



## Areas of Long-Term Forest Cover

Focus  
Paper #2

*The purpose of this focus paper is to describe areas of long-term forest cover (LTFC) within DNR-managed lands and how they contribute to long-term murrelet conservation.*

### Introduction

Evidence from most research on marbled murrelet nesting ecology supports the murrelets' requirement for complex-structured forests with large trees. These trees provide large, moss-covered limbs that become nesting platforms. Other research identifies impacts from timber harvest on the availability of nest sites, and on nest success due to increased predation on eggs and nestlings near forest edges. Murrelets therefore rely on conifer-dominated forest stands with large interior areas and high numbers of large, old trees. Forest stands with these characteristics provide nesting opportunities, contain limited amounts of edge, and provide cover from predators and adverse weather (Ralph and others 1995, cited in McShane and others 2004). These types of forest stands can be found on DNR-managed lands within the range of the marbled murrelet. In many cases, these stands are already designated by existing DNR policy to provide conservation benefits. The marbled murrelet long-term conservation strategy identifies forest lands that will be managed as areas of *long-term forest cover*, which may have current habitat or have the capability to develop into the types of structurally complex forests needed for nesting by the murrelet. These areas will be managed to maintain forest cover over the life of the Habitat Conservation Plan.

### How do DNR-managed forest lands contribute to marbled murrelet conservation?

DNR-managed forest lands are subject to several laws and department policies guiding their management. The following documents have the most direct impact on how forests are managed for purposes of marbled murrelet conservation:

- The 1997 State Trust Lands Habitat Conservation Plan (HCP), a 70-year agreement between the federal services and DNR, describes a set of management strategies that DNR employs to offset any incidental take caused to individual listed animals, and promotes conservation of the species as a

whole. The HCP was amended in 2004 in the Klickitat Planning Unit to better implement northern spotted owl habitat conservation strategies.<sup>1</sup> The HCP included an *interim strategy* for marbled murrelet conservation. In addition, concurrence letters between DNR and U.S. Fish and Wildlife Service further specified procedures for identifying and protecting marbled murrelet habitat in the North Puget (2007) and South Puget (2009) HCP planning units.

- The 2006 Policy for Sustainable Forests (PSF) contains the vision of the Board of Natural Resources and DNR for the management of current and future forests on state trust lands. PSF policies are specifically designed to achieve DNR's fiduciary responsibilities by generating revenues for trust beneficiaries, while meeting DNR's obligations under the 1997 HCP.

The analysis area for the marbled murrelet long-term conservation strategy includes just over 1.3 million acres of DNR-managed lands.<sup>2</sup> These lands are managed for a multiple set of objectives including timber production, conservation, recreational and resource land uses. With such a large area and variety of land types and land uses, the development of a long-term conservation strategy takes advantage of a landscape planning approach towards conservation.

DNR collects and maintains information on the forest lands it manages. These data are used to determine where, when and how timber harvest is likely to happen, as well as where on the landscape forests are likely to be maintained and/or conserved over time. For example, some forest stands may be deferred from harvest because they are designated as existing old-growth forests, or serve as gene pool reserves for native trees species. Areas may also be deferred from harvest due to slope stability issues or other local knowledge of ecologically, socially, or culturally important areas. Other forest areas may be managed to maintain forest cover or certain forest structural conditions to achieve wildlife habitat objectives for species covered by the HCP (including the northern spotted owl, salmonids, and other aquatic and riparian obligate species). DNR also manages lands under the state Natural Areas Preserves Act, which dedicates Natural Areas (including Natural Resource Conservation Areas and Natural Area Preserves) in perpetuity for education, scientific research, and conservation of native biological diversity. Together, these DNR forest lands are managed to maintain forest cover<sup>3</sup> for conservation; they provide the building blocks for a landscape approach to the long-term conservation strategy for the marbled murrelet.

The conservation strategy defines these areas as long-term forest cover (LTFC), which may provide potential nesting habitat for marbled murrelet or insulate that habitat from impacts from forest management activities, both now and in the future. This approach implements a key objective of the marbled murrelet conservation strategy.<sup>4</sup>

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<sup>1</sup> Washington State Department of Natural Resources. 2004. HCP Amendment No. 1, Administrative Amendment to the Northern Spotted Owl Conservation Strategy for the Klickitat HCP Planning Unit, April 2004.

<sup>2</sup> See Focus Paper #1, "Analytical Framework," which describes the analysis area in more detail.

<sup>3</sup> "Forest cover" as used here refers to a relatively closed canopy structure, which may provide cover, security and potential nesting habitat to marbled murrelets.

<sup>4</sup> Objective #2 of the marbled murrelet conservation strategy: "Provide forest conditions in strategic locations on forested trust lands that minimize and mitigate incidental take of marbled murrelets resulting from DNR's forest management activities. In accomplishing this objective, DNR and USFWS expect to make a significant contribution to maintaining and protecting marbled murrelet populations."

## What are areas of long-term forest cover?

Areas of LTFC can be found throughout DNR's managed forest landscape. These areas are defined and mapped using GIS information from DNR's databases.<sup>5</sup> Areas of LTFC come in various shapes and sizes, and when in a strategic location and suitable habitat condition provide nesting opportunity for the marbled murrelet.<sup>6</sup> LTFC includes the following types of lands:

- Natural Area Preserves
- Natural Resources Conservation Areas
- Northern Spotted Owl habitat
- Riparian management zones
- Wetlands
- Areas of slope stability concern
- Gene pool reserves
- Old-growth
- Local knowledge of ecological/social and culturally important areas
- Marbled murrelet occupied sites<sup>7</sup>
- Areas specifically designated for marbled murrelet conservation in strategic locations under each of the alternatives.

The areas above, layered together (as illustrated in Figure 1), create blocks of land that contribute to marbled murrelet conservation, if the structure and complexity of the forest within provides nesting habitat and security from predation.<sup>8</sup>

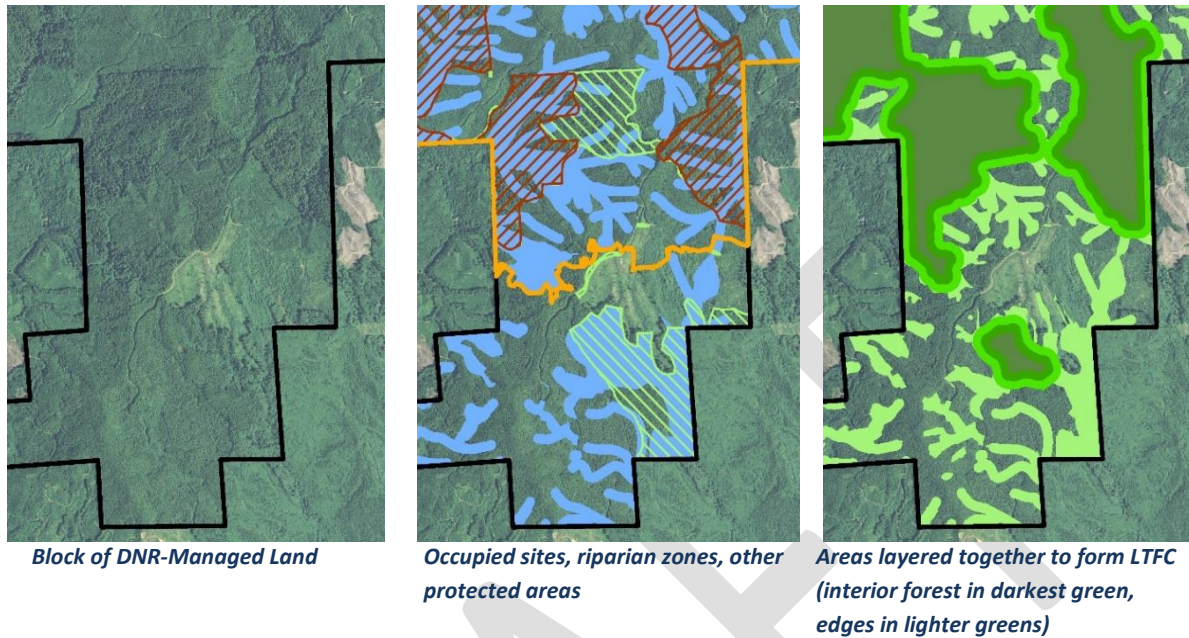
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<sup>5</sup> DNR Large Data Overlay, 2015.

<sup>6</sup> See Objective #2 of the long-term conservation strategy: "Provide forest conditions in strategic locations on forested trust lands that minimize and mitigate incidental take of marbled murrelets resulting from DNR's forest management activities. In accomplishing this objective, we expect to make a significant contribution to maintaining and protecting marbled murrelet populations."

<sup>7</sup> See Focus Paper #4, "Occupied Sites." *Note: This paper will be available in late November 2015.*

<sup>8</sup> The varying quality of the habitat found within LTFC is analyzed using a mathematical model, described in Focus Paper #3, "Estimating the Location and Quality of Stands of Marbled Murrelet Habitat." *Note: This paper will be available in late November 2015.*

**Figure 1. Layering Data to Map Areas of LTFC**

The precise boundaries of some categories of LTFC are accurately mapped in the DNR databases. Examples include gene pool reserves and natural areas. These boundaries are not expected to change throughout the life of the HCP. Other categories of LTFC are not precisely mapped but are approximated until field inspections can more accurately define correct boundaries. LTFC associated with riparian areas, wetlands, and unstable slopes are examples where the boundaries may be adjusted when site-specific information becomes available. Although the exact location of LTFC associated with riparian areas can change with field verification, the total acres of LTFC associated with these deferrals is a reasonably accurate estimate of the total LTFC expected to be retained on the landscape.

### **How does LTFC provide nesting security to murrelets?**

LTFC is assumed to conserve habitat by protecting current and potential nest sites from harvest and other land uses in the managed forest. The shape and amount of *interior forest* patches within LTFC is a critical factor in nesting success and security. *Forest edges* created from harvest or other types of openings (e.g., roads) impact this security. LTFC can be classified into one of three forest zones that support varying levels of marbled murrelet conservation. These zones are influenced by the condition of the adjacent managed forest, which is characterized as “hard-edged,” “soft-edged,” or in a “no-edge” state. In addition, some areas, referred to as riparian “stringers” (see below), are linear in nature and do not include any interior forest. Beyond these areas is the actively managed forest, where most of the harvest and related activities occur.

## Interior forest

The *interior forest* (Figure 2) is comprised of forested area (patch) that is at least 100 meters from any type of edge. These interior areas are protected from effects associated with harvest edges. Edge effects include changes in microclimate (such as decreasing humidity), windthrow, changes in vegetative species such as reduction in epiphyte presence, and increased risk of predation (Nelson and Hamer 1995; McShane and others 2004; Van Rooyen and others 2011). Further, impacts to murrelets from disturbance (loud noise and activity that can interrupt breeding and nesting behaviors) is reduced in the interior forest portions of LTFC. (See Focus Paper #5, “Potential Impacts and Mitigation,” for a detailed description of edge effects.)

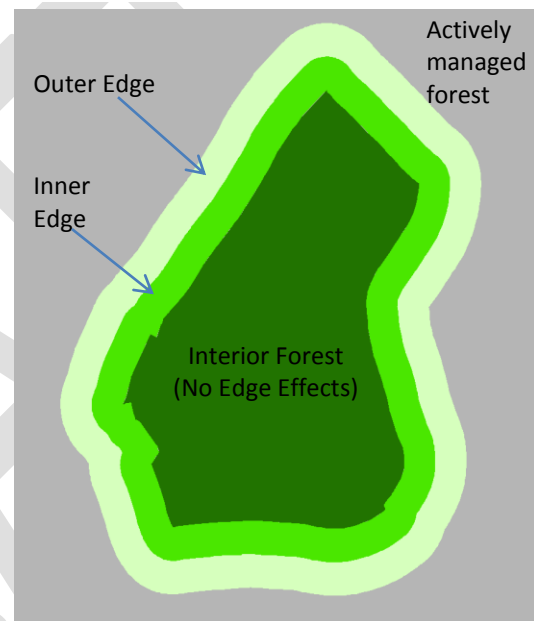
## Outer edge

The *outer edge* of the interior forest patch is located between 0 to 50 meters from the edge of managed forest (Figure 2). Because this area is adjacent to the actively managed forest, edge effects are more pronounced in the outer edge.

## Inner edge

The *inner edge* (Figure 2) is a forested area located 51 to 100 meters from the edge of the actively-managed forest, and is adjacent to the interior forest patch. The literature indicates that the edge effects from the actively managed forest extend further than 50 meters into the stand, but diminish until there is minimal effect after 100 m from the managed area (Burger and others 2004).

**Figure 2. Conceptual Illustration of an Area of LTFC and Edges**



## Hard-, soft- and no edges

Depending on the age and height of the trees in the actively managed forest, edges can be characterized as either “hard” or “soft.” Hard edge effects extend through the outer and inner edges, and occur when the actively managed forest is comprised of young stands (0-20 years old) that are expected to be generally less than 40 feet high. Higher risk of nest predation, and increased microclimate and windthrow effects are all associated with hard edges.

Soft edges are characterized by managed forest stands that are expected to be generally 20-40 years old and 40-80 feet high adjacent to the long-term forest cover.<sup>9</sup> At this stage, interior forest and the outer and inner edges are less affected by predation risk and microclimate and windthrow effects still factor into edge impacts, but to a lesser degree. Trees in the managed forest that are beyond 40 years of age and 80

<sup>9</sup> Note that the tree height and age associations described here are generalized, and may vary somewhat across the landscape depending on site conditions.

feet in height are assumed to have minimal edge effects to the interior, and therefore are not counted as edge under the analytical framework.

DNR can assess the edge conditions of managed forest lands in the analysis area using forest inventory and GIS data. This information is used to determine potential impacts to murrelet habitat from forest edges, and to calculate necessary mitigation (see Focus Paper #5, “Potential Impacts and Mitigation.”)

### **Roads as edges**

New and existing forest roads (logging roads) also create edges. Depending on their location relative to murrelet habitat, and whether they are actively used or are undergoing transition back to forest, roads have effects similar to other hard or soft edges. Roads can attract corridors and affect microclimate. (See Focus Paper #5, “Potential Impacts and Mitigation,” for a discussion on how roads and other edges impact habitat and mitigation values.)

### **“Stringers”**

Areas mapped as long-term forest cover using GIS will show large and small blocks of LTFC, as well as some narrow strips of land. These narrow strips are termed “stringers,” and are predominantly riparian management zones. Stringers are areas less than 200 meters wide and therefore do not have interior forest. Stringers are considered part of LTFC; however, they may not be assigned credit for mitigation under the conservation alternatives.

### **Areas outside LTFC**

Forest land outside of LTFC is managed for harvest to meet fiduciary responsibilities to DNR’s trust beneficiaries. These are part of the actively managed forest.

## **How does LTFC differ across the conservation alternatives?**

DNR and the U.S. Fish and Wildlife Service are developing alternative approaches to long-term marbled murrelet conservation. These alternatives will be evaluated using a common analytical framework.<sup>10</sup> Designating areas of LTFC under each alternative allows potential impacts to be quantified, mitigation to be calculated,<sup>11</sup> and conservation benefits to be evaluated. The amount and composition of LTFC varies among alternatives (see Figure 3 for an example). The proportion of interior forest to outer and inner edges may vary, or the occupied sites or conservation areas that are included may be different.

These differences in composition mean that the geographic extent of LTFC (how much of and where on the landscape it is located) will differ among alternatives. All LTFC is intended to provide conservation benefit to the murrelet. However, the conservation value of one area of LTFC may be higher or lower than another, depending on its relative habitat quality, its location relative to occupied sites or marine

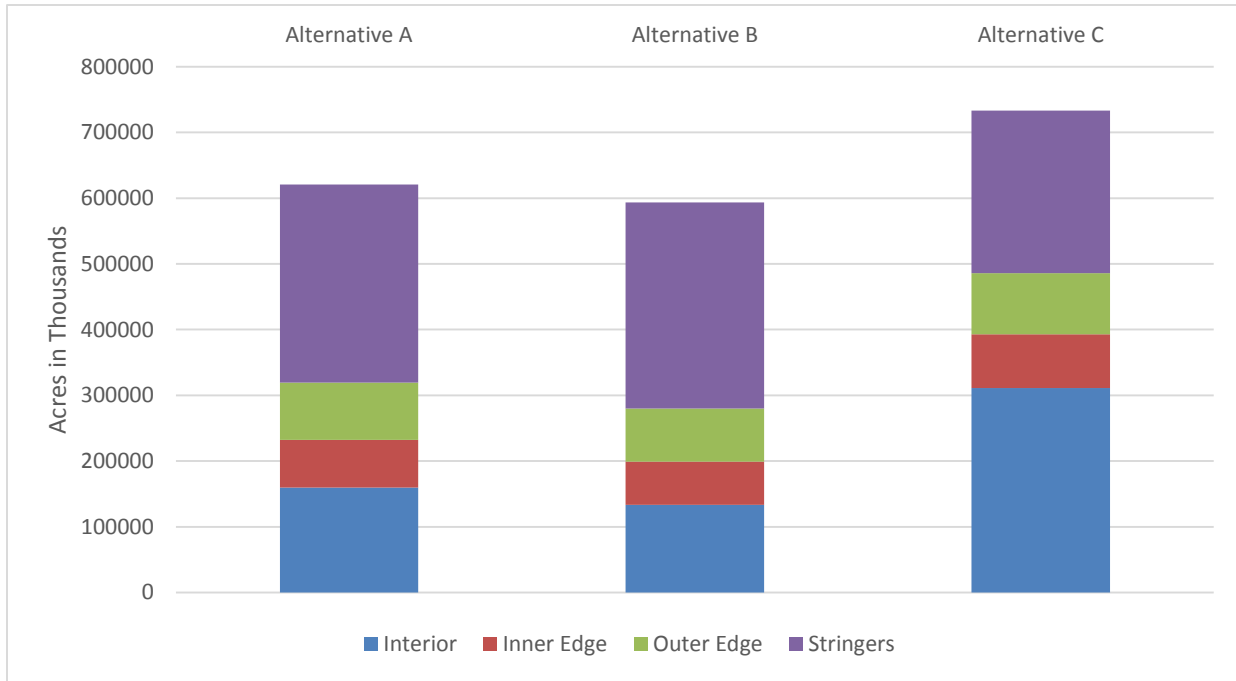
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<sup>10</sup> See Focus Paper #1, “Analytical Framework.”

<sup>11</sup> See Focus Paper #5, “Potential Impacts and Mitigation.”

populations, and other factors. The analytical framework takes these factors into account when calculating potential impacts and mitigation through the life of the HCP.

**Figure 3. How the Amount and Composition of LTFC May Differ Across Conservation Alternatives; Data for Illustration Purposes Only (does not reflect the actual alternatives)**



### How will areas of LTFC be managed for purposes of marbled murrelet conservation?

Although the exact make-up of LTFC may differ among conservation alternatives, the management objective of LTFC is the same under every alternative: to provide long-term forest cover. Forest stands within areas of LTFC that have murrelet habitat characteristics, or that have the potential to develop murrelet habitat characteristics, will be conserved over the life of the HCP. No major harvest activities will be allowed within LTFC. The conservation alternatives being developed may allow some thinning or habitat enhancement within areas of LTFC, consistent with the underlying conservation objectives. For example, riparian areas within LTFC may be thinned consistent with DNR’s Riparian Forest Restoration Strategy. Management of non-timber harvest land uses will also be addressed under the alternatives.

**Stands within interior areas of LTFC that have marbled murrelet habitat characteristics, or that have the potential to develop those characteristics, will be protected from potential impacts from harvest, edge effects, and other types of disturbance.**

Management will be consistent with the conservation objective that the quality and quantity of habitat within areas of LTFC is expected to improve as forest stands mature. Mature stands that do not currently have murrelet habitat characteristics will also have the potential to develop into habitat over the life of the HCP.

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