or failed plantation forests with an emphasis on site characteristics that indicate the stocking of plantations.

Stand	TPA ^a ≥8-10"	Total TPA ^a	Tree Richness ^b >2" DBH	MBF /acre ^c	3 Most Common Tree Species ^d	Largest tree, species
3	121	965	5	5.8	TABR, TSHE, THPL	8-10" PSME
4	162	468	3	13.3	PSME, TSHE, ACMA	12-14" PSME
5	29	331	3	10.1	ACMA, PSME, THPL	26-28" THPL
7	0	260	3	0	PSME, POBAT, ACMA	4-6" POBAT
8	5	1797	4	0	POBAT, FRLA, ACMA	12-14" FRLA
14	177	1504	6	4.7	ACMA, PSME, POBAT	8-10" PSME
16	78	1403	8	8.1	PSME, POBAT, ACMA	8-10" PSME
19	0	681	7	3.1	PSME, PREM, ACMA	6-8" PSME
20	171	300	4	18.6	PSME, POBAT, ACMA	14-16" PSME
21	105	252	2	11.2	PSME, THPL.	12-14" PSME
22	38	138	1	6.8	PSME	14-16" PSME
25	296	501	2	25.7	PSME, PREM.	12-14" PSME
26	127	298	2	11.9	PSME, PREM	12-14" PSME
27	227	538	4	21.9	PSME, THPL, ALRU	14-16" PSME
29	50	880	7	5.6	PSME, PREM, FRLA	10-12" POBAT
34	181	755	7	16.2	PSME, FRLA, ALRU	12-14" PSME
43	335	1609	3	38.9	PSME, THPL, TSHE	14-16" PSME
44	267	1003	5	28.3	PSME, ALRU, THPL	26-28" PSME

^aTrees per acre larger than the 8-10" size class

^bNumber of tree species within the survey plots

^cThousands of board feet of timber as determined by an LMS bucking algorithm with a 6" top

^dSpecies codes are listed in Appendix 4.

Logging costs and log prices experience seasonal fluctuations and are influenced by regional and international pressures. It is difficult to predict future logging costs or prices so we applied a historical average net price for logs sold by the Center for Sustainable Forestry at Pack Forest during the past 5 years.

Using LMS to Assess Current and Future Wildlife Habitat

We used LMS to provide outputs from simulated stand treatments as a means of assessing the effectiveness of those treatments in creating wildlife attributes. Our ultimate goal is to create stands with old-growth structure. One metric for determining

old-growth structure has been proposed and tested on WA-DNR lands. For example, the Washington Old Growth Habitat Index (OGHI) integrates 5 structural elements: large trees (TPA > 40”), large snags (standing dead TPA > 20” DBH), volume of woody debris, tree size diversity, and stand age (WDNR 2005). The OGHI metric is designed to assess forests with larger trees that are further in stand development, than were produced through our modeling efforts. In fact, our treatments failed to produce suitable old-growth structure by 2107. Hence, while our treatments failed to produce substantial old-growth structure in accordance with the OGHI elements in the allotted time (100 years), they do have the potential to create many old-growth forest attributes and the habitat they provide. Therefore we looked for stand conditions of mature forests as a way of assessing the trajectory of the treated stands: are they moving toward old-growth structure?

In an effort to assess habitat, with and without silvicultural treatments in the park stands, we examined the following three measures. First, we used the default settings in LMS (after Baker and Wilson 2000) to determine the number of canopy layers present (where increasing layers equate to greater vertical stand structure and we presume increased wildlife habitat). Second we used the Johnson and O’Neil habitat classification scheme where stands are sorted by both size and relative canopy closure. In the Johnson and O’Neil scheme stands with “giant” trees and moderate or open canopy classification are more closely analogous to old-growth habitat types (see Appendix 3). Finally, we used Curtis’s (1982) measure of relative density to determine canopy closure as a means of assessing the relative risk of forest stagnation.

$$\text{Relative density} = \text{basal area (ft}^2\text{/ac)} / \sqrt{\text{quadratic mean DBH in inches}}$$

Relative density (RD) provides a quick measure of canopy closure, with a RD > 70 typically reflecting stands that are beyond a desirable “full stocking”. Maximum timber production is achieved by staying close to this full stocking, closer to a RD of 55. Commercial thinning often aims to reduce stands to a stocking significantly below an RD of 55 to allow space, and therefore time, for the stand to grow toward full stocking prior

to final harvest. Commercially oriented plantations are therefore designed to have a high RD, whereas wildlife-oriented thinning would advocate for a RD of 25-45 preventing canopy closure (Hanley et al. 2005).

We surveyed and planned treatments for planted stands with a goal of reducing relative densities to: 1) open stand structure for wildlife, and 2) to restore stand densities that would be more typical for the region under native disturbance regimes. Johnson and O'Neil habitat classifications of open and moderate canopy closure correspond to a RD from 25-45. One complication is that we are, at least initially, restricted to considering management scenarios that allow a one time entry in the near future. This means that no matter what treatments we employ, there is likely to be a time within the computer simulation window (both 50 and 100 years) when the stands reach or exceed full stocking¹⁴. I presume that tree-level or gap-level mortality will occur at that time and given the lower stocking levels this process will be closer to natural processes than would be expected in unthinned stands.

Other Data: Integrated LYRA Biological Survey Information

We used Pierce County soil survey maps (Zulaf 2007, web-based map) to describe the soils on a site-by-site basis. We used LMS to summarize the initial stand conditions from field data¹⁵ including the vegetation classification that was assigned by LYRA Biological. We supplement LYRA Biological's (2006) classification with LMS generated composite stand conditions from our surveys including: trees/ac, number of trees/ac $\geq 8-10''$, the tree species richness, the largest trees in our plots, the 3 most common trees species, and wood volume of all species in thousand board feet (MBF—Table 1). We also used LYRA's general description of invasive species to rate the risk of invasive species spread on each site. Appendix 5 provides stand summaries.

¹⁴ Full stocking implies that without additional later treatments some trees will be subjected to density-dependent mortality.

¹⁵ LMS allows importation of fixed and variable plot data that is then used to initialize stand conditions. In many cases high stand-level variability and our coarse-level survey leads to the creation of composite stands of more mixed species composition. In many cases existing stand boundaries include: a mixture of successful and failed plantations, as well as hardwood dominated areas, and this is important to keep in mind as we consider management.

SURVEY FINDINGS

Stand data are summarized in a series of Excel spreadsheets and site data are linked to a shapefile (CD of supplemental materials). Each sample plot includes a photograph which is linked to the shape file and therefore once loaded the shapefile provides an interactive tool for exploring initial stand conditions.

Forest Characterization

The upland forests surveyed (Appendix 2) represent both successful and failed plantations (from the standpoint of establishing commercial timber). Refer to Appendix 1 and Luginbuhl and Darrach (2006) for details of stands that are not considered suitable/desirable for treatment at this time. The plantations are of variable species composition and stocking both across and within stands. In stands with a high proportion of Douglas-fir and relatively high stocking > 100 trees/ac of trees at least 8-10" DBH, plantations are defined as "established" (Stands 3, 4, 14, 20, 21, 25, 26, 27, 34, 43, and 44; Table 1, Figure 1). These are the stands that are to be the focus of silvicultural prescriptions. Stands with a high proportion of hardwoods: 5, 7, 8, 14, 20, and 29; and stands with overall poor stocking: 7, 8, 19, 22, and 29, are of either lower priority for thinning, or will require treatment of only part of the site to achieve desired future conditions.

Edaphic factors are presumed to have a primary influence on vegetation (Figure 2). Stands with relatively poor drainage and silty soils (e.g., Bellingham series) are more likely dominated by Oregon ash and black cottonwood (portions of stand 8). Relatively nutrient poor soils derived from well-drained gravelly loams, especially the Barneston and Baldhill¹⁶ series, have resulted in high mortality of Douglas-fir planted after harvest. It seems reasonable that spatial variation within stands reflects the Barneston, Kapowsin, and Bellingham series in some locations. In many places big-leaf maple initiating from vigorous stump sprouts equal or exceed the height of planted stock. It is unclear whether relatively low stocking of Douglas-fir on these sites is related to poor soils, low intensity planting effort, or a failure to weed big-leaf maple; regardless the current Douglas-fir

¹⁶ The description for the Barneston and Baldhill series are similar.

stocking is low in these areas. Field observations suggest that forest operations may have also resulted in soil compaction and/or altered drainage across the park leading to pockets of moist forests in many locations. The end result is that many stands are highly variable in both their vegetation and soil characteristics. The Spana soil series is presumed to be coincident with the historic Mashel Prairie (Figures 2 and 4), and it seems reasonable that frequent, low-intensity fire would favor grassland-woodland habitat. I speculate that fires set to help maintain the prairie may have driven more open woodland habitats on the associated Barneston soils (perhaps on all soils) near native settlements dating back to the Holocene.

It is important to note that the vast majority of acreage we have selected for potential silvicultural treatments are associated with the Barneston and Baldhill series. The gravel loam structure of the soils should permit operation of heavy equipment with lower risk of damaging these soils. Low lying areas are likely to have accumulated finer materials and sites with Bellingham soils should be handled with significantly more care.

Forest Habitat Suitability

We used Johnson and O'Neil habitat classification schemes (O'Neil et al. 2001) as both a starting point for classifying stands and as a means of describing projected stand structures under various management scenarios (see discussion of stand treatments in the Methodology section). In all cases, habitat created by silvicultural prescriptions is compared to a scenario of no action (control) where the stands are allowed to develop from their existing condition. Our field surveys classified 16 of 18 stands in a sapling stage, and only 2 stands (stands 5 and 44) as medium sized trees. The Johnson and O'Neil classification reflects the relative young age of most stands, although it is important to note that poor soils also slow stand development. We examined timber production and associated habitat produced from harvests in either 2007-08 or 2012-13 (see footnote 21 below), allowing us a means of evaluating economic gains / costs associated with the treatments (waiting 5 years should create conditions where thinning treatments in many stands will pay for themselves vs. treating in 2007-08 where costs are expected to exceed revenue). Our preliminary stand projections demonstrate that

thinning stands is likely to produce more open canopy conditions, a prerequisite to accelerating old-growth development (Table 2).

Table 2. Habitat characteristic summary for 18 stands from field surveys. The 50 TPA and 100 TPA represent reducing stand stocking to 50 and 100 trees/ac by removing smaller trees. Thinning creates more open canopy conditions (fewer closed canopies), and also larger trees which becomes more apparent through time.

Johnson and O'Neil Classification ^a	No Action	100 TPA	50 TPA
2007			
Medium	2		
Sapling	16		
2057			
Giant/single	1 closed		
Giant/multi	0		
Large/single	1, all closed		1 closed
Large/multi	16, all closed	17, 3 closed	16, 2 closed
Medium	1	1	1
Canopy layers ^b	Five -1 , Four-5, Three-7, Two-5, one-1	Two-18	Two-16, One-2
2107			
Giant/single	1 closed		
Giant/multi	3, all closed	15, 7 closed	18, 6 closed
Large/single			
Large/multi	14, all closed	3	
Medium			
Canopy layers ^b	Six-1, Five-2, Four-5, Three-6, Two-2, One-1	Three-17, Two-1	Three-6, Two-12

^a The proportion of stands in each of Johnson and O'Neil habitat classifications both now, and in 50 years with two thinning treatments (50 and 100 TPA residual) and with no action. Appendix 3 provides definitions.

^b Canopy layers represents the number of canopy layers projected in LMS, stand by stand projections are found in Appendix 5.

MANAGEMENT RECOMMENDATIONS

Thinning Recommendations: Stand Development and Wildlife Habitat Creation

We have prescribed a thinning from below (emphasis is on removing small diameter trees and retaining larger, healthier individuals) to either 50 or 100 trees/ac for the majority of the stands. We selected thinning regimes based on the size and species present for harvest and only suggest thinning where trees are large enough to pay for the operation. In most cases the stands we have recommended for no treatment have a high proportion

of hardwoods, are situated (at least in part) in forested wetlands, or have trees that are too small to consider thinning at this time. It should be noted that one weakness of this management plan is its emphasis on entry over the next 5 years without a plan for follow up treatments¹⁷. Development of hardwood dominated stands will either progress through succession to conifer dominated sites or progress to shrub dominated communities (as documented for some red alder sites, Harrington 1996), and there is a risk that a spread of invasive plants (e.g., Himalayan and evergreen blackberries) may result in shrub dominated systems in some sites. Our simulation of stand development indicates that untreated hardwood stands develop multilayered canopies. However, the development of Puget Sound hardwood stands is poorly known and I recommend no management as the most conservative treatment for these sites; sensitive soils (primarily in moister sites) drive this recommendation. If the LMS projections are correct then untreated hardwood stands will result in an overstory of hardwoods that is taken over by conifers through time (i.e. multilayered); this structure would presumably be valuable to a variety of wildlife species (Table 2, and Appendix 5 - visualizations for stands 5 and 8 provide examples). It seems likely that future managers will want to consider additional treatments for all sites by 2050 and we aim to leave sufficient options for future managers to shape the forest in light of advancements in our knowledge and changes in the public's and management's view of the best use of the park. The production of large multilayered canopies is one goal of this work as this structure would mimic the structure anticipated in the early stages of old-growth Douglas-fir stands (i.e. the production of very large trees- Zenner 2004) and our stand projections indicate this development happens by 2107 for three sites in the absence of thinning (Table 2).

In contrast thinned sites produce giant trees (after Johnson and O'Neil) for the majority of treated sites supporting the view that thinning will accelerate old-growth like structures. Stands that were thinned to 50 TPA all produce "giant" trees by 2107, providing evidence of the effectiveness of early treatments. However, note that stands that are thinned more aggressively (50 TPA vs. 100 TPA) are more likely to develop two-layered stands (vs. unthinned stands which may produce twice this number of layers). Planting under stands

¹⁷ Early entry is desirable to minimize use conflicts that are likely to occur with logging operations.

thinned to 50 TPA facilitates the establishment of a second cohort¹⁸. This could be viewed as a plantation beneath the remnant structure of the past plantation (although we plant a mixture) and this two-cohort structure is likely to be apparent¹⁹ within a decade of thinning. We strive to both accelerate the development of old-growth structures and to provide managers future options by thinning only portions of many stands. Variability in residual stand structure could be further varied by applying variation around each specific treatment; perhaps a variable approach where 50 TPA translates to an average of 50 TPA within a range of 35-65 TPA targeted through thinning across a unit.

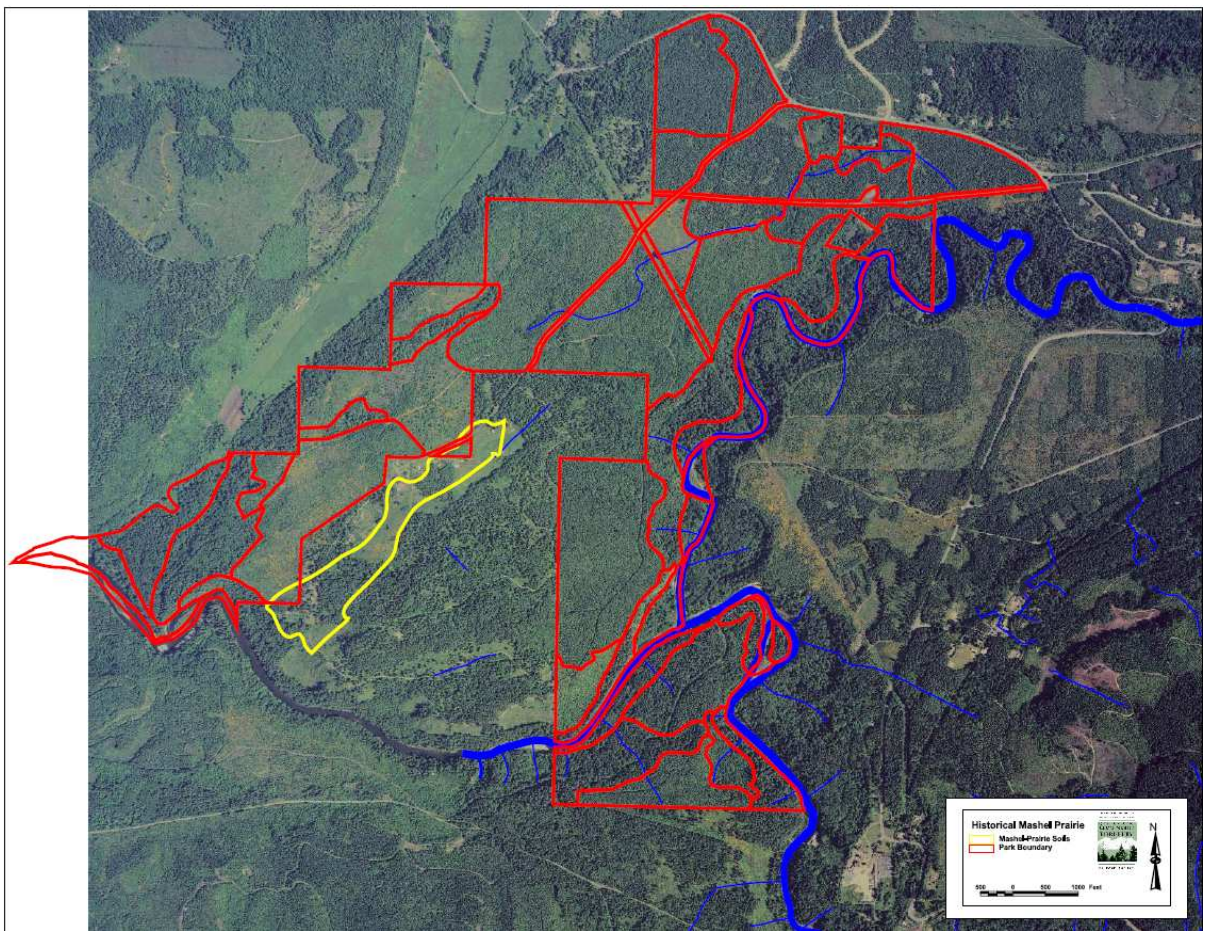


Figure 4. The area outlined in yellow is believed to be the location of the Mashel Prairie. The soils for this area are a part of the Spana series which includes a well developed A horizon. This site is also the burial site of Indian Henry and historic accounts place the prairie in this area.

¹⁸ We recommend planting to increase native tree diversity and structure, speed up regeneration, and help control the spread of invasive species.

¹⁹ It is unclear if the general public will view these two cohort stands favorably.

Simulated stands allow an opportunity to compare the effectiveness of thinning to accelerate old-growth structure. Oliver and Larson (1996) discuss stand development that transitions through a stand reinitiation phase prior to the production of old-growth. In this phase there would be competition-related mortality of overstory trees which would result in light gaps that allow establishment or release of an understory cohort, as well as recruitment of large snags and coarse woody debris. Thinned and planted stands in the park are expected to achieve an advanced reinitiation phase by 2027, with a well-established understory growing into mid-canopy positions. Similarly, Franklin et al.'s (2002) classification scheme would place our simulated stands in a maturation phase with a well-established understory. Vertical and horizontal stratification (a more advanced stage of development) will likely occur by 2107 with some planted stock growing into (or near) overstory positions, and small-scale windthrow opening up new gaps. We lack knowledge of how persistent the two-aged structure these prescriptions create will be. It is possible that the proposed thinning will set the stage for density dependent competition in the understory layer that will slow subsequent multi-layering and our simulated stands confirm this (i.e., more heavily thinned stands produced more two-cohort stands—Table 2). Still, we believe that the thinning will achieve the early stages of old-growth development including the production of large-giant trees (Acker et al. 1998; Zenner. 2004), and future managers may need to facilitate later stages of old-growth development (i.e., a greater diversity in stem diameters) by additional variable thinning of the second cohort. A second thinning should be considered if and when this mid-canopy cohort reaches canopy closure²⁰ (after Oliver and Larson 1996).

²⁰ It is difficult to determine when this may happen due to the limited amount of information available from two-cohort stands. I believe that additional treatments will be necessary some time between 2025 and 2035.

We recommend thinning five stands (20, 25, 26, 43, and 44 – see Figure 1) in 2008²¹ as a means of initiating work in the park (Table 3). The harvest of these stands will require substantial supervisory-level attention (see Forest Operations section below) and coordination. The thinning of 83 ac will most likely take a logging crew 1-3 months (depending on the size of the crew), and the management commitment will include work both before and after the harvest. We estimate that these 5 stands will yield 235 MBF of sawlogs, and 544 tons of pulp (Table 4), and up to \$100,000 of gross income, not including marking and management costs²². We recommend treating only part of each stand²³ with the exception of stand 44²⁴. This will allow park personnel and/or a hired contractor to make decisions on what is left and treated allowing ample opportunity to shape the aesthetics (see aesthetics section below) and habitat of the park. The advantage of starting with these 5 stands is that Washington State Parks and Recreation Commission personnel can evaluate the process and outcomes to see how closely the prescriptions match the stated goals (i.e., before and after comparisons). The early entry also has the presumed advantage of increasing the effectiveness of creating structurally diverse stands and in establishing a management presence in the park.

We recommend delaying the application of thinning prescriptions until 2012-13 on the majority of stands, with an estimated 945 MBF of sawlogs and 1915 tons of pulp anticipated (Table 3). A delay in harvest allows trees to grow into sawlog and/or higher value log sorts. There is no directive or need to make income on treatments, and thus we approached harvesting decisions with two questions: 1) does harvesting the unit advance the wildlife and recreation objectives of the park? and, 2) will the harvest pay for the costs of the operation? Thinning that on paper pays for itself is less likely to incur an unforeseen loss and provides a means to pay management or contractor fees: cruise

²¹ It may not be practical to apply silvicultural treatments in one or all of these stands in the 2007-08 period owing to a need to inform the public, seek Commission approval, identify a forester to help execute the operations, etc. The reader thus should view the 2007-08 start dates as an approximate starting time for select treatments and that the agency will strive to implement these recommendations within a maximum of five years (i.e., the short-term). Ditto for recommendations slated for 2012-13 (i.e., the short-medium term, where treatments should be applied between 2013 and 2018 – a five year period).

²² A stumpage sale would simplify some of these steps but also lowers the overall financial yield.

²³ Due to poor stocking in some places, and to increase intra-stand heterogeneity.

²⁴ Stand 44 is relatively inaccessible to harvest and special permission may be required to access this site. At a minimum, hauling costs for moving logs will be greater than in other stands.

timber, acquire permits, mark trees, and supervise the logging, as well as covering internal accounting and follow-up treatment costs (e.g., release of planted trees, weed control).

Thinning on sites with marginal returns will require a more active involvement of park personnel while sites that project greater financial returns allow more opportunity to pay contractors to handle the process. Our recommendations ignore thinning of some sites where habitat improvement might result from thinning because there are substantial financial risks associated with break-even operations (e.g., fluctuation in labor costs and timber or pulp prices may make operations money losing ventures). We believe some sites (e.g., sites 3, 14, & 26—Table 4) that are marginally profitable with management costs internalized (i.e. park personnel take on management responsibility) will lose money if contractors are employed to perform the work. Stands 27, 34, and 44 provide the income necessary to make operations possible across the NMSP landscape (Table 4), and thus it is recommended that these three stands be treated to generate the revenues required for non-revenue generating treatments in the other stands. Most logging contractors should have sufficient experience to know which stands are likely to yield a positive return through a proper timber cruise.

Forest Operations

The sale of timber from public lands requires: filing a state Forest Practices Applications and county Notice of Moratorium on Non-forestry Use of Land, filing a Disposition Certification for Export Restricted Timber to the Department of Revenue, laying out of the timber sale, monitoring logging operations, and accounting for all logs and receipts²⁵. The first step in a sale would be a timber cruise of all stands that are scheduled to be sold. The cruise should be intensive enough to determine expected timber yields²⁶ with a 95% confidence interval under the recommended thinning described in Table 4. Next it will be necessary to determine who will mark the stand boundaries and trees to be

²⁵ There are likely to be other complications such as developing a road maintenance and abandonment plan.

²⁶ The forest inventory conducted for this management plan is sufficient for planning but is inadequate to know what timber will be produced, a prerequisite for being able to manage a proper timber sale. Another possible approach is to sell the timber “on the stump”, and be paid based on what is produced.

harvested; various private contractors are available for hire. Alternatively, those decisions could be left to the logging operator.

Table 3. Timber sorts expected from harvest (where sawlogs is in MBF = thousand board feet and pulp is in tons). The calculation of sorts and yield is based on log bucking algorithms applied to each stand. Predicted yields are consistent with results obtained for small diameter thinning conducted at Pack Forest.

Stand	2007-08 Sawlogs	2007-08 Pulp	2012-13 Sawlogs	2012-13 Pulp
3			3	8
4			76	176
5				
7				
8				
14			18	32
16			47	132
19				
20	26	61		
21			31	71
22				
25	54	127		
26	16	34		
27			235	544
29			37	86
34			498	866
43	39	91		
44	100	231		
Total	235	544	945	1915

The harvest operations will vary by contractor hired and it would appear that a processor-based operation would be the most cost-effective. Small diameter processor harvesting would entail the use of a tracked processor to harvest trees within a yarding corridor, typically spaced every 50 feet throughout the unit. The processor would drive through the stands and remove marked (or unmarked trees), processing the trees and piling the logs alongside the yarding corridor. A wheeled forwarder would then collect the logs and deliver them to a landing where they would be loaded and transported to a mill. During the harvest process the operator would strip the limbs of the trees and leave this slash behind on the stand, piling some slash in front of the vehicle to provide a cushion of slash which reduces compaction and helps to maintain the integrity of the soil. The end result of the process would then be stands with reduced overstory density, and ground slash,

which should become less visible to the public with understory green-up. Some disruption of the understory layer would be expected and while a carefully monitored operation could be expected to minimize soil disruption²⁷, a spread of exotic species could occur and appropriate precautions should be taken (see Invasive Species Management below). The operation could take place at any time of year that the ground is dry enough to work.

Table 4. Harvest recommendations for two harvest periods 2007-08 and 2012-13. For each site, there is a recommendation of the number of ac to be thinned to either 50 or 100 TPA, or left unharvested.

Stand	No Action	100 TPA 2007-08	50 TPA 2007-08	100 TPA 2012-13	50 TPA 2012-13
3	4 acres				2 acres \$1386
4	0 acres			17 acres \$16,741	9 acres \$15,343
5	9 acres				
7	13 acres				
8	57 acres				
14	12 acres			20 acres \$4859	11 acres \$2,671
16	15 acres			47 acres \$14,738	11 acres \$9429
19	78 acres				
20	5 acres	11 acres \$4973	5 acres \$6,064		
21	15 acres			12 acres \$2,478	12 acres \$10,513
22	15 acres				
25	4 acres	6 acres \$9660	6 acres \$13,314		
26	5 acres	11 acres \$1,987	6 acres \$4242		
27	0 acres			22 acres \$37,678	22 acres \$61,324
29	20 acres				81 acres \$15,725
34	38 acres			38 acres \$39,417	57 acres \$118,058
43	3 acres	4 acres \$6,674	4 acres \$9,836		
44	0 acres	15 acres \$14,866	15 acres \$27,187		
Total	302 acres	47 acres \$38,160	36 acres \$60,644	156 acres \$115,912	205 acres \$234,448

Horse logging would provide an alternative to using heavy equipment to move logs. The process would most likely involve hiring one or two sawyers to hand feel trees. A team of horses would then be used to pull those logs to a landing where they could be loaded to logging trucks for transport to a mill. Horse logging provides both advantages and disadvantages. Advantages include lower soil disturbance, often with minimal exposure

²⁷ The Barneston soil series should be easy to work with as the coarse nature will minimize compaction. The Kapowsin series will also be suitable for logging on gentle slopes and equipment should result in minimum compaction.

of bare soil, and lower levels of damage to retained (residual) trees because horses are more maneuverable than tractors (McNamara 1983). The relatively high residual stand densities recommended in this management plan are well matched to using horses for logging. The biggest advantage may include a better overall aesthetic as less disruption to the site returns a pre-harvest greened understory more quickly. On the downside, horse logging is likely to take longer and exceed the costs of mechanized harvesting (McNamara and Kaufman 1985), although there is a paucity of data in this area. Uphill skidding is in general not possible and pull distances are much shorter (~500') than can be achieved with tractors. The flat sites recommended for treatment and the abundance of logging roads in the park would allow horses to work on most sites however. On many sites we describe a harvest plan that is marginally profitable and the added costs of horse logging may result in logging costs for some stands exceeding the revenue produced in timber. A final obstacle may be finding a logger with a team of horses to do the work; this process could be further complicated by requirements to seek multiple bids and award a state contract to the lowest bidder.

Invasive Species Management

The population of invasive species in the park is low in many places with many of the problems being restricted to open sites and roadside edges. Nevertheless, it seems prudent to consider the management of invasive species from the outset, as a spread of invasive species would oppose the goal of managing for native vegetation. Forest operations should seek to minimize the entry and spread of invasive species. Dried mud in equipment tires, tracks, or horse hooves/excrement all pose a risk of spread. Forest operators should be required to maintain clean equipment throughout the process with certain areas dedicated for removing material (i.e., areas to wash tires before forest entry).

One goal of this plan is to try and recreate native species composition, density, and structure. Open canopies mimic the low densities that would be expected following high intensity disturbance events (e.g., catastrophic wildfire or windstorm) is likely to allow invasive species to spread at the expense of native understory plants (Bailey et al. 1998).

Not treating stands won't guarantee invasive species control and therefore we recommend an intermediate approach of thinning with follow up invasive species control. However, consideration needs to be given to the relative risk of treating stands if that process facilitates the spread of invasive species. Invasive species control could be initiated with funds generated through timber harvest. It seems almost certain that there will be a perpetual need for invasive species management and a plan for invasive species control should be developed and implemented.

Treatments to eliminate targeted exotic invasive species should be intensive with an aim of killing all individuals in as large of areas as funding will allow. Intensive, repeated treatments to smaller areas are likely to be much more successful than more low-level treatments across the entire park in bringing problem species under control. Extensive maintenance level treatments should also be employed in areas with larger populations, but it is important to keep in mind that this treatment approach may keep the population growth rates of invasive species near their maximum because these treatments have the potential to consistently reduce the population below its carrying capacity (i.e., closer to the maximum growth rate). Small isolated pockets of highly invasive species should be the targeted priorities as these sites will hold the greatest promise of eliminating recently or poorly established populations before they spread.

The sites with high risk of invasive species include 8, 16, 19, and 29 (Figure 1). The thinning prescribed for sites 16, 19, and 29 (no treatments are recommended for 8) hold the greatest risk for spread of invasive species and I recommend that thinning is tied to an intensive effort to control invasives on these sites. Failure to link thinning treatments and management of invasives on these sites may result in a dramatic spread on exotics as the sites are disturbed. In the worst case scenario these sites will become virtual monocultures of non-native species in the understory. It seems reasonable that operations designed to minimize soil movement and disturbance will be the most likely to minimize the spread of invasive species. I believe horse logging may hold some advantages in preventing the spread of invasive plants, but I know of no studies that have tested my conjecture.

The priority of species to be treated will likely change through time, but a good place to start would be those species that are likely to cause major vegetation changes. Non-native blackberries provide an obvious target. The park should join efforts with the Nisqually River Cooperative Agreement to control invasive species in the Nisqually River Basin. Sean MacDougal²⁸ is heading up this effort and coordination has begun around the invasive knotweeds (*Polygonum* spp.) that have been found along the Nisqually River. Knotweeds are very abundant above the Alder Dam, with the Dam presumably serving as a barrier to movement downstream. The park should develop a means for monitoring invasive species, including knotweed along the Nisqually and Mashel Rivers.

Spatial and Aesthetic Consideration

This plan seeks to create wildlife habitat while balancing aesthetic and recreation needs. Washington State HWY 7 borders the park and is a heavily traveled route to Mt. Rainier. The viewshed of the park is visible from the ridge above Ohop Valley and from several sites along HWY 7 and therefore harvesting activities that leave behind large amounts of wood or other evidence of recent logging are likely to be considered unsightly to the general public. One goal of this work should therefore be enhancing this viewshed now and with a vision for the future. Aesthetic preferences are likely to vary but I propose to treat stands to wide spacing (e.g. 50 TPA) with the assumption that open structure will be visually appealing. Stands could be feathered with the stand density increasing with a distance from the road (perhaps over 150') until the density blends into current stocking (Figure 5). Douglas-fir plantations along the portion of Pack Forest bordering HWY 7 provide an example of what widely spaced stands would most likely resemble as these stands mature (Figure 6). The residual stocking of the Pack Forest stand is close to 70 TPA giving the stand an understory that travelers can easily see into and these stands may match what the park could expect the roadside edges of thinned stands to look like in 30-100 years. The application of this type of treatment along roadside edges would

²⁸ Pierce County Noxious Weed Control Program 1420 East 112th Street Tacoma, WA 98445 (253) 798-6802

eventually lead to large trees with an open understory bordering the well traveled routes of the park.

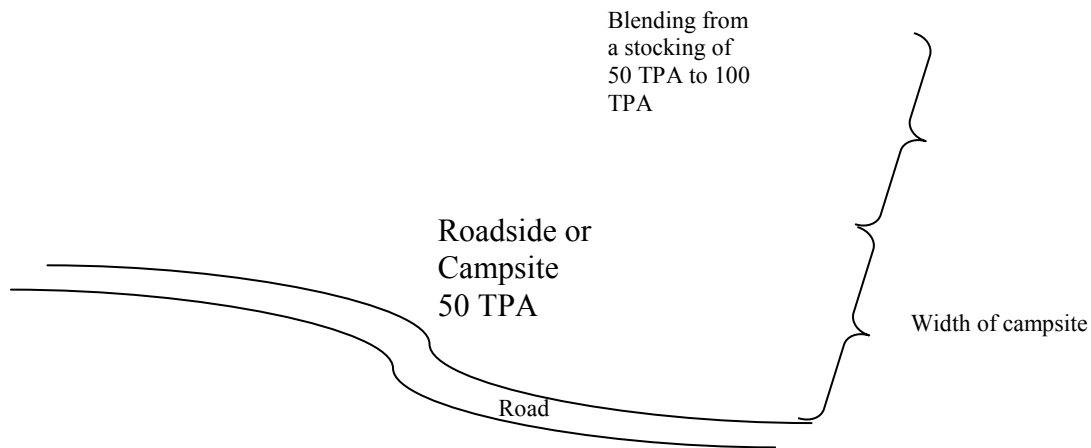


Figure 5. Spatial arrangement for proposed thinning treatments along roadside edges and/or other park facilities. The relatively heavy thinning in proposed recreation areas will open the stand understory to allow adequate site lines and ease of foot travel. A gradual increase in density is recommended to allow for blending of high use stands with untreated stands.

The benefits of roadside thinning may be offset by the increased public access these open sites might provide. One of the biggest risks to open roadside edges is that they would provide increased access to ATV use²⁹. Open roadside sites are also a likely target for illegal dumping. On a positive note, in general stands with an open understory are more likely to receive greater recreational use. It would be possible to use the reverse approach where roadside edges are maintained at high densities in order to provide a barrier to entry. The final spatial arrangement of various treatments should balance the likely aesthetic appeal with any perceived negatives of increased public access.

²⁹ Delaying harvests along roadside edges, until park services are established, may help reduce ATV access.



Figure 6. Seventy-five year-old stand at Pack Forest a decade after thinning, note the development of ground vegetation.

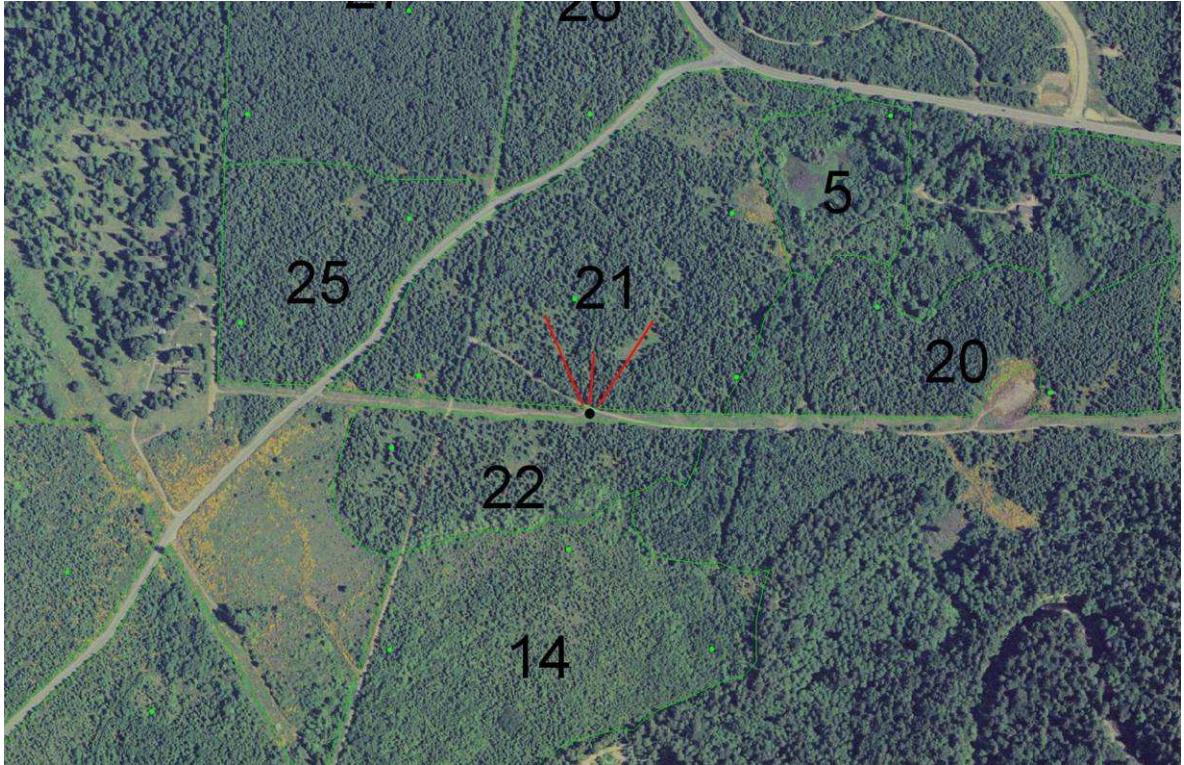
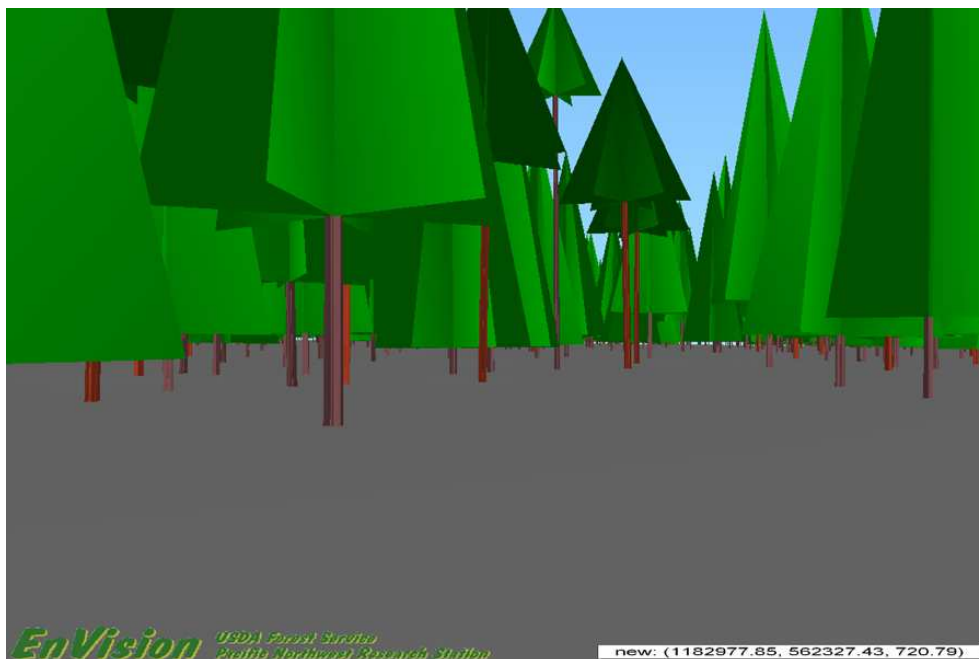


Figure 7. Aerial photograph of portions of sites on the northern portion of the unit. Stand 5 shows a prominent wetland, surrounded by largely deciduous vegetation—no treatment is recommend for this site. The black dot marks a vantage point for stand 21 a possible campground site. The red lines show potential viewpoints which are shown from 6' off the ground in figures 7 & 8.

It seems likely that a campground will be created to serve park visitors; one possible location of a campground is near stand 21 (Figures 1 and 7). We created projections of site looking into stand 21 using the Envision software (McGaughey 2005) as a means of visualizing stand structures. The software allows us to create a visual of the stand from a particular viewpoint with different treatments. We contrast what a typical visitor will see from the road intersection at a height of 6' above ground level in a stand that is thinned to 50 TPA or 100 TPA, or left untreated (Figure 8). In 100 years the thinned stand shows a multiple canopy layer with a more open appearance than in the untreated stand. Feathered edges with the lowest stocking levels near campgrounds and then increasing in stocking toward 100 TPA should provide the appearance of a welcoming campground that blends seamlessly (without sharp edges) into the surrounding forest (Figure 9).



a) Projection in 2008 after being thinned to 100 trees/ac.

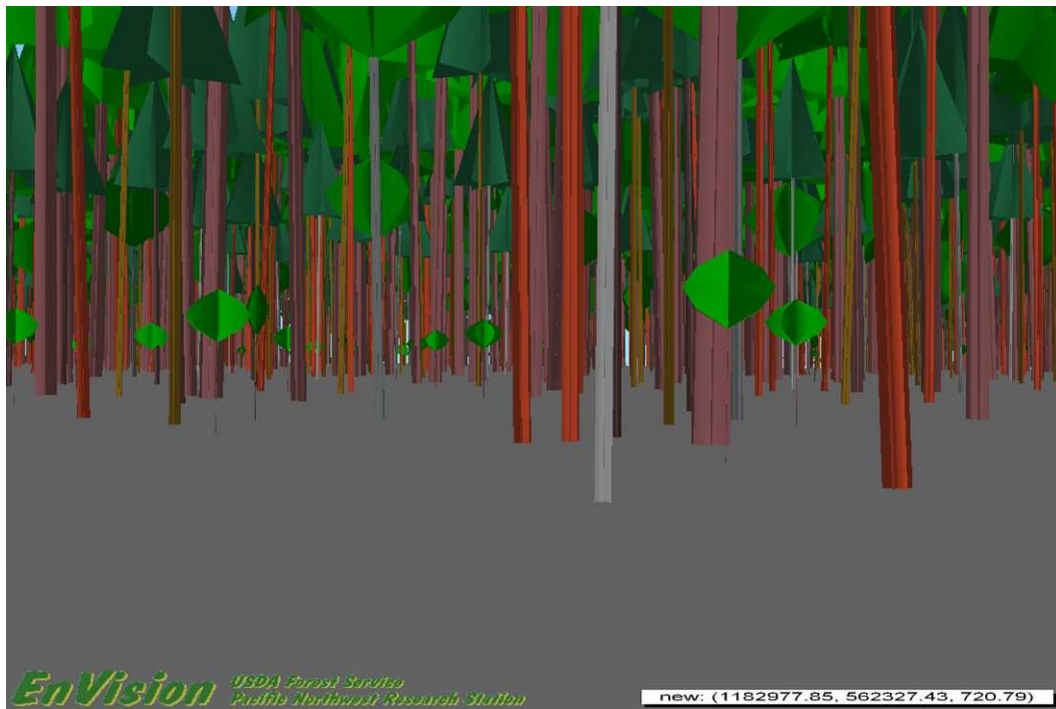


b) Projection in 2012 after being thinned to 50 trees/ac.

Figure 8. Current envision stand visualizations for possible campground sites at stand 21.



a) Stand 21 from vantage point in 2107 without treatment



b) Stand 21 from vantage point in 2107 reduced to 50 trees/ac in 2112.

Figure 9. Stand 21 visualized using EnVision software to project stands from the same vantage point as in Figure 8 in 2107.

Certification steps and costs

One goal of this management plan is to provide sufficient management planning to allow the Nisqually-Mashel State Park to pursue certification under the Forest Stewardship Council's (FSC) Pacific Coast Standard. Obtaining certification is likely to be both time consuming and expensive. Pack Forest is certified under the Sustainable Forestry Initiative's program and it cost Pack Forest more than \$45,000 in fees and personnel hours to achieve certification. Much of our expense was related to greater detail on accounting in order to demonstrate sustainable harvest levels than may be required by the low-intensity harvesting proposed in this plan. Nevertheless, sufficient money should be budgeted to allow for the process. I outline the likely steps required for certification but a consultant will need to be hired to handle this process.

1. Develop a management plan (*This document should fulfill this need*).
2. Pre-audit—used to assess the management plan and on the ground survey of forests to determine steps needed to obtain certification. Pack Forest spent close to \$6000 on this step. FSC certification is more focused on the forest conditions and proposed treatments than SFI and this may help keep costs down.
3. The information gained from this pre-audit will need to be used to develop a refined management plan that addresses the concerns of the auditors.
4. Final audit will then examine the management plan incorporating any suggestions from the auditor. It may be necessary to designate this task to State Park employees in order to ensure oversight and a mechanism for measuring compliance.
5. Each year the park will need to go through a surveillance audit to make sure the park is managing as stated in the plan—budget \$5000/yr.

The benefit of forest certification is that managers can discuss the certification as a means of assuring the prescribed forestry practices are sustainable, and the FSC standard should be broadly accepted as a means of demonstrating sustainable forestry. This plan describes harvesting stands over a 5-10 year period, after that time the benefits of certification will diminish.

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APPENDIX 1. Vegetation survey data for Nisqually-Mashel State Park where silvicultural prescriptions should be used judiciously. (LYRA Biological 2006)

Polygon	acres	Age Category*	Plant Association (see LYRA Biological 2006)	% of stand	Additional Notes
2	20.04	B/C -	TSHE-PSME/POMU-DREX2 Floodplain margin/sand-gravel bar	55 45	Sand/gravel bar at N end and clearings along road completely dominated by exotics. Some small patches of floodplain margin along river bank
6	8.62	C B/C - - -	PSME/GASH/POMU PSME/COCO6/POMU-TITR FRLA/CAOB3 SALUL SPDO	40 30 15 10 5	Hydrology: diversions from adjacent development
10	43.76	B -	TSHE-PSME/POMU-DREX2 ALRU2/POMU	75 25	Cored: main canopy THPL
11	32.01	B - - -	TSHE-PSME/POMU-DREX2 ALRU2/RUSP FRLA/CAOB3 COSES	45 35 15 5	Very old tall stumps. COSES in small patches along Ohop Creek channel
23	17.75	D	PICO-PSME/Gaultheria shallon	90	G1 habitat type
30	33.09	A/B A/B -	PSME-THPL/OXOR TSHE-PSME/POMU-DREX2 ALRU2/POMU	50 40 10	
32	96.36	B A/B - B C	PSME-THPL/OXOR TSHE-PSME/POMU-DREX2 ALRU2/POMU THPL-TSHE/OPHO/POMU PSME/GASH/POMU	42 35 15 3 5	Scattered large, very old cut stumps. Wildlife: deer, cliff-nesting birds. Recreation type: hiking, horseback riding, ORV. Most exotic species (except GERO) found along road.
36	35.28	B - B -	TSHE-PSME/POMU-DREX2 ALRU2/POMU PSME/COCO6/POMU-TITR ALRU2/RUSP	75 10 10 5	Hydrology: altered by culverts. Mostly exotics (except GERO) restricted to road corridor. ALRU2/POMU is mostly in small patches along road. ALRU2/RUSP in small patches along intermittent stream
37	44.53	B/C B/C -	PSME/GASH/POMU PSME/COCO6/POMU-TITR ALRU2/POMU	40 40 20	Hydrology: deep culverts on either side of road. ALRU2/POMU in small patches along road corridor. Cored: main canopy PSME
38	3.03	A/B -	PSME-TSHE/GASH/POMU floodplain margin/sand-gravel bar	90 10	A few very old high-cut stumps by river. Cored: main canopy PSME
39	13.28	B A/B B/C	PSME-TSHE/GASH-MANE2 TSHE-PSME/POMU-DREX2 PSME-ARME/GASH	40 55 5	Wildlife: deer, cliff-nesting birds. PSME-TSHE and PSME-ARME communities are found along the upper slope and ridge break at NE. A few old remnant PSME scattered.
40	14.55	A/B A/B -	TSHE-PSME/POMU-DREX2 PSME-THPL/OXOR floodplain margin/sand-gravel bar	24 70 6	A few scattered very old cut stumps. Low exotic cover. Overall in excellent ecological condition
42	7.75	C B/C	TSHE-PSME/POMU-DREX2 PSME-THPL/OXOR	75 25	Scattered very old cut stumps. Widespread heavy GERO. Cored: main canopy/intermediate PSME
46	8.74	- -	ALRU2/POMU FRLA/CAOB3	60 40	Wildlife: doe observed. Deciduous overstory with an understory of planted Doug-fir saplings; this are will succeed to Doug-fir associations within a few decades. Large English ivy patch in N near road. Heavy patchy blackberry cover throughout.

* The age category schemes include A: Old growth, B: Mature, C Young, and D very young.

Non-forested areas and Sensitive habitat polygon: 1, 9, 12, 13, 15, 17, 18, 23, 24, 31, 33, 35, 41, 45

APPENDIX 2. Vegetation survey data for Nisqually-Mashel State Park stands where silvicultural prescriptions to advance stand development should be encouraged.

Polygon	acres	Age Category*	Plant Association (see LYRA Biological 2006)	% of stand	Additional Notes
3	7.24	C	PSME-TSHE/VAOV2/POMU	100	Ridgetop area has GASH cover >60%, higher than PSME-TSHE/VAOV2/POMU description calls for but keys to this association. Slopes very steep (90-120%)
4	35	C/D C/D D	PSME/GASH-HODI PSME/GASH/POMU PSME/Depauperate	50 35 15	Actively used unauthorized FWD track through forest from Hwy 7 to power line road
5	8.60	C - - - -	PSME/GASH/POMU FRLA/CAOB3 TYLA CAVE6 SPDO	50 15 15 10 10	
7	12.87	C/D C/D	PSME/GASH-HODI PSME-(ACMA3)/ELGL	80 20	In PSME/GASH-HODI, PSME saplings are ,10yrs; large canopy gaps with many exotics and high shrub cover
8	57.3	C/D C/D -	PSME/GASH-HODI PSME-(ACMA3)/ELGL ALRU2/POMU	65 20 15	PSME regeneration very uneven, many canopy gaps with high shrub and exotic cover. <i>Cirsium arvense</i> and <i>Cytisus scoparius</i> widespread with high cover
14	39.58	C/D - -	PSME/GASH/POMU FRLA/CAOB3 SALUL	63 30 7	Main canopy PSME. SALUL is located in W of polygon where intersection of power line and old logging road create a small impounded wetland. FRLA/CAOB3 is found throughout in small depression wetlands.
16	72.63	D - D -	PSME/GASH/POMU ARLU2/POMU PSME/GASH-HODI FRLA/CAOB3	70 15 10 5	Uneven regeneration, many canopy gaps with high shrub and exotic cover. <i>Rubus armeniacus</i> , <i>R. lacinatus</i> and <i>Cytisus scoparius</i> widespread with high cover. Recreation type: vehicle traffic, hiking, hunting, and horseback riding. Hydrology: altered by culvert placements
19	78.31	D D - D	PSME/GASH-HODI PSME/GASH/POMU ALRU2/POMU PSME-(ACMA3)/ELGL	50 30 15 5	Recreation type: vehicle and hiking. Cored: main canopy PSME. Many small canopy gaps with high exotic cover. Portions of this polygon adjacent to road used as parking area.
20	21.4	C/D C/D	PSME/GASH-HODI PSME/GASH/POMU	60 40	Variable cover plantation with many small canopy

21	38.37	C/D C/D	PSME/GASH-HODI PSME/GASH/POMU	70 30	gaps. Main cover PSME Several large forest openings dominated by <i>Holodiscus discolor</i> , <i>Symphoricarpos albus</i> , <i>Rubus ursinus</i> , and <i>Pteridium aquilinum</i> . Recreation type: vehicle, hiking, and horseback riding
22	15.34	C	PSME/GASH-HODI	100	West portion of polygon with large canopy gaps dominated by oceanspray and salal. Recreation type: vehicles, hiking, and horseback riding. Cored: main canopy PSME
25	16.26	C	PSME/GASH/POMU	100	Widespread scotch broom. Cored: main canopy PSME
26	21.86	C/D	PSME/GASH/POMU	100	Many pockets with dense closed canopy and depauperate understory. Cored: main canopy PSME
27	43.13	C/D -	PSME/GASH/POMU ALRU2/POMU	95 5	PSME/GASH/POMU has large areas of dense canopy with nearly depauperate understory. ALRU2/POMU is in two small patches along old logging road in N end. Cored: main canopy PSME
28	16.14	C - B/C	PSME/GASH/POMU ALRU2/POMU PSME/COCO6/POMU-TITR	40 30 15	ORV damage. Cored: main canopy PSME
29	101.26	D - - - -	PSME/Depauperate PSME/GASH/POMU ARLU2/POMU SALUL CAOD3 FRLA/CAOB3	15 65 15 3 4 13	Recreation type: ORV traffic, hiking, and horseback riding. Wildlife: many deer tracks and scat in wetland area in NW side. Hydrology: altered by culverts. Cored: main canopy PSME
34	95.34	C/D D	PSME/GASH/POMU PSME/Depauperate	70 30	Recreation type: hiking, horseback riding, ORV. Stand is mostly at stem-exclusion stage with many small patches having no understory veg.
43	11.36	- - C	ARLU2/POMU ARLU/RUSP PSME/GASH/POMU	70 20 10	Most of the polygon is dominated by ALRU2 but with some understory PSME on higher slopes.
44	30.36	C/D D -	PSME/GASH/POMU PSME/Depauperate ALRU2/POMU	50 35 15	Large areas of closed canopy regeneration with depauperate understory. ALRU2/POMU in small patches in N portion. Cored: main canopy PSME

* The age category schemes include A: Old growth, B: Mature, C Young, and D very young.

APPENDIX 3. Stand Summaries, Habitat, and Management Recommendations

Stand # = polygon # in Figure 1

Acres = stand size

LYRA Forest Types = Vegetation types described by LYRA Biological survey for the same sites

% in LYRA Forest Type = Percentage of each vegetation classification for the stand, note that many stands classify to more than one habitat type. Stand numbers also match Weyerhaeuser road map suggesting these were numbered harvest units and therefore probably share at common history.

3 Most Common Tree Species = LMS composite stand data showing the 3 most common tree species for each stand. Composite stand data was created by inputting field data into LMS which then uses this information to generate one stand.

% Closed Canopy Field Survey = average canopy cover at sample plots from spherical densiometer

Soil Series = Soil classification based on Pierce County Soil Survey maps which were overlain the stand maps

Barneston = Coarse gravelly loam; excessively well-drained soils

Bellingham = silty clay loam; poorly drained soils

Kapowsin = gravelly loam; well-drained soils

% Cover of Invasive Species = Invasive species cover calculated by LYRA Biological

Risk of Invasive Species = Broad ranking is suggestive of risk of further spread with thinning treatments

Low risk 1-5%,

Moderate risk 6-25%,

High risk > 25% invasive species cover respectively.

Curtis Relative Density = A measure of relative stocking density. Stands with RD>70 are fully stocked, meaning that some trees will begin to die from density-dependent mortality. Stands greater than a current RD of 80 should show mortality in conjunction with growth, and achieving relative densities greater than 100 would suggest the stand is seriously overstocked. The literature confirms RDs over 100 do sometimes occur (I did so calculations, e.g. Worthington 1958, Shaw et al. 2004), but they are not uncommon. I have assumed that LMS needs site calibration, it is growing more basal area then should be possible and I have therefore scaled these risks proportionally. It is well known that stand projections out 100 years are problematic.

Density Risk = Risk based on stand projections 100 years into the future without treatment. Stands were categorized as follows:

High risk stands: RD> 100 in 2107

Moderate risk stands: RD 90-100 in 2107

Low risk stands RD: <80 in 2107

At first look it may seem unusual to list any stand with a RD>70 as being at low risk of being overstocked, however there are a number of factors that we took into consideration in creating this scale. First, many stands in the low and moderate risk categories currently have low stocking, and I used summaries of the number of trees/ac as an

additional factor in deciding risk. Second, field data and aerial photos suggest that stocking is irregular across many units, with natural openings and scattered wetlands present throughout. [A different way to explain this point is that the LMS generated site stands are an aggregate of several, more variable stands, and therefore some portions of a site are more in need of treatment than others.] Third, field surveys with stakeholders revealed conflicted and alternating opinions of stands that might require treatment now vs. some time in the future; we tried to reflect stakeholder sentiments of risk on a stand-by-stand basis.

Canopy Layers = LMS determined canopy layers. LMS assigns canopy layers conservatively and therefore distinct layers probably exist.

Johnson and O'Neil Habitat Types = Habitat classification schemes based of canopy closures and tree size

- Tree size
 - 1-9" sapling/pole
 - 10-14" small trees
 - 15-19" Medium trees
 - 20-29" Large trees
 - >30" Giant trees
- Percent Canopy Cover
 - Open 10-39% cover
 - Moderate 40-69% cover
 - Closed 70-100% cover
- Number of Canopy layers
 - Single story
 - Multi-story: 2 or more layers

Possible Revenue = The anticipated revenue if the site is treated as listed (e.g. 50 TPA in 2012). Revenue is calculated with an average net return of \$420/MBF based on LMS per acre wood volume projections. Timber prices and pulp prices fluctuate, so it is best to use the figures comparatively; a proper timber cruise will be needed to obtain firm revenue estimates prior to harvest [Pulp prices are currently at a 10 year high of \$42/ton. This spot price may result in higher returns than those predicted due to the fact that the majority of the stands within the park are of a smaller size and age class, well suited for manufacture into those "chip and saw" and pulp sorts.]

Treatment Cost = The cost of harvesting the entire stand with each treatment column. There is no treatment cost associated with a no harvest scenario. The total cost is calculating by multiplying the associated/ac treatment costs by the number of ac for the site. *Example: stand 3 is 7.2 ac, the cost of thinning and planting in 2007 is \$1000.80. This price is calculated as follows: \$49+\$80+\$10=\$139. \$139/ac * 7.2 ac= \$1000.80. Note that thinning to 100 TPA in 2012 cost less, this is because the activity is now commercial (i.e. the trees are paying for the thinning and the net profit price has that priced in). The costs to go to 100 TPA in 2012 is \$80+\$10=\$90. \$90* 7.2 ac=\$648.*

- Precommercial thinning and weeding: \$49/ac
- Planting: \$80/acre (assuming DNR corrections crew planting rate)
- Purchase 50 seedlings/ac: \$10
- Purchase 100 seedlings/ac: \$20

Recommended Treatment = % of the stand that we are recommending be harvested with that prescription. Recall that many sites have variable density and in that case we recommend treatments targeted at denser areas. Many stands are recommended with mixed treatments, some stands being thinned to 50 TPA and others to 100 TPA. Variable application across the stands could increase horizontal diversity.

Projected Revenue = is the projected revenue if the % of the acreage on the site is treated as recommended. There are uncertainties in expected revenue including method of timber sale, timber prices, and administrative costs. The numbers are based on our experiences at Pack Forest.

APPENDIX 4. Species codes and associated common and Latin names.

Species Code	Common Name	Latin Name
TSHE	Western Hemlock	<i>Tsuga Heterophylla</i>
PSME	Douglas-Fir	<i>Pseudotsuga menziesii</i> ssp. <i>menziesii</i>
ALRU2	Red alder	<i>Alnus rubra</i>
ACMA3	Bigleaf maple	<i>Acer macrophyllum</i>
POBA	Black cottonwood	<i>Populus balsamifera</i> ssp. <i>Trichocarpa</i>
THPL	Western redcedar	<i>Thuja plicata</i>
ABGR	Grand fir	<i>Abies grandis</i>
ARME	Pacific madrone	<i>Arbutus menziesii</i>
FRLA	Oregon ash	<i>Fraxinus latifolia</i>
PICO	Lodgepole pine	<i>Pinus contorta</i>
CYSC	Scot's broom*	<i>Cytisus scoparius</i>
POMU	Western swordfern	<i>Polystichum munitum</i>
DREX2	Spreading woodfern	<i>Dryopteris expansa</i>
GASH	Salal	<i>Gaultheria shallon</i>
COCO6	Beaked hazelnut	<i>Corylus cornuta</i>
SYVU-TITA	Common lilac	<i>Syringa vulgaris</i>
CAOB3	Slough sedge	<i>Carex obnupta</i>
SALUL	Pacific willow	<i>Salix lucida</i>
SPDO	Rose spiraea	<i>Spiraea douglasii</i>
RUSP	Salmonberry	<i>Rubus spectabilis</i>
COSES	Redosier dogwood	<i>Cornus sericea</i>
OXOR	Redwood sorrel	<i>Oxalis oregana</i>
OPHO	Devilsclub	<i>Oplopqanux horidus</i>
TITR	Threelaf foamflower	<i>Tiarella trifoliata</i>
MANE2	Cascade barberry	<i>Mahonia nervosa</i>
VAOV2	California huckleberry	<i>Vaccinium ovatum</i>
HODI	Oceanspray	<i>Holodiscus discolor</i>
TYLA	Broadleaf cattail	<i>Typha latifolia</i>
CAVE6	Blister sedge	<i>Carex vesicaria</i>
ELGL	Blue wildrye	<i>Elymus glaucus</i>
GERO	Robert germanium*	<i>Geranium robertianum</i>
CIAR	Canada thistle*	<i>Cirsium arvense</i>
RUAR	Himalayan blackberry*	<i>Rubus armeniacus</i>
RULA	Cut-leaf, evergreen blackberry*	<i>Rubus laciniatus</i>

* non-native, invasive

APPENDIX 5. Stand tables summarizing both existing stand conditions and expected habitat and timber production under various management strategies.

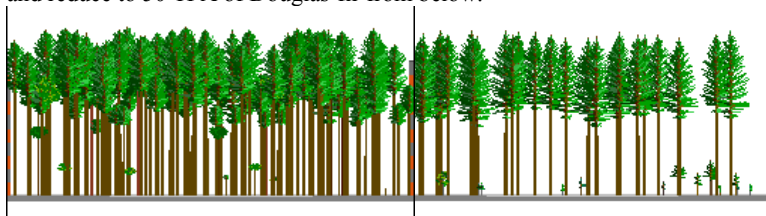
Stand 3. Site characteristics and risk of spread of invasive species and closed canopy conditions.

Acres: 7.2		% in LYRA Forest Type
LYRA Forest Types	PSME-TSHE/VAOV2/POMU	100
3 Most Common Tree Species	TABR, TSHE, THPL	
% Closed Canopy		
Field Survey	91-100	
Soil Series	Kapowsin	
% Cover of Invasive Species	1-5	
Risk from Invasive Species	Low	
Density Risk	High	

Stand 3. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification are used to show the potential impact of various treatments.

Treatments	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	50.9	14	19	7.4	9.7
Curtis Relative Density 2107	110.2	68.4	67.9	62.9	61.2
Canopy Layers 2057	3	2	2	2	2
Canopy Layers 2107	4	3	3	3	3
Johnson & O'Neil Habitat 2007	Sapling-Pole-Single-Closed	Sapling-Pole- Single- Moderate	Sapling-Pole- Single-Closed	Sapling- Pole-Single- Open	Sapling-Pole- Single-Closed
Johnson & O'Neil Habitat 2057	Large-Multi-Closed	Large-Multi- Closed	Large-Multi- Closed	Large-Multi- Closed	Large-Multi- Moderate
Johnson & O'Neil Habitat 2107	Giant-Multi-Closed	Giant-Multi- Closed	Giant-Multi- Closed	Giant-Multi- Closed	Giant-Multi- Closed
Possible Revenue	\$0.00	\$0.00	\$1,802.18	\$0.00	\$6,265.00
Treatment Cost	\$0.00	\$1,000.80	\$648.00	\$1,072.80	\$720.00
Recommended Treatment	75%				25%
Projected Revenue					\$1386

Stand 3. Projected stand structures 2057 with no treatment to the left, and 50 trees/acre on the right. Target highest density areas and reduce to 50 TPA of Douglas-fir from below.



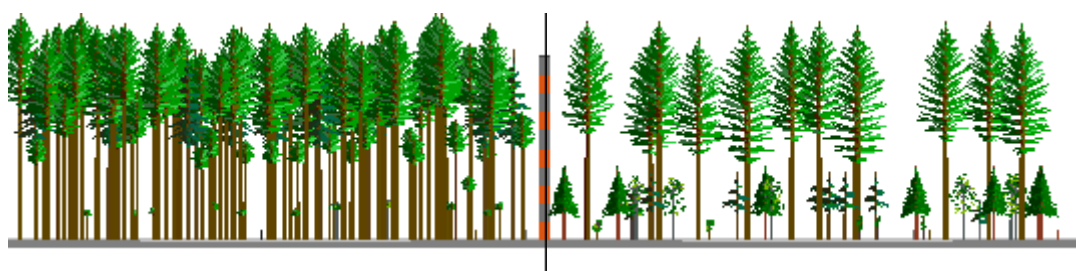
Stand 4. Site characteristics and risk of spread of invasive species and closed canopy conditions.

Acres: 35.3		% in LYRA Forest Type
LYRA Forest Types	PSME/GASH-HODI	50
	PSME/GASH/POMU	35
	PSME/Depauperate	15
3 Most Common Tree Species	PSME, TSHE, ACMA	
% Closed Canopy Field Survey	61-90	
Soil Series	Barneston	
% Cover of Invasive Species	6-25	
Risk from Invasive Species	Moderate	
Density Risk	Moderate	

Stand 4. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification are used to show the potential impact of various treatments.

Treatments	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	45.2	17.9	22.4	10	12.7
Curtis Relative Density 2107	94.3	64.9	65.2	62.6	61.8
Canopy Layers 2057	3	2	2	2	2
Canopy Layers 2107	3	3	2	3	3
Johnson & O'Neil Habitat 2007	Small-Single-Closed	Small-Single- Moderate	Small-Single- Closed	Small-Single- Open	Small-Single- Closed
Johnson & O'Neil Habitat 2057	Large-Multi-Closed	Large-Multi- Moderate	Large-Multi- Moderate	Large-Multi- Moderate	Large-Multi- Moderate
Johnson & O'Neil Habitat 2107	Large-Multi-Closed	Giant-Multi- Moderate	Giant-Multi- Moderate	Giant-Multi- Closed	Giant-Multi- Moderate
Possible Revenue	\$0.00	\$0.00	\$36,657.73	\$16,884.44	\$64,899.93
Treatment Cost	\$0.00	\$4,906.70	\$3,177.00	\$3,530.00	\$3,530.00
Recommended Treatment	25%		50%		25%
Projected Revenue			\$16,740		\$15,342

Stand 4. Projected stand structures 2057, no action left, and 50 TPA right. It will be important to treat all dense areas. The majority of this stand should be reduced to 100 TPA, the 50 TPA should be mixed through where trees are largest.



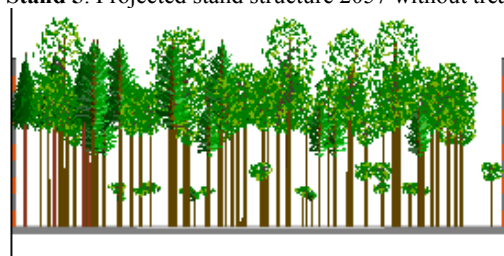
Stand 5. Site characteristics and risk of spread of invasive species and closed canopy conditions.

		% in LYRA Forest Type
Acres: 8.6		
LYRA Forest Types	PSME/GASH/POMU	50
	FRLA/CAOB3	15
	TYLA	15
	CAVE6	10
	SPDO	10
3 Most Common Tree Species	ACMA,PSME,THPL	
% Closed Canopy Field Survey	26-60	
Soil Series	Barneston	
% Cover of Invasive species	1-5	
Risk from Invasive Species	Low	
Density Risk	Low	

Stand 5. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification are used to show the potential impact of various treatments.

Potential Treatments	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	37.7	25.4	27.9	20	21.7
Curtis Relative Density 2107	78.1	59.9	60.6	59.2	57
Canopy Layers 2057	2	2	2	2	2
Canopy Layers 2107	3	3	2	3	3
Johnson & O'Neil Habitat 2007	Medium-Multi-Closed	Medium-Single- Moderate	Medium-Multi- Closed	Medium- Single- Moderate	Medium- Multi-Closed
Johnson & O'Neil Habitat 2057	Large-Multi-Closed	Large-Multi- Moderate	Large-Multi- Moderate	Large-Multi- Moderate	Large-Multi- Moderate
Johnson & O'Neil Habitat 2107	Giant-Multi-Closed	Giant-Multi- Moderate	Giant-Multi- Moderate	Giant-Multi- Moderate	Giant-Multi- Moderate
Possible Revenue	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Treatment Cost	\$0.00	\$1,195.40	\$1,195.40	\$1,281.40	\$1,281.40
Recommended Treatment	100%				

Stand 5. Projected stand structure 2057 without treatment.



Stand 7. Site characteristics and risk of spread of invasive species and closed canopy conditions.

Acres: 12.9		% in LYRA Forest Type
LYRA Forest Types	PSME/GASH-HODI	80
	PSME-(ACMA3)/ELGL	20
3 Most Common Tree Species	PSME, POBAT, ACMA	
% Closed Canopy Field Survey	26-60	
Soil Series	Kapowsin	
% Cover of Invasive Species	6-25	
Risk from Invasive Species	Moderate	
Density Risk	Low	

Stand 7. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification are used to show the potential impact of various treatments.

Potential Treatments	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	4.4	2.8	4.6	1.7	2.9
Curtis Relative Density 2107	74.1	61.8	61.3	62.8	62.2
Canopy Layers 2057	2	2	2	1	1
Canopy Layers 2107	2	3	2	2	2
Johnson & O'Neil Habitat 2007	Sapling-Pole-Single-Open	Grass-Forb	Sapling-Pole- Single-Open	Grass-Forb	Sapling-Pole- Single-Open
Johnson & O'Neil Habitat 2057	Large-Multi-Closed	Large-Multi- Moderate	Large-Multi- Moderate	Medium- Single-Closed	Large-Single- Moderate
Johnson & O'Neil Habitat 2107	Large-Multi-Closed	Large-Multi- Closed	Giant-Multi- Closed	Large-Multi- Closed	Large-Multi- Closed
Possible Revenue	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Treatment Cost	\$0.00	\$1,793.10	\$1,793.10	\$1,922.10	\$1,922.10
Recommended Treatment	100%				

Stand 7. Projected stand structure 2057 without treatment.



Stand 8. Site characteristics and risk of spread of invasive species and closed canopy conditions.

		% in LYRA Forest Type
Acres: 57.3		
LYRA Forest Types	PSME/GASH-HODI	65
	PSME-(ACMA3)/ELGL	20
	ALRU2/POMU	15
3 Most Common Tree Species	POBAT, FRLA, ACMA	
% Closed Canopy Field Survey	61-90	
Soil Series	Barneston, Bellingham	
% Cover of Invasive Species	26-60	
Risk from Invasive Species	High	
Density Risk	High	

Stand 8. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification are used to show the potential impact of various treatments.

	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	27.7	5.3	7.3	3.5	4.5
Curtis Relative Density 2107	128.2	59.8	56.4	57.2	57.3
Canopy Layers 2057	2	2	2	1	2
Canopy Layers 2107	4	3	3	2	2
Johnson & O'Neil Habitat 2007	Sapling-Pole-Multi-Closed	Sapling-Pole- Single-Open	Sapling-Pole- Multi-Closed	Sapling-Pole- Single-Open	Sapling-Pole- Multi-Closed
Johnson & O'Neil Habitat 2057	Medium-Multi-Closed	Large-Multi- Moderate	Medium-Multi- Moderate	Medium- Single- Moderate	Medium-Multi- Moderate
Johnson & O'Neil Habitat 2107	Large-Multi-Closed	Large-Multi- Closed	Large-Multi- Moderate	Large-Multi- Closed	Large-Multi- Closed
Possible Revenue	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Treatment Cost	\$0.00	\$7,964.70	\$7,964.70	\$8,537.70	\$8,537.70
Recommended Treatment	100%				

Stand 8. Projected stand structures 2057 with no treatment. This stand is a good example of the pitfalls of using computer models. The stand has very low stocking in 2007 (RD=28), and is compromised of a large number of small bigleaf maple stump sprouts. Projected densities seem unlikely to reach the projected RD of 128, and therefore I recommend no action.



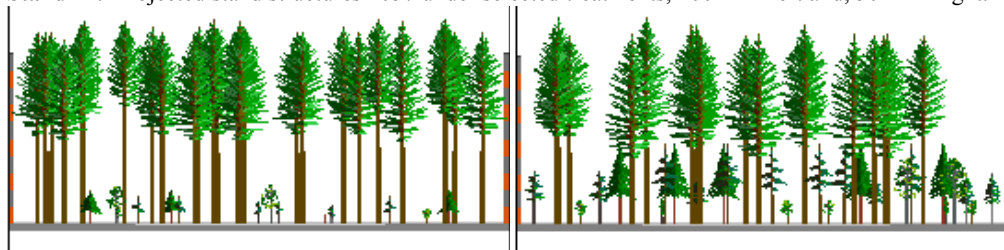
Stand 14. Site characteristics and risk of spread of invasive species and closed canopy conditions.

		% in LYRA Forest Type
Acres: 39.6		
LYRA Forest Types	PSME/GASH/POMU	63
	FRLA/CAOB3	30
	SALUL	7
3 Most Common Tree Species	ACMA, PSME, POBAT	
% Closed Canopy Field Survey	61-90	
Soil Series	Kapowsin	
% Cover of Invasive Species	6-25	
Risk from Invasive Species	Moderate	
Density Risk	High	

Stand 14. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification are used to show the potential impact of various treatments.

	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	67.1	12.3	16.4	6.6	9
Curtis Relative Density 2107	122.5	64	64.7	62.8	61.7
Canopy Layers 2057	3	2	2	2	2
Canopy Layers 2107	4	3	3	3	3
Johnson & O'Neil Habitat 2007	Sapling-Pole-Multi-Closed	Sapling-Pole-Single-Open	Sapling-Pole-Multi-Closed	Sapling-Pole-Single-Open	Sapling-Pole-Multi-Closed
Johnson & O'Neil Habitat 2057	Large-Multi-Closed	Large-Multi-Closed	Large-Multi-Moderate	Large-Multi-Moderate	Large-Multi-Moderate
Johnson & O'Neil Habitat 2107	Large-Multi-Closed	Giant-Multi-Closed	Giant-Multi-Moderate	Giant-Multi-Closed	Giant-Multi-Closed
Possible Revenue	\$0.00	\$0.00	\$3,684.82	\$0.00	\$12,871.17
Treatment Cost	\$0.00	\$5,504.40	\$3,564.00	\$5,900.40	\$3,960.00
Recommended Treatment	30%		40%		30%
Projected Revenue			\$4859		\$2671

Stand 14. Projected stand structures 2057 under selected treatments, 100 TPA left and, 50 TPA right.



Stand 16. Site characteristics and risk of spread of invasive species and closed canopy conditions.

		% in LYRA Forest Type
Acres: 72.6		
LYRA Forest Types	PSME/GASH/POMU	70
	ARLU2/POMU	15
	PSME/GASH-HODI	10
	FRLA/CAOB3	5
3 Most Common Tree Species	PSME, POBAT, ACMA	
% Closed Canopy Field Survey	61-90	
Soil Series	Barneston	
% Cover of Invasive Species	26-60	
Risk from Invasive Species	High	
Density Risk	High	

Stand 16. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification are used to show the potential impact of various treatments.

	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	65.4	14.6	18.7	8.4	10.4
Curtis Relative Density 2107	121	63.7	63.4	58.9	61
Canopy Layers 2057	4	2	2	2	2
Canopy Layers 2107	4	3	3	3	3
Johnson & O'Neil Habitat 2007	Small-Multi-Closed	Small-Single- Open	Small-Multi- Closed	Small-Single- Open	Small-Multi- Closed
Johnson & O'Neil Habitat 2057	Large-Multi-Closed	Large-Multi- Closed	Large-Multi- Closed	Large-Multi- Closed	Large-Multi- Moderate
Johnson & O'Neil Habitat 2107	Large-Multi-Closed	Giant-Multi- Closed	Giant-Multi- Closed	Large-Multi- Closed	Giant-Multi- Closed
Possible Revenue	\$0.00	\$0.00	\$29,209.51	\$0.00	\$70,136.17
Treatment Cost	\$0.00	\$10,091.40	\$6,534.00	\$10,817.40	\$7,260.00
Recommended Treatment	20%		65%		15%
Projected Revenue			\$14,739		\$9,429

Stand 16. Projected stand structures 2057 under no action, 100 TPA center and, 50 TPA right. Treatments to target the highest density stands. No action sites should be matched with wetter soils represented by Oregon ash.



Stand 19. Site characteristics and risk of spread of invasive species and closed canopy conditions.

		% in LYRA Forest Type
Acres: 78.3		
LYRA Forest		
Types	PSME/GASH-HODI	50
	PSME/GASH/POMU	30
	ALRU2/POMU	15
	PSME-(ACMA3)/ELGL	5
3 Most Common Tree Species	PSME, PREM, ACMA	
% Closed Canopy Field Survey	26-60	
Soil Series	Barneston, Kapowsin	
% Cover of Invasive Species	26-60	
Risk from Invasive Species	High	
Density Risk	High	

Stand 19. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification are used to show the potential impact of various treatments.

	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	30.9	8.8	13.6	4.7	7.6
Curtis Relative Density 2107	102.8	64.7	63.9	63.1	59.9
Canopy Layers 2057	3	2	2	2	2
Canopy Layers 2107	4	3	3	3	3
Johnson & O'Neil Habitat 2007	Sapling-Pole-Single-Closed	Sapling-Pole- Single-Open	Sapling-Pole- Single-Closed	Sapling-Pole- Single-Open	Sapling-Pole- Single-Closed
Johnson & O'Neil Habitat 2057	Large-Multi-Closed	Large-Multi- Closed	Large-Multi- Moderate	Large-Multi- Closed	Large-Multi- Moderate
Johnson & O'Neil Habitat 2107	Large-Multi-Closed	Giant-Multi- Closed	Giant-Multi- Closed	Giant-Multi- Closed	Giant-Multi- Closed
Possible Revenue	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Treatment Cost	\$0.00	\$10,883.70	\$10,883.70	\$11,666.70	\$11,666.70
Recommended Treatment	100%				

Stand 19. Projected stand structure in 2057 with no treatment. This stand poses some problems. It has a high concentration of invasive species which is why I have recommended no treatment. It may be a good candidate for later treatment.



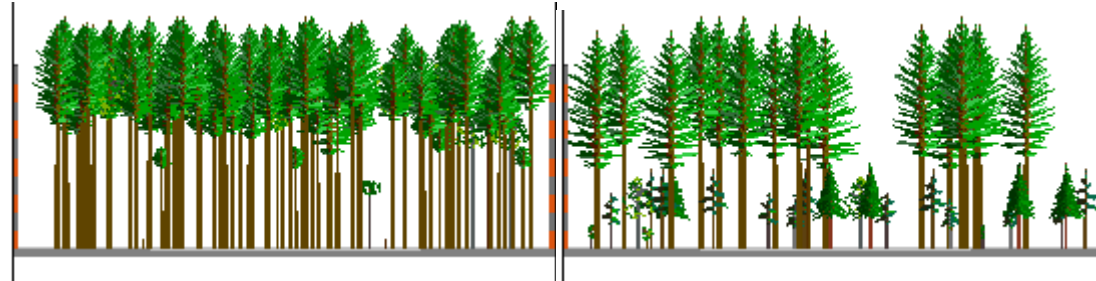
Stand 20. Site characteristics and risk of spread of invasive species and closed canopy conditions.

Acres: 21.4		% in LYRA
LYRA Forest		Forest Type
Types	PSME/GASH-HODI	60
	PSME/GASH/POMU	40
3 Most Common Tree Species	PSME, POBAT, ACMA	
% Closed Canopy		
Field Survey	91-100	
Soil Series	Barneston	
% Cover of Invasive Species	1-5	
Risk from Invasive Species	Low	
Density Risk	Moderate	

Stand 20. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification are used to show the potential impact of various treatments.

	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	43.9	21.8	25.6	12.1	14.3
Curtis Relative Density 2107	83.5	64.4	64.7	61.5	59.9
Canopy Layers 2057	3	2	2	2	2
Canopy Layers 2107	3	2	2	3	3
Johnson & O'Neil Habitat 2007	Small-Single-Closed	Small-Single-Moderate	Small-Single-Closed	Small-Single-Open	Small-Single-Closed
Johnson & O'Neil Habitat 2057	Large-Multi-Closed	Large-Multi-Moderate	Large-Multi-Moderate	Large-Multi-Moderate	Large-Multi-Moderate
Johnson & O'Neil Habitat 2107	Large-Multi-Closed	Giant-Multi-Moderate	Giant-Multi-Moderate	Giant-Multi-Moderate	Giant-Multi-Moderate
Possible Revenue	\$0.00	\$11,868.29	\$26,003.90	\$28,565.48	\$52,520.12
Treatment Cost	\$0.00	\$1,926.00	\$1,926.00	\$2,140.00	\$2,140.00
Recommended Treatment	25%	50%		25%	
Projected Revenue		\$4,973		\$6,064	

Stand 20. Projected stand structure in 2057 with no treatment, and thinning to 50 TPA. Treatment aimed at creating some larger trees.



Stand 21. Site characteristics and risk of spread of invasive species and closed canopy conditions.

Acres: 38.4		% in LYRA
LYRA Forest		Forest Type
Types	PSME/GASH-HODI	70
	PSME/GASH/POMU	30
3 Most Common Tree Species	PSME, THPL.	
% Closed Canopy		
Field Survey	0	
Soil Series	Kapowsin	
% Cover of Invasive Species	6-25	
Risk from Invasive Species	Moderate	
Density Risk	Low	

Stand 21. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification are used to show the potential impact of various treatments.

	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	32.2	19.1	24	11.7	14.5
Curtis Relative Density 2107	80.1	64.3	65.5	60.8	60.2
Canopy Layers 2057	4	2	2	2	2
Canopy Layers 2107	4	3	2	3	3
Johnson & O'Neil Habitat 2007	Small-Multi-Moderate	Small-Single-Moderate	Small-Multi-Moderate	Small-Single-Open	Small-Multi-Moderate
Johnson & O'Neil Habitat 2057	Large-Multi-Closed	Large-Multi-Moderate	Large-Multi-Moderate	Large-Multi-Moderate	Large-Multi-Moderate
Johnson & O'Neil Habitat 2107	Giant-Multi-Closed	Giant-Multi-Moderate	Giant-Multi-Moderate	Giant-Multi-Moderate	Giant-Multi-Moderate
Possible Revenue	\$0.00	\$0.00	\$11,713.61	\$11,557.16	\$38,887.99
Treatment Cost	\$0.00	\$5,337.60	\$3,456.00	\$3,840.00	\$3,840.00
Recommended Treatment	40%		30%		30%
Projected Revenue			\$2477		\$10,514

Stand 21. Projected stand structure in 2057 with no treatment, 100 TPA, and 50 TPA.



Stand 22. Site characteristics and risk of spread of invasive species and closed canopy conditions.

Acres: 15.3		% in LYRA Forest Type
LYRA Forest Types	PSME/GASH-HODI	100
3 Most Common Tree Species	PSME	
% Closed Canopy Field Survey	61-90	
Soil Series	Kapowsin	
% Cover of Invasive Species	6-25	
Risk from Invasive Species	Moderate	
Density Risk	Low	

Stand 22. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification are used to show the potential impact of various treatments.

	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	15.5	14.2	18.7	9.8	12.8
Curtis Relative Density 2107	63	66.2	65.4	64	62.1
Canopy Layers 2057	1	2	2	2	2
Canopy Layers 2107	1	3	2	3	3
Johnson & O'Neil Habitat 2007	Small-Single-Open	Small-Single- Open	Small-Single- Open	Small-Single- Open	Small-Single- Open
Johnson & O'Neil Habitat 2057	Large-Single-Moderate	Large-Multi- Moderate	Large-Multi- Moderate	Large-Multi- Moderate	Large-Multi- Moderate
Johnson & O'Neil Habitat 2107	Giant-Single-Moderate	Giant-Multi- Closed	Giant-Multi- Moderate	Giant-Multi- Closed	Giant-Multi- Closed
Possible Revenue	\$0.00	\$0.00	\$0.00	\$0.00	\$4,726.32
Treatment Cost	\$0.00	\$2,126.70	\$2,126.70	\$2,279.70	\$1,530.00
Recommended Treatment	100%				

Stand 22. Projected stand structure in 2057 with no treatment.



Stand 25. Site characteristics and risk of spread of invasive species and closed canopy conditions.

Acres: 16.3		% in LYRA Forest Type
LYRA Forest Types	PSME/GASH/POMU	100
3 Most Common Tree Species	PSME, PREM.	
Proportion of plots with closed canopy		
% Closed Canopy Field Survey	61-90	
Soil Series	Barneston	
% Cover of Invasive Species	6-25	
Risk from Invasive Species	Moderate	
Density Risk	Moderate	

Stand 25. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification are used to show the potential impact of various treatments.

	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	67.8	20.1	24.1	11.1	13.3
Curtis Relative Density 2107	95.5	65.4	65.6	62.3	60.8
Canopy Layers 2057	2	2	2	2	2
Canopy Layers 2107	3	2	2	3	3
Johnson & O'Neil Habitat 2007	Small-Single-Closed	Small-Single- Moderate	Small-Single- Closed	Small-Single- Open	Small-Single- Closed
Johnson & O'Neil Habitat 2057	Large-Multi-Closed	Large-Multi- Moderate	Large-Multi- Moderate	Large-Multi- Moderate	Large-Multi- Moderate
Johnson & O'Neil Habitat 2107	Large-Multi-Closed	Giant-Multi- Moderate	Giant-Multi- Moderate	Giant-Multi- Moderate	Giant-Multi- Moderate
Possible Revenue	\$0.00	\$25,721.65	\$42,067.71	\$34,914.67	\$57,871.57
Treatment Cost	\$0.00	\$1,467.00	\$1,467.00	\$1,630.00	\$1,630.00
Recommended Treatment	20%	40%		40%	
Projected Revenue		\$9660		\$13,314	

Stand 25. Projected stand structure in 2057 with no treatment, 100 TPA, and 50 TPA.



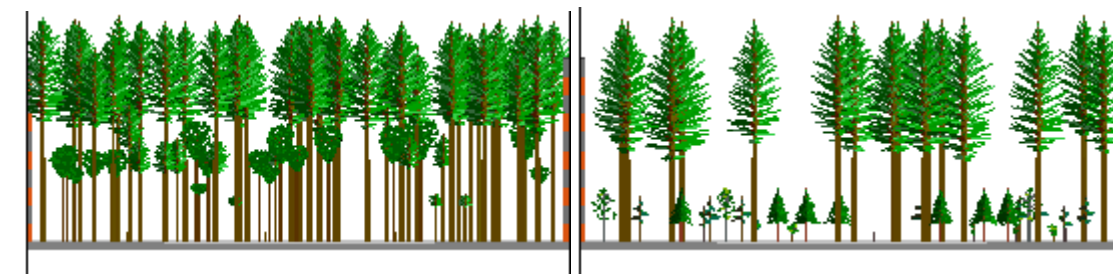
Stand 26. Site characteristics and risk of spread of invasive species and closed canopy conditions.

Acres: 21.9		% in LYRA Forest Type
LYRA Forest Types	PSME/GASH/POMU	100
3 Most Common Tree Species	PSME, PREM	
% Closed Canopy Field Survey	91-100	
Soil Series	Barneston, Kapowsin	
% Cover of Invasive Species	6-25	
Risk from Invasive Species	Moderate	
Density Risk	Moderate	

Stand 26. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification are used to show the potential impact of various treatments.

	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	33	19	24.2	10.3	13.1
Curtis Relative Density 2107	82.1	66.7	66.8	62.6	61.3
Canopy Layers 2057	3	2	2	2	2
Canopy Layers 2107	3	2	2	3	3
Johnson & O'Neil Habitat 2007	Small-Multi-Closed	Small-Single- Moderate	Small-Multi- Closed	Small-Single- Open	Small-Multi- Closed
Johnson & O'Neil Habitat 2057	Large-Multi-Closed	Large-Multi- Moderate	Large-Multi- Moderate	Large-Multi- Moderate	Large-Multi- Moderate
Johnson & O'Neil Habitat 2107	Large-Multi-Closed	Giant-Multi- Moderate	Giant-Multi- Moderate	Giant-Multi- Moderate	Giant-Multi- Moderate
Possible Revenue	\$0.00	\$5,947.61	\$11,457.21	\$19,152.72	\$34,987.72
Treatment Cost	\$0.00	\$1,971.00	\$1,971.00	\$2,190.00	\$2,190.00
Recommended Treatment	25%	50%		25%	
Projected Revenue		\$1987		\$4242	

Stand 26. Projected forest structure in 2057 with no treatment and at 50 TPA targeted high density areas.



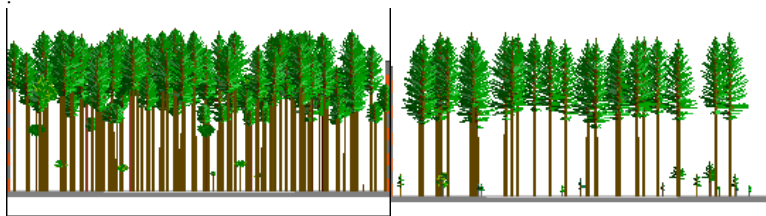
Stand 27. Site characteristics and risk of spread of invasive species and closed canopy conditions.

Acres: 43.1		% in LYRA Forest Type
LYRA Forest Types	PSME/GASH/POMU	95
	ALRU2/POMU	5
3 Most Common Tree Species	PSME, THPL, ALRU	
% Closed Canopy Field Survey	91-100	
Soil Series	Kapowsin	
% Cover of Invasive Species	6-25	
Risk from Invasive Species	Moderate	
Density Risk	Moderate	

Stand 27. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification are used to show the potential impact of various treatments.

	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	64.3	19	22.5	10.6	12.6
Curtis Relative Density 2107	97.7	63.8	63.6	61.4	60.1
Canopy Layers 2057	4	2	2	2	2
Canopy Layers 2107	5	3	2	3	3
Johnson & O'Neil Habitat 2007	Small-Multi-Closed	Small-Single- Moderate	Small-Multi- Closed	Small-Single- Open	Small-Multi- Closed
Johnson & O'Neil Habitat 2057	Large-Multi-Closed	Large-Multi- Moderate	Large-Multi- Moderate	Large-Multi- Moderate	Large-Multi- Moderate
Johnson & O'Neil Habitat 2107	Large-Multi-Closed	Giant-Multi- Moderate	Giant-Multi- Moderate	Giant-Multi- Moderate	Giant-Multi- Moderate
Possible Revenue	\$0.00	\$46,281.56	\$79,236.07	\$74,025.78	\$126,958.20
Treatment Cost	\$0.00	\$3,879.00	\$3,879.00	\$4,310.00	\$4,310.00
Recommended Treatment			50%		50%
Projected Revenue			\$37,678		\$61,324

Stand 27. Projected forest structure in 2057 with no treatment and thinning to 100 TPA. A good sites to generate revenue for other treatments.



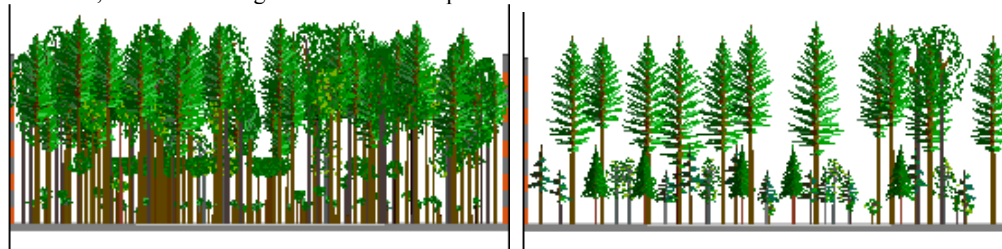
Stand 29. Site characteristics and risk of spread of invasive species and closed canopy conditions.

Acres: 101.3		% in LYRA
LYRA Forest Types	PSME/GASH/POMU	65
	ARLU2/POMU	15
	SALUL	3
	CAOD3	4
	FRLA/CAOB3	13
3 Most Common Tree Species	PSME, PREM, FRLA	
% Closed Canopy	61-90	
Field Survey	61-90	
Soil Series	Barneston	
% Cover of Invasive Species	26-60	
Risk from Invasive Species	High	
Density Risk	High	

Stand 29. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification are used to show the potential impact of various treatments.

	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	44.5	12.8	17	7.3	9.4
Curtis Relative Density 2107	108.7	63.3	63.4	58.9	57.6
Canopy Layers 2057	3	2	2	2	2
Canopy Layers 2107	3	3	3	3	3
Johnson & O'Neil Habitat 2007	Sapling-Pole-Multi-Closed	Sapling-Pole-Single-Open	Sapling-Pole-Multi-Closed	Sapling-Pole-Single-Open	Sapling-Pole-Multi-Closed
Johnson & O'Neil Habitat 2057	Large-Multi-Closed	Large-Multi-Closed	Large-Multi-Moderate	Large-Multi-Moderate	Large-Multi-Moderate
Johnson & O'Neil Habitat 2107	Large-Multi-Closed	Giant-Multi-Closed	Giant-Multi-Closed	Giant-Multi-Closed	Giant-Multi-Closed
Possible Revenue	\$0.00	\$0.00	\$0.00	\$0.00	\$29,786.03
Treatment Cost	\$0.00	\$14,080.70	\$14,080.70	\$15,093.70	\$10,130.00
Recommended Treatment	20%				80%
Projected Revenue					\$15,725

Stand 29. Projected stand structure in 2057 with no treatment, and 50 TPA. Stand density would benefit from widespread treatment, but note that high risk of invasive species increases costs and limits revenue.



Stand 34. Site characteristics and risk of spread of invasive species and closed canopy conditions.

Acres: 95.3		% in LYRA Forest Type
LYRA Forest Types	PSME/GASH/POMU	70
	PSME/Depauperate	30
3 Most Common Tree Species	PSME, FRLA, ALRU	
% Closed Canopy Field Survey	91-100	
Soil Series	Kapowsin	
% Cover of Invasive Species	6-25	
Risk from Invasive Species	Moderate	
Density Risk	High	

Stand 34. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification are used to show the potential impact of various treatments.

	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	62.7	18.4	21.5	10	11.7
Curtis Relative Density 2107	105.1	61.8	61.6	60	56.6
Canopy Layers 2057	4	2	2	2	2
Canopy Layers 2107	5	3	2	3	3
Johnson & O'Neil Habitat 2007	Small-Multi-Closed	Small-Single- Moderate	Small-Multi- Closed	Small-Single- Open	Small-Multi- Closed
Johnson & O'Neil Habitat 2057	Large-Multi-Closed	Large-Multi- Moderate	Large-Multi- Moderate	Large-Multi- Moderate	Large-Multi- Moderate
Johnson & O'Neil Habitat 2107	Large-Multi-Closed	Large-Multi- Moderate	Large-Multi- Moderate	Large-Multi- Moderate	Giant-Multi- Moderate
Possible Revenue	\$0.00	\$24,158.89	\$107,116.38	\$88,120.84	\$206,292.80
Treatment Cost	\$0.00	\$8,577.00	\$8,577.00	\$9,530.00	\$9,530.00
Recommended Treatment			40%		60%
Projected Revenue			\$39,417		\$118,057

Stand 34. Projected stand structure in 2057 with no treatment, 100 TPA, and 50 TPA. High timber value site that should benefit greatly from thinning.



Stand 43. Site characteristics and risk of spread of invasive species and closed canopy conditions.

Acres: 11.4		% in LYRA Forest Type
LYRA Forest Types	ARLU2/POMU	70
	ARLU/RUSP	20
	PSME/GASH/POMU	10
3 Most Common Tree Species	PSME, THPL, TSHE	
% Closed Canopy Field Survey	91-100	
Soil Series	Barneston	
% Cover of Invasive Species	1-5	
Risk from Invasive Species	Low	
Density Risk	High	

Stand 43. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification used to show the impact of various treatments.

	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	125	22.2	24.3	13.4	14.4
Curtis Relative Density 2107	123.4	63.2	63	58.7	57.4
Canopy Layers 2057	5	2	2	2	2
Canopy Layers 2107	6	2	2	3	3
Johnson & O'Neil Habitat 2007	Small-Multi-Closed	Small-Single-Moderate	Small-Multi-Closed	Small-Single-Open	Small-Multi-Closed
Johnson & O'Neil Habitat 2057	Large-Multi-Closed	Large-Multi-Moderate	Large-Multi-Moderate	Large-Multi-Moderate	Large-Multi-Moderate
Johnson & O'Neil Habitat 2107	Large-Multi-Closed	Giant-Multi-Moderate	Large-Multi-Moderate	Giant-Multi-Moderate	Giant-Multi-Moderate
Possible Revenue	\$0.00	\$20,091.93	\$39,976.16	\$29,248.93	\$52,059.45
Treatment Cost	\$0.00	\$1,026.00	\$1,026.00	\$1,140.00	\$1,140.00
Recommended Treatment	30%	35%		35%	
Projected Revenue		\$6,674		\$9836	

Stand 43. Projected stand structure in 2057 with no treatment, 100 TPA, and 50 TPA. A large portion of this stand should be treated. Highest risk areas should be entered in 2007 with other dense stands delayed for 5 years.



Stand 44. Site characteristics and risk of spread of invasive species and closed canopy conditions.

Acres: 30.4		% in LYRA
LYRA Forest		Forest Type
Types	PSME/GASH/POMU	50
	PSME/Depauperate	35
	ALRU2/POMU	15
3 Most Common Tree Species	PSME, ALRU, THPL	
% Closed Canopy Field Survey	91-100	
Soil Series	Barneston	
% Cover of Invasive Species	6-25	
Risk from Invasive Species	Moderate	
Density Risk	High	

Stand 44. Summary of current and projected stand conditions under potential treatments. Curtis Relative Density, current and projected canopy layers, and Johnson and O'Neil Habitat classification are used to show the potential impact of various treatments.

	No Action	100 TPA 2007	100 TPA 2012	50 TPA 2007	50 TPA 2012
Curtis Relative Density 2007	50.9	14	19	7.4	9.7
Curtis Relative Density 2107	110.2	68.4	67.9	62.9	61.2
Canopy Layers 2057	3	2	2	2	2
Canopy Layers 2107	4	3	3	3	3
Johnson & O'Neil Habitat 2007	Sapling-Pole-Single-Closed	Sapling-Pole-Single-Moderate	Sapling-Pole-Single-Closed	Sapling-Pole-Single-Open	Sapling-Pole-Single-Closed
Johnson & O'Neil Habitat 2057	Large-Multi-Closed	Large-Multi-Closed	Large-Multi-Closed	Large-Multi-Closed	Large-Multi-Moderate
Johnson & O'Neil Habitat 2107	Giant-Multi-Closed	Giant-Multi-Closed	Giant-Multi-Closed	Giant-Multi-Closed	Giant-Multi-Closed
Possible Revenue	\$0.00	\$32,468.39	\$63,654.74	\$57,415.65	\$97,060.42
Treatment Cost	\$0.00	\$2,736.00	\$2,736.00	\$3,040.00	\$3,040.00
Recommended Treatment		50%		50%	
Projected Revenue		\$14,866		\$27,187	

Stand 44. Projected stand structure in 2057 100 TPA, and 50 TPA. Density risk trumps risk from invasive species on this site.



Master Plan Appendix G

Summary of 2008 Cultural Resources Investigations

Introduction

The Washington State Parks and Recreation Commission (WSPRC) is completing a public planning process to best determine appropriate stewardship and recreational land-uses in regard to the creation of a new park, the Nisqually-Mashel State Park Site. Proposed park development will likely embrace local prehistory-history, on-site natural resources, recreation opportunities, and sustained landscape conservation. In the coming years of park development, ground-disturbing activities could include road and trail construction; utilities installation; and construction of campsites, picnic grounds, rest rooms, interpretation sites, cabins, administration buildings, and maintenance facilities.

Such capital improvement activities have the potential to disturb sensitive cultural resources such as archaeological features and deposits, historic sites, and other locations of cultural significance. In advance of proposed constructions, the WSPRC employed Archaeological and Historical Services (AHS) from Eastern Washington University to conduct a site file search at the Department of Archaeology and Historic Preservation (DAHP) in Olympia, undertake a sample survey of 100 acres of proposed parkland developments, conduct limited shovel test excavations, initiate informal contact with the Nisqually Tribe, prepare a cultural resources probability map, and, submit a report of findings and recommendations

Background Information

The resulting report of findings, AHS Short Report 993 (Emerson and Ives 2008), details information concerning the local environment (i.e., geologic setting, vegetation and prairies, and existing ground-surface conditions), prehistoric/ethnographic/historic background (i.e., regional prehistory, Sahaptin-Salish relations, early Euro-American settlement, the Puget Sound Indian War of 1855-1856, Indian Henry, logging, mining, and assorted historical interests. In addition, the report summarizes data regarding Traditional Cultural Properties, and previously recorded cultural resources near the proposed state park.

Research Design

Study objectives focused on assessing cultural resources potential by the location and preliminary characterization of both previously and as yet unidentified cultural resources within the proposed Nisqually-Mashel State Park Site, and offering recommendations in regard to resource eligibility for listing in the National Register of Historic Places (NRHP). To that end, AHS personnel conducted a site search at DAHP; background research in federal, state, and local repositories; informal contact with the Nisqually

Tribe; 100 percent visual survey of (10) 10-acre land parcels via controlled pedestrian transects; shovel testing of select locations with potential for archaeological deposits; and completion of inventory forms for identified cultural resources. Nisqually tribal personnel visited the project during fieldwork and observed the shovel test excavations. Tribal representatives included Mr. Joe Kalama, Mr. Steve Pruitt, Mr. Jim McCloud, and Ms. Kitten Leschi.

Survey Results

Although no cultural materials were observed during the pedestrian sample survey, results were positive for three prehistoric sites identified by the shovel test excavations. Two sites were discovered in separate 10-acre land parcels, with a third prehistoric site located via a verbal tip from an informant and shovel testing in an Ohop Creek locality. All three resources relate to the site type; pre-contact lithic material. The resulting cultural resources probability map indicates that select areas of the parkland have a moderate and/or high potential to contain cultural resources. At present, the study information is not sufficient to assess NRHP eligibility of the identified cultural resources without additional test excavations to obtain a larger sample size, determine the presence of cultural features and datable materials, and assess the depositional integrity of the identified sites' cultural materials.

Management Summary and Recommendations

The diverse environment of the Nisqually-Mashel State Park Site lands attracted both Indian peoples and subsequent Euro-American settlers. Proposed parklands include upland and lowland settings with a wide variety of natural resources and a potential for cultural resources. Study results indicate that there is strong likelihood to identify cultural resources in many park environs, but that future surveys of development areas must include shovel testing to assure site identification. In terms of resource eligibility for NRHP listing, insufficient information presently exists. Additional investigations are necessary to fully characterize the nature of the identified cultural resource assemblages and to establish the degree of on-site integrity. Investigations with tribal members or other traditional communities have potential to identify Traditional Cultural Properties within the park. Future land acquisitions of adjacent property will likely contain additional sites or locations of cultural significance, but may add considerable value to the Nisqually-Mashel State Park Site

References

Emerson, Stephen, and Ryan Ives
2008 *Cultural Resources Survey of the Proposed Nisqually-Mashel State Park, Pierce and Thurston Counties, Washington*. Short Report 993. Archaeological and Historical Services, Eastern Washington University, Cheney.

I am Jack McCloud, Jr.

I am descended from Leschi, War Chief of the Medicine Creek Nation

I address you today on behalf of the Tribes of the Medicine Creek Nation

I bring you this message:

"When the great ice receded from the Whulge

More than ten thousand years ago

Creating what is now called Puget Sound

My people crossed over the great mountain Tacobet

Which is now called Rainier

We lived between the mountain (our protector) and the sea (our provider)

We lived on the prairie along the river

We fished and hunted and gathered the gifts of our Mother, the Earth

We lived in the prosperity of the salmon and the cedar for a very long time

When the King Georges came (from England) we welcomed them

We sold them furs and they taught us how to farm

Our daughters married their sons and we lived in peace

And then the Bostons came (who are now called Americans)

Our way of life changed forever

My people changed then, too, but not forever

We, the Squalli Absch , (who are called "Native" Americans) are waking up again

We thirst once more to know our story, and to tell it

I am here to thank you for hearing our story, and for helping us tell it

But most importantly, I am here to thank you for giving us a new story

This new story is not the story of my people alone

It is the story of all who are now called Americans

If we tell it well, it will be a better story than the stories we have told in the past

It will be a story that honors the spirit of all of the people, and all of nature

It will be a story of new prosperity

It will be a story of hope and of peace to last another ten thousand years"

Thank you!

TRANSMITTED BY STEVE FRUIT 8.3.09

October 15, 2008

Nikki Fields, Parks Planner
Washington State Parks and Recreation
2840 Riverwalk Drive SE
Auburn, WA 98002

Dear Ms. Fields:

Thank you for giving the Nisqually Tribe's State Park Committee a full presentation of the Master Plan for the new State Park on the Nisqually River, as prepared by the Portico Group. Our Tribal State Park Committee is extremely grateful for the wonderful response to the expressed interest by the Nisqually Tribe for a partnership role in the new park. From top to bottom, the Washington State Parks and Recreation Commission and Staff have been gracious and enthusiastic about the possibilities for a unique and compelling partnership.

Attached you will find our responses in three categories (appreciations, concerns and additions), along with suggestions on next steps. Please don't hesitate to let me know if I can help with additional details. Steve Pruitt is also available at 360-832-7787 to receive and forward any unofficial communications.

Sincerely,

Jack McCloud, Jr., Chair
The Nisqually Tribe State Park Committee
4820 She-Na-Num Drive SE
Olympia, WA 98513

**Nisqually Tribal Parks Committee
Nisqually Mashel State Park Feedback
September 2008 Master Plan**

Appreciations...

We are delighted with the concept of the Park, featuring the historical, cultural and natural resources of the land.
We are excited about the possibilities for telling the story of our people to fellow Washingtonians and the world.
We are very pleased that plans call, for the most part, for highest impact uses to be located far from environmentally sensitive areas (with high bridges to span a number of those areas).
We like the idea of a future Mashel Prairie without human structures.

Concerns...

Our primary concerns are related to fish and wildlife habitat, and the protection of salmon in particular.
The single highest concern is the plan to have horse and service use of the old road and trail from the bluff above the Mashel River to and across the existing bridge – and to build a bridge across an existing slide area.
Additionally, the plan to rebuild a bridge over the Ohop Creek near the mouth would be problematic if it involved any attempt to restrict the natural migration of the Nisqually River. A river migration could also dictate a relocation of any road and bridge work near a new channel.

Additions...

In our original input to the planning process (attached), we proposed a number of possibilities for the Park. Your design has included (or allows for) almost all of them. The major exception is the notion of an Indian Village. This idea has not been discussed at length, without fault on your part (we did not talk much about it, and have no concrete plans regarding it at this time). To keep the possibility open for future consideration, a potential place for the Village could be located on the map as an area for possible development.
The area south of the Nisqually may need a development designation on higher ground than the area currently designated in the plan.

Suggestions...

Conversations move toward formalization of the role the Tribe will play in the future (please see the draft letter of intent attached –as a draft it represents the level of communication that Committee Chair, Jack McCloud, Jr. is authorized to conduct, and will be subject to approval through the Tribe's Legal Department and Tribal Council prior to a final version).

Have a meeting to discuss concerns identified above. Tribal Committee Members and Tribal Natural Resources Staff would meet with State Parks Staff, along with the State's contract planners and environmental subcontractors.

Identify process for addressing the comments in the "additions" category.

Nisqually Tribal Input to the Nisqually-Mashel State Park Planning Process

For ten thousand years the ancestors of the Nisqually Tribe hunted and gathered in the Nisqually Watershed. The Nisqually and their relatives, the Salish Tribes of the Pacific Northwest, were unique in what is now the continental United States. We did not practice any agriculture. The abundance of cedar (with endless uses) and salmon (which could be preserved through smoking) gave us the resources needed for trading, accumulating wealth, and developing a sophisticated society.

In the last two hundred years, life in the Nisqually Watershed has undergone most of the same changes that have taken place throughout America (and now much of the world). European influence, agricultural and industrial practices, and related religious beliefs characterize the dominant culture. In the 1970's, the Boldt Decision, acknowledging the rights of the Nisqually to traditional and customary fishing practices, resulted in a joint management of State fisheries (by the Tribes and the State). The formation of the Nisqually River Council in 1987 continued the young tradition of cooperative resource management in the Nisqually.

It was, in fact, the River Council's original Nisqually River Management Plan that called for the creation of a State Park on the Nisqually River, near the confluence of the Mashel River (one of the Nisqually's most important tributaries). In 2006, your agency began its site planning for the property that has been acquired to date. On State Park property (and adjoining private lots), the Mashel Prairie boasts many significant historical sites. There was a tribal village there, and the Nisqually's legendary chief, Leschi, called it home. There was an old Shaker Church and cemetery, where the grave of Soo-Too-Let (Indian Henry) is still well maintained. An infamous massacre took place on the site, as well. There may be undiscovered artifacts of significance, and other sacred places yet to be claimed by the Nisqually people – who have every reason to proceed with caution.

State Park neighbors include Pack Forest, the Pioneer Farm Museum, and the Nisqually Land Trust. Each has interpretive and property resources that can be partnered with the State Park to expand its area and capacity of service. Pack Forest has already played a role in property and logging rights acquisitions, as well as with access and public meeting facilitation. It is also the largest landholding neighbor, with vast holdings south and east of the Park. The Pioneer Farm Museum has been operating the Farm for thirty years and the Ohop Indian Village for fifteen – on property that adjoins the State Park to the north of Highway 7. The Nisqually Land Trust owns property to the north and west of the Park, and has been instrumental in the State Park's successful property acquisition efforts.

Given these unique circumstances, the Tribe proposes a one-of-a-kind design for the Park that adds the following possibilities (on Park property and/or adjoining sites) to the traditional services of the Park:

- a) A reconstructed Leschi's Village, where his story is told and village life demonstrated
- b) An area of the park set aside for the Tribe's exclusive ceremonial and educational use (such as that portion of the Park lying south of the Nisqually River)
- c) An opportunity to restore and protect habitat, promote stewardship practices, and involve the public in preservation activities
- d) Fishing, hunting and gathering sites for Tribal use – and trails to connect the park to other tribal use areas
- e) Unique opportunities for the public to experience Nisqually life "pre-contact"
- f) An Interpretive Center to tell the story of the hunting and gathering Nisqually culture
- g) Interpretive signs and guided tours of Medicine Springs and the Cemetery (protected and maintained by the Tribe)
- h) Trails connecting the park and neighboring sites – such as the University of Washington's Pack Forest, Pioneer Farm Museum and Ohop Indian Village, Nisqually Land Trust properties on the Mashel River and Ohop Creek, and the Town of Eatonville's Smallwood Park

DRAFT

October 16, 2008

Nikki Fields, Parks Planner
Washington State Parks and Recreation
2840 Riverwalk Drive SE
Auburn, WA 98002

Dear Ms. Fields:

Thank you for giving the Nisqually Tribe's State Park Committee a full presentation of the Master Plan for the new State Park on the Nisqually River, as prepared by the Portico Group. Our Tribal State Park Committee is extremely grateful for the wonderful response to the expressed interest by the Nisqually Tribe for a partnership role in the new park. From top to bottom, the Washington State Parks and Recreation Commission and Staff have been gracious and enthusiastic about the possibilities for a unique and compelling partnership.

We offer this letter of intent to facilitate the adoption of the Master Plan and begin the creation of a formal partnership for the ongoing development and management of the park. With your agreement, it is the intent of the Nisqually Tribe to:

- 1) Enter into a memorandum of understanding with Washington State Parks and recreation (WSPR) that will address the details (as they are agreed upon) of all of the items listed below
- 2) Collaborate with willing neighbors (organizations and individuals) and State Parks personnel to create a long range vision of the greater "community" that surrounds and supports the park effort. This collaboration would not replace or compete with the WSPR Department's direct relationship and collaboration with any of the individual "neighbors".
- 3) Act in accordance with that vision in all its activities outside of park boundaries.
- 4) Inside the long term park boundaries, the tribe is prepared to enter into appropriate memorandums of understanding and into legal and binding contracts to:
 - a) Exercise ownership and full responsibility for development, maintenance, and management of any and all properties that by such ownership can best serve the public, the park purpose, and the mutual needs of the Tribe and the State
 - b) Assist in the development, maintenance, and management of any and all properties owned by the State (or its Neighbors) that by such assistance can best serve the public, the park purpose, and the mutual needs of the Tribe, the Neighbor, and the State
 - c) Serve as the lead entity for the Tribes of the Medicine Creek Treaty to ensure full access to and participation in all park related planning, development, maintenance, management, and use (including any land designated exclusively for Tribal use).

Specifically, the Tribe proposes that a portion of the park be identified that would be appropriate for some combination of State and Tribal planning, development, maintenance, and/or management (leaving the remainder totally planned, developed, maintained, and managed by WSPR). In general, these would be areas where tribal culture is featured and tribal stewardship is practiced. In the current draft of the Master Plan that could involve the corridors of the Nisqually River, the Mashel River, and Ohop Creek – as well as property south of the Nisqually and property north of the Nisqually into the "People's Center" and Mashel Prairie areas.

The result would be areas in the long term boundary of the park that are:

- 1) WSPR owned and operated

- 2) WSPR owned and jointly operated (with varying degrees of Tribal involvement)
- 3) Tribally owned and operated (under legal binding mutually agreed upon terms)
- 4) Tribally owned and jointly operated (with varying degrees of WSPR involvement)

We have prepared specific responses to the details of the Master Plan separately. Once the final version of the Master Plan is ready for Commission preview, we can identify details to “flesh out” the concepts in this letter of intent.

Thank you again for the all of the consideration you have given us.

Sincerely,

Jack McCloud, Jr., Chair
The Nisqually Tribe State Park Committee
4820 She-Na-Num Drive SE
Olympia, WA 98513

FOOTNOTE: And, of course, since this is a draft – we welcome your suggestions for changes – minor or major!

Nisqually-Mashel State Park

MASTER PLAN

Market, Business and Economic Performance Summary

The following synopsis addresses the market assessment, business plan and economic performance projections prepared for the Nisqually-Mashel State Park Master Plan.

Market and Use Projections:

Profitability and conservation are not mutually exclusive and may be mutually beneficial in terms of enhancing economic, environmental and social values. Thus, profitability is linked to the capacity of Washington State Parks Department, and its Native American partners, to facilitate enterprise recreation, interpretation of natural resources and to extol cultural heritage values. It is therefore probable that a number of enterprise (revenue producing) recreation activities, suited to the market and the Nisqually–Mashel State Park resource, can be established to help sustain economic performance.

Recreation markets/demand is the *estimated number of people* who are projected to participate in a particular *recreation opportunity* at some predetermined future *time* and location. Demand is a synthesis of populations, recreation interests, resource quality and geographically or time/distance defined market areas and is predicated on and influenced by the general need and preferences for outdoor recreation opportunities or experiences.

The following tables identify market participation, monthly visitation projections and peak seasonal use for selected recreation opportunities considered within the Nisqually–Mashel State Park.

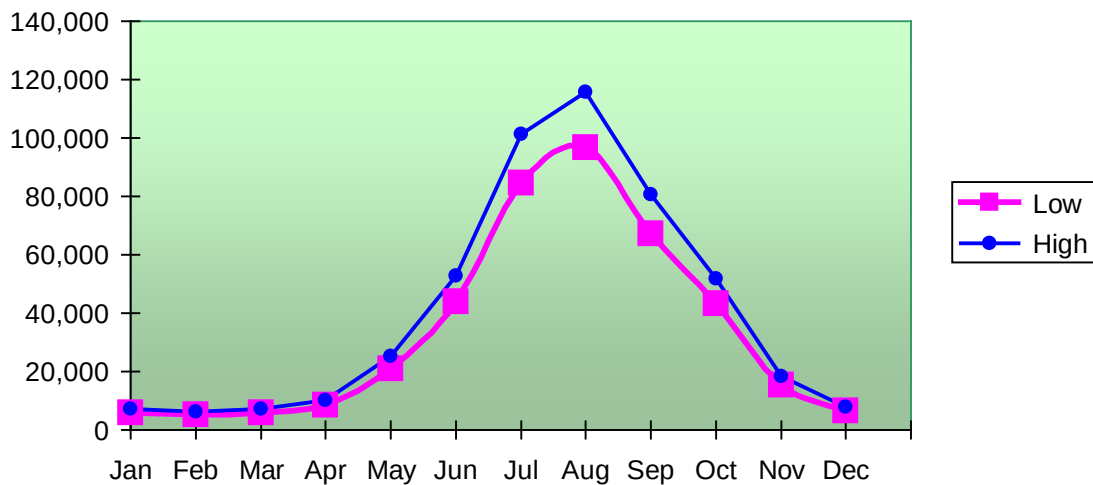
Market Area Annual Visitors
Range Projection
By Percent of Total Visitors

Market Area	Percent	Low	High
Local Area *	46%	185,886	223,063
State-Wide	16%	64,656	77,587
Multi-State	36%	145,476	174,572
Foreign Countries	2%	8,082	9,698
Total:	100%	404,100	484,920

Nisqually – Mashel State Park
Monthly Visitor Projections
 (At Operational Stabilization)

Month	Percent Annual	Low	High
Jan	1.5%	6,062	7,274
Feb	1.3%	5,253	6,304
March	1.5%	6,062	7,274
April	2.1%	8,486	10,183
May	5.2%	21,013	25,216
June	10.9%	44,047	52,856
July	20.9%	84,457	101,348
August	23.9%	96,578	115,896
September	16.6%	67,081	80,497
October	10.7%	43,239	51,864
November	3.8%	15,356	18,427
December	1.6%	6,466	7,781
Totals	100.0%	404,100	484,920

Nisqually – Mashel State Park Monthly Visitor Projection



Business Plan:

The Business Plan is predicated on formation of a strategic alliance between the State of Washington and the Nisqually Tribe and associated tribes of the Salish Nation. The Business Plan addresses Traditional and Enterprise Recreation creating a mix of recreation opportunities whereby the Nisqually Tribe and Washington State Parks and Recreation Commission may enter into a master agreement and facilitate concession and lease agreements with qualified service providers.

The alliances, partnerships and concession/lease agreements are the principal vehicles that initiate the development process, implement a 20 year phased capital improvement program, mature through progressive operational capacities and create revenue centers. The principle instrument that forms an alliance is the Master Development & Operating Agreement which contains the following key articles.

- **Subject of Agreement, Term and Definitions**
- **Project Development, Phasing and Elements**
- **Project Funding**
- **Project Design and Construction**
- **Assurances**
- **Operations Following Construction**
- **General Provisions**

Recreation market and user demand analysis revealed a potential for up to 484,920 annual visitors after build-out of all facilities. Peak use occurs during the month of August and is projected at 115,896 visitors. A daily visitation at peak use is projected to be up to 4,000 persons. User demand and participation is predicated on establishing a robust Recreation Activities Menu as indicated in the following list.

- Special Events
- Seasonal Celebrations
- RV Camping
- Tent Camping
- Cabins/Yurts
- Equestrian Activities
- Cultural Attractions
- Interpretative Exhibits
- Education Programs
- Hiking

To facilitate progressive implementation of traditional and enterprise recreation opportunities, the Phase I development program is organized into four (4) increments, covering a twenty (20)-year period with separate capitalization responsibilities.

Phase	Years	Parks	Tribe
Sub-Phase 1a	2009-2010	\$ 1,099,812	\$ -0-
Sub-Phase 1b	2010-2013	\$ 5,788,398	\$ 13,798,100
Sub-Phase 1c	2014-2018	\$ 22,878,388	\$ 9,005,500
Sub-Phase 1d	2019-2028	\$ 20,233,402	\$ 12,196,400
Totals:		\$ 50,000,000	\$ 35,000,000

As recreation investments are implemented it will become necessary to test feasibility through market confirmation, project design and development concepts, economic performance analysis and formation of operating agreements. Revenue generating capital projects identified within the 20-year Development Program are listed as follows.

- Phase 1a No revenue generating projects
- Phase 1b Bridge and Peoples Center
- Phase 1c Camping, Events Center, Picnicking, Village Store, Leschi Village, Peoples Center Observatory, Tour facilities
- Phase 1d Added Camping, Equestrian Center

Revenue Performance:

Enterprise recreation activities are scheduled for development between 2014 and 2028. These activities are market sensitive and present varying levels of revenue performance. The following summarizes revenue and expense projections for all anticipated functions and activities. Please note that the first summary table includes park entry fees. The second summary excludes park entry fees

**NISQUALLY-MASHEL STATE PARK
REVENUE & EXPENSE PERFORMANCE SUMMARY
Phases 1a to 1d
(2009 - 2028)**

BUDGET CATEGORY	PHASE 1a	PHASE 1b	PHASE 1c	PHASE 1d
Operating Expenses:	\$ 432,620	\$ 686,882	\$ 1,935,330	\$ 3,190,330
Operating Revenues:	\$ -0-	\$ -0-	\$ 1,362,386	\$ 4,113,605
Fund Balance	<\$ 432,620>	<\$ 686,882>	<\$ 572,944>	\$ 923,275
Deficiency/ Positive	<100%>	<100%>	<70.3%>	22.4%

Phase 1c indicates revenue offsetting expenses by about 70%. Phase 1d indicates a possible positive cash flow which is driven by the inclusion of park entry fees.

One of the stated objectives of Washington State Parks in planning the development of Nisqually-Mashel State Park is to implement sufficient enterprise recreation activity to achieve a 50% offset to annual operating expenses. This objective brought enterprise principles in to play which included entry fees as a possible revenue source. The fact that a statute prohibits entry fees, yet an ‘Enterprise Park’ development program is being pursued, suggests that the Nisqually-Mashel State Park may require creation of a distinct classification that would allow such fees to be employed.

If it is determined that Washington State Parks can not formulate and adopt a separate classification that allow entry fees, it is useful to consider the following function tables and Revenue Performance Summary that does not include entry fees.

PHASE 1c, 2014-2018

FUNCTION	REVENUE PROJECTION
RV Camping	\$ 296,100
Village Store & Merchandising	\$ 329,760
Events & Amphitheater	\$ 95,730
Total	\$ 721,590

PHASE 1d, 2019-2028

FUNCTION	REVENUE PROJECTION
RV Camping*	\$ 1,095,584
Village Store & Merchandising	\$ 418,314
Events & Amphitheater	\$ 143,280
Equestrian	\$ 320,464
Total	\$ 1,977,642

* Combines revenue projections for Phase 1c and Phase 1d.

NISQUALLY-MASHEL STATE PARK REVENUE & EXPENSE PERFORMANCE SUMMARY Phases 1a to 1d (2009 - 2028)

BUDGET CATEGORY	PHASE 1a	PHASE 1b	PHASE 1c	PHASE 1d
Operating Expenses:	\$ 432,620	\$ 686,882	\$ 1,935,330	\$ 3,190,330
Operating Revenues:	\$ -0-	\$ -0-	\$ 721,590	\$ 1,977,642
Fund Balance	<\$ 432,620>	<\$ 686,882>	<\$ 1,213,740>	<\$ 1,212,688>
Deficiency/ Offset	<100%>	<100%>	<37.3%>	<62.0%>

This table indicates that for Phase 1c Operating Expenses are off-set by 37.3%. As Phase 1d is implemented, revenues off-set Operating Expenses by 62.0%. Thus it is probable that over time, and with all things considered, the Nisqually-Mashel State Park may achieve a 50% off-set to its operating costs after full development and operational stabilization has occurred.

* * * * *



LANDERMAN • MOORE ASSOCIATES

DATE: January 28, 2009

TO: Jay Rood, The Portico Group

CC: Dennis Meyers, The Portico Group

RE: Nisqually-Mashel State Park-Economic Performance

Technical Memorandum

As you may be aware, Washington State Parks and Recreation has a statute in place which prohibits "Park Entry Fees". The reason I bring this matter to your attention is explained as follows.

One of the stated objectives of Washington State Parks in planning the development of Nisqually-Mashel State Park is to implement sufficient enterprise recreation activity to achieve a 50% offset to annual operating expenses. This objective brought enterprise principles in to play which included entry fees as one possible revenue source.

The fact that a statute prohibits entry fees, yet an "Enterprise Park" development program is being pursued, suggests that the Nisqually-Mashel State Park may require a separate classification that allow such fees to be employed. However, to my knowledge, Washington State Parks has yet to establish a formal policy basis for such a classification and thus a specific exemption from the statute.

However, recognizing that entry fees may wish to be considered, they are included in the Economic Performance analysis as a revenue source. If it is determined that there is no possible way for Washington State Parks to formulate and adopt a separate classification that allows entry fees, I felt it would be useful to provide the following Economic Performance Summary that shows a fund balance without entry fees.

It should be noted that the operating expense projections have not been altered in that any significant change in staffing, equipment and supplies, etc. is not calculated in the detail

of the assessment. However some reduction of operating costs may in fact be realized. Please consider the following tables in your Master Plan.

PHASE 1c, 2014-2018

FUNCTION	REVENUE	PROJECTION
RV Camping	\$	296,100
Village Store & Merchandising	\$	329,760
Events & Amphitheater	\$	95,730
Total	\$	721,590

PHASE 1d, 2019-2028

FUNCTION	REVENUE	PROJECTION
RV Camping*	\$	1,095,584
Village Store & Merchandising	\$	418,314
Events & Amphitheater	\$	143,280
Equestrian	\$	320,464
Total	\$	1,977,642

* Combines revenue projections for Phase 1c and Phase 1d.

**NISQUALLY-MASHEL STATE PARK
ECONOMIC PERFORMANCE SUMMARY
Phases 1a to 1d
(2009 - 2028)**

BUDGET CATEGORY	PHASE 1a	PHASE 1b	PHASE 1c	PHASE 1d
Operating Expenses:	\$ 432,620	\$ 686,882	\$ 1,935,330	\$ 3,190,330
Operating Revenues:	\$ -0-	\$ -0-	\$ 721,590	\$ 1,977,642
Fund Balance	<\$ 432,620>	<\$ 686,882>	<\$ 1,213,740>	<\$ 1,212,688>
Deficiency/ Offset	<100%>	<100%>	<37.3%>	<62.0%>

The table above indicates that for Phase 1a Operating Expenses are off-set by 37.3%. As Phase 1d is implemented, revenues off-set Operating Expenses by 62.0%. Thus it is probable that over time, and with all things considered, the Nisqually-Mashel State Park may achieve a 50% off-set to its operating costs after full development and operational stabilization has occurred. According to the Phasing Schedule, that may be in the 2030's.

I offer this assessment and comments for your consideration.

Norman J. Landerman-Moore



**Nisqually-Mashel State Park Master Plan and Phase I Design
Washington State Parks and Recreation Commission**

Thursday
March 6, 2008
10:00AM to 12:30 PM

Partners and Planning Consultants – UW Pack Forest Conference Center

Meeting Notes

Participants:

NMSP Partners and Planning Consultants

David Hymel, Eatonville Chamber
Jeanne Francher, Citizen
Greg Ettl, Director, UW Center for Sustainable Forestry at Pack Forest
Steve Pruitt, Nisqually River Council
Bobbi Allison, Eatonville Town Council
Tom Smallwood, Eatonville Mayor
Bryan Bowden, Mt Rainer National Park
Bret Forrester, Tacoma Power
Louise Caywood, Backcountry Horsemen of Washington, Nisqually Chapter
Craig – Horse
Isabella Deditch, General Manager OHOP Mutual Light Company
Lens – Eatonville Chamber
Courtland – Bicycle rider, Trips for Kids
Mel Cox, Eatonville

Washington State Parks and Recreation Commission

Nikki Fields, WSPR&C – Project Manager
Eric Lewis, WSPR&C – Park Ranger

The Portico Group (TPG):

Dennis Meyer, Landscape Architect / Project Director
Paul Stromdahl, Interpretive Planner/Designer
Jay Rood, Landscape Architect / Project Manager
Audrey Stout, Landscape Designer
Crystal Elliot and Josh Wozniak, Herrera Environmental
Norm Landerman Moore, NLM



Objective: The Portico Group (TPG) led the meeting with a discussion of the site analysis, preliminary economic analysis, possible interpretive themes, and an exercise to help participants and partners define a successful Nisqually Mashel State Park design. Meeting focused on discussion and evaluation of programmatic elements for their appropriateness as they relate to programs, activities, facilities and plan alternatives.

10:00 – 10: 15am Introduction

Nikki introduced the meeting, adding that the next steps in the Nisqually Mashel State Park process will include public meetings. All attendees introduced themselves and their interest/role in the Nisqually Mashel State Park.

10:15 – 10: 30am Site Analysis

Audrey Stout and Crystal Lewis presented site analysis representing efforts from both The Portico Group and Herrera Environmental Consultants. Presentation highlighted the context within which The Park operates, including environmental and cultural attributes of the local and regional surrounding areas, and the natural features/landforms, cultural amenities/resources, experiential features, and opportunities and constraints within and immediately adjacent to The Park site. Crystal presented Herrera's research of jurisdictional boundaries and vegetation types found onsite. Jurisdictional boundaries identified included wetland, stream, and steep slope buffers. Participant comments:

- Suggestion that TPG look at the greater plans within the region, including the Puget Sound Partnership.

10:15 – 10:30am Activities and Facilities

Jay Rood presented a potential list of Park Activities, Facilities Program and Infrastructure that are possible on the Nisqually Mashel State Park. List compiles a shortened list based on the Nisqually Mashel CAMP plan and economic research via Norm Landerman Moore.

10:30 – 10:50am Review of Preliminary Economic Analysis

Norm Landerman Moore presented key tables from his draft economic report. Preliminary economic analysis includes the local market resident population, market area annual visitors (using Mt. Rainier National Park as a base), accommodations (both lodging and camping) within the Nisqually Mashel State Park surrounding area, and monthly visitor projections for the Nisqually Mashel State Park. Discussion points below:

- Agri-tourism has been discussed by Eatonville Chamber, and has possibilities on Nisqually Mashel State Park.



- Puyallup Tourist Walking Tour: Walking tour connects 5 cities together. Walking tour could connect The Park, or similar idea could be used to connect The Park to surrounding parks and towns.
- Horses: The market for horse trails within The Park does not come from people who own their own horses, rather from families looking for a horse experience. Entrepreneurial partnerships with horse stables could provide horse rides instead of facilitating a horse camp within park boundaries. Onsite horse stable/rental could provide following Park Benefits:
 1. Horse trails could become ADA accessible if guides are trained to offer such horse guides.
 2. If trail surfaces durable enough, horse trails can be an off-season market.

10:45 – 11:45am Card Exercise: Defining Success and Impediments to Success

Dennis Meyer and Paul Stromdahl led a participatory exercise with meeting attendees. Two questions were asked designed to get the group thinking about what achievements would define success, and what are the greatest impediments to reaching success. Each participant answered by writing their ideas on a 5x7 card, and presenting it to the group. The cards were then categorized and grouped. Below are the answers to the questions:

- Question 1: What will Nisqually Mashel State Park look like in 10 years?
 - o Connected by activities
 - Variety of opportunities linked to the community
 - A River Park that connects the community with the river (rafting, trails, fish)
 - A picturesque park that provides regional trail connections
 - o Connected by Views
 - Lots of trees, views of Mt. Rainier and trails to ride and hike. Camping areas with surrounding trees and privacy. Historical opportunities.
 - A Park with multiple views of Mt. Rainier, miles of hiking and biking trails, and opportunities to catch trophy fish from the Nisqually River.
 - o A natural experience
 - An inviting wilderness experience – “Nature in the Raw”
 - Starbucks
 - A place of tranquility to do (freedom for park user to chose activity that makes them feel tranquil)
 - Low impact camping, hiking access, a Nisqually Tribe Interpretive Center
 - o A cultural experience



- Environmental Recreation Center giving everyone a vision of the past, present and future of watershed
 - Beautiful, Natural, inviting, exciting opportunities to explore nature and appreciate culture and history
 - Nisqually Tribal Heritage, River recreation (1, 2, and 4 hour float trips), “Traditional” State park (Camping, picnicking, hiking, biking, etc)
 - o Multi-Use/ Multi-functional
 - In 10 years, the public will be using the park’s multi-use trail system and the forest will be on its way to being healthier
 - o Used
 - Family Outings (including Lunch!)
 - Over crowded – over used
 - o Something for everyone
 - Completed with a variety of interests
- Question 2: What are the impediments to making this a successful park?
 - o Nothing
 - Nothing impedes this from being a successful state park!
 - o Limited Funds
 - Money (written by 6 participants)
 - Legislative Funding
 - o Competing Interests
 - Consensus
 - Too many people or groups competing for the same spaces
 - o Jurisdictional
 - The County (permits)
 - Traditional thinking
 - Us
 - o Economic drivers
 - Profit Motive
 - Discussion:
 - o Carbon banking can be an economic generation stream on Park property. (ie. Wetlands by Paine Field)
 - o Is profit motive right way to look at a public park because the public should pay for park to preserve land.
 - o Park should be examined with social justice in mind – not everyone can get to the park.



- o Ecotourism: people are looking for eco experiences combined with histories. Park has capability to meet these experiences. Eco-experiences could provide revenue.
- o Yurt Camping: Yurt camping can continue park demand into winter months.
- o Courtland: Many younger people are looking for gas efficient travel methods to outdoor experiences.

11:45am – 12:15pm Interpretive Themes Leading to Concept Diagrams

Paul Stromdahl and Jay Rood presented preliminary interpretive theme and concept diagrams. The three thematic concepts were presented:

- People's Center
 - o Theme concentrates on revealing the adaptability of the Nisqually Tribe to the seasons and to post-settlement. Main elements of theme include:
 - People's Camp – Squalli Absch
 - Celestial Observatory Story Circle
 - Traditional Knowledge Camp
 - o Other programmatic elements include
 - RV, tent, and horse camping
 - Trails (horse and hiking)
 - River access
- Woodland Experience
 - o Theme concentrates on creating a park where users can experience the woods, the river, the sky, and the outdoor experience. Main elements of theme include:
 - Woods Canopy Center - Ropes Course
 - Woodland Recreation
 - RV, tent, and horse Camping
 - Canopy Bridge
- Conservation Connections
 - o Theme concentrates on teaching conservation and expanding upon the conservation efforts of UW Pack Forest. Main elements of theme include:
 - Conservation Education Center
 - Conservation interpretive elements
 - Forest succession and restoration within The Park's boundaries
 - Canopy Bridge
 - o Other programmatic elements include
 - RV, tent, and horse camping
 - Trails (horse and hiking)
- Discussion:
 - o School camp facility for purpose of teaching conservation.



- ie. Camp Arnold is used in conjunction with N.W. Trek and Pioneer Farm for school camp events.
- o Multiple uses for program – combination of three themes
- o Location of programmatic elements – let land speak from conservation standpoint in placing programmatic elements
- o Pack Forest: Portion of Pack Forest west of Highway 7 has glacial till soils making it not the best for forestry practices.
- o Wildlife: Has a detailed wildlife study been conducted?
 - Wildlife corridor study currently being conducted by WDF&W.

12:15 – 12:30pm Summary and Conclusions

Dennis Meyer and Jay Rood thanked participants for their input and insight.



**Nisqually-Mashel State Park Master Plan and Phase I Design
Washington State Parks and Recreation Commission**

Thursday
March 6, 2008
4:00PM to 6:00 PM

Nisqually Tribe – Nisqually Tribal Center

Meeting Notes

Participants:

Nisqually Tribal Park Committee

Jack McCloud, Tribal Park Committee Chair

Kitten Leschi, Tribal Park Committee

Lacey Leschi, Tribal Member

Tony Sanchez, Tribal Park Committee`

Steve Pruitt, Tribal Park Committee Liaison and Nisqually River Council Chair

Jeannette Dorner, Nisqually Tribe DNR

Washington State Parks and Recreation Commission

Nikki Fields, WSPR&C – Project Manager

Eric Lewis, WSPR&C – Park Ranger

The Portico Group (TPG):

Dennis Meyer, Landscape Architect / Project Director

Paul Stromdahl, Interpretive Planner/Designer

Jay Rood, Landscape Architect / Project Manager

Audrey Stout, Landscape Designer

Crystal Elliot, Herrera Environmental

Norm Landerman Moore, NLM



Objective: The Portico Group (TPG) led the meeting with a discussion and exploration of the site analysis, preliminary economic analysis, and possible interpretive themes.

4:00 – 4:15pm Introduction

Nikki introduced the meeting, adding that the next steps in the Nisqually Mashel State park process include public meetings. All attendees introduced themselves and their interest in the Nisqually Mashel State Park and role within the Nisqually Tribe.

4:15 – 4:30pm Site Analysis

Audrey Stout and Crystal Lewis presented site analysis representing efforts from both The Portico Group and Herrera Environmental Consultants. Presentation highlighted the context within which The Park operates, including environmental and cultural attributes of the local and regional surrounding areas, and the natural features/landforms, cultural amenities/resources, experiential features, and opportunities and constraints within and immediately adjacent to The Park site. Crystal presented Herrera's photos from onsite visits, and research of jurisdictional boundaries and vegetation types found onsite. Jurisdictional boundaries identified included wetland, stream, and steep slope buffers. Comments:

- Expressed interest in having copies of the site analysis and concept plans. TPG will provide PDF files to Nikki who will then distribute.
- Any disturbance to the river beds can critically disturb steelhead spawning, as the steelhead won't return to spawn for years.

4:30 – 4:45pm Review of Preliminary Economic Analysis

Norm Landerman Moore presented key tables from his draft economic report. Preliminary economic analysis includes the local market resident population, market area annual visitors (using Mt. Rainier National Park as a base), accommodations (both lodging and camping) within the Nisqually Mashel State Park surrounding area, and monthly visitor projections for the Nisqually Mashel State Park. Discussion points below:

- Seasons of programmatic use should be examined against spawning seasons. Seasons of Park's high use are May through September, with July through August being the highest. Steelheads spawn in the spring. Other salmon species spawn in September/October.

4:45 – 5:55pm Workshop Tasks

Interpretive Themes Leading to Concept Diagrams

Paul Stromdahl and Jay Rood presented preliminary interpretive theme and concept diagrams. The three thematic concepts were presented:

- People's Center



- o Theme concentrates on revealing the adaptability of the Nisqually Tribe to the seasons and to post-settlement. Main elements of theme include:
 - People's Camp – Squalli Absch
 - Celestial Observatory Story Circle
 - Traditional Knowledge Camp
 - o Other programmatic elements include
 - RV, tent, and horse camping
 - Trails (horse and hiking)
 - River access
- Woodland Experience
 - o Theme concentrates on creating a park where users can experience the woods, the river, the sky, and the outdoor experience. Main elements include:
 - Woods Canopy Center - Ropes Course
 - Woodland Recreation
 - RV, tent, and horse Camping
 - Canopy Bridge
- Conservation Connections
 - o Theme concentrates on teaching conservation and expanding upon the conservation efforts of UW Pack Forest. Main elements of theme include:
 - Conservation Education Center
 - Conservation interpretive elements
 - Forest succession and restoration within The Park's boundaries
 - Canopy Bridge
 - o Other programmatic elements include
 - RV, tent, and horse camping
 - Trails (horse and hiking)
- Discussion:
 - o Concerned about having various river access points because of potential increase in pollutants. Concerned about motor boats – would need careful management about time/ ease of access.
 - TPG clarified that river access would be for paddle boats only.
 - o Information of river stretches that are particularly sensitive:
 - Ohop Creek Mouth: gravel is good spawning grounds.
 - No infrastructure should be in floodplain at mouth of Ohop Creek. An old River migration path be restored (especially during a flood), and structures could be wiped out. This not only destroys structure, but it pollutes river and affects spawning grounds.
 - Current River access: Not highly used because there is a lack of access/ take out points.



- Limited Floats are an amazing experience between the Nisqually River/Mashel River confluence and Wilcox Farm. Only about 2 built structures can be seen along the 4 hour float.

4:45 – 5:55pm Workshop Tasks

Evaluation of Park Activities, Facilities Program and Infrastructure

Jay Rood led an exercise for the Tribal Park's board to identify park activities, and facilities programs that are preferred/not preferred by the tribe. Each tribe made notes on an 11x17 printout of the Park Activities, Facilities Program and Infrastructure handout. Some duplicates occur in the lists below representing the variance in opinions. A compiled list is below:

- Park Activities - Preferred
 - Short and long trails
 - Nature trails
 - Viewpoints/ highpoints
 - All age and abilities trails and programs
 - Forest, meadow, and river viewing
 - River rafting (controlled)
 - Canoeing
 - Interpretive and educational programs
 - Living history programs
 - Nature, environmental and conservation learning programs
 - Nisqually Tribe/ Salish/ Native American programs
 - Traditional Knowledge Camp
 - Book, map and other recreational support sales
 - Community gatherings and festivals
 - Park celebrations
 - Picnicking and hiking
 - Food and Beverage Concessions
 - Equipment sales/ rentals
- Park Activities - Not Preferred
 - Hunting access to Pack Forest/ DNR land
 - Rifle and Archery shooting
 - Fishing in rivers and nearby lakes
 - River rafting (controlled)
 - Canoeing
 - Water trails portages and camping
- Park Program - Preferred
 - Interpretive Center
 - Tribal Center, Village



- o Restrooms
- o Park Entry/ Control Facility
 - Highway geometry
 - Sign
 - Gates
 - Vehicle access and circulation
 - Cable slides / Zip lines
- o Gathering Shelters/ Structures
- o Emergence Access
- o New bridge over the Mashel to Pack forest
- o Pet areas
- Park Program – Not Preferred
 - o Vehicle access & circulation
 - o Vehicle Tent sites
 - o Play
 - o Yurts – Kitchen
 - o Linkages and connects off-park
 - o RV Camping
- Discussion
 - o Derived his programmatic list from People’s Center alternative. Like that the bulk of population is close to road, and the rest of site is accessible by trail. Prefers access through Weyerhaeuser to Traditional Knowledge Camp because it will keep away from cemeteries.
 - o Curiosity expressed about what are the biggest problems facing other parks. Jack wants to keep pollution down – no permanent damage to waters and plant-life. Nisqually tribe wants to educate people about protecting natural features and about Nisqually way of life.
 - Overuse and exceeding site’s capacity is most common difficulty for state parks.
 - o Discussed existing trail washout location and potential for restoring trail connection. Jeannette offered following information:
 - Trail washout is currently pouring a lot of sediment into the river.
 - Trail washout was further complicated by a stolen truck being dumped into river at this site and carelessly pulled out.
 - Extra sediment is settling in a key spawning area.
 - Reconnecting trail complicates protecting spawning grounds downstream.
 - Likes idea of bluff to bluff bridge. Connects both side with less impact to river.



5:55 – 6:00pm Summary and Conclusions

Dennis Meyer and Jay Rood thanked participants for their input and insight.



**Nisqually-Mashel State Park Master Plan and Phase I Design
Washington State Parks and Recreation Commission**

Thursday
April 10, 2008
4:00 PM to 5:00 PM

Nisqually Tribal Park Committee – Tribal Center
Workshop #2
Meeting Notes

Anticipated Participants:

Nisqually Tribal Park Committee

Tribal Park Committee and other Tribal members.

Washington State Parks and Recreation Commission

Nikki Fields, WSPR&C – Project Manager

The Portico Group (TPG):

Dennis Meyer, Landscape Architect / Project Director

Jay Rood, Landscape Architect / Project Manager

Audrey Stout, Landscape Designer



MEETING NOTES:

Introductions

Nikki Fields led introductions describing the design and review process thus far. Nikki updated Tribal Parks Committee on progress of Forest Health Plan, Archaeological report, and the Classifications Management Plan, with particular attention to the Archeological Report. A preliminary map showing the state selected 100 acres for archeological survey was passed around. The tribe expressed interest in having the confluence surveyed and perhaps contributing tribal funds to expand the survey acreage.

Review of Alternatives

Dennis Meyer presented the “The People’s Center” alternative in depth and referenced the, “Woodland Experience,” and “Conservation Connections” alternatives presented at the last meeting (03-06-2008). Boards with images from past tribal related projects completed by The Portico Group were presented giving tribal members an image of potential program elements that may be incorporated into the Nisqually Mashel State Park. Key Discussion Points:

- Key Questions for Tribe:
 - Tribe interested in matching funds for archeological study to double the surveyed acreage?
 - Tribe to discuss potential tribal acquisition of properties identified through the Master Plan process. Is tribe able to contribute funds from Casino Revenue towards these land acquisitions?
 - Would the incorporation of the Nisqually Tribe into the People’s Center alternative include other tribes created under the Nisqually Treaty?
 - Discussions should begin with other Tribal Committees, including the General Council, to raise awareness of Nisqually Mashel State Park project.
- Key Questions for the State:
 - How many tribal member employees are projected to work in the Nisqually Mashel State Park and what are the state required qualifications? Tribe would like to ensure that they have ample time to prepare training opportunities for tribal members.
- Program Elements Discussion:
 - Tribe responded well to The Portico Group’s shelter design at Beaver Lake, Issaquah. Tribe would like to see a structure that is both sheltered and open to the outdoors.
 - Downed cedar on/off site may be potential building material. Tribe works closely with National Parks to identify potentially usable downed cedar.



- o Design should consider Nisqually Tradition for any built structures – understanding the traditional use/non-use by Nisqually Tribe of a Long House, Plank House, and a Smoke House.
- o Interest expressed in using only Nisqually Tribe carvers for any carved features. Phillip Martin mentioned as a knowledgeable contact for carving projects.
- o Footbridge: concern expressed about ability for elders to cross footbridge safely. Ensure car access is also available if footbridge is provided.
- All school districts in traditional Nisqually Tribe's original land territory are strongly urged to have historically accurate curriculum teaching about the Nisqually Tribe. The People's Center alternative has ample opportunity to incorporate learning objectives.

Summary and conclusions

Nikki Fields thanked everyone for attending and announced the Community meeting scheduled for April 16, 2008.



**Nisqually-Mashel State Park Master Plan and Phase I Design
Washington State Parks and Recreation Commission**

Thursday
April 10, 2008
12:30 PM to 3:00 PM

Partners and Planning Consultants – UW Pack Forest Conference Center

Workshop #2
Meeting Notes

Anticipated Participants:

NMSP Partners and Planning Consultants

David Hymel, Eatonville Chamber

Jeanne Francher, Citizen

Skip Frerucci, P.C. Parks

Greg Ettl, Director, UW Center for Sustainable Forestry at Pack Forest

Steve Pruitt, Nisqually River Council

Bryan Bowden, Mt Rainer National Park

Bret Forrester, Tacoma Power

Louise Caywood, Backcountry Horsemen of Washington, Nisqually Chapter

Larry Phillips, Washington State Department of Fish and Wildlife

Washington State Parks and Recreation Commission

Nikki Fields, WSPR&C – Project Manager

The Portico Group (TPG):

Dennis Meyer, Landscape Architect / Project Director

Jay Rood, Landscape Architect / Project Manager

Audrey Stout, Landscape Designer



MEETING NOTES:

Introductions

Nikki Fields and Dennis Meyer led introductions describing the design and review process thus far. Nikki updated Partners on progress of Forest Health Plan, Archaeological Report, and the Classifications Management Plan.

Review of Site Analysis

Audrey Stout presented a summary site analysis map showing developable land within the Nisqually Mashel State Park site and in properties of interest for acquisition or partnership.

Review of Alternatives

Dennis Meyer and Jay Rood presented three conceptual alternatives for the Nisqually Mashel State Park, including “The People’s Center,” “Woodland Experience,” and “Conservation Connections.” Key Discussion Points:

- Ensure connections to off-site access/trail points are provide for in the plan
- Nisqually Mashel State Park should be a river access destination park, though access to the river should be carefully controlled to minimize pollution and impacts to salmon runs. May generate revenues, have resource impacts that need to be evaluated, manage around critical fish seasons and power/water release periods. State parks does not have jurisdiction in the River.
- Spawning area: The stretch of the Nisqually River between Ohop Creek and Mashel River is one of the highest density spawning areas for steelhead along the Nisqually, in part because it is so inaccessible. February to June critical fish spawning period.
- Replacement of the Nisqually Bridge and linkage to future Thurston County trail is an important park planning alternative
- Quality of park and recreation experience must be weighed against park/camping development density, efficiency and cost. A balance must be reached.
- Environmental education should be woven into all alternatives – accessing forestry, ecology, river/salmon and cultural values
- People’s Center (Cultural Resources):
 - Concern expressed about exclusive use of tribe for the south side of Nisqually River. Perhaps an area of exclusive use could be provided, with other trail opportunities for other Nisqually Mashel State Park user groups.
 - Steve Pruitt, representing the Nisqually tribe, clarified that the tribe would contribute a monetary investment into structures exclusively used by the tribe.
- Woodland Experience (Experiential Resources):



- o NPS suggesting Thurston County connect to Nisqually Bridge with trail system. Trail connections to Nisqually Mashel State Park through southside of Nisqually River possible.
- Conservation Connections (Educational Resources):
 - o Potential educational partnerships include local schools, 5th and 6th grade camping excursions, and the U.W.
 - o Suggested clarification of trail system between three alternatives. Each alternative would focus on an interpretive trail system specific to the alternative's theme.
- Suggested clarification of trail system between three alternatives. Each alternative would focus on a trail system specific to the alternative's theme: Cultural Interpretive Trail, The People's Center; Recreation Trail, Woodland Experience; and Environmental Education Trail, Conservation Connections.

Evaluation Criteria – Dot Exercise

Dennis Meyer led a group exercise to evaluate the three alternatives based on a select, 13 point criteria. Every partner attending was asked to rank the three alternatives on a basis of “High Potential to meet criteria,” Medium Potential to meet criteria,” and “Low Potential to meet criteria” for each of the 13 criteria. Each partner put a colored dot correlating with their ranking of high, medium, or low potential on a shared matrix.

The exercise revealed that The People's Center alternative had the highest potential, as 6 of the 13 criteria were ranked “High potential.” The Conservation Connections alternative had the second highest ranking, with 4 out of 13 criteria ranking “High Potential.” The Woodland Experience alternative ranked with the lowest potential, containing 8 out of 13 criteria ranked as “Low potential.” Discussion points:

- Gregg Ettl would like to approach U.W. Board of Regence prior to any contact between State Parks and board. Nikki Fields to coordinate with Gregg so discussions can happen in a timely manor.

Summary and conclusions

Jay Rood and Nikki Fields thanked everyone for attending and announce the Community meeting scheduled for April 16, 2008.

***Rare Plant and Vegetation Survey of
Nisqually-Mashel State Park***



LYRA Biological
December, 2006

Rare Plant and Vegetation Survey of Nisqually-Mashel State Park

December, 2006

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Photo Credits

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P. 31: THPL-TSHE/OPHO/POMU habitat courtesy of Ian Cumming
All others by John Luginbuhl, LYRA Biological

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Introduction

Nisqually-Mashel State Park is located near Eatonville, Washington, in the foothills of the Cascades in southern Pierce County. Situated on the boundary of the Cascades and Puget Lowlands Ecoregions (Pater et al., 1998), the park's 1230 acres are a wide variety of mixed conifer and deciduous forest habitats ranging from river bottoms and steep canyon slopes, to gently rolling ridge tops with marshy stream corridors and wetland depressions.

As a recent addition to the State Park System, the property is currently undeveloped but the early stages of planning are currently underway to develop camping and multiple-use recreational facilities in the near future. Knowledge of the diversity, extent, and spatial distribution of current vegetation communities, as well as the presence of rare plant taxa, is important to guide this planning process. Under subcontract to Pacific Biodiversity Institute and the Washington State Parks and Recreation Commission (WSPRC), LYRA Biological performed a comprehensive vegetation survey of Nisqually-Mashel State Park in the spring and summer of 2006 with two main objectives; (1) document and map the presence of any rare vascular plant taxa, and (2) identify and delineate current plant community diversity and ecological conditions. During the course of these tasks, LYRA staff also noted land-use history, compiled a comprehensive vascular plant species list for the park property, and documented the presence and extent of state listed noxious plant infestations. This report presents and summarizes data from these surveys, and discusses the park's current ecological condition with attention to potential management concerns.

Survey Strategy and Routes

In order to guide our initial survey strategy, the park was divided into two general areas based on landform and land use history: (1) the upland flats, between the Mashel River and Ohop Creek drainage, which are heavily impacted by recent forest harvests and dominated by dense, young forest plantations, and (2) the river canyons/floodplains consisting largely of mature, primary forest and younger, naturally-occurring second growth forest resulting from natural disturbance.

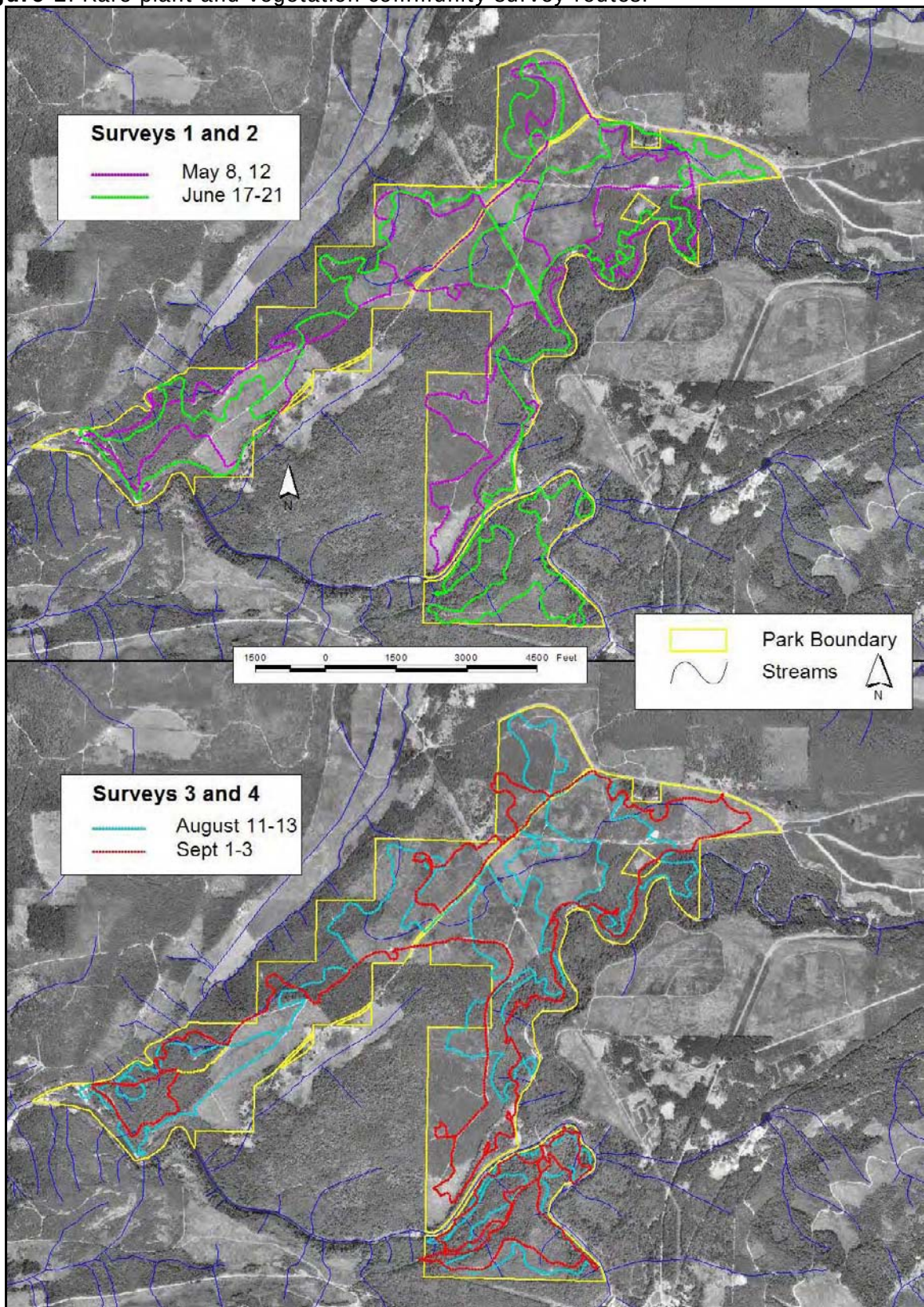
Within the upland flats, an extensive network of maintained and old logging roads allowed widespread access. We relied on these routes to more easily reach patches of unique wetland and older forest habitats embedded in extensive, low-diversity, exotic-dominated forest plantations made difficult to traverse by blackberry thickets and other dense shrubs.

This allowed us to focus survey efforts in these areas on less-disturbed, high-diversity plant communities with a greater likelihood of containing rare species, while also permitting us to document exotic and noxious species occurrences within weedy plantations.

Within the older, primary forests of the river drainages, diverse, high-quality habitats are much more extensive. Our survey efforts here placed greater emphasis on covering as much unique ground as possible within and between survey periods. Some canyon portions proved especially difficult to access where extremely steep slopes and cliffs made foot traverse somewhat treacherous. We surveyed these steep cliffy areas as best we could by traversing above or below, using binoculars where possible to scan vegetation in inaccessible areas. We also had difficulty accessing the park property south of the Nisqually River during the first survey period in May. Access roads on extensive private lands south and east of the park were gated and posted, and we were unable to cross the river from the north side until water levels dropped enough to be forded in mid June.

During surveys, all traverse routes were electronically recorded in real-time using handheld Garmin 12XL Global Positioning System (GPS) devices. These data were later uploaded and converted to projected ESRI shapefiles using the DNR Garmin extension for ArcMap (Minnesota Department of Natural Resources, 2005). Figure 1 depicts all routes traversed by LYRA staff during rare plant and vegetation mapping surveys in the spring and summer of 2006.

Figure 1. Rare plant and vegetation community survey routes.



Vegetation Community Surveys

Methods

Current vegetation communities (plant associations) within Nisqually-Mashel State Park were delineated and classified utilizing a combination of remote sensing and field surveys techniques. Prior to field surveys, we delineated initial plant association boundaries in a digital GIS environment using orthorectified black-and-white aerial photographs (image date 1994) provided by WSPRC. Initial boundaries were determined based on obvious vegetation, land form, and land-use changes. Overlay of USGS digital elevation model (DEM) data, hydrology, and transportation layers aided with these delineations.

We visited all polygons during the course of field surveys to classify the plant associations present, and to ground-truth polygon boundary locations. Any necessary boundary corrections were hand drawn on orthophoto topographic maps in the field and later transferred to the digital boundary layer. During field surveys, we also collected specific data on floristic and ecological characteristics and general information about land use within each polygon (see Appendix B).

We classified vegetation associations using several sources. For upland forest communities, we used the keys and descriptions developed for the Puget Trough ecoregion developed by Chappell (2006). For wetland communities, we used classifications developed by Kunze (1994) for the Northern Puget Trough lowlands. Portions of the park that did not satisfactorily conform to the above classification systems were assigned vegetation associations derived by LYRA Biological staff with reference to associations derived and compiled by the Western Ecology Group (NatureServe, 2006).

Results

We mapped and surveyed a total of 46 vegetation polygons (Figure 2) in which 23 individual plant associations were recognized; 13 upland types (Table 1) and 10 wetland types (Table 2). Individual associations are described in detail in the following section, but there are several landscape-level patterns in vegetation communities worth noting.

Before discussing landscape community patterns however, it is important to note that vegetation mapping at this scale requires some generalization of the vegetation pattern

Figure 2. Map of Nisqually-Mashel vegetation community polygons overlaid on a 1994 topographic orthophoto. Complete data for each numbered polygon are found in Appendix B.

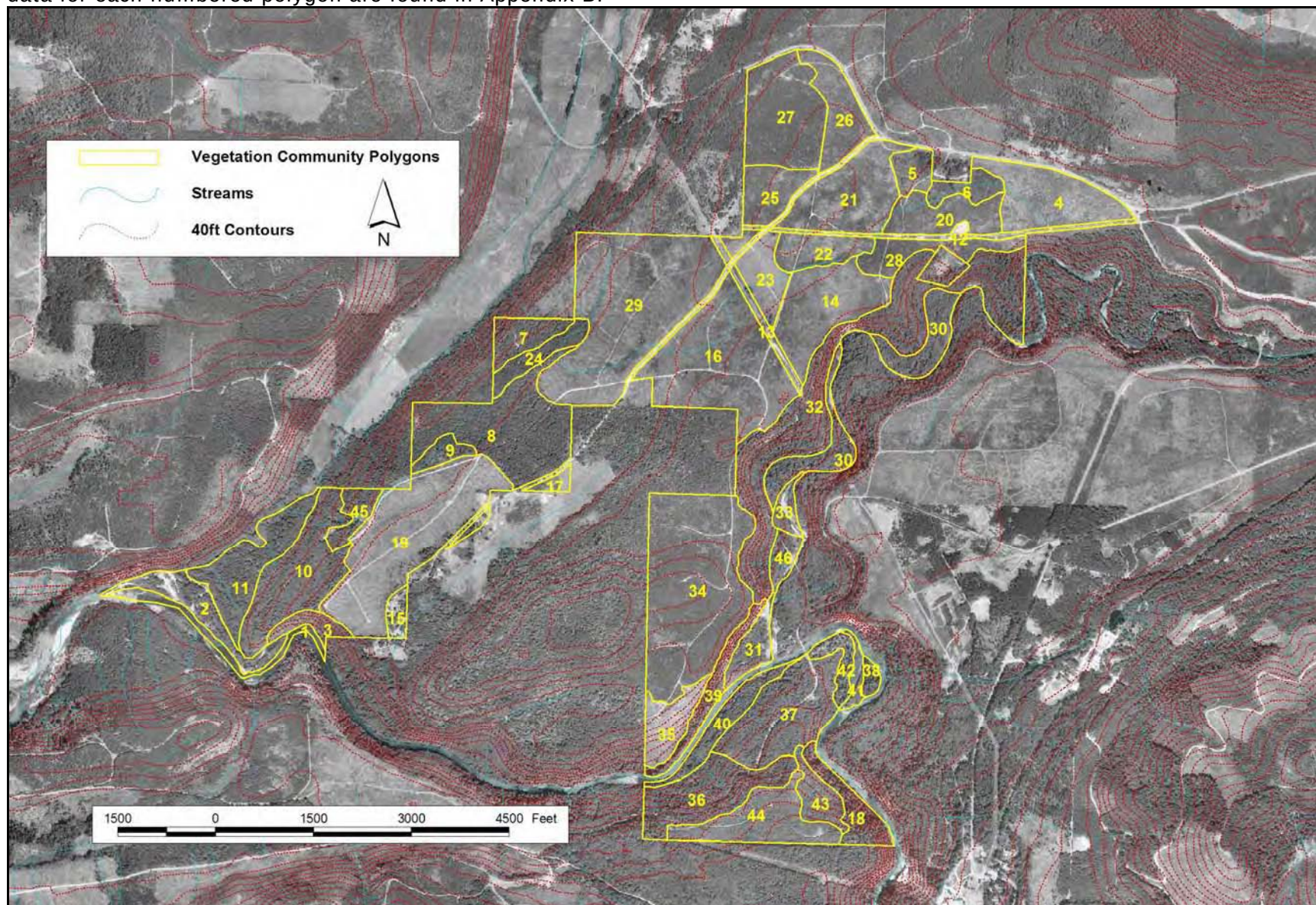


Table 1. Upland Vegetation Community Types (for “Status” codes refer to key with Table 2 below).

Abbreviation	Association Name	Common Name	Reference	Status [†]
ALRU2/POMU	<i>Alnus rubra</i> / <i>Polystichum munitum</i> forest	red alder / sword fern forest	Chappell 2006	G4S4
PICOC2-PSME/GASH	<i>Pinus contorta</i> var. <i>contorta</i> – <i>Pseudotsuga menziesii</i> / <i>Gaultheria shallon</i> forest	lodgepole pine - Douglas-fir / salal forest	Chappell 2006	G1G2S1
PSME-(ACMA3)/ELGL	<i>Pseudotsuga menziesii</i> – (<i>Acer macrophyllum</i>) / <i>Elymus glaucus</i> forest	Douglas-fir – (bigleaf maple) / blue wildrye forest	LYRA Biological	–
PSME-ARME/GASH	<i>Pseudotsuga menziesii</i> – <i>Arbutus menziesii</i> / <i>Gaultheria shallon</i> forest	Douglas-fir - Pacific madrone / salal forest	Chappell 2006	G3S2
PSME/Depauperate	<i>Pseudotsuga menziesii</i> / <i>Depauperate</i> understory forest	Douglas-fir / Depauperate understory forest	LYRA Biological	–
PSME/COCO6/POMU-TITR	<i>Pseudotsuga menziesii</i> / <i>Corylus cornuta</i> / <i>Polystichum munitum</i> – <i>Tiarella trifoliata</i> forest	Douglas-fir / beaked hazelnut / sword fern – threeleaf foamflower forest	Chappell 2006	GNRS2?
PSME/GASH-HODI	<i>Pseudotsuga menziesii</i> / <i>Gaultheria shallon</i> – <i>Holodiscus discolor</i> forest	Douglas-fir / salal – oceanspray forest	Chappell 2006	G2G3S2
PSME/GASH/POMU	<i>Pseudotsuga menziesii</i> / <i>Gaultheria shallon</i> / <i>Polystichum munitum</i> forest	Douglas-fir / salal / sword fern forest	Chappell 2006	GNRS3S5Q
PSME-THPL/OXOR	<i>Pseudotsuga menziesii</i> – <i>Thuja plicata</i> / <i>Oxalis oregana</i> forest	Douglas-fir – western redcedar / Oregon oxalis forest	Chappell 2006	G3G4S2
PSME-TSHE/GASH-MANE2	<i>Pseudotsuga menziesii</i> – <i>Tsuga heterophylla</i> / <i>Gaultheria shallon</i> – <i>Mahonia nervosa</i> forest	Douglas-fir – western redcedar / salal – dwarf Oregongrape forest	Chappell 2006	G4S4
PSME-TSHE/GASH/POMU	<i>Pseudotsuga menziesii</i> – <i>Tsuga heterophylla</i> / <i>Gaultheria shallon</i> / <i>Polystichum munitum</i> forest	Douglas-fir – western redcedar / salal / sword fern forest	Chappell 2006	G4G5S4
PSME-TSHE/VAOV2/POMU	<i>Pseudotsuga menziesii</i> – <i>Tsuga heterophylla</i> / <i>Vaccinium ovatum</i> / <i>Polystichum munitum</i> forest	Douglas-fir – western redcedar / evergreen huckleberry / sword fern forest	Chappell 2006	G3S1
TSHE-PSME/POMU-DREX2	<i>Tsuga heterophylla</i> – <i>Pseudotsuga menziesii</i> / <i>Polystichum munitum</i> – <i>Dryopteris expansa</i> forest	western hemlock – Douglas-fir / sword fern – spreading woodfern forest	Chappell 2006	G3G4S3
Disturbed/Developed	Disturbed/Developed	Disturbed/Developed	LYRA Biological	–

Table 2. Wetland Vegetation Community Types

Abbreviation	Association Name	Common Name	Reference	Status [†]
ALRU2/RUSP	<i>Alnus rubra</i> / <i>Rubus spectabilis</i> forest	red alder / salmonberry forest	Kunze 1994	G4G5S?
CAOB3	<i>Carex obnupta</i> herbaceous vegetation	slough sedge herbaceous vegetation	Kunze 1994	G4S?
CAVE6	<i>Carex vesicaria</i> herbaceous vegetation	blister sedge herbaceous vegetation	Kunze 1994	G4QS?
COSES-SALIX-SPDO	<i>Cornus sericea</i> var. <i>sericea</i> – <i>Salix</i> spp. – <i>Spiraea douglasii</i> shrubland	redosier dogwood – willow – rose spirea shrubland	Kunze 1994	GNRQS?
FRLA/CAOB3	<i>Fraxinus latifolia</i> / <i>Carex obnupta</i> forest	Oregon ash / slough sedge forest	Kunze 1994	G4S?
SALUL	<i>Salix lucida</i> ssp. <i>lasiandra</i> seasonally flooded forest	Pacific willow seasonally flooded forest	Kunze 1994	G4Q
SPDO	<i>Spiraea douglasii</i> shrubland	rose spirea shrubland	Kunze 1994	G5S?
THPL-TSHE/OPHO/POMU	<i>Thuja plicata</i> – <i>Tsuga heterophylla</i> / <i>Oplopanax horridus</i> / <i>Polystichum munitum</i> forest	western redcedar – western hemlock / devil's club / sword fern forest	Chappell 2006	G4S4
TYLA	<i>Typha latifolia</i> Western herbaceous vegetation	broadleaf cattail Western herbaceous vegetation	Kunze 1994	G5S?
Floodplain margin/sand-gravel bar	Floodplain margin/sand-gravel bar	Floodplain margin/sand-gravel bar	LYRA Biological	–

[†]Status Codes (See http://www.dnr.wa.gov/nhp/refdesk/lists/stat_rank.html#srank for detailed descriptions)

Global

G1 = Critically imperiled

G2 = Imperiled

G3 = Very rare and local throughout its range, found locally in a restricted range, or otherwise vulnerable to extinction

G4 = Widespread, abundant, and apparently secure

G5 = Demonstrably widespread, abundant, and secure

GNR = Globally not rated

WA State

S1 = Critically imperiled

S2 = Imperiled

S3 = Rare or uncommon

S4 = Widespread, abundant, and apparently secure

S5 = Demonstrably widespread, abundant, and secure

Q = Taxonomic status is questionable/numeric rank may change

? = unknown/unclassified

actually present (Muller-Dombois and Ellenberg, 1974). This generalization occurs for two reasons. The first is due to a necessary difference between the scale of mapping and the scale of community recognition. While a minimum polygon size of 2 hectares (4.9 acres) is set for the purposes of clarity in mapping and management logistics, important vegetation community changes often occur, and are recognized, at smaller scales, down to 1/10th acre in size. During polygon delineation, this requires that very small, unique community patches be combined as inclusions within other, often more extensive adjacent community types. The second reason for generalization in coarse-scale mapping is spatial complexity. Different communities often form mosaics of complex interlocking or interspersed patches that cannot be reasonably mapped as individual polygons. In these instances, larger areas with relatively uniform mosaic pattern, or some other overarching characteristic (i.e. similar landform, landscape position, or land-use) are delineated and described. For these reasons, most of the polygons delineated for Nisqually-Mashel consist of two or more vegetation communities. For the purpose of coarse-scale mapping, the thirteen upland forested communities found in the park were grouped by dominance type as described by Chappell (2006), and each polygon was then labeled by its most prevalent dominance type. The distribution of these five forest types, along with disturbed/developed areas and large wetlands, are displayed in Figure 3.

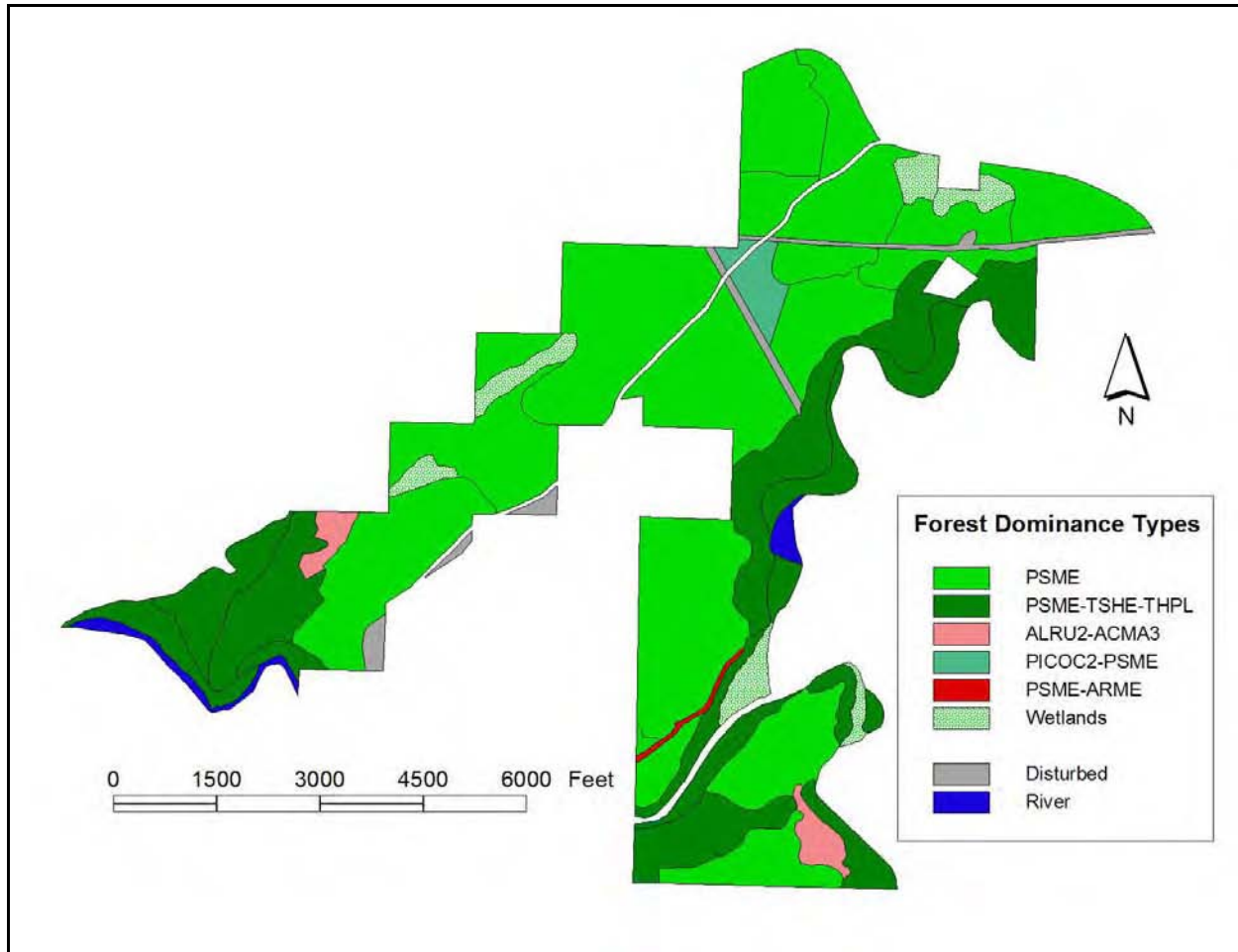
At the landscape scale, our initial division of the park property into two areas, based on differing landform and land-use history, is clearly reflected in the distribution of forest dominance types. The mature, primary forests of the canyon slopes and river terraces are almost exclusively Douglas-fir – western hemlock – western redcedar (PSME-TSHE-THPL) types. In contrast, the young plantation forests of the upland flats are largely Douglas-fir (PSME) forest types, though with several notable, large wetland communities and one rather sizable plantation of lodgepole pine – Douglas-fir forest type (a rare forest community unusual in this part of the Puget Trough; see PICOC2-PSME/GASH association description below).

A very small amount of Douglas-fir – pacific madrone (PSME-ARME) forest type occurs at the boundary of the upland flats and canyon slopes areas, just north of the Nisqually River, where it occupies a very narrow (50-100 feet), intermittent strip along the upper-most slopes and canyon rim in polygons 35 and 39 (Figure 3).

It is important to note that both the red alder – bigleaf maple (ALRU2-ACMA3) forest type and wetland community type are under-represented graphically at this scale, since much of

these types occur as small patches less than 2 hectares in size and thus recorded as minor components of more extensive PSME and PSME-TSHE-THPL dominated polygons throughout the park.

Figure 3. Distribution of vegetation communities grouped by forest dominance type. Disturbed/developed areas, and areas of large, contiguous wetland are also shown. Note that many small patches of ALRU2-ACMA3 forest, various wetland communities, and differing forest dominance type occur as inclusions not evident at this scale. Refer to Appendix B for complete, fine-scale community data.



Vegetation Communities by Forest Dominance Type

PSME

- PSME-(ACMA3)/ELGL
- PSME/Depauperate
- PSME/COCO6/POMU-TITR
- PSME/GASH-HOD1
- PSME/GASH/POMU

PSME-TSHE-THPL

- PSME-THPL/OXOR
- PSME-TSHE/GASH-MANE2
- PSME-TSHE/GASH/POMU
- PSME-TSHE/VAOV2/POMU
- TSHE-PSME/POMU-DREX2

ALRU-ACMA

- ALRU2/POMU

PICO-PSME

- PICOC2-PSME/GASH

PSME-ARME

- PSME-ARME/GASH

Wetlands

- ALRU2/RUSP
- CAVE3
- COSES-SALIX-SPDO
- FRLA/CAOB3
- SALUL
- SPDO
- TYLA
- Floodplain margin/sand-gravel bar

Vegetation Communities of Nisqually-Mashel State Park

Alnus rubra / *Polystichum munitum* forest

[ALRU2/POMU]

This forest association is widespread in the park, typically occurring as relatively small inclusions within matrices of more extensive mixed conifer associations. ALRU2/POMU patches are especially common along the margins of disturbed areas such as roads and powerline corridors, and in older forests in windthrow canopy gaps. The overstory ranges from nearly pure red alder to red alder mixed with varying amounts of black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), bigleaf maple (*Acer macrophyllum*), and Oregon ash (*Fraxinus latifolia*). Understory vegetation is dominated by a heavy swordfern (*Polystichum munitum*) layer. While defined strictly as an upland association (Chappell, 2006), ALRU/POMU appears to grade into the FRLA/CAOB3 wetland forest association as soils become increasingly saturated in moist depressions, at seeps on toe slopes, and in drainage bottoms, with a concurrent increase in Oregon ash and black cottonwood in the overstory and sedge species in the herb layer.



***Alnus rubra* / *Rubus spectabilis* forest**
[ALRU2/RUSP]

This association has a limited extent within the park. It occurs in two settings; in small patches at mid- and low-slope seeps and streams within the Nisqually River canyon (polygons 36 and 43), and in several larger patches along the forested floodplains of both rivers (polygons 31, 41, and 46). The overstory varies from nearly pure red alder on the slopes to a more equal mix of red alder, black cottonwood and bigleaf maple on the floodplains. The understory is characterized in most areas by dense salmonberry (*Rubus spectabilis*) and little else. While most ALRU2/RUSP habitat is in excellent condition, some exotic species are encroaching into stands along the river corridor, especially west of the Mashel river bridge (polygon 46) where the disturbed areas adjacent to the road have become infested with Scotch broom (*Cytisus scoparius*) and dense Himalayan (*Rubus armeniacus*) and evergreen blackberry (*R. laciniatus*) thickets. Ranked as “apparently secure/secure” globally, this wetland indicator association is designated by the Washington WNHP as having “high quality/rare” status in Pierce County.



***Carex obnupta* herbaceous vegetation**

[CAOB3]

We observed slough sedge (*Carex obnupta*) herbaceous wetland in only one location; as a narrow, intermittent corridor along the tributary to Ohop Creek flowing through the northwest portion of polygon 29. This marshy, low-gradient seasonal stream is surrounded by young, even-aged PSME/GASH/POMU forest planted after the area was clear-cut 10 to 15 years ago. This marshy stream margin, either not replanted or replanted unsuccessfully, is



dominated by slough sedge interspersed with trailing blackberry (*Rubus ursinus*), common rush (*Juncus effusus*), and brackenfern (*Pteridium aquilinum*). Oregon ash saplings are encroaching on the margins of this habitat indicating that it will likely soon succeed to the Oregon ash / slough sedge association found just a few hundred yards south and common in wet depressions throughout the upland flats. The length of this marshy stream is in relatively good condition with almost no exotic species, despite heavy exotic cover in the surrounding plantations.

***Carex vesicaria* herbaceous vegetation**

[CAVE6]

Blister sedge herbaceous vegetation type was observed in only one small (~1 acre) patch on the west margin of the large cattail wetland in polygon 5. Inundated until late summer, this habitat is a near monoculture of pedestaled blister sedge tussocks interspersed with deep, bare muck soils. This habitat is bordered on the upland margin by Oregon ash / slough sedge habitat and in this shallow margin, sedge tussocks are interspersed with northern water plantain (*Alisma triviale*) and western bog yellowcress (*Rorippa palustris* ssp.



occidentalis). This sedge/forest boundary appears stable and this unique sedge wetland community does not appear subject to impending successional changes.

***Cornus sericea* var. *sericea* – *Salix* spp. – *Spiraea douglasii* shrubland**

[COSES-SALIX-SPDO]

A narrow stringer of redosier dogwood mixed with rose spirea at the margins occurs along the Ohop creek in polygon 11. Little other vegetation can grow within or beneath this dense, nearly impenetrable shrub layer. This community is described by Kunze (1994) but no equivalent is identified by NatureServe (2006). We therefore consider this designation uncertain and its status unknown.

***Fraxinus latifolia* / *Carex obnupta* forest**
[FRLA / CAOB3]

This wetland forest type is found in wet depressions and swampy, slow-moving stream corridors throughout the upland flats portion of the park. It occurs typically in small patches within the surrounding matrix of young PSME/GASH/POMU and PSME/GASH-HODI plantations that dominate in this heavily managed landscape. FRLA/CAOB3 patches are often bordered by, and intergrade with, ALRU2/POMU communities in adjacent, drier habitats. Forest age and floristic composition are extremely variable. The tree layer ranges from very young poletimber in recently cut stands to large (12-20 inch diameter), mature trees in areas where riparian buffers remained uncut during recent logging. While overstory composition also varies considerably, with some stands having large amounts of black



cottonwood and red alder, all have Oregon ash well represented and reproducing successfully. Shrub and forb layers also vary considerably, depending on the local hydrologic regime. Impounded wetlands with persistent standing water are dominated by a patchy slough sedge layer, often with little else in the shrub and forb layers apparently able to establish. Other better-drained areas have a light to moderate, diverse shrub layer of salmonberry, rose spirea (*Spiraea douglasii* var. *douglasii*), common snowberry (*Symphoricarpus albus*), and willows (*Salix* spp.). Owlfruit sedge (*Carex*

stipata) and Dewey sedge (*C. deweyana*) are also well represented in some areas. Reed

canarygrass (*Phalaris arundinaceae*) is present at most sites, with rather high cover in several. Some drier-site patches of FRLA/CAOB3 are being encroached upon by, and will likely ultimately succeed to, Douglas-fir associations. The majority of this habitat is found on sites too wet to sustain Douglas-fir and, given the paucity of other wetland-tolerant, late-successional tree species (i.e. western hemlock and western redcedar) found in this area, many of these FRLA/CAOB3 patches will likely persist.

***Pinus contorta* var. *contorta* – *Pseudotsuga menziesii* / *Gaultheria shallon* forest**

[PICOC2-PSME/GASH]

In western Washington, lodgepole pine – Douglas-fir associations occur naturally only in the relatively dry, rain-shadow region of the central and northern Puget Trough, where they are considered mid-seral communities linked to relatively frequent stand-replacing fires. In Nisqually-Mashel, PICOC2-PSME/GASH is present in one 5-10 year old stand in Mashel Prairie (polygon 23) as the result of post-harvest replanting of both Douglas-fir and lodgepole pine. While this stand has an extremely heavy shrub layer dominated by exotics (Himalayan blackberry, evergreen blackberry, and Scotch broom), both tree species are



growing vigorously; this stand will likely mature as and remain in the PICOC2-PSME series for many decades (Note: NatureServe currently lists this association as PICOC2/GASH; it is ranked as critically imperiled at both the global and state level).

***Pseudotsuga menziesii* – (*Acer macrophyllum*) / *Elymus glaucus* forest
[PSME-(ACMA3)/ELGL]**

PSME-(ACMA3)/ELGL is an *ad hoc* designation proposed here to describe a highly disturbed vegetation community found in portions of very young forest plantation between Mineral Springs Road and the northwest park boundary (portions of polygons 7 and 8). Clear-cut and replanted within the past 5-8 years, the tree layer consists of under-stocked, patchy Douglas-fir and bigleaf maple saplings with a dense understory of planted blue wildrye and invasive exotics. While superficially similar to several associations in a Douglas-fir – bigleaf maple alliance purported to occur in second-growth forests in southwest Washington (NatureServe, 2006), the lack of any consistent native plant cover in the understory makes this determination uncertain. Given the recentness and high intensity of disturbance, the future successional course of this community is also uncertain. Several noxious weeds have moderate levels of infestation here, including Scotch broom (Class B) and Canada thistle (Class C).



***Pseudotsuga menziesii* – *Arbutus menziesii* / *Gaultheria shallon* forest**
[PSME-ARME/GASH]

Pacific madrone (*Arbutus menziesii*) and the PSME-ARME/GASH community are uncommon in Nisqually-Mashel, occurring only on the uppermost south-facing slope above the Nisqually River (polygons 35 and 39; see Figure 3). Found more commonly in the drier rain shadow region of the north and central Puget Trough, this community is likely restricted to this area as the only suitable dry, sunny habitat within the park. The western portion of this community, within polygon 35, has been clear-cut within the last 10-15 years and replanted with Douglas-fir. Along the upper slopes here, where stumps indicate madrone grew prior to harvest, naturally regenerating madrone is keeping pace with the vigorously growing Douglas-fir, indicating that this community type is persisting. The understory in this open young forest is extremely brushy, with dense salal and high exotic cover, including Himalayan blackberry, evergreen blackberry, and Scotch broom. In the uncut forest farther east (polygon 39), the PSME-ARME/GASH community has not been affected by forest



management. The forest here is uneven aged and multi-storied, with an open main-canopy of mature Douglas-fir with a few scattered old Douglas-fir emergents, and a patchy intermediate canopy of mature madrone. Here the understory is more diverse, still with high salal cover but also with dwarf Oregon grape, oceanspray and trailing blackberry well represented. Twinflower (*Linnaea borealis*) and some swordfern are present in the forb/herb layer. This community is rated G3 (globally vulnerable) and S2 (state imperiled) as few high quality sites remain (Chappell, 2006), and is designated by the WNHP as a “high quality/rare” community in Pierce County.

***Pseudotsuga menziesii* / Depauperate forest**
[PSME/depauperate]

We used the PSME/Depauperate designation to describe young, dense forest plantations found on the upland flats between the Nisqually River and Ohop Creek. These stands are comprised of a single, densely inter-grown canopy layer (closed stem-exclusion stage forest) with little or no understory vegetation. This vegetation type occurs as small and medium sized inclusions within the PSME/GASH/POMU and PSME/GASH-HODI forest communities that dominate this heavily managed upland landscape, and represent the near-future state for much of this young forest. If undisturbed, this suppressed, low-diversity forest could persist for many decades.



***Pseudotsuga menziesii* / *Corylus cornuta* / *Polystichum munitum* –
Tiarella trifoliata forest**
[PSME/COCO6/POMU-TITR]

This association is a minor component the overall park habitat, occurring mostly on the northwest facing mid-slopes south of the Nisqually River (polygons 36 and 37), and as two

small inclusions on the upland flats in the north end of the park, between the Mashel River and Highway 17 (polygons 6 and 28). These forests are characterized by Douglas-fir as the only conifer, a few scattered bigleaf maple and red alder, and high swordfern cover. The shrub layer is patchy, from scant to patchy beaked hazelnut (*Corylus cornuta*) and vine maple (*Acer circinatum*). Spreading woodfern (*Dryopteris expansa*), ladyfern (*Athyrium filix-femina*), and three-lead foamflower (*Tiarella trifoliata*) are minor but consistent components in the herb layer. This is an S2 ranked plant community (imperiled in Washington State), but is currently unranked globally.



***Pseudotsuga menziesii* / *Gaultheria shallon* – *Holodiscus discolor* forest
[PSME/GASH-HODI]**

The PSME/GASH-HODI forest community occurs commonly on drier sites throughout the young forest plantations of the upland flats between the Nisqually River and Ohop Creek drainages. The overstory in these forests is almost exclusively a single-storied Douglas-fir monoculture ranging in age from 5 to 25 years. Understories vary from densely shrubby with high exotic cover in the youngest “stand initiation stage” plantations, and grade to

scant and depauperate as plantations grow toward stem-exclusion stage. Salal (*Gaultheria shallon*) and oceanspray (*Holodiscus discolor*) are consistently present with varying amounts of trailing blackberry, vine maple, dwarf Oregongrape (*Mahonia nervosa*), and common snowberry. Brackenfern and small amounts of swordfern frequently occur in the forb/herb layer. The understory in younger, open stands is generally dominated by exotic species; these include Himalayan blackberry, evergreen blackberry, and St. Johnswort (*Hypericum perforatum*), as well as locally heavy infestations of the noxious species Scotch broom and Canada thistle. Though relatively widespread, this association is rated as imperiled/rare at both the state and global level due to the lack of remaining high-quality occurrences.



***Pseudotsuga menziesii* / *Gaultheria shallon* / *Polystichum munitum* forest
[PSME/GASH/POMU]**

By far the most common association within the park, the PSME/GASH/POMU community dominates drier habitats in the heavily managed upland flats between the Mashel River and Ohop Creek drainages, as well as a small area of upland flats in the park property south of the Nisqually River. Within this landscape, PSME/GASH/POMU is the matrix community type within which smaller patches of PSME/GASH-HODI, ALRU/POMU, riparian wetland, and

impounded wetland communities are embedded. This community is very similar to the PSME/GASH-HODI community, differing mainly in having greater swordfern cover and little



or no oceanspray. Like PSME/GASH-HODI, PSME/GASH/POMU forests are single-aged, single-storied, and vary similarly in stand age (5 to 25 years), and understory composition/density (high diversity/extremely dense grading to low diversity/depauperate). As in nearby PSME/GASH-HODI habitats, young plantations are choked with dense blackberry thickets, widespread Scotch broom, and pockets of heavy Canada thistle infestations. Road corridors in this area are especially high in exotic species cover and diversity, including oxeye daisy

(*Leucanthemum vulgare*), Queen Anne's lace (*Daucus carota*), hairy catsear (*Hypochaeris radicata*), and quackgrass (*Elymus repens*).



***Pseudotsuga menziesii* – *Thuja plicata* / *Oxalis oregana* forest**
[PSME-THPL/OXOR]

The PSME-THPL/OXOR community type occurs within the older forests of the Nisqually and Mashel river canyons, mostly on very moist, north- to east-facing toe-slopes and floodplains. These forests are mature (90-200 yrs) and floristically and structurally diverse, with multi-aged, multi-storied canopy mostly of Douglas-fir but with redcedar well represented and even co-dominant on the lower slopes and flats. Wind-thrown trees are relatively common, resulting in large down woody debris and creating overstory gaps with pockets of young to mature red alder and bigleaf maple. Scattered western hemlock often occurs in all canopy layers. The shrub layer is a diverse, typically patchy mix of vine maple, salmonberry, and red huckleberry. Closer to the rivers, common snowberry and trailing blackberry are common. The herb/forb layer is well developed within shrub layer gaps. Swordfern and dense Oregon oxalis are typical here, as well as more scattered brackenfern. White insideout flower (*Vancouveria hexandra*) and spreading woodfern are also found in lesser amounts.



Several invasive exotics were noted: Herb Robert (*Geranium robertianum*), occurs with high cover in many areas with low shrub cover, especially closer to the river; Canada thistle,

Himalayan blackberry, Scotch broom, and reed canarygrass all occur with regularity along river edges, and; English ivy (*Hedera helix*) was observed within forest close to the river in one location (polygon 18). Except for infrequent, very old cut stumps and two gated primitive roads, these forests show little evidence of human disturbance. The PSME-THPL/OXOR community is ranked as “imperiled” in Washington State. In Nisqually-Mashel, it is usually bordered upslope by the TSHE-PSME/POMU-DREX2 community.

***Pseudotsuga menziesii* – *Tsuga heterophylla* / *Gaultheria shallon* – *Mahonia nervosa* forest**

[PSME-TSHE/GASH-MANE2]

Relatively common elsewhere in the Puget Trough ecoregion, the PSME-TSHE/GASH-MANE2 association was observed in only one relatively small occurrence, in a thin buffer of unmanaged forest on the dry, southern edge of the upland flats, between dense, young



plantation forest and the steep, cliffy northern slopes of the Nisqually River canyon (polygon 39). This is mature, structurally diverse forest, mostly

Douglas-fir in the overstory and a variable, multi-layered understory on young to mature Douglas-fir and western redcedar. The shrub layer is dense, dominated by salal with lesser amounts of dwarf Oregongrape and vine maple. Herb/forb cover is scant but includes scattered patches of twinflower. This association borders the PSME-ARME/GASH community found on the upper canyon slopes to the south.

***Pseudotsuga menziesii* – *Tsuga heterophylla* / *Gaultheria shallon* / *Polystichum munitum* forest**

[PSME-TSHE/GASH/POMU]

This community type, uncommon at Nisqually-Mashel, is found in an irregular, fragmented distribution of four small patches ranging from 1-3 acres in size. These forests are relatively dense with closed-canopy overstories of codominant Douglas-fir and western redcedar, with red alder and western hemlock as a minor component in some patches. The shrub layer is dense to patchy, consistently dominated by salal with lesser amounts of dwarf Oregongrape, red huckleberry (*Vaccinium parvifolium*), vine maple, and trailing blackberry also common. The forb/herb layer is scant in most patches, consisting mainly of swordfern, with twinflower as the only other consistent component. All patches occur on nearly flat sites, with most



just upland
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habitats
(contrary to
the dry to
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preference
described for
this
association
by Chappell).
The two
largest
occurrences
are on the
Nisqually
River

floodplain (polygon 38) and adjacent to an Oregon oak swamp (polygon 24). Two occurrences north and west of the Mashel River (in polygons 23 and 24) were left as wetland buffers during harvest and represent some of the only remaining mature forest in this young, plantation dominated landscape.

***Pseudotsuga menziesii* – *Tsuga heterophylla* / *Vaccinium ovatum* / *Polystichum munitum* forest**

[PSME-TSHE/VAOV2/POMU]

We found only one instance of this uncommon association; on the steep south-facing slopes and ridge top above the Nisqually River at the end of Medical Springs Road. This is a young to mature stand, largely single-canopied but with a few older emergents. Douglas-fir dominates the overstory along the ridge top with a more even mix of Douglas-fir and western redcedar on the slopes. The regenerating understory is scant, mostly redcedar but with some Douglas-fir and a few scattered madrone on the dry slopes. The shrub layer has salal and evergreen huckleberry well-represented throughout, and variable amounts of beaked hazelnut, trailing snowberry, and dwarf Oregongrape. Swordfern was the only consistent element noted in the scant herb/forb layer. Several areas of top-soil sloughing were noted on the steeper slopes and Scotch broom is beginning to invade this habitat where it borders weedy plantation forest to the north.

***Salix lucida* ssp. *lasiandra* seasonally flooded forest**

[SALUL]





Four small (~1-3 acres) patches of SALUL community type are located in wet depressions and swampy, slow-moving stream corridors in the upland-flats. Closely associated with the FRLA/CAOB community, SALUL occupies the deeper portions of wetlands that are subject to longer periods of inundation (all SALUL wetlands had standing water until mid-late August). They are populated with dense overstory of sapling-sized Pacific willow with an understory varying from bare muck soil to dense rose spirea (*Spiraea douglasii*). Some slough sedge and owlfruit sedge occur at the boundary of adjacent FRLA/CAOB3 communities, but otherwise little else grows beneath the shrub layer.

***Spiraea douglasii* shrubland [SPDO]**



With a total cover of about two acres, rose spirea shrubland is one of the least common plant associations in the park. It is found in two closely situated 1-acre patches in the depressional wetlands just east of the Highway 17/Mineral Springs Road junction. This community is characterized by dense, 1-2 meter tall rose spirea with little or no other plant cover.

***Thuja plicata* – *Tsuga heterophylla* / *Oplopanax horridus* / *Polystichum munitum* forest**

[THPL-TSHE/OPHO/POMU]

This forested wetland association is very poorly represented, present only in three very small patches on the northeast to east facing slopes of the Mashel River canyon. All occurrences are <1 acre in size, located on mid- to lower-slopes in creek bottoms/seeps and surrounded by TSHE-PSME/POMU-DREX2 and PSME-THPL/OXOR communities. The forest overstory is mature Douglas-fir and redcedar with a variable mid-canopy of red alder and bigleaf maple. Salmonberry is codominant with devil's club at two sites and some red elderberry (*Sambucus racemosa*) is usually also present. The herb/forb layer varies, usually with some amount of swordfern, brackenfern, and youth-on-age (*Tolmiea menziesii*). Herb Robert, a potentially problematic invasive, was observed at one location.

While ranked as “apparently secure” at both the global and state level, this wetland indicator association is designated by the WNHP as having “high quality/rare” status in Pierce County.



***Tsuga heterophylla* – *Pseudotsuga menziesii* / *Polystichum munitum* – *Dryopteris expansa* forest**

[TSHE-PSME/POMU-DREX2]

The TSHE-PSME/POMU-DREX2 association is found only in the unmanaged older forests of the Nisqually, Mashel, and Ohop drainages, where it is the dominant plant community. Found in close proximity to the PSME-THPL/OXOR community, TSHE-PSME/POMU-DREX2 tends to occupy adjacent, slightly drier mid- to upper-slope positions. Aspect ranges from northwest to east, and slopes are moderate to very steep, especially along the Nisqually River canyon in the south portion of the park where there this habitat contains irregular cliff bands (polygons 18 and 39). Like neighboring PSME-THPL/OXOR forests, these mature forests are structurally complex, with several irregular canopy levels, and variable, patchy



shrub and forb/herb layers. Mature (100-180 yrs) Douglas-fir dominates the overstory with occasional mature hemlock and red cedar (there are a few very old Douglas-fir remnants on the upper canyon slopes of polygon 18, and near the Nisqually River in polygon 42; these could not be cored but are estimated at 200-250 yrs). An irregular understory of younger conifers and deciduous trees exists in many areas where the overstory is widely spaced or opened by windthrown trees. Bigleaf maple especially thrives in these situations, forming a rather extensive intermediate canopy layer



in some locations. Shrub cover in the TSHE-PSME/POMU-DREX2 community is highly variable, from almost non-existent to a locally dense mix of vine maple, salal, salmonberry, red elderberry, and trailing blackberry. Swordfern is the dominant forb, forming a thick continuous layer in many areas. Spreading woodfern and common ladyfern (*Athyrium filix-femina*) are consistently present in small amounts, while brackenfern and three-leaf foamflower are often observed on the lower slopes.

We observed only two exotic species with significant cover in this community. The first, Herb Robert, is locally abundant, especially on lower slopes and along roads, and is potentially problematic. The other, flat pea (*Lathyrus sylvestris*), while not identified as an invasive in our region, does dominate the herb layer in the one occurrence of TSHE-PSME/POMU-DREX2 near the river (polygon 42).

The TSHE-PSME/POMU-DREX2 community is ranked as rare/vulnerable in Washington State with few occurrences of high quality, natural-origin stands remaining.

***Typha latifolia* Western herbaceous vegetation**

[TYLA]

The broadleaf cattail wetland community, rather common elsewhere in the Puget Trough ecoregion, is very rare in Nisqually-Mashel, with total cover of about one acre. It is found in one area as a continuous patch in the deeper portion of an otherwise shallow depression wetland located in the north of the park, near the junction of Highway 17 and Mineral Springs Road (polygon 5). As is typical, this is a mono-specific community comprised wholly of dense broadleaf cattail and boundaries with the surrounding SPDO, CAVE6, and FRLA/CAOB3 wetland communities are narrow and distinct.



Floodplain margin/sand-gravel bar

We used this designation for vegetated habitats within, and immediately adjacent to, the Nisqually and Mashel River channels. These areas are intensely disturbed by frequent flooding during bank-full river flow and hence do not support stable plant communities. Young (3-15 yrs) red alder colonies are common in these habitats; larger and older pole-sized trees occurring on relatively stable point-bars and younger saplings on frequently shifting sand and gravel bars. Most of the sand-gravel substrate is scoured clean with remaining vegetation flattened and clogged with water-deposited debris. Other native vegetation is scant but includes irregular occurrences of salmonberry and common snowberry. Rivers are significant vectors for the spread of invasive plant species and a wide variety of weedy exotics are found here, including Himalayan blackberry, evergreen blackberry, reed canarygrass, orchardgrass (*Dactylis glomerata*), and curly dock (*Rumex crispus*). Several noxious weeds are also present, including widespread Scotch broom, scattered small-to-large patches of butterflybush (*Buddleja davidii*), and a few instances of purple loosestrife (*Lythrum salicaria*).

Disturbed / Developed

No attempt was made to classify the vegetation in several areas disturbed by recent or ongoing human-use. These areas includes powerline corridors (polygons 12 and 13), residential areas and pastures (polygons 15 and 17), and road/bridge construction (polygon 46). Additionally, we identified as disturbed a portion of floodplain just northwest of the river confluence. This unforested area was densely infested with exotics (mostly blackberry and reed canarygrass) to the exclusion of any meaningful native indicator species cover.

Rare Plant Surveys

Methods

The WNHP currently tracks 368 vascular plant taxa, with an additional 190 species of concern categorized with “watch” status. Prior to the beginning of field surveys, we compiled a list of focal rare plant taxa with the greatest likelihood of occurring in Nisqually-Mashel State Park. We developed this list by first including all rare taxa known to occur in the general park vicinity from existing data (Washington Natural Heritage Program Rare Plants GIS Spatial Data Set; WNHP, 2005a). Several additional taxa were added to this list after reviewing the distribution maps and habitat/ecology descriptions for the state's rare plants in the Program's Rare Plant Guide (WNHP, 2005b). Through this process, we identified 16 species with moderate to high likelihood of presence at Nisqually-Mashel (Appendix A). While we made an effort to search for and identify all unique vascular plant species, this approach helped guide and prioritize survey efforts through specific knowledge of the vegetative associates and habitats for rare taxa we were most likely to encounter.

We visited Nisqually-Mashel State Park 12 times in four discrete survey periods during the 2006 field season to maximize the likelihood of detection for plants of varying phenologies. These survey periods were May 8-12, June 17-21, August 11-13, and September 1-3 (Appendix A). Survey routes were guided by the desire to efficiently cover a large proportion of the park's area throughout the field season, while focusing more intensively on habitats we considered to have a higher likelihood of having rare taxa based on our pre-field review (Figure 1).

During surveys, we were equipped with reference literature, pre-field review data, orthophotos, and handheld GIS units. All vascular plant species encountered during the inventory were identified to species (and to variety where possible) on site, or collected and pressed for later identification at our office or through comparison to documented specimens at the University of Washington WTU Herbarium. For plant identification, we relied on the technical keys of Hitchcock and Cronquist (1973), the accepted standard reference for vascular plants of the Pacific Northwest, with frequent reference to the five volume flora upon which this single volume is based (Hitchcock et al., 1955-1969).

Results

We identified a total of 283 vascular plant taxa during the 2006 surveys at Nisqually-Mashel State Park (280 species, with 3 of these species represented by two subspecies; Table 3). Of these, 89 are non-native, accounting for 32% of the total. No listed rare plant species were found during our surveys. However, one WNHP “watch” species, Sierra marsh fern (*Thelypteris nevadensis*), was infrequently encountered during surveys of the TSHE-PSME/POMU-DREX2 forest community on the mid- and upper-slopes in polygon 32 (abundance code 5). Plant taxa designated with “watch” status are not formally tracked by WNHP but general occurrence information is collected.

There is a considerable amount of potential habitat within the park for several listed rare species. Several historical occurrences of tall bugbane (*Acaea elata*, formerly *Cimicifuga elata*), a state and federally listed rare plant, have been recorded at several locations in Pierce County, one within just three miles of the park boundary. This tall, rather distinctive forb is associated with the PSME/COCO6/POMU-TITR and TSHE-PSME/POMU-DREX2 forest communities. While the extent of PSME/COCO6/POMU-TITR habitat in the park is limited, PSME/POMU-DREX2 occurs over large portions of the slopes and terraces within both the Nisqually and Mashel river drainages and we searched these areas extensively for *A. elata* without success. Some portions of TSHE-PSME/POMU-DREX2 habitat do occur on the very steep, cliffy upper canyon slopes and were therefore difficult to survey thoroughly. Here, it is possible that young, scattered individuals could have been missed, but it remains unlikely that any sizeable, established population of this distinctive species went undetected.

Western burning bush (*Euonymus occidentalis*), was another potential occurrence at Nisqually-Mashel. A threatened species with only seven detections in Washington, all in forests within shaded draws and ravines in the Puget Trough, it too is associated with the TSHE-PSME/POMU-DREX2 forest community. We found no occurrences, and, as a tall, distinctive shrub, it is unlikely that any individuals of this species were missed.

In our initial surveys during May and early June, we encountered many wetlands scattered throughout the upland forest landscape, and on benches and terraces within both river drainages. Many wetlands were open-canopied and suitable habitat for a variety of sedge species and we returned to these areas during later surveys with the hope of finding one or more rare *Carex* species. We had identified two listed sedges in our pre-field review, Buxbaum's sedge (*C. buxbaumii*) and, especially, bristly sedge (*C. comosa*, with a known occurrence less than 5 miles from the park) as two promising species. Though we returned

several times as water levels dropped and likely wetlands became accessible, we did not detect either of these species. During repeated visits to these wetland areas we were also unsuccessful in locating several other rare species we felt might occur there, including northern bog aster (*Aster borealis*), bulb-bearing water-hemlock (*Cicuta bulbifera*), howellia (*Howellia aquatilis*), floating water pennywort (*Hydrocotyle ranunculoides*), and Nuttall's quillwort (*Isoetes nuttallii*). All of these species have been observed in similar wetland habitats, within 3 to 7 miles of the park property.

Also notable by its absence was small-flowered trillium (*Trillium parviflorum*), a state sensitive species endemic to the southern Puget Trough and with several nearby populations in Pierce and Thurston Counties. We searched associated Oregon ash and riparian red alder habitats with no detections.

Table 3. Vascular plant taxa encountered in Nisqually-Mashel State Park (refer to key page 48).

#	Ab	Symbol	Accepted Scientific Name	Common Name	Family	Habit	Exotic?	Hitchcock & Cronquist Synonym	Status
1	2	ACCI	<i>Acer circinatum</i>	vine maple	Aceraceae	s			
2	2	ACMA3	<i>Acer macrophyllum</i>	bigleaf maple	Aceraceae	t			
3	3	ACMI2	<i>Achillea millefolium</i>	common yarrow	Asteraceae	f/h			
4	3	ACTR	<i>Achlys triphylla</i>	sweet after death	Berberidaceae	f/h			
5	3	ADAL	<i>Adiantum aleuticum</i>	Aleutian maidenhair	Pteridaceae	f/h		<i>Adiantum pedatum ssp. aleuticum</i>	
6	2	AGCA5	<i>Agrostis capillaris</i>	colonial bentgrass	Poaceae	g	Y	<i>Agrostis tenuis</i>	
7	4	AGOR	<i>Agrostis oregonensis</i>	Oregon bentgrass	Poaceae	g			
8	3	AICA	<i>Aira caryophylla</i>	silver hairgrass	Poaceae	g	Y		
9	3	ALTR7	<i>Alisma triviale</i>	northern water plantain	Alismataceae	f/h		<i>Alisma plantago-aquatica var. americanum</i>	
10	2	ALRU2	<i>Alnus rubra</i>	red alder	Betulaceae	t			
11	4	ALGE2	<i>Alopecurus geniculatus</i>	water foxtail	Poaceae	g	Y		
12	2	ANMA	<i>Anaphalis margaritacea</i>	western pearly everlasting	Asteraceae	f/h			
13	3	ANDE3	<i>Anemone deltoidea</i>	Columbian windflower	Ranunculaceae	f/h			
14	4	ANOD	<i>Anthoxanthum odoratum</i>	sweet vernalgrass	Poaceae	g	Y		
15	5	ARTH	<i>Arabidopsis thaliana</i>	mouseear cress	Brassicaceae	f/h	Y		
16	4	ARME	<i>Arbutus menziesii</i>	Pacific madrone	Ericaceae	t			
17	4	ARSU4	<i>Artemisia suksdorfii</i>	coastal wormwood	Asteraceae	f/h			
18	4	ARDIA	<i>Aruncus dioicus var. acuminatus</i>	bride's feathers	Rosaceae	f/h		<i>Aruncus sylvestris</i>	
19	3	ASCA2	<i>Asarum caudatum</i>	British Columbia wildginger	Aristolochiaceae	f/h			
20	3	ATFI	<i>Athyrium filix-femina</i>	common ladyfern	Dryopteridaceae	f/h			
21	3	BAVU	<i>Barbarea vulgaris</i>	garden yellowrocket	Brassicaceae	f/h	Y		
22	5	BESY	<i>Beckmannia syzigachne</i>	American sloughgrass	Poaceae	g			
23	3	BLSP	<i>Blechnum spicant</i>	deer fern	Blechnaceae	f/h			
24	3	BRPA3	<i>Bromus pacificus</i>	Pacific brome	Poaceae	g			
25	3	BRRA2	<i>Bromus racemosus</i>	bald brome	Poaceae	g	Y	<i>Bromus commutatus</i>	
26	3	BRSI	<i>Bromus sitchensis</i>	Alaska brome	Poaceae	g		<i>Bromus sitchensis var. sitchensis</i>	
27	4	BRST2	<i>Bromus sterilis</i>	poverty brome	Poaceae	g	Y		
28	3	BRTE	<i>Bromus tectorum</i>	cheatgrass	Poaceae	g	Y		
29	4	BRVU	<i>Bromus vulgaris</i>	Columbia brome	Poaceae	g		<i>Bromus vulgaris var. vulgaris</i>	

#	Ab	Symbol	Accepted Scientific Name	Common Name	Family	Habit	Exotic?	Hitchcock & Cronquist Synonym	Status
30	4	BUDA2	<i>Buddleja davidii</i>	orange eye butterflybush	Buddlejaceae	s	Y		Class C Noxious
31	4	CAAN5	<i>Cardamine angulata</i>	seaside bittercress	Brassicaceae	f/h			
32	4	CACAS4	<i>Cardamine californica</i> var. <i>sinuata</i>	milkmaids	Brassicaceae	f/h		<i>Cardanime integrifolia</i> var. <i>sinuata</i>	
33	3	CAOLO	<i>Cardamine oligosperma</i> var. <i>oligosperma</i>	little western bittercress	Brassicaceae	f/h			
34	3	CAPE3	<i>Cardamine pensylvanica</i>	Pennsylvania bittercress	Brassicaceae	f/h			
35	4	CAAR2	<i>Carex arcta</i>	northern cluster sedge	Cyperaceae	g			
36	3	CADE9	<i>Carex deweyana</i>	Dewey sedge	Cyperaceae	g			
37	5	CAFR2	<i>Carex fracta</i>	fragile sheath sedge	Cyperaceae	g			
38	3	CALE8	<i>Carex lenticularis</i>	lakeshore sedge	Cyperaceae	g			
39	4	CAMI7	<i>Carex microptera</i>	smallwing sedge	Cyperaceae	g			
40	3	CAOB3	<i>Carex obnupta</i>	slough sedge	Cyperaceae	g			
41	3	CAST5	<i>Carex stipata</i>	owlfruit sedge	Cyperaceae	g			
42	4	CAVE6	<i>Carex vesicaria</i>	blister sedge	Cyperaceae	g			
43	3	CESA	<i>Ceanothus sanguineus</i>	redstem ceanothus	Rhamnaceae	s			
44	4	CECY2	<i>Centaurea cyanus</i>	garden cornflower	Asteraceae	f/h	Y		
45	4	CEJA	<i>Centaurea jacea</i>	brownray knapweed	Asteraceae	f/h	Y		Class B Noxious
46	5	CESTM	<i>Centaurea stoebe</i> ssp. <i>micranthos</i>	spotted knapweed	Asteraceae	f/h	Y	<i>Centaurea maculosa</i>	
47	4	CEFOV2	<i>Cerastium fontanum</i> ssp. <i>vulgare</i>	big chickweed	Caryophyllaceae	f/h	Y	<i>Cerastium vulgatum</i>	
48	2	CEGL2	<i>Cerastium glomeratum</i>	sticky chickweed	Caryophyllaceae	f/h	Y	<i>Cerastium viscosum</i>	
49	2	CHANA2	<i>Chamerion angustifolium</i> ssp. <i>angustifolium</i>	fireweed	Onagraceae	f/h		<i>Epilobium angustifolium</i>	
50	3	CHUM	<i>Chimaphila umbellata</i>	pipsissewa	Pyrolaceae	ss			
51	3	CIDO	<i>Cicuta douglasii</i>	western water hemlock	Apiaceae	f/h			
52	2	CIAL	<i>Circaea alpina</i>	small enchanter's nightshade	Onagraceae	f/h			
53	3	CIAR4	<i>Cirsium arvense</i>	Canada thistle	Asteraceae	f/h	Y		Class C Noxious
54	4	CIVU	<i>Cirsium vulgare</i>	bull thistle	Asteraceae	f/h	Y		(Class C Noxious)
55	2	CLPEP	<i>Claytonia perfoliata</i> ssp. <i>perfoliata</i>	miner's lettuce	Portulacaceae	f/h		<i>Montia perfoliata</i>	
56	3	CLSIS	<i>Claytonia sibirica</i> var. <i>sibirica</i>	Siberian springbeauty	Portulacaceae	f/h		<i>Montia sibirica</i> var. <i>sibirica</i>	
57	4	COHE2	<i>Collomia heterophylla</i>	variableleaf collomia	Polemoniaceae	f/h			
58	3	COCA5	<i>Conyza canadensis</i>	Canadian horseweed	Asteraceae	f/h			
59	4	COMA25	<i>Corallorhiza maculata</i>	summer coralroot	Orchidaceae	f/h			

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60	3	COSES	<i>Cornus sericea</i> ssp. <i>sericea</i>	redosier dogwood	Cornaceae	t, s		<i>Cornus stolonifera</i>	
61	4	COSC4	<i>Corydalis scouleri</i>	Scouler's fumewort	Fumariaceae	f/h			
62	2	COCO6	<i>Corylus cornuta</i>	beaked hazelnut	Betulaceae	t, s			
63	3	CRCA3	<i>Crepis capillaris</i>	smooth hawksbeard	Asteraceae	f/h	Y		
64	5	CYCR	<i>Cynosurus cristatus</i>	crested dogstail grass	Poaceae	g	Y		
65	3	CYFR2	<i>Cystopteris fragilis</i>	brittle bladderfern	Dryopteridaceae	f/h			
66	2	CYSC4	<i>Cytisus scoparius</i>	Scotch broom	Fabaceae	s	Y		Class B Noxious
67	2	DAGL	<i>Dactylis glomerata</i>	orchardgrass	Poaceae	g	Y		
68	2	DACA6	<i>Daucus carota</i>	Queen Anne's lace	Apiaceae	f/h	Y		(Class B Noxious)
69	3	DAPU3	<i>Daucus pusillus</i>	American wild carrot	Apiaceae	f/h			
70	5	DEEL	<i>Deschampsia elongata</i>	slender hairgrass	Poaceae	g			
71	4	DIAR	<i>Dianthus armeria</i>	Deptford pink	Caryophyllaceae	f/h	Y		
72	3	DIFO	<i>Dicentra formosa</i>	Pacific bleeding heart	Fumariaceae	f/h			
73	3	DIPU	<i>Digitalis purpurea</i>	purple foxglove	Scrophulariaceae	f/h	Y		
74	4	DRVE2	<i>Draba verna</i>	spring draba	Brassicaceae	f/h	Y		
75	3	DREX2	<i>Dryopteris expansa</i>	spreading woodfern	Dryopteridaceae	f/h			
76	4	ECCR	<i>Echinochloa crus-galli</i>	barnyardgrass	Poaceae	g	Y		
77	4	ELOV	<i>Eleocharis ovata</i>	ovate spikerush	Cyperaceae	g			
78	3	ELPA3	<i>Eleocharis palustris</i>	common spikerush	Cyperaceae	g			
79	2	ELGLG	<i>Elymus glaucus</i> ssp. <i>glaucus</i>	blue wildrye	Poaceae	g		<i>Elymus glaucus</i> var. <i>glaucus</i>	
80	3	ELGLJ2	<i>Elymus glaucus</i> ssp. <i>jepsonii</i>	Jepson's blue wildrye	Poaceae	g		<i>Elymus glaucus</i> var. <i>jepsonii</i>	
81	2	ELRE4	<i>Elymus repens</i>	quackgrass	Poaceae	g	Y	<i>Agropyron repens</i>	
82	4	ELTRT	<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	slender wheatgrass	Poaceae	g		<i>Agropyron caninum</i> ssp. <i>majus</i>	
83	3	EPCIC	<i>Epilobium ciliatum</i> ssp. <i>ciliatum</i>	fringed willowherb	Onagraceae	f/h		<i>Epilobium glandulosum</i> var. <i>macounii</i>	
84	5	EPDE4	<i>Epilobium densiflorum</i>	denseflower willowherb	Onagraceae	f/h		<i>Boisduvalia densiflora</i>	
85	3	EPMI	<i>Epilobium minutum</i>	chaparral willowherb	Onagraceae	f/h			
86	2	EQAR	<i>Equisetum arvense</i>	field horsetail	Equisetaceae	f/h			
87	3	EQHY	<i>Equisetum hyemale</i>	scouringrush horsetail	Equisetaceae	f/h			
88	3	EQLA	<i>Equisetum laevigatum</i>	smooth horsetail	Equisetaceae	f/h			
89	3	EQTE	<i>Equisetum telmateia</i>	giant horsetail	Equisetaceae	f/h			

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90	3	ERPH	<i>Erigeron philadelphicus</i>	Philadelphia fleabane	Asteraceae	f/h			
91	4	ERST5	<i>Erigeron strigosus</i> var. <i>strigosus</i>	prairie fleabane	Asteraceae	f/h		<i>Erigeron annuus</i> ssp. <i>strigosus</i>	
92	3	EUNE3	<i>Euphrasia nemorosa</i>	common eyebright	Scrophulariaceae	f/h		<i>Euphrasia officinalis</i>	
93	3	EUOC4	<i>Euthamia occidentalis</i>	western goldentop	Asteraceae	f/h		<i>Solidago occidentalis</i>	
94	4	FERUR2	<i>Festuca rubra</i> ssp. <i>rubra</i>	red fescue	Poaceae	g			
95	4	FESU	<i>Festuca subulata</i>	bearded fescue	Poaceae	g			
96	4	FESU2	<i>Festuca subuliflora</i>	crinkleawn fescue	Poaceae	g			
97	3	FRVEB2	<i>Fragaria vesca</i> ssp. <i>bracteata</i>	woodland strawberry	Rosaceae	f/h		<i>Fragaria vesca</i> var. <i>crinita</i>	
98	3	FRPU7	<i>Frangula purshiana</i>	Cascara buckthorn	Rhamnaceae	t, s		<i>Rhamnus purshiana</i>	
99	3	FRLA	<i>Fraxinus latifolia</i>	Oregon ash	Oleaceae	t			
100	1	GAAP2	<i>Galium aparine</i>	stickywilly	Rubiaceae	f/h			
101	3	GATR2	<i>Galium trifidum</i>	threepetal bedstraw	Rubiaceae	f/h			
102	3	GATR3	<i>Galium triflorum</i>	fragrant bedstraw	Rubiaceae	f/h			
103	4	GAOV2	<i>Gaultheria ovatifolia</i>	western teaberry	Ericaceae	s			
104	1	GASH	<i>Gaultheria shallon</i>	salal	Ericaceae	s			
105	3	GED1	<i>Geranium dissectum</i>	cutleaf geranium	Geraniaceae	f/h	Y		
106	3	GEMO	<i>Geranium molle</i>	dovefoot geranium	Geraniaceae	f/h	Y		
107	2	GERO	<i>Geranium robertianum</i>	Herb Robert	Geraniaceae	f/h	Y		(Class B Noxious)
108	3	GEMAM	<i>Geum macrophyllum</i> var. <i>macrophyllum</i>	largeleaf avens	Rosaceae	f/h			
109	3	GLHE2	<i>Glechoma hederacea</i>	ground ivy	Lamiaceae	f/h	Y		
110	3	GLST	<i>Glyceria striata</i>	fowl mannagrass	Poaceae	g		<i>Glyceria elata</i>	
111	3	GNUL	<i>Gnaphalium uliginosum</i>	marsh cudweed	Asteraceae	f/h	Y		
112	5	GOOB2	<i>Goodyera oblongifolia</i>	western rattlesnake plantain	Orchidaceae	f/h			
113	3	GYDR	<i>Gymnocarpium dryopteris</i>	western oakfern	Dryopteridaceae	f/h			
114	4	HEHE	<i>Hedera helix</i>	English ivy	Araliaceae	v	Y		(Class C Noxious)
115	3	HEMA80	<i>Heracleum maximum</i>	common cowparsnip	Apiaceae	f/h		<i>Heracleum lanatum</i>	
116	3	HIAL2	<i>Hieracium albiflorum</i>	white hawkweed	Asteraceae	f/h			
117	3	HOLA	<i>Holcus lanatus</i>	common velvetgrass	Poaceae	g	Y		
118	2	HOD1	<i>Holodiscus discolor</i>	oceanspray	Rosaceae	s			
119	2	HYTE	<i>Hydrophyllum tenuipes</i>	Pacific waterleaf	Hydrophyllaceae	f/h			

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120	3	HYPE	<i>Hypericum perforatum</i>	common St. Johnswort	Clusiaceae	f/h	Y		(Class C Noxious)
121	2	HYRA3	<i>Hypochaeris radicata</i>	hairy catsear	Asteraceae	f/h	Y		(Class C Noxious)
122	4	ILAQ80	<i>Ilex aquifolium</i>	English holly	Aquifoliaceae	t, s	Y		
123	3	JUAC	<i>Juncus acuminatus</i>	tapertip rush	Juncaceae	g			
124	3	JUBU	<i>Juncus bufonius</i>	toad rush	Juncaceae	g			
125	2	JUEFC2	<i>Juncus effusus</i> var. <i>conglomeratus</i>	common rush	Juncaceae	g		<i>Juncus effusus</i> var. <i>compactus</i>	
126	2	LACO3	<i>Lapsana communis</i>	common nipplewort	Asteraceae	f/h	Y		
127	2	LAPO3	<i>Lathyrus polyphyllus</i>	leafy pea	Fabaceae	f/h			
128	3	LASY	<i>Lathyrus sylvestris</i>	flat pea	Fabaceae	f/h	Y		
129	2	LEVU	<i>Leucanthemum vulgare</i>	oxeye daisy	Asteraceae	f/h	Y	<i>Chrysanthemum leucanthemum</i>	(Class B Noxious)
130	4	LICO	<i>Lilium columbianum</i>	Columbia lily	Liliaceae	f/h			
131	3	LIBO3	<i>Linnaea borealis</i>	twinline	Caprifoliaceae	f/h			
132	3	LOPE	<i>Lolium perenne</i>	perennial ryegrass	Poaceae	g	Y		
133	4	LOC13	<i>Lonicera ciliosa</i>	orange honeysuckle	Caprifoliaceae	v			
134	3	LOIN5	<i>Lonicera involucrata</i>	twinline honeysuckle	Caprifoliaceae	s			
135	3	LOCO6	<i>Lotus corniculatus</i>	bird's-foot trefoil	Fabaceae	f/h	Y		
136	3	LOMI	<i>Lotus micranthus</i>	desert deervetch	Fabaceae	f/h			
137	3	LUMUM2	<i>Luzula multiflora</i> ssp. <i>multiflora</i> var. <i>multiflora</i>	common woodrush	Juncaceae	g		<i>Luzula campestris</i> var. <i>multiflora</i>	
138	4	LUPA4	<i>Luzula parviflora</i>	smallflowered woodrush	Juncaceae	g			
139	4	LYCO	<i>Lychnis coronaria</i>	rose campion	Caryophyllaceae	f/h	Y		
140	4	LYUN	<i>Lycopus uniflorus</i>	northern bugleweed	Lamiaceae	f/h			
141	3	LYAM3	<i>Lysichiton americanus</i>	American skunkcabbage	Araceae	f/h		<i>Lysichiton americanum</i>	
142	5	LYSA2	<i>Lythrum salicaria</i>	Purple loosestrife	Lythraceae	f/h	Y		Class B Noxious
143	3	MAGR3	<i>Madia gracilis</i>	grassy tarweed	Asteraceae	f/h			
144	3	MASA	<i>Madia sativa</i>	coast tarweed	Asteraceae	f/h		<i>Madia sativa</i> var. <i>sativa</i>	
145	3	MAAQ2	<i>Mahonia aquifolium</i>	hollyleaved barberry	Berberidaceae	s		<i>Berberis aquifolium</i>	
146	1	MANE2	<i>Mahonia nervosa</i>	Cascade barberry	Berberidaceae	s		<i>Berberis nervosa</i>	
147	3	MADI	<i>Maianthemum dilatatum</i>	false lily of the valley	Liliaceae	f/h			
148	2	MARAA	<i>Maianthemum racemosum</i> ssp. <i>amplexicaule</i>	feathery false lily of the valley	Liliaceae	f/h		<i>Smilacina racemosa</i>	
149	2	MAST4	<i>Maianthemum stellatum</i>	starry false lily of the valley	Liliaceae	f/h		<i>Smilacina stellata</i>	

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150	3	MADI6	<i>Matricaria discoidea</i>	disc mayweed	Asteraceae	f/h	Y	<i>Matricaria matricarioides</i>	
151	4	MEOF	<i>Melilotus officinalis</i>	yellow sweetclover	Fabaceae	f/h	Y	<i>Melilotus alba</i>	
152	3	MEAR4	<i>Mentha arvensis</i>	wild mint	Lamiaceae	f/h			
153	4	MEPAP	<i>Mertensia paniculata</i> var. <i>paniculata</i>	tall bluebells	Boraginaceae	f/h			
154	4	MIDE3	<i>Mimulus dentatus</i>	coastal monkeyflower	Scrophulariaceae	f/h			
155	3	MIGU	<i>Mimulus guttatus</i>	seep monkeyflower	Scrophulariaceae	f/h			
156	3	MOMA3	<i>Moehringia macrophylla</i>	largeleaf sandwort	Caryophyllaceae	f/h		<i>Arenaria macrophylla</i>	
157	5	MOUN3	<i>Monotropa uniflora</i>	Indianpipe	Monotropaceae	f/h			
158	4	MOPAF	<i>Montia parvifolia</i> ssp. <i>flagellaris</i>	littleleaf minerslettuce	Portulacaceae	f/h		<i>Montia parvifolia</i> var. <i>flagellaris</i>	
159	3	MOPAP	<i>Montia parvifolia</i> ssp. <i>parvifolia</i>	littleleaf minerslettuce	Portulacaceae	f/h		<i>Montia parvifolia</i> var. <i>parvifolia</i>	
160	3	MYMU	<i>Mycelis muralis</i>	wall-lettuce	Asteraceae	f/h	Y	<i>Lactuca muralis</i>	
161	3	MYAR	<i>Myosotis arvensis</i>	field forget-me-not	Boraginaceae	f/h	Y		
162	4	MYDI	<i>Myosotis discolor</i>	changing forget-me-not	Boraginaceae	f/h	Y		
163	4	MYLA	<i>Myosotis laxa</i>	bay forget-me-not	Boraginaceae	f/h			
164	3	MYGA	<i>Myrica gale</i>	sweetgale	Myricaceae	s			
165	5	NAOF	<i>Nasturtium officinale</i>	watercress	Brassicaceae	f/h	Y	<i>Rorippa nasturtium-aquaticum</i>	
166	3	NEPAP	<i>Nemophila parviflora</i> var. <i>parviflora</i>	smallflower nemophila	Hydrophyllaceae	f/h			
167	2	OECE	<i>Oemleria cerasiformis</i>	Indian plum	Rosaceae	t, s			
168	3	OESA	<i>Oenanthe sarmentosa</i>	water parsely	Apiaceae	f/h			
169	3	OPHO	<i>Oplopanax horridus</i>	devilsclub	Araliaceae	s			
170	2	OSBE	<i>Osmorhiza berteroi</i>	sweetcicely	Apiaceae	f/h		<i>Osmorhiza chilensis</i>	
171	2	OXOR	<i>Oxalis oregana</i>	redwood-sorrel	Oxalidaceae	f/h			
172	4	OXTR	<i>Oxalis trillifolia</i>	threeleaf woodsorrel	Oxalidaceae	f/h			
173	4	PAVI3	<i>Parentucellia viscosa</i>	yellow glandweed	Scrophulariaceae	f/h	Y		
174	4	PAMY	<i>Paxistima myrsinites</i>	Oregon boxleaf	Celastraceae	s		<i>Pachystima myrsinites</i>	
175	3	PEFRP	<i>Petasites frigidus</i> var. <i>palmatus</i>	arctic sweet coltsfoot	Asteraceae	f/h			
176	2	PHAR3	<i>Phalaris arundinacea</i>	reed canarygrass	Poaceae	g			(Class C Noxious)
177	3	PHLE4	<i>Philadelphus lewisii</i>	Lewis' mock orange	Hydrangeaceae	s			
178	2	PHCA11	<i>Physocarpus capitatus</i>	Pacific ninebark	Rosaceae	s			
179	3	PICOC2	<i>Pinus contorta</i> var. <i>contorta</i>	lodgepole pine	Pinaceae	t			

#	Ab	Symbol	Accepted Scientific Name	Common Name	Family	Habit	Exotic?	Hitchcock & Cronquist Synonym	Status
180	3	PLLA	<i>Plantago lanceolata</i>	narrowleaf plantain	Plantaginaceae	f/h	Y		
181	3	PLMA2	<i>Plantago major</i>	common plantain	Plantaginaceae	f/h			
182	3	POAN	<i>Poa annua</i>	annual bluegrass	Poaceae	g	Y		
183	3	POCO	<i>Poa compressa</i>	Canada bluegrass	Poaceae	g	Y		
184	4	POPA2	<i>Poa palustris</i>	fowl bluegrass	Poaceae	g			
185	4	Pole2	<i>Poa leptocoma</i>	marsh bluegrass	Poaceae	g		<i>Poa leptocoma</i> var. <i>leptocoma</i>	
186	3	POAV	<i>Polygonum aviculare</i>	prostrate knotweed	Polygonaceae	f/h	Y		
187	4	POHY	<i>Polygonum hydropiper</i>	marshpepper knotweed	Polygonaceae	f/h	Y		
188	4	POPE3	<i>Polygonum persicaria</i>	spotted ladythumb	Polygonaceae	f/h	Y		
189	3	POGL8	<i>Polypodium glycyrrhiza</i>	licorice fern	Polypodiaceae	f/h			
190	4	POHE3	<i>Polypodium hesperium</i>	western polypody	Polypodiaceae	f/h			
191	4	POLO4	<i>Polystichum lonchitis</i>	northern hollyfern	Dryopteridaceae	f/h			
192	1	POMU	<i>Polystichum munitum</i>	western swordfern	Dryopteridaceae	f/h			
193	2	POBAT	<i>Populus balsamifera</i> ssp. <i>trichocarpa</i>	black cottonwood	Salicaceae	t		<i>Populus trichocarpa</i>	
194	4	POTR5	<i>Populus tremuloides</i>	quaking aspen	Salicaceae	t			
195	4	PODI2	<i>Potentilla diversifolia</i>	varileaf cinquefoil	Rosaceae	f/h			
196	3	PRHO0	<i>Prosartes hookeri</i> var. <i>oregana</i>	Oregon drops of gold	Liliaceae	f/h		<i>Disporum hookeri</i> var. <i>oreganum</i>	
197	3	PRVU	<i>Prunella vulgaris</i>	common selfheal	Lamiaceae	f/h			
198	3	PREM	<i>Prunus emarginata</i>	bitter cherry	Rosaceae	t, s			
199	1	PSME	<i>Pseudotsuga menziesii</i>	Douglas-fir	Pinaceae	t			
200	1	PTAQ	<i>Pteridium aquilinum</i>	western brackenfern	Dennstaedtiaceae	f/h			
201	4	PYASA	<i>Pyrola asarifolia</i> ssp. <i>asarifolia</i>	liverleaf wintergreen	Pyrolaceae	ss			
202	4	PYPU	<i>Pyrus pumila</i>	domestic apple	Rosaceae	t	Y	<i>Pyrus malus</i>	
203	5	QUGA4	<i>Quercus garryana</i>	Oregon white oak	Fagaceae	t, s			
204	3	RAFL2	<i>Ranunculus flammula</i>	greater creeping spearwort	Ranunculaceae	f/h			
205	2	RARE3	<i>Ranunculus repens</i>	creeping buttercup	Ranunculaceae	f/h	Y		
206	2	RAUNP	<i>Ranunculus uncinatus</i> var. <i>parviflorus</i>	Idaho buttercup	Ranunculaceae	f/h			
207	4	RIDI	<i>Ribes divaricatum</i>	spreading gooseberry	Grossulariaceae	s			
208	3	RISA	<i>Ribes sanguineum</i>	redflower currant	Grossulariaceae	s			
209	4	ROPA0	<i>Rorippa palustris</i> ssp. <i>occidentalis</i>	western bog yellowcress	Brassicaceae	f/h		<i>Rorippa islandica</i> var. <i>occidentale</i>	

#	Ab	Symbol	Accepted Scientific Name	Common Name	Family	Habit	Exotic?	Hitchcock & Cronquist Synonym	Status
210	3	ROGY	<i>Rosa gymnocarpa</i>	dwarf rose	Rosaceae	ss			
211	2	RUAR9	<i>Rubus armeniacus</i>	Himalayan blackberry	Rosaceae	ss	Y	<i>Rubus discolor</i>	
212	3	RULA	<i>Rubus laciniatus</i>	cutleaf blackberry	Rosaceae	ss	Y		
213	2	RUPA	<i>Rubus parviflorus</i>	thimbleberry	Rosaceae	ss			
214	2	RUSP	<i>Rubus spectabilis</i>	salmonberry	Rosaceae	ss			
215	2	RUUR	<i>Rubus ursinus</i>	California blackberry	Rosaceae	ss			
216	3	RUAC3	<i>Rumex acetosella</i>	common sheep sorrel	Polygonaceae	f/h	Y		
217	3	RUCR	<i>Rumex crispus</i>	curly dock	Polygonaceae	f/h	Y		
218	3	RUPH3	<i>Rupertia physodes</i>	forest scurpea	Fabaceae	f/h		<i>Psoralea physodes</i>	
219	4	SAPR	<i>Sagina procumbens</i>	birdeye pearlwort	Caryophyllaceae	f/h	Y		
220	4	SAAM2	<i>Salix amygdaloides</i>	peachleaf willow	Salicaceae	t, s			
221	3	SALUL	<i>Salix lucida ssp. lasiandra</i>	Pacific willow	Salicaceae	t, s		<i>Salix lasiandra</i>	
222	3	SASC	<i>Salix scouleriana</i>	Scouler's willow	Salicaceae	t, s			
223	3	SASI2	<i>Salix sitchensis</i>	Sitka willow	Salicaceae	t, s			
224	3	SARA2	<i>Sambucus racemosa</i>	red elderberry	Caprifoliaceae	t, s			
225	4	SAGR5	<i>Sanicula graveolens</i>	northern sanicle	Apiaceae	f/h			
226	3	SCPH	<i>Schedonorus phoenix</i>	tall fescue	Poaceae	g	Y	<i>Festuca arundinacea</i>	
227	3	SCPR4	<i>Schedonorus pratensis</i>	meadow fescue	Poaceae	g	Y	<i>Festuca pratensis</i>	
228	3	SCMI2	<i>Scirpus microcarpus</i>	panicled bulrush	Cyperaceae	g			
229	4	SECE	<i>Secale cereale</i>	cereal rye	Poaceae	g	Y		
230	3	SEJA	<i>Senecio jacobaea</i>	stinking willie	Asteraceae	f/h	Y		
231	3	SEVU	<i>Senecio vulgaris</i>	old-man-in-the-Spring	Asteraceae	f/h	Y		(Class C Noxious)
232	3	SISU2	<i>Sium suave</i>	hemlock waterparsnip	Apiaceae	f/h			
233	3	SODU	<i>Solanum dulcamara</i>	climbing nightshade	Solanaceae	f/h	Y		
234	3	SOCAS	<i>Solidago canadensis var. salebrosa</i>	salebrosa goldenrod	Asteraceae	f/h			
235	3	SOAS	<i>Sonchus asper</i>	spiny sowthistle	Asteraceae	f/h	Y		
236	4	SPAN2	<i>Sparganium angustifolium</i>	narrowleaf bur-reed	Sparganiaceae	f/h		<i>Sparganium emersum var. multipedunculatum</i>	
237	3	SPRU	<i>Spergularia rubra</i>	red sandspurry	Caryophyllaceae	f/h	Y		
238	3	SPDOD	<i>Spiraea douglasii var. douglasii</i>	rose spirea	Rosaceae	s			
239	3	STCHC3	<i>Stachys chamissonis var. cooleyae</i>	coastal hedgenettle	Lamiaceae	f/h		<i>Stachys cooleyae</i>	

#	Ab	Symbol	Accepted Scientific Name	Common Name	Family	Habit	Exotic?	Hitchcock & Cronquist Synonym	Status
240	3	STLO2	<i>Stellaria longipes</i>	longstalk starwort	Caryophyllaceae	f/h			
241	2	STME2	<i>Stellaria media</i>	common chickweed	Caryophyllaceae	f/h	Y		
242	3	SYAL	<i>Symphoricarpos albus</i>	common snowberry	Caprifoliaceae	s			
243	4	SYHE	<i>Symphoricarpos hesperius</i>	trailing snowberry	Caprifoliaceae	s		<i>Symphoricarpos mollis</i> var. <i>hesperius</i>	
244	3	SYEA2	<i>Symphyotrichum eatonii</i>	Eaton's aster	Asteraceae	f/h		<i>Aster eatonii</i>	
245	3	SYSUS	<i>Symphyotrichum sspicatum</i> var. <i>ssp. sspicatum</i>	Douglas aster	Asteraceae	f/h		<i>Aster subspicatus</i>	
246	3	TAVU	<i>Tanacetum vulgare</i>	common tansy	Asteraceae	f/h	Y		(Class C Noxious)
247	3	TAOF	<i>Taraxacum officinale</i>	common dandelion	Asteraceae	f/h	Y		
248	3	TABR2	<i>Taxus brevifolia</i>	Pacific yew	Taxaceae	t			
249	4	TENU	<i>Teesdalia nudicaulis</i>	barestem teesdalia	Brassicaceae	f/h	Y		
250	2	TEGR2	<i>Tellima grandiflora</i>	bigflower tellima	Saxifragaceae	f/h			
251	5	THNE	<i>Thelypteris nevadensis</i>	Sierra marsh fern	Thelypteridaceae	f/h			WNHP Watch
252	2	THPL	<i>Thuja plicata</i>	western red cedar	Cupressaceae	t			
253	4	THPRA	<i>Thymus praecox</i> ssp. <i>arcticus</i>	creeping thyme	Lamiaceae	f/h	Y	<i>Thymus serpyllum</i>	
254	3	TITR	<i>Tiarella trifoliata</i>	threeleaf foamflower	Saxifragaceae	f/h			
255	2	TOME	<i>Tolmiea menziesii</i>	youth on age	Saxifragaceae	f/h			
256	5	TOPAP3	<i>Torreyochloa pallida</i> var. <i>pauciflora</i>	pale false mannagrass	Poaceae	g		<i>Puccinellia pauciflora</i>	
257	3	TRBOL	<i>Trientalis borealis</i> ssp. <i>latifolia</i>	broadleaf starflower	Primulaceae	f/h		<i>Trientalis latifolia</i>	
258	3	TRAR4	<i>Trifolium arvense</i>	rabbitfoot clover	Fabaceae	f/h	Y		
259	4	TRCA5	<i>Trifolium campestre</i>	field clover	Fabaceae	f/h	Y	<i>Trifolium procumbens</i>	
260	3	TRDU2	<i>Trifolium dubium</i>	suckling clover	Fabaceae	f/h	Y		
261	3	TRPR2	<i>Trifolium pratense</i>	red clover	Fabaceae	f/h	Y		
262	3	TRRE3	<i>Trifolium repens</i>	white clover	Fabaceae	f/h	Y		
263	3	TROV2	<i>Trillium ovatum</i>	Pacific trillium	Liliaceae	f/h			
264	5	TRCA21	<i>Trisetum canescens</i>	tall trisetum	Poaceae	g		<i>Trisetum cernuum</i>	
265	2	TSHE	<i>Tsuga heterophylla</i>	western hemlock	Pinaceae	t			
266	4	TYLA	<i>Typha latifolia</i>	broadleaf cattail	Typhaceae	f/h			
267	2	URDI	<i>Urtica dioica</i>	stinging nettle	Urticaceae	f/h			
268	4	VAOV2	<i>Vaccinium ovatum</i>	California huckleberry	Ericaceae	s			
269	2	VAPA	<i>Vaccinium parvifolium</i>	red huckleberry	Ericaceae	s			

#	Ab	Symbol	Accepted Scientific Name	Common Name	Family	Habit	Exotic?	Hitchcock & Cronquist Synonym	Status
270	3	VASC2	<i>Valeriana scouleri</i>	Scouler's valerian	Valerianaceae	f/h			
271	4	VALO	<i>Valerianella locusta</i>	Lewiston cornsalad	Valerianaceae	f/h	Y		
272	2	VAHE	<i>Vancouveria hexandra</i>	white insideout flower	Berberidaceae	f/h			
273	4	VECA2	<i>Veratrum californicum</i>	California false hellebore	Liliaceae	f/h			
274	3	VEAM2	<i>Veronica americana</i>	American speedwell	Scrophulariaceae	f/h			
275	3	VEAR	<i>Veronica arvensis</i>	corn speedwell	Scrophulariaceae	f/h	Y		
276	3	VEOF2	<i>Veronica officinalis</i>	common gypsyweed	Scrophulariaceae	f/h	Y		
277	4	VESC2	<i>Veronica scutellata</i>	skullcap speedwell	Scrophulariaceae	f/h			
278	3	VESEH2	<i>Veronica serpyllifolia ssp. humifusa</i>	brightblue speedwell	Scrophulariaceae	f/h			
279	5	VESES	<i>Veronica serpyllifolia ssp. serpyllifolia</i>	thymeleaf speedwell	Scrophulariaceae	f/h	Y		
280	3	VIHI	<i>Vicia hirsuta</i>	tiny vetch	Fabaceae	f/h	Y		
281	3	VISAN2	<i>Vicia sativa ssp. nigra</i>	garden vetch	Fabaceae	f/h	Y	<i>Vicia sativa var. angustifolia</i>	
282	3	VUBR	<i>Vulpia bromoides</i>	brome fescue	Poaceae	g	Y	<i>Festuca bromoides</i>	
283	3	VUMY	<i>Vulpia myuros</i>	rat-tail fescue	Poaceae	g	Y	<i>Festuca myuros</i>	

Key to Codes Used

Ab: Abundance. An abundance rating system indicates how common each species is in the park. The 5 rating levels are:

- 1—Abundant in multiple plant communities
- 2—Common in multiple plant communities
- 3—Common in specific plant communities
- 4—Uncommon in specific plant associations
- 5—Rare, five or fewer sightings in the park.

Code: Four-six digit alphanumeric species code as shown on the USDA PLANTS database (USDA, NRCS. 2006).

Habit: Growth habit:

- t = tree
- ss = subshrub
- s = shrub
- f/h = forb/herb
- g = graminoid

Exotic?: Species that are not native to the park are indicated with a "Y"

Hitchcock & Cronquist Synonym: Indicates previous nomenclature, when different from current, as used in Hitchcock and Cronquist (1973).

Status: Any species classified by the WNHP as "endangered", "threatened," "sensitive" or "watch." Also species listed as noxious by the Washington State Noxious Weed Control Board (<http://www.nwcb.wa.gov>) are identified by class. "()" indicates noxious weed listing at state level but not in Pierce or Thurston Counties.

Ecological Condition of Nisqually-Mashel State Park

Recent forest harvests have had a tremendous impact on vegetation communities throughout a large portion of the park property, leaving the remainder in largely pristine condition. As a result, ecological conditions within these two areas are dramatically different and therefore discussed separately.

Managed Upland Flats

About 60% of the park property lies on flat or gently rolling upland areas that have been harvested within the last 10 to 30 years. Ecological conditions in the young plantation forests that dominate these areas are generally quite poor; nearly all conifer forest associations here were assigned condition ranks of “C” or “D” due to very young age, lack of structural complexity (single-age, single canopy layer, and few canopy gaps), lack of snags and large woody debris, low overall species diversity, and high invasive exotic cover (see Appendix C for details on ranking criteria).

In younger plantations (5 to 15 years) where young trees have not yet formed extensive canopy, invasive exotics dominate both the shrub and forb layers. Himalayan blackberry, evergreen blackberry and Scotch broom are the most consistent exotics shrubs, present in nearly all areas and forming extensive, dense thickets in many locations. Other problem invasives in open plantations include orchardgrass, quackgrass and Canada thistle, a Class C noxious weed. Ecologically, these invasive species effectively out-compete native species, retarding, or in severe infestations even preventing, the re-establishment of native plant communities.

As young plantations mature, individual tree canopies begin to converge into a continuous canopy layer. In the absence of forest management or other natural disturbance (fire, insects, or disease) to open this dense canopy, it will suppress and eventually exclude all understory plant growth. While this process can effectively remove problem invasives, it also excludes desirable native species, creating an ecologically depauperate understory of moss, thick duff and little else. Large portions of the managed uplands have reached, or are nearing this poor condition “stem exclusion” stage of forest growth.

Forest management activities have also contributed to the low overall plant diversity in managed areas through mono-specific re-plantation of Douglas-fir. Examples of undisturbed mature forests in nearby comparable habitats are lacking in this heavily managed region,

making historical forest types difficult to determine with certainty. Adjacent unmanaged canyon forests, as well as the few remaining patches of mature forest within the upland flats (typically left as buffers around streams and other wetlands) are mixed conifer types, with hemlock and redcedar well represented. While differences in physiographic and soil characteristics between upland flats and canyon slopes may favor Douglas-fir in drier upland areas, the exclusive dominance of Douglas-fir in plantations here is certainly due largely to the exclusive choice of Douglas-fir for replanting.

The many small wetlands scattered throughout the managed uplands improve the overall ecological condition here through increased habitat and species diversity. These communities include deciduous forest, shrub, sedge, and cattail associations in both riparian and depression wetland settings. Nearly all are impacted by forest management activities to some extent, but ecological conditions vary. In some smaller or less well defined wetlands, complete overstory removal has severely disrupted vegetation communities, resulting in heavy invasive cover and few remaining native wetland species. In these heavily disturbed wetlands, pioneering red alder and black cottonwood are fast out-growing replanted Douglas-fir, which is poorly adapted to these seasonally inundated environments (i.e. polygon 45). In several areas, mature forest buffers remain around larger wetland, and these appear in good condition with only minor encroachment by exotics (polygons 6, 9, and 24). Reed canarygrass is the most common invasive, present to some extent at most moist areas in the managed uplands.

Two small but unique communities occur within the managed uplands, adding a limited but important amount of diversity to this area. A roughly 15 acre clear-cut adjacent to the high-tension powerline corridor (polygon 23) was replanted with a mix of lodgepole pine and Douglas-fir 5 to 10 years ago. While lodgepole pine is an unusual occurrence this far south in the Puget Trough, both tree species appear to be growing vigorously and this patch shows promise to develop into a mature PICO2-PSME/GASH community. This young forest, like other nearby plantations, is currently in poor ecological condition, with severe infestations of invasive blackberry, Scotch broom, and Canada thistle. Also of concern are potential successional changes. Chappell (2006) predicts that in the absence of fire, this dominance type will progress into Douglas-fir and hemlock dominated communities (particularly mentioning the adjacent PSME/GASH-HOD1 type). The PICOC2-PSME/GASH community is ranked as critically imperiled at both the state and global level so despite the artificial origin of this occurrence and current poor condition, this stand represents a valuable habitat worthy of conservation efforts.

The PSME-ARME/GASH community represents another small but ecologically important area of unique forest type at Nisqually-Mashel. Located along the southern edge of the large managed flats north of the Nisqually River, about half of this community was clear-cut and replanted with Douglas-fir 10 to 15 years ago. Despite this intense disturbance, madrone has regenerated naturally and is codominant with the Douglas-fir in the thin strip of suitable south-facing slope-top habitat. While very weedy (the usual high cover of blackberry and Scotch broom), a healthy layer of salal exists here and this young forest seems well on its way to maturing as PSME-ARME/GASH community type. Farther along this ridge to the northeast, this forest type is in excellent condition, buffered on both sides by mature forest. This community is ranked vulnerable/imperiled globally and imperiled in Washington State, with only 11 good quality occurrences known. The occurrence here at Nisqually-Mashel, while small (2-3 acres), patchy, and partially degraded, is recommended as a conservation priority.

Unmanaged River Canyons

Ecological conditions within the unmanaged forests of the river canyons stand in stark contrast to those in plantation forests above. Generally, these forest habitats are in good to excellent conditions (conditions ranks "A/B" to "B"). While not old enough to be considered "old growth" by most definitions, these forest are fully mature (100-200 years) and have levels of structural and floristic complexity approaching those characteristically found in old growth forests (multi-storied; multi-aged; mixed tree species assemblages; well developed, diverse shrub and herb/forb layers; large woody debris and, to a lesser extent snags, well represented). These mature, primary forests, about 40% of the park's total area, are rare elsewhere in the Puget Lowlands and represent an important part of regional diversity.

Exotic species, and noxious species in particular, have low cover and limited distribution within the river canyons, but there are several problem areas that need mention. The most serious is the presence of several noxious species along the edges of both rivers. Class B noxious butterfly bush is becoming established in several limited sites along the banks of both rivers. This escaped ornamental shrub, recently added to the State noxious weed list, can form dense thickets along watercourses, disrupting and displacing native riparian communities. Once establish, this species is very difficult to remove. Two other Class B noxious weeds, purple loosestrife and brownray knapweed, were also noted on floodplains immediately adjacent to both rivers. Both species, observed as only few scattered individuals, could be easily contained and eradicated at current levels but will likely spread if

untreated. We found several small patches of English ivy becoming established within the mature PSME-THPL/OXOR forest adjacent to the Nisqually River (polygon 18). While this species does not currently have noxious status in Pierce or Thurston Counties, it thrives in western Washington forests and can overrun the native understory. Chappell (2006) specifically cites English ivy as a potential threat to the PSME-THPL/OXOR community (and several others).

Another exotic, herb Robert, is also widespread in some areas of mature canyon forest habitat. This invasive annual thrives in sheltered understories where it poses a threat to plant diversity by displacing native species. We noted large, often dense patches of herb Robert in PSME-THPL/OXOR forests along the lower canyon slopes and river benches, and to a lesser extent in the PSME-TSHE/POMU-DREX communities higher on these slopes. Herb Robert is a Class B Designate species in Washington, and since it is already widespread throughout the Puget Trough, control is not mandatory in this region. However, both of these community types are specifically identified by Chappell as being susceptible to damage by heavy herb Robert infestations. Given the otherwise high-quality of these communities, we believe efforts should be made to monitor the extent and spread of this species.

Two other important community types occur within the river canyons, contributing to the overall high ecological diversity here. Three sizable patches of red alder / salmonberry wetland forest are found along the upper river floodplain margins. While not ranked as rare at the global or state level, WNHP does list this community as “rare/high-quality” within Pierce County. These occurrences are mostly in excellent condition, threatened only slightly by encroachment by invasives from along the adjacent river margins, and as discussed, these invasive populations are currently small and easily eradicated. Also, a single patch of PSME-TSHE/VAOV2/POMU community is located on the steep slopes north of the Nisqually River. This is a relatively young (60-120 years) forest with little structural diversity, and some encroachment of exotics from the weedy plantations to the north. While these factors resulted in an fairly poor condition rank, this areas has not been subject to forest management or human disturbance. This community is designated as a critically imperiled within Washington.

Management Considerations

Based on our assessments, we would recommend the following actions to protect specific plant communities and improve overall ecological conditions on the Nisqually-Mashel property:

- Remove all occurrences of noxious butterfly bush, English ivy, purple loosestrife, and brownray knapweed from the river corridors and periodically monitor here for re-infestations of these and other noxious species.
- Monitor the extent of herb Robert infestation within high-quality mixed conifer forests on the lower canyon slopes. Consider removal strategies if spread is apparent.
- Remove blackberry, Scotch broom and other invasives from along road corridors through high-quality mixed conifer forest.
- Consider silvicultural options to reduce stocking and increase forest structure and species diversity within the dense, stem exclusion stage plantations of the managed uplands.
- Monitor and ensure the continued health and development of the young PICOC2-PSME and PSME-ARME communities to ensure the continued presence of these unique forest communities.
- Ensure protection for the many wetland occurrences and types within the park, with special attention to recreational impacts and the spread of invasive reed canarygrass in the managed uplands.

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(<http://www.dnr.wa.gov/nhp/refdesk/gis/wnhpgis.html>).
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Appendix A: Field Survey Schedule and Effort

May 8-12, 2005

Survey Effort: 15 personnel-hours
Field Staff: John Luginbuhl

June 17-21, 2005

Survey Effort: 28.25 personnel-hours
Field Staff: John Luginbuhl and Steven Youngs

August 11-13, 2005

Survey Effort: 20.5 personnel-hours
Field Staff: John Luginbuhl

September 1-3, 2005

Survey Effort: 15 personnel-hours
Field Staff: John Luginbuhl

Appendix B: Pre-field Review of Rare Plant Taxa

Scientific Name (Common Name)	General Habitat (Vegetative Associates)	Substrate Affinity	Identification Period
<i>Actaea elata</i> (tall bugbane)	Within or on margins of old growth. Most sites are at or below 600 ft. (PSME, THPL, ACMA, ALRU, ACCI, HODI, COCO, POMU, SYMPH). Associated with PSME/ COCO6/POMU-TITR and TSHE- PSME/POMU-DREX2 plant communities. Population observed ~3 miles SE of park in 1977.	None noted	May - early August
<i>Arenaria paludicola</i> (marsh sandwort)	Wetlands and freshwater marshes from sea level to 1476 ft. Very rare, possibly extirpated in WA. Historical in Pierce County.	Saturated acidic and sandy soils with high organic content	May - August
<i>Aster borealis</i> (northern bog aster)	Marshes, bogs, fens, and lakesides from the lowland to subalpine zones (CAREX, AGROS). Collected historically within 5 miles.	None noted	July - September
<i>Aster curtus</i> (white-top aster)	Open grassland habitats in the Puget Trough, at 100-550 ft. (FEID, SYAL, AMAL2, SOLID, ERLA6, VIAD, BADE2, ACMI2, HYRA3, HYPE, CYSC4). Known populations in Pierce County.	Gravelly, glacial outwash soils	July - August
<i>Balsamorhiza deltoidea</i> (deltoid baslamroot)	Dry grassy areas and rocky, open woodlands at low elevations. Known population within 5 miles.	None noted	June - July
<i>Carex buxbaumii</i> (Buxbaum's sedge)	Peat bogs, marshes, wet meadows, and other wet places from 700-6200 ft. (Sphagnum, ERIOP, SPDO, CAUT, EQUIS, COPA28, PIEN, SALIX, PICO).	Rooted in saturated soil	June - August
<i>Carex comosa</i> (bristly sedge)	Marshes, lake shores, and wet meadows from 50-2000 ft. (CAUT, COPA28, TYLA, SPDO, DUAR3, PHAR3). Known population within 5 miles.	None noted	May - July
<i>Cicuta bulbifera</i> (bulb-bearing water-hemlock)	Edges of marshes and lake margins, in bogs, wet meadows, shallow standing water and along slow moving streams (Sphagnum, CAREX, JUEN, ERGR8, GLYCE, COPA28, METR3, EQUIS, SPDO, PHAR3). Known population within 5 miles.	None noted	August - September
<i>Euonymus occidentalis</i> (western burning bush)	Shaded, moist draws and ravines, associated with oak savannah and TSHE- PSME/POMU-DREX2 forest community. (QUGA, PSME, RHPU, SYAL, RUUR, MAAQ, AMAL2, OECR, ROGY, COCO6, RONU, GAAP2, VIGL, TROV2, DIFO, GASH, MAST4, TSHE, THPL, POMU, FRVE, VIAM, POPR).	Often on fine sandy loam, silty loam, and silty clay loam soils.	May - June

Appendix B: (continued)

Scientific Name (Common Name)	General Habitat (Vegetative Associates)	Substrate Affinity	Identification Period
<i>Githopsis specularioides</i> (common blue-cup)	Open habitats in otherwise forested landscape (PSME, PIPO, QUGA, PSSP6, FEID, BRTE, BRMO, LOMAT, COPA3, HERA3, PLCO4, ZIVE). Known population within 5 miles.	Relatively bare soil, bedrock outcrops, talus slopes, gravelly prairies	Mid April - mid June
<i>Howellia aquatilis</i> (howellia)	Seasonally inundated, low elevation minerotrophic wetlands (FRLA, SYAL, SISU2, CAVE6, POTAM, PHAR3). Collected with 15 miles.	None noted	March - July
<i>Hydrocotyle ranunculoides</i> (floating water pennywort)	Shallow freshwater lakes, ponds, ditches and swamps (PHAR3, LYSA2, NULUP, SPDO, MYLA, COPA28). Known population within 5 miles.	Generally muddy/sandy	
<i>Isoetes nuttallii</i> (Nuttall's quillwort)	Terrestrial in wet ground or seepages and in mud near vernal pools. Low to middle elevations. Known population within 5 miles.	None noted	Mid April - early June
<i>Lathyrus torreyi</i> (Torrey's peavine)	Within somewhat open areas within Douglas fir dominated sites (POMU, PTAQ, MANE2, GASH, GAAP2, RUBUS). Collected historically in Pierce County.	Forest openings, trail edges	May - July
<i>Polystichum californicum</i> (California swordfern)	Various forests habitats ~100-400 ft. Known population within 5 miles.	None noted	Year round but sori useful
<i>Trillium parviflorum</i> (small-flowered trillium)	Moist areas dominated by hardwoods, 25-700 ft. (FRLA, QUGA, ACCI, MOPA2, MANE2, POMU, MADI, RAUN, GAAP2, CAO3). Known population within 3 miles.	Generally moist alluvial soil often covered with humus	July - Aug

Appendix C: Vegetation Survey Data

Legend

Polygon # = map number

Observer = observer name(s)

Date = day-month-year completed polygon survey

Polygon Area = in acres

Survey intensity

- 1 = walked or could see most of polygon (high confidence in survey data)
- 2 = walked or could see part of polygon interior (moderate confidence)
- 3 = walked perimeter or could see part of polygon interior (low confidence)
- 4 = photo interpretation or other remote survey

Total Vegetation Cover (%) Includes all vascular plants, mosses, lichens and foliose lichens (crustose lichens excluded); this never exceeds 100%.

Vegetation Cover by Layer (Trees, Shrubs, Graminoids, Forbs, and Exotics) This is canopy cover, including the space between leaves/branches. Each layer total cover can be 0-100%. Therefore, the sum of all layers can exceed 100%.

Dominant Species = most abundant species in each layer

Covers = all cover estimates are coded as:

Code	Cover(%)
0	0
1	<1
2	1-5
3	6-25
4	26-60
5	61-90
6	91-100

SOIL SURFACE estimated to nearest % (sum of categories = 100%) the following:

Rock outcrop = exposed bedrock including detached boulders over 1m across

Gravel/cobble = large fragments between sand and boulder

Bare ground = exposed mineral soil

Mosses/lichens = nonvascular plant cover on soil

Litter = logs, branches, and basal area of plants

LAND USE—coded as follows (“0” for any category not applicable to site)

Logging

- 1 = unlogged, no evidence of past logging or occasional cut stumps not part of systematic harvest of trees, no or very little impact on stand composition
- 2 = selectively logged: frequent cut stumps but origin of dominant or co-dominant cohort appears to be natural disturbance
- 3 = heavy logging disturbance with natural regeneration: many cut stumps that predate the dominant or co-dominant cohort with no tree planting
- 4 = tree plantation: dominant cohort appears to be planted after clearcutting

Stand Age

- 1 = very young 0-40 yr
- 2 = young 40-90 yr
- 3 = mature 90-200 yr
- 4 = old-growth 200+ yr
- 5 = young with scattered old trees (2-10 old trees per acre)
- 6 = mature with scattered old trees

Agriculture

- 1 = active annual cropping
- 2 = active perennial herbaceous cropping
- 3 = active woody plant cultivation
- 4 = fallow, plowed no crops this yr
- 5 = Federal CRP
- 6 = other

Livestock

- 1 = active heavy grazing (most forage used to ground soil compaction or churning)
- 2 = active moderate grazing (25-75% forage used)
- 3 = active light grazing (lots of last yrs litter left)
- 4 = no current, heavy past grazing
- 5 = no current, light past grazing
- 6 = no obvious sign of grazing

Development

- 1 = actively used facilities
- 2 = roads
- 3 = established trails
- 4 = abandoned facilities
- 5 = none obvious
- 6 = multiple types (detail in comments)

Wildlife

- 1 = heavy ungulate use
- 2 = moderate ungulate use
- 3 = light to no ungulate use
- 4 = burrowing animals
- 5 = active beaver
- 6 = active porcupine
- 7 = other, list animal

Recreation Use Severity

- 1 = heavy use, abundant soil and vegetation displacement off trail/road
- 2 = moderate use, frequent soil and vegetation displacement off trail/road
- 3 = light use, little sign of activity off trail/road

Recreation Use Primary Type

- 1 = wheeled
- 2 = hoofed
- 3 = pedestrian
- 4 = combination of above
- 5 = other

Hydrology

- 1 = unaltered
- 2 = altered; dams, dikes, ditches, culverts, etc
- 3 = not assessed

Plant Association (PA) = All PAs encountered in polygon

Condition Rank - a qualitative measure of forest ecological condition, estimated for coniferous forests associations based on the following criteria:

- A = Old growth (>200yrs) overstory, or mature (90-200yrs) overstory with scattered remnant old-growth trees; multi-aged and multi-storied canopies with many large canopy gaps (complex structure); numerous large snags and large woody debris well represented; species diversity moderate to high; little or no exotic species present at any vegetation level; no history of forest management.
- B = Mature overstory with well-defined intermediate or understory canopy layers and some canopy gap formation; some small snags and large woody debris present; moderate understory species diversity; exotics, when present not dominant at any level; little or no history of forest management.
- C = Young (40-90yrs) overstory; mostly single-storied, single-aged but with some understory development (understory re-initiation stage); few snags and little large woody debris; low to medium understory species diversity; exotics usually present, often dominant in disturbed areas; native species usually dominant in undisturbed areas; usually historical, intensive forest management or other stand replacement disturbance.
- D = Very young (0-40yrs) overstory; single-aged, single-storied with uniform canopy cover (stand initiation to stem exclusion stage); few snags, little or no large woody debris; low species diversity and/or exotic species dominate the understory; recent intensive forest management or other stand replacement disturbance.

% of Polygon = estimated

Pattern = how PA is distributed in polygon

- 1 = matrix (most of polygon)
- 2 = large patches
- 3 = small patches
- 4 = clumped, clustered, contiguous
- 5 = scattered, more or less evenly repeating
- 6 = linear
- 7 = other

Exotic Species - species observed and cover code

Notes: Details on codes used above. When trees are cored, canopy position, species, dbh, age, and length of core are noted.

Polygon # 1					
Observer: J. Luginbuhl		Polygon Area (acres): 10.01			
Date: 3-Sep-06		Survey Intensity: 3			
Specific Location: Southernmost edge of western arm of park, beyond end of Medical Springs Rd.					
TOTAL VEG COVER (%)		0			
TREES	Dominant species				
	Cover (Code)	Total	0		
		Emergent	0		
		Main canopy	0		
		Subcanopy	0		
SHRUBS	Dominant species				
	Cover (Code)	Total	0		
		> 1.5' tall	0		
		< 1.5' tall	0		
GRAMINOIDS	Dominant species				
	Cover (Code)	Total	0		
		Perennial	0		
		Annual	0		
FORBS	Dominant species				
	Cover (Code)	Total	0		
		Perennial	0		
		Annual	0		
EXOTICS	Cover (Code)	Total	0	EXOTIC SPECIES	CCode
		Perennial	0	1)	
		Annual	0	2)	
				3)	
SOIL	Rock Outcrop	NA	4)		
	SURFACE (%)	Gravel	NA	5)	
		Bare Ground	NA	6)	
		Moss-Lichen	NA		
		Litter	NA		
LAND USE	Logging	0	Wildlife	0	
	CODE	Stand Age	0	Recreation Severity	0
		Agriculture	0	Recreation Type	0
		Livestock	0	Hydrology	1
		Development	0		
PLANT ASSOCIATIONS			Rank	%	Pattern
1) River			-	100	4
2)					
3)					
4)					
NOTES:					

Polygon # 2					
Observer: J. Luginbuhl		Polygon Area (acres): 20.04			
Date: 3-Sep-06		Survey Intensity: 1			
Specific Location: Nisqually River bank past end of Medical Springs Rd.					
TOTAL VEG COVER (%)		90			
TREES	Dominant species		PSME / ALRU2 / POBAT / THPL		
	Cover (Code)	Total	4		
		Emergent	0		
		Main canopy	4		
		Subcanopy	2		
SHRUBS	Dominant species		CYSC4 / COSES / RUAR9 / SYAL		
	Cover (Code)	Total	4		
		> 1.5' tall	4		
		< 1.5' tall	3		
GRAMINOIDS	Dominant species		PHAR3 / DAGL / BROMU		
	Cover (Code)	Total	4		
		Perennial	4		
		Annual	2		
FORBS	Dominant species		EQUIS / HYRA3 / PRVU		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
EXOTICS	Cover (Code)	Total	5	EXOTIC SPECIES	CCode
		Perennial	5	1) CESTM	2
		Annual	3	2) CYSC4	3
				3) RUAR9	3
SOIL	Rock Outcrop	0	4) RULA	2	
			5) PHAR3	3	
SURFACE (%)	Gravel	10	6) HYRA	2	
	Bare Ground	5			
	Moss-Lichen	0			
	Litter	85			
LAND USE CODE	Logging	0	Wildlife	3	
	Stand Age	1	Recreation Severity	3	
	Agriculture	5	Recreation Type	3	
	Livestock	0	Hydrology	1	
	Development	0			
PLANT ASSOCIATIONS			Rank	%	Pattern
1) TSHE-PSME/POMU-DREX2			B/C	55	4
2) Floodplain margin/sand-gravel bar			-	45	4
3)					
4)					
NOTES: Sand/gravel bar at N end and clearings along road is completely dominated by exotics. Some small patches of floodplain margin along river bank.					

Polygon # 3					
Observer: J. Luginbuhl		Polygon Area (acres): 7.24			
Date: 3-Sep-06		Survey Intensity: 1			
Specific Location: Ridge top and steep S facing slope on N bank of Nisqually River at S end of Medical Springs Rd.					
TOTAL VEG COVER (%)		100			
TREES	Dominant species		PSME / THPL / ARME		
	Cover (Code)	Total	6		
		Emergent	3		
		Main canopy	4		
		Subcanopy	4		
SHRUBS	Dominant species		VAOV2 / COCO6 / GASH		
	Cover (Code)	Total	5		
		> 1.5' tall	4		
		< 1.5' tall	4		
GRAMINOIDS	Dominant species		BROMU		
	Cover (Code)	Total	2		
		Perennial	2		
		Annual	0		
FORBS	Dominant species		LIBO3 / ANMA / MYMU		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
EXOTICS	Cover (Code)	Total	2		
		Perennial	2		
		Annual	1		
			EXOTIC SPECIES	CCode	
			1) CYSC4	2	
SOIL	Rock Outcrop		0		
	SURFACE (%)	Gravel		3	
		Bare Ground		7	
		Moss-Lichen		15	
		Litter		75	
LAND USE	Logging		1		
	CODE	Stand Age		2	
		Agriculture		0	
		Livestock		0	
		Development		0	
		Wildlife	3		
		Recreation Severity	0		
		Recreation Type	0		
		Hydrology	1		
PLANT ASSOCIATIONS				Rank	
1) PSME-TSHE/VAOV2/POMU				C	
2)					
3)					
4)					
				%	
				Pattern	
				4	
NOTES: Ridge top area has GASH cover >60%, higher than PSME-TSHE/VAOV2/POMU description calls for but keys to this association. Slopes very steep (90-120%).					

Polygon # 4				
Observer: J. Luginbuhl		Polygon Area (acres): 35.25		
Date: 2-Sep-06		Survey Intensity: 1		
Specific Location: NE edge of park, between HW 7 and powerline corridor.				
TOTAL VEG COVER (%)		99		
TREES	Dominant species		PSME / ACMA3	
	Cover (Code)	Total	5	
		Emergent	0	
		Main canopy	5	
		Subcanopy	0	
SHRUBS	Dominant species		GASH / RUUR / MANE2 / HODI / VAPA	
	Cover (Code)	Total	4	
		> 1.5' tall	3	
		< 1.5' tall	3	
GRAMINOIDS	Dominant species		BROMU	
	Cover (Code)	Total	2	
		Perennial	2	
		Annual	0	
FORBS	Dominant species		PTAQ / POMU / LIBO3 / TRBOL	
	Cover (Code)	Total	3	
		Perennial	3	
		Annual	2	
EXOTICS	Cover (Code)	Total	3	
		Perennial	3	
		Annual	0	
			EXOTIC SPECIES	CCode
		1) CIAR4	2	
		2) CYSC4	2	
		3) RUAR9	2	
		4) RULA	2	
		5) ELRE4	2	
		6) HYRA3	2	
SOIL	Rock Outcrop	0		
SURFACE (%)	Gravel	0		
	Bare Ground	0		
	Moss-Lichen	35		
	Litter	65		
LAND USE	Logging	4	Wildlife	3
CODE	Stand Age	1	Recreation Severity	2
	Agriculture	0	Recreation Type	1
	Livestock	6	Hydrology	1
	Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern
1) PSME/GASH-HODI		C/D	50	1
2) PSME/GASH/POMU		C/D	35	3
3) PSME/Depauperate		D	15	3
4)				
NOTES: Actively used unauthorized FWD track through forest from HW 7 to powerline road.				

Polygon # 5				
Observer: J. Luginbuhl		Polygon Area (acres): 8.60		
Date: 2-Sep-06		Survey Intensity: 1		
Specific Location: SE of intersection of HW 7 and Medical Springs Rd.				
TOTAL VEG COVER (%)		97		
TREES	Dominant species		PSME / FRLA / POBAT / THPL / ALRU2	
	Cover (Code)	Total	4	
		Emergent	0	
		Main canopy	4	
		Subcanopy	0	
SHRUBS	Dominant species		SPSO / GASH / RUUR / ACCI	
	Cover (Code)	Total	4	
		> 1.5' tall	4	
		< 1.5' tall	3	
GRAMINOIDS	Dominant species		TYLA / SPEM2 / CAOBS / PHAR3	
	Cover (Code)	Total	4	
		Perennial	4	
		Annual	0	
FORBS	Dominant species		POMU / PTAQ / ALPL	
	Cover (Code)	Total	3	
		Perennial	3	
		Annual	2	
EXOTICS	Cover (Code)	Total	2	
		Perennial	2	
		Annual	0	
			EXOTIC SPECIES	CCode
			1) CYSC4	1
		2) PHAR3	2	
		3) HYRA3	1	
		4)		
		5)		
		6)		
SOIL	Rock Outcrop	0		
SURFACE (%)	Gravel	0		
	Bare Ground	2		
	Moss-Lichen	5		
	Litter	92		
LAND USE	Logging	4		
CODE	Stand Age	1		
	Agriculture	0		
	Livestock	6		
	Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern
1) PSME/GASH/POMU		C	50	1
2) FRLA/CAOB3		-	15	6
3) TYLA		-	15	4
4) CAVE6		-	10	4
5) SPDO		-	10	4
NOTES:				

Polygon # 6						
Observer: J. Luginbuhl		Polygon Area (acres): 8.62				
Date: 2-Sep-06		Survey Intensity: 1				
Specific Location: SE of junction of HW 7 and Medical Springs Rd.						
TOTAL VEG COVER (%)		99				
TREES	Dominant species		FRLA / PSME / POBAT / ALRU2			
	Cover (Code)	Total	5			
		Emergent	3			
		Main canopy	5			
		Subcanopy	3			
SHRUBS	Dominant species		RUUR / HODI / RUAR9 / MANE2 / SPDO			
	Cover (Code)	Total	4			
		> 1.5' tall	4			
		< 1.5' tall	3			
GRAMINOIDS	Dominant species		ELGL / TYLA / CAO3 / CADE9			
	Cover (Code)	Total	3			
		Perennial	3			
		Annual	0			
FORBS	Dominant species		PTAQ / CIAR4 / POMU			
	Cover (Code)	Total	4			
		Perennial	4			
		Annual	2			
EXOTICS	Cover (Code)	Total	3			
		Perennial	3			
		Annual	0			
			EXOTIC SPECIES	CCode		
			1) CIAR4	2		
SOIL	Rock Outcrop		0			
	SURFACE (%)	Gravel	0			
		Bare Ground	5			
		Moss-Lichen	35			
		Litter	60			
LAND USE	Logging	2		Wildlife	3	
	CODE	Stand Age	2		Recreation Severity	3
		Agriculture	0		Recreation Type	3
		Livestock	6		Hydrology	2
		Development	0			
PLANT ASSOCIATIONS		Rank	%	Pattern		
1) PSME/GASH/POMU		C	40	3		
2) PSME/COCO6/POMU-TITR		B/C	30	3		
3) FRLA/CAOB3		-	15	3		
4) SALUL		-	10	3		
5) SPDO		-	5	4		
NOTES: Hydrology: diversions from adjacent development						

Polygon # 7				
Observer: J. Luginbuhl		Polygon Area (acres): 12.87		
Date: 3-Sep-06		Survey Intensity: 2		
Specific Location: NW edge of park property west of Medical Springs Rd.				
TOTAL VEG COVER (%)		98		
TREES	Dominant species	PSME / ACMA3		
	Cover (Code) Total	4		
	Emergent	0		
	Main canopy	4		
	Subcanopy	0		
SHRUBS	Dominant species	HODI / GASH / CYSC4 / RUUR / COCO6		
	Cover (Code) Total	5		
	> 1.5' tall	4		
	< 1.5' tall	4		
GRAMINOIDS	Dominant species	ELGL / DAGL / PHAR3 / FESTU		
	Cover (Code) Total	4		
	Perennial	4		
	Annual	2		
FORBS	Dominant species	POMU / PTAQ / CIAR4 / HYPE		
	Cover (Code) Total	3		
	Perennial	3		
	Annual	2		
EXOTICS	Cover (Code) Total	3	EXOTIC SPECIES	CCode
	Perennial	3	1) CYSC4	3
	Annual	2	2) CIAR4	2
			3) RUAR9	2
SOIL	Rock Outcrop	0	4) PHAR3	3
			5) DAGL	2
			6) HYRA3	2
SURFACE (%)	Gravel	0		
	Bare Ground	0		
	Moss-Lichen	5		
	Litter	95		
LAND USE CODE	Logging	4	Wildlife	2
	Stand Age	1	Recreation Severity	0
	Agriculture	0	Recreation Type	0
	Livestock	6	Hydrology	1
	Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern
1) PSME/GASH-HODI		C/D	80	1
2) PSME-(ACMA3)/ELGL		C/D	20	3
3)				
4)				
NOTES: In PSME/GASH-HODI, PSME saplings are <10yrs; large canopy gaps with many exotics and high shrub cover.				

Polygon # 8				
Observer: J. Luginbuhl		Polygon Area (acres): 57.30		
Date: 3-Sep-06		Survey Intensity: 2		
Specific Location: W arm of park property, W of Medical Springs Rd.				
TOTAL VEG COVER (%)		98		
TREES	Dominant species		PSME / ACMA3 / POBAT	
	Cover (Code)	Total	5	
		Emergent	2	
		Main canopy	4	
		Subcanopy	0	
SHRUBS	Dominant species		MANE2 / CYSC4 / SYAL / GASH / RUUR	
	Cover (Code)	Total	4	
		> 1.5' tall	4	
		< 1.5' tall	4	
GRAMINOIDS	Dominant species		ELGL / FESTU / HOLA / AGCA5	
	Cover (Code)	Total	3	
		Perennial	3	
		Annual	0	
FORBS	Dominant species		POMU / PTAQ / CIAR4	
	Cover (Code)	Total	4	
		Perennial	4	
		Annual	2	
EXOTICS	Cover (Code)	Total	4	
		Perennial	4	
		Annual	2	
SOIL	Rock Outcrop	0		
	SURFACE (%)	Gravel	2	
		Bare Ground	2	
		Moss-Lichen	5	
		Litter	91	
LAND USE	Logging	4		
	CODE	Stand Age	1	
		Agriculture	0	
		Livestock	6	
		Development	0	
PLANT ASSOCIATIONS		Rank	%	Pattern
1) PSME/GASH-HODI		C/D	65	1
2) PSME-(ACMA3)/ELGL		C/D	20	3
3) ALRU2/POMU		-	15	3
4)				
NOTES: PSME regeneration very uneven, many canopy gaps with high shrub and exotic cover. Cirsium arvense and Cytisus scoparius widespread with high cover.				

Polygon # 9					
Observer: J. Luginbuhl		Polygon Area (acres): 6.23			
Date: 3-Sep-06		Survey Intensity: 1			
Specific Location: Wetland just NE of cemetery on Medical Springs Rd.					
TOTAL VEG COVER (%)		100			
TREES	Dominant species		ALRU2 / FRLA / THPL / ACMA3		
	Cover (Code)	Total	5		
		Emergent	3		
		Main canopy	4		
		Subcanopy	3		
SHRUBS	Dominant species		SALIX / SPDO / ROGY / ACCI		
	Cover (Code)	Total	5		
		> 1.5' tall	5		
		< 1.5' tall	3		
GRAMINOIDS	Dominant species		CAOB3 / CADE9 / CAST5		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	0		
FORBS	Dominant species		POMU / VAHE / SODU / TOME		
	Cover (Code)	Total	4		
		Perennial	4		
		Annual	2		
EXOTICS	Cover (Code)	Total	3		
		Perennial	2		
		Annual	1		
			EXOTIC SPECIES	CCode	
SOIL	Rock Outcrop	0	1) DAGL	2	
	SURFACE (%)	Gravel	0	2) MYMU	1
		Bare Ground	5	3) RUAR9	1
		Moss-Lichen	15	4) RULA	1
		Litter	80	5)	
			6)		
LAND USE	Logging	1	Wildlife	3	
CODE	Stand Age	2	Recreation Severity	0	
	Agriculture	0	Recreation Type	0	
	Livestock	6	Hydrology	1	
	Development	5			
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) ALRU2/POMU		-	50	1	
2) FRLA/CAOB3		-	30	4	
3) SALUL		-	20	2	
4)					
NOTES: Wetland dry by early Sept. Good ecological condition, very few exotics.					

Polygon # 10					
Observer: J. Luginbuhl		Polygon Area (acres): 43.76			
Date: 3-Sep-06		Survey Intensity: 1			
Specific Location: Forested slopes above confluence of Nisqually River and Ohop Creek.					
TOTAL VEG COVER (%)		100			
TREES	Dominant species		PSME / THPL / ACMA3 / POBAT		
	Cover (Code)	Total	6		
		Emergent	3		
		Main canopy	3		
		Subcanopy	5		
SHRUBS	Dominant species		ACCI / GASH / RUSP / MANE2		
	Cover (Code)	Total	3		
		> 1.5' tall	3		
		< 1.5' tall	2		
GRAMINOIDS	Dominant species		PHAR3 / CAREX / BROMU		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	0		
FORBS	Dominant species		POMU / PTAQ / TOME / LIBO3 / VAHE		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
EXOTICS	Cover (Code)	Total	3		
		Perennial	2		
		Annual	1		
			EXOTIC SPECIES	CCode	
SOIL	Rock Outcrop	0	1) PHAR3 2		
	SURFACE (%)	Gravel	3	2) MYMU 2	
		Bare Ground	2	3) RULA 1	
		Moss-Lichen	20	4) RUAR9 1	
		Litter	75	5) 6)	
LAND USE	Logging	1	Wildlife 3		
	CODE	Stand Age	2	Recreation Severity 3	
		Agriculture	0	Recreation Type 3	
		Livestock	0	Hydrology 1	
		Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) TSHE-PSME/POMU-DREX2		B	75	1	
2) ALRU2/POMU		-	25	3	
3)					
4)					
NOTES: Cored: main canopy THPL (dbh 59.9cm, age 1, length 36.3cm).					

Polygon # 11					
Observer: J. Luginbuhl		Polygon Area (acres): 32.01			
Date: 3-Sep-06		Survey Intensity: 1			
Specific Location: Forested wet-flats along Ohop Creek to confluence with Nisqually River.					
TOTAL VEG COVER (%)		100			
TREES	Dominant species		ALRU2 / POBAT / FRLA / THPL		
	Cover (Code)	Total	5		
		Emergent	2		
		Main canopy	5		
		Subcanopy	3		
SHRUBS	Dominant species		RUSP / ACCI / COSES / MANE2 / RUUR / SARA2		
	Cover (Code)	Total	4		
		> 1.5' tall	4		
		< 1.5' tall	2		
GRAMINOIDS	Dominant species		CAOB3 / PHAR3		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	0		
FORBS	Dominant species		POMU / PTAQ / TOME / ASCA2		
	Cover (Code)	Total	4		
		Perennial	4		
		Annual	2		
EXOTICS	Cover (Code)	Total	3		
		Perennial	3		
		Annual	0		
			EXOTIC SPECIES	CCode	
SOIL	Rock Outcrop	0	1) CYSC4 2		
	SURFACE (%)	Gravel	0	2) DAGL 3	
		Bare Ground	0	3) PHAR3 3	
		Moss-Lichen	15	4) RULA 2	
		Litter	85	5) 6)	
LAND USE	Logging	2	Wildlife 3		
	CODE	Stand Age	2	Recreation Severity 0	
		Agriculture	0	Recreation Type 0	
		Livestock	5	Hydrology 1	
		Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) TSHE-PSME/POME-DREX2		B	45	1	
2) ALRU2/RUSP		-	35	3	
3) FRLA/CAOB3		-	15	3	
4) COSES		-	5	3	
NOTES: Very old tall stumps (with springboard notches). COSES in small patches along Ohop Creek channel.					

Polygon # 12				
Observer: J. Luginbuhl		Polygon Area (acres): 9.84		
Date: 2-Sep-06		Survey Intensity: 1		
Specific Location: E-W powerline corridor between Medical Springs Rd. and HW 7.				
TOTAL VEG COVER (%)		80		
TREES	Dominant species	PSME / ACMA3		
	Cover (Code) Total	2		
	Emergent	0		
	Main canopy	2		
	Subcanopy	0		
SHRUBS	Dominant species	SYAL / RUUR / GASH / RUPA		
	Cover (Code) Total	4		
	> 1.5' tall	2		
	< 1.5' tall	3		
GRAMINOIDS	Dominant species	POPR / DAGL / ELGL / AGCA5		
	Cover (Code) Total	5		
	Perennial	5		
	Annual	2		
FORBS	Dominant species	PTAQ / HYRA3 / POAV		
	Cover (Code) Total	4		
	Perennial	3		
	Annual	3		
EXOTICS	Cover (Code) Total	4	EXOTIC SPECIES	CCode
	Perennial	4	1) CYSC4	3
	Annual	3	2) CIAR4	2
			3) POPR	3
SOIL	Rock Outcrop	0	4) PHAR3	2
			5) RULA	2
SURFACE (%)	Gravel	10	6) DAGL	2
	Bare Ground	10	7) PLLA	2
	Moss-Lichen	0	8) HYRA3	2
	Litter	80		
LAND USE CODE	Logging	3	Wildlife	3
	Stand Age	0	Recreation Severity	3
	Agriculture	0	Recreation Type	4
	Livestock	6	Hydrology	1
	Development	6		
PLANT ASSOCIATIONS		Rank	%	Pattern
1) Disturbed		-	100	6
2)				
3)				
4)				
NOTES: Polygon is a powerline corridor and access road. Recreation Type: FWD vehicles, hiking, and horseback riding. Unauthorized FWD access is by informal road through polygon 4.				

Polygon # 13				
Observer: J. Luginbuhl		Polygon Area (acres): 6.84		
Date: 2-Sep-06		Survey Intensity: 1		
Specific Location: High tension powerline corridor running from Medical Springs Rd. SE over Mashel River.				
TOTAL VEG COVER (%)		90		
TREES	Dominant species	POBAT / ACMA3		
	Cover (Code) Total	3		
	Emergent	0		
	Main canopy	3		
	Subcanopy	0		
SHRUBS	Dominant species	CYSC4 / GASH / RUUR		
	Cover (Code) Total	4		
	> 1.5' tall	3		
	< 1.5' tall	4		
GRAMINOIDS	Dominant species	PHAR3 / DAGL / AGCA5 / ELGL / BROMU		
	Cover (Code) Total	5		
	Perennial	5		
	Annual	2		
FORBS	Dominant species	PTAQ / HYPE / POLYG4		
	Cover (Code) Total	4		
	Perennial	3		
	Annual	3		
EXOTICS	Cover (Code) Total	5	EXOTIC SPECIES	CCode
	Perennial	4	1) CYSC4	3
	Annual	3	2) CIAR4	2
			3) CIVU	1
SOIL	Rock Outcrop	0	4) PHAR3	2
			5) DAGL	2
SURFACE (%)	Gravel	5	6) HYRA3	2
	Bare Ground	5	7) PLLA	2
	Moss-Lichen	5		
	Litter	85		
LAND USE CODE	Logging	3	Wildlife	7
	Stand Age	0	Recreation Severity	3
	Agriculture	0	Recreation Type	4
	Livestock	3	Hydrology	1
	Development	1		
PLANT ASSOCIATIONS		Rank	%	Pattern
1) Disturbed		-	100	1
2)				
3)				
4)				
NOTES: Polygon is a powerline corridor and access road. A small impoundment wetland in S half is heavily impacted by powerline corridor maintenance and unauthorized FWD access. Recreation Type: vehicles, hiking, hunting, and horseback riding. Wildlife: deer tracks and bear scat.				

Polygon # 14				
Observer: J. Luginbuhl		Polygon Area (acres): 39.58		
Date: 11-Aug-06		Survey Intensity: 2		
Specific Location: Between Medical Springs Rd. and Mashel River canyon.				
TOTAL VEG COVER (%)		99		
TREES	Dominant species	PSME / POBAT / FRLA / ALRU2		
	Cover (Code) Total	5		
	Emergent	0		
	Main canopy	5		
	Subcanopy	3		
SHRUBS	Dominant species	ACCI / SALUL / COCO6 / GASH / RUUR		
	Cover (Code) Total	4		
	> 1.5' tall	4		
	< 1.5' tall	3		
GRAMINOIDS	Dominant species	CAOB3 / PHAR3 / AGCA5 / DAGL		
	Cover (Code) Total	3		
	Perennial	3		
	Annual	0		
FORBS	Dominant species	PTAQ / POMU / CIAR4		
	Cover (Code) Total	3		
	Perennial	3		
	Annual	2		
EXOTICS	Cover (Code) Total	3	EXOTIC SPECIES	CCode
	Perennial	3	1) CIAR4	3
	Annual	2	2) PHAR3	3
			3) RUAR9	2
SOIL	Rock Outcrop	0	4) RULA	2
			5) DAGL	2
SURFACE (%)	Gravel	0	6) HYPE	1
	Bare Ground	10		
	Moss-Lichen	15		
	Litter	75		
LAND USE	Logging	4	Wildlife	3
CODE	Stand Age	1	Recreation Severity	0
	Agriculture	0	Recreation Type	0
	Livestock	6	Hydrology	1
	Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern
1) PSME/GASH/POMU		C/D	63	1
2) FRLA/CAOB3		-	30	3
3) SALUL		-	7	4
4)				
NOTES: Cored: main canopy PSME (dbh=19.3cm, dbh age=15, length=8.53cm). SALUL is located in W of polygon where intersection of powerline and old logging road beds create a small impoundment wetland. FRLA/CAOB3 is found throughout in small depression wetlands.				

Polygon # 15 Observer: J. Luginbuhl Date: 12-Aug-06 Specific Location: End of Medical Springs Rd.				Polygon Area (acres): 4.87 Survey Intensity: 3			
TOTAL VEG COVER (%)							
TREES		Dominant species Cover (Code) Total Emergent Main canopy Subcanopy					
SHRUBS		Dominant species Cover (Code) Total > 1.5' tall < 1.5' tall					
GRAMINOIDS		Dominant species Cover (Code) Total Perennial Annual					
FORBS		Dominant species Cover (Code) Total Perennial Annual					
EXOTICS		Cover (Code) Total		EXOTIC SPECIES		CCode	
		Perennial		1)			
		Annual		2)			
				3)			
				4)			
SOIL		Rock Outcrop		5)			
SURFACE (%)		Gravel		6)			
		Bare Ground					
		Moss-Lichen					
		Litter					
LAND USE		Logging		0		Wildlife	
CODE		Stand Age		0		Recreation Severity	
		Agriculture		0		Recreation Type	
		Livestock		0		Hydrology	
		Development		6		3	
PLANT ASSOCIATIONS				Rank		% Pattern	
1) Disturbed/developed				-		100 4	
2)							
3)							
4)							
NOTES: Ownership of this polygon is uncertain - posted as "Private Property - No Trespassing" where road enters.							

Polygon # 16				
Observer: J. Luginbuhl		Polygon Area (acres): 72.63		
Date: 11-Aug-06		Survey Intensity: 2		
Specific Location: S of intersection of high tension powerline and Medical Springs Rd.				
TOTAL VEG COVER (%)		98		
TREES	Dominant species		PSME / POBAT / ALRU2 / FRLA	
	Cover (Code)	Total	5	
		Emergent	3	
		Main canopy	5	
		Subcanopy	2	
SHRUBS	Dominant species		GASH / HODI / RUUR / CYST4 / PHCA11	
	Cover (Code)	Total	4	
		> 1.5' tall	4	
		< 1.5' tall	2	
GRAMINOIDS	Dominant species		ELGL / PHAR3 / CAO3 / DAGL / AGCA5	
	Cover (Code)	Total	3	
		Perennial	3	
		Annual	0	
FORBS	Dominant species		POMU / PTAQ / DACA6 / LOTUS	
	Cover (Code)	Total	3	
		Perennial	3	
		Annual	2	
EXOTICS	Cover (Code)	Total	4	
		Perennial	3	
		Annual	2	
			EXOTIC SPECIES	CCode
SOIL	Rock Outcrop	0		
	SURFACE (%)	Gravel	2	
		Bare Ground	2	
		Moss-Lichen	20	
		Litter	76	
			1) CYSC4	3
			2) CIAR4	2
			3) RUAR9	3
			4) RULA	3
			5) PHAR3	2
			6) DAGL	2
			7) HYRA3	1
			8) HYPE	1
LAND USE	Logging	4	Wildlife	3
CODE	Stand Age	1	Recreation Severity	3
	Agriculture	0	Recreation Type	4
	Livestock	6	Hydrology	2
	Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern
1) PSME/GASH/POMU		D	70	1
2) ALRU2/POMU		-	15	2
3) PSME/GASH-HODI		D	10	3
4) FRLA/CAOB3		-	5	3
NOTES: Uneven regeneration, many canopy gaps with high shrub and exotic cover. Rubus armeniacus, R. laciniatus and Cytisus scoparius widespread with high cover. Recreation Type: vehicle traffic, hiking, hunting, and horseback riding. Hydrology: altered by culvert placements.				

Polygon # 17				
Observer: J. Luginbuhl		Polygon Area (acres): 4.80		
Date: 12-Aug-06		Survey Intensity: 2		
Specific Location: Two isolated park property blocks S of Medical Springs Rd.				
TOTAL VEG COVER (%)		95		
TREES	Dominant species	PSME / ACMA3		
	Cover (Code) Total	4		
	Emergent	3		
	Main canopy	4		
	Subcanopy	3		
SHRUBS	Dominant species	SYAL / RUUR / GASH / COCO6		
	Cover (Code) Total	4		
	> 1.5' tall	3		
	< 1.5' tall	3		
GRAMINOIDS	Dominant species	DAGL / PHAR3 / POPR		
	Cover (Code) Total	3		
	Perennial	3		
	Annual	2		
FORBS	Dominant species	HYRA3 / MYMU / ASCA5 / COCA5		
	Cover (Code) Total	3		
	Perennial	3		
	Annual	2		
EXOTICS	Cover (Code) Total	3	EXOTIC SPECIES	CCode
	Perennial	3	1) POPR	3
	Annual	2	2) RUAR9	2
			3) DAGL	2
SOIL	Rock Outcrop	0	4) PHAR3	2
			5) RULA	1
SURFACE (%)	Gravel	0	6) ELGL	1
	Bare Ground	0		
	Moss-Lichen	15		
	Litter	85		
LAND USE CODE	Logging	2	Wildlife	0
	Stand Age	2	Recreation Severity	3
	Agriculture	0	Recreation Type	3
	Livestock	5	Hydrology	1
	Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern
1) Disturbed		-	40	4
2) PSME/GASH/POMU		B/C	30	2
3) ALRU2/POMU		-	30	2
4)				
NOTES: Adjacent to and effected by lawn/pasture on private property.				

Polygon # 18				
Observer: J. Luginbuhl		Polygon Area (acres): 14.56		
Date: 1-Sep-06		Survey Intensity: 1		
Specific Location: SE edge of S park property block, in Nisqually River canyon.				
TOTAL VEG COVER (%)		100		
TREES	Dominant species	TSHE / PSME / THPL / ALRU2 / ACMA		
	Cover (Code) Total	6		
	Emergent	3		
	Main canopy	5		
	Subcanopy	3		
SHRUBS	Dominant species	GASH / VAPA / ACCI / MANE2 / RUUR		
	Cover (Code) Total	4		
	> 1.5' tall	3		
	< 1.5' tall	3		
GRAMINOIDS	Dominant species	LUMUM2 / GLST / DAGL		
	Cover (Code) Total	2		
	Perennial	2		
	Annual	0		
FORBS	Dominant species	POMU / OXOR / DREX2 / PTAQ / TITR		
	Cover (Code) Total	6		
	Perennial	5		
	Annual	2		
EXOTICS	Cover (Code) Total	2	EXOTIC SPECIES	CCode
	Perennial	2	1) CIAR4	2
	Annual	1	2) RUAR9	1
			3) DAGL	1
SOIL	Rock Outcrop	15	4) GERO	1
			5) HEHE	1
SURFACE (%)	Gravel	5	6)	
	Bare Ground	5		
	Moss-Lichen	20		
	Litter	55		
LAND USE CODE	Logging	1	Wildlife	3
	Stand Age	5	Recreation Severity	0
	Agriculture	0	Recreation Type	0
	Livestock	6	Hydrology	1
	Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern
1) TSHE-PSME/POMU-DREX2		B	50	1
2) PSME-TSHE/GASH/POMU		B	30	3
3) PSME-THPL/OXOR		A/B	20	4
4)				
NOTES: Slopes very steep (70-90%); soils loose/rocky. Nearly all graminoids and exotics are on lower slopes adjacent to river.				

Polygon # 19				
Observer: J. Luginbuhl		Polygon Area (acres): 78.31		
Date: 12-Aug-06		Survey Intensity: 1		
Specific Location: Clearcut area N of residences at the end of Medical Springs Rd.				
TOTAL VEG COVER (%)		99		
TREES	Dominant species	PSME / POBAT / ACMA3 / ALRU2		
	Cover (Code) Total	4		
	Emergent	5		
	Main canopy	2		
	Subcanopy	4		
SHRUBS	Dominant species	GASH / MANE2 / RUUR / HODI / COCO6		
	Cover (Code) Total	4		
	> 1.5' tall	4		
	< 1.5' tall	3		
GRAMINOIDS	Dominant species	ELGL / DAGL / AGCA5		
	Cover (Code) Total	3		
	Perennial	3		
	Annual	0		
FORBS	Dominant species	POMU / PTAQ / CIAR4 / PRVU		
	Cover (Code) Total	3		
	Perennial	3		
	Annual	2		
EXOTICS	Cover (Code) Total	4	EXOTIC SPECIES	CCode
	Perennial	4	1) CESTM	1
	Annual	2	2) CYSC4	3
			3) RUAR9	3
SOIL	Rock Outcrop	0	4) RULA	3
			5) CIVU	1
SURFACE (%)	Gravel	2	6) DAGL	2
	Bare Ground	2	7) HYPE	2
	Moss-Lichen	10		
	Litter	86		
LAND USE CODE	Logging	4	Wildlife	3
	Stand Age	1	Recreation Severity	3
	Agriculture	0	Recreation Type	4
	Livestock	6	Hydrology	1
	Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern
1) PSME/GASH-HODI		D	50	1
2) PSME/GASH/POMU		D	30	5
3) ALRU2/POMU		-	15	3
4) PSME-(ACMA3)/ELGL		D	5	3
NOTES: Recreation Type: vehicle (FWD access via unauthorized track from Medical Springs Rd.) and hiking. Portions of this polygon adjacent to road used as parking area by local residents for vehicles and trailers. Cored: main canopy PSME (dbh age=12.2cm, age=9, length=5.8cm). Many small canopy gaps with high exotic cover.				

Polygon # 20				
Observer: J. Luginbuhl		Polygon Area (acres): 21.40		
Date: 2-Sep-06		Survey Intensity: 1		
Specific Location: Between HW 7 and E-W poseline corridor to S.				
TOTAL VEG COVER (%)		100		
TREES	Dominant species		PSME / ALRU2 / FRLA	
	Cover (Code)	Total	6	
		Emergent	0	
		Main canopy	5	
		Subcanopy	2	
SHRUBS	Dominant species		GASH / MANE2 / ACCI / HODI / RUUR	
	Cover (Code)	Total	4	
		> 1.5' tall	3	
		< 1.5' tall	4	
GRAMINOIDS	Dominant species		CAREX / BROMU	
	Cover (Code)	Total	2	
		Perennial	2	
		Annual	0	
FORBS	Dominant species		POMU / PTAQ / TRBOL / MAST4	
	Cover (Code)	Total	4	
		Perennial	4	
		Annual	1	
EXOTICS	Cover (Code)	Total	2	
		Perennial	2	
		Annual	0	
			EXOTIC SPECIES	CCode
			1) CYSC4	1
		2) PHAR3	1	
		3)		
		4)		
		5)		
		6)		
SOIL	Rock Outcrop	0		
SURFACE (%)	Gravel	0		
	Bare Ground	0		
	Moss-Lichen	50		
	Litter	50		
LAND USE	Logging	4		
CODE	Stand Age	1		
	Agriculture	0		
	Livestock	6		
	Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern
1) PSME/GASH-HODI		C/D	60	1
2) PSME/GASH/POMU		C/D	40	5
3)				
4)				
NOTES: Variable cover plantation with many small canopy gaps. Cored: main canopy PSME (dbh=20.6cm, dbh age=20, length=8.8cm).				

Polygon # 21										
Observer: J. Luginbuhl		Polygon Area (acres): 38.37								
Date: 2-Sep-06		Survey Intensity: 2								
Specific Location: Just S of junction of HW 7 and Medical Springs Rd.										
TOTAL VEG COVER (%)		99								
TREES	Dominant species		PSME							
	Cover (Code)	Total	0							
		Emergent	5							
		Main canopy	5							
		Subcanopy	2							
SHRUBS	Dominant species		GASH / MANE2 / RUUR / HODI / SYAL							
	Cover (Code)	Total	4							
		> 1.5' tall	3							
		< 1.5' tall	4							
GRAMINOIDS	Dominant species		ELGL / AGCA5 / BROMU							
	Cover (Code)	Total	3							
		Perennial	3							
		Annual	0							
FORBS	Dominant species		POMU / PTAQ / SOLID							
	Cover (Code)	Total	3							
		Perennial	3							
		Annual	2							
EXOTICS	Cover (Code)	Total	3	EXOTIC SPECIES	CCode					
		Perennial	3	1) CIAR4	1					
		Annual	2	2) CYSC4	2					
				3) RUAR9	2					
SOIL	Rock Outcrop	0	4) RULA	2						
			5) HYPE	2						
SURFACE (%)	Gravel	0	6) HYRA3	2						
			Bare Ground	0						
					Moss-Lichen	10				
							Litter	90		
LAND USE CODE	Logging	4	Wildlife	3						
			Stand Age	1	Recreation Severity	3				
					Agriculture	0	Recreation Type	4		
							Livestock	6	Hydrology	1
									Development	0
PLANT ASSOCIATIONS		Rank	%	Pattern						
1) PSME/GASH-HODI		C/D	70	1						
2) PSME/GASH/POMU		C/D	30	5						
3)										
4)										
NOTES: Several large forest openings dominated by Holodiscus discolor, Symphoricarpos albus, Rubus ursinus, and Pteridium aquilinum. Recreation Type: vehicle, hiking, and horseback riding.										

Polygon # 22					
Observer: J. Luginbuhl		Polygon Area (acres): 15.34			
Date: 2-Sep-06		Survey Intensity: 1			
Specific Location: E of junction of high tension powerline and Medical Springs Rd.					
TOTAL VEG COVER (%)		98			
TREES	Dominant species	PSME			
	Cover (Code) Total	5			
	Emergent	0			
	Main canopy	5			
	Subcanopy	2			
SHRUBS	Dominant species	GASH / HODI / SYAL / CTSC4 / MANE2			
	Cover (Code) Total	5			
	> 1.5' tall	4			
	< 1.5' tall	4			
GRAMINOIDS	Dominant species	ELGL / BROMU / DAGL			
	Cover (Code) Total	3			
	Perennial	3			
	Annual	2			
FORBS	Dominant species	PTAQ / CIAR4 / HYPE / EPAN2			
	Cover (Code) Total	3			
	Perennial	3			
	Annual	2			
EXOTICS	Cover (Code) Total	3	EXOTIC SPECIES	CCode	
	Perennial	3	1) CIAR4	3	
	Annual	2	2) CYSC4	3	
			3) HYPE	3	
SOIL	Rock Outcrop	0	4) RULA	2	
	SURFACE (%)	Gravel	0	5) HYRA3	2
		Bare Ground	0	6)	
		Moss-Lichen	10		
Litter		90			
LAND USE CODE	Logging	4	Wildlife	3	
	Stand Age	1	Recreation Severity	3	
	Agriculture	0	Recreation Type	4	
	Livestock	6	Hydrology	2	
	Development	0			
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) PSME/GASH-HODI		C	100	4	
2)					
3)					
4)					
NOTES: West portion of polygon with large canopy gaps dominated by oceanspray and salal Recreation Type: vehicles, hiking, and horseback riding. Cored: main canopy PSME (dbh=26.4cm, dbh age=17, length=11.3cm).					

Polygon # 23					
Observer: J. Luginbuhl		Polygon Area (acres): 17.75			
Date: 11-Aug-06		Survey Intensity: 2			
Specific Location: E of junction of high tension powerline and Medical Springs Rd.					
TOTAL VEG COVER (%)		100			
TREES	Dominant species		PSME / PICO / POBAT / ACMA3		
	Cover (Code)	Total	4		
		Emergent	0		
		Main canopy	4		
		Subcanopy	0		
SHRUBS	Dominant species		CYSC4 / RUAR9 / GASH / SYAL / MANE2 / HODI		
	Cover (Code)	Total	5		
		> 1.5' tall	4		
		< 1.5' tall	4		
GRAMINOIDS	Dominant species		ELGL / AGCA5		
	Cover (Code)	Total	2		
		Perennial	2		
		Annual	0		
FORBS	Dominant species		PTAQ / POMU / ANMA		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
EXOTICS	Cover (Code)	Total	4		
		Perennial	4		
		Annual	2		
			EXOTIC SPECIES	CCode	
SOIL	Rock Outcrop	0	1) CYSC4 4		
	SURFACE (%)	Gravel	0	2) RULA 3	
		Bare Ground	0	3) CIAR4 3	
		Moss-Lichen	5	4) RUAR9 3	
		Litter	95	5) HYPE 2	
			6)		
LAND USE	Logging	4	Wildlife	3	
CODE	Stand Age	1	Recreation Severity	0	
	Agriculture	0	Recreation Type	0	
	Livestock	6	Hydrology	1	
	Development	0			
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) PICOC2-PSME/GASH		D	90	1	
2) PSME/GASH/POMU		C	5	4	
3) PSME-TSHE/GASH/POMU		C	5	4	
4)					
NOTES: Tree cover <30%, very high exotic shrub cover suppressing conifer regeneration. PSME/GASH/POME restricted to one small patch N of Medical Springs Rd. PSME-TSHE/GASH/POMU in one small patch along road along S polygon boundary.					

Polygon # 24					
Observer: J. Luginbuhl		Polygon Area (acres): 10.62			
Date: 3-Sep-06		Survey Intensity: 1			
Specific Location: Forested wetland W of Medical Springs Rd. and N of cemetery.					
TOTAL VEG COVER (%)		100			
TREES	Dominant species		FRLA / PSME / POBAT		
	Cover (Code)	Total	6		
		Emergent	3		
		Main canopy	5		
		Subcanopy	3		
SHRUBS	Dominant species		GASH / ACCI / SPDO / COCO6		
	Cover (Code)	Total	4		
		> 1.5' tall	4		
		< 1.5' tall	3		
GRAMINOIDS	Dominant species		CAOB3 / CAST5		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	0		
FORBS	Dominant species		POMU / PTAQ / VAHE / ASCA2		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
EXOTICS	Cover (Code)	Total	2		
		Perennial	2		
		Annual	1		
			EXOTIC SPECIES	CCode	
			1) RUAR9	1	
SOIL	Rock Outcrop	0	5)		
	SURFACE (%)	Gravel	0	6)	
		Bare Ground	0		
		Moss-Lichen	15		
		Litter	85		
LAND USE	Logging	1	Wildlife	3	
	CODE	Stand Age	3	Recreation Severity	0
		Agriculture	0	Recreation Type	0
		Livestock	6	Hydrology	1
		Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) FRLA/CAOB3		-	60	4	
2) PSME-TSHE/GASH/POMU		B/C	40	4	
3)					
4)					
NOTES: Mature wetland forest in good ecological condition with very few exotics.					

Polygon # 25						
Observer: J. Luginbuhl		Polygon Area (acres): 16.26				
Date: 11-Aug-06		Survey Intensity: 1				
Specific Location: N of intersection of high tension powerline and Medical Springs Rd.						
TOTAL VEG COVER (%)		100				
TREES	Dominant species		PSME / POBAT / ACMA3			
	Cover (Code)	Total	5			
		Emergent	0			
		Main canopy	5			
		Subcanopy	2			
SHRUBS	Dominant species		GASH / MANE2 / HODI / RUUR / SYAL			
	Cover (Code)	Total	5			
		> 1.5' tall	3			
		< 1.5' tall	4			
GRAMINOIDS	Dominant species		CADE9 / ELGL			
	Cover (Code)	Total	3			
		Perennial	3			
		Annual	0			
FORBS	Dominant species		POMU / PTAQ / VICIA			
	Cover (Code)	Total	3			
		Perennial	3			
		Annual	2			
EXOTICS	Cover (Code)	Total	3	EXOTIC SPECIES	CCode	
		Perennial	3	1) CYSC4	3	
		Annual	0	2) GERO	2	
				3) RUAR9	2	
SOIL	Rock Outcrop	0		4) HYPE	2	
	SURFACE (%)	Gravel	0		5) RULA	1
		Bare Ground	0		6) CIAR4	1
		Moss-Lichen	50			
Litter		50				
LAND USE CODE	Logging	4		Wildlife	3	
	Stand Age	1		Recreation Severity	0	
	Agriculture	0		Recreation Type	0	
	Livestock	6		Hydrology	1	
	Development	0				
PLANT ASSOCIATIONS			Rank	%	Pattern	
1) PSME/GASH/POMU			C	100	1	
2)						
3)						
4)						
NOTES: Widespread Scotch broom. Cored: main canopy PSME (dbh=20.8cm, dbh age=18, length=9.4cm); main canopy PSME (dbh=25.9cm, dbh age=24, length=18.3cm).						

Polygon # 26				
Observer: J. Luginbuhl		Polygon Area (acres): 21.86		
Date: 11-Aug-06		Survey Intensity: 1		
Specific Location: W of junction of HW 7 and Medical Springs Rd.				
TOTAL VEG COVER (%)		100		
TREES	Dominant species		PSME / POBAT	
	Cover (Code)	Total	6	
		Emergent	0	
		Main canopy	5	
		Subcanopy	2	
SHRUBS	Dominant species		GASH / RUUR / MANE2 / SYAL / HODI	
	Cover (Code)	Total	4	
		> 1.5' tall	3	
		< 1.5' tall	4	
GRAMINOIDS	Dominant species		AGCA5 / BROMU	
	Cover (Code)	Total	2	
		Perennial	2	
		Annual	0	
FORBS	Dominant species		POMU / PTAQ / TRBOL / LIBO3	
	Cover (Code)	Total	3	
		Perennial	3	
		Annual	2	
EXOTICS	Cover (Code)	Total	3	
		Perennial	2	
		Annual	2	
			EXOTIC SPECIES	CCode
			1) CYSC4	2
		2) HYRA3	2	
		3) RUAR9	1	
		4) PLMA2	1	
SOIL	Rock Outcrop	0	5)	
SURFACE (%)	Gravel	0	6)	
	Bare Ground	0		
	Moss-Lichen	40		
	Litter	60		
LAND USE	Logging	4	Wildlife	3
CODE	Stand Age	1	Recreation Severity	0
	Agriculture	0	Recreation Type	0
	Livestock	6	Hydrology	1
	Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern
1) PSME/GASH/POMU		C/D	100	4
2)				
3)				
4)				
NOTES: Many pockets with dense closed canopy and depauperate understory. Cored: main canopy PSME (dbh=23.1cm, dbh age=18, length=10.7cm)				

Polygon # 27					
Observer: J. Luginbuhl		Polygon Area (acres): 43.13			
Date: 11-Aug-06		Survey Intensity: 1			
Specific Location: W of junction of HW 7 and Medical Springs Rd.					
TOTAL VEG COVER (%)		100			
TREES	Dominant species		PSME / ACMA3 / POBAT		
	Cover (Code)	Total	6		
		Emergent	0		
		Main canopy	6		
		Subcanopy	2		
SHRUBS	Dominant species		GASH / MANE2 / RUUR / COCO6 / HODI		
	Cover (Code)	Total	4		
		> 1.5' tall	3		
		< 1.5' tall	3		
GRAMINOIDS	Dominant species		AGCA5 / BROMU		
	Cover (Code)	Total	2		
		Perennial	2		
		Annual	0		
FORBS	Dominant species		POMU / LIBO3 / PTAQ / TRBOL		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
EXOTICS	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
			EXOTIC SPECIES	CCode	
SOIL	Rock Outcrop	0	1) CYSC4	2	
	SURFACE (%)	Gravel	0	2) CIAR4	1
		Bare Ground	0	3) HYRA3	2
		Moss-Lichen	50	4) RUAR9	1
		Litter	50	5) RULA	1
		6) PLMA2	1		
LAND USE	Logging	4	Wildlife	3	
	CODE	Stand Age	1	Recreation Severity	0
		Agriculture	0	Recreation Type	0
		Livestock	6	Hydrology	1
		Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) PSME/GASH/POMU		C/D	95	1	
2) ALRU2/POMU		-	5	4	
3)					
4)					
NOTES: PSME/GASH/POMU has large areas of dense canopy with nearly depauperate understory. ALRU2/POMU is in two small patches along old logging road in N end of polygon. Cored: main canopy PSME (dbh=26.7cm, dbh age=25, length=13.1cm).					

Polygon # 28					
Observer: J. Luginbuhl		Polygon Area (acres): 16.14			
Date: 2-Sep-06		Survey Intensity: 1			
Specific Location: N end of park property, S of powerline corridor.					
TOTAL VEG COVER (%)		98			
TREES	Dominant species		PSME / POBAT / ALRU / FRLA		
	Cover (Code)	Total	6		
		Emergent	0		
		Main canopy	5		
		Subcanopy	3		
SHRUBS	Dominant species		ACCI / MANE2 / GASH / RUUR / SYAL		
	Cover (Code)	Total	4		
		> 1.5' tall	4		
		< 1.5' tall	3		
GRAMINOIDS	Dominant species		CADE9 / ELRE4		
	Cover (Code)	Total	2		
		Perennial	2		
		Annual	0		
FORBS	Dominant species		POMU / URDI / MYMU		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	0		
EXOTICS	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
			EXOTIC SPECIES	CCode	
SOIL	Rock Outcrop	0	1) CIAR4	2	
	SURFACE (%)	Gravel	0	2) CYST4	2
		Bare Ground	2	3) ILAQ80	1
		Moss-Lichen	30	4) RUAR9	2
		Litter	68	5) RULA	1
		6) ELRE4	1		
LAND USE	Logging	4	Wildlife	3	
CODE	Stand Age	1	Recreation Severity	2	
	Agriculture	0	Recreation Type	1	
	Livestock	6	Hydrology	1	
	Development	0			
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) PSME/GASH/POMU		C	40	1	
2) ALRU2/POMU		-	30	4	
3) PSME/COCO6/POMU-TITR		B/C	15	3	
4) PSME/Depauperate		D	15	3	
NOTES: ORV damage. Cored: main canopy PSME (dbh=23.1, dbh age=20, length=11.3cm).					

Polygon # 29					
Observer: J. Luginbuhl		Polygon Area (acres): 101.26			
Date: 11-Aug-06		Survey Intensity: 1			
Specific Location: W of intersection of high tension powerline and Medical Springs Rd.					
TOTAL VEG COVER (%)		99			
TREES	Dominant species		PSME / POBAT / ACMA3		
	Cover (Code)	Total	5		
		Emergent	2		
		Main canopy	5		
		Subcanopy	2		
SHRUBS	Dominant species		GASH / ACCI / RUUR / CTSC4 / RUAR9		
	Cover (Code)	Total	5		
		> 1.5' tall	4		
		< 1.5' tall	4		
GRAMINOIDS	Dominant species		CADE9 / FESTU / ELGL / CAO3		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	0		
FORBS	Dominant species		POMU / PTAQ / DACA6 / CIDO		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
EXOTICS	Cover (Code)	Total	4		
		Perennial	4		
		Annual	2		
			EXOTIC SPECIES	CCode	
SOIL	Rock Outcrop	0			
	SURFACE (%)	Gravel	3		
		Bare Ground	2		
		Moss-Lichen	15		
		Litter	80		
LAND USE	Logging	4			
	CODE	Stand Age	1		
		Agriculture	0		
		Livestock	6		
		Development	0		
PLANT ASSOCIATIONS			Rank	%	Pattern
	1) PSME/GASH/POMU		D	65	1
	2) ALRU2/POMU		-	15	2
	3) SALUL		-	3	4
	4) CAO3		-	4	6
	5) FRLA/CAO3		-	13	3
NOTES: Recreation Type: ORV traffic, hiking and horseback riding. Wildlife: many deer tracks and scat in wetland area in NW side of polygon. Hydrology: altered by culverts. Cored: main canopy PSME (dbh=18.3cm,dbh age=16, length=8.5cm).					

Polygon # 30					
Observer: J. Luginbuhl		Polygon Area (acres): 33.09			
Date: 2-Sep-06		Survey Intensity: 1			
Specific Location: Forested flats along W bank of Mashel River, N of bridge.					
TOTAL VEG COVER (%)		100			
TREES	Dominant species		PSME / THPL / ACMA3 / ALRU2 / POBAT		
	Cover (Code)	Total	6		
		Emergent	3		
		Main canopy	5		
		Subcanopy	3		
SHRUBS	Dominant species		RUSP / ACCI / RUUR / COCO6		
	Cover (Code)	Total	4		
		> 1.5' tall	4		
		< 1.5' tall	3		
GRAMINOIDS	Dominant species		LUZUL / BROMU / CAREX		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	0		
FORBS	Dominant species		POMU / OXOR / GERO / PTAQ		
	Cover (Code)	Total	5		
		Perennial	4		
		Annual	2		
EXOTICS	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
			EXOTIC SPECIES	CCode	
SOIL	Rock Outcrop	0	1) GERO 3		
	SURFACE (%)	Gravel	0	2) MYMU 2	
		Bare Ground	0	3) RARE3 2	
		Moss-Lichen	35	4) RUAR9 1	
		Litter	65	5) RUCR 1	
			6)		
LAND USE	Logging	1	Wildlife	3	
CODE	Stand Age	3	Recreation Severity	3	
	Agriculture	0	Recreation Type	3	
	Livestock	0	Hydrology	1	
	Development	0			
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) PSME-THPL/OXOR		A/B	50	2	
2) TSHE-PSME/POMU-DREX2		A/B	40	2	
3) ALRU2/POMU		-	10	3	
4)					
NOTES:					

Polygon # 31					
Observer: J. Luginbuhl		Polygon Area (acres): 10.58			
Date: 2-Sep-06		Survey Intensity: 2			
Specific Location: Forested floodplain at confluence of Nisqually and Mashel Rivers.					
TOTAL VEG COVER (%)		99			
TREES	Dominant species		ALRU2 / ACMA3 / POBAT		
	Cover (Code)	Total	5		
		Emergent	2		
		Main canopy	5		
		Subcanopy	3		
SHRUBS	Dominant species		RUSP / RUAR9 / CYSC4 / RULA		
	Cover (Code)	Total	5		
		> 1.5' tall	5		
		< 1.5' tall	3		
GRAMINOIDS	Dominant species		PHAR3 / DAGL / BROMUS		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	0		
FORBS	Dominant species		MYMU / SOLID / SEVU		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
EXOTICS	Cover (Code)	Total	4		
		Perennial	4		
		Annual	2		
			EXOTIC SPECIES	CCode	
SOIL	Rock Outcrop	0	1) CYSC4	3	
	SURFACE (%)	Gravel	3	2) CEJA	1
		Bare Ground	3	3) RUAR9	3
		Moss-Lichen	10	4) RULA	2
		Litter	84	5) GERO	2
				6) CECY2	1
LAND USE	Logging	0	Wildlife	3	
CODE	Stand Age	2	Recreation Severity	3	
	Agriculture	0	Recreation Type	3	
	Livestock	0	Hydrology	1	
	Development	0			
PLANT ASSOCIATIONS			Rank	%	Pattern
1) ALRU2/RUSP			-	80	
2) Disturbed			-	20	
3)					
4)					
NOTES: Disturbed portion is dense blackberry and reed canarygrass thicket along bank of Mashel River.					

Polygon # 32					
Observer: J. Luginbuhl		Polygon Area (acres): 96.36			
Date: 2-Sep-06		Survey Intensity: 1			
Specific Location: W slopes of the Mashel River canyon.					
TOTAL VEG COVER (%)		100			
TREES	Dominant species		PSME / THPL / ACMA3 / ALRU2		
	Cover (Code)	Total	6		
		Emergent	2		
		Main canopy	3		
		Subcanopy	5		
SHRUBS	Dominant species		RUUR / ACCI / RUSP / SYAL / SARA2		
	Cover (Code)	Total	4		
		> 1.5' tall	4		
		< 1.5' tall	3		
GRAMINOIDS	Dominant species				
	Cover (Code)	Total	0		
		Perennial	0		
		Annual	0		
FORBS	Dominant species		POMU / OXOR / GERO / DREX		
	Cover (Code)	Total	5		
		Perennial	5		
		Annual	2		
EXOTICS	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
			EXOTIC SPECIES	CCode	
SOIL	Rock Outcrop	0	1) CYSC4	1	
	SURFACE (%)	Gravel	2	2) GERO	3
		Bare Ground	3	3) RUAR9	1
		Moss-Lichen	20	4) RARE3	2
		Litter	75	5) MYMU	1
		6) POCO	1		
		7) HYPE	1		
LAND USE	Logging	2	Wildlife	7	
	CODE	Stand Age	3	Recreation Severity	3
		Agriculture	0	Recreation Type	4
		Livestock	0	Hydrology	1
		Development	2		
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) PSME-THPL/OXOR		B	42	4	
2) TSHE-PSME/POMU-DREX2		A/B	35	4	
3) ALRU2/POMU		-	15	3	
4) THPL-TSHE/OPHO/POMU		B	3	3	
5) PSME/GASH/POMU		C	5	3	
NOTES: Scattered large, very old cut stumps. Wildlife: deer, cliff-nesting birds. Recreation Type: hiking, horseback riding, ORV. Most exotic species (except GERO) found mostly along road.					

Polygon # 33					
Observer: J. Luginbuhl		Polygon Area (acres): 5.67			
Date: 2-Sep-06		Survey Intensity: 1			
Specific Location: Mashel River channel N of Mashel River bridge.					
TOTAL VEG COVER (%)		45			
TREES	Dominant species		POBAT / ALRU2		
	Cover (Code)	Total	3		
		Emergent	0		
		Main canopy	3		
		Subcanopy	0		
SHRUBS	Dominant species		RUSP / CYSC4		
	Cover (Code)	Total	4		
		> 1.5' tall	3		
		< 1.5' tall	3		
GRAMINOIDS	Dominant species		PHAR3 / DAGL		
	Cover (Code)	Total	2		
		Perennial	2		
		Annual	0		
FORBS	Dominant species		EPILO / SPRU		
	Cover (Code)	Total	2		
		Perennial	2		
		Annual	1		
EXOTICS	Cover (Code)	Total	3		
		Perennial	3		
		Annual	1		
			EXOTIC SPECIES	CCode	
SOIL	Rock Outcrop	0	1) CYSC4 3		
	SURFACE (%)	Gravel	60	2) GERO 1	
		Bare Ground	0	3) MYMU 1	
		Moss-Lichen	0	4) RUCR 1	
		Litter	40	5) 6)	
LAND USE	Logging	0	Wildlife 0		
	CODE	Stand Age	1	Recreation Severity 0	
		Agriculture	0	Recreation Type 0	
		Livestock	0	Hydrology 1	
		Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) River		-	55	4	
2) Floodplain margin/sand-gravel bar		-	35	4	
3) PSME-THPL/OXOR		A/B	10	3	
4)					
NOTES: River channel has cut to west to road since 1994 photo.					

Polygon # 34				
Observer: J. Luginbuhl		Polygon Area (acres): 95.34		
Date: 2-Sep-06		Survey Intensity: 1		
Specific Location: Young forest on flats to W of river confluence.				
TOTAL VEG COVER (%)		99		
TREES	Dominant species		PSME / ALRU2 / POBAT	
	Cover (Code)	Total	6	
		Emergent	0	
		Main canopy	6	
		Subcanopy	2	
SHRUBS	Dominant species		GASH / MANE2 / RUUR	
	Cover (Code)	Total	4	
		> 1.5' tall	3	
		< 1.5' tall	3	
GRAMINOIDS	Dominant species		PHAR3 / ELGL	
	Cover (Code)	Total	2	
		Perennial	2	
		Annual	0	
FORBS	Dominant species		POMU / PTAQ	
	Cover (Code)	Total	4	
		Perennial	3	
		Annual	1	
EXOTICS	Cover (Code)	Total	3	
		Perennial	3	
		Annual	2	
			EXOTIC SPECIES	CCode
			1) CYSC4	3
			2) RUAR9	2
			3) GERO	2
			4) RARE3	2
			5) RULA	1
			6) MYMU	1
SOIL	Rock Outcrop	0		
SURFACE (%)	Gravel	0		
	Bare Ground	3		
	Moss-Lichen	30		
	Litter	67		
LAND USE	Logging	4		Wildlife 3
CODE	Stand Age	1		Recreation Severity 3
	Agriculture	0		Recreation Type 4
	Livestock	0		Hydrology 1
	Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern
1) PSME/GASH/POMU		C/D	70	1
2) PSME/Depauperate		D	30	3
3)				
4)				
NOTES: Recreation Type: hiking, horseback riding, ORV. Stand is mostly at stem-exclusion stage with many small patches having no understory vegetation.				

Polygon # 35					
Observer: J. Luginbuhl		Polygon Area (acres): 15.68			
Date: 2-Sep-06		Survey Intensity: 1			
Specific Location: Young regeneration clearcut on N slope of Nisqually River.					
TOTAL VEG COVER (%)		98			
TREES	Dominant species		PSME / ARME		
	Cover (Code)	Total	5		
		Emergent	0		
		Main canopy	5		
		Subcanopy	2		
SHRUBS	Dominant species		ACCI / RUAR9 / GASH / MANE2		
	Cover (Code)	Total	5		
		> 1.5' tall	4		
		< 1.5' tall	4		
GRAMINOIDS	Dominant species		DAGL / BROMU		
	Cover (Code)	Total	2		
		Perennial	2		
		Annual	1		
FORBS	Dominant species		POMU / PTAQ		
	Cover (Code)	Total	4		
		Perennial	4		
		Annual	2		
EXOTICS	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
			EXOTIC SPECIES	CCode	
SOIL	Rock Outcrop	0	1) RUAR9 3		
	SURFACE (%)	Gravel	2	2) CYST4 2	
		Bare Ground	3	3) RULA 3	
		Moss-Lichen	25	4) MYMU 1	
		Litter	70	5) HYRA3 1	
			6)		
LAND USE	Logging	4	Wildlife 3		
CODE	Stand Age	1	Recreation Severity 0		
	Agriculture	0	Recreation Type 0		
	Livestock	0	Hydrology 1		
	Development	0			
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) PSME/GASH/POMU		D	90	4	
2) PSME-ARME/GASH		C/D	10	6	
3)					
4)					
NOTES: PSME-ARME community is found in a thin strip along the slope crest.					

Polygon # 36					
Observer: J. Luginbuhl		Polygon Area (acres): 35.28			
Date: 1-Sep-06		Survey Intensity: 1			
Specific Location: W end on S park property block, S of Nisqually River.					
TOTAL VEG COVER (%)		98			
TREES	Dominant species		PSME / THPL / ALRU2 / TSHE		
	Cover (Code)	Total	6		
		Emergent	3		
		Main canopy	5		
		Subcanopy	3		
SHRUBS	Dominant species		RUSP / RUPA / RUUR / GASH		
	Cover (Code)	Total	3		
		> 1.5' tall	3		
		< 1.5' tall	2		
GRAMINOIDS	Dominant species		BROMU / DAGL / LUZUL		
	Cover (Code)	Total	2		
		Perennial	2		
		Annual	0		
FORBS	Dominant species		POMU / PTAQ / GERO / DREX2 / TITR		
	Cover (Code)	Total	5		
		Perennial	5		
		Annual	2		
EXOTICS	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
			EXOTIC SPECIES	CCode	
SOIL	Rock Outcrop	0	1) GERO	3	
	SURFACE (%)	Gravel	3	2) RUAR9	2
		Bare Ground	2	3) HYRA3	2
		Moss-Lichen	15	4) MYMU	2
		Litter	80	5) DAGL	1
				6) TRPR2	1
LAND USE	Logging	1	Wildlife	3	
	CODE	Stand Age	2	Recreation Severity	3
		Agriculture	0	Recreation Type	3
		Livestock	6	Hydrology	2
		Development	2		
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) TSHE-PSME/POMU-DREX2		B	75	1	
2) ALRU2/POMU		-	10	3	
3) PSME/COCO6/POMU-TITR		B	10	3	
4) ALRU2/RUSP		-	5	3	
NOTES: Hydrology: altered by culverts. Most exotics (except Geranium robertianum) restricted to road corridor. ALRU2/POMU is mostly in small patches along road. ALRU2/RUSP in small patches along intermittent stream.					

Polygon # 37					
Observer: J. Luginbuhl		Polygon Area (acres): 44.53			
Date: 1-Sep-06		Survey Intensity: 1			
Specific Location: In S park property block, just S of decommissioned bridge over Nisqually River.					
TOTAL VEG COVER (%)		95			
TREES	Dominant species	PSME / POBAT / ALRU2 / THPL			
	Cover (Code) Total	6			
	Emergent	3			
	Main canopy	5			
	Subcanopy	3			
SHRUBS	Dominant species	GASH / RUUR / ACCI / RUPA			
	Cover (Code) Total	4			
	> 1.5' tall	3			
	< 1.5' tall	4			
GRAMINOIDS	Dominant species	CADE9 / DAGL / BROMU			
	Cover (Code) Total	3			
	Perennial	3			
	Annual	0			
FORBS	Dominant species	POMU / PTAQ / GERO / GAAP2			
	Cover (Code) Total	4			
	Perennial	4			
	Annual	2			
EXOTICS	Cover (Code) Total	3	EXOTIC SPECIES	CCode	
	Perennial	3	1) CESTM	1	
	Annual	0	2) CYSC4	2	
			3) GERO	2	
SOIL	Rock Outcrop	0	4) HEHE	1	
	SURFACE (%)	Gravel	5	5)	
		Bare Ground	0	6)	
		Moss-Lichen	15		
Litter		80			
LAND USE CODE	Logging	1	Wildlife	3	
	Stand Age	2	Recreation Severity	3	
	Agriculture	0	Recreation Type	3	
	Livestock	6	Hydrology	2	
	Development	0			
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) PSME/GASH/POMU		B/C	40	4	
2) PSME/COCO6/POMU-TITR		B/C	40	2	
3) ALRU2/POMU		-	20	3	
4)					
NOTES: Hydrology: deep culverts on either side of road. ALRU2/POMU in small patches along road corridor. Cored: main canopy PSME (dbh=46.5cm, dbh age=49, length=20.4cm).					

Polygon # 38					
Observer: J. Luginbuhl		Polygon Area (acres): 3.03			
Date: 1-Sep-06		Survey Intensity: 1			
Specific Location: NE tip of S park property block, S of Nisqually River.					
TOTAL VEG COVER (%)		100			
TREES	Dominant species	PSME / THPL / TSHE / ALRU2			
	Cover (Code) Total	6			
	Emergent	2			
	Main canopy	5			
	Subcanopy	3			
SHRUBS	Dominant species	GASH / VAPA / ACCI / MANE2 / RUUR			
	Cover (Code) Total	4			
	> 1.5' tall	4			
	< 1.5' tall	3			
GRAMINOIDS	Dominant species	FESTU / DAGL / PHAR3			
	Cover (Code) Total	2			
	Perennial	2			
	Annual	0			
FORBS	Dominant species	POMU / TRBOL / LIBO3 / ACTR / VAHE / GAAP2			
	Cover (Code) Total	4			
	Perennial	4			
	Annual	2			
EXOTICS	Cover (Code) Total	2	EXOTIC SPECIES	CCode	
	Perennial	2	1) BUDA2	1	
	Annual	2	2) ILAQ80	1	
			3) PHAR3	2	
SOIL	Rock Outcrop	0	4) DAGL	2	
	SURFACE (%)	Gravel	2	5) MYMU	1
		Bare Ground	0	6)	
		Moss-Lichen	40		
Litter		58			
LAND USE CODE	Logging	1	Wildlife	3	
	Stand Age	3	Recreation Severity	3	
	Agriculture	0	Recreation Type	3	
	Livestock	6	Hydrology	1	
	Development	0			
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) PSME-TSHE/GASH/POMU		A/B	90	4	
2) Floodplain margin/sand-gravel bar		-	10	3	
3)					
4)					
NOTES: A few very old high cut stumps by river. Cored: main canopy PSME (dbh=67.6cm, dbh age=108, length=31.1cm).					

Polygon # 39					
Observer: J. Luginbuhl		Polygon Area (acres): 13.28			
Date: 2-Sep-06		Survey Intensity: 1			
Specific Location: Forested slope along N bank of Nisqually River.					
TOTAL VEG COVER (%)		100			
TREES	Dominant species		PSME / THPL		
	Cover (Code)	Total	5		
		Emergent	3		
		Main canopy	5		
		Subcanopy	3		
SHRUBS	Dominant species		GASH / MANE2		
	Cover (Code)	Total	4		
		> 1.5' tall	3		
		< 1.5' tall	4		
GRAMINOIDS	Dominant species		PHAR3 / ELGL / LUZUL		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	0		
FORBS	Dominant species		LIBO3 / POMU		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
EXOTICS	Cover (Code)	Total	2	EXOTIC SPECIES	CCode
		Perennial	2	1) PHAR3	2
		Annual	0	2) MYMU	1
				3) RUAR9	1
	SOIL	Rock Outcrop	0	4)	
SURFACE (%)	Gravel	10	5)		
	Bare Ground	10	6)		
	Moss-Lichen	20			
	Litter	60			
LAND USE	Logging	0	Wildlife	7	
CODE	Stand Age	5	Recreation Severity	0	
	Agriculture	0	Recreation Type	0	
	Livestock	0	Hydrology	1	
	Development	0			
PLANT ASSOCIATIONS			Rank	%	Pattern
1) PSME-TSHE/GASH-MANE2			B	40	4
2) TSHE-PSME/POMU-DREX2			A/B	55	4
3) PSME-ARME/GASH			B/C	5	3
4)					
NOTES: Wildlife: deer, cliff-nesting birds. PSME-TSHE AND PSME-ARME communities are found along the upper slope and ridge break at NE end of polygon. A few old remnant PSME scattered throughout.					

Polygon # 40					
Observer: J. Luginbuhl		Polygon Area (acres): 14.55			
Date: 1-Sep-06		Survey Intensity: 1			
Specific Location: S bank of Nisqually River.					
TOTAL VEG COVER (%)		100			
TREES	Dominant species		PSME / THPL / ALRU2		
	Cover (Code)	Total	6		
		Emergent	2		
		Main canopy	5		
		Subcanopy	3		
SHRUBS	Dominant species		GASH / RUUR / ACCI / RUSP		
	Cover (Code)	Total	4		
		> 1.5' tall	3		
		< 1.5' tall	4		
GRAMINOIDS	Dominant species		LUZUL / PHAR3 / BROMU		
	Cover (Code)	Total	2		
		Perennial	2		
		Annual	0		
FORBS	Dominant species		POMU / PTAQ / GERO / DREX2		
	Cover (Code)	Total	4		
		Perennial	4		
		Annual	1		
EXOTICS	Cover (Code)	Total	3		
		Perennial	3		
		Annual	1		
			EXOTIC SPECIES	CCode	
SOIL	Rock Outcrop	0	1) GERO 3		
	SURFACE (%)	Gravel	3	2) PHAR3 2	
		Bare Ground	2	3) MYMU 1	
		Moss-Lichen	30	4) HYPE 1	
		Litter	65	5) 6)	
LAND USE	Logging	1	Wildlife 3		
CODE	Stand Age	3	Recreation Severity 3		
	Agriculture	0	Recreation Type 3		
	Livestock	0	Hydrology 1		
	Development	0			
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) TSHE-PSME/POMU-DREX2		A/B	24	3	
2) PSME-THPL/OXOR		A/B	70	1	
3) Floodplain margin/sand-gravel bar		-	6	3	
4)					
NOTES: A few scattered very old cut stumps. Low exotic cover. Overall in excellent ecological condition.					

Polygon # 41				
Observer: J. Luginbuhl		Polygon Area (acres): 4.31		
Date: 1-Sep-06		Survey Intensity: 1		
Specific Location: Alder forested seasonal river channel, NE tip of S park property block, SW of Nisqually River.				
TOTAL VEG COVER (%)		90		
TREES	Dominant species	ALRU2 / PSME		
	Cover (Code) Total	5		
	Emergent	0		
	Main canopy	5		
	Subcanopy	3		
SHRUBS	Dominant species	RUSP / RUAR9 / RUUR / SYAL / RUPA		
	Cover (Code) Total	5		
	> 1.5' tall	3		
	< 1.5' tall	4		
GRAMINOIDS	Dominant species	DAGL / PHAR3 / CAST5 / BROMU		
	Cover (Code) Total	4		
	Perennial	4		
	Annual	0		
FORBS	Dominant species	GERO / POMU / LAPO3 / EQAR		
	Cover (Code) Total	4		
	Perennial	3		
	Annual	2		
EXOTICS	Cover (Code) Total	4	EXOTIC SPECIES	CCode
	Perennial	4	1) LYSA2	1
	Annual	2	2) GERO	3
			3) DAGL	3
SOIL	Rock Outcrop	0	4) RUAR9	3
			5) CYSC4	2
SURFACE (%)	Gravel	15	6) PHAR3	2
	Bare Ground	0		
	Moss-Lichen	5		
	Litter	80		
LAND USE CODE	Logging	1	Wildlife	3
	Stand Age	1	Recreation Severity	3
	Agriculture	0	Recreation Type	0
	Livestock	6	Hydrology	1
	Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern
1) Floodplain margin/sand-gravel bar		-	60	4
2) ALRU2/RUSP		-	40	4
3)				
4)				
NOTES: Floodplain margin/sand-gravel bar is a seasonally flooded river channel and consists of 5-10 yr old alder saplings (many severely bent by water flow) in otherwise unvegetated river gravel. ALRU2/RUSP occurs on higher floodplain along W side of polygon. Cored: main canopy ALRU (dbh=21.1cm, dbh age=28, length=9.1cm).				

Polygon # 42				
Observer: J. Luginbuhl		Polygon Area (acres): 7.75		
Date: 1-Sep-06		Survey Intensity: 1		
Specific Location: NE tip of S park property block, SW of Nisqually River.				
TOTAL VEG COVER (%)		100		
TREES	Dominant species	PSME / THPL / TSHE / ALRU2 / ACMA3		
	Cover (Code) Total	6		
	Emergent	3		
	Main canopy	5		
	Subcanopy	3		
SHRUBS	Dominant species	GASH / ACCI / MANE2 / RUUR		
	Cover (Code) Total	4		
	> 1.5' tall	3		
	< 1.5' tall	3		
GRAMINOIDS	Dominant species	DAGL / ELRE4 / PHAR3		
	Cover (Code) Total	3		
	Perennial	3		
	Annual	0		
FORBS	Dominant species	POMU / OXOR / PTAQ / LAPO3		
	Cover (Code) Total	5		
	Perennial	4		
	Annual	2		
EXOTICS	Cover (Code) Total	3	EXOTIC SPECIES	CCode
	Perennial	3	1) CYSC4	2
	Annual	2	2) GERO	3
			3) RUAR9	2
SOIL	Rock Outcrop	0	4) PHAR3	2
			5) DAGL	2
SURFACE (%)	Gravel	2	6)	
	Bare Ground	0		
	Moss-Lichen	20		
	Litter	78		
LAND USE CODE	Logging	1	Wildlife	3
	Stand Age	3	Recreation Severity	3
	Agriculture	0	Recreation Type	0
	Livestock	6	Hydrology	1
	Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern
1) TSHE-PSME/POMU-DREX2		C	75	4
2) PSME-THPL/OXOR		B/C	25	3
3)				
4)				
NOTES: Scattered very old cut stumps. Widespread heavy Geranium robertianum. Cored: main canopy/intermediate PSME (dbh=17.3cm, dbh age=20, length=7.6cm).				

Polygon # 43				
Observer: J. Luginbuhl		Polygon Area (acres): 11.36		
Date: 1-Sep-06		Survey Intensity: 1		
Specific Location: SE portion of S park property block, S of Nisqually River.				
TOTAL VEG COVER (%)		100		
TREES	Dominant species		ALRU2 / POBAT	
	Cover (Code)	Total	6	
		Emergent	2	
		Main canopy	5	
		Subcanopy	2	
SHRUBS	Dominant species		RUSP / RUUR / ACCI / GASH / COCO6	
	Cover (Code)	Total	4	
		> 1.5' tall	3	
		< 1.5' tall	3	
GRAMINOIDS	Dominant species		LUZUL / CAREX	
	Cover (Code)	Total	2	
		Perennial	2	
		Annual	0	
FORBS	Dominant species		POMU / URDI / PTAQ	
	Cover (Code)	Total	4	
		Perennial	4	
		Annual	2	
EXOTICS	Cover (Code)	Total	2	
		Perennial	2	
		Annual	1	
			EXOTIC SPECIES	CCode
			1) GERO	2
		2) MYMU	1	
		3)		
		4)		
		5)		
		6)		
SOIL	Rock Outcrop	0		
SURFACE (%)	Gravel	0		
	Bare Ground	0		
	Moss-Lichen	20		
	Litter	80		
LAND USE	Logging	2		Wildlife 3
CODE	Stand Age	2		Recreation Severity 0
	Agriculture	0		Recreation Type 0
	Livestock	6		Hydrology 1
	Development	0		
PLANT ASSOCIATIONS		Rank	%	Pattern
1) ALRU2/POMU		-	70	1
2) ALRU2/RUSP		-	20	3
3) PSME/GASH/POMU		C	10	4
4)				
NOTES: Most of polygon is dominated by ALRU2 but with some understory PSME on higher slopes. Not apparent if PSME is planted or natural regeneration.				

Polygon # 44					
Observer: J. Luginbuhl		Polygon Area (acres): 30.36			
Date: 1-Sep-06		Survey Intensity: 1			
Specific Location: S most portion of S park property block, S of Nisqually River.					
TOTAL VEG COVER (%)		99			
TREES	Dominant species		PSME / ALRU2		
	Cover (Code)	Total	6		
		Emergent	2		
		Main canopy	6		
		Subcanopy	0		
SHRUBS	Dominant species		GASH / MANE2 / RUUR / HODI / ACCI		
	Cover (Code)	Total	3		
		> 1.5' tall	3		
		< 1.5' tall	2		
GRAMINOIDS	Dominant species		AGCA5 / DAGL		
	Cover (Code)	Total	2		
		Perennial	2		
		Annual	0		
FORBS	Dominant species		POMU / TRBOL / PTAQ / PLMA2		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	1		
EXOTICS	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
			EXOTIC SPECIES	CCode	
SOIL	Rock Outcrop	0	1) CIAR4	1	
	SURFACE (%)	Gravel	0	2) ILAQ80	1
		Bare Ground	0	3) DAGL	2
		Moss-Lichen	35	4) RUAR9	1
		Litter	65	5) GERO	1
		6) HYRA3	1		
LAND USE	Logging	4	Wildlife	3	
CODE	Stand Age	1	Recreation Severity	0	
	Agriculture	0	Recreation Type	0	
	Livestock	6	Hydrology	1	
	Development	0			
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) PSME/GASH/POMU		C/D	50	1	
2) PSME/Depauperate		D	35	3	
3) ALRU2/POMU		-	15	3	
4)					
NOTES: Large areas of closed canopy regeneration with depauperate understory. ALRU2/POMU in small patches in N portion of polygon. Cored: main canopy PSME (25.1cm, dbh age=24, length=11.3cm).					

Polygon # 45					
Observer: J. Luginbuhl		Polygon Area (acres): 8.74			
Date: 3-Sep-06		Survey Intensity: 1			
Specific Location: On N property boundary W of cemetery.					
TOTAL VEG COVER (%)		100			
TREES	Dominant species		PSME / FRLA / POBAT / ACME3 / ALRU2		
	Cover (Code)	Total	5		
		Emergent	2		
		Main canopy	5		
		Subcanopy	4		
SHRUBS	Dominant species		GASH / RULA / CYSC4 / RUUR / MANE2		
	Cover (Code)	Total	5		
		> 1.5' tall	4		
		< 1.5' tall	4		
GRAMINOIDS	Dominant species		CAOB3		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	0		
FORBS	Dominant species		POMU / PTAQ / TOME / SOLID		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
EXOTICS	Cover (Code)	Total	4		
		Perennial	4		
		Annual	2		
			EXOTIC SPECIES	CCode	
SOIL	Rock Outcrop	0	1) CYSC4	2	
	SURFACE (%)	Gravel	0	2) CIAR4	2
		Bare Ground	0	3) RULA	3
		Moss-Lichen	0	4) RUAR9	3
		Litter	100	5) HEHE	3
		6) HYRA3	2		
LAND USE	Logging	4	Wildlife	3	
CODE	Stand Age	1	Recreation Severity	3	
	Agriculture	0	Recreation Type	3	
	Livestock	0	Hydrology	2	
	Development	0			
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) ALRU2/POMU		-	60	1	
2) FRLA/CAOB3		-	40	2	
3)					
4)					
NOTES: Wildlife: doe observed. Deciduous overstory with an understory of planted Douglas-fir saplings; this area will succeed to Douglas-fir associations within a few decades. Large English ivy patch in N near road. Heavy patchy blackberry cover throughout.					

Polygon # 46					
Observer: J. Luginbuhl		Polygon Area (acres): 6.72			
Date: 13-Aug-06		Survey Intensity: 1			
Specific Location: River flats just W of Mashel River bridge.					
TOTAL VEG COVER (%)		100			
TREES	Dominant species		ALRU2 / POBAT / ACMA3 / THPL		
	Cover (Code)	Total	5		
		Emergent	2		
		Main canopy	5		
		Subcanopy	3		
SHRUBS	Dominant species		RUSP / ACCI / GASH / VAPA / SYAL		
	Cover (Code)	Total	5		
		> 1.5' tall	4		
		< 1.5' tall	4		
GRAMINOIDS	Dominant species		PHAR3 / DAGL / CAO3 / BROMU		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
FORBS	Dominant species		POMU / LASV / URDI / TOME / ASCA2		
	Cover (Code)	Total	3		
		Perennial	3		
		Annual	2		
EXOTICS	Cover (Code)	Total	4		
		Perennial	4		
		Annual	2		
			EXOTIC SPECIES	CCode	
SOIL	Rock Outcrop	0			
	SURFACE (%)	Gravel	3		
		Bare Ground	7		
		Moss-Lichen	15		
		Litter	75		
			1) CYSC4	2	
			2) BUDA2	3	
			3) RUAR9	3	
			4) DAGL	3	
			5) PHAR3	3	
			6) LASV	3	
			7) GERO	3	
			8) RARE3	2	
LAND USE	Logging	1	Wildlife	3	
CODE	Stand Age	2	Recreation Severity	3	
	Agriculture	0	Recreation Type	4	
	Livestock	0	Hydrology	2	
	Development	2			
PLANT ASSOCIATIONS		Rank	%	Pattern	
1) ALRU2/RUSP		-	25	2	
2) ALRU2/POMU		-	15	2	
3) PSME-THPL/OXOR		B	40	4	
4) Disturbed		-	20	4	
NOTES: Recreation Type: hiking, horseback riding, ORV. Disturbed areas along river edge N and S of bridge has had some moderately successful restoration plantings. Large patch of invasive butterfly bush along river edge N of bridge. Thick blackberry some Scotch broom along road.					