

# Chapter 3

## AFFECTED ENVIRONMENT

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## Chapter 3

# Affected Environment

This chapter describes the current conditions for the elements of the natural and built environment most likely to be impacted by the proposed action. Current conditions are described so that an evaluation of potential impacts can be conducted in Chapter 4, Environmental Consequences.

## Elements of the Environment

The purpose of this chapter is to describe the elements of the natural and built environment within the analysis area, which is defined as all DNR-managed lands within 55 miles of all marine waters in western Washington (refer to Figure 1.3.1 in Chapter 1) that could be affected by the proposed alternatives. Each section will describe a different element of the environment, its current condition on the landscape, and the policy and regulatory context for management of the element. The environmental impacts of the action alternatives on these current conditions are analyzed over time in comparison to the no action alternative (refer to Chapter 4, Environmental Consequences).

SEPA and NEPA provide guidance on what elements to consider in environmental impact statements.<sup>1</sup> Only those elements of the environment most likely to be impacted by the proposed action are included in this chapter. Elements were chosen based on the likelihood of impact and from information gathered during the scoping process (as described in Chapter 1 and summarized in Appendix A). The following elements will be described in this chapter and analyzed for potential impacts in Chapter 4:

- Earth (geology and soils)
- Climate
- Vegetation
- Aquatic Resources (water, riparian habitats, and fish)
- Wildlife and Biodiversity
- Marbled Murrelet
- Recreation
- Forest Roads
- Public Services and Utilities
- Environmental Justice\*
- Socioeconomics\*
- Cultural Resources

\* Those elements with an asterisk must be addressed under NEPA but not under SEPA.

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<sup>1</sup> WAC 197-11-444, 40 CFR 1508.14.

The Joint Agencies determined that the following elements of the environment would not be analyzed in this DEIS because of the low likelihood of impacts:

<b>Element of the environment</b>	<b>Findings</b>
<b>Air quality (other than climate)</b>	No new emissions or increases in emissions of pollutants that could affect air quality are proposed under the alternatives.
<b>Visual/scenic resources/light and glare</b>	None of the alternatives will affect scenic views. All alternatives set aside forested lands for conservation additional to the acres that currently provide scenic views.
<b>Water: Runoff/absorption/flooding/groundwater and public water supplies</b>	Increasing forested acres set aside for conservation has no anticipated impact on runoff or absorption. Water quality impacts are addressed in Aquatic Resources section. No public water supply sources will be affected by the proposal or any alternatives.
<b>Traffic and transportation</b>	Only forest roads and associated infrastructure are evaluated. The proposal will not impact traffic or transportation on public roadways. Recreational trails will be analyzed in the DEIS.
<b>Noise</b>	None of the alternatives include activities that would increase or cause new sources of noise. Ongoing noise from forest management activities is addressed by conservation measures; the effects of noise disturbance on murrelets is discussed in Section 4.6.
<b>Urban land uses (including population and housing impacts), sewer, solid waste</b>	The conservation strategy alternatives all take place in non-urban environments. No urban land uses will be affected. Impacts to trusts (which fund some urban services) will be analyzed under Sections 3.11 and 4.11, Socioeconomics.
<b>Environmental health</b>	No activities proposed by any alternative would impact environmental health generally. Impacts to water quality and quantity will be addressed.
<b>Agricultural lands/crops</b>	There are no significant agricultural lands within the analysis area.

## ■ Data sources

DNR's 2015 large data overlay is the primary source of data for describing the current conditions of each element of the environment. Additional databases maintained separately by DNR or other federal, state, or local sources were also used as appropriate. Previously adopted plans, policies, and regulations are also sources of data for describing each element of the environment. Expert knowledge from DNR staff is also a source of information for describing the policy and regulatory context for each element of the environment.

## ■ Scope and scale of analysis

The analysis area can be broken up into subareas for purposes of describing different elements of the environment. Some elements are best described at larger scales, such as the entire analysis area or planning units. Other elements might be described at a county or other subarea level. Decisions about the appropriate scope and scale of analysis to use relate to the types of data available and the context and intensity of potential impacts. Each section will be explicit about the scope and scale of analysis used to describe the element of the environment.

It is important to recognize that these SEPA and NEPA analyses are for the purpose of amending the 1997 HCP with a long-term marbled murrelet conservation strategy. There are no changes proposed to the other 1997 HCP conservation strategies or how their objectives are to be accomplished. The objectives and conservation strategies for northern spotted owls (DNR 1997, p. IV.1), the objectives and conservation strategies for riparian habitats (DNR 1997, p. IV.55), the integrated approach to production and conservation for the Olympic Experimental State Forest (DNR 1997, p. IV.81), and the multispecies conservation strategy for the OESF (DNR 1997, p. IV.134) and the west-side planning units (DNR 1997, p. IV.145) would remain unchanged under this proposed amendment. The only 1997 HCP conservation strategy change being considered is replacing the interim strategy with a long-term conservation strategy for the marbled murrelet.

## 3.1 Earth: Geology and Soils

This section provides a brief description of geology and soils within the analysis area and how DNR manages these resources.

### Why are geology and soils important?

The marbled murrelet long-term conservation strategy depends on sustainable, mature forests to provide long-term nesting habitat. Healthy soils are a foundation of healthy, productive forests. Understanding how the alternatives could potentially affect soil stability, erosion, and productivity is an important part of determining environmental impacts.

### Current conditions

The soils and geology of DNR-managed lands within the analysis area have been previously described in several DNR documents, including the *South Puget Forest Land Plan* (DNR 2010), *Sustainable Harvest Calculation Final Environmental Impact Statement* (DNR 2004), the *Final Environmental Impact Statement for the Proposed Issuance of Multiple Species Incidental Take Permits or 4(d) Rules for the Washington State Forest Practices Habitat Conservation Plan* (Chapter 3.4, NMFS and USFWS 2006), and Appendix B of the *Forest Practices Board Manual*, Section 16 (DNR 2016c). These conditions are briefly summarized here.

Soil characteristics vary throughout the analysis area because of the diversity of soil-forming factors. The type of parent material (mineral or rock material from which a soil develops) largely determines the susceptibility of the resulting soil to land use impacts.

In the Puget Lowlands and North Cascade Foothills, past glaciation has formed thick layers of fine-grained glacial lake sediments, coarse-grained outwash, and till. Much of these sediments are very compact, having been overridden by thousands of feet of ice. Glacial meltwater and river and marine erosion have left over-steepened slopes on the margins of river valleys and marine shorelines, which are often highly susceptible to a great variety of landslide types.

Rock falls and complex rock slides are dominant in the steep bedrock slopes of the North Cascades. In the South Cascades, shallow landslides generating debris avalanches and flows are common on steep slopes and drainages. Soils on mountain slopes and ridge tops can compact easily because of coarse textures. Volcanic ash is a common parent material and compacts easily when wet.

On the Olympic Peninsula, lowlands and major river valleys are underlain by sediments derived by glaciations, which are in turn underlain by very weak sedimentary and volcanic rocks. Large landslide complexes are widespread along Hood Canal and lower reaches of the major river valleys. Landslides are also abundant in the very weak marine sedimentary rocks in western and northwestern portions of the Peninsula.

In southwest Washington, which was largely never glaciated, soils are older, deeper, and finer than soils in the northern and Olympic regions. The Willapa Hills are comprised primarily of very weak marine sedimentary and volcanic rocks, with weak residual soils subject to widespread landslides. Thick and deeply weathered loess deposits along the lower Columbia River valley are subject to shallow landslides and debris flows.

## **Soil productivity**

Soil productivity refers to a soil's capacity to support vegetation. Productivity depends on many factors, including amount of organic matter and organisms, density or porosity, and levels of carbon, nitrogen, and other beneficial nutrients. Processes affecting soil productivity include landslides, surface erosion, and soil compaction. These processes are described in detail in the *Final Environmental Impact Statement on Alternatives for Sustainable Forest Management of State Trust Lands in Western Washington* (DNR 2004) and are summarized briefly in this section as they relate to the proposed alternatives. Timber harvest and road-building activities can adversely affect soil productivity by compacting soils, changing soil temperature, removing organic layers, changing nutrient dynamics, or increasing the risk of landslide or surface erosion.

## **Surface erosion**

Forest practices, including harvest activities, timber hauling, and road construction, can be a source of sediment delivery to aquatic resources when they loosen or disturb sediments near or upslope of aquatic resources. Forest vegetation stabilizes soils and reduces erosion, minimizing management-induced sediment delivery to aquatic resources. Surface erosion may also impact general forest productivity over long time frames.

## **Soil compaction**

Water, air, and nutrients enter soils through pore spaces. Compaction is the loss of or decrease in pore space due to an external force, such as heavy machinery and road or trail construction and use. Compaction reduces the amount of water and nutrients that can be delivered to plants and also increases the risk of overland flow of water, resulting in erosion. Compaction can also result in shallow rooting, increasing the risk of wind throw or impacts of disease on forest stands.

## **Landslides**

Landslides (also known as mass wasting events) are the movement of a mass of rock, debris, or earth down a slope caused by natural events such as high precipitation, river bank erosion, or earthquakes. Management actions such as timber harvest and road building on potentially unstable slopes can make

them more susceptible to landslides.<sup>2</sup> Protection of potentially unstable slopes is a major consideration in DNR’s planning for timber harvests, road building, and road removal because landslides pose significant risks to human safety, state trust assets, public resources, and overall forest productivity. DNR identifies and verifies areas of landslides and potentially unstable slopes on forested trust lands at the site scale during individual timber sale planning and layout. For landscape-scale planning projects, DNR uses the best available information from a variety of screening tools to estimate the occurrence of potentially unstable landforms. Screening tools include slope hazard models, watershed scale inventory data, Lidar, and other mapping tools. The features identified using these tools reflect where DNR suspects there could be potentially unstable slopes.

The availability and accuracy of screening tools varies across DNR-managed land. Inventory and remotely sensed data are intended to trigger field verification at the time of harvest planning. Field verification may find that no potentially unstable slope is actually present, may find new areas of potential instability, or may change the extent of the mapped hazard. Potentially unstable areas are present throughout the analysis area. In LTFC, a majority of the land identified as potentially unstable is already in a long-term deferral or conservation status.<sup>3</sup> Unstable slopes continue to be identified as screening tools are updated with remote sensing and field assessment.

## Existing policies and regulations

DNR manages its forestlands to reduce the risk of increasing landslide potential, surface erosion and compaction, and loss of soil productivity.

All forest management activities occurring on DNR-managed lands must comply with *Washington’s Forest Practice Rules* (Title 222 of the Washington Administrative Code (WAC)), which regulate all activities that would affect slope stability, erosion, and productivity. The *Washington State Forest Practices Board Manual*,<sup>4</sup> *Policy for Sustainable Forests*, and the 1997 HCP also guide DNR’s management activities that may impact potentially unstable slopes and soils.

### *Regulating activities that can damage soils*

Timber harvest, road and trail building, maintenance, and use can damage soils. DNR timber sales contracts include clauses requiring equipment limitations for timber harvesting to minimize or avoid soil compaction. The state forest practices rules and board manual are designed to ensure that DNR road construction, maintenance, and abandonment do not cause damaging soil erosion that will affect the stream network or contribute to the frequency or severity of slope failure. DNR’s *Policy for Sustainable Forests* also sets the expectation that DNR will minimize the extent of the road network and that the

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<sup>2</sup> The types of landslides commonly found in the analysis area are described in the *South Puget HCP Forest Land Plan* (DNR 2010, p. 78-79). How harvest and road-building activities relate to mass wasting are analyzed in Chapter 4 of the *Forest Practices Habitat Conservation Plan FEIS* (NMFS and USFWS 2006).

<sup>3</sup> Areas identified using the “UNSTABSLPS” field in DNR’s large data overlay created in September 2015. The “UNSTABSLPS” field indicates the type/presence of an “important” unstable slope polygon originating from the Forest Practices Landslide Inventory and Hazard Zonation and DNR’s Trismorph GIS layer.

<sup>4</sup> Refer to Section 3, Guidelines for Forest Roads, and Section 16, Guidelines for Evaluating Potentially Unstable Slopes and Landforms.



design, location, and abandonment of forest roads be carefully considered in regard to the impacts to the environment. Trail construction and maintenance follow U.S. Forest Service guidelines,<sup>5</sup> which are designed to minimize potential soil erosion. SEPA may require additional review of projects with potential operational effects on soil and water quality.

### ***Preventing landslides in potentially unstable areas***

For proposed timber harvests and road building projects, DNR geologists assist foresters and engineers in identifying and protecting areas that are potentially unstable to reduce the risk of management related landslides. When a DNR geologist identifies potentially unstable slopes in a proposed project area based on available screening tools such as GIS, aerial photos, or other data sources, he or she works with the forester or engineer to do a preliminary field visit and look for indicators of instability on the ground. During the field visit, the geologist assesses the risk of slope failure. If risks are deemed too high, the project will be halted or redesigned to avoid and mitigate the risks.

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<sup>5</sup> Refer to *USDA Forest Service Standard Trail Plans and Specifications* (2014) and *Trail Construction and Maintenance Notebook* (2007).

## 3.2 Climate

This section describes the major drivers of climate change and how DNR-managed resources and other elements of the environment within the analysis area are expected to be impacted in conjunction with potential climate change.

### Why is climate change important?

Forest resources are vulnerable to climate change. It is important to understand the potential effects of climate change on environmental conditions under a long-term conservation strategy. A long-term conservation strategy depends on structurally complex long-term forest cover, and it is therefore also important to understand how a change in DNR management activities proposed under the alternatives may or may not exacerbate potential effects from climate change.

### Current conditions

Natural drivers alone cannot explain recently observed warming at the global scale (Gillett and others 2012). From reconstructions of past climates and climate models to current scientific understanding of how heat-trapping gases interact with the atmosphere, there are multiple lines of evidence that humans have been a primary driver of recent warming over the past 50 years and will continue to be the primary driver of climate change into the future (IPCC 2013, Walsh and others 2014). Most greenhouse gas (GHG) emissions from human activities have originated from the burning of fossil fuels. Deforestation (both the replacement of older forest with younger forests and forest conversion to non-forest) has also contributed to greenhouse gas emissions.

The Intergovernmental Panel on Climate Change (IPCC) released their fifth assessment report on climate change in 2013 (IPCC 2013). Within the report, the IPCC examined a range of trends in greenhouse gas concentrations, called representative concentration pathways (RCPs).<sup>6</sup> Unless otherwise noted, this DEIS reports on trends informed by two of these pathways, a pathway that assumes greenhouse gas emissions peak around 2040 before declining (RCP 4.5) and a pathway that assumes greenhouse gas emissions continue to rise throughout the century (RCP 8.5, Van Vuuren and others 2011).<sup>7</sup>

Standardized sets of RCPs in the IPCC report (IPCC 2013) are used to inform trends in general circulation models. These models incorporate our current understanding of key elements and drivers of the climate system to project future climate dynamics, such as trends in precipitation and temperature. Different general circulation models will model distinct climate trends even under the same RCP because all processes that drive climate are not completely understood, and each model uses different assumptions. For this reason, the discussion on projected future climate trends examines not only a range

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<sup>6</sup> Each RCP describes a distinct, plausible climate future that varies in its assumptions of land use, population growth, economic development, and energy use and demand, among other considerations (IPCC 2013). In part, the intent of these futures is to help identify potential adaptation needs and strategies, and mitigation strategies, under a range of possible futures (Moss 2010).

<sup>7</sup> RCP 8.5 represents the current greenhouse gas emissions trajectory.

of RCPs where possible, but also a range of general circulation models. The majority of general circulation model trends described in the following section have been statistically downscaled to finer resolutions. Regional climate models, which use a dynamic downscaling method to better incorporate simulated general circulation models climate patterns with local terrain, are currently limited in the Pacific Northwest in part because of modeling cost. Consequently, the assessment exclusively relies on statistically downscaled general circulation models output. Although RCP and global circulation model outputs are produced for every year, projections for any given year are uncertain. Climate-related trends are therefore typically reported over 30-year periods, which is also what this DEIS uses to inform the analysis.

Future climate across the northwest is projected to be an exaggeration of current seasonal trends in precipitation and temperature (Rogers and others 2011, Mote and others 2013). All climate models project increases in temperatures throughout the year with warmest temperatures occurring during the summer months under both RCP 4.5 and RCP 8.5 for the 2041–2070 time period (Mote and others 2013). For the 2040–2069 period, the average air temperatures in the Puget Sound region are projected to increase 4.2°F under RCP 4.5 and 5.9°F under RCP 8.5 (Mauger and others 2015). Precipitation projections are less consistent with annual precipitation, varying from a 4.5 percent decrease to a 13.5 percent increase (Mote and others 2013). Yet whether annual precipitation increases, decreases, or remains at current levels, model projections of seasonal precipitation patterns show greater consistency: the majority of models project less precipitation during the summer and more precipitation in other months (Mote and others 2013, Mauger and others 2015). Along with these annual and seasonal trends, temperature and precipitation extreme events are also projected to increase by mid-century (Mote and others 2013). These trends in precipitation and temperature will likely have environmental and ecological consequences for many of the elements of the environment analyzed in this DEIS. These consequences are discussed in Chapter 4.2.

## ***Effects of climate change on elements of the environment***

The anticipated effects of climate change on DNR-managed elements of the environment within the analysis area are described briefly here in order to provide context for the question of how the proposed alternatives interact with a changing climate. This question will be examined in Chapter 4, Environmental Consequences.

### **VEGETATION**

#### ***Forest conditions***

Vegetation in Washington can be broadly classified as moisture- or energy-limited (Milne and others 2002, McKenzie and others 2003, Littell and Peterson 2005) in recognition of the role of climate in driving vegetation dynamics and bounding vegetation occurrences at broad spatial scales. Moisture-limited systems reflect forests where a lack of moisture constrains vegetation growth. Productivity in moisture-limited forests is likely to become even more limited as plant water needs is exceeded by available atmospheric and soil moisture (Littell and others 2010). Energy-limited systems typically reflect limitations to forests where light or temperature constrain vegetation growth. Examples in western Washington are those productive forests where cloud cover or competition limit available light for

individuals and higher elevation forests where temperatures are colder. Productivity in energy-limited systems may increase at higher elevations as temperatures warm but could decline in lower elevations due to increased summer drought stress (Littell and others 2008). This potential shift in forest productivity illustrates how different factors (for example, energy and moisture) can limit vegetation within a species range and across seasons (Peterson and Peterson 2001, Stephenson 1990, 1998).

Plant species will respond individually to a changing climate, which will result in changes to plant communities. Both statistical and mechanistic models have been used in the northwest to examine trends in individual species (Littell and others 2010, Rehfeldt and others 2006) and broader vegetation types (Rogers and others 2011, Conklin and others 2015, Sheehan and others 2015, Halofsky and others forthcoming). All modeling efforts project drying in the Puget trough, but the amount of projected changes in species composition and/or structure vary by modeling approach, assumptions in how vegetation types may respond to changes in precipitation and temperature, and climate projections used. Those studies that cover all vegetation types in western Washington also project a decline in subalpine parkland<sup>8</sup> area due to increasing temperatures, decreased snow, and an upward elevation shift in tree line. Other vegetation types located below subalpine parkland and above the Puget trough will likely respond variably to a changing climate, likely declining in the lower portion of its existing range but also possibly expanding upwards in elevation. The timing of such changes is uncertain and will at least partially relate to annual and seasonal trends in temperature and moisture and the timing and frequency of stand-replacing disturbances (refer to next section). While such changes are less likely over the next decade, the risk that changes in forest composition will occur will increase with time.

## *Disturbances*

Higher temperatures and/or below average precipitation can result in drought conditions, which can increase tree stress and mortality risk, reduce tree growth and productivity, and increase the frequency of drought-related disturbances such as insect and wildfire occurrence (Allen and others 2015, Littell and others 2016, Vose and others 2016). Drought can also influence the regeneration success of species, potentially resulting in novel forest assemblages (Vose and others 2016). As the seasonality, frequency, and intensity of drought changes with climate, drought severity could be amplified (Allen and others 2015), exacerbating physical plant responses and disturbance-related events, especially in moisture-limited systems. While future temperature projections for western Washington consistently project a warmer future, precipitation projections are less certain when viewed annually. Yet future precipitation patterns are more consistent when examined seasonally, typically projecting less precipitation during the summer (refer to preceding current conditions section for additional detail). It is therefore possible drought frequency and severity will also be greater in the future in western Washington. However, the timing and duration of such future potential events is unknown (days versus months or longer), and thus, the magnitude of effects on western Washington forests are uncertain.

In addition to drought, warmer temperatures and reduced summer precipitation will increase the likelihood of wildfire. Several studies project an increase in area burned under a changing climate (Littell and others 2010, Rogers and others 2011, Conklin and others 2015, Sheehan and others 2015, Halofsky and others forthcoming). All studies project at least a doubling in area burned relative to the historical fire

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<sup>8</sup> Subalpine parkland is a high-elevation vegetation type without continuous tree cover.

return intervals,<sup>9</sup> even after accounting for some level of fire suppression. It is likely that future wildfires in western Washington will burn at a high severity given the fuel density found west of the Cascade crest and examples from the past in the paleo-record (Henderson and others 1989).

While wildfire is the primary mechanism of broad-scale forest renewal in western Washington, historically and currently, many west-side forests are more frequently disturbed by wind than wildfire. Near-surface wind speeds, which contribute to localized wind disturbance events, are generally projected to decline under RCP 8.5 (Luce and others 2013). There is little literature examining trends in episodic wind events, which disturb a larger area of the landscape in a short period of time. The only known study did not find a consistent trend in future episodic wind events for western Washington across ten general circulation models (Salathé and others 2015) suggesting future episodic wind events will become no more or less frequent than the past.

Broad trends related to forest diseases and climate are difficult to project because our current understanding of climate-pathogen relationships is limited, and climate-pathogen interactions are likely to be species and host-tree specific (Kliejunas 2011, Littell and others 2013). However, several studies have projected that the overall area suitable for beetle outbreaks is projected to decline (Hicke and others 2006, Littell and others 2010, Littell and others 2013). These projections indicated that beetle outbreaks will increase in frequency at higher elevations but decrease in frequency at lower elevations due to changes in year-round suitable temperatures for beetles and disruptions of life cycle events.

## EARTH

As further discussed in the subsequent freshwater resources section, winter flood risk is likely to increase with higher projected winter stream flows (Hamlet and others 2013) and more frequent and more intense heavy rain events (Mote and others 2013). These same mechanisms, among other factors such as a decline in snowpack, will increase the conditions that trigger landslides (Salathé and others 2014, Mauger and others 2015).

## AQUATIC RESOURCES

More precipitation falling as rain rather than snow, reductions in snowpack, earlier snowmelt, and reduced spring snowpack have all occurred over the last 50 years with increasing temperatures (Barnett and others 2008, Hamlet and others 2005, Hamlet and others 2007, Mote and others 2003, Mote and others 2005). Such trends are likely to continue with increasing 21<sup>st</sup> century temperatures.

The consequences of these trends will vary by watershed type. Hamlet and others 2013 classified most western Washington watersheds as either currently rain dominant or mixed rain and snow dominant. Rain-dominant watersheds produce peak flows throughout the winter months with little precipitation resulting from snow. Mixed rain- and snow-dominant watersheds typically have two peak streamflow periods: one occurring during the fall/winter months largely reflecting the precipitation falling as rain, and one in late spring/early summer mostly reflecting snow melt. With projected increases in winter precipitation, rain-dominant watersheds are expected to have little change to higher winter stream flows

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<sup>9</sup> Historical fire return intervals for forests in western Washington range from 200 to over 1000 years depending on vegetation type.

(Hamlet and others 2013). Those watersheds Hamlet and others 2013 classified as historically mixed rain-snow watersheds in western Washington, primarily found on the west slope of the Cascade Mountains and northeast portion of the Olympic Peninsula, are projected to become rain dominant by the 2080s under moderate warming.<sup>10</sup> These mixed rain and snow watersheds are more likely to display changes in timing of peak flow with increasing temperatures (Elsner and others 2010) because of projected declines in snowpack, possibly resulting in a single, earlier peak streamflow period, similar to rain-dominant basins. In addition to timing changes, flooding magnitude and frequency are also projected to increase with time (Mauger and others 2015) with notable increases occurring in watersheds currently classified as mixed rain and snow (Mantua and others 2010).

Wetlands are expected to be sensitive to changes in climate given the relationship between wetland hydrology, structure, and function with temperature and precipitation (Carpenter and others 1992, Parry and others 2007). The timing and form of precipitation, increases in temperature, and increasing frequency of summer drought, among other factors, may all cause changes to wetland habitat (Lawler and others 2014).

Stream and wetland habitat for species, such as salmon, steelhead trout, and bull trout, are more likely to be impacted with changes in precipitation intensity, changes in flow regime, and stream temperatures. Warmer stream temperatures and lower summer flows will increase the thermal stress experienced by salmon and possibly increase the difficulty of migrating salmon to pass physical and thermal barriers (Beechie and others 2006, Independent Science Advisory Board 2007, Mantua and others 2010). An increase in winter flooding and mean flows could create negative impacts on salmon eggs through scouring (Mantua and others 2011) and possibly change the timing of life history events (Crozier and others 2011).

## WILDLIFE

Similar to vegetation, wildlife species will respond individually to a changing climate with some species responding positively and other species negatively. Climate change will affect the physiology, distribution, and phenology of species resulting in direct effects on individual wildlife species as well as indirect effects through changes in wildlife habitat (Parmesan 2006, Parmesan and Yohe 2003). Across the northwest, amphibians and reptiles as a whole are considered more sensitive to climate change relative to birds, mammals, and plants based on a combination of both expert opinion and available literature (Case and others 2015). But individual species response will vary based on species sensitivity to habitat, disturbance regimes, and dispersal ability, among other factors (Case and others 2015). For example, some species that are generalists are considered less sensitive because they can easily disperse, use a variety of habitats and structures, and have a wide phenotypic plasticity, among other reasons (Lawler and others 2014).

Recent work by Case and others 2015 combined opinions from approximately 300 experts to assess the sensitivities of 195 plant and animal species to a changing climate across the northwest. According to a database created from the assessment,<sup>11</sup> the marbled murrelet, northern spotted owl, and Taylor's

<sup>10</sup> Hamlet and others 2013 used an emissions scenario called A1B1, which is older than the RCP emissions scenario used throughout this analysis. A1B1 results in more warming than RCP 4.5 but less than RCP 8.5.

<sup>11</sup> Refer to <http://climatechangesensitivity.org>.

checkerspot butterfly all received overall sensitivity scores of “high” based on a weighted average of sensitivity to eight individual factors (refer to Case and others 2015 for a list of factors). Overall expert confidence in their sensitivity assessment ranged from fair for the marbled murrelet and northern spotted owl to good” for the Taylor’s checkerspot butterfly. While the work examined species sensitivity, it did not address individual species vulnerability or risk to a changing climate. However, one of the eight sensitivities assessed by Case and others 2015 was habitat. All three species had the highest sensitivity score for habitat indicating experts felt all three species are habitat specialists and therefore have narrow habitat niches. Expert confidence in habitat sensitivity assignment ranged from very good (the highest confidence ranking) for the butterfly to good” (the second most confident ranking) for the murrelet and owl. Using data from Case and others 2015, *Washington’s State Wildlife Action Plan* (2015) examined individual species’ vulnerability, defined as the sensitivity and exposure of a species to climatic factors. Marbled murrelet and northern spotted owl respectively received moderate and moderate-high vulnerability scores, which in part reflect the habitat-specialist nature of both species.

## ***Effects of DNR management on a changing climate***

While DNR’s contribution to global emissions may be small, DNR’s possible contribution to a changing climate is considered here because “climate change results from the incremental additions of GHG emissions from millions of individual sources, which collectively have a large impact on a global scale” (CEQ 2016). Carbon is the leading type of greenhouse gas emitted.<sup>12</sup> Primary potential sources of carbon emissions from DNR-managed lands would originate from harvesting older forests (approximately more than 160 years old), shortening the age of DNR final harvest stands, and if volume removed by thinning in LTFC in stands without a final harvest was greater than residual stand volume growth. Additional carbon emissions occur from vehicle and equipment emissions related to all timber activities. Primary sources of carbon sequestration (capture and storage) on DNR-managed lands are tree growth and carbon storage in long-term wood products such as timber rather than paper products. Carbon sequestration in soils and release from soils via decomposition will vary depending on management intensity. Whether DNR-managed lands sequester and store more carbon than is emitted is analyzed in Chapter 4, Environmental Consequences.

## **Existing policies and regulations**

A description of recommended climate change analyses was issued by the Council of Environmental Quality (CEQ) 2016 guidance in for NEPA analysis.<sup>13</sup> This guidance informs the analysis of environmental consequences in Chapter 4. DNR does not currently have a policy that specifically addresses climate change. Nonetheless, existing language in the 2006 *Policy for Sustainable Forests* (DNR 2006) provides silvicultural flexibility and both forest health and natural disturbance-response guidance that should facilitate an adaptive agency response to a changing climate.

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<sup>12</sup> Refer to [www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data](http://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data).

<sup>13</sup> Refer to [www.whitehouse.gov/sites/whitehouse.gov/files/documents/nepa\\_final\\_ghg\\_guidance.pdf](http://www.whitehouse.gov/sites/whitehouse.gov/files/documents/nepa_final_ghg_guidance.pdf).

## 3.3 Vegetation

This section of the DEIS describes the current conditions of vegetation in the analysis area, including both general forest conditions as well as vegetation in special management or conservation status. Forest conditions directly related to climate change, riparian areas and wildlife habitat are described in other sections of this chapter.



Forest in the OESF. Photo: Richard Bigley

### Why is vegetation important?

Areas of structurally complex, long-term forest cover provide potential nesting opportunities for the marbled murrelet. The proposed alternatives change the management of vegetation on a small percentage of forestlands in the analysis area in order to support the development and maintenance of this type of forest.

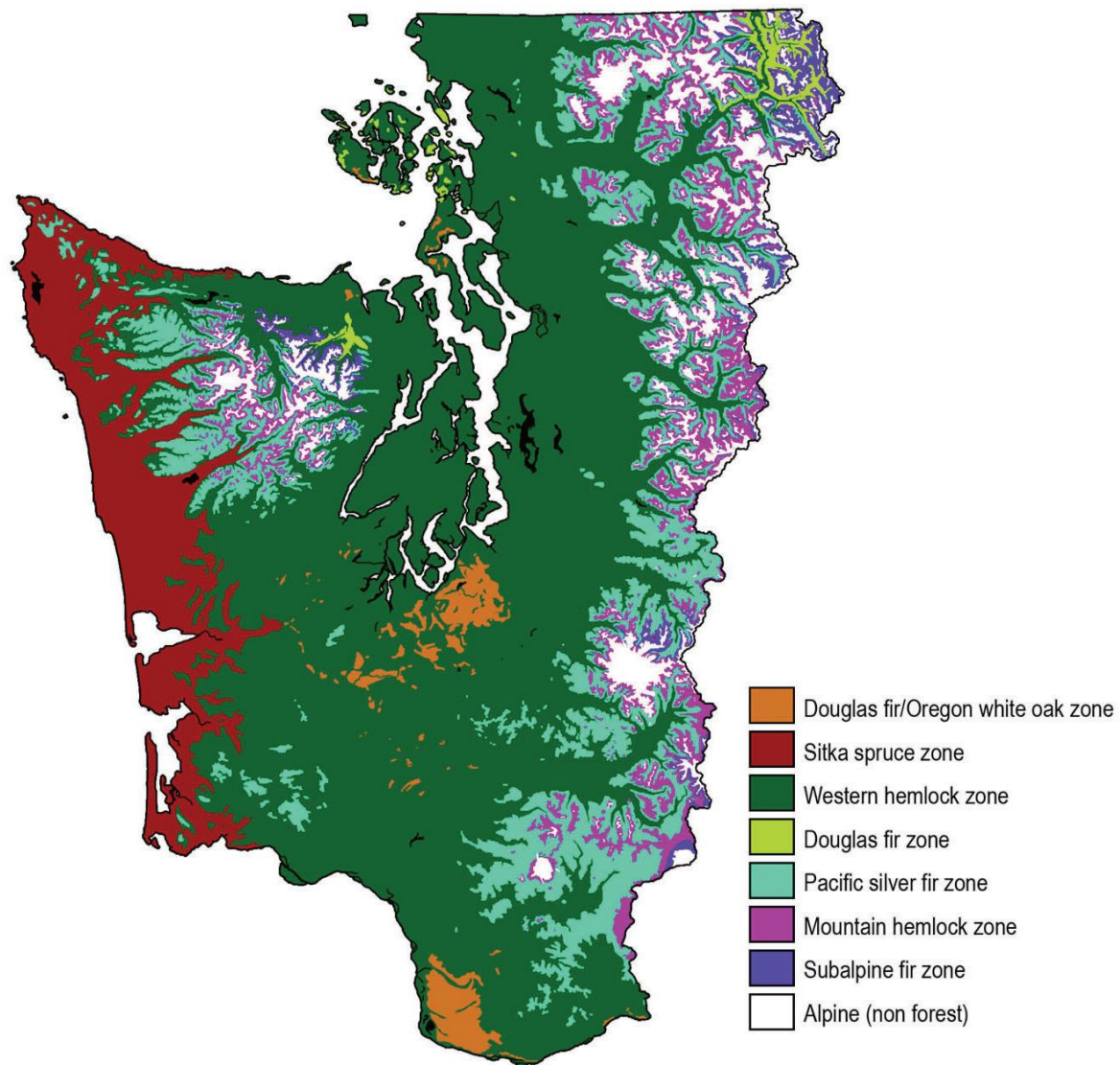
### Current conditions

DNR maintains data from various sources on forest conditions in the analysis area. This section summarizes the existing conditions of forestlands in the analysis area in order to understand potential impacts from the alternatives.

The analysis area contains a great diversity of forested habitats. The steep, mountainous topography of western Washington has dramatic effects on precipitation and temperature. Accordingly, tree species have become stratified by their tolerance and competitive abilities. In *The Natural Vegetation of Oregon and Washington*, Franklin and Dyrness (1973) separate the region into vegetation zones based on the dominant tree species. In the simplest terms, western Washington can be divided into seven vegetation zones (Figure 3.3.1).



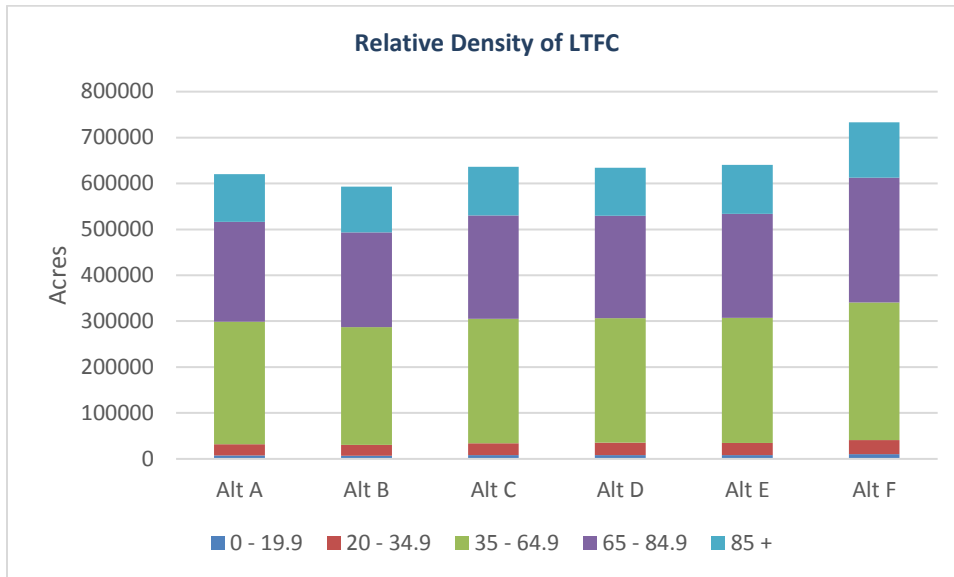
Figure 3.3.1. Potential Natural Vegetation Zones of Western Washington (Van Pelt 2007)



### ***General forest conditions***

Forests on DNR-managed lands in western Washington generally reflect a history of active timber harvest, however stands that have never been harvested still remain. Over 80 percent of DNR-managed forests in the analysis area are dominated by Douglas fir or western hemlock. Areas of LTFC are also dominated by these species, although with a higher proportion of western hemlock. Most forest stands within the LTFC have with a relative density below 85 (Curtis 1982), while between 16 and 17 percent of stands have relative densities over 85 depending on the alternative (Figure 3.3.2). High stand density can be related to increased risks from weather and disease in the presence of other risk factors, such as landscape position, soil, and climate (Powell 1999, Mitchell 2000).

Figure 3.3.2. Current Proportional Distribution of Acres in LTFC by Stand Density Class (Curtis' Relative Density), by Alternative



### Forest health issues

DNR, in conjunction with the U.S. Forest Service, conducts annual aerial forest health surveys (Dozic and others 2015). The 2015 survey detected several sources of damage to forests in the analysis area, mostly from insect and bear damage (refer to Table 3.3.1). Several root diseases are common in western Washington and are likely present in LTFC. In order to address forest health issues, DNR manages its forest consistent with DNR’s Policy on Forest Health (DNR 2006, p. 32), which includes strategies to adjust stand composition to favor species best adapted to the site, to incorporate other cost-effective forest health practices into the management of forested state trust lands, and to work closely with the scientific community, other agencies, and other landowners to effectively address forest health issues (DNR 2006, p. 32).

Table 3.3.1. Sources of Forest Damage in the Analysis Area (Dozic and Others 2015)

Source of Forest Damage Detected	Damaged Area
Douglas-fir beetle ( <i>Dendroctonus pseudotsugae</i> )	615 acres
Damage from black bears ( <i>Ursus americanus</i> )	~2 trees per acre over 19,000 acres
Swiss needle cast ( <i>Phaeocryptopus gaeumannii</i> )	1,400 acres severe, 48,000 acres moderate
Douglas-fir engraver ( <i>Scolytus unispinosus</i> )	170 acres
Fir engraver ( <i>Scolytus ventralis</i> )	160 acres
Bigleaf maple dieback and decline (unknown agent)	90 acres
Pacific madrone decline (unknown agent)	6 acres

**Table 3.3.2. Common Root Diseases in Western Washington (Dozic and Others 2015)**

Disease name	Host species
<b>Black stain root disease (<i>Leptographium wageneri</i>)</b>	Douglas fir
<i>Armillaria</i> sp.	All conifers
<b>Laminated root rot (<i>Phellinus sulphurascens</i>)</b>	Douglas fir
<b>Annosus root disease (<i>Heterobasidion irregulare</i> and <i>Heterobasidion occidentale</i>)</b>	All conifers

As described in Sections 3.2 and 4.2, a changing climate may bring increased disturbance events such as fire or disease, although trends are difficult to predict and may not necessarily increase during the planning period. Many of these disturbances are outside of DNR’s management control, although the department does conduct forest health treatments to increase wind firmness and resilience to wildfire in some stands. Such activities are consistent with DNR policy. Section 4.2 discusses the potential for climate-related loss of forest structure in LTFC.

### **Vegetation in special management or conservation status**

DNR-managed forestlands within the analysis area includes vegetation that is managed for conservation purposes pursuant to the 1997 HCP, DNR’s *Policy for Sustainable Forests*, or state law. These lands are managed primarily to maintain habitat for protected species, biodiversity, or unique natural features of regional or statewide significance.

### **OLD GROWTH**

DNR policy generally defers from harvest old-growth stands (stands 5 acres and larger that originated naturally before the year 1850), as well as very large-diameter, structurally unique trees. Old growth within the analysis area is included as LTFC under every alternative. According to DNR inventory information, there are approximately 88,000 acres of potential old growth in western Washington, with 60 percent of those acres demonstrating a high potential to be old growth (DNR 2005).

### **GENETIC RESOURCES**

DNR protects the genetic resources of its native tree populations by maintaining a system of gene pool reserves, which are included as LTFC. These reserves are generally located in forestlands that are protected for other reasons (as unstable slopes, old growth, or riparian areas). Gene pool reserves are deferred from harvest under the *Policy for Sustainable Forests*. There are approximately 2,400 acres of gene pool reserves designated as LTFC under each alternative.

### **NATURAL AREAS**

As described in Chapter 1, DNR manages two types of natural areas defined by state law: Natural Area Preserves (NAPs) and Natural Resource Conservation Areas (NRCAs). These areas protect native ecosystems, rare plant and animal species, or unique natural features. Both types of natural areas are covered under the HCP and are included as LTFC for this DEIS. NAPs are managed under the *State of*

*Washington Natural Heritage Plan*, and some NAPs also have site-based management plans. The NRCAs are managed under the *NRCA Statewide Management Plan* or individual management plans.

Natural areas are managed for primarily for the protection of important biological or ecological resources, including plant communities that are in good to excellent ecological condition and some examples of mature forest. Research, environmental education, and low-impact recreation activities also occur on these lands. Natural areas are protected under state law from conversion to non-conservation uses. A summary of the status and management of these lands can be found in the *2014 State Trust Lands HCP Annual Report* (DNR 2015).

There are approximately 85,000 acres of forested natural areas within LTFC. Some of these natural areas maintain marbled murrelet habitat by protecting late-seral forests with potential nesting platforms. Natural areas managers work with DNR biologists and consult with USFWS as necessary, to avoid, minimize, and mitigate potential impacts from activities or projects in marbled murrelet habitat. Such activities can include new recreational facilities or forest restoration.

## RARE PLANTS AND HIGH-QUALITY ECOSYSTEMS (SPECIAL ECOLOGICAL FEATURES)

The *Policy for Sustainable Forests* specifies that DNR will identify forested state trust lands with “special ecological features” of regional or statewide significance. This task is informed by Washington’s *Natural Heritage Plan* (2007, updated 2011), which identifies and prioritizes plant species and ecosystems for conservation. Rare plants and high-quality ecosystems are priorities for inclusion as natural areas. DNR’s Natural Heritage Program maintains a comprehensive database on rare plant species, communities, and their locations. The database of known locations is consulted by DNR’s regional foresters when planning timber sales activities, with the intent of avoiding impacts to special ecological features. 34 species of rare plants are currently known to occur within LTFC under any alternative (refer to Appendix K for a list of species).

Federally listed threatened plants within the analysis area include water howellia and golden paintbrush. The habitat of these plants is covered under the 1997 HCP, but they are not known to occur in forested habitat on DNR-managed lands.

## PLANTS ASSOCIATED WITH UNCOMMON HABITATS

DNR’s conservation strategies in the 1997 HCP provide measures to protect wildlife species that rely on uncommon habitats or uncommon habitat elements (DNR 1997, p. IV.151). These measures specifically protect features such as talus, caves, cliffs, oak woodlands, large snags, and large structurally unique trees. These uncommon wildlife habitats are included as LTFC and provide conditions for different types of vegetation, and in some cases, unique vegetation. Oak woodlands, composed of the only native oak in Washington, the Oregon white oak, have been designated a priority habitat by the Washington Department of Fish and Wildlife. Talus and cliffs can provide conditions for pioneering vegetation, while cliffs provide conditions for shade tolerant vegetation. DNR’s regional foresters consult with staff biologists when planning timber sales activities with the intent of conserving these features.

## 3.4 Aquatic Resources

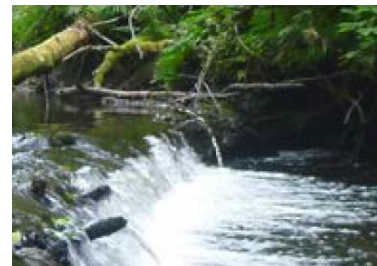
This section describes the existing conditions of riparian habitat, wetlands, water quality and quantity, and fish populations and habitat within the analysis area, which this DEIS refers to collectively as aquatic resources.

DNR and USFWS often consider these elements of the environment individually when reviewing proposed actions. However, for this DEIS, the Joint Agencies are considering these elements collectively because they would all be affected by the alternatives in similar ways, by similar means, and to similar degrees.

### Why are aquatic resources important?

Aquatic resources provide a valuable suite of functions and ecosystem services, improving water quality and providing fish and wildlife habitat. DNR's management philosophies are based largely on the underlying approach that maintaining the hydrologic functions of wetlands and riparian areas is essential to maintaining the health and function of forest ecosystems on state trust lands (DNR 2006, p. 36). All forested aquatic resources in the analysis area are considered part of long-term forest cover.

#### Text Box 3.4.1



### Current conditions

#### *Riparian and wetland habitat*

Approximately one-third of all DNR-managed lands within the analysis area is forested riparian or wetland habitat. This habitat was modeled by applying the 1997 HCP riparian management buffers to DNR stream and wetland data. Forested areas within these modeled buffers were designated as long-term forest cover under each alternative.

#### What is riparian habitat?

Riparian habitat is located where land and water meet along the edges of streams and lakes.

Riparian areas include stream banks, adjacent floodplains, wetlands, and associated riparian plant communities.

Water quality and quantity are directly related to riparian function, as are fish populations and habitats.

## **Waters**

### **RIVERS AND STREAMS**

The *Policy for Sustainable Forests* (DNR 2006) and 1997 HCP include protection for Type 1 through 5 streams.<sup>14</sup> The level of protection is based on the specific nature of the stream channel and its position relative to fish-bearing stream habitat.

### **WATER QUALITY**

Washington State Department of Ecology's *Water Quality Assessment* lists the water quality conditions for water bodies in the state, as required under Sections 303(d) of the Clean Water Act (Ecology 2016). Not all streams have been assessed for this list, and forest streams are generally not a priority for 303(d) listing due to the regulatory framework in place to protect water quality in working forests. Only localized areas of non-compliance (or inconsistent compliance) with water quality standards are listed for state trust lands. For example, on the OESF, out of nearly 3,000 miles of streams on state trust lands, only 10 miles are on the 303(d) list for failure to consistently meet the criteria for stream temperature, dissolved oxygen, turbidity, or fecal coliform bacteria (DNR 2013).

### **WATER QUANTITY**

Timber harvest and associated roads can increase stormwater runoff that is delivered to rivers, streams, and wetlands. Peak flows and discharges are of greatest concern; these occur within the analysis areas primarily during fall and winter, when Pacific storms deliver large amounts of precipitation to the region. DNR minimizes the effects of peak flows through watershed-level planning and operating procedures. DNR ensures that sufficient amounts of hydrologically mature forest is maintained in each watershed to prevent detectable increases in peak flows that could impact water quality.

## **Fish**

At least nine native species of resident and anadromous salmonids occur in rivers and streams crossing DNR state trust lands in the analysis area (NMFS and USFWS 2006, Table 3-21). In addition, several salmonid species in the analysis area are currently listed under the ESA. Numerous other native fish species are also distributed in waterbodies throughout the analysis area, including minnows, suckers, sculpins, and three species of lamprey. Appendix J contains a list of these species and their general distribution within the analysis area.

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<sup>14</sup> DNR types streams based on *Washington Forest Practices Board Emergency Rules* (stream typing) from November 1996, reproduced in PR-14-004-150.

## Existing policies and regulations

### *Forest Practices Rules*

All forest management activities on non-federal lands in Washington are regulated under the state *Forest Practices Rules* (WAC Title 222). The rules establish standards for forest practices such as timber harvest, pre-commercial thinning, road construction, maintenance and abandonment, hydraulic projects (water crossing structures), and fertilization and forest chemical application. Many of these standards serve to protect aquatic resources.

The rules allow landowners with an HCP to be exempt from certain sections if they apply protections that will achieve at least the same level of protection as the rules. DNR applies its 1997 HCP riparian conservation strategies, described in the following section, for several activities, including delineating riparian management zones.

#### Text Box 3.4.2

##### **How are aquatic resources managed?**

Aquatic resources on DNR-managed lands are protected by an extensive framework of regulations, policies and plans.

This DEIS considers these existing protections when evaluating potential adverse effects of the alternatives on aquatic resources.

### *Riparian conservation strategies*

For state trust lands, riparian conservation is implemented through two riparian conservation strategies in the 1997 HCP. One strategy applies specifically to the OESF planning unit, and another applies to the remaining west-side planning units (“west-side strategy”).

Both strategies establish riparian management zones (RMZs) to protect salmonid-bearing streams and some non-fish-bearing streams. The OESF riparian strategy uses a watershed analysis approach to achieve riparian restoration objectives set by the 1997 HCP. Some limited harvest, including thinning, can be permitted in riparian zones, depending on this watershed analysis. The west-side strategy is supported by a Riparian Forest Restoration Strategy (RFRS) that provides direction on how to develop site-specific riparian forest prescriptions to achieve desired future conditions on stream reaches.

The 1997 HCP also does not allow variable retention harvest<sup>15</sup> of forested wetlands; thinning is permitted in the wetland management zone.

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<sup>15</sup> Refer to Chapter 7 for definition.

## 3.5 Wildlife and Biodiversity

The section describes wildlife species and overall wildlife diversity of the analysis area.

### Why is wildlife important?

Many of the species associated with the habitat provided in long-term forest cover, while not particularly rare, are nevertheless important for recreational, economic, cultural, and ecological values. LTFC also includes the habitat of some species listed under the Endangered Species Act, which are covered by the 1997 HCP.

The analysis area has a variety of forested habitats that support these species, with some variability in the amount and distribution of this habitat depending on the alternative. This section describes the current species and overall wildlife biodiversity within the analysis area. Special emphasis is given to a discussion of northern spotted owls (*Strix occidentalis caurina*), whose habitat overlaps significantly with marbled murrelet nesting habitat.



Black bear. Photo: WDFW






### Current conditions

#### *Wildlife habitat*

DNR classifies forested stands into “stand development stages” that represent the general progression of growth and structural development that any particular stand of trees goes through over time. Table 3.5.1 summarizes these stages and the number of wildlife species closely associated with them. The greatest diversity and abundance of wildlife occurs in the early ecosystem initiation stage and in the later structurally complex stages (Johnson and O’Neil 2001, Carey 2003).



Table 3.5.1. Stand Development Stages and Associated Wildlife Species Diversity

Stand development stage <sup>a</sup>	Approximate acres within the analysis area	Number of species closely associated with stage <sup>b</sup>
<p><b>Ecosystem Initiation</b> Begins soon after most overstory trees have been removed by harvest or natural events. This stage is known to support a high number of wildlife species, particularly as foraging habitat.</p>		134,000
<p><b>Competitive Exclusion</b> Trees fully occupy the site, competing for light, water, nutrients, and space. Dense overstory means there are few or no shrubs or groundcovers and relatively little wildlife use.</p>		1,066,000
<p><b>Understory Development</b> Overstory trees die, fall down, or are harvested, creating gaps in the canopy. An understory of trees, ferns, and shrubs develops. This process can be accelerated through active management.</p>		64,000
<p><b>Biomass Accumulation</b> Numerous large overstory trees rapidly grow larger in diameter, producing woody biomass. Forest stands lack large snags or downed woody debris in this stage.</p>		26,000
<p><b>Structurally Complex</b> Approaching conditions of natural older forests with multiple tree and shrub canopy layers, dead and downed logs, and well-developed understory. Multiple tree canopies are present, supporting diverse vertebrate and invertebrate species.</p>		86,000

<sup>a</sup> Adapted from OESF RDEIS, p. 3-26.

<sup>b</sup> Habitat associations are based on Brown 1985 and Johnson and O'Neil 2001.

Thinning is a silvicultural strategy that DNR uses to move dense stands (stands in the competitive exclusion stage) into more structurally complex forests. Thinning dense stands of relatively low value wildlife habitat can expedite the transition over time into more variable stands containing physical elements important to forest wildlife, including snags, large trees, and diverse shrub and ground covers.

## Wildlife species

This section describes wildlife species “guilds.” A guild is a group of species utilizing the same class of resources in a similar way. It is hypothesized that these groups of species could be affected in similar ways by the alternatives. In addition, this section describes wildlife species that are especially important to consider because of their sensitivity to disturbance, low population levels, and/or recreational, commercial, cultural, and ecological values.

### WILDLIFE GUILDS

This DEIS uses wildlife guilds to describe species that will be most affected by various forest conditions expected to be created or altered by the alternatives. The guilds, which are based on habitat associations described by Brown 1985 and Johnson and O'Neil 2001, are as follows:

- *Early successional guild* is composed of the many species that are associated primarily with very young forest stands (ecosystem initiation stage), including deer, elk, and several species of bats, small mammals, and migratory songbirds.
- *Late successional guild* is composed of species that are primarily associated with the structurally complex forest stage. Representative species include the northern goshawk, northern pygmy owl, brown creeper, Vaux’s swift, Townsend’s warbler, northern flying squirrel, and black bear (for denning).
- *Edge guild* is composed of species that use the edges between early and competitive exclusion and later stage forest stands. Representative species include the red-tailed hawk, great horned owl, Cascades fox, and mountain lion.
- *Interior guild* is composed of species that avoid edges or otherwise require large blocks of interior forest. Representative species include the pygmy owl and several species of migratory songbirds.
- *Riparian guild* is composed of species closely associated with streams and nearby upland habitat. Representative species include several species of amphibians and migratory songbirds, as well as aquatic mammals such as minks and beavers.

### STATE-LISTED, CANDIDATE, SENSITIVE AND REGIONALLY IMPORTANT SPECIES

Appendix L provides a list of state-listed, candidate, and sensitive species present within the analysis area and their primary forest habitat associations. Appendix L also provides a table of species of regional importance, including those species that are important for recreational, commercial, cultural, or ecological values. This DEIS focuses on those species of state and regional importance that are highly dependent on specific forest conditions that may vary among the alternatives.

## FEDERALLY LISTED SPECIES IN THE ANALYSIS AREA

Several federally listed terrestrial species are found in forested habitats or openings within forested areas in the analysis area. The species in Table 3.5.2 occur, or may occur, on HCP-covered lands within the analysis area. (Fish species are discussed in Section 3.4, Aquatic Resources.) The 1997 HCP provides conservation for these species. These species are currently covered or are likely to be covered under the HCP in the near future.

**Table 3.5.2. Terrestrial Wildlife in the Analysis Area Listed as Threatened or Endangered Under the Endangered Species Act**

Category	Species	Listing status
<b>Mammals</b>	Columbian white-tailed deer ( <i>Odocoileus virginianus leucurus</i> )	Endangered
	Gray wolf ( <i>Canis lupus</i> )	Endangered
	Grizzly bear ( <i>Ursus arctos horribilis</i> )	Threatened
	Mazama pocket gopher ( <i>Thomomys mazama subspecies</i> )	Threatened
<b>Birds</b>	Streaked horned lark ( <i>Eremophila alpestris strigata</i> )	Threatened
	Northern spotted owl ( <i>Strix occidentalis caurina</i> )	Threatened
	Marbled murrelet ( <i>Brachyramphus marmoratus</i> )	Threatened
	Snowy plover ( <i>Charadrius alexandrinus nivosus</i> )	Threatened
	Western yellow-billed cuckoo ( <i>Coccyzus americanus</i> )	Threatened
<b>Amphibians</b>	Oregon spotted frog ( <i>Rana pretiosa</i> )	Threatened
<b>Invertebrates</b>	Oregon silverspot butterfly ( <i>Speyeria zerene hippolyta</i> )	Threatened
	Taylor's checkerspot butterfly ( <i>Euphydryas editha taylori</i> )	Endangered

The 1997 HCP covers DNR forestlands within the range of the northern spotted owl. The HCP is a multispecies conservation strategy with the current incidental take permit (ITP) covering several listed species. Within the six west-side planning units, newly listed species under the ESA can be added to DNR's ITP (HCP B.12).

### **Northern spotted owl**

The northern spotted owl was listed as threatened under the ESA in 1990 (55 FR 26114) because of widespread loss of habitat across the spotted owl's range. More recently, and based on the best available scientific information, competition from the barred owl (*Strix varia*) poses a significant and complex threat to the spotted owl (*Revised Recovery Plan for the Northern Spotted Owl*, USFWS 2011). The 1997 HCP covers the northern spotted owl and has a comprehensive approach to conserving the spotted owl on DNR-managed forestlands.

The 1997 HCP conservation objective for the northern spotted owl is to provide habitat that makes a significant contribution to demographic support, maintains species distribution, and facilitates dispersal (DNR 1997, p. IV.1). In the five west-side planning units (not including OESF), these objectives are accomplished primarily through the designation of dispersal areas and designation of nesting, roosting, and foraging areas (NRF areas). In areas designated to provide nesting, roosting, and foraging habitat,

DNR shall provide at least 50 percent habitat (DNR 1997, p. IV.4). In areas designated to provide dispersal support, at least 50 percent shall be in a dispersal habitat condition (DNR 1997, p. IV.9). A detailed accounting of the status of habitat within NRF nesting, roosting, and foraging areas and dispersal areas is available in the 2015 DNR HCP annual report.

In the OESF planning unit, the conservation strategy for the northern spotted owl identifies landscapes for maintenance and restoration of northern spotted owl habitat (DNR 1997, p. IV.88). A detailed accounting of the current amount of habitat within landscapes is available in the 2015 DNR HCP annual report. The HCP directs that each landscape shall provide at least 20 percent old forest habitat and 40 percent young forest habitat or better.

## Existing policies and regulations

### *The 1997 HCP*

Conservation strategies described in the 1997 HCP are designed to conserve currently threatened and endangered species, and to help avoid future listing of other wildlife species (DNR 1997). Specific conservation strategies are included for: 1) northern spotted owls (DNR 1997, p. IV.1; for the OESF refer to p. IV.86); 2) riparian conservation that conserves salmonid freshwater habitat and other aquatic and riparian obligate species (DNR 1997, p. IV.55; for the OESF refer to p. IV.106); 3) marbled murrelets (DNR 1997, p. IV.39); and the multispecies conservation strategy for unlisted species (DNR 1997, p. IV.145; for OESF refer to p. IV.134). These various conservation strategies are intended to work together to accomplish the long-term multi-species conservation program.

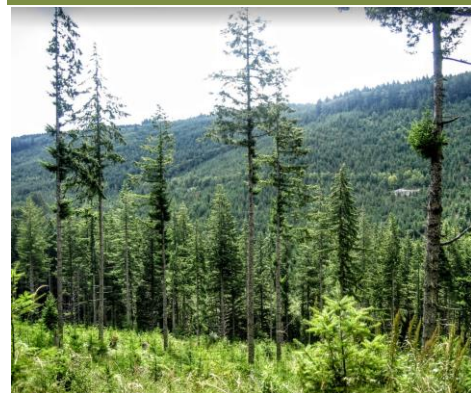
### *Policy for Sustainable Forests*

The 2006 *Policy for Sustainable Forests* identifies biodiversity as one of the primary goals for landscape-level management of state trust lands (DNR 2006, p. 6).

The 2006 Policy also defines DNR’s general silvicultural strategy (DNR 2006, p. 46), which is to use “biodiversity pathways” to increase wildlife habitat values through active forest management, including the following:

- Retaining trees and snags (biological legacies) at harvest.
- Thinning to variable densities to encourage development of an understory.
- Improving habitat by creating snags and felling trees to create structure (DNR 2004).

#### Text Box 3.5.1



#### What are biodiversity pathways?

DNR policy is to use “biodiversity pathways” techniques—such as retaining trees and creating snags—to increase forest structure and associated wildlife habitat values in actively managed stands across the analysis area.

## 3.6 Marbled Murrelet

This section briefly describes the biology and ecology of the federally listed marbled murrelet and the current habitat conditions, population, and regulatory status of the species.



Marbled murrelet at sea. Photo: DNR

### Why is the marbled murrelet important?

Marbled murrelets spend most of their lives on the coastal marine waters from southern Alaska to central California. They are unique among seabirds because they nest inland from these waters in mature forests. Marbled murrelets do not build a typical nest; rather, they lay a single egg on a branch in the live crowns of coniferous trees. They use a variety of tree species, but in Washington, Douglas fir and western hemlock are the primary species where marbled murrelet nesting is found. Marbled murrelets have a tendency to return to the same nesting areas. Population declines in Washington are greater than in other parts of the species' range. The species was federally listed as threatened in Washington, Oregon, and California in 1992.

### Current population trends and habitat conditions

This subsection presents information on the status and trends of marbled murrelet populations, as well as their inland and marine habitat and a brief summary of recent findings on their population ecology and habitat relationships. These summaries are largely based on several recently published reviews (McShane and others 2004, Huff and others 2006, Piatt and others 2007, USFWS 2009, Raphael and others 2011, COSEWIC 2012, Falxa and others 2016). Information on marbled murrelets and habitat in Washington includes findings from DNR-sponsored surveys and estimates of the distribution, quantity, and quality of marbled murrelet habitat on DNR-managed lands.

#### *Population decline*

The federally listed murrelet population in Washington, Oregon, and California is classified by the Service as a distinct population segment (75 FR 3424). Since 2000, this population has been monitored through the effectiveness monitoring program of the federal Northwest Forest Plan (NWFP). Researchers conduct annual at-sea murrelet surveys (Madsen and others 1999, Huff and others 2006, Raphael and others 2011, Falxa and others 2016) to estimate population size and trend across the plan area which encompasses five of the conservation zones in the marbled murrelet recovery plan (USFWS 1997) (refer to Figure 3.6.1).

**Figure 3.6.1. Five of the Marbled Murrelet Conservation Zones (USFWS 1997) that are Monitored by the Northwest Forest Plan Effectiveness Monitoring Program.**



Shaded area is overlap between Northwest Forest Plan area and breeding distribution area of the marbled murrelet. Copied from Falxa and others 2015 (p. 44).

The marbled murrelet population is declining in Washington. Examination of population trends by conservation zone suggest a clear decline in Washington’s inner waters (Zone 1) and a possible decline in coastal waters of Zone 2 (Lance and Pearson 2016). The overall Washington murrelet population declined 4.4 percent per year 2001–2015 (Lance and Pearson 2016). There is no evidence of a declining trend in California or Oregon (Falxa and others 2016). Over all zones, Falxa and others 2016 estimated that the population declined 1.2 percent per year over the 2001–2013 period, but note that the evidence for a population decline at the scale of the entire NWFP is inconclusive. The NWFP area trend for this period differs from the population decline previously observed for the 2001–2010 period (Falxa and others 2016). This difference was the result of higher population estimates for 2011 through 2013 compared to previous years (Falxa and others 2016).

While the direct causes for marbled murrelet population declines are unknown, potential factors include the loss of nesting habitat, including cumulative and time-lag effects of nesting habitat losses over the past 20 years, changes in the marine environment reducing the availability and quality of prey, and increased densities of nest predators (Miller and others 2012, Falxa and others 2016). Recent analysis indicates that the amount and distribution of higher suitability habitat are the primary factors influencing the abundance and trends of murrelet populations. Habitat loss has occurred throughout the listed range of

the murrelet, with the greatest losses documented in Washington, where the steepest declines of murrelet populations occurred (Raphael and others 2016).

## MARINE CONDITIONS

Marbled murrelets face a variety of challenges finding food, avoiding predators, and surviving in their marine environment. Changes in prey abundance and availability are largely due to ocean conditions, harmful algal blooms, and degradation of prey resources from pollution, shoreline development, and fishing. Other human-caused risks to murrelets at sea include direct mortality from pollution, especially oil spills, and entanglement in fishing gear, also disturbance from vessel traffic and potential negative influences from anthropogenic global warming on marine ecosystems (Piatt and others 2007, USFWS 2009).

Although marine habitat challenges likely have contributed to marbled murrelet population declines, there is not a yet a body of science to clearly identify the primary cause of marbled murrelet population decline. From studies of marine populations of marbled murrelets and studies of inland forest conditions, scientists have inferred that the marine distribution of marbled murrelets during the breeding season appears to be substantially related to the abundance and proximity of large, contiguous patches of inland nesting habitat (Miller and others 2002, Piatt and others 2007, Raphael and others 2016).

## AVAILABILITY OF INLAND NESTING HABITAT

Habitat characteristics important to the marbled murrelet include large nesting platforms on mature trees, adequate canopy cover, and sufficient interior forest to provide security. The loss of nesting habitat was a major cause of the murrelet's decline over the past century and may still be contributing as nesting habitat continues to be lost to fires, logging, and wind storms (Raphael and others 2016).



Marbled murrelet egg in nest. Photo: Nicholas Hatch

### *Causes of habitat loss within the listed range*

Monitoring of murrelet nesting habitat within the Northwest Forest Plan area indicates nesting habitat declined from an estimated 2.53 million acres in 1993 to an estimated 2.23 million acres in 2012, a decline of about 12.1 percent (Raphael and others 2016). Habitat loss was greatest on non-federal lands, with a net 27 percent loss over twenty years, almost entirely due to timber harvest, while fire has been the major cause of nesting habitat loss on federal lands (Raphael and others 2016). While most (60 percent) of the potential habitat is located on federal-reserved lands, a substantial amount of nesting habitat occurs on non-federal lands (34 percent) (Raphael and others 2016).

Habitat models developed for the Northwest Forest Plan indicate approximately 1.3 million acres of potential nesting habitat in Washington. Most habitat occurs on federal lands managed under the

Northwest Forest Plan, while approximately 14 percent (187,000 acres) of the potential nesting habitat occurs on DNR-managed lands. Cumulative habitat losses since 1993 have been greatest in Washington, with a 13.3 percent decline over the monitoring period, with most habitat loss occurring on non-federal lands due to timber harvest (Raphael and others 2016). Currently, only about 12 percent of habitat-capable lands<sup>16</sup> in Washington contain potential nesting habitat for the marbled murrelet.

As described briefly in Chapter 2 and with more detail in Appendix F, DNR developed a habitat classification model to identify potential nesting habitat on Washington state trust lands. The P-stage model was applied to all DNR-managed land within the analysis area using DNR forest inventory data from 2015. The P-stage model identified approximately 213,000 acres of habitat, 9 percent more than had been previously identified under the Northwest Forest Plan (Raphael and others 2016).<sup>17</sup>

**Table 3.6.1. Distribution of Marbled Murrelet Habitat on DNR-Managed Land, by P-Stage Class and HCP Planning Unit in October 2015**

HCP planning unit	P-stage (acres)							Total Habitat	Total Land
	0	0.25	0.36	0.47	0.62	0.89	1		
OESF	202,461	5,180	10,790	6,587	5,283	880	39,611	68,331	270,791
Straits	109,338	6,604	2,174	614	927	19	5,661	16,000	125,338
North Puget	361,548	30,377	14,100	5,061	5,625	21,279	5,583	82,025	443,573
South Puget and Yakima	162,768	8,061	4,171	1,538	1,746	352	575	16,442	179,210
Columbia	85,793	4,810	4,967	370	169	2	2,699	13,016	98,809
South Coast	242,195	6,275	2,981	704	487	157	6,957	17,561	259,755
<b>Total</b>	<b>1,164,102</b>	<b>61,307</b>	<b>39,183</b>	<b>14,873</b>	<b>14,238</b>	<b>22,689</b>	<b>61,085</b>	<b>213,375</b>	<b>1,377,477</b>

As Table 3.6.1 illustrates, marbled murrelet habitat makes up approximately 15.5 percent of total DNR-managed land within the analysis area. This habitat is distributed throughout the analysis area. On the Olympic Peninsula (OESF and portions of Straits) and parts of the North Puget planning unit, DNR-managed lands are adjacent to federal reserves with extensive and abundant high-quality habitat. In southwest Washington (South Coast and Columbia planning units) these lands are embedded in extensive industrial forests with relatively scarce and fragmented murrelet habitat. Southwest Washington has been acknowledged as a priority area for murrelet habitat conservation (DNR 1997, USFWS 1997). In the Puget Trough lowlands there are marginal landscapes (portions of Straits, South Puget, and Columbia planning units; refer to Appendix H) where there is a much lower probability of marbled murrelet occupancy in DNR-managed forests.

<sup>16</sup> Habitat-capable land refers to areas within the Northwest Forest Plan boundaries capable of developing into forest.

<sup>17</sup> A discussion of how the P-stage model compares with other available habitat models is provided in Appendix E.



## FACTORS INFLUENCING NEST SUCCESS

The ability of a marbled murrelet to successfully produce an egg and raise a chick is influenced by where the nest is located within the forest. A 5-year radiotelemetry study of marbled murrelet breeding ecology in Washington found only 4 of 20 nests were successful in a sample of 152 murrelets tagged near the Olympic Peninsula during the 2004–2008 breeding seasons (Bloxtton and Raphael 2009). That success rate is consistent with other studies throughout the range (refer to, for example, Peery and others 2007, Barbaree and others 2014).

One factor found to contribute to failed nests is predation (USFWS 1997, McShane and others 2004, USFWS 2009). Although there is uncertainty about how key elements affecting nest predation interact, predator abundance, patterns of land use and cover, proximity and type of forest edge, and proximity to human-enriched food sources all appear to play a role in nest predation risk (USFWS 2009). Corvids (jays, crows, and ravens) are known predators of murrelet eggs and nestlings, and several species including the Steller’s jay are more abundant in patchy, fragmented landscapes and/or in landscapes with higher levels of human use (Luginbuhl and others 2001, Raphael and others 2002, Neatherlin and Marzluff and others 2004, Malt and Lank 2009). Studies of simulated marbled murrelet nests have shown that proximity to early-seral forest edge, campgrounds, and small settlements are associated with higher levels of corvid use and predation (Marzluff and others 2004, Marzluff and Neatherlin 2004, Malt and Lank 2007). In addition to predation impacts, other human activities and land uses can disturb nesting marbled murrelets, which can affect their nesting success. These activities are summarized *in Appendix H* and are quantified in Section 4.6.

### *Edge conditions*

A forest edge is an abrupt transition between two populations of trees, where the characteristics of the forest on one side are different from that of the other. Some edges are naturally occurring, created by wetlands, streams, or avalanche chutes, and others are created through human activity. Timber harvesting can create a high contrast edge along the boundary between the harvested area and the adjacent forested stands. Some types of forest edges increase the risk of disturbance to habitat and nest sites. Interior forests (forest stands at least 100 meters away from any non-forested area; refer to Chapter 2, Figure 2.4.4, and Appendix H) are better protected from the effects of predation and from many of the other disturbances that have been found to affect marbled murrelet habitat or nests. Changes to microclimate and the effects of windthrow are also greater near forest edges than within the forest interior. Edge categories are defined as follows: habitat over 100 meters from an edge is considered interior forest within 50 meters is outer edge, between 50-100 meters is inner edge, and all edge habitat and habitat not adjacent to interior forest is “stringer” habitat. The adverse impacts of edges are assumed to decline with distance from edge and as edge-creating stands mature (Appendix I). Table 3.6.2 summarizes the current edge conditions of potential marbled murrelet habitat on all DNR-managed land in the analysis area at the beginning of the planning period (referred to as “Decade 0” throughout this analysis). How these edge conditions affect habitat quality is analyzed in Section 4.6.

**Table 3.6.2. Edge Condition of Existing Murrelet Habitat on DNR-Managed Land, Decade 0**

Edge condition of habitat (acres with a P-stage value)				
Interior	Inner edge	Outer edge	Stringer	Total
80,827 (38%)	41,485 (19%)	48,485 (23%)	42,556 (20%)	213,352

## Existing policies and regulations

### *Federal designation of critical habitat*

Critical habitat for the marbled murrelet is designated on over 3.69 million acres in Washington, Oregon, and California (76 Federal Register 61599, Oct. 5, 2011). In Washington, the critical habitat designation includes over 1.2 million acres, located primarily on National Forest lands. In August 2016, USFWS published a determination confirming its previous critical habitat designations.<sup>18</sup>

In 1997, the USFWS completed a recovery plan for the marbled murrelet. The primary objectives of the recovery plan are: to stabilize and increase murrelet populations, changing the downward trend to an upward trend throughout the listed range; to provide conditions in the future that allow for a reasonable likelihood of continued existence of viable populations; and to gather the necessary information to develop specific delisting criteria. The Northwest Forest Plan (which includes critical habitat designated on federal lands) has been largely effective at conserving habitat on federal lands in Washington (Raphael and others 2016). Implementation of the Northwest Forest Plan, in conjunction with designation of critical habitat, has substantially decreased the rate of net habitat loss on federal lands, such that the net change in the amount of habitat on federal lands from all causes has been limited to just 6 percent of all net loss among all ownerships for Washington (Raphael and others 2016). However, the federal recovery plan (USFWS 1997) goal of stabilizing marbled murrelet populations in Washington has not yet been met.

### *Habitat conservation plans*

Seven habitat conservation plans (HCPs) and two safe harbor agreements in Washington include the marbled murrelet as a covered species. HCPs that cover the marbled murrelet in Washington vary considerably in scale and scope of habitat protection for murrelets based on ownership objectives, forestry operations, capabilities, and geographic location. DNR’s 1997 HCP is the largest in the state covering marbled murrelets.

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<sup>18</sup> 81 Federal Register 51348 (Aug. 4, 2016)

## ***State Forest Practices Rules***

The Washington *Forest Practices Rules* (WAC 222) for marbled murrelets regulate timber harvest on private, state, county, and municipal lands. The rules require forest landowners to identify potential nesting habitat (as defined in the rules) where it exists and conduct protocol surveys to detect murrelets before any modification or alteration of habitat can take place. If surveys determine there is a high likelihood that nesting is present in a stand, the contiguous habitat is designated “occupied” and is held to a higher assessment level to assess any further likely adverse effects from management (i.e., Class IV Special review; DNR 1997a). Landowners that have ESA Section 10 permits for listed species receive take coverage that allows different management prescriptions than in the *Forest Practice Rules*.

## ***Washington State listing and periodic status review***

The marbled murrelet was listed as a threatened species by the Washington Fish and Wildlife Commission in 1993. It is currently undergoing a Periodic Status Review by the Washington Department of Fish and Wildlife (WDFW).<sup>19</sup> WDFW has recommended to the Fish and Wildlife Commission to change the listing status to “state endangered.” A decision on listing status is expected in late 2016.

## ***Interim Strategy (no action alternative)***

As described in Chapter 1, DNR implements an interim strategy under the 1997 HCP to protect marbled murrelet habitat on state trust lands. There are 401 occupied sites identified through audio-visual surveys on DNR-managed lands, but only 13 confirmed nest sites (see Appendix D). DNR designates and protects HCP-surveyed occupied sites and additional habitat areas identified under the HCP interim strategy from harvest. The distribution of protected habitat is mapped in Chapter 2 and Appendix F.

The no action alternative, Alternative A, is described in Chapter 2, and includes ongoing protection of HCP-surveyed occupied sites and buffers in addition to areas already in conservation status, plus additional habitat areas in all planning units. A variety of forest management activities are addressed in the 1997 HCP, including transportation system management, harvest and thinning, and other silvicultural practices. The 1997 HCP calls for development of a long-term strategy that will bring greater certainty to how and where habitat will be protected.

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<sup>19</sup> WAC 232-12-297 (10.1)

## 3.7 Recreation

This section describes how DNR recreation lands are used and managed within the analysis area.

### Why is recreation important?

Every year, there are an estimated 11 million visits to DNR-managed lands by people seeking a variety of recreational opportunities. There are numerous recreation lands located within areas designated as long-term forest cover. Recreation and public access are therefore important considerations when evaluating impacts to DNR-managed lands from the alternatives.

### Current conditions

DNR’s primary recreation focus is to provide a primitive experience in a natural setting through trails, water access, trailhead facilities, and rustic camping facilities. The department broadly categorizes recreation as either “developed” or “dispersed.” Developed recreation occurs at DNR-managed recreation facilities and on DNR-managed trails. Dispersed recreation occurs outside of designated facilities and trails.

Recreational use of DNR-managed lands, both designated and non-designated, is influenced by many factors. These include, but are not limited to, historic use of the area; topography of the landscape; presence of landscape features that are attractive to the recreating public; publicly accessible roads; the presence, density, and use intensity of facilities and trails (both designated and non-designated); proximity to population centers; forest management activities; enforcement presence; and adjacent landowners and land uses.

### *Types of facilities and trails*

Statewide, DNR manages over 160 designated recreation facilities and over 1,100 miles of designated trails for both motorized and non-motorized uses. Designated facilities include trailheads, campgrounds, and day-use sites. Day-use sites are visited for a variety of activities including picnicking, environmental education and interpretation, paragliding and hang gliding, water access, and other activities

#### Text Box 3.7.1

**What is the difference between developed and dispersed recreation?**

Developed recreation occurs at DNR-managed recreation facilities and managed trails. Dispersed recreation occurs outside of these designated areas throughout DNR-managed lands.



Picnic facility on DNR-managed forest. Photo: DNR



**Trail through DNR-managed forest. Photo: DNR**

where recreationists do not stay overnight. Trailheads provide access to DNR-managed trails and trail systems. Day use sites and trailheads often provide informational kiosks and toilet facilities. Campgrounds provide recreationists the opportunity to stay overnight in an area managed for camping and may also provide access to nearby trail systems. Many campgrounds contain fire rings, picnic tables, cleared areas for tents, campers, automobiles, and some recreational vehicles. Many of DNR's campgrounds also have informational kiosks and toilet facilities.

Trail-based recreational use includes both motorized and non-motorized activities. Non-motorized uses include hiking and walking, trail running, horseback riding, hiking or riding with pack stock and/or pets, and mountain bicycle riding. Motorized uses include motorcycle riding, ATV riding, and 4x4 driving. DNR manages designated trails for specific recreational uses or combinations of uses. Trails can be exclusively non-motorized, primarily motorized, or mixed motorized and non-motorized. In addition to trails, forest roads provide considerable access for both developed and dispersed recreation activities. Many people recreate directly on forest roads or use these roads to access developed or dispersed recreation areas.

Dispersed recreational activities include, but are not limited to, hunting, fishing, target shooting, rock climbing, dispersed camping, water activities, hiking, forest product gathering, and geocaching. DNR encourages responsible public use of roads, trails, land, and water, consistent with its obligations as a trust and land manager. In some areas, dispersed use can become concentrated enough that non-designated trails and informal recreation areas are created. Recreational users sometime also venture off designated trails and roads and create trails without authorization from DNR. It is estimated there are hundreds of miles of non-designated trails on DNR-managed lands, and the department may not be aware of all the locations. Non-designated trails are not managed by the department and can cause conflicts with land management and environmental responsibilities.

## Recreation planning

DNR uses a recreation planning process when assessing a landscape (a defined block of DNR-managed land) for recreational use and public access. Formal recreation planning is an in-depth, multi-year process that considers many factors including, but not limited to, land management responsibilities, public and stakeholder input, adjacent landowners and land uses, and environmental responsibilities.

A critical step in formal recreation planning is the *recreation suitability assessment* for the landscape. This is a process where scientists, lands managers, planners, and GIS analysts identify criteria, gather data, and map areas that have long-term limiting factors for recreational use. Criteria are grouped into three categories: biological, geological/soils, and management. Maps are created to reflect areas with moderate to no suitability for recreational development. For recreation landscapes in the analysis area, marbled murrelet habitat has been identified as an important biological criterion in the recreation suitability maps. Three landscapes in the west-side planning units have undergone formal recreation planning: Reiter Foothills Forest, Snoqualmie Corridor, and Green Mountain and Tahuya State Forests.

### Text Box 3.7.2

#### Is marbled murrelet habitat a current consideration in recreation planning?

Yes. Marbled murrelet habitat is part of the recreation suitability analysis done at the beginning of a recreation planning process.

## Current projects and planning

### BAKER TO BELLINGHAM RECREATION PLANNING

In autumn 2015, DNR launched a formal recreation planning process for approximately 86,000 acres of DNR-managed lands in Whatcom County. This planning process will include a full recreation suitability analysis, including marbled murrelet conservation strategies identified in the six alternatives.

### DARRINGTON TO NORTH MOUNTAIN TRAIL DEVELOPMENT

Beginning in 2016, DNR is developing a new landscape for non-motorized recreation in the North Puget planning unit. To ensure compliance with the interim marbled murrelet strategy, the area will be field assessed by a trained biologist to identify suitable habitat and evaluate impacts and restrictions prior to the development of the trails.

## Existing policies and regulations

Recreation on DNR-managed lands is guided by a variety of statutes, regulations, rules, county ordinances, and internal policies. RCW 79.10 directs the department to apply a “multiple use concept” to public lands “where such a concept is in the best interests of the state and the general welfare of the citizens thereof, and is consistent with the applicable provisions of the various lands involved.”<sup>20</sup> Public access and recreation on DNR-managed lands are regulated under WAC Chapter 332-52. Trails built

<sup>20</sup> RCW 79.10.100

without department permission and that are not recognized by the department as part of a formal recreational trail system are referred to in this analysis as non-designated trails, consistent with DNR's *Recreational Trails Policy*. Several other department policies and plans guide recreation and public access on DNR-managed lands. These include, but are not limited to, the *Policy for Sustainable Forests*, the *South Puget HCP Planning Unit Forest Land Plan*, the *Policy on Public Use on DNR-Managed Trust Lands*, and adopted recreation plans for eight landscapes.

Development and maintenance of recreational facilities, trails, and trail bridges are also subject to applicable county ordinance and permit requirements, which vary from county to county. Recreational development and maintenance actions may also be subject to review under the State Environmental Policy Act (SEPA), RCW Chapter 43.21c, and WAC Chapter 197.11, depending on the scope of the project.

### ***Recreation under the interim strategy***

Under the interim marbled murrelet strategy, DNR follows specific practices related to recreational development to achieve marbled murrelet conservation objectives.

#### **STRAITS, COLUMBIA, SOUTH COAST PLANNING UNITS**

No new recreational development is permitted within occupied sites and buffers. Some additional areas are also deferred from harvest but are not known to contain occupied sites. Within these areas, recreation planning is done on a site-specific basis, depending on potential environmental impacts.

#### **OESF, NORTH PUGET, AND SOUTH PUGET PLANNING UNITS**

Marbled murrelet audio/visual surveys are incomplete in these areas. For known occupied sites, buffers, and unsurveyed old forest in the OESF planning unit, no new recreational development is permitted. For all other forested areas, a site-specific assessment is conducted for new recreation development proposals. The assessment looks for suitable habitat in the area where recreational development is being proposed. The type of recreation and any tree harvest would be evaluated against a quality rating of the area, and decisions are made on a site-specific basis.

## 3.8 Forest Roads

This section describes the use and management of DNR forest roads within the analysis area and how environmental impacts from forest roads are addressed by current regulations and policies.

### Why are forest roads important?

Timber harvest operations, land management, and recreation all have a high dependency on the forest road system maintained by DNR. Construction and management of forest roads affect many natural resources, including wildlife, soils, and water. While the proposed alternatives do not amend the regulations and procedures already in place to minimize these impacts, they do propose some changes to the location and management of forest roads. Understanding the current rules related to road management is important to determine whether proposed changes might exacerbate environmental impacts or affect activities dependent upon forest roads.



Example of forest road on DNR-managed land. Photo: DNR

### Current conditions

The risk of impact to natural resources from roads varies but is related to the location, quality of construction, density of roads, the number of stream crossings, noise disturbance from road use, construction, and maintenance activities. DNR implements rules, policies, and procedures (described in the next section) to minimize these impacts.

#### *Road miles in the analysis area*

DNR currently has 8,306 miles of active roads in the six west-side HCP planning units. In the analysis area, 63 percent (251 of 401) of the marbled murrelet occupied sites identified under the interim strategy (Alternative A) contain roads within the occupied site and/or the buffer. These roads include 793 miles of active, drivable road; 20 miles of active, decommissioned roads; 10 miles of orphaned roads; and 26 miles with unknown status but are most likely active.

#### Text Box 3.8.1

##### How many roads are currently located in occupied sites?

In the analysis area, 63 percent of occupied sites identified under the interim strategy contain roads within the occupied site and/or the buffer.



(Abandoned roads are not included in this count.) These road locations vary from the edge of the occupied site buffer to bisecting the occupied site.<sup>21</sup>

DNR conducts a variety of road work (construction, reconstruction, and maintenance activities) throughout the analysis area. “Construction” involves building new roads as well as major upgrade or widening of an existing road to accommodate a new use or standard. “Reconstruction” means reopening a decommissioned road, rebuilding failed road segments, or significantly reshaping the surface of the road.



Example of recently abandoned DNR forest road. Photo: DNR

Typically, reconstruction takes place within the existing road prism. “Maintenance” involves new surfacing, grading, brushing, replacing existing culverts, and similar activities.

From 2003 to 2014, the miles of active road increased from 7,628 miles to 8,306 miles; however, the majority of this increase is due to a better road inventory and the acquisition of new property. Over the same 12-year period, DNR constructed 109 miles and abandoned 110 miles per year (on average), keeping the actual growth of the forest roads system due to new construction to a minimum (refer to Table 3.8.1).

Since 2011, new road construction mileage has dropped to an average of 88 miles per year, while road abandonment has increased to 117 miles per year; refer to Table 3.8.2. Future road management numbers are expected to match these current mileages, with abandonment decreasing to match or be slightly higher than the new construction numbers. The decrease in planned abandonment is due to the upcoming completion of the *Road Maintenance and Abandonment Plans* required under WAC 222-24-050. However, abandonment will still be an important management option under the action alternatives.

<sup>21</sup> DNR designates forest roads as active, abandoned, or orphaned roads. *Active roads* are currently used for timber management or are *decommissioned*, meaning that they are closed for current use but are needed for long-term management so they can be re-opened in the future. *Abandoned roads* are physically closed to all current and future uses, and natural resources have been restored within the road prism. *Orphaned roads* are roads or railroad grades that have not been used for forest practices activities since 1974 and have not been abandoned (WAC 222-24-052 (4)). Orphaned roads are available for use and can become active roads when used again for forest practices.

Table 3.8.1. Average Miles of Annual Road Work From 2003 to 2014, by Planning Unit

Type of road work (miles)	Columbia	North Puget	OESF	South Coast	South Puget	Straits	All Units
New construction	21	43	4	21	10	10	109
Reconstruction	16	96	2	10	4	4	132
Decommissioning	4	8	6	5	2	4	28
Abandonment	18	70	1	9	9	3	110

Table 3.8.2. Average Miles of Annual Road Work From 2011 to 2014, by Planning Unit

Type of road work (miles)	Columbia	North Puget	OESF	South Coast	South Puget	Straits	All Units
New construction	18	35	3	16	9	7	88
Reconstruction	8	96	2	3	4	3	115
Decommissioning	0	0	7	2	1	1	11
Abandonment	15	77	0	8	13	3	117

## ROCK PITS

Rock pits are closely associated with roads. Aggregate is an important, non-renewable resource within the landscape. Forest roads continually lose rock from the road surface from many causes such as log truck haul, recreational traffic, and revegetation. More rock sources will need to be developed to meet the future road construction and maintenance needs of the forest road system. As older rock sources are depleted, they are reclaimed (abandoned) similarly to roads. There are currently six rock pits located within the occupied sites designated under Alternative A, with another 27 located within 0.25 miles of an occupied site. Frequency of use of these rock pits varies widely depending on road work needs. Some are used annually or multiple times per year, while others may only be used once every 1 to 5 years.

## How roads impact the environment

Roads provide access to forest resources for timber harvest and management, collection of non-timber forest products, research, and a variety of recreational uses. Forest roads are also a source of environmental impacts, including habitat disturbance, disruption of natural water flow paths, potential for mass wasting, and erosion affecting water quality.

## HABITAT DISTURBANCE

Roads can disturb habitat for wildlife by creating edges that disrupt blocks of continuous forested habitat needed by many wildlife species (refer to Section 3.5 and Appendix H, Potential Impacts and Mitigation focus paper). Roads also provide corridors for predators such as jays and ravens, which prey on marbled murrelet eggs and chicks. Recreational use of forest roads can also lead to increased amounts of garbage that also attracts predators of marbled murrelets.

## Noise

Road construction and maintenance activities include blasting and use of heavy equipment that have noise-disturbing impacts on marbled murrelets. Blasting is used for road construction, rock production, and expansion and development of new rock pits. Use of roads by heavy hauling trucks, as well as by off-road vehicles, trucks, and other vehicles can also cause noise-related disturbance impacts (refer to Section 4.6).

Road work is largely conducted during the summer construction season, which aligns with the marbled murrelet nesting season. Under the interim strategy, noise-producing activities such as blasting, pile-driving, rock crushing, and using heavy equipment in or within one-quarter mile of occupied sites must follow daily timing restrictions to avoid coinciding with marbled murrelets visiting their nests. Timing restrictions are also applied to activities in other types of habitat (refer to sections that follow).

## Stream crossings

Stream crossings (predominately culverts) can create barriers to fish passage by increasing water velocities, creating large vertical drops, and containing inadequate water depths. There are currently 212 culverts and 39 bridges located within occupied sites and buffers designated under Alternative A. All of these stream crossings require maintenance during their lifespan and require replacement when found to be functionally or structurally deficient (undersized or failing). Culvert lifespan varies by material, location, exposure to saltwater or acidic soils, and abrasion rates. Previous galvanized metal culverts have lasted 20 to 40 years before needing replacement. Newer aluminized coated culverts are expected to last 40 to 60 years.

Historically, DNR averages 87 fish barrier replacements or removals each year. Removals of fish barriers are expected to decrease in the analysis area beyond 2016, except in OESF where the decrease is expected after 2021. The number of replacements of non-fish stream crossings is not known at this time but is expected to be slightly higher than the fish barrier replacement numbers. New stream crossings will be needed with new road construction and during reconstruction of decommissioned roads. The number of new stream crossings is unknown because it is determined on a case-by-case basis along with road location.

## DISRUPTION OF WATER FLOW PATHS

Road construction can cause the disruption of the natural flow patterns of groundwater and surface water. A road cut into a hillside can intercept subsurface water, bringing it to the surface and causing it to flow down a ditch or road surface. Inadequate drainage can interrupt the hydrologic connectivity of surface water and cause concentration of flows or move water from one drainage to another (pirating).

Concentrating flows increases the energy carried by the water and can cause erosion, puddles, or ground saturation that can lead to sediment delivery, maintenance problems, or mass wasting events. Pirating water moves water from one basin to another, changing the natural amount of water each drainage is prepared to carry. This can cause changes in the size and shape of the channel, decreased water availability for fish, and changes in vegetation type. Managing drainage structures so the road does not

carry water for long distances eliminates pirating water and reduces the amount of water (energy) carried by ditches to erodible soils, surface water, or other protected infrastructure.

Inadequately sized culverts in non-fish bearing streams cause an imbalance in the channel, creating deposits of sediment upstream and scouring streambed material downstream. They also increase the chance of culvert blockages and flooding across the road. Flooding at culverts can lead to a distinct failure of the road at the culvert site or a long failure along the road or ditch line. Replacing undersized culverts with larger structures vastly reduces the risk of these types of failures.

## MASS WASTING

Poor location, quality of construction, and management of water can lead to road-caused mass wasting events (such as small slumps or large landslides). Roads built on unstable slopes or landforms can increase the potential for landslides, threatening natural resources and/or public safety. Road-caused mass wasting events are typically shallow but can still produce large quantities of sediment and damage to the road system as well. Well-planned road locations and active management of water can reduce the risk of road-caused mass wasting.

## EROSION AND WATER QUALITY

Fine sediments from native surface or aggregate surface roads can enter surface waters, increasing turbidity and lowering water quality. Erosion caused by traffic creates sediment particles that are washed from the roads by rain and captured by ground or surface water or are lifted into the air by passing vehicles. Sediments are also created during construction and maintenance activities. These activities remove vegetation, exposing bare soil, and loosen compacted earth, making the particles easier to transport. Adequate and well-placed drainage structures, good vegetation cover, lower traffic rates, and quality aggregate surfaces all help to reduce erosion and delivery of sediment to water.

## Existing policies and regulations

The Forest Practices Act (RCW 76.09 and WAC 222-24 concerning Road Construction and Maintenance) and the 1997 HCP road management strategies are the primary regulations that govern road work. In addition, internal policies and guidance on road work include the *Policy for Sustainable Forests*, watershed analysis plans, and the DNR *Forest Roads Guidebook*. Typical road construction and hydraulic projects are considered Class I–III forest practice and are exempt from the State Environmental Policy Act (SEPA) by RWC 43.21C.037(1). SEPA is required for road work in conjunction with a timber sale or other non-exempt project to eliminate the segmentation of environmental effects and may be used for stand-alone projects depending on the scope of work. For individual projects, SEPA may be needed if the project has the potential to affect public resources or use. SEPA is used to determine if there are environmental impacts, if specific impacts can be mitigated, or if significant environmental impacts are likely to occur, requiring more analysis or a change of plans.

## 1997 HCP road management under the interim strategy (no action alternative)

The 1997 HCP road management strategies guide DNR to reduce the amount of new roads, control the overall size of the road network, design, plan, construct, and abandon roads to avoid impacts to habitat areas of federally listed and certain unlisted species and protect riparian areas.

Management is similar across the analysis area, but because the process for identifying marbled murrelet habitat currently differs among the planning units, different management approaches apply in different types of marbled murrelet habitat under the no action alternative (refer to Table 3.8.3).

**Table 3.8.3. Summary of Road Management in Marbled Murrelet Habitat Under the No Action Alternative (Alternative A, Interim Strategy)**

Habitat type	Road construction	Reconstruction, abandonment, and maintenance	Noise-creating activities related to road work
Occupied sites	Prohibited	OESF: subject to review if felling trees over 6" in diameter <sup>a</sup>	Timing restrictions evaluated or required within a one-quarter mile of occupied sites
Old forest habitat (OESF)	Subject to review	Subject to review if felling trees over 6" in diameter	Timing restrictions evaluated within a one-quarter mile of unsurveyed old forest habitat
Reclassified habitat	Subject to review	OESF: subject to review if felling trees over 6" in diameter	n/a
North and South Puget field-delineated, newly-identified habitat <sup>b</sup>	Operational access is prohibited in higher-quality habitat; some access may be allowed in low-quality habitat if surveys determine no occupancy, unless within a one-quarter mile of occupied site	Operational activities must minimize the loss of platform trees, especially those containing four or more platforms. Consultation with USFWS is required.	Timing restrictions on the use of heavy equipment

<sup>a</sup> OESF interim strategies letter dated March 7, 2013.

<sup>b</sup> 2007 and 2009 concurrence letters.

To avoid impacts or potential impacts to marbled murrelet habitat, longer roads are sometimes built and in areas that may be less desirable for road construction. This has included building mid-slope roads, locating roads with more stream crossings, and choosing more restrictive hauling routes. Avoiding occupied sites, buffers, and reclassified habitat can put pressure on other lands by causing higher road use (more hauling) and haul-related maintenance on existing roads in those areas.

The interim strategy is challenging to implement for road activities in the North and South Puget HCP units. Survey work to identify occupied sites and buffers are incomplete in these areas; therefore, site-specific assessments of habitat are needed to build roads. This sometimes leads to delay in road management or road-building decisions and delay the timing of timber harvest or timber sales.

## 3.9 Public Services and Utilities

This section describes the current location and management of public services and utilities within the analysis area.

### Why are public services and utilities important?

Non-timber revenue sources—such as selling rights-of-way and leases for communications and energy-related uses—are a critical component of DNR’s business strategy (DNR 2006, p 26). In addition to providing revenues for state trust beneficiaries, these uses are important to the communications and energy infrastructure of the entire Puget Sound region.

The following sections describe existing rights-of-way and leases for communications and energy-related uses that may be affected by the alternatives. For this assessment, these uses include the following:

- Utility rights-of-way for transmission lines.
- Communications sites (for example, cell and radio towers).
- Oil and gas production.



**A technician repairs microwave dishes on a communication tower located on state trust lands (Grass Mountain, South Puget planning unit). Photo: Steve Diamond/NorthWest Tower Engineering, Inc.**

## Current conditions

### *Utility rights-of-way*

Dozens of telephone companies, public utilities districts, and power providers, including Puget Sound Power and Light, Pacific Power, Seattle City Light and Tacoma Public Utilities, and the federal Bonneville Power Administration (BPA), maintain utility rights-of-way through DNR-managed lands in the analysis area.

Rights-of-way for major utility corridors may be up to 300-feet wide for areas where multiple lines share a single corridor.

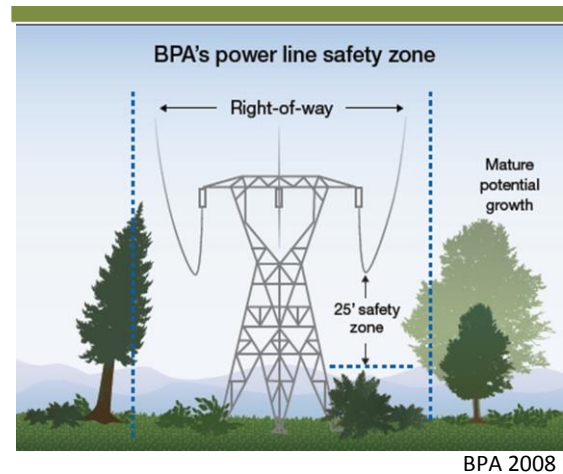
Maintenance of telephone and electric transmission lines requires access roads, many of which occur outside the transmission line rights-of-way. A typical access road right-of-way is 50-feet wide. Inspection, maintenance, and repairs of utility lines may involve occasional use of helicopters. Maintenance crews may also remove trees outside of the right-of-way to prevent trees from falling onto transmission lines or structures. All transmission lines also eventually require replacement, tower upgrades, or expansion.

### ***Leases for communications and energy-related facilities***

Communication facilities include antennas and associated small buildings or sheds for commercial television and radio, 2-way VHF radio, cellular, and wireless broadband. DNR manages more than 100 communication sites across Washington, including several key sites in the analysis area. Communication sites are typically located on non-forested hilltops and mountaintops within range of populated areas and highway corridors.

Table 3.9.1 contains descriptions of these uses as well as known and potential future locations trends within the analysis area.

#### **Text Box 3.9.1**



#### **How are transmission lines managed?**

BPA typically maintains a 150-foot-wide cleared right-of-way easement for 500-kV transmission lines under its Vegetation Management Program (BPA 2000 and 2015).



Table 3.9.1. Communication and Energy-Related Infrastructure on HCP Lands

Leases/contracts	General locations within analysis area	Description	Trends
<b>Communication sites</b>	Found in multiple locations, primarily on high peaks, including: <ul style="list-style-type: none"> <li>• Devil’s Mountain (North Puget planning unit)</li> <li>• Grass and Tiger Mountains (South Puget planning unit)</li> <li>• Radar Ridge and Capitol Peak</li> </ul>	Typically high-elevation sites with multiple towers, antennas, and other structures and outbuildings. Usually less than an acre. Include DNR-provided or lessee-constructed access roads.	Based on recent annual DNR reports, demand for and placement of communication sites on DNR state trust lands is increasing.
<b>Oil and gas leases</b>	No oil or gas is currently produced on DNR HCP lands, though potential oil and gas resources are located in the North and South Puget planning units. Pipeline corridors do run through some DNR-managed lands.	DNR may sell rights to explore for, drill, extract, or remove underground deposits of oil and gas (i.e., petroleum and natural gas). Site size varies, but most are only a few acres.	DNR anticipates new leases to be granted in the next decade. <sup>a</sup>

<sup>a</sup> 2015 State Trust Lands HCP 2014 Annual Report (DNR 2015b)

## Existing policies and regulations

### *Policy for Sustainable Forests*

The 2006 *Policy for Sustainable Forests* clearly identifies that selling rights-of-way and leases for communications and energy-related uses are a critical component of DNR’s business strategy (DNR 2006, p. 26). It also recognizes that public or private utilities may need to cross state trust lands and directs DNR to cooperate with requests by granting permanent and temporary rights-of-way consistent with applicable policies and regulations, including SEPA, *Forest Practice Rules*, the 1997 HCP (including the riparian strategies), the sustainable harvest calculation, and other state and federal laws (refer to Chapter 1).

### *The 1997 HCP*

Leases, contracts, permits, and easements granted by DNR for communications and energy-related facilities are subject to the conditions of their contracts and the 1997 HCP. DNR reviews proposed uses to ensure compliance with the commitments of the 1997 HCP. These commitments are included in the HCP such that activities will not increase the level of take beyond a *de minimis* level. The 1997 HCP defines

what levels of activity are *de minimis* and how the activity is otherwise covered by the HCP (DNR 1997, Ch. IV, Section H).<sup>22</sup>

ESA compliance for any additional take of marbled murrelets (or take of any other listed species) beyond a *de minimis* level for non-timber resources would need to be addressed as a separate action, with formal consultation between DNR and USFWS. This could potentially initiate further NEPA and SEPA review.

Federal agencies consult with DNR on projects that may cross state lands. For example, as part of project review under NEPA, BPA may identify and mitigate potential conflicts with DNR land use plans, including the 1997 HCP.

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<sup>22</sup> The level of impact from these activities is reviewed during the annual meetings described in the Implementation Agreement §16.2b; also refer to §17.0 for easements that are accomplished through a land transfer, sale, or exchange (DNR 1997, p. B.4-6).

## 3.10 Environmental Justice

This section describes where minority and low-income populations are located within the analysis area and the degree to which those populations use and depend upon DNR-managed forestlands.

### Why is environmental justice important?

The term “environmental justice” addresses Executive Order 12898, which directs federal agencies to identify and address any “disproportionately high and adverse effects” of their actions, programs, or policies on low-income and minority populations (CEQ 1997).

Environmental justice concerns considered in this DEIS are focused on whether any of the alternatives may cause disproportionately high adverse economic effects on minority or low-income populations due to reduced timber harvest and other forest management activities, particularly where these populations are dependent on timber revenues and forest-related jobs.

Potential economic effects on American Indians are also considered.<sup>23</sup> Issues related to traditional tribal access and cultural uses of state lands are addressed separately under Sections 3.12 and 4.12, Cultural Resources.

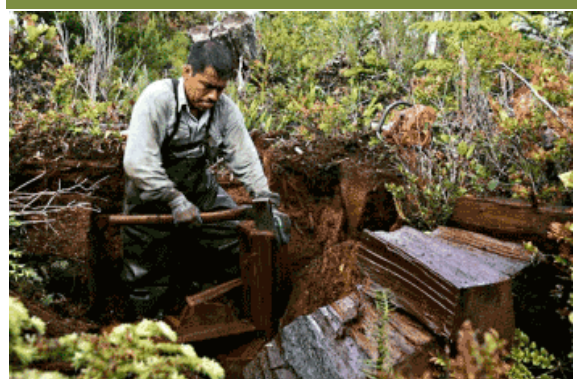
### Current conditions

#### *Minority forest workforce*

The forest workforce, like the forest industry itself, has changed and will likely continue to do so. Shifting from the primarily local, white workforce that harvested trees during the high harvest years of the second half of the last century, the workforce is now made up to a large degree by immigrant workers, primarily Hispanic. This trend of increasing populations of minority forestry workers in rural communities began as early as the 1970s and continues today.

Hispanic forest workers now make up a large proportion of the workforce when it comes to some of the most difficult (and often lowest-paying) forest-related jobs, including tree planting, thinning, and

Text Box 3.10.1



Cedar block cutting. Photo: UW 2016

#### Who relies on the forest?

Many Hispanic communities within the analysis area are economically tied to private, state, and federal forests. Hispanic forest workers now make up a large proportion of the workforce when it comes to some of the most difficult (and often lowest-paying) forest-related jobs, including tree planting, thinning, and harvesting and collection of both timber and non-timber products such as western floral greens. Shown in photo: Cedar block cutting.

<sup>23</sup> The term American Indian is used in this section based on U.S. Census Bureau race classifications.

harvesting of both timber and non-timber forest products including mushrooms, salal, bear grass, and other western greens (Ballard 2004, Campe and others 2008).

Due to this trend in forest workers, many Hispanic communities within the analysis area are economically tied to private, state, and federal forests. Other work crews are part of a seasonal workforce that travels around the western U.S. following seasonal peaks in labor markets.

### **Minority and low-income populations**

For this assessment, minorities are considered within the following U.S. census tracking data racial and ethnicity categories:

- Black or African American
- American Indian and Alaska native
- Asian
- Native Hawaiian and other Pacific Islander
- Hispanic
- Two or more races

Minority and low-income populations are listed in Table 3.10.1 by county.<sup>24</sup> Acres of DNR-managed land within the county are provided for context.

**Table 3.10.1. Minority and Low-Income Populations, by County, With Acres of DNR-Managed Land**

<b>County</b>	<b>Minority population (% of county population)</b>	<b>Low-income population (% of county population)</b>	<b>Acres of DNR- managed lands</b>
<b>Clallam</b>	18.3	16.2	162,041
<b>Cowlitz</b>	17	20.6	28,270
<b>Grays Harbor</b>	22.5	19.6	90,603
<b>Island</b>	21.5	10.3	340
<b>Jefferson</b>	12.4	14.1	203,774
<b>King</b>	40.2	11.3	116,880
<b>Kitsap</b>	24.4	11.2	14,235
<b>Kittitas</b>	17.1	18.6	2,591
<b>Lewis</b>	17.4	17.1	96,317
<b>Mason</b>	21	15.6	58,925

<sup>24</sup> The environmental justice guidelines developed by CEQ 1997 and EPA 1998 indicate that low-income populations should be identified based on the annual statistical poverty thresholds established by the U.S. Census Bureau. The U.S. Census Bureau defines a poverty area as a census tract or other area where at least 20 percent of residents are below the poverty level (U.S. Census Bureau 2013). Median household income and per capita income are other measures that can be used to identify low-income environmental justice populations.

County	Minority population (% of county population)	Low-income population (% of county population)	Acres of DNR- managed lands
Pacific	19.5	17.8	86,898
Pierce	34.7	13.1	24,959
San Juan	11.8	12.7	1,193
Skagit	27.3	15.7	139,540
Snohomish	30.2	9.9	157,225
Thurston	26.2	11.9	64,588
Wahkiakum	10.9	13.9	40,195
Whatcom	22.1	15.7	88,903
<b>Total (Average)</b>	32.1	13.2	1,377,477

Source: U.S. Census 2015

## Existing policies and regulations

Executive Order 12898 requires federal agencies to take appropriate steps to identify and avoid disproportionately high and adverse effects of federal actions on the health and surrounding environment of minority and low-income persons and populations. All federal programs, policies, and activities that substantially affect human health or the environment shall be conducted to ensure that the action does not exclude persons or populations from participation in, deny persons or populations the benefits of, or subject persons or populations to discrimination under such actions because of their race, color, income level, or national origin. The Executive Order was also intended to provide minority and low-income communities with access to public information and public participation in matters relating to human health and the environment.

## 3.11 Socioeconomics

This section describes the economic conditions that may result from current management practices on state trust lands. Impacts of the alternatives on these conditions will be discussed in Section 4.11.

### Why are socioeconomics important?

DNR-managed forestland plays an important role in the local economies of 18 counties in the analysis area. Changes to how much land is available to harvest or use for other ecosystem services can impact these local economies. Maintaining funding to state trusts is an important piece of the need, purpose, and objectives for the long-term conservation strategy.

The affected environment for this section is all trusts and counties with state trust lands inside the marbled murrelet analysis area (Table 3.11.1). Counties that do not contain trust lands within the analysis area are not part of the affected environment. State trust lands are defined in Chapter 1.

**Table 3.11.1. Acres of Trust Lands by Management Category in Counties Within the Analysis Area (counties containing state trust lands only)**

County	DNR-managed lands in analysis area: Acres	No harvest allowed: Acres (%)	Harvest is constrained: Acres (%)	Available for harvest: Acres (%)	DNR-managed lands outside the analysis area: Acres
Clallam	162,041	44,425 (27%)	75,984 (47%)	41,632 (26%)	0
Cowlitz	28,270	9,188 (11%)	46,144 (53%)	31,118 (36%)	58,229
Grays Harbor	90,603	23,680 (26%)	18,999 (21%)	47,924 (53%)	0
Island	340	340 (100%)	0 (0%)	0 (0%)	0
Jefferson	203,774	86,380 (42%)	101,047 (50%)	16,346 (8%)	0
King	116,880	53,536 (46%)	41,339 (35%)	22,005 (19%)	0
Kitsap	14,235	4,944 (35%)	3,908 (27%)	5,383 (38%)	0
Kittitas <sup>a</sup>	2,591	74,517 (36%)	120,598 (58%)	12,905 (6%)	208,403
Lewis	96,317	15,415 (16%)	47,828 (49%)	33,647 (35%)	0
Mason	58,925	10,148 (17%)	13,563 (23%)	35,214 (60%)	0
Pacific	86,898	30,488 (35%)	19,615 (23%)	36,795 (42%)	0
Pierce	24,959	2,971 (12%)	20,593 (83%)	1,495 (6%)	0
San Juan	1,193	1,193 (100%)	0 (0%)	0 (0%)	0
Skagit	139,540	49,469 (35%)	51,156 (37%)	38,916 (28%)	0
Snohomish	157,225	65,740 (42%)	40,891 (26%)	50,593 (32%)	0
Thurston	64,588	9,762 (15%)	15,457 (24%)	39,370 (61%)	0
Wahkiakum	40,195	12,201 (30%)	10,954 (27%)	17,040 (42%)	0
Whatcom	88,903	37,384 (42%)	25,926 (29%)	25,595 (29%)	0
<b>Total</b>	<b>1,377,477</b>	<b>497,176 (32%)</b>	<b>604,188 (38%)</b>	<b>469,392 (30%)</b>	<b>1,746,244</b>

<sup>a</sup> DNR-managed lands in Kittitas County are not subject to the interim strategy for marbled murrelet in the 1997 HCP. A small portion of this county is included within the inland range of the marbled murrelet and is listed here for context, but impacts will not be evaluated in this DEIS because the long-term strategy will not apply to this county.

## Current conditions

### Population

The total human population in affected counties in the marbled murrelet analysis area as of 2015 is about 5 million (OFM 2016a; Table 3.11.2).

### Economic diversification and timber dependency

Daniels 2004 assessed the economic diversity<sup>25</sup> and socioeconomic resiliency<sup>26</sup> of Washington counties. Most counties in the analysis area were found to have medium or high socioeconomic resiliency and be among the counties with greater economic diversity in the state. There were notable exceptions, however. Wahkiakum County is one of the least socioeconomically resilient and least economically diverse county in the state (refer to Table 3.11.2). Pacific County also has low socioeconomic resiliency and below-median economic diversity. All counties in the analysis area are classed as having medium or high forest dependence.<sup>27</sup> Daniels 2004 identified Pacific and Wahkiakum counties as “DNR counties of concern” due to the relatively large role DNR-managed lands have in the socioeconomic well-being of these counties. Daniels states that these counties “may experience difficulty adapting to changes in DNR forest management strategies.”

Since the Daniels study was done in 2004, the economies of Pacific and Wahkiakum counties have not changed markedly. The Washington State Employment Security Department 2016 states that employment fell in Pacific County from 2006 to 2012 and has since recovered slowly. The primary industries in the county were natural resource-based including shellfish farming, forest-products, and other farming. The only sectors with an increase in employment were the information and finance sectors, but these sectors were relatively small in Pacific County. The population of Pacific County has declined since 2000 (Pacific County 2014). For Wahkiakum County, the Washington State Employment Security Department 2016 states that logging is the main industry in the county, and local government is the main source of jobs and wages. Total employment in the county has declined since the 1990s. Most of this decline has been from the loss of service jobs.

#### Text Box 3.11.1

##### How resilient are local economies to changes in DNR forest management?

While most counties in the analysis area have medium to high socioeconomic resiliency, Pacific and Wahkiakum counties are highly dependent on DNR-managed lands and “may experience difficulty adapting to changes in forest management strategies.” (Daniels 2004)

<sup>25</sup> Economic diversity is measured by Daniels 2004 using an index of regional specialization.

<sup>26</sup> Socioeconomic resiliency is defined by Daniels 2004 as the ability to adapt to change. Daniels assumes that communities with high social and economic diversity are more resilient.

<sup>27</sup> Forest dependence is determined by Daniels 2004 based on the forest area in each county.

Table 3.11.2. Socioeconomic Resiliency and Economic Diversity Rating (Modified From Daniels 2004)

County	Socioeconomic resiliency	Economic diversity 4 = high diversity	Population, 2015 (OFM 2016a)	Employment, 2014 (OFM 2016a)
Clallam	Medium	3	72,650	22,035
Cowlitz	High	4	104,280	36,910
Grays Harbor	Medium	3	73,110	21,769
Island	High	3	80,600	15,200
Jefferson	Medium	3	30,880	7,920
King	High	4	2,052,800	1,237,660
Kitsap	High	4	258,200	82,400
Kittitas	Medium	2	42,670	13,909
Lewis	Medium	3	76,660	23,590
Mason	Medium	2	62,200	13,900
Pacific	Low	2	21,210	6,195
Pierce	High	4	830,120	277,863
San Juan	Medium	2	16,180	5,445
Skagit	High	4	120,620	48,291
Snohomish	High	4	757,600	267,792
Thurston	High	4	267,410	103,100
Wahkiakum	Low	1	3,980	729
Whatcom	High	4	209,790	83,691
<b>Total</b>	N/A	N/A	5,080,960	

### Trust revenue

State trust lands provide revenue for trust beneficiaries (refer to Chapter 1). Timber sales are the single largest source of revenue. However, other revenue sources exist, including leasing of lands for communication sites and special forest products,<sup>28</sup> interest income, permits, fees, and miscellaneous sales and other revenue.<sup>29</sup>

From 2011 to 2015, an annual average of about \$175 million (2015 dollars; U.S. Bureau of Labor Statistics 2016) was distributed to trust beneficiaries that receive revenue from lands within the analysis area (Tables 3.11.3 and 3.11.4). Some of these beneficiaries also received revenue from lands outside of the analysis area (Tables 3.11.3 and 3.11.4). Total distributions vary due to fluctuations in timber and agricultural markets. The Common School and Escheat Trust received distributions from land transactions under the Trust Land Transfer Program. Funding for this program varies from year to year. (Refer to DNR 2013 for more information about the Trust Land Transfer Program).

Distributions from most major sources have been relatively stable over the 2011 to 2015 period. The exception is funds for the Trust Land Transfer Program, which have decreased over the period. Timber sales generated an average of \$114.5 million per year. Other important sources of trust revenue are agricultural and commercial leases and fund transfers through the Trust Land Transfer Program. From 2011 to 2015, the trust land transfer program provided an average of \$32.7 million (2015 dollars) per

<sup>28</sup> Such as brush and boughs.

<sup>29</sup> Other lease categories include agriculture, mineral and hydrocarbon, special use, commercial real estate, and right-of-way.



year, all to the Common School Trust. Leases allowing harvest of non-timber forest products from trust lands generated about \$500,000 or less per year in revenue. Refer to DNR Annual Reports for more detail on trust revenues and distributions. The revenue generated from sales and leases varied based on market conditions and qualities sold.

**Table 3.11.3. Average Annual Fund Distribution to Beneficiaries of the Federally Granted Trusts for Fiscal Years 2011–2015 in 2015 Real Dollars (Revenue from lands statewide)**

Trust(s)	Distributions from timber sales and timber sale related activities	Distributions from all other revenue sources	Total distributions
Agricultural School Grant	\$3,655,419	\$417,510	\$4,072,930
Capitol Building Grant	\$6,704,014	\$146,399	\$6,850,413
CEP&RI and CEP&RI transferred <sup>a</sup>	\$4,407,988	\$928,689	\$5,336,677
Common School and Escheat	\$35,168,373	\$56,391,303	\$91,559,676
Normal School	\$2,304,357	\$158,619	\$2,462,976
Scientific School Grant	\$6,339,614	\$1,219,878	\$7,559,493
University Grant (original and transferred)	\$1,863,713	\$270,382	\$2,134,095
<b>Total</b>	<b>\$60,443,478</b>	<b>\$59,532,781</b>	<b>\$119,976,259</b>

<sup>a</sup> CEP&RI refers to charitable, educational, penal, and reformatory institutions as defined by the state.

**Table 3.11.4. Average Annual Distribution of Funds to Beneficiaries of State Forest Trust Lands (State Forest Transfer and State Forest Purchase Trusts) for Fiscal Years 2011–2015, in 2015 Dollars<sup>30</sup>**

Beneficiary county*	Distributions from timber sales and timber sale related activities	Distributions from all other revenue sources	Total distributions
Clallam	\$5,872,468	\$318,449	\$6,190,916
Cowlitz	\$2,112,276	\$26,159	\$2,138,435
Grays Harbor	\$1,543,343	\$2,930	\$1,546,273
Jefferson	\$1,693,830	\$27,912	\$1,721,743
King	\$1,872,807	\$73,671	\$1,946,478
Kitsap	\$380,168	\$67,450	\$447,618
Lewis	\$7,042,221	\$8,016	\$7,050,237
Mason	\$3,312,323	\$160,334	\$3,472,657
Pacific	\$1,893,294	\$11,719	\$1,905,012
Pierce	\$391,641	\$1,732	\$393,373
Skagit	\$9,498,820	\$55,382	\$9,554,201
Snohomish	\$10,309,824	\$161,050	\$10,470,874
Thurston	\$3,340,066	\$133,284	\$3,473,350
Wahkiakum	\$1,610,234	\$2,073	\$1,612,307
Whatcom	\$3,322,456	\$68,600	\$3,391,056
<b>Total</b>	<b>\$54,195,769</b>	<b>\$1,118,761</b>	<b>\$55,314,530</b>

\* No State Forest Lands are present in Island or San Juan counties.

<sup>30</sup> Includes only counties that benefit from lands within then analysis area. Several counties in the analysis area do not contain State Forest Trust lands and several counties contain State Forest Trust lands outside the analysis area. Does not include an average of \$8,600 of interest distributed to state forestland beneficiaries.

## Trust acreage and management options

Trust lands are distributed throughout the state. Federal trusts are located both inside and outside the marbled murrelet analysis area. State Forest lands are present in 15 of the counties that fall within the analysis area (Table 3.11.5). For all counties except Cowlitz County, all the State Forest lands fall within the analysis area (Table 3.11.6).

Trust lands are organized into land classes that define areas with different management constraints. Lands may be deferred or constrained from harvest to meet objectives defined by the HCP, *Policy for Sustainable Forests*, or state or federal laws. Examples of these constraints include northern spotted owl conservation, unique habitats, lands in stream and wetland buffers, and associated unstable slopes. In most cases, only thinning harvest can occur on lands in riparian areas.

**Table 3.11.5. Statewide Management Options by Trust or Trust Group under the No Action Alternative (Acres where harvest is limited includes both the uplands with specific objectives and the riparian land classes)**

	Trust(s)	No harvest allowed Acres (%)	Harvest is constrained Acres (%)	Available for harvest (includes non-forested lands) Acres (%)	Total trust area Acres (% of acres in the analysis area)
Federally granted trusts	Agricultural School Grant	1,684 (19%)	15,612 (22%)	41,800 (59%)	71,110 (35%)
	Capitol Building Grant	28,504 (26%)	44,762 (41%)	36,294 (33%)	109,563 (73%)
	CEP&RI (including CEP&RI transferred) Grant	6,883 (10%)	12,734 (18%)	49,901 (72%)	69,518 (38%)
	Common School and Escheat	317,645 (18%)	369,527 (21%)	1,105,051 (62%)	1,792,224 (28%)
	Normal School	14,040 (21%)	23,815 (36%)	28,899 (43%)	66,754 (39%)
	Scientific School Grant	15,693 (19%)	32,050 (38%)	36,342 (43%)	84,084 (51%)
	University Grant (original and transferred)	15,136 (17%)	26,718 (30%)	47,209 (53%)	89,062 (50%)
Other lands	Community College Forest Reserve	72 (2%)	1,080 (31%)	2,340 (67%)	3,492 (100%)
	Community Forest Trust	49,782 (100%)	0	0 (0%)	49,782 (3%)
	Land Bank	0	0	364 (100%)	364 (>1%)
	Water Pollution Control Division Trust land	811 (14%)	1,520 (25%)	3,659 (61%)	5,990 (100%)
	Other	111,537 (91%)	3,508 (3%)	7,730 (6%)	122,776 (96%)

**Table 3.11.6. Management Options on State Forest Lands (State Forest Transfer and State Forest Purchase Trusts) Within the Analysis Area, by County, for Alternative A**

County	No harvest allowed Acres (%)	Harvest is constrained Acres (%)	Available for harvest Acres (%)	Total trust area Acres (% of acres in the analysis area)
Clallam	24,305 (26%)	37,930 (41%)	31,072 (33%)	71,110 (100%)
Cowlitz	803 (7%)	4,164 (37%)	6,389 (56%)	11,355 (46%)
Grays Harbor	2,810 (9%)	8,123 (26%)	20,412 (65%)	31,345 (100%)
Jefferson	2,265 (15%)	1,935 (13%)	10,515 (71%)	14,716 (100%)
King	6,326 (28%)	11,273 (49%)	5,324 (23%)	22,923 (100%)
Kitsap	1,188 (16%)	2,996 (39%)	3,450 (45%)	7,633 (100%)
Lewis	8,293 (19%)	16,694 (39%)	18,074 (42%)	43,061 (100%)
Mason	4,743 (16%)	6,407 (22%)	17,764 (61%)	28,914 (100%)
Pacific	8,599 (37%)	4,844 (21%)	9,841 (42%)	23,284 (100%)
Pierce	1,306 (11%)	10,907 (89%)	8 (0%)	12,221 (100%)
Skagit	27,653 (33%)	27,111 (32%)	29,998 (35%)	84,762 (100%)
Snohomish	13,728 (21%)	20,435 (32%)	29,974 (47%)	64,137 (100%)
Thurston	5,527 (13%)	9,993 (23%)	28,044 (64%)	43,563 (100%)
Wahkiakum	4,072 (32%)	3,213 (28%)	5,504 (43%)	12,789 (100%)
Whatcom	9,946 (33%)	8,696 (29%)	11,601 (38%)	30,242 (100%)

### Tax revenue

Timber harvests generate direct revenue for county governments and the state general fund through the forest tax and create economic activity that results in other state and local tax revenue (Washington Department of Revenue 2016a). From 2011 to 2014, an average of \$26.0 million per year (in 2015 dollars) was distributed to counties within the analysis area from forest tax revenue (Table 3.11.7 Washington Department of Revenue 2016b). Average sales tax distributions were \$400 million in the same period. Sales tax distributions exceed forest tax distributions in all counties in the analysis area except Pacific and Wahkiakum counties.

Looking broadly at taxes generated by harvest of timber and manufacture of wood products, Mason and Lippke 2007 reported that the state and local taxes generated per million board feet of annual timber production equaled \$210,000 (in 2004 dollars, which equals \$259,000 in 2015 dollars), not including the forest tax. The DNR harvested 5.038 billion board feet in western Washington in the 2005–2014 period. At this harvest volume, state and local taxes generated from state trust lands is about \$130 million per year (2015 dollars).

Other activities, such as recreation and harvesting of non-timber forest products on state trust lands, also have the potential to generate tax revenue in counties within the analysis area. The extent to which they do is not known. A report by Briceno and Schundler 2015 looking at all ownerships estimated that outdoor recreation generates state and local tax contributions of about \$2 billion per year (2015 dollars).

They estimated that recreation expenditures, excluding equipment, related to trust lands was \$456 million per year (2015 dollars), while expenditures, excluding equipment, on all lands was \$12.8 billion (2015 dollars). If the state and local tax contributions from state trust land recreation is proportional to the contribution of state trust land recreation to total expenditures, the state and local taxes generated by recreation on state trust lands is \$73 million per year (2015 dollars).

**Table 3.11.7. Average Sales Tax Distributed to Counties in the Analysis Area in 2011–2014, in 2015 Real Dollars (Washington Department of Revenue 2016b, 2016c)**

County	Average annual sales tax distribution by county	Average annual forest tax distribution by county	Ratio of forest tax distribution to sales tax distribution <sup>a</sup>
Clallam	\$7,814,019	\$1,838,801	0.24
Cowlitz	\$7,870,334	\$2,697,259	0.34
Grays Harbor	\$5,646,926	\$3,440,238	0.61
Island	\$7,155,632	\$49,588	0.01
Jefferson	\$4,164,881	\$1,118,991	0.27
King	\$142,725,487	\$1,238,050	0.01
Kitsap	\$28,232,022	\$342,274	0.01
Kittitas	\$6,052,652	\$48,980	0.01
Lewis	\$7,903,983	\$4,558,113	0.58
Mason	\$5,991,640	\$1,341,302	0.22
Pacific <sup>b</sup>	\$1,564,607	\$2,598,692	1.66
Pierce	\$64,077,495	\$1,489,606	0.02
San Juan	\$4,825,095	\$6,534	0.00
Skagit	\$15,093,817	\$1,234,753	0.08
Snohomish	\$53,844,884	\$1,369,989	0.03
Thurston	\$26,245,441	\$1,069,567	0.04
Wahkiakum <sup>b</sup>	\$332,772	\$762,843	2.29
Whatcom	\$24,188,002	\$797,614	0.03
<b>Total</b>	<b>\$413,729,689</b>	<b>\$26,003,193</b>	<b>0.06</b>

<sup>a</sup> Ratio of forest tax distribution to sales tax distribution >1.0 indicates timber tax distribution exceeds sales tax distribution.

<sup>b</sup> Indicates counties where the forest tax distribution exceeds sales tax distribution.

## Employment

Activities on trust lands provide direct and indirect employment in counties in the analysis area. Examples of direct employment include land management staff hired by DNR, timber harvest operators, and non-timber forest product harvesters. Examples of indirect employment include hauling and processing, equipment servicers, and sporting goods vendors.

Mason and Lippke 2007 found that the direct employment resulting from both the harvesting and processing of 1 million board feet of timber in Washington State is equal to 8.67 full time jobs. These jobs were divided between logging jobs, mill jobs, and wood product manufacturers (Table 3.11.9). Not every county contains mills or wood product manufacturers.

**Table 3.11.8. Jobs Created for Each Million Board Feet of Timber Harvested in Washington State (Reproduced From Mason and Lippke 2007)**

	Logging	Sawn wood	Secondary wood products <sup>a</sup>	Primary Paper products <sup>b</sup>	Total
<b>Direct employment</b>	1.30	2.97	3.26	1.13	8.67
<b>Indirect employment</b>	0.53	1.14	0.83	0.12	2.62
<b>Total</b>	1.83	4.81	4.09	1.25	11.28

<sup>a</sup> Secondary wood products include manufactured wood products such as doors, molding, and furniture.

<sup>b</sup> Primary paper products are pulp and paper manufactured from pulp logs and wood chips.

The Washington Employment Security Department 2016 estimates that seasonally adjusted monthly employment in the “Logging” sector in Washington State ranged from 3,600 and 4,100 from January 2014 to December 2015. Over the same period, employment in the “Wood Products Manufacturing” sector increased from 13,400 to 13,900. The Washington Employment Security Department does not provide estimates of employment in other sectors which trust lands may support, such as outdoor recreation or non-timber forest product collection. However, employment in in the broad category of “Arts, Entertainment and Recreation” ranged from 46,100 to 49,100. The source data do not show the wages associated with these jobs or whether these jobs are full or part-time. Briceno and Schundler 2015 estimated that approximately 200,000 full- and part-time jobs are supported by recreation in Washington.

Table 3.11.9. December 2015 Employment Information for Each County With State Trust Lands in the Analysis Area

County	% of total county paid employees in logging and wood product manufacturing sectors <sup>a</sup>	Unemployment rate <sup>b</sup>	Socioeconomic resiliency	Economic diversity (4 = high diversity)	Population, 2015
Clallam	4%	8.3 %	Medium	3	72,650
Cowlitz	4%	7.5 %	High	4	104,280
Grays Harbor	5%	9.3 %	Medium	3	73,110
Island	<1%	6.1 %	High	3	80,600
Jefferson	1%	7.3 %	Medium	3	30,880
King	<1%	4.5 %	High	4	2,052,800
Kitsap	<1%	5.5 %	High	4	258,200
Kittitas	1%	6.3 %	Medium	2	42,670
Lewis	4%	8.3 %	Medium	3	76,660
Mason	3%	7.9 %	Medium	2	62,200
Pacific	25%	9.5 %	Low	2	21,210
Pierce	<1%	6.1 %	High	4	830,120
San Juan	n/a	5.7 %	Medium	2	16,180
Skagit	<1%	7.0 %	High	4	120,620
Snohomish	<1%	5.0 %	High	4	757,600
Thurston	<1%	5.9 %	High	4	267,410
Wahkiakum	17%	9.0 %	Low	1	3,980
Whatcom	2%	5.9 %	High	4	209,790
Statewide rate		5.9 %	N/A	N/A	

<sup>a</sup> Estimated using 2014 County Business Patterns Census Data, <http://censtats.census.gov/cgi-bin/cbpnaic/cbpcomp.pl>

<sup>b</sup> Non-seasonally-adjusted Unemployment Rate (Washington Employment Security Department 2016).

As illustrated in Table 3.11.9, most counties have a low percentage of total paid employees identified by the U.S. Census as working in the logging or wood product manufacturing sectors. Pacific and Wahkiakum counties had the highest percentage of their paid employees employed in the logging or wood product manufacturing sectors (U.S. Census 2014). These two counties also had the highest and third-highest unemployment rates, respectively, of counties in the analysis area, making their economic resilience to changes in these sectors low.

Statewide, the annual unemployment rate has fallen every year since 2010 from 9.9 percent to 6.3 percent. The unemployment rate in Washington has closely tracked the nationwide rate since the 1990s, though with higher state-level unemployment in economic downturns (OFM 2016b).

### Carbon sequestration

Currently, no trust lands generate revenue though the sale of credit for carbon sequestration, and there is no program applicable to these lands.

## *Environmental services and other non-market values*

Estimating the value of DNR-managed timber lands beyond markets directly related to timber production requires looking at estimates of the value of environmental services and other land uses provided by forestlands.

### ENVIRONMENTAL SERVICES AND CONSERVATION VALUES

Surveys have been developed to understand these non-market values and assess the value of different management options. For example, Garber-Yonts and others 2004 studied Oregon residents' willingness to pay for conservation in the Oregon Coast Range. They found that a hypothetical policy to increase the area of forests with old-growth characteristics resulted in a willingness to pay of up to \$380 per household per year. Willingness to pay for large (40 to 180 square miles) biodiversity reserves peaked at \$45 per household per year. For all conservation policies, willingness to pay for additional conservation peaked at moderate levels of conservation and was negative for all policies at high levels of conservation.

Some people place value on the continued survival of species. Richardson and Loomis 2009 reviewed studies valuing preservation of threatened, endangered, and rare species. They found that willingness to pay for protection of these species ranged from \$8 to \$311 per year per household.

Cedar River Group and others 2002 studied the value of the property attributes a 4,800-acre block of trust land on Blanchard Mountain in Skagit County. These attributes included 18 different non-timber social, environmental, and economic resources. They found that the total value of these resources to Skagit and Whatcom county residents was \$8.5 million. The study does not assess how this value may change with different levels of timber harvest.

Briceno and Schundler 2015 estimated that land and waters that provide recreation experiences also provide at least \$137 billion to \$253 billion (2015 dollars) in economic benefits from clean water, wildlife habitat, aesthetic attributes, and enhanced recreation experiences for the entire state.

### RECREATION

Across Washington State, recreation is an important contributor to the economy. Briceno and Schundler 2015, in a report for the Washington State Recreation and Conservation Office, estimated that recreation expenditures, excluding equipment, related to trust lands was \$456 million per year (2015 dollars).

DNR-managed lands provide opportunities for recreation. Section 4.7 discusses the impacts of the alternatives to recreation opportunities. The value of these opportunities has not been studied in detail for all trust lands in the marbled murrelet analysis area. However, the value of one area, trust lands on Blanchard Mountain in Skagit County, have been studied. There, the Cedar River Group and others 2002 estimated that between 30,000 and 50,000 people visited the 4,800-acre block of trust lands. The economic impact of these visits to Skagit and Whatcom counties was \$534,000 per year. They compared this value to the estimated value of harvest of 2 million board feet. This harvest level provided \$1.6 million per year in economic impact to Skagit and Whatcom counties. The economic impact of these activities to the entire state is estimated as greater than \$938,000 per year for recreation and \$6.6 million per year for harvest of 2 million board feet.

## MINERALS AND HYDROCARBONS

The analysis leases in this category include surface mining leases for rock, sand, and gravel and prospecting leases for minerals or hydrocarbons. Nearly all of this revenue comes from the surface mining leases. The total revenue to the trusts in the analysis area from surface mining grew from fiscal year 2011 to 2015 from \$594,000 to \$1.1 million. This revenue comes from royalties from two surface mines. The revenue varies as extraction volume changes. No new surface mine leases are currently planned.

## HARVEST OF NON-TIMBER FOREST PRODUCTS

Collection of non-timber forest products for non-tribal uses is allowed with a valid permit. Collection for tribal use does not require a permit. Permits are issued by the region. The price varies—permits for small quantities of firewood are free, while other permits are priced in a bid process. Revenue from the collection of non-timber forest product on trust lands statewide is about \$500,000 annually (2015 dollars), mostly from western Washington.

# Existing policies and regulations

## *Trust distribution rate*

Revenue generated for the trusts is split between the trust beneficiaries and the DNR’s management funds. The distribution rate of funds to the beneficiaries and DNR’s management accounts<sup>31</sup> differs between the federally granted trusts, State Forest Transfer Trust, and State Forest Purchase Trust (Table 3.11.10). One federally granted trust, the Agriculture School Grant, receives 100 percent of the revenue for activity on the lands in that trust (DNR 2015). The Legislature sets the maximum allowable distribution to DNR’s management funds. The Board of Natural Resources sets the rate received by these funds within this limit. These rates have changed over time.

Revenue from State Forest Transfer and State Forest Purchase trusts is distributed within counties based on junior tax districts, which are tax districts created to fund particular services such as schools, emergency services, and libraries. Junior tax districts may receive a proportion of the revenue generated within the district. The proportion of the revenue they receive depends on factors such as the number of tax districts receiving revenue and the tax rate within the district as directed by RCW 76.64.110.

**Table 3.11.10. General Distribution Rates, Upland Trust Revenue as of January 2016**

Trust group	Beneficiaries	State general fund	DNR management accounts
Federally granted trusts	69%	0%	31%
State Forest Transfer	75%	0%	25%
State Forest Purchase	26.5%	23.5%	50%

<sup>31</sup> These accounts are the Resource Management Cost Account and the Forest Development Account. The Resource Management Cost Account receives money from the federally granted trusts. The Forest Development Account receives money from the State Forest Transfer and State Forest Purchase lands.



## ***Tax rates***

The state timber tax is applied to harvests on private and state lands. The current rate is 5 percent of the stumpage value (Washington Department of Revenue 2016a).<sup>32</sup> Revenue from this tax is split between the state general fund and counties, with 20 percent going to the general fund and 80 percent to the county where the harvest occurred. Sales tax varies by location due to local taxes in addition to the 6.5 percent state sales tax. There are numerous other state and local taxes in counties in the marbled murrelet analysis area. Current state tax rates can be accessed at the Washington Department of Revenue. Other tax rates are available from county governments.

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<sup>32</sup> Stumpage is the price of standing timber or the right to harvest timber. Stumpage does not include costs of harvesting or transporting timber.

## 3.12 Cultural and Historic Resources

This section describes cultural and historic resources commonly found within the analysis area and how DNR manages those resources.

### Why are cultural and historic resources important?

DNR-managed lands within the analysis area contain many types of cultural and historic resources. DNR routinely surveys for these resources as part of its forest practices. DNR works with tribes to ensure protection of and access to traditional cultural materials and foods, as well as sites of cultural importance to tribal communities.

### Current conditions

Washington State law (WAC 222-16-010) defines cultural resources for forest practices as “archaeological and historic sites and artifacts and traditional religious, ceremonial, and social uses and activities of affected Indian Tribes.” Cultural and historic resources on DNR-managed lands include archaeological and historic sites, resources, and objects.<sup>33</sup> Common examples on state trust lands include logging railroad grades, logging camps, mining camps, homesteads, and culturally modified trees. Logging railroad grades are the most common archaeological site type found on DNR-managed lands.

Traditional cultural properties, materials, and foods are also found on DNR-managed lands. These are places that have been identified as playing a significant role in a community’s historically rooted beliefs, customs, and practices. Traditional cultural properties are eligible for listing in the National Register of Historic Places (refer to the following section). Traditional cultural materials and foods include many plants, fish, animals, and minerals traditionally used for food, medicine, and raw materials by Native peoples. There are 25 federally recognized Tribes within the analysis area.<sup>34</sup> Maintaining Tribal access to state lands for cultural practices, including the harvest of traditional plants, fish, roots, berries, wildlife,

Text Box 3.12.1



#### How are cultural resources investigated in the field?

DNR has its own archaeological staff and cultural resource technicians. DNR also works closely with Tribal staff to locate and document cultural resources.

Photo: Sara Palmer

<sup>33</sup> See WAC 25-48-020, sections 9-11.

<sup>34</sup> For a list of federally recognized tribes in Washington, refer to [www.goia.wa.gov/TribalDirectory/TribalDirectory.pdf](http://www.goia.wa.gov/TribalDirectory/TribalDirectory.pdf).

cedar bark, and bough, is an important part of DNR’s stewardship of state lands. Use of these resources is part of treaty rights for some tribes.

## Existing policies and regulations

### *DNR review and consultation*

DNR’s practice is to avoid impacts to cultural resources when managing forestlands. Field staff routinely survey for cultural resources as part of forest practices. The 2006 *Policy for Sustainable Forests* directs the department to identify and protect significant historic and archaeological sites, consistent with state and federal law, and to work with tribes and interested stakeholders to address culturally significant areas.<sup>35</sup> DNR consults with the Department of Archaeology and Historic Preservation (DAHP) and affected tribes to ensure avoidance and protection of cultural and historic resources. Tribes and DAHP regularly review and provide input for proposed forest management activities to ensure that areas of cultural significance are not disturbed.

### *Federal review and consultation*

The issuance of an ESA incidental take permit is considered a federal undertaking. The principal federal law addressing cultural resources is the National Historic Preservation Act (NHPA) of 1966 as amended (54 United States Code, Section 300101 et seq.) and its implementing regulations (36 CFR, Part 800), which address compliance with Section 106 of the NHPA. The regulations describe the process for identifying and evaluating historic properties, assessing the effects of federal actions on historic properties, and consulting with interested parties, including the State Historic Preservation Officer, to develop measures that would avoid, reduce, or minimize adverse effects. Federal consultation with federally recognized Tribes is also mandatory, where applicable.<sup>36</sup>

Under the NHPA, the term “historic properties” refers to cultural resources that are listed on or meet specific criteria of eligibility for listing on the National Register of Historic Places. These criteria include the resource is at least 50-years old (generally), demonstrates historical significance, and meets other criteria relating to significant historical use or contribution. Section 106 of the NHPA describes the procedures for identifying and evaluating eligible properties, assessing the effects of federal actions on eligible properties, and consulting to avoid, reduce, or minimize adverse effects. Section 106 does not require preservation of historic properties but ensures that decisions of federal agencies include meaningful consideration of cultural and historic values and options to protect those properties.

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<sup>35</sup> Several state and federal laws address these resources, including Archaeological Sites and Resources (RCW 27-53), Forest Practices Application approval (WAC 222-16-010), SEPA (WAC 197-11-960), and Section 106 of the National Historic Preservation Act. Department policies and procedures addressing this topic include Executive Order 05-05, Commissioner’s Order on Tribal Relations, Identifying and Protecting Cultural Resources (PR 14-004-030), Interim Direction on Special Ecological Features and Archaeological Resources (PO 14-012), and the Cultural Resources Inadvertent Discovery Guidelines.

<sup>36</sup> Also refer to Fish and Wildlife Native American Policy (2016); Department of Interior’s Policy on Consultation with Indian Tribes and Alaska Native Corporations (512 DM 4).

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