WASHINGTON STATE DEPARTMENT OF
Natural Resources

DOUG SUTHERLAND
Commissioner of Public Lands

MEMORANDUM

June 27, 2007 File No. 02-022201

TO: Interested Parties

FROM: Rochelle Knust, SEPA Center Manager

SUBJECT: **ADDENDUM TO A FINAL ENVIRONMENTAL IMPACT STATEMENT (SEPA FILE #02-022201)**

The Department of Natural Resources has filed an addendum to the existing **Final Environmental Impact Statement on Alternatives for Sustainable Forest Management of State Trust Lands in Western Washington and for Determining the Sustainable Harvest Level, July 2004.** Notification of the availability of the original FEIS was mailed to you on July 30, 2004.

This addendum is being distributed pursuant to WAC 197-11-600 and 197-11-625. It has been determined that this new information does not substantially change the analysis of significant impacts in the existing environmental document.

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WASHINGTON STATE DEPARTMENT OF
Natural Resources

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Commissioner of Public Lands

ADDENDUM

SEPA File No. 02-022201

Description of the original proposal: In September 2004 the Board, in Resolution 1134, adopted the current decadal sustainable harvest for July 2004 through fiscal year 2014 along with specific policies, procedures, and tasks to implement it. A Final EIS was issued that analyzed the impacts of the Board's decision.

Description of the addendum: This addendum describes the key changes to the 2004 Final EIS on *Alternatives for Sustainable Forest Management of State Trust Lands in Western Washington and for Determining the Sustainable Harvest Level.* The Department's adjustments are based on the implementation of:

a. The Riparian Forest Restoration Strategy (RFRS) (DNR 2006a).
b. The Sustainable Harvest Settlement Agreement (*WEC v. Sutherland 2006-Summary Settlement Agreement "Appendix A"*).

Description of existing environmental document: *Final Environmental Impact Statement on Alternatives for Sustainable Forest Management of State Trust Lands in Western Washington and for Determining the Sustainable Harvest Level, July 2004, Available at Washington Dept. of Natural Resources, SEPA Center, PO Box 47015, Olympia, WA 98504-7015.*

Proponent: Department of Natural Resources

Lead Agency: Department of Natural Resources

This addendum is being distributed pursuant to WAC 197-11-600 and 197-11-625. It has been determined that this new information does not substantially change the analysis of significant impacts in the existing environmental document.

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Date: June 25, 2007 **Signature:** Howard L. Thronson

There is no agency SEPA appeal.

INTRODUCTION

In 2000, the Board of Natural Resources (the Board) and the Department of Natural Resources (DNR) began a process to set a new 10-year sustainable harvest level for western Washington. In November of 2003, DNR issued a Draft Environmental Impact Statement (Draft EIS) with six management alternatives to be analyzed for potential environmental impacts. In March 2004, the Board adopted Resolution 1110 contained in Appendix 'F'. In the July 2004 Final EIS (DNR 2004), this resolution directed DNR to develop a Preferred Alternative, giving specific guidance and criteria within the resolution.

Until 2004, the sustainable harvest calculation for Washington's forested state trust lands had been viewed by DNR as a once per decade decision, used to satisfy fiduciary duties, such as preserving the corpus of the trust and generating income for schools and other trust beneficiaries. While the primary focus is still in meeting the fiduciary duty; the sustainable harvest is also a tool DNR can use to balance economic, environmental and social objectives.

These multiple objectives are reflected in the 2006 *Policy for Sustainable Forests*, the 1997 *Habitat Conservation Plan* and the Board of Natural Resources' 2004 Resolution 1110. In 2004, the Board anticipated changes that could lead to the need for adjusting the sustainable harvest during the decade. The Board adopted a two-part policy in 2006 to address establishing the decadal sustainable harvest, and anticipate possible changes within the harvest decade. The second part of the policy reads, "The Department will adjust the calculation and recommend adoption by the Board of Natural Resources when the Department determines changing circumstances within the planning decade suggest that an adjusted harvest level would be prudent. Such circumstances may include major changes in legal requirements, significant new policy direction from the Board of Natural Resources, new information about the resource base available for harvest, or changes in technology." (DNR 2006c).

In September 2004, the Board adopted the current Westside decadal sustainable harvest for July 2004 through fiscal year 2014. The harvest level adopted was a component of in the Preferred Alternative presented in the July 2004 Final EIS (DNR 2004)— along with specific policies, procedures, and tasks to implement it through Resolution 1134. At the time of the adoption, the Board and DNR had a set of unanswered questions regarding riparian forest management, and the operational feasibility of implementing specific activities. The Board policy regarding recalculation of the sustainable harvest and the 2004 Final EIS, established the decision space "establishing where the Board expected to end up" regarding these unanswered questions. DNR would later return to the Board with analysis and recommendations.

The desired outcomes and objectives of the 2004 sustainable harvest calculation have not changed. However, the magnitude of some of the circumstances had changed within the planning decade suggesting that an adjustment to the sustainable harvest level would be prudent, specifically in regard to riparian silvicultural treatments.

Analyses were provided to the Board in the months of May and June of 2007 and within this document, demonstrate DNR's commitment to continuous improvements in implementing the fiduciary responsibilities of the Board. DNR is striving to implement the management principles articulated in the 2004 Board Resolution 1110 and continues to look for effective and efficient strategies to reach the desired outcomes, even as circumstances in the external environment change.

The components of the 2006 *Riparian Forest Restoration Strategy* (DNR 2006a) and the Settlement Agreement (Appendix A-Executive Summary of Settlement Agreement) have been used to modify the 2004 Preferred Alternative adopted by the Board of Natural Resources in Resolution 1134 in September 2004. This Addendum presents new information and provides a comparison of the environmental impacts of this Modified Alternative to those in the 2004 Preferred Alternative.

KEY COMPONENTS OF THIS ADDENDUM

This Addendum brings the results to the Board of Natural Resources for their decision as required before the end of 2007. The key changes that have triggered the Department's adjustments to the sustainable harvest are the implementation of:

a. The *Riparian Forest Restoration Strategy* (RFRS) (DNR 2006a).
b. The Sustainable Harvest Settlement Agreement (*WEC v. Sutherland 2006*).

CHANGES TO DESCRIPTIONS OF STRUCTURAL DIVERSITY IN FOREST STAND DEVELOPMENT STAGES

The initial stand development stages were presented in the 2004 *Final EIS on Alternatives for Sustainable Forest Management of State Trust Lands in Western Washington* (p. 4-11) with a break down by HCP planning unit (p. 4-12). During the review of new information for this Addendum, the stand development process was reviewed. No changes were made to the model process. The only new information was in the classification of the stand development stages and in the description of the associated ecological process.

One important change is the description of 'Botanically Diverse' stands. In the 2004 Final EIS, these stands were included in the 'Structurally Complex' stand development stage (DNR 2004, p. 4-11, and discussion Appendix B-47). While this stand development stage may contain some of the structural components of the 'Structurally Complex' or old-growth like forests (notably large trees), the ecological processes of these forest types are very different from an old-growth like forest. In fact, forest stands in the 'Botanically Diverse' stand development stage are characterized by the continual dominance of wood fiber growth. Franklin et al. (2002) and Carey (2003) label this stage more aptly as 'Biomass Accumulation'. Therefore, 'Botanically Diverse' stands have been removed from the 'Structurally Complex' stage and placed into an ecologically-distinct classification of 'Biomass Accumulation'. The following is a brief description of these summarized stand development stages (Table 1).

TABLE 1. STAND DEVELOPMENT STAGE SUMMARY

Summarized Stand Development Stage	Stand Development Stages
Ecosystem Initiation	Ecosystem Initiation
Competitive Exclusion	Sapling Exclusion
	Pole Exclusion
	Large Tree Exclusion
	Understory Development
Biomass Accumulation	Botanically Diverse
Structurally Complex or Older forests	Niche Diversification
	Fully Functional

For a number of reasons, structural attributes of forest stands are increasingly recognized as being of theoretical and practical importance in understanding and managing forest ecosystems (Franklin et al. 2002). The Department developed a modeling process to track the structural development of stands using stand attributes from its growth and yield model. This modeling process identifies the stand development stages.

Ecosystem Initiation: The first stand development stage begins as open, newly regenerated stands of actively growing young trees.

Competitive Exclusion: Consists (collectively) of the following stand development stages: sapling exclusion, pole exclusion, large tree exclusion, and understory development. Often, particularly on soil site class I and II, these stages are not uniformly continuous (i.e., each stage has its own mortality release after which stands grow freely for a while prior to entering the next mortality phase). 'Competitive Exclusion' represents a series of stages when competition for direct sunlight, nutrients, water, and space increases (Oliver and Larson 1996); as well as stands that near and exceed full site occupancy (Carey 2003). The 'Competitive Exclusion' stage provides the least favorable conditions for wildlife and the lowest biodiversity (Carey and Johnson 1995)

Biomass Accumulation (formerly Botanically Diverse): These are stands that have passed their peak density but still contain a large number of overstory trees falling into this category. These remaining trees are generally large and have enough room and resources to grow and add woody biomass. Franklin et al.(2002) and Carey (2003) highlight this stage as 'Biomass Accumulation' describing the principle ecological process of this stand development stage. The 2004 Final EIS on *Alternatives for Sustainable Forest Management of State Trust Lands in Western Washington* described this stage as 'Botanically Diverse'

Structurally Complex or Older Forest: These stands are divided into two developmental stages: 'Niche Diversification' and 'Fully Functional'. Forest stands with a significant presence of tree decadence, tree species diversity as well as vertical and horizontal spatial heterogeneity, and lacking giant structures of old-growth forests are partitioned into the 'Niche Diversification' stage. 'Fully Functional' stage forests contain all the attributes of 'Niche Diversification' stage forests but are older and contain large structures associated with old-growth forests.

The percent to total acres in each stand development stage is presented in Table 4.2-5 in the 2004 Final EIS (DNR 2004).

KEY RIPARIAN ELEMENTS

In the 70-year 1997 *Habitat Conservation Plan* (HCP), there is a Riparian Conservation Strategy that was explicit about the size of the riparian management zone along different stream types and allowed a very limited range of activities in riparian areas. However, explicit implementation procedures were not developed at that time. The HCP anticipated that more detailed procedures would be developed by DNR in the years following the signing of the HCP. The limited range of activities allowed by the HCP proved difficult to implement, and the DNR chose not to manage in riparian areas until a long-term riparian implementation procedure (strategy) was written.

The 1997 HCP envisioned that the Department would develop the implementation procedures within a year of signing the agreement. However, due to the sensitivity and complexity of managing in the riparian zone, the Department did not develop the implementation procedures until 2006.

When the sustainable harvest calculation was adopted in 2004, it anticipated possible outcomes of the riparian implementation procedures that were still under development. DNR modeled the use of heavy thinnings to promote older forests structures in the riparian areas in the 2004 harvest calculation, anticipating the pending riparian strategy. However, at that time, there were very minimal harvest activities occurring in the Westside HCP planning unit riparian areas. Riparian areas were being deferred from harvest between 1996 and 2006 until the implementation procedures were completed which is referred to in the remainder of this document as the 2006 *Riparian Restoration Strategy*.

In April 2006, DNR released the *Riparian Forest Restoration Strategy*. This document details methods for making site-specific forest restoration decisions in the riparian areas of the Westside Planning Units, excluding the Olympic Experimental State Forest (OESF).

In order to meet their long-term restoration goals, DNR has established measurable benchmark targets, known as Riparian Desired Future Condition (RDFC), to assess opportunities and progress toward the long-term management objective. The Riparian Desired Future Condition (RDFC) is divided into five categories (Table 2) and DNR's *Riparian Forest Restoration Strategy* (DNR 2006a p. 9). representing the most important measurable components for eventual evaluation of development of the 'Fully Functional' forest development stage. Forests that meet these targets will demonstrate some, but not all, elements of a structurally complex forest.

TABLE 2. RIPARIAN DESIRED FUTURE CONDITIONS (DNR 2006)

RDFC Characteristics	RDFC Threshold Targets
Basal area	Maintain ≥300 sq ft per acre.
Quadratic mean diameter (Trees >7 inches DBH)	Retain a QMD of ≥21 inches.
Snags	Retain existing snags ≥ 20 inches DBH through no-cut zones Maintain at least 3 snags per acre.
Large down wood	Maintain ≥ 2,400 cubic feet per acre. Actively create down wood (contribute 5 trees from the largest thinned DBH class) during each conifer management entry.
Vertical stand structure	Maintain at least two canopy layers.
Species diversity	Maintain at least two main canopy tree species suited to the site.

If these thresholds are met, it is assumed the stand is on a development pathway to the 'Fully Functional' forest development stage. Therefore, these riparian stands will be deferred from harvest, as will any riparian stand classified in the 'Biomass Accumulation', 'Niche Diversification' or 'Fully Functional' stand development stage.

Furthermore, although age class is not considered useful for describing the ecological conditions of a forest when managing for structural and biological diversity, the *Riparian Forest Restoration Strategy* (RFRS) approach is conservative in assuming that harvest of all riparian stands older than 70 years will be deferred until at least 2013[1].

[1] The RFRS indicates that a review with the Federal Services will occur in 2009. However, based on the assumed timeframe for negotiation, environmental analysis, and approval time, an implementation date of 2013 was assumed for modeling purposes.

Since the adoption of the sustainable harvest calculation, DNR has worked in conjunction with the United States Fish and Wildlife Service and National Marine Fisheries Service on the Implementation Procedures for the Habitat Conservation Plan (HCP) 2006 *Riparian Forest Restoration Strategy* (RFRS). The main components of the Implementation Procedures for the *Riparian Forest Restoration Strategy* (RFRS) that are different from the 2004 sustainable harvest calculation modeling assumption are listed in Table 3.

TABLE 3. KEY DIFFERENCES BETWEEN 2006 *RIPARIAN FOREST RESTORATION STRATEGY* AND THE 2004 SUSTAINABLE HARVEST MODELING

HCP Riparian Conservation components	**2004 Sustainable Harvest modeling assumptions**	**2006 *Riparian Forest Restoration Strategy* modeling assumptions**
Desired Future Condition	Structurally complex forest (older forest)	Intermediate condition determined by stands with an average diameter of 21 inches or greater. Once stands are in this condition, then harvest treatments are curtailed.
Thinning Treatments	A mixture of light and heavy (with residual tree densities of 40-60 TPA or RD >=20) variable density thinning with snags and dwd treatments and patch cuts (up to 2.5 acres) based on biodiversity pathways approaches.	Light variable density thinning (with residual tree densities of 75-100 TPA or RD >=35) with snags and dwd treatments and gaps opening (up to 0.25 acres) based on biodiversity pathways approaches.
Thinning Intensity	A maximum of 10 percent of the riparian area per decade can be treated.	A maximum of 10 percent of the riparian area per decade can be treated. Total number of entries into a stand limited to two.
Treatment Priority	Heavy thinnings in older (>50 yr old forest stands) and hardwood conversions.	Light thinning in younger stand (30-40 year old).
Age Class Constraint	None	No treatment in stands over 70 years of age until at least 2013.

2006 SETTLEMENT AGREEMENT

After the Board adopted the sustainable harvest calculation (March 2004), the Washington Environmental Council (WEC) filed litigation (October 2004) seeking a declaration that Resolution 1134 was invalid on the grounds it was adopted without proper compliance with the State Environmental Policy Act (SEPA).

In October 2005, Judge Armstrong rendered a memorandum opinion that the 2004 Final EIS, which provided the basis for SEPA compliance for Resolution 1134, was inadequate as to impacts on the northern spotted owl, riparian management and the alternatives analyzed. If reduced to a final order, this memorandum opinion would have vacated Resolution 1134 and the Department's ability to implement the sustainable harvest volume

anticipated to be 5.97 billion board feet over the 2004-2014 planning decade. As a consequence, DNR estimated it would harvest less than 400 million board feet per year until a legal remedy and/or an administrative remedy could be achieved.

To avoid this potential loss in revenue to the trust beneficiaries and delay in meeting several HCP objectives, the Department entered into settlement negotiations with the plaintiffs and interveners in November 2005.

In March 2006, a Settlement Agreement (Appendix A) was signed requiring DNR to manage specific areas for northern spotted owl habitat for the planning decade but restored Resolution 1134.

NEW SCIENTIFIC INFORMATION RELATED TO NORTHERN SPOTTED OWLS

The following subsections provide an update of northern spotted owl research since the Final EIS was published. Key areas of interest include population status and trends, habitat availability, habitat use, and the potential impact of new threats (particularly, barred owls) on northern spotted owl recovery.

Population Status and Trends

No new large scale demographic studies of the northern spotted owl have been completed since the publication of the status and trends study by Anthony et al. (2004).

In their five-year review of the Endangered Species Act listing status of northern spotted owls, USFWS (2004a) summarized the status of owl populations as follows:

> *"In general, northern spotted owl populations are exhibiting strong declines in the northern portion of their range in Canada, Washington, and parts of Oregon, while populations in the southern portions of their range are generally stable. Declines in Washington appear to be driven by decreased adult survivorship*."

Noon and Blakesley (2006) expressed particular concern about the long-term viability of the northern spotted owl, stating that the data presented by Anthony et al. (2004) do not allow one to discriminate between the two key, opposing hypotheses: (1) owl populations are slowly declining to a new equilibrium and (2) owl populations have crossed a threshold and are slowly declining to extinction.

In his review of northern spotted owl population status and trends on federal lands managed under the Northwest Forest Plan, Lint (2005) noted that the 7 percent annual rate of population decline observed in Washington prompted particular concern for the magnitude and direction of future population changes in this state.

Additional insight into the status of northern spotted owl populations in Washington is apparent in other recent, less extensive studies. Data from various study areas in Washington suggest that nearly two-thirds of the pair locations known a decade ago are not currently active (Buchanan and Swedeen 2005). A particularly vivid example of this decline is found in a two-year northern spotted owl survey project recently conducted in southwestern Washington (DNR 2006c). The survey area encompassed forest stands greater than or equal to 50 years of age in two Nesting, Roosting, and Foraging (NRF) Management Areas in the Columbia HCP planning unit, and in DNR-managed lands within the 2.7-mile buffers around eight site centers in the western Washington lowlands. The total number of previously known northern spotted owl sites in the survey area is 29. The final results of the two-year surveys showed northern spotted owl

occupancy in 6 sites (Fleming 2007). The cumulative number of northern spotted owl detections was 17. All detections were in the vicinity of historic site centers and no sign of successful reproduction were observed. The number of barred owl detections, recorded incidentally to the northern spotted owl surveys, was surprisingly a high cumulative number which totaled 533 detections with 152 of those detections being pairs (Fleming 2007)

Notably, Buchanan and Swedeen (2005) reported that the number of northern spotted owl site centers documented in Washington is 1,044, representing a slight (3.9 percent) increase since 1996. They attributed the rise in numbers to increased survey effort in new landscapes and cautioned that the best estimates of population demography come from areas surveyed repeatedly through time; such areas show consistent population decline (Buchanan and Swedeen 2005). In addition, the total number of documented site centers includes all sites known by Washington Department of Fish and Wildlife (WDFW) during any time, in the past 30 years. An unknown number of these have likely been abandoned due to fires, or other disturbances that eliminated habitat, but remain in the database as active sites because we do not have the information necessary to revise their status (Buchanan and Swedeen 2005). Some of the existing sites may have been vacated through displacement by barred owls.

Data from the western Washington field office of the U.S. Fish and Wildlife Service (USFWS), was corrected for a small number of errors in ownership designation, Buchanan and Swedeen (2005) presented the number of territorial northern spotted owl sites centered on federal, tribal, and non-federal lands in Washington. Although Buchanan and Swedeen (2005) did not differentiate between site centers on state and private lands, the proportion of known site centers they reported on federal lands (84.1 percent) was close to the value presented in the 2004 Final EIS (82.5 percent).

Northern Spotted Owl Habitat Availability

Reflecting the central role of federal lands in the conservation and recovery of northern spotted owls, recent analyses and reports on the status and trends of northern spotted owl habitat have focused primarily on federal lands (Anthony et al. 2006, Davis and Lint 2005, Moeur et al. 2005). Lint (2005) described the contribution of federal lands managed under the Northwest Forest Plan as “a cornerstone of the conservation and recovery of the spotted owl.” The reliability of current estimates of the amount of northern spotted owl habitat on non-federal lands in Washington, or of trends in the change in the amount of habitat, is poorly understood (Courtney et al. 2004).

Based on modeled projections developed for the Northwest Forest Plan, the US Fish and Wildlife Service (USFWS) (2004b) estimated an increase of approximately 600,000 acres of forest greater than 80-years old on federal lands throughout the range of the northern spotted owl during the first decade of plan implementation (1994 to 2004). They acknowledged however, that this estimate applies only at the range-wide scale, does not account for habitat function, and likely overestimates the amount of habitat development.

In a study designed to estimate recent changes in the amount of suitable northern spotted owl habitat on lands affected by Washington State Forest Practices Rules. Pierce et al. (2005) estimated the amount of northern spotted owl habitat on non-federal lands in Washington. The study focused on areas (including federal lands) within the boundaries of Spotted Owl Special Emphasis Areas (SOSEAs) and owl management circles only. SOSEAs are strategically selected areas designed to preserve habitat on non-federal lands contributing to the overall health of Washington’s owl population (222-16-086 WAC, Pierce et al. 2005).

Pierce et al. (2005) used a Relative Change Index (RCI) to assess the amount of suitable owl habitat harvested since rule adoption in 1996. The RCI was defined as the ratio of two values: (1) the amount of habitat harvested between 1996 and 2004, and (2) the maximum potential amount of habitat in 2004 (i.e., how much would have been present on the landscape if no harvest had occurred, accounting for the development of new habitat and the loss of existing habitat through natural processes). In all westside zones of the study area, RCI values for state, local and private lands were significantly greater in areas that were not being managed under HCPs, indicating a substantially higher rate of harvest on non-HCP lands compared to HCP lands (including the 1997 DNR HCP) (Pierce et al. 2005).

Northern Spotted Owl Habitat Associations

The following sections address several aspects of northern spotted owl habitat use. These include northern spotted owls' association with large, unbroken expanses of old-growth forest, the potential for intermediate-aged forest to provide suitable habitat, the value of dispersal habitat, and the potential for commercial thinning to influence habitat suitability for northern spotted owls.

Northern Spotted Owl Stand Conditions

In their five-year review of the Endangered Species Act listing status of northern spotted owls, USFWS (2004a) affirmed that numerous habitat relationship studies have substantiated the general understanding that northern spotted owls are closely associated with mature and old-growth forests. The majority of northern spotted owl nest sites in western Washington are in older forests; comparatively few nests have been documented in mature or younger second-growth forest areas (Buchanan and Swedeen 2005).

Forsman et al. (2005) maintained that management for northern spotted owls in western Washington and Oregon should focus on the retention of older forests. They noted that findings of higher reproductive output in landscapes with a mixture of old forest and edges with other forest types came from areas south of the northern spotted owl range where woodrats were a primary prey species. A radio telemetry study conducted by Glenn et al. (2004) in the central Oregon Coast Range, where flying squirrels are considered to be the primary prey species, showed a trend toward smaller home-range sizes with greater proportions of older conifer forest; older forest appeared to be most important close to the nest. Owls were usually located closer to deciduous edges (associated with riparian areas) and farther from forest-nonforest edges (edges associated with clearcuts) than random points.

Northern Spotted Owl Dispersal Habitat

Buchanan (2004) reviewed 18 dispersal habitat definitions and management strategies proposed or developed in Washington or Oregon between 1990 and 1999. He expressed particular concern about the general lack of structurally complex forest conditions in management strategies for dispersal habitat. Only one study has been conducted to examine the relationship between dispersing northern spotted owls and forest conditions across a landscape. That study, conducted in western Oregon, found a strong association between locations of dispersing northern spotted owls and old-growth forests (Miller et al. 1997).

The current definition of dispersal habitat in DNR's 1997 Habitat Conservation Plan describes, as a minimal condition of dispersal habitat, forest in the 'Competitive Exclusion' stages of forest development. Forests in the 'Competitive Exclusion' stage of development provide few or no foraging opportunities for juvenile northern spotted owls and likely do not meet other life requisites (Buchanan 2004, Carey et al. 1999). Buchanan and Swedeen (2005) suggested that,

as the proportion of the landscape in 'Competitive Exclusion' stages increases, so does the risk that dispersing owls will not find adequate food resources.

Thinning Activity Effects on Northern Spotted Owl Habitat

Little information is available on the effect of commercial thinning on northern spotted owl use of second-growth forests in western Washington and Oregon. Buchanan and Swedeen (2005) commented on the lack of information documenting how northern spotted owls respond to changes in the structure of forest areas managed to recruit or enhance suitable habitat. This lack of information is likely attributable to the fact that this line of inquiry has been pursued only for a decade or so—a relatively short time compared to the pace of habitat development in forested areas.

Meiman et al. (2003) offered anecdotal evidence of the short-term effects of thinning, documenting the home range and habitat use patterns of a single adult male northern spotted owl before, during, and after a commercial thinning operation in second-growth forest in the Oregon Coast Range. They found a significant reduction in the use of the thinned area during and after harvest, and a shift of the core use area away from the thinned stand.

There are several recent studies on the short-term effect of thinnings on small mammal populations (spotted owl prey): Suzuki and Hayes (2003) for coastal Douglas-fir/western hemlock forests; Ransome and Sullivan (2003) for flying squirrels in British Columbia; Wilson and Carey (2000) for small mammal communities in Washington. These studies did not find negative effects.

According to the preliminary results presented in the Annual Progress Reports from adaptive management monitoring of spotted owls in several study areas in WA, OR and CA (Irwin et al., 2005); no owls vacated their home ranges after silvicultural treatments (thinnings and partial harvests) were applied.

THREATS TO NORTHERN SPOTTED OWL RECOVERY

Habitat loss

Habitat loss is a well-known factor influencing northern spotted owl populations throughout their range (Courtney et al. 2004, USFWS 2004a, 2004b). Since enactment of the Northwest Forest Plan, timber harvest rates on federal lands have declined substantially from their peak in the 1980s (Noon and Blakesley 2006). Rates of harvest of owl habitat on federal lands since 1994 averaged less than 1 percent per year (USFWS 2004b). While Pierce et al. (2005) have identified a loss of habitat from private and state lands not managed under HCPs, the ongoing habitat loss over the last decade on federal lands has largely been curtailed. Therefore, ongoing habitat loss over the last decade on federal lands is largely excluded as a contemporary factor driving population decline on a range-wide scale, although it still may be important for some local populations (Noon and Blakesley 2006).

Habitat fragmentation

The USFWS (2004a) reported that forest fragmentation has contributed to poor demographic performance in the northern portion of the northern spotted owl's range. Some recent studies have indicated that habitat heterogeneity and the presence of ecotones within owl home ranges may impart positive effects through prey availability in some portions of the southern range. These findings should not be extended to other areas of the subspecies' range, particularly where primary prey species prefer late-successional forests (e.g., Washington, where northern

flying squirrels are a primary prey species). Habitat fragmentation remains a threat in the northern part of the range, with little change in magnitude (USFWS 2004a).

Barred owls

Gutiérrez et al. (2006) reviewed theoretical and empirical evidence for competition between barred owls and northern spotted owls. They assessed the potential for negative interactions between barred owls and spotted owls by examining size dimorphism and ecological relationships within various owl species assemblages worldwide. Based on the size similarity of the two species (compared to other closely related owl species that share similar ranges and habitat associations), Gutiérrez et al. (2006) found compelling theoretical evidence for strong competition between barred owls and northern spotted owls. Their study suggested that stable coexistence seems unlikely. Reviewing empirical evidence, they noted that the smaller home range size of barred owls implies the species either has superior ability to exploit more resources in a smaller area, or has access to additional resources that are unavailable to northern spotted owls under similar conditions. Dietary relationships suggest that interference competition (i.e., through depletion of shared prey) may be a factor in determining whether the two species can coexist. These assertions are supported by modeling of empirical data, which has shown a negative correlation between barred owl presence and northern spotted owl fecundity (Olson et al. 2004) as well as site occupancy (Olson et al. 2005). Kelly et al. (2003) have suggested that when barred owls established territories within an half-mile of northern spotted owl nests, direct competition occurs in northern spotted owl and their productive performance is reduced.

Barred owls may also face fewer limitations than northern spotted owls in the availability of suitable nesting sites. In a study based in the eastern Cascades of Washington State, Buchanan et al. (2004) found that barred owls used a greater range of tree species for nesting. Also, barred owl nest sites were more commonly situated on gentle slopes, closer to water, and included more hardwoods than northern spotted owl nest sites.

Barred owl populations appear to be increasing throughout the Pacific Northwest, particularly in Washington and Oregon (Zabel et al. 1996, Dark et al. 1998, Wiedemeier and Horton 2000, Kelly et al. 2003, Pearson and Livezey 2003, Anthony et al. 2004). Barred owl numbers now may exceed northern spotted owl numbers in the northern Washington Cascades (Kuntz and Christopherson 1996) and British Columbia (Dunbar et al. 1991).

Some scientists (e.g., Buchanan et al. 2006, Gutiérrez et al. 2007, Noon and Blakesley 2006) have suggested that the experimental removal of barred owls might be an effective way to test the extent to which inter-species competition exerts an influence on northern spotted owl populations.

It is impossible to predict with a high level of accuracy or confidence the ultimate impact of the barred owl on the northern spotted owl in the Pacific Northwest. However, it is widely recognized that the barred owl appears to be having negative impacts on the northern spotted owl (Gutiérrez et al. 2007, Olson et al. 2004, 2005, Anthony et al. 2006). The USFWS (2004a) concluded that, while habitat loss due to timber harvest and fire, may be important and contributing to declining population trends, the only factor known to be both widespread and increasing in effect is the presence of barred owls. “Our understanding of this threat has improved, raising it from an issue of concern to a primary threat of greater imminence.” In spite of uncertainties regarding interactions between barred and northern spotted owls, the preponderance of the evidence gathered thus far is consistent with the hypothesis that barred owls are playing some role in the decline of the northern spotted owl population, particularly in

Washington, portions of Oregon and the northern coast of California (USFWS 2004a). For more information regarding northern spotted owl recovery refer to: 2007 *Draft Recovery Plan for the Northern Spotted Owl.*

The main differences in northern spotted owl modeling assumptions are presented in Table 4.

TABLE 4. DIFFERENCES BETWEEN THE SETTLEMENT AGREEMENT AND THE 2004 SUSTAINABLE HARVEST MODELING ASSUMPTIONS FOR NORTHERN SPOTTED OWLS.

Northern Spotted Owl Management Components	2004 Sustainable Harvest Modeling Assumptions	Settlement Agreement
Habitat Mapping	Not included	Completed in 2005 and included in model.
Management in high-quality northern spotted owl habitat (high quality nesting habitat, old forest, Type A and B habitat).	No specific limitations, although existing nest patches in Nesting, Roosting and Foraging (NRF) areas are deferred from harvest and habitat landscape targets limit all silvicultural treatment.	Deferred from harvest activities until 2014.
Management in low-quality northern spotted owl habitat (sub-mature, young forest marginal and dispersal habitat) in Nesting, Roosting & Foraging (NRF) and Dispersal Management Areas.	No specific limitations, habitat landscape targets limit the full range of silvicultural treatments on all stands. The objective was to enhance the habitat to higher quality using a mixture of light and heavy (with residual tree densities of 40-60 TPA or RD ≥20) variable density/retention thinnings with snags and down woody debris (dwd) treatments and patch cuts (up to 2.5 acres) based on biodiversity pathways approaches.	Maintain and enhance low-quality habitat. The objective was to enhance the habitat to a higher quality using a light thinning (while maintain at least 115 TPA and a RD ≥48) with variable density thinning with snags and dwd treatments based on biodiversity pathway approaches.
Management in low-quality northern spotted owl habitat (sub-mature, young forest marginal habitat) in Owl Areas (formerly owl circles).	No specific limitations.	Maintain and enhance low-quality habitat.
Management in low-quality northern spotted owl habitat (sub-mature, young forest marginal habitat (Structural habitat)) in the Olympic Experimental State Forest (OESF).	No specific limitations, habitat landscape targets limit the full range of silvicultural treatments on all stands. The objective was to enhance the habitat to a higher quality using a mixture of light and heavy (with residual tree densities of 40-60 TPA or RD ≥20) variable density/retention thinnings with snags and dwd treatments and patch cuts (up to 2.5 acres) based on biodiversity pathway approaches.	Maintain or enhance low-quality habitat. The objective was to enhance the habitat to a higher quality using a mixture of light and heavy (with residual tree densities of 40-60 TPA or RD ≥20) variable density/retention thinnings with snags and dwd treatments and patch cuts (up to 2.5 acres) based on biodiversity pathway approaches.

CHANGES SINCE THE SETTLEMENT AGREEMENT

Since 2004, a number of management strategies for northern spotted owls were changed as a result of the Settlement Agreement (*WEC v. Sutherland 2006*).

In areas designated for northern spotted owl management under the 1997 HCP (i.e., Nesting, Roosting & Foraging (NRF) Management Areas and Dispersal Management Areas), no timber harvest will occur in the highest-quality habitat. Timber harvest is allowed in lower-quality habitat, but it must maintain habitat conditions and retain or enhance the trajectory of habitat improvement. All other procedural approaches to the northern spotted owl management remain unchanged from 2004.

In all Owl Areas, formerly known as owl circles, outside of HCP designated northern spotted owl management areas and in the Olympic Experimental State Forest (OESF), DNR will not harvest in the highest-quality habitat areas. Any harvesting activities in *sub-mature and young forest marginal* habitat will maintain the function of that habitat. DNR will avoid or minimize thinning activities in any owl habitat where a nesting pair of northern spotted owls has been observed (with the exception of state forest lands in Owl Areas that are managed on behalf of Pacific and Wahkiakum Counties, where all harvest activities allowed under the HCP can proceed). As mitigation, for harvest in Pacific and Wahkiakum county trust lands, DNR will complete an acre of habitat enhancement in northern spotted owl management areas elsewhere in western Washington for each acre of habitat harvested in these areas.

Pending adoption of an OESF Forest Land Plan, the amount of regeneration harvest in stands more than age 50 that are not old forest, sub-mature, or young forest marginal habitat, will be subject to the acreage limits contained in the OESF Interim HCP Implementation Procedure for Northern Spotted Owls (PR-HCP-021(e), June 1997).

In western Washington, DNR agreed to perform at least the same number of acres of enhancement activities as regeneration harvests in HCP designated northern spotted owl management areas (OESF, NRF and Dispersal), and to concentrate the enhancement activities where they will have the greatest habitat benefit.

COMPARISON OF ENVIRONMENTAL EFFECTS OF THE 2004 PREFERRED ALTERNATIVE VS MODIFIED ALTERNATIVE

The following section includes discussions of the environmental effects about how forest management under the Modified Alternative would affect the riparian land class, hydrologic change and threats to northern spotted owl (NSO). Specifically the discussion will compare the Modified Alternative to the 2004 Preferred Alternative, emphasizing the differences.

RIPARIAN MANAGEMENT ACTIVITIES

Key elements of the overall riparian management strategy contained in the Modified Alternative were described earlier in this document, while the strategies for the other alternatives can be found in the 2004 Final EIS (DNR 2004). Each alternative proposes different amounts of forest management within riparian areas (Table 5).

Modeling of the *Riparian Forest Restoration Strategy* for the remainder of the 1997 *Habitat Conservation Plan* suggests that on average, about the same number of acres will be disturbed, as was analyzed in the 2004 Preferred Alternative in the Westside HCP planning units. The

modeling suggest slightly more acreage will be disturbed on average over the planning decades as a result of harvesting activities in the OESF planning unit compared to Alternative 5 (DNR 2004, Table 4.3-2, p. 4-47). The modeling indicates a significant increase in acreage being disturbed in the first decade as a result of harvesting activities in the OESF planning unit than the 2004 Preferred Alternative. Alternative 5 was identified as having the highest potential for future cumulative effects from harvest activities compared to the other alternatives (DNR 2004, 4-205). However the Department currently has a number of specific procedures, such as the twelve-step watershed assessment (DNR 1997, IV. 126-133) to avoid these potential short-term impacts. Impacts to the riparian areas in the OESF will be further reviewed and analyzed during the OESF Forest Land Planning process, which develops strategies to provide direction to on-the-ground activities.

For the other Westside HCP planning units, the distribution of harvest intensity (area) over the planning period appears similar to the 2004 Preferred Alternative (Table 5). The Modified Alternative modeled results indicate the level of disturbance is likely to be less than 10 percent of the total riparian area for any decade of the planning period. For the first decade, while there is an increase in the acres affected, the impacts of these harvest treatments are less intensive (less trees are removed) than the 2004 Preferred Alternative. The impacts appear to be similar to Alternative 5 (DNR 2004).

TABLE 5. ESTIMATED ACRES OF FOREST MANAGEMENT IN THE RIPARIAN LAND CLASS PER DECADE BETWEEN THE OESF AND WESTSIDE HCP PLANNING UNITS FOR THE 2004 PREFERRED ALTERNATIVE (PA) AND THE MODIFIED ALTERNATIVE (MOD).

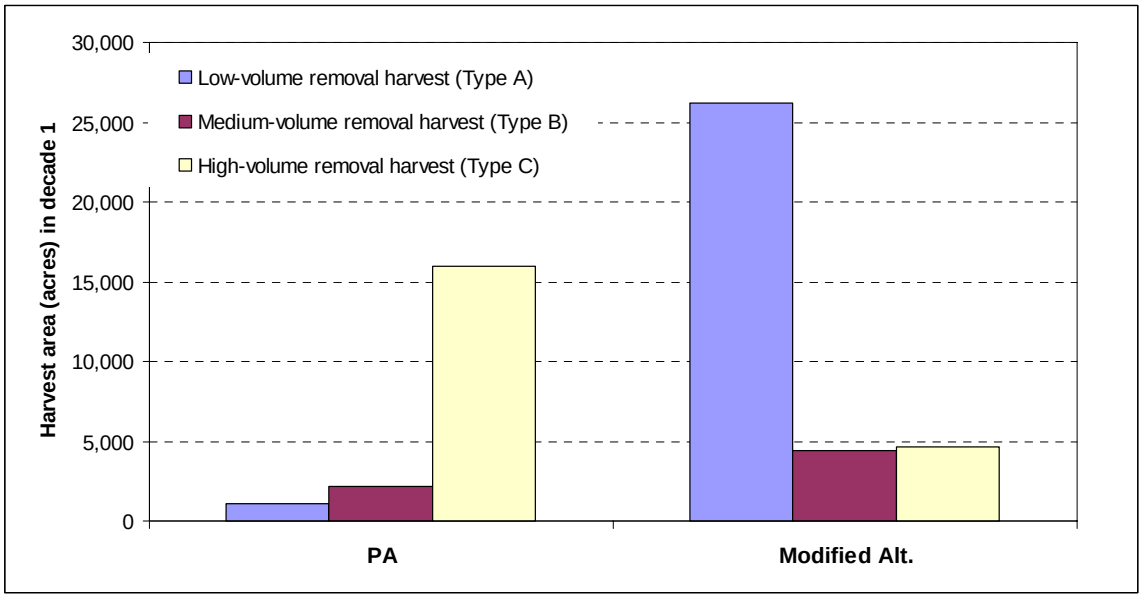
HCP Planning Units	Period	PA	Mod
Olympic Experimental State Forest (110,000 total acres in Riparian land class)	2004-2013	5,169	14,099
	2014-2023	3,882	15,518
	2024-2033	6,270	8,718
	2034-2043	5,435	9,983
	2044-2053	6,925	9,052
	2054-2063	9,292	9,622
	2064-2067	2,807	9,918
	Mean	**6,216**	**10,987**
Five Westside Planning Units (excludes OESF; 315,000 total acres in Riparian land class)	2004-2013	14,010	21,201
	2014-2023	39,779	31,496
	2024-2033	24,130	31,505
	2034-2043	22,860	31,474
	2044-2053	29,955	20,698
	2054-2063	25,725	14,604
	2064-2067	13,714	11,852
	Mean	**26,589**	**23,261**

Data Source: Model output data – timber flow levels.

OESF = Olympic Experimental State Forest

PA = Preferred Alternative

In addition to the differences in quantity of overall riparian harvest activity amount between the different alternatives, the relative intensity of timber harvest also varies. On average within each year, the Modified Alternative requires active management in more riparian areas with low-volume removal, as compared to all other alternatives (Figure1 below; Compare to DNR 2004, Figure D-4 in Appendix D).



Data Source: Model output data – TFL
[1]Type A removes up to 11 thousand board feet/acre.
Type B removes 11-20 thousand board feet/acre.
Type C removes more than 20 thousand board feet /acre. (DNR 2004, Appendix B-59 *Definition of Harvest Types)*

FIGURE 1. AVERAGE ANNUAL AMOUNT OF RIPARIAN LAND CLASS SUBJECTED TO TIMBER HARVEST IN DECADE 1, BY HARVEST INTENSITY CLASS[1] ON WESTSIDE FORESTS AND THE OESF.

Conversely, there is relatively little, high-volume removal within riparian areas under the Modified Alternative. These factors are a direct result from implementation of the *Riparian Forest Restoration Strategy (RFRS)* and other elements of the Modified Alternative. The effects of the *Riparian Forest Restoration Strategy (RFRS)* are included in Table 6.

TABLE 6. EFFECT OF THE *RIPARIAN FOREST RESTORATION STRATEGY* (RFRS)

Independent Impacts on 2004 Sustainable Harvest Calculation	1st Decade Harvest Level (MMBF/yr)	Net Present Value for 1 Decade ($ Millions)	Cumulative Harvest Volume 7 Decades (BBF)	Net Present Value over 7 Decades ($ Millions)	Older Forest in Riparian Areas after 7 Decades (Acres)
Board Adopted	597	$804	38.3	$1,980	57,000
Riparian Forest Restoration Strategy Impact	576	$846	34.8	$1,870	23,000
Percentage Difference	-4%	5%	-9%	-6%	-60%

Entry into riparian areas for timber harvest activities increase the likelihood for short-term effects to riparian functions, as does the intensity of the disturbing activity. Harvest activities within or adjacent to the riparian area of a stream have the potential to reduce stream shading and litterfall, alter microclimate, increase soil disturbance and compaction, decrease the sites sediment filtration potential, and reduce large woody debris (LWD) recruitment over the short-term (DNR 2004 p 4-36 to 4-52).

Although patch cuts and high volume thinning may increase the risk of windthrow within a stand, the risk to specific riparian functions from timber harvest varies with the intensity of the harvest. For example, the majority of stream shading is provided within 0.5 to 0.75 site potential tree height (SPTH), while stream microclimate can be influenced by harvest up to several SPTHs from the stream (FEMAT 1993). Although the majority of instream LWD recruitment occurs within first 25 to 50 feet of the riparian zone, harvest of riparian stands within one SPTH of a stream can negatively effect overall LWD recruitment. The contribution to LWD recruitment from trees 0.75 to 1 SPTH away from the stream is relatively small (FEMAT 1993). Furthermore, if mature trees are removed from 0.75 to 1 SPTH, the stand would require a much longer time before actively contributing to instream LWD again, as the trees would need to obtain nearly full height to reach the stream. The environmental effects of forest management activities in the riparian zones were analyzed in the 2004 Final EIS (p. 4-44 to 4-52)

HYDROLOGIC EFFECTS

The 2004 Preferred Alternative and the Modified Alternative have only minor differences in the potential to change hydrologic effects from land management (Section 4.7.4.1 Final EIS on *Alternatives for Sustainable Forest Management of State Trust Lands in Western Washington* p. 4-119 to 4-121)

Procedure 14-004-060 "*Assessing Hydrologic Maturity*", which prohibits harvest of hydrologically mature forest in rain-on-snow and snow zones where the mature forest types make up less than 66 percent of the sub-basin, would not change under either alternative. Consequently, significant changes in peak flows due to harvest activities would continue to be avoided under either alternative. Further, new road construction is assumed to be similar under the two alternatives; therefore, the impacts from the road network would be essentially the same. The potential for impacts to peak flows would most likely result from soil compaction associated with timber harvest activities, particularly in riparian areas however, these impacts were analyzed in the 2004 Final EIS (p. 4-117 to 4-121).

SUMMARY OF ENVIRONMENTAL EFFECTS

The environmental impacts of the Modified Alternative are, for the most part, within the range of impacts analyzed in the 2004 Final EIS. These impacts are summarized below.

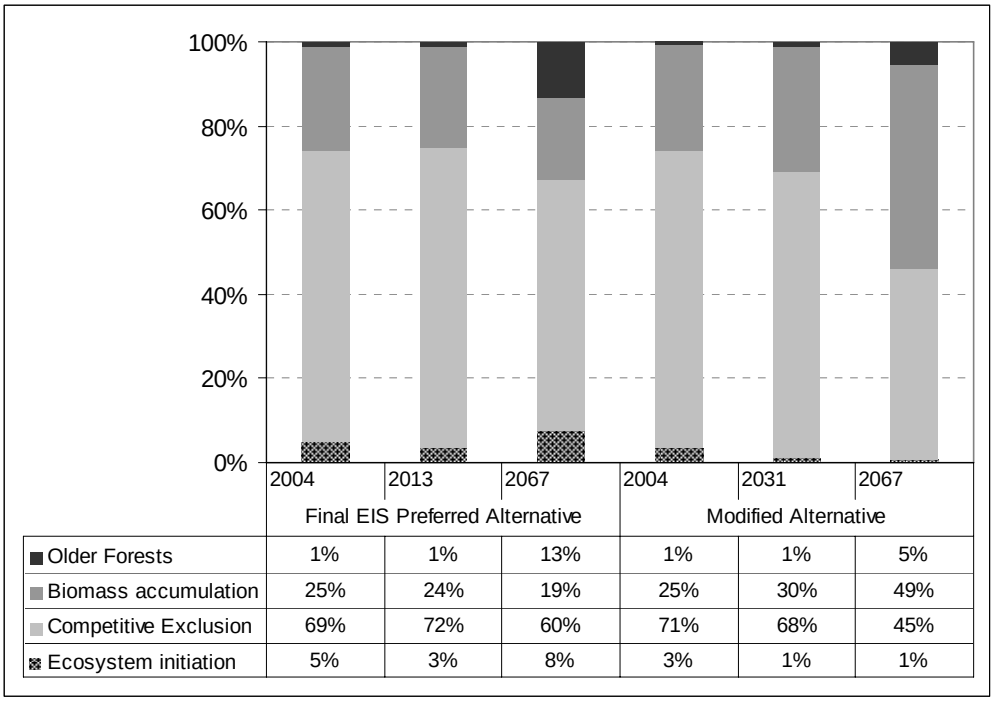
RIPARIAN AREAS

Over the duration of the 1997 *Habitat Conservation Plan*, the Modified Alternative would impact a similar number of acres in the riparian land class in the Westside HCP planning units as the Preferred Alternative (DNR 2004). For the OESF the riparian land class, the Modified Alternative would impact a similar number of acres as Alternative 5 (DNR 2004 p. 4-47 table 4.3-2). In the first decade, according to the modeling results, DNR suggests the harvest acres in riparian areas will be greater than any other alternative's decade 1 modeled activity levels which were assessed in the 2004 Final EIS. However, the level of activity does not exceed that of the range analyzed in 2004, nor does it exceed more than 10 percent of the riparian area per decade. In addition, the harvest treatments in riparian areas are limited to light thinning, at least 25 feet from stream banks with a minimum residual tree density of 75 trees or more in the riparian management zone.

The primary difference between the two alternatives is the rate of progression toward the 'Structurally Complex' stand development category, which would be slower for the Modified Alternative than for the 2004 Preferred Alternative (Figure 2 below; see also DNR 2004, Table D-10f). The principle reason for this is the higher level of stocking that is maintained in the riparian areas as a result of the *Riparian Forest Restoration Strategy* (RFRS) silvicultural prescriptions. For stands to develop an understory, the overstory tree density needs to be reduced (as a rule of thumb: below 70 trees per acre; or relative density level below 30 or a stand density index below 200[2]) to allow understory trees to grow. In addition, moderate over-stocking can promote tree vigor. Over the long-term, the Modified Alternative is expected to yield a riparian land class having potentially greater area with large trees in the riparian land class than the 2004 Preferred Alternative, but the long-term (i.e within 100 years) trade-off results in less of the riparian land class in the 'Structurally Complex' categories. However, treatment options specifically designed to maximize decadence (active recruitment of down woody debris (dwd) to terrestrial and aquatic systems and creation of large snags) could be implemented to help provide decadent structure to the riparian area.

It should be noted that scientific information is limited on the long-term effects of alternative timber harvest strategies on forest succession, stand development and the development of vertical forest structure, particularly in riparian areas. Studies are currently underway to examine these long-term effects and determine the treatment regimes most suitable to accelerate forest development toward 'Structurally Complex' or older-forest stand development stages (Cissel et al. 2006). The final results of these studies may not be known for several decades. The results of these studies, combined with new technology, may allow DNR to maximize the rate of stand development while simultaneously minimizing short-term impacts to riparian functions.

[2] These values vary by site type (wet or dry) and by the plant associations and tree species. Shade tolerate tree species, such as western hemlock and western red cedar can tolerate and grow with more overstory canopy than shade intolerate species such as Douglas-fir.



	2004	2013	2067	2004	2031	2067
	Final EIS Preferred Alternative			Modified Alternative		
Older Forests	1%	1%	13%	1%	1%	5%
Biomass accumulation	25%	24%	19%	25%	30%	49%
Competitive Exclusion	69%	72%	60%	71%	68%	45%
Ecosystem initiation	5%	3%	8%	3%	1%	1%

FIGURE 2. PROVIDES A COMPARISON OF THE STAND DEVELOPMENT STAGES IN THE RIPARIAN LAND CLASS BETWEEN THE 2004 PREFERRED ALTERNATIVE AND THE MODIFIED ALTERNATIVE OVER TIME.

NORTHERN SPOTTED OWL

This analysis is based on a qualitative assessment of the differences that would be expected to result from the modifications to the 2004 Preferred Alternative, with model output data used to illustrate and support that assessment. Discussions compare the Modified Alternative to the 2004 Preferred Alternative, emphasizing the comparisons.

Changes in the Amount of Habitat Within Nesting, Roosting, Foraging, and Dispersal Management Areas

The 2004 Final EIS described northern spotted owls strong association with structurally complex forests, which were defined as including stands in the 'Botanically Diverse', 'Niche Diversification', and 'Fully Functional' stand development stages (DNR 2004, p. 4-56). While recognizing the definition of structurally complex forests did not equate to suitable nesting, roosting and foraging habitat for northern spotted owls, analyses in the 2004 Final EIS used changes in the amount of structurally complex forests as an indicator of differences in the amount of owl habitat under each of the alternatives.

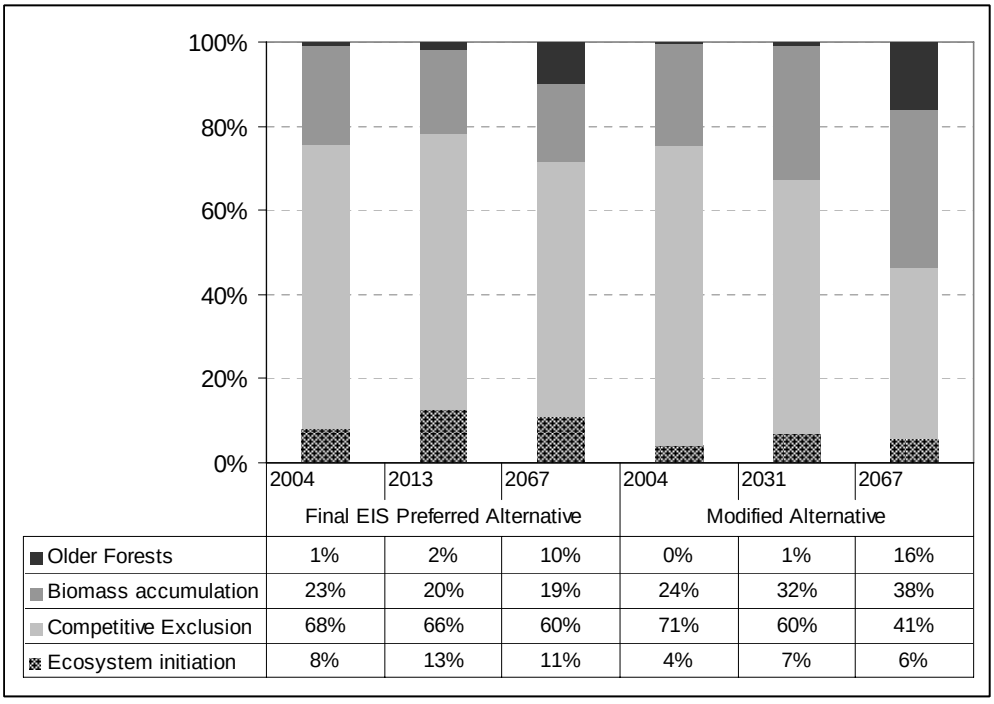
This analysis also employs structurally complex forests or older-forest conditions as an indicator of changes in the availability of northern spotted owl habitat, but uses a narrower definition of that structural class. As it was defined in the 2004 Final EIS (DNR 2004 Appendix B), the 'Botanically Diverse' stage of stand development lacked the elements of decadence, deformed live trees, standing large dead trees, and large woody debris that characterize structurally complex forests (and suitable nesting, roosting, and foraging habitat for northern spotted owls). For this analysis, the 'Botanically Diverse' stage has been excluded from the structurally complex group and re-labeled as the 'Biomass Accumulation' stage (Table 7), descriptive of the principal ecological process operating in such stands.

'Biomass Accumulation' is not considered habitat within Nesting, Roosting and Foraging (NRF) Management Areas.

Hence, structurally complex forests or older-forest conditions will include only stands in the 'Niche Diversification' and 'Fully Functional' development stages. Modeled values for the anticipated amount of older-forest condition in the analysis area, therefore, are substantially lower than the values presented in the 2004 Final EIS. Based on tree size and canopy cover characteristics of the 'Biomass Accumulation' stage, as well as the lack of snags and woody debris, forests in that stage can be assumed to provide dispersal habitat for northern spotted owls.

Similar to the 2004 Preferred Alternative, the Modified Alternative would employ biodiversity pathways management techniques to emphasize the maintenance and development of older-forest conditions over the long-term. In all time periods, model output data indicate less harvest activity in riparian areas and more in upland areas (both those with specific management objectives and those with general management objectives) would occur under the Modified Alternative, compared to the 2004 Preferred Alternative.

The Modified Alternative is modeled as resulting in more structurally complex forests or older forests than any of the other alternatives by 2067, including the 2004 Preferred Alternative (Figure 3). The acreage of stands in the 'Biomass Accumulation' stage would also be greater under the Modified Alternative compared to the other alternatives (Figure 3 see also DNR 2004, Table D-12 Appendix D). The reason for this difference is the mix of thinning strategies, heavy and light, that are applied over time in the Modified Alternative, compared to the 2004 Preferred Alternative.



	Final EIS Preferred Alternative			Modified Alternative		
	2004	2013	2067	2004	2031	2067
Older Forests	1%	2%	10%	0%	1%	16%
Biomass accumulation	23%	20%	19%	24%	32%	38%
Competitive Exclusion	68%	66%	60%	71%	60%	41%
Ecosystem initiation	8%	13%	11%	4%	7%	6%

FIGURE 3. ESTIMATED PROPORTION OF WESTERN WASHINGTON FORESTED STATE TRUST LANDS IN DIFFERENT STAND DEVELOPMENT STAGES BETWEEN THE 2004 PREFERRED ALTERNATIVES AND THE MODIFIED ALTERNATIVE OVER-TIME.

Data Source: Model output data – stand development stages.
[1] PA = Preferred Alternative

In the Olympic Experimental State Forest[3], the Modified Alternative would result in more older forests than any of the alternatives, starting in 2013. By 2067, more than 16 percent of the Olympic Experimental State Forest (OESF) would consist of forests in the 'Niche Diversification' and 'Fully Functional' stages (older forests). This level is comparable to most of the other alternatives and slightly more than the 12 percent under the 2004 Preferred Alternative (DNR 2004) (Figure 6).

In Nesting, Roosting, and Foraging (NRF) Management Areas and Dispersal Management Areas, intensive management under the biodiversity pathways approach of the Modified Alternative would be expected to result in long-term increases in older forests. Model results support this expectation: long-term increases in the amount of structurally complex forest in Nesting, Roosting and Foraging (NRF) Management Areas modeled for the Modified Alternative surpass all other alternatives, including the 2004 Preferred Alternative (Figure 4).

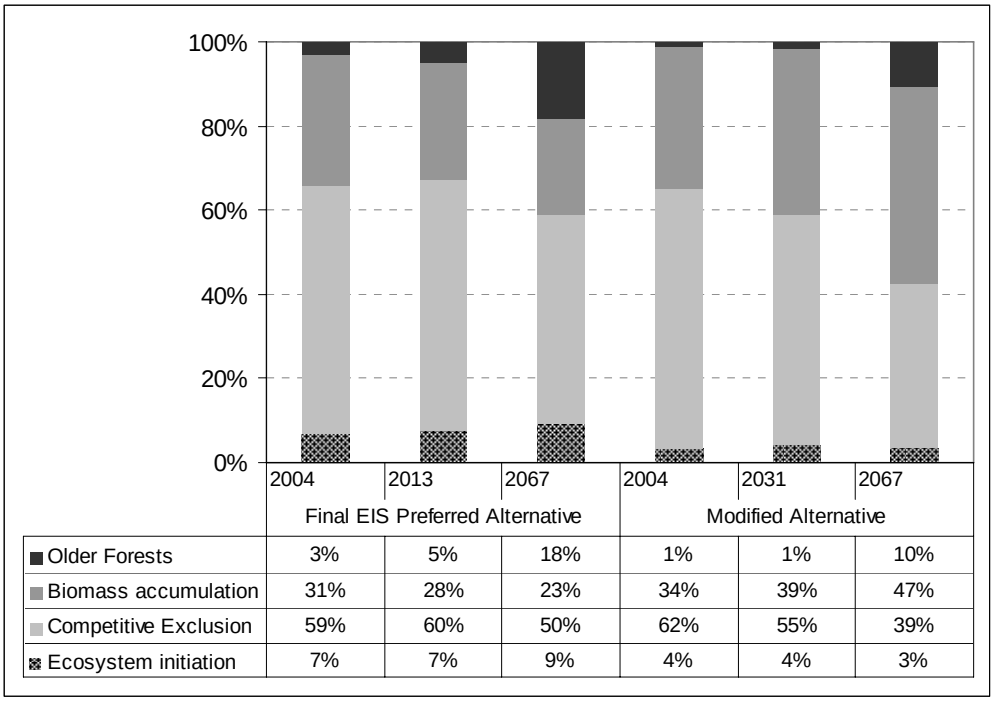
Similarly, the amount of older-forest conditions in Dispersal Management Areas is modeled as showing substantially greater increases under the Modified Alternative compared to the other alternatives, including the 2004 Preferred Alternative (Figure 5 and DNR 2004). In light of recent research suggesting the risk of northern spotted owl mortality in areas managed for regulatory definitions of dispersal habitat, increases in the amount of older forest conditions in Dispersal Management Areas may be particularly important for ensuring the survival of dispersing owls.

Timber Harvest in Areas Designated as Nesting, Roosting and Foraging Management Areas

Similar to the 2004 Preferred Alternative, the Modified Alternative would not allow activities that reduce the amount of nesting, roosting and foraging habitat in below-threshold WAUs. Also, similar to all of the alternatives analyzed in the 2004 Final EIS, harvest in designated Nesting, Roosting, and Foraging Management Areas would occur at a lower rate than the rate for all lands. Over the seven-decade term of the sustainable harvest model, harvest rates in Nesting, Roosting, and Foraging Management Areas under the Modified Alternative would exceed those modeled for the 2004 Preferred Alternative, and would be similar to those anticipated under Alternative 2 in the 2004 Final EIS (Table 7). The amount of high-volume removal harvest activity in designated Nesting, Roosting, and Foraging Management Areas under the Modified Alternative would be less than under the 2004 Preferred Alternative, and similar to the amounts anticipated for Alternatives 2 and 5.

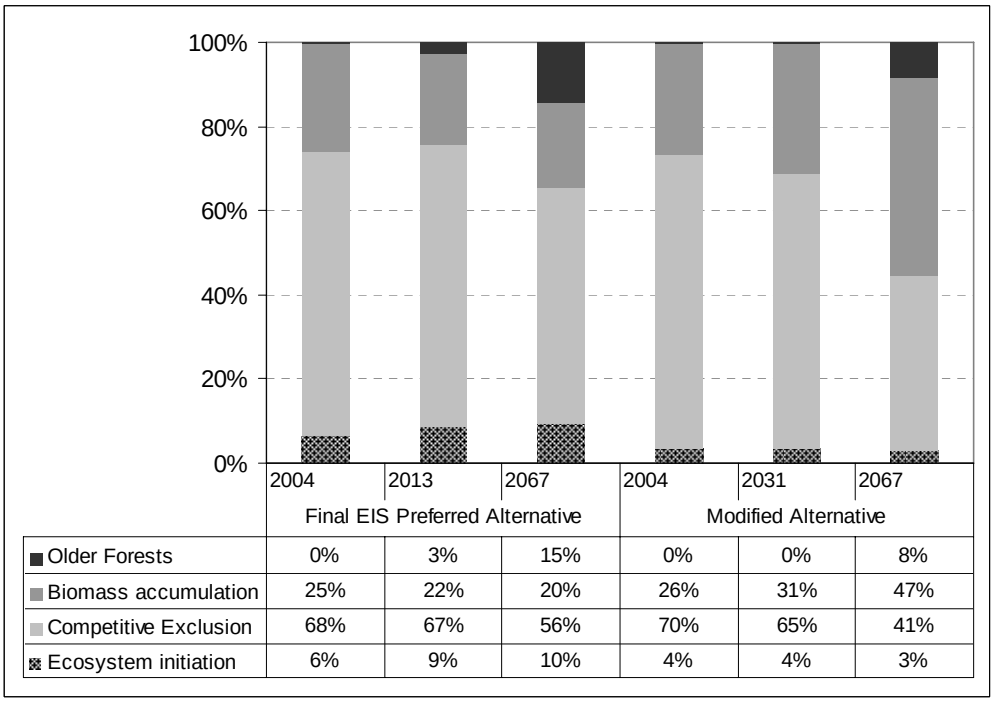
As with the 2004 Preferred Alternative, the majority of harvest in designated Nesting, Roosting and Foraging (NRF) Management Areas under the Modified Alternative would consist of biodiversity thinnings, and would, therefore, be designed to improve habitat conditions and increase the potential for a stand to become nesting, roosting, and foraging habitat sooner.

[3] Note this definition of older forests is different from the 1997 Habitat Conservation Plan definition for old forests in the OESF. The stand development stage model used in the sustainable harvest is based upon the ecological development of west Cascade forests, dominated by Douglas-fir and poorly distinguishes the forest stand development stages of different forest types such as the coastal Sitka spruce, western hemlock and silver-fir.



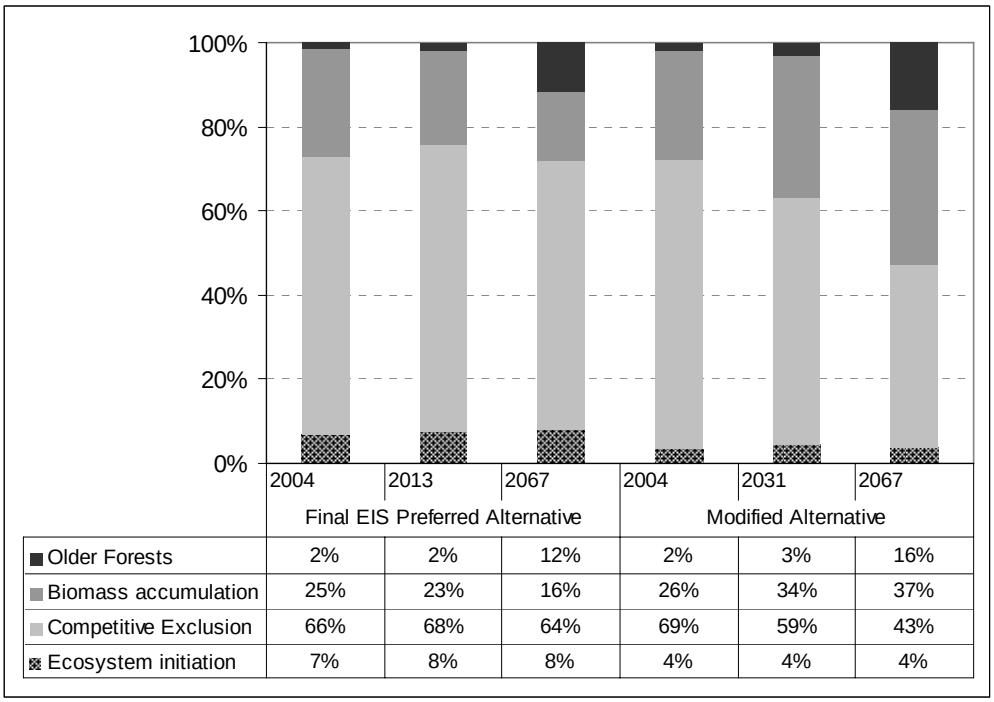
	Final EIS Preferred Alternative			Modified Alternative		
Older Forests	3%	5%	18%	1%	1%	10%
Biomass accumulation	31%	28%	23%	34%	39%	47%
Competitive Exclusion	59%	60%	50%	62%	55%	39%
Ecosystem initiation	7%	7%	9%	4%	4%	3%

FIGURE 4. COMPARISON BETWEEN THE 2004 PREFERRED ALTERNATIVE AND THE MODIFIED ALTERNATIVE STAND DEVELOPMENT STAGES IN NESTING, ROOSTING AND FORAGING MANAGEMENT AREAS.



	Final EIS Preferred Alternative			Modified Alternative		
Older Forests	0%	3%	15%	0%	0%	8%
Biomass accumulation	25%	22%	20%	26%	31%	47%
Competitive Exclusion	68%	67%	56%	70%	65%	41%
Ecosystem initiation	6%	9%	10%	4%	4%	3%

FIGURE 5. COMPARISON BETWEEN THE 2004 PREFERRED ALTERNATIVE AND THE MODIFIED ALTERNATIVE STAND DEVELOPMENT STAGES IN DISPERSAL MANAGEMENT AREAS.



	2004	2013	2067	2004	2031	2067
	Final EIS Preferred Alternative			Modified Alternative		
Older Forests	2%	2%	12%	2%	3%	16%
Biomass accumulation	25%	23%	16%	26%	34%	37%
Competitive Exclusion	66%	68%	64%	69%	59%	43%
Ecosystem initiation	7%	8%	8%	4%	4%	4%

FIGURE 6. COMPARISON BETWEEN THE 2004 PREFERRED ALTERNATIVE AND THE MODIFIED ALTERNATIVE STAND DEVELOPMENT STAGES IN THE OESF.

HARVESTING IMPACTS

Overall disturbance levels as a result of all harvest activities over the planning horizon (7 decades) in both the 2004 Preferred Alternative and the Modified Alternative are comparable at 11 to 18 percent, with an average of between 13 and 14 percent of the total forest land base (Table 7). The distribution of these harvest activities across the northern spotted owl management areas is significantly different in the initial decades (specifically in decade 1). While these differences are described here, DNR is exploring as part of the Forest Land Planning process whether or not these are the result of the modeling structure and process or a result of the procedural changes from the Settlement Agreement.

The Modified Alternative projects a marked decrease in activities in Dispersal Management Areas from around 17 percent (or approximately 19,000 acres to approximately 6 percent (6,400 acres) in decade 1 (Table 7). In decade 2 however, the Modified Alternative projects an approximate doubling of activities in dispersal management areas to 10 percent (11,000 acres) of harvest activities within the dispersal area.

TABLE 7. PROJECTED DISTURBANCE LEVELS AS A RESULT OF ALL HARVEST ACTIVITIES

Alternative	Decade	NON_NSO	NRF	OESF	Dispersal	Overall the entire forest base
Final EIS Preferred Alternative (2004)	1	17%	12%	9%	17%	15%
	2	14%	7%	6%	12%	12%
	3	11%	7%	11%	12%	11%
	4	14%	10%	11%	11%	13%
	5	12%	15%	9%	15%	12%
	6	14%	11%	9%	12%	12%
	7	14%	11%	9%	17%	13%
Modified Preferred Alternative (2007)	1	20%	7%	14%	6%	16%
	2	21%	10%	16%	10%	18%
	3	21%	8%	9%	10%	16%
	4	16%	9%	10%	18%	14%
	5	14%	6%	9%	6%	11%
	6	14%	9%	10%	10%	12%
	7	14%	8%	9%	14%	12%
Total forest base area (acres)		860,931	157,059	256,659	116,055	1,390,704

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APPENDIX A

Washington Environmental Council et al v Sutherland et al
SETTLEMENT AGREEMENT
Executive Summary
March 21, 2006

Introduction

This settlement agreement resolves *Washington Environmental Council, et al v. Sutherland, et al,* litigation brought in King County Superior Court in October 2004. Prior to the judge's opinion being reduced to a final judgment, the parties agreed to enter into settlement discussions. Those negotiations occurred from November 2005 through March 2006. The parties believe they have reached an agreement that meets the core objectives of all parties. The agreement lays out a number of important tasks, which the parties will work cooperatively to accomplish.

Parties to the Agreement

Conservation groups—Washington Environmental Council, National Audubon Society, Conservation Northwest, Olympic Forest Coalition

State government—Commissioner of Public Lands Doug Sutherland, the Board of Natural Resources (BNR), the Department of Natural Resources (DNR)

Intervenors—American Forest Resource Council; Pacific, Skamania, Snohomish and Skagit Counties; City of Forks; Quillayute Valley, Toutle Lake, Willapa Valley and Castle Rock School Districts; and Willapa Harbor Hospital.

Key Components of the Agreement (with reference to Agreement Sections)

I. Northern Spotted Owl Conservation Measures

The agreement provides additional short-term protection for existing northern spotted owl habitat.

• In areas set aside for spotted owl management under DNR's Habitat Conservation Plan (HCP), No timber harvest will occur in the highest quality habitat. In lower quality habitat, any harvest must maintain habitat conditions and/or improve its development. The next best stands will be identified and enhanced, to meet the HCP's targets of 50% of each designated owl management area being habitat. DNR intends to actively pursue habitat enhancement, generally in amounts on a par with traditional timber harvest. The agreement sets sideboards on enhancement forestry to ensure that it maintains or improves the habitat and to focus enhancement in areas where it will have the greatest habitat benefit. The other 50% of these management areas are available for the full range of management activities allowed by the HCP. All previous "owl circles" are lifted.

• In Owl Areas (formerly "owl circles") outside of the HCP's owl management areas, DNR will not harvest the highest quality habitat. Any logging activities in other habitat will maintain the function of that habitat. DNR will avoid or minimize thinning activities in owl habitat where a nesting pair of owls has been observed by DNR or the Washington Department of Fish and Wildlife in the previous year. Because of potentially severe fiscal impacts, an exception is made for the State Forest lands in Owl Areas that are managed on behalf of Pacific and Wahkiakum Counties, where all harvest activities allowed under the HCP can proceed. As mitigation, DNR will complete an acre of habitat enhancement in spotted owl management areas elsewhere in western Washington for each acre of habitat harvested in these areas.

Olympic Experimental State Forest (OESF)

The Olympic Experimental State Forest (OESF) comprises 264,000 acres of DNR-managed lands in western Clallam and western Jefferson Counties. Under the HCP, the goal of the OESF Conservation Strategy is to learn how to integrate timber production and conservation across the landscape.

• DNR will not conduct any logging in mapped "old forest" stands.

- DNR will conduct a landscape plan for the OESF, next in line after the South Puget Sound region plan, and the parties will be invited to participate.
- Prior to adoption of the plan, only harvests that sustain or improve habitat quality will occur in stands with defined habitat structure features. DNR will impose a planning goal of maintaining all areas of defined habitat structure, along with other planning goals, for the full term of the agreement. The completed plan, along with the HCP, will guide subsequent activities in the OESF.
- In habitat and non-habitat, enhancement activities will be performed to meet OESF landscape level habitat targets. DNR agrees to perform at least the same number of acres of enhancement activities as regeneration harvests, and to concentrate them where they will have the greatest habitat benefit.
- All previous "owl circles" are lifted.

II. Innovative Silviculture

DNR will set up scientifically designed demonstration projects in the OESF testing Dr. Andrew Carey's "biodiversity pathways" principles, which aim to integrate timber production and conservation. In the next year, DNR will also initiate a 100-year modeling exercise to examine alternative innovative silvicultural techniques, including those proposed by Dr. Carey, across the OESF. The parties will reach consensus on the model design before the project proceeds. The project will be peer-reviewed, and DNR will also seek to publish the work in a peer-reviewed journal. This exercise will likely provide information useful to the design of research projects in the OESF.

III. & IV. Other Land Management & Implementation

DNR will proceed with other land management decisions, including lifting certain prior procedures as directed by the Board, implementing the *Riparian Forest Restoration Strategy*, bringing the Policy for Sustainable Forests to the Board for adoption, and beginning analysis of old growth in eastern Washington. DNR will continue its forest land planning process, develop timber harvest schedules, record silvicultural activities in its data base, and share HCP monitoring reports with all parties. DNR will re-run the sustainable harvest model to reflect the commitments of the agreement and the *Riparian Forest Restoration Strategy* and bring the results to the BNR for decision before the end of 2007.

V. Legal Issues Resolved

- Within 5 days of the effective date of this Agreement, *WEC v. Sutherland* will be dismissed voluntarily with prejudice or by stipulation of the parties.
- Plaintiffs waive any challenge to the new harvest calculation and accompanying SEPA documents that comply with the agreement, as well as to the *Riparian Forest Restoration Strategy* and accompanying SEPA document**,** and to the EIS for the forthcoming Policy for Sustainable Forests, based on its reliance on the Sustainable Harvest EIS challenged in WEC v Sutherland.
- Plaintiffs will not challenge DNR timber sales that comply with the agreement on the basis of impacts to the northern spotted owl, nor will they challenge the landscape plan for the OESF to the extent it protects all owl habitat for the duration of the agreement.

VI. Management Fee for the Resource Management Cost Account

Plaintiffs will actively support legislative re-authorization of the 30% RMCA management fee, needed to fund management of the trust lands subject to this agreement.

VII. Increased Communication and Dispute Resolution Process

- Parties expect enhanced communication and collaboration to be one of the positive outcomes of this settlement agreement. The parties are committed to building relationships of greater trust and collaboration.
- The parties will hold annual meetings in the fall of each year to discuss implementation of the agreement including projected harvest activities in spotted owl habitat; parties will attempt to resolve any disagreements over proposed harvest and enhancement in owl habitat.
- The agreement lays out a dispute resolution process for use when a party believes that another is out of compliance with the terms of the agreement. The process calls for parties to discuss issues of agreement compliance before taking their concerns to outside parties, and DNR will not allow forestry activities until the process is complete.

VIII. Term

The Agreement terminates when the BNR approves a sustainable harvest calculation extending beyond fiscal year 2014, but no earlier than June 30, 2014.