

Executive Summary



Proposed Action

The action proposed by the Washington Department of Natural Resources (DNR) is to develop and implement a **forest land plan** for the management of state trust lands in the Olympic Experimental State Forest (OESF). Along with developing the forest land plan, DNR also will update existing procedures as needed and develop a new procedure for salvage of timber after natural disturbance events such as wind and fire.

■ What is the OESF, and Where is it Located?

The OESF is an experimental forest that was established in 1992 and designated in 1997 as one of the nine *State Trust Lands Habitat Conservation Plan* (HCP) planning units within the range of the northern spotted owl in Washington. In this final environmental impact statement (FEIS), “OESF HCP planning unit” has been shortened to “OESF.”

In addition to being an HCP planning unit, the OESF also is an independent sustainable harvest unit. As an independent sustainable harvest unit, the OESF is assigned its own sustainable harvest level. The OESF is located in western Clallam and Jefferson counties on the Olympic Peninsula. It is bordered approximately by the Pacific Ocean to the west, the Strait of Juan de Fuca to the north, and the Olympic Mountains to the east and south (refer to Map ES-1). To help with planning and management, the OESF is divided into 11 areas called landscapes.

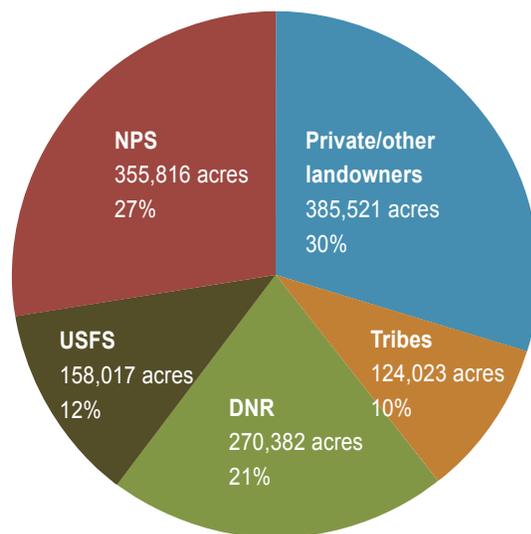
Map ES-1. OESF Vicinity Map



■ How Much of the OESF Does DNR Manage?

Because its boundaries were established largely along watershed lines, the OESF encompasses lands managed by DNR as well as the United States Forest Service (USFS), National Park Service (NPS), private landowners (including timber companies), tribes, and others. DNR manages 21 percent, or 270,382 acres,¹ of the approximately 1.3 million acres of the OESF (refer to Chart ES-1). That total includes 3,008 acres of natural resources conservation areas, 504 acres of natural area preserves, and 266,870 acres of state trust lands (refer to “What Are State Trust Lands?” later in this summary).

Chart ES-1. Land Ownership in the OESF



In this FEIS, the term “OESF” refers to the entire planning area, including lands owned and managed by other landowners.

■ What are State Trust Lands?

State trust lands are lands held as fiduciary trusts to provide revenue to specific trust beneficiaries, such as schools and universities. The majority of these lands were granted to the state by the federal Enabling Act (25 U.S. Statutes at Large, c 180 p 676) as a means of financial support, primarily for public schools and colleges (RCW 79.02.010(14)). Other lands were acquired by Washington from the counties; those lands are also held and managed in trust the same as the federally granted lands (RCW 79.02.010(13)). Of the current 5 million acres of state trust lands statewide, roughly 2 million acres are forested and 1 million acres are in agricultural production. The remaining 2 million acres are aquatic lands. On forested state trust lands, the primary means of generating revenue is the harvest and sale of timber.

As a trust lands manager, DNR must follow the common law duties of a trustee. Two of these duties were addressed in the 1984 landmark decision *County of Skamania v. State of Washington*: 1) a trustee must act with undivided loyalty to the trust beneficiaries to the exclusion of all other interests, and 2) a trustee has a duty to manage trust assets prudently (DNR 2006, p. 15). Refer to the *Policy for Sustainable Forests*, p. 9 through 16, for a more detailed discussion of DNR’s trust management duties and the multiple benefits of state trust lands.

■ What is a Forest Land Plan, and What Information Will it Include?

A forest land plan is a document that defines, for a planning area such as the OESF, what DNR wishes to achieve and how it will achieve it. Written for foresters and managers, the forest land plan will include goals, measurable objectives, strategies, and other information necessary to meet policy objectives and manage the OESF on a day-to-day basis.

The forest land plan **will not include site-specific information for individual management activities**, for example maps and other information for individual timber sales or engineering drawings for a specific segment of roadway. The plan only provides guidance on how those activities should be implemented.

■ Will the OESF Forest Land Plan Affect Other Landowners?

No. DNR's proposed forest land plan will not affect management of lands owned or managed by other landowners in the OESF. DNR's forest land plan applies only to the management of state trust lands located within the OESF boundaries.

■ Will the Forest Land Plan be Based on Existing DNR Policies?

Yes. The forest land plan for the OESF will be based on existing DNR policies, as well as all applicable local, state, and federal laws.

■ Can DNR Change its Policies Through This Forest Land Planning Process?

No. To understand why, it is necessary to understand where forest land planning falls in DNR's planning process. The process has three stages: strategic, tactical, and operational (refer to Figure ES-1 on p. ES-5).

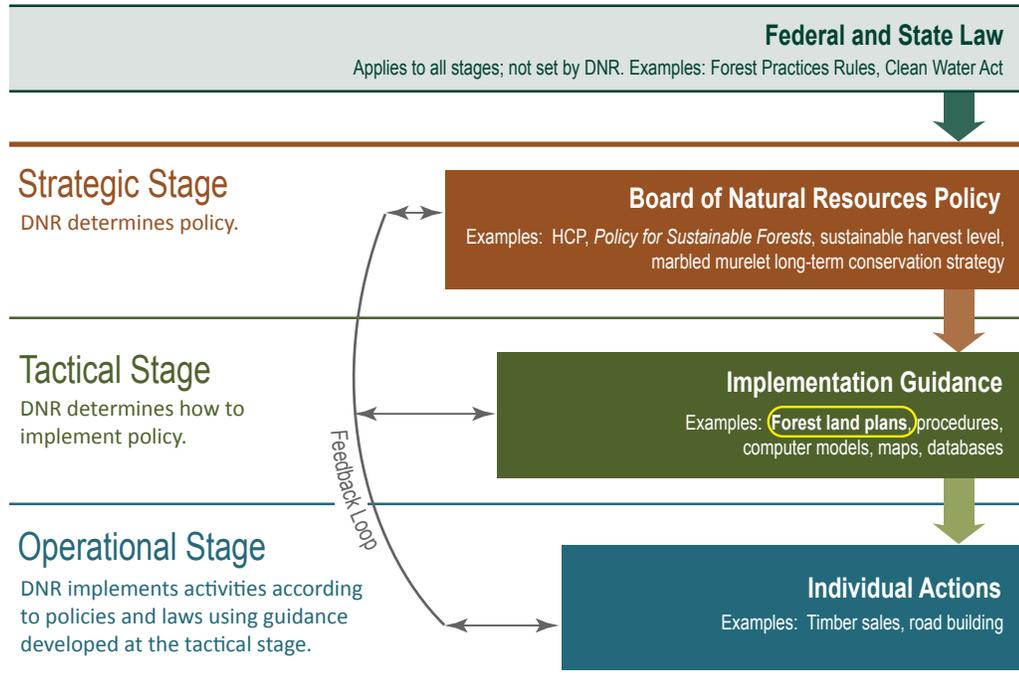
- At the **strategic stage**, DNR develops **policies**. Policies define DNR's basic operating philosophy, set standards and objectives, and provide direction upon which subsequent decisions can be based. All policies are written in the context of local, state, and federal laws, and are approved and adopted by the Board of Natural Resources (Board). Examples of policies include the HCP, the *Policy for Sustainable Forests*, and the sustainable harvest level.

Authorized under the Endangered Species Act (16 U.S.C. 1531 et seq.), the HCP is a long-term management plan that describes, in a suite of habitat conservation strategies, how DNR will restore and enhance habitat for threatened and endangered species such as northern spotted owls, marbled murrelets, and salmon in conjunction with timber harvest and other forest management activities.

The *Policy for Sustainable Forests* guides DNR's stewardship of 2.1 million acres of forested state trust lands.

The sustainable harvest level is the volume of timber to be scheduled for sale from state trust lands during a planning decade as calculated by DNR and approved by the Board (revised code of Washington [RCW] 79.10.300), and represents the amount of timber that can be harvested from state trust lands sustainably in the framework of current laws and DNR policies.

Figure ES-1. DNR's Planning Process



- At the **tactical stage**, DNR determines how it will implement policies developed at the strategic stage. At this stage, DNR develops forest land plans, databases, computer models, maps, procedures, and other tools and guidance. **DNR does not change policies at the tactical stage**, it only determines how to implement them.

For example, through forest land planning **DNR does not set or change the sustainable harvest level**. The forest land plan for the OESF will not be tied to any specific sustainable harvest level. Instead, the forest land plan will provide guidance for meeting the sustainable harvest level, whatever the current level happens to be in a given decade.

However, the planning process includes a feedback loop. The information gathered to develop and implement forest land plans and other materials at the tactical stage may be used to inform future policy decisions at the strategic stage.

- Site-specific activities such as individual timber sales are designed at the **operational stage** of planning using the guidance and tools developed at the tactical stage. Management activities must comply with all applicable local, state, and federal laws as well as policies developed at the strategic stage.

State Environmental Policy Act (SEPA) review for agency actions occurs at each stage of planning. Policies are reviewed at the strategic phase, forest land plans are reviewed at the tactical stage, and site-specific projects or actions, such as an individual timber sale, are reviewed at the operational stage, if required, as they are proposed.² Therefore, this forest land plan is part of a phased review under Washington Administrative Code (WAC) 197-11-060 (5)(c)(i).

Not all activities completed in the operational phase require SEPA review. For example, precommercial thinning³ and tree planting are Class I Forest Practices⁴ and so are categorically exempt from SEPA review, as described in RCW 43.21C.037.

What if DNR Policies Change During Forest Land Plan Implementation?

DNR recognizes that economic, social, political, and cultural changes over time may result in a change in DNR policies or state or federal laws. DNR also may update its policies as a result of new scientific information. Changes in policy or laws may or may not require an update or amendment to the forest land plan.

For example, DNR has begun the sustainable harvest calculation, the outcome of which will be a new sustainable harvest level for the fiscal year 2015 through 2024 planning decade. Because the forest land plan for the OESF is not based on a specific harvest level, DNR does not anticipate that the new level will require an update of the forest land plan unless other policies are changed as part of the calculation process. DNR also is developing the marbled murrelet long-term conservation strategy. Once this strategy is approved, DNR will update the forest land plan if and as necessary.

For this FEIS, DNR assumes that policies and laws will not change during the analysis period. In other words, DNR did not analyze future policy changes in this FEIS because it is not possible to predict what those changes would be.

Purpose, Need, and Objectives

■ Purpose of the Proposed Action

The purpose of the proposed action is **to determine how to implement the management approach and conservation strategies for state trust lands in the OESF described in the HCP while also meeting DNR’s fiduciary responsibility to provide revenue to trust beneficiaries through the harvest and sale of timber.** DNR’s management approach in the OESF is called “integrated management.” Integrated management will be explained later in this summary.

■ Need for the Proposed Action

DNR needs to develop a forest land plan to meet the policy direction in the HCP and the *Policy for Sustainable Forests*.

- The HCP states that “DNR expects landscape planning to be part of the process for implementing conservation strategies” in each HCP planning unit, including the OESF (DNR 1997, p. IV.192).

- The *Policy for Sustainable Forests* states that “In implementing Board of Natural Resources policy, the department will develop forest land plans at geographic scales similar to DNR’s *Habitat Conservation Plan* planning units” (DNR 2006, p. 45).

■ DNR’s Management Objectives for the OESF

DNR’s objectives for managing state trust lands in the OESF are based on the HCP and the *Policy for Sustainable Forests*. The forest land plan must enable DNR to meet these objectives. All of these objectives must be achieved in the context of the integrated management approach.

- Provide a **sustainable flow of revenue** through the harvest and sale of timber. The current sustainable harvest level for state trust lands in the OESF is 576 million board feet for the decade, as approved by the Board of Natural Resources (Board) in 2007. By selling timber for harvest, DNR provides revenue to its trust beneficiaries to meet its fiduciary obligations (DNR 2006, p. 9 through 16).
- Per the requirements of the OESF **northern spotted owl conservation strategy** in the HCP, restore and maintain northern spotted owl habitat capable of supporting northern spotted owls on DNR-managed lands⁵ in each of the 11 landscapes in the OESF by developing and implementing a forest land plan that does not appreciably reduce the chances for the survival and recovery of northern spotted owl sub-population on the Olympic Peninsula (DNR 1997, p. IV.86 through 106).
- Per the requirements of the OESF **riparian conservation strategy** in the HCP, “protect, maintain, and restore habitat capable of supporting viable populations of salmonid species as well as for other non-listed and candidate species that depend on in-stream and riparian environments” on state trust lands in the OESF (DNR 1997, p. IV.106 through 134).
- Per the requirements of the **multispecies conservation strategy** for state trust lands in the OESF, meet HCP objectives for unlisted species of fish, amphibians, birds, and mammals by implementing conservation strategies for riparian areas, northern spotted owls, and marbled murrelets, and additional site-specific conservation measures in response to certain circumstances (DNR 1997, p. IV.134 through 143).
- Implement the existing HCP **marbled murrelet conservation strategy** consistent with guidance provided in the “Memorandum for Marbled Murrelet Management Within the Olympic Experimental State Forest,” dated March 7, 2013 until the marbled murrelet long-term conservation strategy for state trust lands in DNR’s six Western Washington habitat conservation planning units has been completed and approved (a copy of this memorandum can be found in Appendix F).
- Implement a **research and monitoring program** for state trust lands in the OESF in the context of a structured, formal **adaptive management process** (DNR 1997, p. IV. 82 through 85).

What is Integrated Management?

DNR manages state trust lands in the OESF for revenue production (primarily through the harvest and sale of timber) and ecological values (refer to Text Box ES-1) through “integrated management.” Integrated management is an experimental management approach based on the principle that a forested area can be managed for both revenue production and ecological values (such as biodiversity) across its length and width. The integrated management approach differs from the more common approach of dividing a forested area into large blocks to be managed for a single purpose, such as a park managed for ecological values or a working forest managed primarily for revenue production.

The intent behind integrated management is to actively manage as much of the forested land base as possible to provide both revenue production and ecological values. Active management includes planting trees, managing vegetation, thinning forests, and performing stand-replacement harvests (refer to Text Box ES-2). Each of these “human-influenced disturbance” activities is designed to encourage the development, through natural growth processes, of conditions that support revenue production and ecological values.

Text Box ES-1. Ecological Values

Ecological values are defined by DNR as the elements (for example, trees, wildlife, soil, water) and natural relationships between them that are biologically and functionally important to the continued health of the forest ecosystem (DNR 1991). DNR has defined four categories of ecological values for state trust lands in the OESF (DNR 1991).

- **Long-term site productivity:** The ability of an area to support plants and wildlife.
- **Riparian areas and aquatic habitat:** Riparian areas are where aquatic and terrestrial ecosystems interact. Aquatic habitat includes streams and other water bodies.
- **Biological diversity:** The full range of life in all its forms (Washington Biodiversity Council).
- **Ecosystem resilience:** The ability of an ecosystem to recover from disturbance.

DNR’s objectives for northern spotted owls, riparian areas, marbled murrelets, and multiple species contribute to ecological values.

Text Box ES-2. Definitions of Management Terms

- **Management activity:** Any activity done on the ground for the purpose of managing state trust lands; examples include road building, road maintenance, and active management of forest stands.
 - **Active management:** Planting trees, managing vegetation, thinning forests, and performing stand-replacement harvests.
 - **Stand replacement harvest:** A timber harvest in which most trees are removed and replaced with a new forest stand. DNR uses a harvest method called variable retention in which snags, down wood, and other forest structures are retained at the time of harvest. The forest stand either regenerates naturally or is planted with young trees. Refer to Text Box 3-1 in Chapter 3, p. 3-25.
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The integrated management approach does not imply that every acre of state trust lands in the OESF must contribute equally to both revenue production and ecological values, nor does it imply that all areas will be actively managed. Instead, DNR actively manages state trust lands in the OESF *to the maximum extent possible* (DNR 2006).

Some areas, due to their physical characteristics or their importance to ecological values (or both), provide more support for ecological values than revenue production. An example is a riparian management zone. Riparian management zones are designated along streams and managed for the objectives of the riparian conservation strategy.



Riparian area in the OESF

Other areas have been deferred from harvest per DNR policies, such as old-growth forests;⁴ these areas will remain deferred for as long as the policy that deferred them remains in place. The OESF also includes natural resources conservation areas and natural area preserves, which have been deferred from harvest permanently.

What makes the integrated management approach unique is that deferrals, riparian management zones, and other areas that provide more support for ecological values are interspersed with more actively managed areas, not located in a single, contiguous block. Through active management and deferrals, DNR promotes the development of a diverse working forest ecosystem in which areas that provide more support for revenue production and those that provide more support for ecological values complement each other. The successful outcome of integrated management should be a functioning, healthy, productive forest ecosystem with conditions ranging from young stands to mature, structurally complex stands, providing quality timber for harvest and habitat for native species across state trust lands in the OESF.

Integrated management is expected to evolve over time. As DNR implements integrated management, it will intentionally learn how to achieve integration more effectively. In addition to operational experience, DNR will learn through **research and monitoring**. DNR conducts research and monitors management activities to gather information about natural systems and how they are affected by management. This information will be considered for possible adjustments to management through the **adaptive management process**. Adaptive management is a formal process for continually improving management practices by learning from the outcomes of operational and experimental approaches (Bunnell and Dunsworth 2009).

Alternatives

DNR is proposing three alternatives for this proposed action: the **No Action Alternative**, the **Landscape Alternative**, and the **Pathways Alternative**, which was added in response to comments received on the revised draft environmental impact statement (RDEIS). Each of DNR’s alternatives is designed to meet the following:

- DNR’s purpose, need, and objectives for this proposal.
- Applicable **federal and state laws**. Examples of applicable federal laws include the Clean Water Act, which established the basic structure for regulating discharge of pollutants into the waters of the United States, and the Endangered Species Act. Examples of applicable state laws include the Shoreline Management Act (Chapter 90.58 RCW), which protects valuable shoreline resources, the Washington Clean Air Act (70.94 RCW), SEPA, and the Forest Practices Act. Certain local laws also affect the management of state trust lands.
- **DNR policies**, including the HCP and *Policy for Sustainable Forests*.

As implemented on the ground, the alternatives will look similar and have similar environmental impacts, primarily because the alternatives are required to implement, not change, existing DNR policies. Under each alternative:

- DNR will continue to meet the requirements of the HCP, which include the integrated management approach, the four major habitat conservation strategies (northern spotted owl, riparian, marbled murrelet, and multispecies), research and monitoring, and adaptive management.
- DNR will conduct “planning from a landscape perspective,” which is a multi-scale approach to planning that was recommended in the HCP as a means of implementing integrated management. This type of planning involves looking at the entire land base at different spatial scales to determine the best means of meeting multiple objectives over time.

Following, DNR describes the major features of each alternative.

■ No Action Alternative

The No-Action Alternative represents DNR’s current management practices. Under this alternative:

- DNR will conduct planning from a landscape perspective using maps, databases, and other existing tools.
- For each timber sale, DNR will designate riparian management zones on streams and then use the “12-step watershed assessment process” in the HCP to determine whether these zones meet the objectives of the riparian conservation strategy. The riparian management zone consists of an interior-core buffer, which is adjacent to the stream, and an exterior buffer, which is adjacent to the interior-core buffer. The exterior buffer protects the interior-core buffer from windthrow (blowing over

or breaking of trees in the wind). The 12-step process enables DNR to evaluate streamside conditions in the context of physical, biological, and land use influences throughout the watershed (DNR 1997, p. IV.127).

- Per the northern spotted owl conservation strategy for the OESF, DNR must restore, then maintain threshold proportions of northern spotted owl habitat in each of the OESF's 11 landscapes. Under the No Action Alternative, DNR will use habitat maps to track the amount of northern spotted owl habitat in each landscape and to help make decisions on when, where, and how to harvest. Habitat maps will be updated periodically to reflect forest development, natural disturbance, land transactions, and other changes.

■ Landscape Alternative

Under this alternative:

- DNR will conduct planning from a landscape perspective using the outputs of a forest estate model. Forest estate models are powerful, computer-based tools that enable DNR to consider the entire land base at once to find efficient and effective ways to balance multiple objectives. The forest estate model DNR will use during implementation of the forest land plan is referred to in this FEIS as the “tactical model.”

The tactical model⁶ will be built with information on current conditions, management objectives, and management activities, and an understanding of natural growth processes and how forests respond to management activities. By simultaneously considering all of this information, the tactical model will develop an “optimal solution” of which forest stands to harvest, when, and by what method and which stands to retain across all state trust lands in the OESF over multiple decades to meet objectives for revenue production and ecological values. To develop its solution, the model will consider numerous interrelated factors, such as when a forest stand will be mature enough to harvest, how it may contribute to the objectives of DNR's conservation strategies, and how it may contribute to revenue production. The model's solution will be expressed as a harvest schedule, which is a list of the recommended type, locations, and timing of harvests.

The harvest schedule will be used as a starting point for selecting an area to harvest, and will be used in conjunction with other tools, databases, and information. **The tactical model and its harvest schedule are only tools; they are not meant to replace on-the-ground observation and decision making. Harvest and other management decisions will be based on field-verified conditions.**

- The 12-step watershed assessment process in the HCP will be automated within the tactical model. DNR will use the results of this watershed assessment process to determine the number of acres of regeneration harvest that may occur each decade without impeding riparian function within the interior-core buffers of Type 1 through 4 streams in each Type 3 watershed.
- DNR will use a windthrow probability model (along with remote reconnaissance and field assessments as needed) to identify segments of interior-core buffers with the

potential for severe endemic windthrow. Along these identified areas, DNR will apply an exterior buffer or reconfigure the harvest to reduce windthrow risk. If the latter, foresters will rerun the windthrow probability model on the reconfigured timber sale and, if there is still a risk of severe endemic windthrow, apply an exterior buffer where needed. Endemic windthrow results from peak winds that occur fairly frequently (every five years or less), and is considered severe when it causes a significant loss of riparian function. For example, a loss of half or more of the forest canopy could significantly reduce shade along the stream.

- DNR will use the tactical model to help implement the northern spotted owl conservation strategy. As explained previously, the model will develop an optimal solution of which stands to harvest and which to retain over time to meet DNR’s management objectives, including threshold proportions of northern spotted owl habitat.

■ Pathways Alternative

The Pathways Alternative is DNR’s preferred alternative. DNR developed this alternative to improve how it manages northern spotted owl habitat under the HCP. For this alternative, DNR will apply management “pathways” to each landscape. A pathway is a course of action DNR will take to achieve one or more of the following: attain threshold proportions of northern spotted owl habitat thresholds in each landscape more quickly than projected under the Landscape Alternative, create or accelerate habitat development in areas deferred from harvest to take full advantage of these areas where possible, and consolidate habitat in larger patches or near existing high quality habitat on state trust lands or adjacent federal lands where feasible. Most pathways involve selecting forest stands as candidates for either active management (thinning) to create or accelerate development of habitat, or passive management. Passive management means the selected stand will not be harvested for as long as the pathway remains in place.



Northern spotted owl

Environmental Analysis

The proposed forest land plan is a non-project action under SEPA. Non-project actions include the adoption of plans, policies, programs, or regulations that contain standards controlling the use of the environment, or that regulate or guide future on-the-ground actions (WAC 197-11-704(2)(b)). Non-project actions do not include design of specific activities.

Because the proposed forest land plan is a non-project action, DNR did not analyze the potential environmental impacts of site-specific management activities such as individual timber sales or the construction of specific sections of roads. Those potential impacts are analyzed at the time they are proposed, at the operational stage of planning.

The Role of SEPA

The intent behind SEPA is to ensure that environmental values are considered during decision-making by state and local agencies (Ecology 2003).

Instead, in this FEIS DNR analyzed long-term ecological changes across state trust lands in the OESF that may result from implementing each alternative over time. For example:

- How will each alternative affect riparian conditions across state trust lands in the OESF? Will riparian conditions improve, stay the same, or worsen over time?
- Over time and across the OESF, how will each alternative affect overall forest health, soil conditions, or the ability of the OESF to sequester more carbon than is released through harvest?

■ What Were the Preliminary Steps?

In August 2007, DNR issued a “Determination of Significance and Request for Comments on Scope of Environmental Impact Statement for the Development of a Forest Land Plan for the Olympic Experimental State Forest.” This document determined that an environmental impact statement (EIS) would be required under SEPA (43.21C RCW). Per SEPA, an EIS is required for a non-project action such as a forest land plan when that plan has the potential to have probable significant adverse environmental impacts.

DNR held three public workshops (one each in Forks, Port Angeles, and Port Hadlock, Washington) in June 2007 to discuss the proposed forest land plan. Public notices and press releases invited interested people to attend these workshops. In addition, personal invitations were sent to individuals and organizations interested in state trust lands management decisions. These stakeholders included recreation groups, environmental organizations, representatives of the timber industry and local communities, and trust beneficiaries.

About 50 people participated in these workshops. The attendees offered local information and expressed their concerns about state trust lands in the OESF. Participants listened to a presentation on the preliminary stages of planning and then shared information with DNR. Participants also discussed how they use the forest and presented their ideas about forest management activities in specific areas.

Project Scoping

DNR initiated the scoping process—defining the issues to be discussed in the EIS—in August 2007 by holding three public meetings. Like the public workshops, these meetings were held in Forks, Port Angeles, and Port Hadlock. During these meetings, DNR heard comments regarding its management of state trust lands from concerned citizens and organizations. Their comments captured diverse and sometimes conflicting opinions and ideas. The comments were summarized by subject, and responses were provided in August 2009 (refer to Appendix B). DNR’s professional judgment and careful review of the comments helped DNR focus the environmental analysis on areas of concern, eliminate less significant impacts from detailed environmental study, and identify reasonable management alternatives to be analyzed in the EIS. The opportunity to comment during the scoping process helped promote public interaction.

Draft EIS (DEIS)

Once scoping was completed, DNR prepared a DEIS. In this document, DNR analyzed each alternative to identify potential probable significant adverse environmental impacts. As part of this analysis, DNR also identified mitigation. DNR submitted the DEIS for comments from June 1, 2010 to July 15, 2010. Public hearings were held on June 16 in Port Angeles and June 17 in Forks.

RDEIS and Draft OESF Forest Land Plan

Because of comments received on readability and other issues, DNR decided to revise the DEIS to make it easier to read and understand and publish it as an RDEIS. The RDEIS was published in October, 2013. As part of this process, DNR developed a draft forest land plan for the OESF. The draft plan, which was based on the Landscape Alternative, was provided to help the reader understand what a forest land plan is and the type of information it may contain.

DNR communicated with stakeholders, settlement partners, tribes, and the Federal Services (United States Fish and Wildlife Service [USFWS] and NOAA Fisheries) through meetings, teleconferences, and field tours while developing the RDEIS.

Response to Comments and Final EIS (FEIS)

During the RDEIS comment period (October 31 through December 16, 2013), DNR received over 300 pages of comments from individuals, trust beneficiaries, timber organizations, conservation organizations, tribes, and government agencies. DNR held two public meetings:

- November 19, 2013, 6:30-8:30 pm, DNR's Olympic Region office in Forks, Washington
- November 21, 2013, 6:30-8:30 pm, Natural Resources Building in Olympia, Washington

A summary of the comments received and DNR's responses to them can be found in Appendix L of this FEIS.

For the FEIS, DNR made a number of changes to the RDEIS text and analysis. Major changes include the following:

- In response to comments received on the RDEIS, DNR developed and analyzed a new action alternative called the "Pathways Alternative," as mentioned previously in this summary.
- Based on comments received on the RDEIS, DNR made significant revisions to its analysis methodology in "Riparian" for the No Action and Landscape alternatives. These revisions changed results for four indicators (fine sediment delivery, leaf and

needle litter, riparian microclimate, and the composite watershed score). Detailed information about the revised analysis methodology can be found in Appendix G.

- DNR did not use intrinsic potential models to analyze potential impacts to fish for this FEIS because of comments received expressing concern about these models. Instead, similar to the fish analysis in the DEIS, DNR completed a qualitative analysis based primarily on the results of the riparian analysis. In “Riparian,” DNR analyzed a suite of indicators, each of which represents an ecosystem process that takes place in and around riparian areas. Together, these processes describe the numerous interactions that occur between in-stream, stream side, and upslope areas. The condition of the riparian ecosystem is the end-result of a variety of such processes, and their integrity can be used as a gauge of the riparian ecosystem as a whole. It is the condition and interaction of these processes that determine the amount, quality, and complexity of riparian habitat, and whether that habitat is capable of supporting viable salmonid populations and other species that depend on in-stream and riparian environments. Because of the change in analysis methods, the results of the analysis also have changed.
- Also in response to comments received, DNR added new information to “Climate Change” on how climate change may affect state trust lands in the future.

■ What are the Next Steps?

The final action in this process will be to adopt a forest land plan. DNR’s decision maker, the Deputy Supervisor for State Uplands, will consider the range of alternatives and associated, potential environmental impacts described in this FEIS and reasonable mitigation measures that DNR can implement. Although the final forest land plan may not be identical to any one alternative in this FEIS, it will fall within the range analyzed.

Because adoption of a forest land plan is not a policy-level decision, the plan does not require approval from the Board. The forest land plan for the OESF will be made available to the public once it is adopted.

■ Analysis Methodology

What Topic Areas Does This Analysis Include?

Forest conditions as a whole are analyzed in “Forest Conditions and Management,” p. 3-23. DNR also provides detailed analysis for the following topics: soils, riparian, water quality, fish, wildlife, northern spotted owls, and climate change.



How was Each Topic Analyzed?

To analyze each topic, DNR used **criteria and indicators**. Criteria are broad concepts, such as forest health or functioning riparian habitat. Indicators are the means by which the criteria are measured. For example, the indicator stand density (crowding of forest stands) is used to measure the criterion forest health, and the indicator stream shade is used to measure the criterion functioning riparian habitat. Each criterion may have one or more indicators. This approach is based on the Montréal Process, which was established to advance the development of internationally agreed-upon criteria and indicators for the conservation and sustainable management of temperate and boreal forests (Montréal Process 1995).

DNR used its expertise, existing scientific information, and available data to select the criteria and indicators that would best describe the potential environmental impacts of the alternatives. Each topic area (such as “Northern Spotted Owls”) has its own criteria and indicators.

OVERLAPPING INDICATORS

Forests are complex, interrelated natural systems. Few indicators apply to only one topic in this FEIS; many overlap. DNR analyzed each overlapping indicator in the section to which it most logically applied. Stream shade, for example, was analyzed in “Riparian.” Subsequent sections which use these indicators, such as “Water Quality,” include a brief summary of the indicator and additional information about that indicator specific to the topic being discussed.

Additional indicators could have been used to evaluate the criteria. However, DNR used its expertise to determine which indicators were best to use with the scientific data that is currently available from Ecology, USFS, DNR, and other sources. DNR believes that the selected indicators are sufficient to understand how the criteria are affected.

How did DNR Analyze the Indicators?

Following, DNR first describes the quantitative approach it used to analyze the indicators for the No Action and Landscape alternatives. An explanation of how DNR analyzed the indicators for the Pathways Alternative is provided at the end of this section. All analysis was performed using the best available scientific information and techniques.⁷

NO ACTION AND LANDSCAPE ALTERNATIVES

The Analysis Model

To analyze each indicator for the No Action and Landscape alternatives, DNR used a forest estate model referred to in this FEIS as the “analysis model.” DNR used the same analysis model for the FEIS, RDEIS, and DEIS. To deepen its understanding of certain topic areas, DNR also developed computer models for northern spotted owl territories and habitat and each riparian indicator. DNR developed each of these computer models using data from the analysis model and other data and information.

The analysis model, which is similar to the tactical model DNR will use during implementation of the forest land plan, has two major outputs for each alternative (No Action and Landscape). One output is a harvest schedule that spans 100 years (reported in decade intervals). DNR chose 100 years for the analysis period to fully understand the potential long-term impacts of the alternatives. The second output is a state-of-the-forest file, which is the model’s projection of future conditions that may result from implementing the harvest schedule over the 100-year analysis period. The state of the forest file includes a wealth of detailed information such as tree height, diameter, and species.

In this FEIS, DNR uses the harvest schedule, the state-of-the-forest file, and the territory, habitat, and riparian indicator models to identify trends of change over time in forest ecosystems, for example a change in riparian function, or an increase or decrease in the risk to forest health posed by overcrowded forest stands. DNR used these trends to identify potential environmental impacts for the No Action and Landscape alternatives.

Analysis Process

To analyze indicators for the No Action and Landscape Alternatives, DNR used a two-step process.

Step One: Assigning Potential low, Medium, or High Impact Ratings

DNR first quantified potential environmental impacts for each indicator as low, medium, or high using parameters defined for each indicator. The exact meaning of each term (low, medium, high) was specific to each indicator. For example, some low and medium impacts were potentially beneficial (an improvement in conditions), while others were potentially adverse but not significant. For this analysis, only high impacts were considered potentially significant impacts.

DNR first assigned potential low, medium, or high impact ratings by analyzing management activities *exactly* as they were modeled or mapped, without consider-

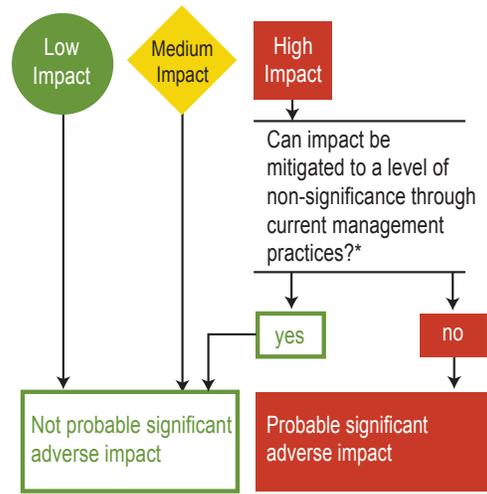
ing current management practices that are expected to mitigate potential high impacts. For example, DNR first analyzed potential impacts from roads based on a straightforward assessment of the mapped size and location of the road network. In this step, DNR assumed that all roads that have not been certified as abandoned⁸ can contribute sediment to streams, even though some of these roads have been mitigated already (or will be mitigated in the future) through current management practices to prevent the delivery of sediment from roads to stream channels. (Mitigation of the road network through current management practices is discussed on p. ES-27.) **Mitigation was not considered until the second step of DNR’s analysis process.**

Step Two: Determining if Impacts are Probable Significant Adverse

In this step, DNR considered the full range of its current management practices to identify particular programs, rules, procedures, or other measures that are expected to mitigate a potential high impact to a level of non-significance. If an impact will be mitigated, it was not considered probable significant adverse (refer to Figure ES-2). For each indicator, DNR described the specific management practice(s) that will be used to mitigate a potential high impact. DNR also determined if a potential high impact was significant based on the role the indicator plays in ecological function.

For each topic, DNR provided a detailed explanation of how each indicator was measured; the thresholds used to measure it; the specific meaning of low, medium and high in the context of that indicator; the mitigation that applies to that indicator; and the final determination of whether the impact is a probable significant adverse impact. To assist the reader, DNR used color-coded symbols in tables throughout this FEIS. A green circle indicated a potential low impact, a yellow diamond indicates a potential medium impact, and a red square indicates a potential high impact.

Figure ES-2. Determining Impacts for Each Indicator



*DNR may also consider the indicator’s role in ecological function to determine significance

What Spatial Scale did DNR use for Each Indicator?

DNR first analyzed each indicator at the spatial scale that it considered most meaningful. For example, peak flow (an indicator for functioning riparian habitat) was analyzed at the scale of the Type 3 watershed, while carbon sequestration (an indicator for climate change) was analyzed at the scale of state trust lands in the OESF. Scales were chosen based on existing literature, available data, and professional judgment. In some cases, multiple scales were used to provide a more comprehensive understanding of potential impacts. DNR then considered potential environmental impacts for each indicator at the scale of all state trust lands in the OESF. Figure ES-3 illustrates the spatial scales used in this analysis. Table ES-1 lists the scales used for each topic.

Figure ES-3. Spatial Scales Used to Plan and Manage State Trust Lands in the OESF

For illustrative purposes only. Type 3 watershed boundaries often do not coincide with watershed administrative boundaries.



Table ES-1. Scale of Analysis by Topic

Topic	Scale of analysis
Forest Conditions and Management	State trust lands in the OESF, landscape; results at watershed administrative unit and Type 3 watershed scale are presented in Appendix E
Riparian	Type 3 watershed, stream reach
Soils	Landscape, watershed administrative unit
Water Quality	Landscape, Type 3 watershed
Fish	Type 3 watershed, stream reach
Wildlife	State trust lands in the OESF
Northern Spotted Owls	State trust lands in the OESF, landscape
Climate	State trust lands in the OESF

PATHWAYS ALTERNATIVE

For this FEIS analysis, DNR did not run the analysis model for the Pathways Alternative because of its similarity to the Landscape Alternative. The only difference between the Landscape and Pathways alternatives is that, under the Pathways Alternative, DNR will apply management pathways to each landscape. In all other respects, these alternatives are the same. Because of these similarities, and because the total number of acres affected by pathways is anticipated to be relatively small, DNR expects the harvest schedule the analysis model would produce for the Pathways Alternative (if the model was run) would not differ substantially from that of the Landscape Alternative.

Because of these similarities between the Landscape and Pathways alternatives, for most indicators DNR qualitatively assessed whether potential impacts identified under the Landscape Alternative would be the same, lower, or higher under the Pathways Alternative. For example, for the indicator “forest health” in “Forest Conditions and Management,” DNR qualitatively assessed how the trends in stand density identified under the Landscape Alternative would differ under the Pathways Alternative. DNR then deter-

mined if those differences were enough to shift the assessed impact from low to medium or high.

For the indicator “number of acres of modeled northern spotted owl habitat” in “Northern Spotted Owls,” DNR completed a quantitative analysis similar to that conducted for the No Action and Landscape Alternatives. This quantitative analysis was based on an estimated range of the amount of northern spotted owl habitat each landscape may have in each decade of the 100-year analysis period. These estimates were developed in a post process (outside the analysis model) and used for this indicator only. Refer to “Northern Spotted Owls” on p. 3-189 and Appendix A for more information.

Harvest Schedule Analyzed

The harvest schedule produced by the analysis model and analyzed in this FEIS represents a harvest level that is higher than the current sustainable harvest level of 576 million board feet for the decade, and higher than DNR can implement with current funding. **DNR is not proposing the harvest level analyzed in this FEIS as a new sustainable harvest level for the OESF.** The forest land plan is not tied to any specific level. Nor does DNR change policies, such as the sustainable harvest level, through the forest land planning process. **DNR will continue to implement the current sustainable harvest level (576 million board feet for the decade) until the new level is selected through the sustainable harvest calculation process.**

■ Analysis Results

In Chapter 3 of this FEIS, DNR provided its analysis of the potential environmental impacts of the alternatives on the forest as a whole and on other elements of the environment such as wildlife or water quality. According to DNR’s analysis, potential environmental impacts for most indicators are low or medium. In fact, some low impacts represent a general *improvement* in conditions. Over the 100-year analysis period, for all three alternatives, DNR anticipates:

- An **increase in the number of acres of state trust lands in the Structurally Complex stand development stage.** DNR considers an increase in structural complexity a benefit to wildlife (refer to “Wildlife,” p. 3-187). Developing and maintaining structural complexity in managed stands is important to any forest management program that intends to maintain forest biodiversity and ecosystem processes (Lindenmayer and Franklin 2002).



Structurally Complex Stand Development Stage

- A **decrease in the number of acres in the Competitive Exclusion stand development stage**. No wildlife species in western Washington are found exclusively in the Competitive Exclusion stand development stage (Carey and Johnson 1995) because of the low structural diversity and low or absent shrub cover in this stage (Johnson and O’Neil 2001).
- A **reduction in the number of acres of state trust lands considered to be in a high forest health risk category** because of overstocking (too many trees). Although not universally true, trees with less room to grow are less able to withstand attack from insects, pathogens, and parasites (Safranyik and others 1998).
- A **gradual improvement in riparian conditions**, as demonstrated by improvements in the composite watershed scores. The composite watershed score was used to assess the health of the riparian system as a whole.
- An **increase in the number of acres of modeled northern spotted owl habitat**. (DNR refers to habitat as “modeled” to emphasize that the current conditions and results of this analysis were based on the outputs of DNR’s analysis model.)

Potential high impacts were identified for only a few indicators. Most of these impacts are related to the potential delivery of fine sediment from the road network. These potential high impacts were identified based on the mapped extent and location of the road network, without considering the condition of the road network or current management practices (established programs, rules, procedures, or other practices) that are expected to mitigate a potential high impact to a level of non-significance. Mitigation was not considered until the second step in DNR’s analysis process, when DNR determined if potential high impacts were probable significant adverse. **All potential high impacts related to the road network are expected to be mitigated to a level of non-significance through current management practices, which include implementing road maintenance and abandonment plans; inspecting, maintaining, and repairing roads; and suspending timber hauling during storm events**, when heavy rainfall can potentially increase surface water runoff and sediment delivery (unless the road is designed for wet-weather haul).

Following is a summary of the analysis results for each topic. As a reminder, for this analysis only potential high impacts were considered potentially significant impacts. Refer to Chapter 3 of the FEIS for the full analysis.

Forest Conditions and Management

This topic is an overview of the potential environmental impacts of harvest activities on the forest as a whole. Table ES-2 shows the potential environmental impacts of the No Action, Landscape, and Pathways alternatives on forest conditions, by indicator.

Table ES-2. Summary of Potential Impacts on Forest Conditions, by Alternative

Criteria	Indicators	No Action Alternative	Landscape Alternative	Pathways Alternative
Forest sustainability	Forest biomass	Low ●	Low ●	Low ●
	Harvest methods and number of forest stand entries	Low ●	Medium ◆	Medium ◆
Forest structural complexity	Stand development stages	Low ●	Low ●	Low ●
Forest health	Stand density	Low ●	Low ●	Low ●

● Low impact ◆ Medium impact

Based on these results, **DNR has not identified probable significant adverse environmental impacts on forest conditions under any of the management alternatives.**

Riparian

Riparian areas are where aquatic and terrestrial ecosystems interact. They include surface waters such as rivers, streams, lakes, ponds, and wetlands, and adjacent forests and groundwater zones. In “Riparian,” DNR examined riparian areas using the criterion functioning riparian habitat. Functioning riparian habitat is “habitat that is capable of supporting viable populations of salmonid species as well as other non-listed and candidate species that depend on healthy in-stream and riparian environments” (DNR 1997, p. IV.107). Table ES-3 shows the potential environmental impacts of the No Action, Landscape, and Pathways alternatives on riparian areas, by indicator.

Table ES-3. Summary of Potential Impacts on Riparian Areas, by Alternative

Criteria	Indicators	No Action Alternative	Landscape Alternative	Pathways Alternative
Functioning riparian habitat	Large woody debris recruitment	Medium ◆	Medium ◆	Medium ◆
	Peak flow	Low ●	Low ●	Low ●
	Stream shade	Low ●	Low ●	Low ●
	Fine sediment delivery	High ■	High ■	High ■
	Leaf and needle litter recruitment	Low ●	Low ●	Low ●
	Riparian microclimate	Medium ◆	High ■	High ■
	Composite watershed score	Low ●	Low ●	Low ●

● Low impact ◆ Medium impact ■ High impact

High impacts were identified for fine sediment delivery under all three alternatives; however, DNR expects these impacts to be mitigated to a level of non-significance through

current management practices (implementation of projects identified in road maintenance and abandonment plans; ongoing inspection, maintenance, and repair of roads; and suspension of timber hauling during storm events). High impacts also were identified for riparian microclimate under the Landscape and Pathways alternatives. DNR considers these impacts to be probable and adverse but not significant because the contribution of riparian microclimate to riparian function is relatively minor: it is only 3 percent of the composite watershed score. Therefore, **DNR has not identified probable significant adverse environmental impacts on riparian areas under any of the management alternatives.** Refer to “Mitigation” later in this summary for more information.

Soils

Since soil is the basis of plant growth, soil conservation is vital to maintaining functioning and productive forest ecosystems. Table ES-4 shows the potential environmental impacts of the No Action, Landscape, and Pathways alternatives on soils, by indicator.

Table ES-4. Summary of Potential Impacts on Soils, by Alternative

Criterion	Indicators	No Action Alternative	Landscape Alternative	Pathways Alternative
Soil conservation	Soil compaction	Medium 	Medium 	Medium 
	Soil erosion	Low 	Low 	Low 
	Soil displacement	Medium 	Medium 	Medium 
	Soil productivity	Low 	Low 	Low 
	Landslide potential	Low 	Low 	Low 
	Potential road failure	High 	High 	High 

 Low impact  Medium impact  High impact

Under all three alternatives, DNR identified only one potential high impact: potential road failure. Should it occur, the potential impact of a road failure could be adverse. However, potential road failure is expected to be mitigated to a level of non-significance through current management practices (implementation of projects identified in road maintenance and abandonment plans and ongoing inspection, maintenance, and repair of roads). Therefore, **DNR has not identified probable significant adverse environmental impacts on soils under any of the management alternatives.** Refer to “Mitigation” later in this summary for more information.

Water Quality

Water quality is fundamental to the health of riparian areas. Riparian areas support native fish populations and other aquatic species as well as the birds and mammals that depend on those areas for all or part of their life cycles. Table ES-5 shows the potential environmental impacts of the No Action, Landscape, and Pathways alternatives on water quality, by indicator.

Table ES-5. Summary of Potential Impacts on Water Quality, by Alternative

Criteria	Indicator ^a	No Action Alternative	Landscape Alternative	Pathways Alternative
Adherence to water quality standards	Stream shade (surrogate for stream temperature and dissolved oxygen)	Medium 	Medium 	Medium 
	Road density (surrogate for turbidity)	High 	High 	High 
	Stream crossing density (surrogate for turbidity)	Low 	Low 	Low 
	Proximity of roads to streams or other water bodies (surrogate for turbidity)	High 	High 	High 
	Traffic use (surrogate for turbidity)	Medium 	Medium 	Medium 

 Low impact  Medium impact  High impact

^a Ecology uses stream temperature, dissolved oxygen, and turbidity as indicators to monitor water quality. DNR uses surrogates to evaluate these indicators.

Under all three alternatives, DNR identified potential high impacts for two indicators: road density and proximity of roads to streams or other water bodies. Roads can potentially deliver fine sediment to streams unless they have been abandoned, and fine sediment delivery to streams is considered an adverse impact. However, potential fine sediment delivery from the road network is expected to be mitigated to a level of non-significance through current management practices (implementation of projects identified in road maintenance and abandonment plans; ongoing inspection, maintenance, and repair of roads; and suspension of timber hauling during storm events). Therefore, **DNR has not identified probable significant adverse environmental impacts on water quality under any of the management alternatives.** Refer to “Mitigation” later in this summary for more information.

Fish

Fish have ecological, economic, and cultural significance in Washington. For this topic, DNR completed a qualitative analysis based primarily on the results of the riparian analysis. Table ES-6 shows the potential environmental impacts of the No Action, Landscape, and Pathways alternatives on fish, by indicator.

Table ES-6. Summary of Potential Impacts on Fish, by Alternative

Criteria	Indicators	No Action Alternative	Landscape Alternative	Pathways Alternative
Functioning riparian habitat	Large woody debris recruitment	Medium 	Medium 	Medium 
	Peak flow	Low 	Low 	Low 
	Stream shade	Low 	Low 	Low 
	Fine sediment delivery	High 	High 	High 
	Coarse sediment delivery	Medium 	Medium 	Medium 
	Leaf and needle litter recruitment	Low 	Low 	Low 

 **Low impact**  **Medium impact**  **High impact**

High impacts were identified for fine sediment delivery under all three alternatives; however, DNR expects these impacts to be mitigated to a level of non-significance through current management practices (implementation of projects identified in road maintenance and abandonment plans; ongoing inspection, maintenance, and repair of roads; and suspension of timber hauling during storm events). Therefore, **DNR has not identified probable significant adverse environmental impacts on fish under any of the management alternatives.** Refer to “Mitigation” later in this summary for more information.

Wildlife

Wildlife habitat is defined as the combination of resources (food, water, cover) and environment (climate, soils, vegetation structure) that attracts and supports a species, population, or group of species (Johnson and O’Neil 2001). In this section of the FEIS, DNR considered how each of the alternatives (No Action, Landscape, Pathways) will impact the ability of state trust lands in the OESF as a whole to support wildlife. The analysis in this section focuses on the habitat needs of a broad range of wildlife species rather than the needs of specific species, and emphasizes potential environmental impacts at the largest spatial scale (all state trust lands in the OESF) instead of smaller scales such as landscapes or watershed administrative units.

The potential environmental impacts of the alternatives on northern spotted owls were analyzed in a separate section of this FEIS because they are listed as threatened under the Endangered Species Act. In this FEIS, DNR did not include a separate section for the potential environmental impacts of the alternatives on marbled murrelets. Although marbled murrelets are also listed as threatened under the Endangered Species Act, DNR currently is developing the marbled murrelet long-term conservation strategy in a **separate planning process**. Instead, DNR includes marbled murrelets in the general discussion on wildlife habitat. Table E-7 shows the potential environmental impacts of all three alternatives on wildlife, by indicator.

Table ES-7. Potential Environmental Impacts on Wildlife by Indicator and Alternative

Criteria	Indicators	No Action Alternative	Landscape Alternative	Pathways Alternative
Conservation of biodiversity	Stand development stages supporting wildlife guilds	Low ●	Low ●	Low ●
	Interior older forest	Medium ◆	Medium ◆	Medium ◆

● Low impact ◆ Medium impact

Based on these results, **DNR has not identified probable significant adverse environmental impacts on wildlife under any of the management alternatives.**

Northern Spotted Owls

The northern spotted owl was federally listed in 1990 as threatened under the Endangered Species Act. DNR’s objective is to restore and maintain northern spotted owl habitat capable of supporting the owl on DNR-managed lands in each of the 11 landscapes in the OESF by developing and implementing a forest land plan that does not appreciably reduce the chances for the survival and recovery of the northern spotted owl sub-population on the Olympic Peninsula. Table ES-8 shows the potential environmental impacts of the No Action, Landscape, and Pathways alternatives on northern spotted owls, by indicator.

Table ES-8. Summary of Potential Impacts on Northern Spotted Owl Habitat, by Alternative

Criteria	Indicators	No Action Alternative	Landscape Alternative	Pathways Alternative
Amount of habitat capable of providing support for the recovery of the Olympic Peninsula sub-population of northern spotted owls	Number of acres of modeled northern spotted owl habitat	Low ●	Low ●	Low ●
	Number of acres supporting northern spotted owl life history requirements	Low ●	Low ●	Low ●
	Number of viable northern spotted owl territories	Low ●	Low ●	Low ●

● Low impact

Based on these results, **DNR has not identified probable significant adverse environmental impacts on northern spotted owls under any of the management alternatives.** Under each of the alternatives, the capability of DNR-managed lands to provide support for the recovery of the Olympic Peninsula sub-population of northern spotted owls is expected to increase, as predicted in the HCP.

Climate Change

Climate change is a change in average temperature and weather patterns that occurs on a regional or global scale over decades to centuries. Climate change is closely linked to a global rise in temperature, which is closely linked to the amount of carbon dioxide in the atmosphere. For this topic, DNR examined the amount of carbon sequestered (stored) in forest stands on state trust lands in the OESF and in wood harvested from state trust lands, and compared it to the amount of carbon emitted (released) from wood harvested from state trust lands in the OESF. Table ES-9 shows the potential environmental impacts of the No Action, Landscape, and Pathways alternatives on climate change, by indicator.

Table ES-9. Summary of Potential Impacts for Climate Change, by Alternative

Criteria	Indicators	No Action Alternative	Landscape Alternative	Pathways Alternative
Carbon sequestration	Amount of carbon sequestered in forest stands	Low ●	Low ●	Low ●
	Difference between amount of carbon sequestered and emitted	Low ●	Low ●	Low ●

● Low impact

The amount of carbon sequestered in forest stands on state trust lands in the OESF is expected not only to increase, but to far exceed the amount of carbon emitted. **DNR has not identified probable significant adverse environmental impacts from any alternative for this topic.**

■ Mitigation

Following, DNR describes current management practices (established programs, rules, procedures, or other practices) that are expected to mitigate potential high impacts to a level of non-significance. This mitigation applies to the following indicators: road density, proximity of roads to streams or other water bodies, road failure, and fine sediment delivery. All of these indicators are related to the road network.

Road Maintenance and Abandonment Plans

The forest practices rules contain specific direction for constructing and maintaining roads (WAC 222-24) to protect water quality and riparian habitat. Specifically, road construction and maintenance must prevent or limit actual or potential delivery of sediment and surface water to any typed water where it would prevent the achievement of fish habitat or water quality goals.

The forest practices rules require large forest landowners,⁹ such as DNR, to prepare road maintenance and abandonment plans for all roads that have been used or constructed

since 1974.¹⁰ These plans specify the steps that will be taken to either abandon roads or bring roads that do not meet current standards into compliance. Consistent with the forest practices rules, DNR has developed road maintenance and abandonment plans for roads on state trust lands in each of the 11 landscapes in the OESF.

Road traffic generates sediment through surface erosion, and the key to controlling sediment is controlling erosion. Erosion control measures are necessary if exposed soils can deliver sediment to streams. DNR's objective for roads is to create a stable, dispersed, non-erosive drainage pattern associated with road surface runoff to minimize potential or actual sediment delivery to streams. Depending on what is appropriate for site-specific conditions, this objective can be accomplished in a variety of ways, such as using ditches, culverts, and other structures to collect sediment-laden water runoff from the road and direct it to areas on the forest floor where it can be captured or safely dissipated away from the stream; stabilizing ditch walls; or constructing catch basins to capture water runoff and allow sediment to settle out of the water.

Work under these plans is ongoing and must be completed by October 31, 2021. A summary of DNR's accomplishments for roads in each of the 11 landscapes in the OESF and DNR's road maintenance priorities and standards are included in Appendix C.

All work completed under these plans is performed using (as appropriate) the best management practices for road construction and maintenance described in the Forest Practices Board Manual (DNR 2016) and the guidance provided in DNR's Forest Roads Guidebook (DNR 2011). DNR continually updates and prioritizes these plans to address newly identified environmental impacts from the existing road network.

Effectiveness of Road Maintenance and Abandonment Plans

The correct implementation of current forest practices rules for road maintenance is expected to minimize runoff water and sediment delivery to typed waters (DNR 2016). A statewide study conducted on private forestlands in Washington found that road maintenance and abandonment appear to reduce the amount of road-related sediment that reaches streams (Martin 2009). This study found that implementing best management practices decreased the number of road miles hydrologically connected to streams, and that most roads studied had a low probability of delivering sediment to streams (Martin 2009). In addition, the monitoring of the effectiveness of road maintenance and abandonment plans that was conducted statewide by Dubé and others (2010) from 2006 through 2008 found that as roads were brought up to modern standards, they showed decreased sediment delivery to streams.

Inspection, Maintenance, and Repair

After work identified under road maintenance and abandonment plans has been completed, DNR will continue to inspect, maintain, and repair roads and bridges as needed using the appropriate best management practices for road maintenance and repair identified in

the current Forest Practices Board Manual and the guidance in the Forest Roads Guidebook. Routine maintenance of road dips and surfaces and quick response to problems can significantly reduce road-caused slumps and slides and prevent the creation of berms that could channelize runoff (Environmental Protection Agency 2012).

Suspension of Timber Hauling During Storm Events

In addition to road maintenance and abandonment plans, DNR also considers how operations can be adjusted to further prevent delivery of fine sediment to streams. For example, DNR suspends timber hauling on state trust lands in the OESF during storm events, when heavy rainfall can potentially increase surface water runoff and sediment delivery (unless the road is designed for wet-weather haul). The decision to suspend timber hauling on state trust lands is based on professional judgment. A weather event is considered a storm event when high levels of precipitation are forecast and there is a potential for drainage structures, such as culverts and ditches, to be overwhelmed, increasing the potential for sediment delivery to streams. Whether timber hauling is suspended or not, DNR compliance foresters monitor the haul roads to determine if potential problems are developing that may lead to sediment delivery to streams and take action as necessary.

Cumulative Impacts and Uncertainties

■ Cumulative Impacts

For cumulative impacts, DNR considered the potential environmental impacts of DNR's alternatives in context with impacts from past, present, and reasonably foreseeable future activities on lands in the OESF managed by other landowners (federal and private). Based on this analysis, DNR anticipates that conditions across ownerships will continue improving over time:

- **Federal landowners** manage 39 percent of the OESF. NPS manages Olympic National Park primarily to maintain natural ecosystems and processes; USFS manages Olympic National Forest to maintain or enhance habitat for late successional and old-growth forest related species, and to protect and enhance watershed and aquatic habitat conditions. Conditions on federal lands are expected to continue improving.
- **DNR** manages 21 percent of the OESF for both revenue production and ecological values through an integrated management approach. As the environmental analysis contained in this FEIS demonstrates, DNR anticipates a general improvement in conditions over time.
- **Private landowners**, including timber companies, manage 30 percent of the OESF according to the forest practices rules. Environmental conditions on private lands are generally expected to improve.

As the proposed forest land plan is implemented on state trust land in the OESF, DNR will gather information on the effectiveness of its management practices through its

research and monitoring program. This information will be considered for possible future management changes through the adaptive management process. Together, research and monitoring and adaptive management should lead to more effective management in the future.

■ Uncertainties

Uncertainties are presented in Chapter 4 of the FEIS. Although uncertainties exist in this analysis, DNR believes that the information provided in the FEIS is sufficient to evaluate the potential environmental impacts of the alternatives.

Some of these uncertainties may be addressed through DNR's proposed research and monitoring program. Uncertainties will be prioritized and selected for research and monitoring based on predefined criteria.

Endnotes

1. Acreage totals throughout this document are based on DNR's GIS data that was current at the time of EIS development. DNR expects the land base to change over time as some lands are acquired and some are transferred out of trust status or to other owners.
2. Site-specific evaluations allow DNR to reconsider all information, make any relevant changes based on localized conditions, and consider mitigation, if appropriate.
3. A precommercial thinning is done to concentrate growth on the more desirable trees. This type of thinning does not generate revenue; trees that are thinned are neither removed from the site nor sold.
4. Operations that have been determined to have no direct potential for damaging a public resource (WAC 222-16-050).
5. DNR uses the term "DNR-managed lands" instead of state trust lands because northern spotted owl habitat in natural resources conservation areas and natural area preserves contributes toward habitat thresholds. While not subject to the HCP, DNR is given credit for the habitat contributions provided by these lands in terms of meeting the conservation objectives of the HCP (DNR 1997, p. 1.5).
6. Over time, DNR expects to take advantages of new technology, software, and modeling methods as they are developed. Future changes may range from modification of the tactical modeling framework, to development of an entirely new tactical model using different software and techniques, to replacement of the tactical model itself with a different type of model or other analytical tools
7. For a definition of "best available science" reference WAC 365-195-905.
8. Under the forest practices rules (WAC 222-24-52(3)), a road is considered abandoned if: (a) roads are outsloped, water barred, or otherwise left in a condition suitable to control erosion and maintain water movement within wetlands and natural drainages; (b) ditches are left in a suitable condition to reduce erosion; (c) the road is blocked so that four-wheel highway vehicles cannot pass the point of closure at the time of abandonment; (d) water crossing structures and fills on all typed waters are removed, except where the department determines other measures would provide adequate protection to public resources; and (e) DNR has determined that the road is abandoned.
9. In Washington, large forest landowners are those who harvest an annual average of more than 2 million board feet of timber from their own forestland in the state.
10. Older roads that have not been used since 1974 are considered "orphaned."