March 23, 2007
PUD # 20977

Ms. Magalie Roman Salas, Secretary
Federal Energy Regulatory Commission
825 North Capitol St. NE
Washington, DC 20426

Dear Ms. Salas:

Re: Henry M. Jackson Project – FERC No. 2157
License Article 53
Wildlife Habitat Management Program
Spada Lake Tract Supplemental Plan

The enclosed Spada Lake Tract Supplemental Plan is submitted as a proposed amendment to the previously approved Wildlife Habitat Management Plan (WHMP) for the Jackson Hydroelectric Project. The Plan was prepared by Public Utility District No. 1 of Snohomish County and the City of Everett, who are co-licensees in the Jackson Project. This detailed plan for management of the Spada Lake Tract is a revision of the Supplemental Plan approved by the FERC in 1997 (Order Approving Wildlife Habitat Management Plan Supplement for the Spada Lake Tract, issued April 18, 1997). As stated in the Order, the plan was to be updated every 10 years, and the enclosed plan fulfills this requirement. The revised plan will cover management activities for the period 2006 – 2015.

The 2006 Supplement covers Jackson Project lands that were included in the 1997 Supplement, including approximately 3,683 acres of forest land and the reservoir. The revised supplement summarizes accomplishments under the 1997 plan and updates vegetation cover types that were identified in the earlier plan. Management objectives have not changed significantly since the 1997 Supplement; however, the 2006 Supplement updates management techniques, reflecting advances in wildlife science over the past decade, and prescribes management actions for the Tract that reflect changes in access and environmental regulations.

The 2006 Supplement was developed in consultation with resource agencies that have an interest in the Jackson Project, including the U.S. Fish and Wildlife Service, the Washington Department of Fish and Wildlife, the Washington Department of Natural Resources and the Tulalip Tribes. The status of the management program on the Spada Lake Tract, and its future direction, were presented to the resource agencies on March 17, 2006. This discussion was

documented in the 2005 Annual Report on the WHMP, dated April 30, 2006. A draft of the 2006 Supplement was submitted to the resource agencies for comment in January 2007. Agency representatives responded that the document was satisfactory.

The Jackson Project licensees respectfully request approval of the enclosed 2006 Supplement as an addition to the Projects Wildlife Habitat Management Plan.

Very truly yours,

Ms. Zeda Williams, Water Resources Interim Assistant General Manager Snohomish County Public Utility District No. 1 PO Box 1107 MS/A2 Everett, WA 98206	Mr. Tom Thetford Director of Public Works City of Everett Public Utilities Department 3200 Cedar Street Everett, WA 98201

BRT/nda

Enclosures – Original plus 7 duplicate copies of Wildlife Habitat Management Plan, 2006 Supplement for the Spada Lake Tract

Distribution List:

Patrick Regan, FERC Portland
Rich Johnson, WDFW
Laurie Bergvall, DNR
Tim Romanski, USFWS
Daryl Williams, Tulalip Tribes

WILDLIFE HABITAT MANAGEMENT PLAN SUPPLEMENT FOR THE SPADA LAKE TRACT

prepared in conjunction with the

WILDLIFE HABITAT MANAGEMENT PLAN

for the

HENRY M. JACKSON HYDROELECTRIC PROJECT
FEDERAL ENERGY REGULATORY COMMISSION
PROJECT NUMBER 2157

LICENSE ARTICLE 53

Submitted by

PUBLIC UTILITY DISTRICT NO. 1
OF
SNOHOMISH COUNTY
AND
THE CITY OF EVERETT.
WASHINGTON

January 31, 2007

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SUMMARY

The Wildlife Habitat Management Plan Supplement for the Spada Lake Tract updates a plan for lands owned by Public Utility District No. 1 of Snohomish County (District) surrounding Spada Lake that are managed for wildlife habitat benefits under License Article 53 of the Henry M. Jackson Hydroelectric Project. The plan was originally approved by the Federal Energy Regulatory Commission (FERC) in April 1997, and covered implementation of wildlife habitat management activities for the period 1996-2005 (1997 Supplement). The updated document (2006 Supplement) will cover the period 2006-2015.

Like the 1997 Supplement, Project lands covered by the 2006 Supplement include approximately 3,683 acres of forest land and the reservoir (1870 acres). Most forest land is 40-50 year old stands of conifer, mixed forest and deciduous cover types, with patches of old growth coniferous forest and wetlands. Vegetation cover types and management methods that were identified in the preparation of the 1997 Supplement have been updated in the 2006 Supplement (Section 2). Management techniques, such as silvicultural treatments, snag and canopy gap creation, that were used in the 1997 Supplement period are described in Section 2 as well.

Management objectives, described in Section 3, have not changed significantly since the 1997 Supplement. They emphasize preservation of water quality, preservation of old growth forests and wetlands, and management of second growth forest stands to promote old growth characteristics. A new section describing constraints on habitat management, including access-related limitations, regulatory constraints and operational constraints, has been added to the 2006 Supplement (Section 4). Habitat enhancement methods have been updated since 1997, reflecting these constraints and advances in wildlife science (Section 5), and the 2006 Supplement (like the 1997 Supplement) prescribes management actions for specific forest stands (Section 6). Monitoring is a key component of the management program to determine the outcome of management actions and identify areas where some action may be appropriate (Section 7).

1.0 INTRODUCTION

This updated plan for management of the Spada Lake Tract is submitted as required by the Federal Energy Regulatory Commission (FERC) in "Order Approving Wildlife Habitat Management Plan Supplement for the Spada Lake Tract" issued April 18, 1997 (Appendix A). It is an updated version of the first supplemental plan (1997 Supplement) to the Wildlife Habitat Management Plan (WHMP, District and City 1988) for the Henry M. Jackson Hydroelectric Project (Federal Energy Regulatory Commission Project No. 2157, License Article 53). The WHMP was completed by the Public Utility District No. 1 of Snohomish County (District) and the City of Everett (City) in 1988 and approved by the FERC "Order Approving With Modification Revised Wildlife Habitat Management Plan (issued May 19, 1989)". A supplemental plan for the period 1996-2005 (District and City 1997) was prepared in cooperation with the U.S. Fish & Wildlife Service (USFWS), the Washington Department of Fish and Wildlife (WDFW), and the Tulalip Indian Tribes (Tribes). The Washington Department of Natural Resources (DNR) was consulted regarding this plan because lands adjacent to the tract are managed by the DNR.

The plan in this document (2006 Supplement) covers implementation for the period 2006-2015. Its purpose is to update the 1997 Supplement by updating forest vegetation management methods and vegetation cover type data. The 2006 Supplement presents stand-specific management plans for the period 2006-2015.

1.1 BACKGROUND

The District and the City are co-licensees for the Jackson Project on the Sultan River in Snohomish County, Washington. The co-licensees were required to prepare the WHMP to mitigate for wildlife impacts resulting from construction and operation of the Jackson Project. During the preparation of the WHMP the District, the U.S. Forest Service (USFS), and the DNR were in the process of conducting a land exchange for lands under and surrounding Spada Lake, the reservoir formed as part of the Jackson Project. As part of the WHMP the co-licensees proposed detailed management prescriptions for the Spada Lake Tract up to elevation 1460 feet MSL and proposed to manage lands around Spada Lake for wildlife, if and when they were obtained from the USFS in the land exchange. The co-licensees and the resource agencies agreed that management would be compatible with the Jackson Project Recreation Plan (District and City 1991) and that the lands would be open to public access subject to water quality protection constraints. Policy on access to the tract for recreation was covered by the Recreation Plan (District and City, 1991) and is now covered by Directive 73 (attached). It was agreed that detailed supplemental wildlife habitat management plans would be prepared in consultation with the resource agencies upon land acquisition and that management emphasis would "be for black-tailed deer, with due regard for other species" (District and City 1988).

The District/USFS land exchange was completed on February 28, 1991. The District obtained approximately 3,487 acres of land from the USFS beneath and adjacent to Spada Lake. Approximately 1,549 of those acres are above elevation 1,460 and therefore are required to be included in the supplemental plans. Also, the District obtained approximately 196 acres directly adjacent to Spada Lake from DNR, which is included in the supplemental plans. The total number of acres for Spada Lake Tract is approximately 3,683. The total number of acres included in the 1997 supplemental plan was approximately 1,745 (Acreages are estimates based on various project documents -see Table 2-2 for current cover-type acreage estimates for the entire Spada Lake Tract.).

During the 1990 and 1991 FERC-required annual report meetings, the co-licensees and resource agencies agreed to goals for the supplemental plan (Section 1.2) and a report outline. Also, it was agreed that specific management prescriptions would be developed for units selected for improvements through the year 2005 and that details would be planned for remaining units in future ten-year plans. Following technical and feasibility studies of the tract (Harza 1995) the first supplemental plan (District and City 1997) was approved, covering the period 1996-2005.

1.2 GOALS OF THE SUPPLEMENTAL PLAN

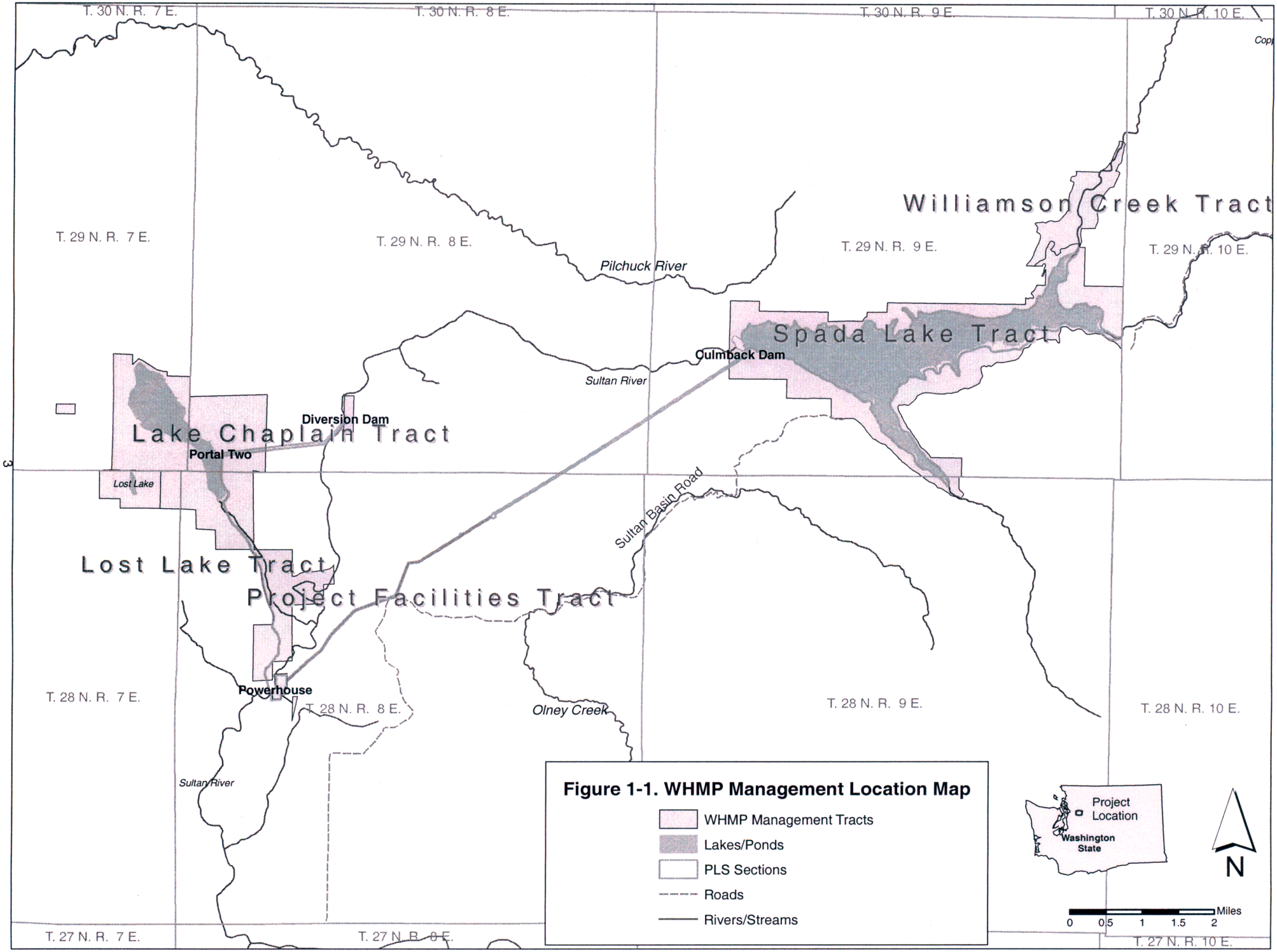
The goals of the supplemental plans are based on the requests of the resource agencies as specified in the WHMP in Sections 1.2.2.3 and 3.4.5.5 and in meeting discussions, and on the needs of the co-licensees regarding water quality and recreation. The lands are managed under the same guidelines specified in the WHMP unless otherwise stated in this document. The goals for wildlife habitat management of approximately 1,745 acres of land above elevation 1460 MSL owned by the District in the Spada Lake Tract are as follows:

1) Preserve water quality;
2) Preserve and enhance old growth, riparian, and wetland habitats;
3) Manage second growth forest primarily for deer with due regard for other species,
4) Consider aesthetics (viewshed) in planning and implementation of the supplemental plan.

The specific objectives and methods for attaining these goals will be addressed in Section 5.0, Habitat Management Objectives and Enhancement Methods. Management of these lands must be consistent with the policies and regulations for public use and recreation and operation of the hydroelectric facilities.

1.3 MANAGEMENT AREA

The Spada Lake Tract is located approximately 10 miles northeast of the town of Sultan, in Snohomish County, Washington, primarily in Township 29N, Range 9E (Figure 1- 1). Note that the Williamson Creek Tract is not included in this plan). Access to the tract is via State Hwy. 2, the Sultan Basin Road and DNR easement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Williamson Creek Tract
Spada Lake Tract
Lake Chaplain Tract
Lost Lake Tract
Project Facilities Tract
Pilchuck River
Sultan River
Culmback Dam
Diversion Dam
Portal Two
Lost Lake
Sultan Basin Road
Powerhouse
Olney Creek
Sultan River
3
Figure 1-1. WHMP Management Location Map
WHMP Management Tracts
Lakes/Ponds
PLS Sections
Roads
Rivers/Streams
Project Location
Washington State
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roads. The entire 3,683-acre tract was acquired by the District from the USFS and the DNR. The tract previously consisted of the 1,870-acre reservoir (at normal maximum operating pool elevation of 1,450 feet MSL) and approximately 68 acres of land above the reservoir (up to elevation 1,460 feet MSL) for which detailed management plans were described in the WHMP. Following the 1991 land exchanges, the tract increased by 1,745 acres of upland and wetland. Management of original tract vegetation below 1,460 feet MSL was included in th1997 Supplement and will be included in all future ten-year plans. Management goals and procedures for the enlarged tract are consistent with management already described in the WHMP (Sections 3.4.5.1 and 3.4.5.2, pages 3-109 and 3-111. Note that stand numbers 9-1 through 9- 11 in the WHMP have been reassigned to different stands in the supplemental plans.).

1.4 APPROACH AND ORGANIZATION

The approach of this updated supplemental plan (2006 Supplement) is similar to the approach described in the WHMP, Section 1.4. The management area has been divided into management units, general objectives are described for management through 2060, and detailed prescriptions are prepared for ten year periods. Wildlife habitat management and forest practices have improved over time since the WHMP was written and probably will continue to change in the future. As implementation proceeds it may be discovered that certain techniques work better than others on these management lands. As in the WHMP, it is stressed that this supplemental plan should be modified to accommodate changes and improvements in wildlife habitat management techniques and forestry practices. The supplemental plans are designed to do so. The goals of this supplemental plan are stated in Section 1.2 and should serve as a guide to future management. Wildlife goals and objectives will take precedence over economic gain through future timber harvesting or other land or resource uses. As stated in the WHMP, water quality is a primary concern and this plan may also be modified to reflect improvements in water quality protection practices.

2.0 DESCRIPTION OF EXISTING CONDITIONS

2.1 VEGETATION

Spada Lake lies in the *Abies amabilis* Zone of the northern Cascades physiographic province (Franklin and Dyrness 1973), where the native vegetation is dense forests of Pacific silver fir (*Abies amabilis*), western hemlock (*Tsuga heterophylla*), Douglas-fir (*Pseudotsuga menziesii*, western red cedar (*Thuja plicata*), red alder (*Alnus rubra)*, bigleaf maple (*Acer macrophyllum)* and black cottonwood (*Populus trichocarpa)*. Most of the Spada Lake Tract was logged in the early 1960s, and is now dominated by 40 to 50 year old stands of pure conifer, mixed forest and deciduous forest. Existing stands are the result of planting, natural regeneration and silvicultural practices. There are patches of old growth forest and wetlands within the tract.

Vegetation cover type descriptions in the 1997 Supplement were consistent with cover types definitions in the WHMP, and the WHMP provided a cover type map of the Tract showing conditions in the late 1980's. The 1997 Supplement utilized this map to depict vegetation cover on 1,972 terrestrial acres of the Spada Lake Tract, with some modifications: Stands in three cover types – early successional conifer (ES), Closed canopy sapling/pole conifer (CS), and mixed forest (MF) – were evaluated in detail for potential future forest management practice in 1995 (Harza 1995), and the cover type definitions were refined. Also during this period some other stands in the Tract were re-typed based on field observations. Further refinements were made in 2001-2004, reflecting vegetative succession changes and new understanding of certain vegetation types, described in detail in Section 2.1.2.

2.1.1 VEGETATION ANALYSIS PROCEDURES

Over a three year period, beginning in the winter of 2000, detailed stand exams, consisting of measurements of stand attributes at systematically distributed sample points, were conducted as part of harvest feasibility studies (Hitchcock, 2001 and 2003). During 2001, other stands were visually examined. These stands are listed in Table 2-1.

The vegetation cover type may presented in the 1997 Supplement was revised by comparing it with stereo interpretation of color aerial photographs were taken by Washington DNR in August 2001 and printed at an approximate scale of 1:12,000. Each forest stand delineated in the 1997 Supplement was assigned a vegetation cover type on the basis of upper canopy composition. Vegetation types followed WHMP and Harza (1995) descriptions, modified as described below. Subsequent field verification was conducted during the fall of 2004.

Table 2-2 summarizes vegetation cover types in comparison to those reported by Harza (1995), and Appendix 1 reports stand by stand cover type changes. Figure 2-1 shows current cover types. Most updates to vegetation cover types simply reflect vegetative succession over the past decade. For example, some non-vegetated types have naturally regenerated with red alder stands and many closed-canopy sapling/pole stands have grown into small sawtimber stands. One large non-vegetated stand is considered part of Spada Lake and two others now support wetland vegetation as a consequence of frequent inundation by fluctuating lake levels. Another stand was transformed into wetland by beaver dams and a portion of the Williamson Creek channel migration zone has been designated riparian forest.

Spada Lake

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Feet

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Figure 2-1. Spada Lake Tract Vegetation Cover Types

- WHMPManagementTracts
- Closed-Canopy Sapling/Pole Coniferous Forest
- Deciduous Forest
- Early Successional Forest
- Grass/Meadow
- Large Sawtimber Coniferous Forest
- Mixed Deciduous/Coniferous Forest
- Mixed Shrub/Brush
- Mosaic Deciduous/Coniferous Forest
- Non-Vegetated
- Old-growth Coniferous Forest
- Open Water
- Open-Canopy Sapling/Pole Coniferous Forest
- Riparian Forest
- Rock
- Slides
- Small Sawtimber Coniferous Forest
- Wetland

Table 2-1. Stand Units by Exam Type

VISUAL EXAM UNITS				DETAILED EXAM UNITS			
STAND NO.	COVER CODE	ACRES	MANAGEMENT UNIT	STAND NO.	COVER CODE	ACRES	MANAGEMENT UNIT
9-1	CS	24.7	East	9-36	SS	42.9	Old Growth
9-2	RF	15.4	East	9-37	SS	3.3	Old Growth
9-8	MO	106.1	East	9-38	CS	27.9	Old Growth
9-11	RK	5.5	East	9-48	SS	112.5	East
9-15	MF	8.8	East	9-108	MO	17.7	South Shore
9-22	MO	17.6	East	9-111	SS	47.7	South Shore
9-24	DF	12.1	East	9-120	SS	41.4	Old Growth
9-25	SS	75.3	East	9-121	SS	73.9	South Shore
9-32	SS	6.6	East	9-124	MF	7.8	South Shore
9-33	MO	13.9	East	9-135	MO	33.3	Old Growth
9-41	MO	44.8	East	9-139	MF	5.5	Old Growth
9-52	SS	1.5	East	9-142	SS	18.8	Old Growth
9-64	SS	32.0	Old Growth	9-148	SS	2.9	Old Growth
9-67	MF	36.1	Old Growth	9-150	SS	14.7	Old Growth
9-69	MF	19.0	East	9-151	SS	6.4	Old Growth
9-70	MF	20.0	East	9-152	MF	3.9	Old Growth
9-80	SS	32.9	East	9-154	SS	15.5	Old Growth
9-90	MO	31.8	East	9-155	MF	1.9	Old Growth
9-96	RF	5.2	East	9-175	SS	10.3	Old Growth
9-97	MF	2.3	East	9-183	SS	23.8	South Shore
9-107	SS	28.5	South Shore	9-184	SS	11.1	South Shore
9-114	CS	51.3	Old Growth				
9-126	MO	23.7	Old Growth				
9-137	CS	9.1	South Shore				
9-144	CS	20.4	South Shore				
9-149	OS	8.5	Old Growth				
9-177	CS	9.6	South Shore				

Vegetation cover types reported by the 1997 Supplement derive from a cover type map extending beyond the boundaries of the Spada Lake Tract (WHMP 3-106). The 1997 Supplement cover types, ranging from zero to over 120 acres, are those portions of the extended cover type polygons falling within the boundaries of the Spada Lake Tract. Some of the smallest polygons were boundary slivers resulting from aerial photograph rectification errors that become apparent in the process of overlaying the Spada Lake Tract boundaries onto the extended cover type map. For example, portions of some plantations on adjacent DNR property are incorrectly shown to extend across the boundaries of the Spada Lake Tract. Most boundary slivers were eliminated by merger into surrounding vegetation types.

Table 2-2. Cover Types and Acres within the Spada Lake Tract

COVER TYPE	CODE	1995	2004
Early Successional	ES	125.6	0.0
Open-Canopy Sapling/Pole Coniferous Forest	OS	21.0	18.9
Closed-Canopy Sapling/Pole Coniferous Forest	CS	883.8	311.7
Small Sawtimber Coniferous Forest	SS	24.7	612.1
Large Sawtimber Coniferous Forest	LS	3.8	11.9
Old Growth	OG	218.0	218.0
Mixed Deciduous/Coniferous Forest	MF	528.5	264.4
Mosaic Deciduous/Coniferous Forest	MO		348.8
Deciduous Forest	DF	55.5	60.9
Riparian Forest	RF	9.8	25.2
Mixed Shrub/Brush	SB	8.8	6.0
Grass/Meadow	GM	1.2	0.8
Wetland	WL	6.2	24.4
Non-Vegetated	NV	73.5	21.5
Slides	SL	12.0	3.1
Rock/Talus	RK		15.2
Open Water	OW	1691.7	1721.2
TOTAL		3664.1	3664.1

Other very small polygons are associated with the least-represented cover types. For example, there are 2 grass/meadow stands averaging 0.4 acres, in comparison with 23 small sawtimber coniferous forest stands averaging 26.6 acres. This disparity illuminates a limitation of identifying cover types from aerial photographs; cover types occurring naturally in small stands are often impractical to delineate. Consequently, sliver stands of riparian forest associated with the low-gradient portions of most streams within the Spada Lake Tract are not accounted.

More importantly, the 1997 Supplement described most mixed forest stands as mosaics of deciduous and closed-canopy conifer stands rather than uniform species distributions. This distinction is important from the standpoint of habitat management. Understory forage found in deciduous and uniformly-distributed mixed stands is usually absent from closed-canopy conifer stands, which are better suited for winter thermal cover. Mosaic stands offer a valuable interspersion of cover and forage not found in uniformly-distributed mixed stands.

The re-examination of cover types (Hitchcock 2004) recognizes that mosaics are similar to the mixed deciduous/coniferous forest cover type presented by the WHMP (pg. A-3), except in the distribution of coniferous trees. In mosaics, the majority of upper canopy conifer trees are contained in groups covering one or more acres. Though somewhat subjective, the difference between the two types is readily

distinguished on aerial photographs. Some identified mosaic stands contained small deciduous or conifer stands that were eliminated by merger.

Rock is the second new cover type identified by Hitchcock (2004) and represents areas of rock outcrop and/or talus. Previously, these cover types were variously described as slides, mixed shrub/brush, or open canopy sapling pole stands. Because of limited soil development, vegetation is not likely to develop along successional pathways typical of the assigned cover type. This distinction is also important because the Washington Department of Fish and Wildlife designates cliffs and talus as priority habitat. Talus is defined as homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft, composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. Cliffs, which may be associated with talus, are greater than 25 feet high and occur below 5000 feet.

2.1.2 MODIFICATIONS OF VEGETATION COVER TYPES

EARLY SUCCESSIONAL CONIFEROUS FOREST

All the early successional (ES) stands that were previously mapped in the WHMP and 1997 Supplement have advanced to the closed-canopy sapling/pole coniferous forest condition through normal succession. Some of the ES stands (9-137, 9-160) were precommercially thinned in the 1990's (See Section 2.6 and Appendix 1.)

CLOSED CANOPY SAPLING/POLE CONIFEROUS FOREST

The 1997 Spada Supplemental Plan identified three types of closed canopy sapling/pole conifer stands, distinguished by differences in tree density, average diameter and the amount of understory present. These differences resulted from past management. Almost all of the closed canopy conifer (CS) stands observed were significantly overstocked when the 1997 Supplement was prepared, and some portions of these stands were commercially thinned in 2003-4 to about 150 trees per acre (See Section 2.6 and Appendix 1). Commercial thinning in portions of CS stands has eliminated the differences between the three sub-types in these areas, but stand densities in untreated areas are still quite high: ranging from approximately 300 trees per acre in Stand 9-1 to over 2,000 trees per acre in Stand 9-38. Many small diameter stems (less than 4 inches dbh), both live and dead, are present in the understory as a result of tree suppression. The species composition is dominated by western hemlock with Douglas-fir and/or Pacific silver fir. Species dominance appears to vary depending upon site specific characteristics and exposure. Western red cedar was noticeably scarce or absent in most stands. This is contrary to what was observed in nearby old growth stands where red cedar was abundant. Identification of stumps within the second growth stands showed that red cedar was common in these stands prior to harvest. Logging residue left some large diameter (> 24 inches) woody debris in most areas which should remain for about 50 years. Bear damage is most evident in stands with stem densities exceeding 500 trees per acre.

Closed Canopy Sapling/Pole Conifer, Type 1
This sub-type of CS was not previously thinned and has little to no understory vegetation present. Portions of stands of this type (9-36, 9-37) were precommercially thinned in 2002; another stand (9-111) was commercially thinned in 2004. Remaining untreated stands of this type also include portions of 9-38, 9-48 and 9-25. Most of these stands (most notably excepting 9-38) can now be retyped as small sawtimber (SS, see Appendix 1). Diameter growth remains slow due to competition between excessive trees and canopy closure exceeding 90 percent. Mortality is occurring among the smaller diameter suppressed conifer trees existing below the main canopy level. The forest floor has no shrub and little to no forb vegetation, consisting primarily of the duff layer, dead branches, and occasional medium to large (> 6 inches) diameter logs left from previous harvest**.**

Closed Canopy SaplingPole Conifer, Type 2
This sub-type of CS was thinned approximately 20 to 30 years ago with a residual tree spacing of 8 to 10 feet, although areas within some stands were left untreated. Portions of Stand 9-111 were commercially thinned in 2004; in untreated stands (including 9-120, portions of 9-25) crown expansion has resulted in canopy closure around 90 percent. Very low levels of shrub and forb vegetation are currently present in most areas and average stand densities range from 400 to 1,000 trees per acre. Most of the stands that were previously identified as CS type 2 are now classified as small sawtimber (SS), (see Appendix 1). The forest floor consists primarily of the duff layer, dead branches, many small diameter (< 6 inches) stems from the thinning, and medium to large (> 6 inches) diameter logs left from the old growth harvest. Some shrubs, such as vine maple are still present although infrequent.

Closed Canopy Sapling/Pole Conifer, Type 3
This sub-type was thinned 16 to 20 years ago at a spacing of approximately 15 feet, resulting in approximately 200 trees per acre remaining in the stand. This spacing allowed understory vegetation to be maintained or become reestablished on the site. One stand (9-107, on the east side of Recreation Site #3) fit this description, and it was left untreated under the 1997 Supplement. The stand, which is currently reclassified as small sawtimber, has a crown closure of approximately 40 percent, with abundant huckleberry, thimbleberry, and salmonberry vegetation present in the understory.

MIXED DECIDUOUS/CONIFEROUS FOREST and MOSAIC FOREST

True mixed stands of conifers growing intermingled with red alder (MF) are scarce on the Spada Lake Tract, however, some areas had conifer saplings less than 15 feet tall growing beneath the deciduous overstory. Mosaic stands (MO) are more common, consisting of scattered patches of red alder growing adjacent to closed canopy conifer stands. Black cottonwood and bigleaf maple occur in some areas such as Stand 9-129. The deciduous patches ranged in size from a half-acre to 5

acres, while the smallest conifer patch was approximately 2-3 acres. Many of the deciduous patches identify abandoned road locations, riparian zones, and logging corridors where bare mineral soil was exposed, creating a favorable site for alder invasion. Western red cedar regeneration appeared more frequently in these alder patches than in the closed canopy sapling/pole stands. Large woody debris (> 24 inches) was absent from most stands, although some areas had medium to small (< 24 inches) woody debris. The mixed and mosaic forest stands were estimated to be 40-45 years of age. Most of the stands originally characterized as mixed forest in the WHMP and the 1997 Supplement are still considered mixed or mosaic stands.

RIPARIAN FOREST

Riparian forest is present in the tract in small scattered patches along streams, but increased in overall extent through the reclassification of Stand 9-2 on the Williamson Creek arm from mixed forest to riparian forest (see Appendix 1). Many small riparian patches were too small to depict on maps of the tract. Stands that were typed in the WHMP and 1997 Supplement as deciduous forest were still classified as this cover type in 2006.

SMALL SAWTIMBER CONIFEROUS FOREST

This cover type was uncommon in 1997 and was not studied in detail by Harza (1995), but has increased significantly in acreage through succession from the CS cover type (Hitchcock 2004), (see Table 2-2 and Appendix 1) .

2.2 RECREATION SITES

Recreation activity on the Spada Lake Tract is subject to water-quality protection restrictions and project facility security concerns. Policies and regulations governing public use of the tract are described in District Directive No. 73, FERC License Article 44, and Snohomish County Codes 12.08.030 and 12.28.020 (Appendix 2**)**. The area that was previously available to vehicle traffic has been reduced by road closures and security concerns since the 1997 Supplement was produced, but most of the developed recreation sites around Spada Lake are available for day use (Figure 2.2). Day-use areas include picnic areas, boat launches, scenic overlooks, access roads and sanitation facilities. Boat launching by the public is allowed only at designated recreation sites.

2.3 OPERATING FACILITIES

Jackson Project operating facilities within the Spada Lake Tract include the reservoir, Culmback Dam, an intake tower, access shaft, spillway control building and microwave building. Two boat launches close to Culmback Dam are occasionally used by project staff, but are closed to the public. Water levels in Spada Lake are regulated in accordance with FERC license requirements for municipal

water supply, hydroelectric power generation and flood control. Within the areas involved in operating the project, highest priority is given to operational needs, and the management program outlined in this supplemental plan will not apply, or will take a secondary role.

2.4 ROAD ACCESS

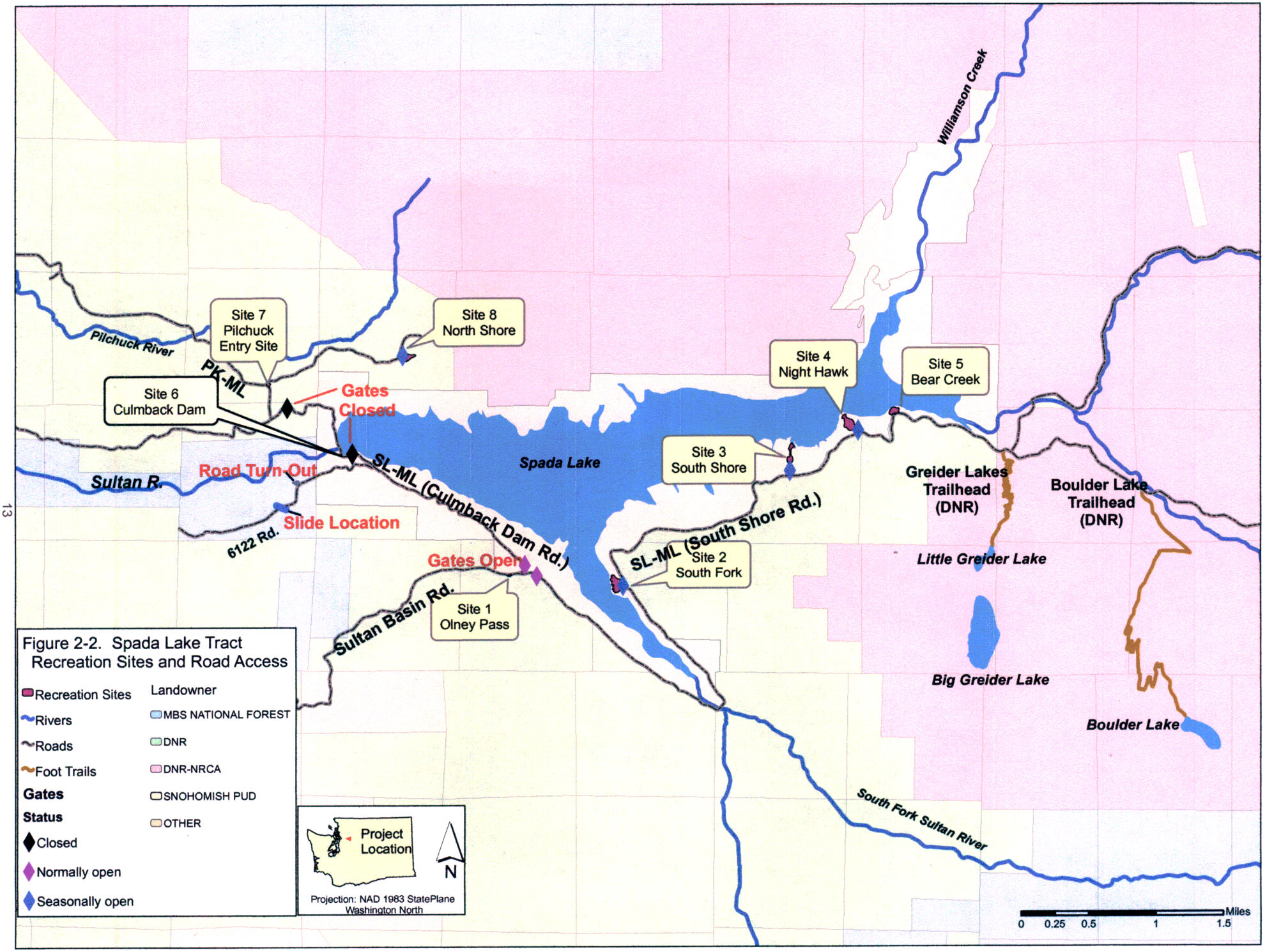
The Sultan Basin Road provides access from the southwest to the Spada Lake Tract, as depicted in Figure 2-2. This road forks at Olney Pass. One fork (South Shore Road) provides access across the South Fork of the Sultan River and forms much of the southern boundary of the Tract. The other fork (Culmback Dam Road) leads northwest to Culmback Dam, eventually connecting with DNR 5000 Road slightly north of the northern boundary of the Tract. The DNR road was abandoned eastward from the point shown on Figure 2-2 in 1999, eliminating road access to the Williamson Creek Tract. DNR intends to abandon the South Shore Road in the future from Olney Pass eastward. Thus, vehicular access along the south side of Spada Lake is uncertain at this time. There is no road access through the east end of the Spada Lake Tract, i.e. the area located between Williamson Creek and the North Fork of the Sultan River. Other logging roads, many of them abandoned or blocked, exist on the Tract.

2.5 SOILS

The soils present within the Spada Lake Tract are primarily silt loams, sandy loams, and some silty clay loams. These soil types are productive for conifer tree growth, yet have characteristics that can restrict forest management activities. Many of these soils are unstable when disturbed (affecting road construction) and are rated as a moderate to high potential for compaction, erosion, and puddling (affecting logging systems and silvicultural treatment) (DNR Forest Management Division, Undated). Feasibility of road construction, logging systems and silvicultural treatments proposed in this plan will be evaluated in the field, as described more fully in Section 5.0

2.6 FOREST MANAGEMENT UNDER THE 1996-2005 SUPPLEMENTAL PLAN

The 1997 Supplement proposed commercial and precommercial thinning of as much as 600 acres, depending on feasibility, during the period 1996-2005. The DNR's abandonment of the North Shore Road and its tributaries in 1999 precluded many of the proposed forest management activities that involved vehicle access. Forest management was completed elsewhere on the tract, however (Figure 2-3).


Williamson Creek
Pilchuck River
Site 7
Pilchuck
Entry Site
Site 8
North Shore
PK-ML
Site 6
Culmback Dam
Gates
Closed
Site 4
Night Hawk
Site 5
Bear Creek
Spada Lake
Site 3
South Shore
Sultan R.
Road Turn-Out
SL-ML (Culmback Dam Rd.)
SL-ML (South Shore Rd.)
Greider Lakes
Trailhead
(DNR)
Boulder Lake
Trailhead
(DNR)
6122 Rd.
Slide Location
Gates Open
Site 2
South Fork
Little Greider Lake
Sultan Basin Rd.
Site 1
Olney Pass
Big Greider Lake
Boulder Lake
South Fork Sultan River
Figure 2-2. Spada Lake Tract
Recreation Sites and Road Access
Recreation Sites
Rivers
Roads
Foot Trails
Gates
Status
Closed
Normally open
Seasonally open
Landowner
MBS NATIONAL FOREST
DNR
DNR-NRCA
SNOHOMISH PUD
OTHER
Project
Location
N
Projection: NAD 1983 StatePlane
Washington North
Miles
0
0.25
0.5
1
1.5

2.6.1 PRECOMMERCIAL THINNING

The objectives of precommercial thinning were to reduce the density of overstory canopy in closed-canopy sapling/pole coniferous forest and mixed or mosaic forest, while promoting understory vegetation and canopy species diversity. Precommercial thinning was accomplished on the following stands:

- Second growth stands (9-137, portions of 9-147, 9-177), totaling about 30 acres on the south shore of Spada Lake were precommercially thinned in September 1996.
- Second growth stands (9-160, portions of 9-163, 9-165, 9-179) totaling about 38 acres on the south fork arm of the lake were precommercially thinned in 2000.
- Second growth stands (9-36, 9-37) totaling about 40 acres, located northwest of Culmback Dam, were precommercially thinned in 2002.

Precommercial thinnings were done using the following prescription:

- Average spacing of leave trees at about 14 feet,
- The order of preference for retaining trees (from most preferred to least preferred) was red cedar, big-leaf maple, cottonwood, other conifers, alder
- Leave 50 foot no-cut buffer zones along streams
- Leave snag trees that do not pose a safety hazard
- Avoid disturbing shrubby and understory vegetation
- Leave a 50 foot buffer zone along the main access road and 100-foot buffer zone along the shoreline of Spada Lake.

2.6.2 COMMERCIAL THINNING

Commercial thinning opportunities were studied on second growth stands from 2001-2003, and culminated in thinning of approximately 100 acres on portions of several stands during 2003-4 (9-111, 9-121, 9-142, 9-150, 9-152, 9-154, 9-155, 9-175, 9-183, 9-184). No road construction was done for these timber sales for economic and environmental reasons, and portions of the stands were left unthinned. The objective of commercial thinning was to reduce overstory canopy density, promote tree species diversity and a multi-story canopy, and promote understory vegetation.

Thinning specifications included the following:

- Leave all trees over 18 inches dbh, except where they must be removed to open yarding corridors
- Leave all Douglas fir and western red cedar, except in yarding corridors
- Leave at least 150 trees per acre
- Leave trees of sufficient size and density such that basal area of leave trees will be between 120 and 140 square feet per acre

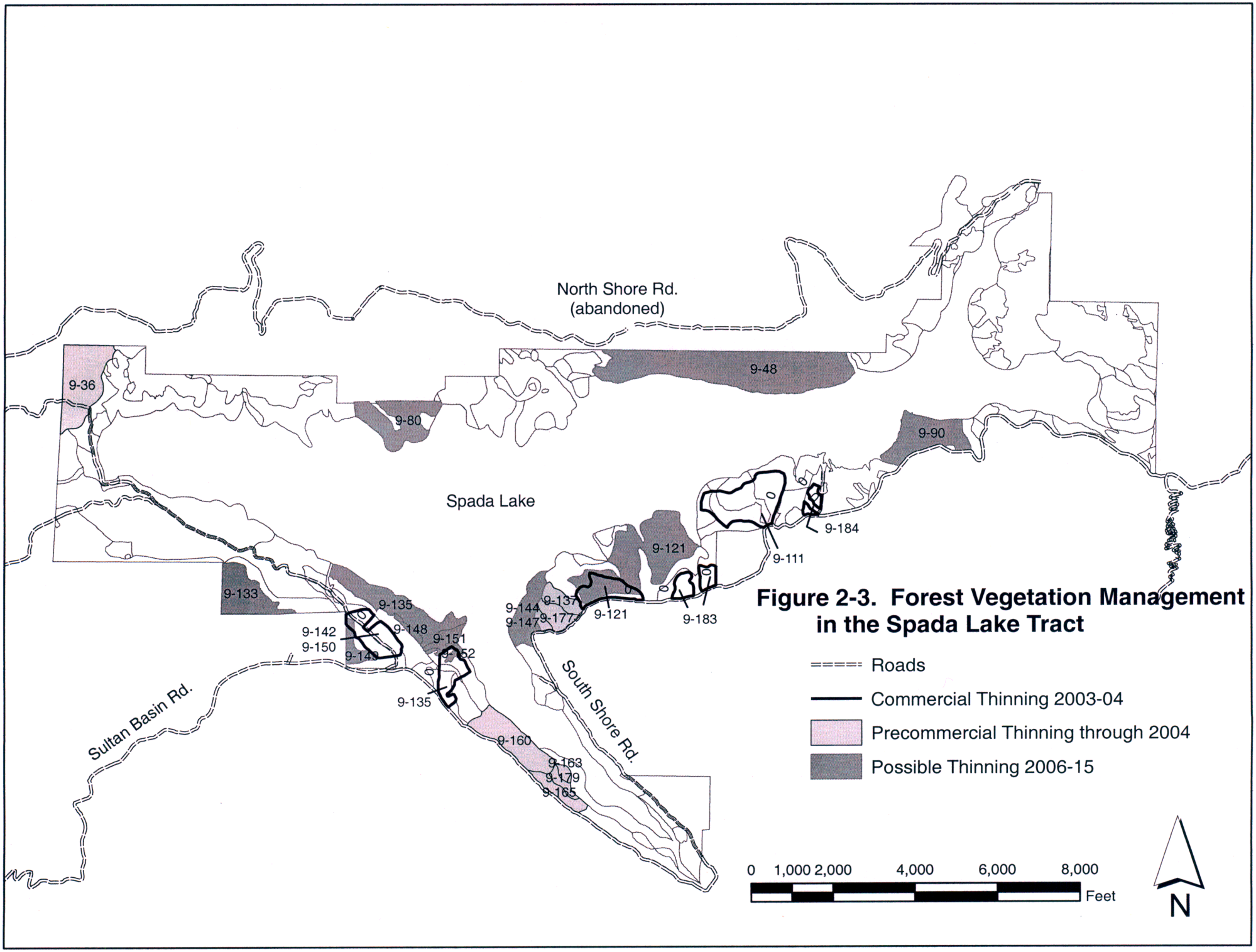


Figure 2-3. Forest Vegetation Management in the Spada Lake Tract

2.6.3 SNAG MANAGEMENT AND GAP CREATION

More than 20 forest stands on the Spada Lake Tract were inventoried to identify snag and canopy gap management opportunities from 2002 through early 2006 (Figure 2-4). Clusters of created snags were produced in some of the stands to simulate canopy gaps that would result from windthrow or other pockets of tree mortality, as described in detail in WHMP Annual Reports for the years 2003 through 2005. Five of the stands meet the WHMP targets for snag density but not size distribution because trees greater than 17 inches dbh are scarce. Additional work is scheduled on the other inventoried units to make them consistent with WHMP targets, within the constraints of available tree sizes.

Canopy gaps have typically been less than 0.1 acres in size, and are spaced roughly at one gap per 5-7 acres, in part to avoid creating more than 3 snags per acre. A review of the literature on canopy gaps that was available in early 2006 and future directions on canopy management for the 2006 Supplement are summarized in Section 5.1.

3.0 DESCRIPTION OF MANAGEMENT UNITS AND SUMMARY OF MANAGEMENT PLAN

The Spada Lake Tract lands are divided into three different management units based on vegetation, soils, accessibility and management objectives (Figure 3-1). Detailed management objectives, enhancements methods and stand prescriptions are provided in Sections 5.0 and 6.0. A summary of management activities on each of the three management units follows.

3.1 OLD GROWTH MANAGEMENT UNIT

The 882.8-acre Old Growth management unit contains all of the old growth in the Spada Lake Tract (Figure 3-1). The goal for this management unit are:

1. Preserve and enhance old growth,
2. Allow second growth stands to mature and manage to promote old growth characteristics,
3. Consolidate old growth patches by incorporating second growth mixed-mosaic forest stands,
4. Provide wildlife habitat and aesthetic buffer between the reservoir and roads.

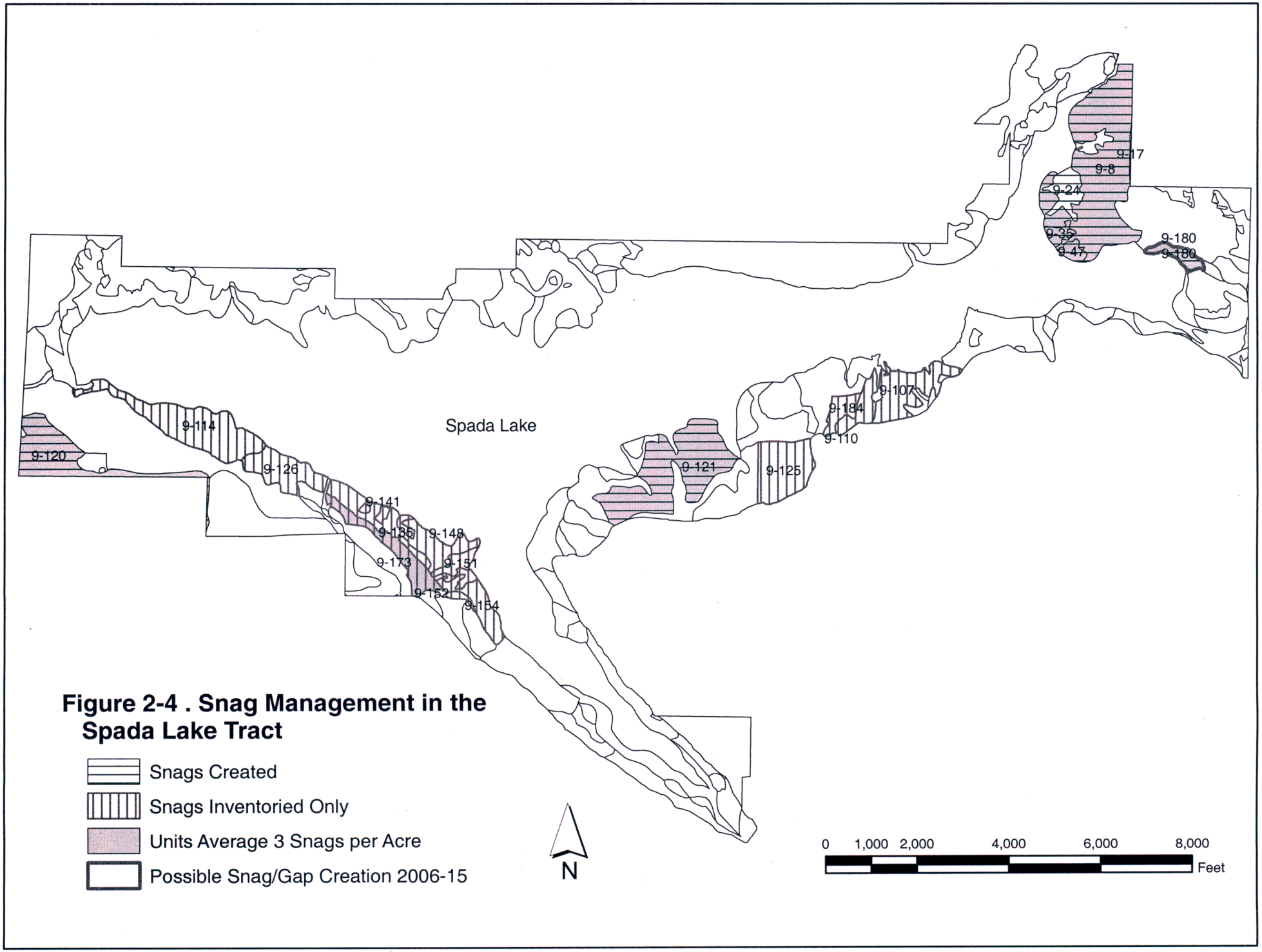


Figure 2-4 . Snag Management in the Spada Lake Tract

- Snags Created
- Snags Inventoried Only
- Units Average 3 Snags per Acre
- Possible Snag/Gap Creation 2006-15

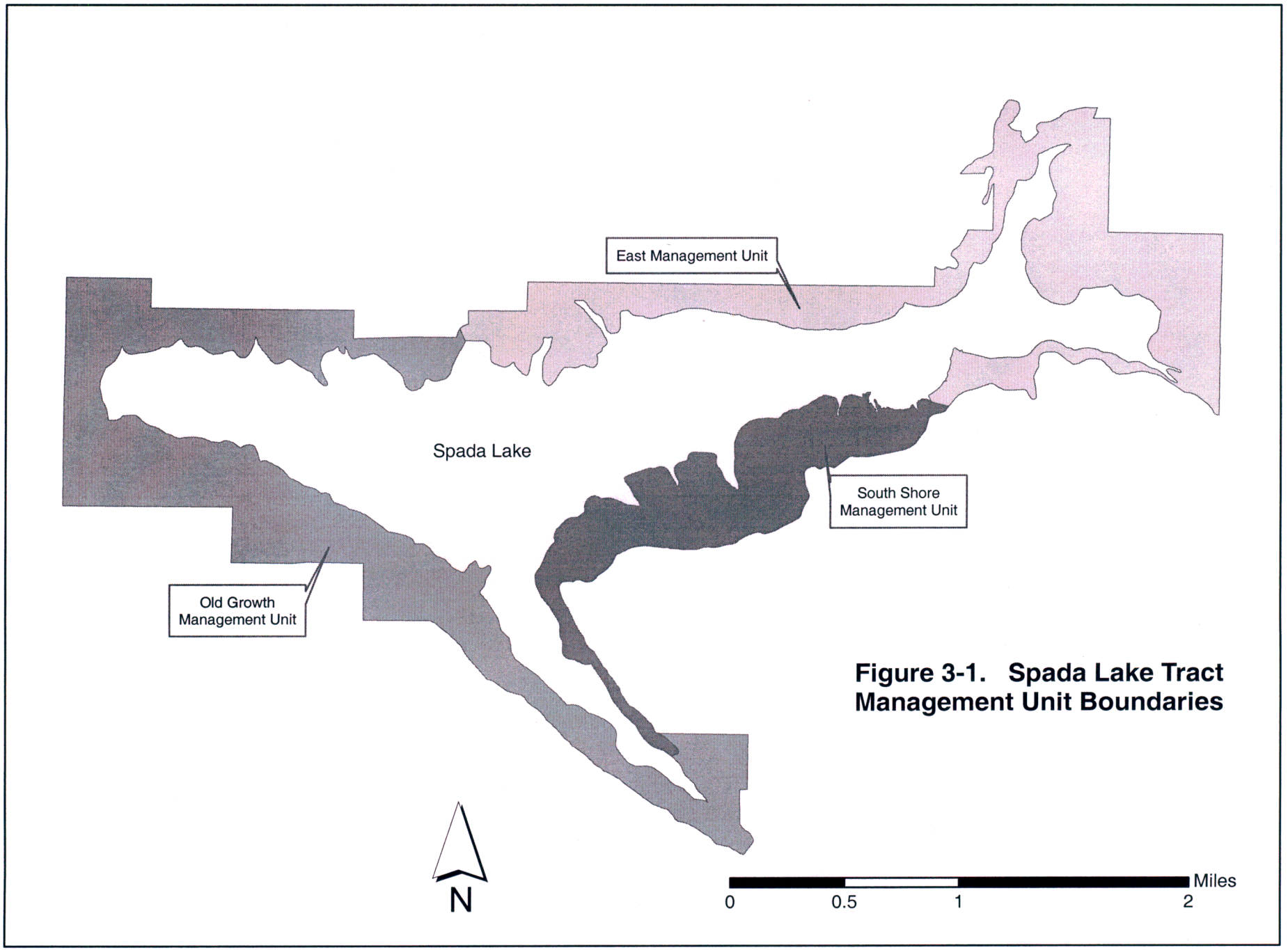


Figure 3-1. Spada Lake Tract Management Unit Boundaries

Important features of such habitat include large diameter trees, snags, CWD, a multi-layer canopy, and a well-developed heterogeneous understory (Franklin and Spies 1991a). Such structure may enhance habitat for a variety of flora and fauna not commonly found in dense homogeneous structures typical of younger forest stands (Franklin and Spies 1991a, 1991b, Carey 1996)

Management will consolidate the relatively small patches of old growth by incorporating all of the second growth and mixed forest stands adjacent to the old growth patches. This strategy will promote and improve old growth habitat and provide an aesthetic buffer between the reservoir and the road. The second growth coniferous forest stands will be allowed to mature and will be managed to promote old growth characteristics. Snags and coarse woody debris will be inventoried and new snags and logs will be created (Figure 2-4) dependent on opportunity and priority as identified by inventory. Existing mixed forest characteristics will be retained for as long as feasible, using measures such as thinning, and snag and coarse woody debris creation (See Sections 5.8 and 5.9). The high-quality wetland at the northeast corner of this unit will be protected as described in Section 5.6.

Coniferous forest will be managed for forest interior species by means of promoting a multi-storied canopy with snags and coarse woody debris. Precommercial thinning may be conducted on the stands shown in Figure 2-3 and as described in the stand prescriptions in Section 6.0. Additionally, gap creation may be used to manage these earlier-successional stands. Portions of the stands currently labeled as closed-canopy sapling/pole coniferous forest, mixed forest, mosaic, and early successional forest shown in Figure 2-1 could be selectively harvested at some time beyond this ten-year plan. Stands that are in the small sawtimber stage could be managed through commercial thinning and/or gap creation. Factors considered prior to recommending any type of selective harvest would include the potential for promoting old growth characteristics (See Section 5.1).

3.2 EAST MANAGEMENT UNIT

The 693.4-acre East management unit includes a relatively narrow strip of land on the north shore between the reservoir and DNR property, and land surrounding the Williamson Creek and North Fork Arms of the reservoir (Figure 3- 1). Most of the vegetation is small sawtimber, closed- canopy sapling/pole coniferous forest, mosaic, and mixed deciduous/coniferous forest. Management objectives are to retain, promote and protect riparian habitat and mixed forest if feasible and to provide a buffer between the reservoir and adjacent property. The conifer stands will be managed for forest interior species. Management will emphasize limited disturbance in conjunction with management for the Williamson Creek Tract, and forests will be allowed to mature.

Mixed and mosaic forest will be managed as described in Section 5.1.4. Heavy clay soils east of the Williamson Creek Arm may allow for a more stable mixed forest stand condition than in other mixed forests on the Spada Lake Tract. Riparian forest

(Figure 2- 1) will be protected as part of the buffer zones described in Sections 5.3 and 5.5. Snag management and coarse woody debris management will be implemented in areas shown in Figure 2-4. Precommercial thinning in closed-canopy sapling pole coniferous forest, with the option of including gap creation, will be conducted as shown in Figure 2-3. Selective harvest could occur in future ten-year plans as described in Section 5.1 in areas currently identified as closed-canopy sapling/pole coniferous forest and in open-canopy coniferous forest and mixed and deciduous forest. Harvesting of any type would depend on access, soil constraints, and economic feasibility, and probably would be limited to cable yarding systems or helicopter logging.

3.3 SOUTH SHORE MANAGEMENT UNIT

The 390.5-acre South Shore Management Unit consists mostly of small sawtimber, closed-canopy sapling/pole coniferous forest and mixed forest stands (Figure 3- 1). Access still exists from the South Shore Road, allowing for more management flexibility with this unit than in the other management units. Therefore, the management objective for this unit is to produce habitat for species that use earlier forest successional stages. Precommercial and commercial thinning, with or without gap creation, may be conducted as appropriate in early successional stands, closed canopy sapling/pole coniferous forest, and small sawtimber stands in areas shown in Figure 2-3. Additional selective harvest may occur in future ten- year plans, if road access still exists (see Section 4.1.2). Mixed forest characteristics will be retained for as long as feasible, as described in Section 5.1.4.

Several wetlands have been identified and mapped (Figure 2-1) in this management unit, and several other wetlands still await more accurate mapping. These areas will be managed as described in Section 5.5.

4.0 CONSTRAINTS ON HABITAT MANAGEMENT

Information contained in the 1997 Supplement was derived from the Harza study (1995). Many management constraints have since been modified or newly introduced since then, and can be grouped into three categories: Regulatory, Access, and Economic (Hitchcock 2004)

4.1 REGULATORY CONSTRAINTS

Washington Forest Practices Rules (Title 222 WAC) have changed significantly during the past decade in response to new listings under the Endangered Species Act and new research findings regarding aquatic resources and unstable landforms. Several previously recommended management prescriptions are now determined to have potential for substantial impact on the environment and require review under the State Environmental Policy Act (SEPA) when conducted in critical wildlife habitat or on unstable landforms. Other recommended management prescriptions, such as snag creation in riparian core zones, may require development of alternate plans

demonstrating protection of public resources that is at least equal to Washington Forest Practices Rules in overall effectiveness. Furthermore, because creation of snags, canopy gaps, and coarse woody debris by the District and City is likely to cut and/or remove more than 5,000 board feet of timber (including live, dead and down material) in any 12-month period, an approved Forest Practices Application may be required (WAC 222-19-050 (3) (k)).

Following are discussions of specific rule changes relative to Supplement and WHMP management recommendations.

(a) Habitat enhancement methods described in the WHMP (2.1.2) provide for killing of overstory trees in old-growth coniferous forest when necessary to maintain target densities of snags. All of the old-growth stands in the Spada Lake Tract meet the definition (WAC 222-16-010) of “suitable marbled murrelet habitat”. Harvesting in these stands, other than removal of down trees outside of the critical nesting season, is prohibited without SEPA review (WAC 222-16-050 (1) (b)). Furthermore, timber harvesting that leaves less than 75 trees per acre within 300 feet (horizontal distance) of suitable marbled murrelet habitat is also subject to SEPA review. Snag creation in old-growth stands is still legally possible, but will require substantial application effort, including pre-submittal review by representatives of Washington Department of Fish and Wildlife (WDFW). The easy recourse is to exclude old-growth coniferous forests, and the surrounding 300 feet (horizontal distance), from harvesting, road construction, and any other management activity that alters existing vegetation. However, it was determined during the District commercial thinning activity in 2003-4 at the Spada Lake Tract that stands adjacent to old-growth can be thinned in accordance with Forest Practice Rules without triggering SEPA review.

(b) The water typing system is now based on the presence or absence of fish habitat (WAC 222-16-030). “Fish habitat” means habitat, which is used by fish at any life stage at any time of the year including potential habitat likely to be used by fish, which could be recovered by restoration or management and includes off-channel habitat. The effect of this change is that most low-gradient stream segments adjacent to Spada Lake must now be protected as fish habitat waters.

Washington Department of Natural Resources (DNR) is developing permanent fish habitat maps derived from a model designed to identify fish habitat on the basis of geomorphic parameters, but this has not yet been implemented. Interim water typing rules are currently in effect. Table 4-1 shows this water typing system, which took effect on March 1, 2006. Landowners are expected to verify water types before harvest operations, and the DNR has a procedure available for making corrections to the water type maps.

Table 4-1. Water Type Definitions

Permanent Water Typing	Description	Former Corresponding Water Type
Type “S”	Shorelines of the State	Type 1 Water
Type “F”	Fish habitat	Type 2 and 3 Water
Type “Np”	Perennial Non-fish habitat	Type 4 Water
Type “Ns”	Seasonal Non-fish habitat	Type 5 Water

(c) Riparian management zones (RMZ) adjacent to fish habitat waters have increased in width and complexity (WAC 222-30-021). In the Spada Lake Tract, fish habitat RMZ widths are 90, 110, or 140 feet, depending on associated soil site class. No harvest is allowed in the 50-foot “core” zone nearest to the water except for the construction or maintenance of road crossings and creation of yarding corridors. Forest practices within the variable-width “inner” zone must meet stand requirements necessary to achieve “desired future conditions” – a site-specific basal area target at age 140 years. That determination is made by growth model projection which requires a tally, by species and diameter class, of all trees within the core and inner zones.

Spada Lake and other fish habitat stream buffer zones established by the 1997 Supplement and the WHMP are wider than RMZ requirements of Forest Practice Rules. However, the 1997 Supplement and the WHMP allow light thinning and creation of snags and coarse woody debris within the portions of the buffers that are restricted by Forest Practice Rules. For example, snag creation within the “core” zone will require an alternate plan demonstrating protection of public resources that is at least equal to Washington Forest Practices Rules in overall effectiveness. The easy recourse is to prohibit harvesting, road construction, and any other management activity that alters existing vegetation within 140 feet (horizontal distance) of any fish habitat waters. Otherwise, strict attention to Forest Practice Rules must be paid.

(d) Riparian management zones (RMZ) adjacent to perennial non-fish habitat waters are entirely new (WAC 222-30-021). The essence of this rule in regard to the Spada Lake Tract is that at least 50% of the perennial non-fish habitat water length, including the first 500 feet above the confluence with fish habitat waters, must be protected with a 50-foot, no-harvest buffer on each side.

Non-fish habitat stream buffer zones established by the Supplement and the WHMP are wider than RMZ requirements of Forest Practice Rules. However, the 1997 Supplement and the WHMP allow light thinning and creation of snags and coarse woody debris within the portions of the buffers that are restricted by Forest Practice Rules. For example, extensive snag creation within fifty feet of non-fish habitat streams could exceed allowable harvest levels. The easy recourse is to prohibit harvesting, road construction, and any other management activity that alters existing vegetation within 50 feet (horizontal distance) of any non-fish perennial habitat waters. Otherwise, strict attention must be paid to Forest Practice Rules.

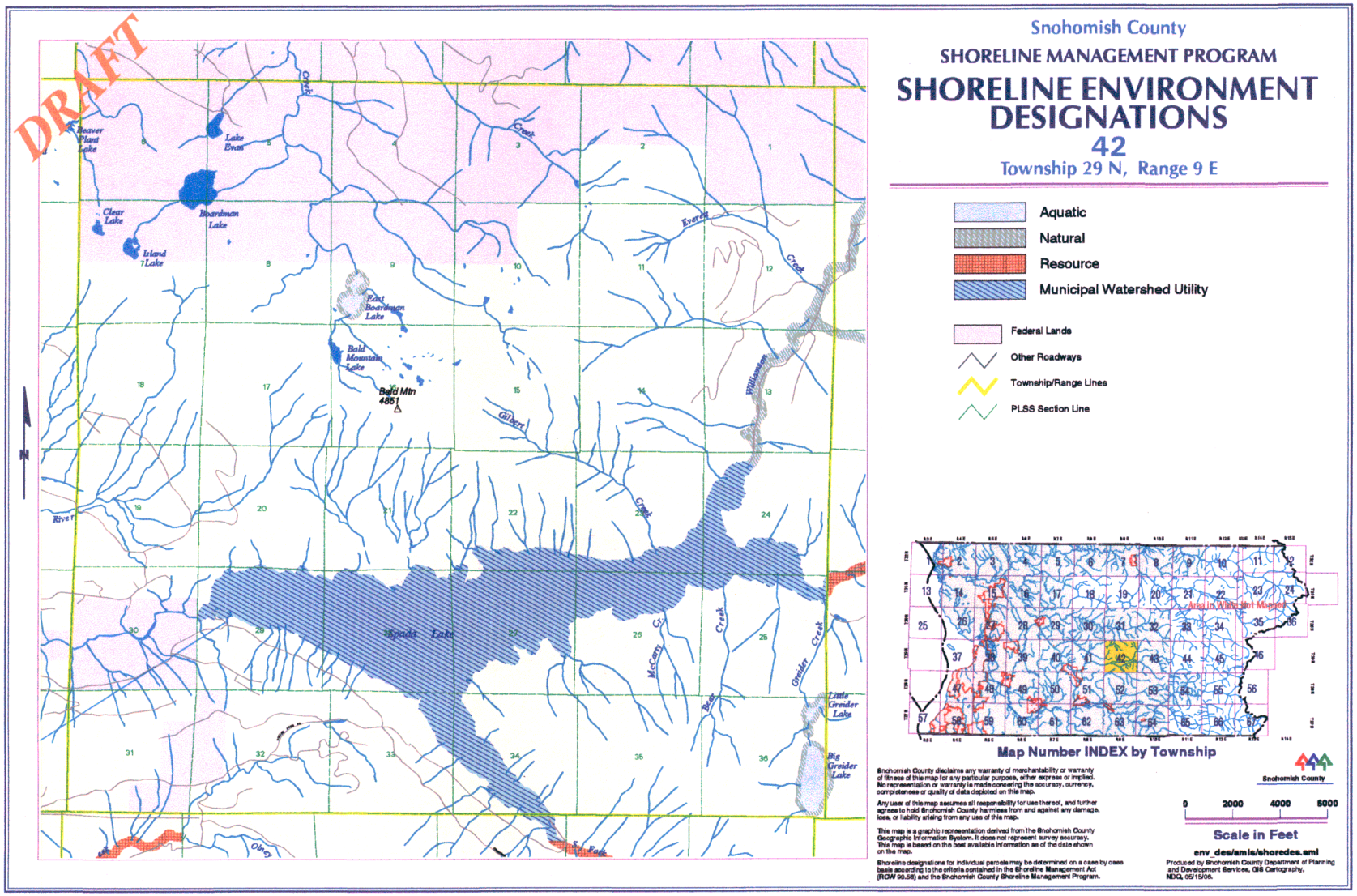
(e) Timber harvest, or construction of roads, landings, gravel pits, rock quarries, or spoil disposal areas, on potentially unstable slopes or landforms, that has the potential to deliver sediment or debris to a public resource or that has the potential to threaten public safety, is prohibited without SEPA review (WAC 222-16-050 (1) (d)). This rule was modified to include threats to public safety and to better describe unstable slopes and landforms. Specifically addressed are inner gorges, convergent headwalls, bedrock hollows, toes of deep-seated landslides, ground water recharge areas for glacial deep-seated landslides, outer edges of meander bends along valley walls or high terraces of an unconfined meandering stream, and any areas containing features indicating the presence of potential slope instability which cumulatively indicate the presence of unstable slopes. Most soils in the Spada Lake Tract derive from unconsolidated sediments, primarily glaciolacustrine deposits and till (Dragovich *et al.* 2002). When occurring on slopes ≥ 30%, Washington Department of Natural Resources Forest Soil Summary Sheets interpret these soils as unstable in their natural state and very unstable when disturbed. Evidence of instability is clearly seen in the inner gorges of streams crossed by the Culmback Dam road and in the slide area located north of the reservoir dam. Heavy rains that fell on October 20, 2003 resulted in damage to the Culmback Dam road in six locations and a failure of the Kromona Mine-to-Market road that nearly slid into Spada Lake. Less obvious are indications of soil movement on gently-sloped lacustrine soils adjacent to Spada Lake along the South Shore road system.

Unstable slopes and landforms are not explicitly addressed by the 1997 Supplement or the WHMP and are only indirectly addressed by the suitability analysis suggested by the Harza (1995) Report. Ultimately, DNR is responsible for slope stability screening and field verification of unstable slopes and landforms. However, to expedite the Forest Practice Application process, all proposals for harvesting, road construction, or any other management activities that alter existing vegetation should be prepared, or reviewed, by someone who has successfully completed a slope stability training session conducted by DNR or other similar organization.

(f) All forest roads must be improved and maintained, or abandoned, according to current Forest Practices standards by the year 2016. Significant among those standards is that structures crossing fish habitat waters must provide fish passage at all life stages and all permanent culverts must be designed to pass the 100-year flood event with consideration for the passage of debris likely to be encountered. The result is that road construction and maintenance costs are significantly increased. Forest landowners are required to prepare a plan and schedule for upgrading and/or abandoning forest roads not in compliance with current standards. The plan (RMAP) prepared by the District was approved by DNR on December 11, 2001. Implementation of the plan thus far includes official abandonment of four inactive spurs of the South Shore road system and upgrading culverts and drainage structures along the Culmback Dam Road.

(g) Snohomish County has proposed an environmental designation for the shoreline of Spada Lake in its draft revised Shoreline Master Program, currently under

Figure 4-1. Snohomish County Shoreline Environment Designations



consideration by the County Planning Commission. In this revised plan, Spada Lake will be designated a "Municipal Watershed Utility Shoreline Environment". As depicted in Figure 4-1 (insert County Shoreline map #42), shorelines of the South Fork and North Fork Sultan River are designated "Resource Shoreline Environment", and Williamson Creek is designated "Natural Shoreline Environment" In those locations, the designated Shoreline Management Zone (SMZ) extends 200 feet from the ordinary high water mark. Timber harvest is permitted in the Municipal

Watershed Utility and Resource Environments, but in the Natural Environment is allowed only when necessary to control fire or prevent an epidemic of insect or disease infestation, or to clean up/restore an area devastated by disaster. Where allowed, timber harvest within the SMZ is limited to 30% of existing merchantable stems in any ten-year period. Any harvests in the SMZ must also be conducted in compliance with Washington Forest Practices Rules, as discussed previously.

Impact of Regulatory Constraints – There are approximately 220 old-growth acres of the Spada Lake Tract which provide suitable habitat for marbled murrelets. Cumulatively, RMZ and SMZ areas cover approximately 385 additional acres of the Spada Lake Tract. Some unstable inner gorge landforms fall within RMZ and SMZ acreage, but many more are associated with seasonal, non-fish habitat streams tributary to Spada Lake. Field observations suggest that inner gorges associated with seasonal, non-fish habitat streams and other associated unstable landforms comprise an estimated 150 additional acres of the Spada Lake Tract. Altogether, the regulatory restrictions discussed above may affect about 40% of the upland acreage in the Spada Lake Tract.

4.2 ACCESS CONSTRAINTS

Many portions of the Spada Lake Tract are no longer accessible by road. Since the Supplement was published, Washington DNR has abandoned the SL-S-6000 road system (including the North Shore road) lying eastward of Recreation Site 8, and other roads that formerly provided vehicle access to Jackson Project lands and facilities (Figure 4-2). Though the District retains easement rights over those road locations, their future use faces substantial economic and environmental hurdles. Consequently, there is now no road access to the Williamson Creek Tract or to approximately 790 acres of the Spada Lake Tract lying along the northern and eastern shores of Spada Lake. Approximately 100 acres of second-growth forest stands in the southwestern corners of the Spada Lake Tract are similarly affected.

Washington DNR has proposed to abandon the entire South Shore road system in two phases, separated by the bridge over the South Fork of the Sultan River and ending at Olney Pass. The DNR has deferred this plan during the relicensing of the Jackson Project, which involves an evaluation of the future needs for this road system. In addition, the Forest Service is considering its road access needs in the area. If the road system is abandoned, no portion of either the South Shore

Figure 4-2. Sultan Basin Road System

ABANDONED
FOOT TRAIL
PAVED
UNPAVED

Gates
Closed
Normally open
Seasonally open

Recreation Sites
Rivers

Landowner
OWNER_NAME
MBS NATIONAL FOREST
DNR
DNR-NRCA
SNOHOMISH PUD
OTHER

Project Location

N

Projection: NAD 1983 StatePlane Washington North

5000 Road
Pilchuck River
Sultan R.
Sultan Basin Rd.
North Shore Rd.
Spada Lake
Culmback Dam Rd.
South Shore Rd.
Williamson Creek
Little Greider Lake
Big Greider Lake
Boulder Lake
South Fork Sultan River
Elk Cr

0 0.5 1 2 Miles

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Management Unit or the East Management Unit will be accessible to commercial harvesting operations after road abandonment. Specifically, the South Shore Management Unit objective of producing habitat for species that use earlier forest successional stages must now be met with vegetation management schemes other than conventional harvesting.

Less than 90 acres of the Spada Lake Tract, lying outside of old-growth stands or riparian management zones, will remain accessible from the Culmback Dam Road. Operable acreage further decreases when the presence of unstable landforms is considered.

4.3. ECONOMIC CONSTRAINTS

Most second-growth stands of timber in the Spada Lake Tract, at or near early commercial thinning age, are comprised largely of western hemlock and Pacific silver fir (collectively "whitewoods"). Prices paid for the small diameter logs typically produced from early commercial thinning operations are strongly linked to pulp market conditions. The pulp market was peaking during preparation of the Harza report (1995) and crashed dramatically after publication. Prices paid for whitewood pulp logs reached $70 per ton in the spring of 1995, plummeted to under $35 per ton by the spring of 1996, and were below $17 per ton in 2004. By 2006, prices rebounded somewhat, but a dramatic return to peak price levels is not expected during the decade covered by the 2006 Supplement.

Lower price levels impact the feasibility of early commercial thinning operations, particularly if ground-based harvesting equipment cannot be employed. Because water quality preservation is the primary management goal, and because nearly all soils in the Spada Lake Tract are derived from unconsolidated glacial sediments, use of cable or helicopter harvesting equipment is mandatory in order to minimize soil disturbance and sediment delivery. The greater costs associated with these harvesting methods serve to economically marginalize early commercial thinning operations. Management prescriptions in this plan (Section 6.) have sufficient flexibility to account for a wide range of economic constraints and opportunities. For the period covered by the 2006 Supplement, commercial thinning proposals are outlined but it must be recognized that their implementation will be limited by economic and other constraints (Section 6.0)

5.0 HABITAT MANAGEMENT OBJECTIVES AND ENHANCEMENT METHODS

5.1 FOREST VEGETATION MANAGEMENT

Forest vegetation management objectives include preservation and enhancement of old growth, riparian and wetland habitats, and the promotion of habitats suited to black-tailed deer, with due regard for other species. In particular, forest stands in the South Shore Management Unit are to be managed with the needs of black-tailed

deer in mind. Research on other black-tailed deer populations (Nyberg 1990) has demonstrated that this species has relatively small home range requirements—usually under 500 acres—and individuals rarely disperse to new ranges even when confronted by habitat degradation. These findings suggest that, to maintain optimal black-tailed deer habitat, vegetation management should ensure that all habitat requirements are provided within areas no larger than home range size.

With regard to vertebrates in general, Carey (2003) describes conservation of biodiversity as the fundamental guiding principle for ecologically sustainable forest management and states that the diversity and structure of vertebrate communities varies consistently in response to complexity of vegetation structure. The WHMP and the Spada Lake Tract Supplemental plans utilize most of the techniques that are currently available to promote diversity of vegetation structure: snag and coarse woody debris creation, variable-density thinning, promotion of mixed species stands, and promotion of multiple canopy layers. Creation of canopy gaps was not widely reported in the literature at the time of the 1997 Supplement, but this technique will be added to the tools used in the 2006 Supplement.

5.1.1 SECOND GROWTH CONIFEROUS FOREST MANAGEMENT

Second growth coniferous forest on the tract currently includes closed-canopy sapling/pole, small sawtimber and large sawtimber coniferous forest (Table 2-2 and Figure 2-1), totaling about 936 acres. Second-growth conifer stands in the Tract that were not thinned under the 1997 Supplement are still significantly overstocked and dense canopy cover has reduced understory forage production. Forage is expected to be a limiting factor for deer for many years, without a reduction of canopy closure.

Management objectives and enhancement methods for second growth coniferous forests include:
1) promotion of forest interior wildlife species via the management for old growth characteristics
2) promotion of early successional and edge species via the enhancement methods described in this section.

Treatment for some stand types consists of a choice between thinning, gap creation, some combination of the two, or not thinning the stand. The following are some factors to consider:

Advantages of "No Treatment":
1. No treatment cost.
2. Slash accumulations will remain low and occur over time.
3. Trees develop with less taper and have fewer and smaller branches which is more desirable for wood quality.
4. No risk of water pollution, soil degradation, etc.

Disadvantages of "No Treatment"
1. Forage production will remain low.
2. Crowns will become smaller and trees will be less responsive to release treatments.
3. Individual tree and stand growth slows until sufficient mortality has occurred to make more growing space available for the remaining live trees.
4. Individual trees and the stand as a whole will become less windfirm.

PRECOMMERCIAL THINNING

The enhancement methods for early successional stands and some closed canopy/sapling stands include precommercial thinning and gap creation. The objectives of precommercial thinning are to open up the highly overstocked stands to improve access by wildlife and to set back the development of a closed canopy stand to permit the growth of understory forage species. Culled trees are left on the ground and haul road access to the stand is not required. Precommercial thinning will be considered where it will be beneficial to wildlife and the stand is reasonably accessible for this activity. Thinning will be performed on the basis of desired spacing, tree vigor, and species preference, with multiple tree species (hardwood and conifers) retained. Most precommercial thinning in sapling/pole stands are prescribed at 14 by 14 foot spacing (220 trees per acre), if it is planned to commercially thin the stand in the future. A heavier thinning to 17 by 17 foot spacing (150 trees per acre) may be considered if feasibility studies show that future commercial thinning should not be done. A higher density, such as 14 by 14 foot spacing (220 trees per acre) is prescribed in sensitive areas (e.g. in the vicinity of unstable slopes), or in early successional stands.

Precommercial thinning should be timed to reduce the amount of slash left as well as to reduce the need for future precommercial thinning. Contract specifications will be designed to protect and provide wildlife movement corridors. See Section 6.0 for detailed stand prescriptions.

COMMERCIAL THINNING

In closed-canopy, mixed forest, mosaic and small sawtimber stands, a selective harvest may be considered, which may include any type of harvest from a light commercial thinning to seed tree cut. Objectives of selective harvest are to open the canopy to allow light to reach the understory to increase forage, increase tree growth rate, maintain tree vigor and species diversity and promote a multi-storied canopy. Detailed stand prescriptions will depend on benefits to wildlife, site conditions (e.g. slope, topography and soil impacts to water quality), access, economic feasibility, water quality protection, and adjacent landowner activities. Small log thinning was performed in 2003-4 on portions of some stands approximately 40 years after the approximate year of stand origin. A more aggressive selective harvest might be performed in the future if road access is available. The prescription should include

retaining many of the large residual trees and some hardwood trees to ensure that a multi-storied and diverse stand develops.

Unit size, location and configuration should be considered on a case by case basis with wildlife management benefits as the primary goal in conjunction with economic feasibility. The maximum harvest unit size should be no more than 40 acres and no part of the unit should be more than 600 feet from thermal cover. The goals of this plan should carry the most weight when considering which method of harvest should be used, and economic gains should not be the overriding factor. Economic feasibility of harvest, however, will be a legitimate factor in determining if various harvesting activities (including thinning) will occur. For technical or economic reasons commercial thinning or overstory harvest may not be feasible in some stands with equipment or methods that are currently available. However, these options should be retained and reexamined in future ten-year plans in the event that reasonable methods do become available.

Green tree retention areas will be required only for units that will be heavily thinned and will be designated for units at the time that tree removal is planned. Green tree areas should be located next to buffer zones or features within the unit that should be protected. The minimum size of green tree retention areas should be 1/4 acre per 5 acres harvested and contain enough trees to ensure that adequate snag trees will be available. If green tree retention areas are thinned an adequate number of replacement snags must be ensured, which may require more than '/4 acre of green tree retention area per 5 acres harvested.

Scheduling of harvest should take into account the status of forests on neighboring properties. Given the configuration of the District's land ownership, the timing of selective harvest in detailed plans beyond this ten-year plan may depend on activities that occur on adjacent lands, so that the objective of an interspersion of forage and cover can be met. Adjacent landowner activities will be considered during the planning and implementation process. Overstory harvest units adjacent to recent clearcuts and possibly to recently thinned units, or to lands scheduled for final harvest in the near future may be undesirable. Rescheduling of harvests should be considered in such situations. Harvest units within the tract will be interspersed to ensure adequate adjacent cover. Contract specifications for reforestation will be developed based on the objective of achieving taxonomically diverse, open and vigorous stands with well developed understory. Douglas-fir should be planted only where site conditions are appropriate. The objectives and treatments for individual stands are described in the silvicultural prescription developed for each stand that will be actively managed. Refer to Section 6.0 for a detailed prescription of proposed treatments for individual stands within the Spada Lake Tract under the 2006 Supplement.

GAP CREATION

Canopy gaps are “holes in the forest caused by trees dying and falling” (Duncan 2002). In the Spada Lake Tract, canopy gaps are created naturally by windthrow, root rot, and wildlife damage. For example, Stand 9-125 exhibits the effect of extensive black bear damage with abundant understory vegetation and multiple canopy layers developing beneath girdled trees. Windthrow resulting from an episode of atypical, winter east winds resulted in small, scattered canopy gaps, examples of which can be seen in Stand 9-162 from the South Shore road system.

Gap creation achieves several habitat objectives. Initially, canopy gaps may permit understory forage vegetation to grow in closed-canopy conifer stands. Canopy gaps that are the product of creating clusters of snags can minimize the quantity of slash and woody debris left on the ground, facilitating access for wildlife. Space and resources are released to surrounding trees, as in thinning, increasing growth rates. Coniferous seedlings may eventually replace understory shrubs and forbs in gaps, becoming hiding/escape cover for deer, and gradually transitioning into another canopy layer in an increasingly complex overstory.

Gap creation in conjunction with thinning of the surrounding stand, or gap creation by itself may be employed in second growth conifer stands. Canopy gaps in conjunction with thinning have been shown in the past decade on Western Oregon study sites to allow the establishment and growth of new species, especially understory vegetation (Beggs 2004, Gray and Spies 1996). Gap size and orientation affect seedling establishment and growth. Seedling mortality, associated with drought stress and high soil surface temperatures, is greatest in the center of large gaps and in portions of gaps where shading from surrounding trees is least. Based on research reports from these areas, it appears that gaps ranging in size from 0.2 to 0.5 acres may accomplish the objectives of increasing growth rates of trees at the edges of gaps, and promoting the establishment of a diverse understory plant assemblage. However, gap sizes exceeding 0.25 acre may increase susceptibility to windthrow (Duncan 2002, Rapp 2002). The ideal size and spacing of gaps for the Spada Lake Tract are not known at present, and for the 2006 Supplemental Plan, gaps will be conservatively spaced 300 feet apart or greater, and will be no larger than 0.25 acre. This spacing will allow additional gaps to be interspersed in the future among the original gaps, or for gap size to be enlarged.

The need for gap creation is greatest in closed-canopy conifer stands where forage and hiding/escape cover is limited. Variable gap size is anticipated and should be guided by site-specific conditions, such as existing shrub pockets. Initially, the area devoted to gaps should be guided by black-tailed deer forage requirements within the context of landscapes equaling home range size. Hiding/escape cover requirements should be considered as conifer regeneration begins to replace understory forage vegetation. Over time, new gaps may be needed to replace lost forage. Gap replacement frequency must be determined through monitoring

because Pacific Northwest forest gaps can remain devoid of tree saplings for 50 years or more after formation (Gray and Spies 1997, Duncan 2002).

5.1.2 EARLY SUCCESSIONAL STANDS:

No stands on the Spada Lake Tract are currently typed as the early successional cover type, and only 19 acres are typed as open-canopy sapling/pole coniferous forest. The open canopy stands will be allowed to mature without treatment under the 2006 Supplemental Plan.

5.1.3 OLD GROWTH FOREST MANAGEMENT

Existing old growth stands in the Spada Lake Tract will be preserved and managed with minimal intervention. Old growth stands will be inventoried over time (See Figure 2.1 and Section 7.0 for stands that will be inventoried during this ten-year plan) to determine if they contain the target densities of snags and coarse woody debris identified in the WHMP and the Standard Operating Procedures for snags and coarse woody debris (District 1997 and 1998).

Stands of second growth mixed and coniferous forest within the Old Growth Management Unit described in Section 3.1 are included with the older stands and managed for old growth characteristics. These younger stands eventually will develop late successional characteristics such as large overstory trees, large snags and coarse woody debris, and multi-layered canopies. A mixture of stands of different densities in close proximity is desirable to provide both adequate thermal cover and forage for wildlife. Expediting this process in second growth stands may require commercial thinning in those stands that are accessible to logging equipment, and/or gap creation.

Stands within the Old Growth Management Unit will be thinned using guidelines that will promote structural and species diversity of the stand. A variable spacing approach is used to create horizontal (spacing) diversity. Vertical spacing diversity is accomplished by retaining trees within all height classes during a treatment, as opposed to thinning from below. Over the long term, vertical spacing is also developed by maintaining a greater mix of fast growing shade intolerant species with slower growing shade tolerant species.

5.1.4 MIXED, MOSAIC AND DECIDUOUS FOREST MANAGEMENT

Many stands typed as mixed deciduous/coniferous forests in the 1997 Supplement were re-typed for the 2006 Supplement as mosaic forest, because the hardwood patches are clumped rather than evenly dispersed through the surrounding coniferous matrix. Understory vegetation in mosaic stands appears to be abundant under the alder patches and these do not require immediate treatment to enhance wildlife forage conditions. Under the closed canopy conifer patches forage is

generally scarce. Due to the clumped and mosaic nature of these stands, conifer patches may need to be evaluated and treated individually. Many patches are adjacent to and/or resemble closed-canopy sapling/pole coniferous forest cover types more closely than the alder patches. Therefore, most of the accessible stands are proposed for treatment in conjunction with nearby closed-canopy sapling/pole coniferous forest stands and small sawtimber stands. The southeast shoreline area (including stand 9-90) is an example of this type of treatment planning, and part of stand 9-108 was commercially thinned in 2004 along with adjacent coniferous stands (9-111).

Mixed and deciduous forests will be managed as specifically described in Section 6.0 of this supplemental plan. Overall objectives are to preserve these stands where feasible, with no clear cutting. Some of these stands are mixed, mosaic or deciduous forests because of moist soils or other edaphic conditions (e.g., riparian) that preclude conifers from becoming dominant and they will remain in this condition with little intervention. Other stands are dominated by alder or a mixture of conifers and alders because they were not replanted with conifers after harvest or they are in an early successional stage and the hardwoods have not yet dropped out. The present condition is only temporary and they will eventually become coniferous stands if left alone.

Some of the stands in this latter condition will be allowed to become coniferous stands and will be managed under the second growth coniferous forest management guidelines or as old growth buffers, depending on their location (See discussions of individual management units under Section 3.0). Preservation of mixed and deciduous forest stands over time will depend on the above mentioned factors and on the practicality and economic feasibility of implementing measures which will preserve them. Management measures may include thinning and gap creation. Selection of trees to be removed may be based on species in order to preserve or promote the hardwood or mixed characteristics of the stand.

Without treatment, the deciduous portions of most of these stands will continue to develop a conifer understory. Conifer patches within the mosaic will develop similarly to the closed-canopy conifer types. The closed-canopy sapling/pole coniferous forest cover type will contribute to conifer understory development in the deciduous areas and succession will eventually produce changes in the overstory composition. Where the conifer understory is developing, such as on dry undisturbed sites, forage will eventually be shaded out after a period of several decades.

5.1.5 DECIDUOUS FOREST:

This cover type is present on about 61 acres of the Spada Lake Tract. Areas within this cover type currently do not require treatment to increase wildlife forage and no treatment is proposed during the period covered by the 2006 Supplement. In the long term these stands may eventually develop a conifer understory, similar to some stands in the Williamson Creek area which currently have a conifer understory. The

exception to this stand development process, is in areas where the water table is inhibiting coniferous vegetation or in riparian areas (such as stand 9-95). Long term objectives for each of these stands should follow the Management Unit objectives with monitoring and future treatments planned accordingly.

5.1.6 UNDERSTORY MANAGEMENT

Understory management will focus on increasing forage production for deer and promoting the development of shrub and herbaceous layers as habitat for smaller animals. This will be accomplished by opening the overstory during thinning and gap creation, protecting desirable forage species during harvest, replanting trees at low densities, and seeding harvested units with grasses and forbs.

5.2 BUFFER ZONE MANAGEMENT

The Snohomish County Shoreline Management Master program governs activities within 200 feet of the ordinary high water mark of Spada Lake. The County has proposed a “Municipal Watershed Utility" designation for the lake, which allows forest practices within certain constraints. The District will be required to apply for a permit under the Master Program for forest practices within the 200 foot shoreline management zone. The Shoreline Management Master Program also governs activities within 200 feet of the ordinary high water mark of the Sultan River. No harvests are proposed in this supplemental plan within the shoreline management zone.

Additionally, Washington Forest Practices rules (Title 222 WAC) govern activities in riparian management zones (RMZ). As described in Section 4.4.1, buffer zones described in this 2006 Supplement are wider than buffer zones provided in the State’s rules.

5.3 SPADA LAKE

On District property a 500 foot buffer zone will be established around Spada Lake and shall be maintained throughout life of the WHMP (2060). The buffer will be measured from the ordinary high water mark. Forest management activities designed to enhance wildlife habitat will be allowed within the Spada Lake buffer following restrictions identified in Volume III of the WHMP and other applicable regulations. The 500 foot buffer zone will be kept in a forested condition with a canopy closure of 60-70% or greater. Access to the lake for wildlife will be maintained. Ground-based yarding systems should not be used in the 500 foot buffer zone. To reduce the input of debris into the lake, there will be a 100 foot no-cutting zone around the lakeshore, measured from the ordinary high water mark. Snags and coarse woody debris may be created in this zone. New road construction or reconstruction is permitted if there are no adverse water quality impacts. Nest boxes or platforms may be placed in the Spada Lake buffer zone if the habitat appears suitable.

5.4 STREAMS

Buffer zones will be established around streams and rivers on the Spada Lake Tract and maintained through the life of the WHMP (through 2060). The objectives and management will be the same as that described in Section 2.2. of the WHMP (p. 2-1 I), except for the changes described in this section.

Streamside buffer zones will be at least 500 feet on District property along either side of Type S waters (Sultan River) at least 200 feet wide along Type F streams and at least 100 feet wide along Type Np and Ns streams (as defined by DNR stream classification system adopted in 2006). Buffer zones may be wider on steep gradients and/or unstable soils or between roads and streams where a larger buffer would be needed to adequately protect the stream or other significant habitat values. Management activities in buffer zones must be planned on a case-by-case basis.

Light thinning and creation of snags and coarse woody debris will be allowed to enhance wildlife habitat in stream buffer zones, provided that no slash may be left in streams, or above a stream such that it could eventually fall into the stream. Any thinning in buffer zones must be done with advice from a qualified forester regarding the integrity of the remaining overstory trees. Yarding of trees or logs through Type N buffer zones is discouraged; however, a narrow corridor may be designated that minimizes damage to buffer zone retention trees. Ground-based yarding systems should not be used in buffer zones. Some buffer zones around high- gradient streams may require restrictions on any felling of trees. Streamside buffer zones will be monitored as described in Section 6.2.

Nest boxes or platforms may be placed in buffer zones if the habitat appears to be suitable.

5.5 WETLANDS AND WETLAND BUFFER ZONE MANAGEMENT

Buffer zone requirements are determined by the Washington Forest Practices Manual for forest practices activities or the Snohomish County Critical Areas Regulations (SCC 30.62) for activities requiring County permits. Washington Forest Practice rules distinguish between forested and non-forested wetlands. No buffers are required on forested wetlands and timber harvesting is allowed provided low impact methods are used. Snohomish County critical areas regulations are much more restrictive in this regard.

Management of wetlands under the Spada Lake Tract Supplemental Plan consists primarily of designating appropriate buffer zones around them and prohibiting most activities within them. Activities to be prohibited within the wetlands include felling or yarding of trees (except for felling to create coarse woody debris), damage or removal of any native or desirable brushy or herbaceous vegetation, disturbance of beaver dams, construction of drainage channels, culverts, roads, foot trails, placement of fill material, etc. Vegetation management, i.e. removal of trees or other

plants, may be done with the objective of maintaining a diverse native wetland plant community. If revegetation work is performed in wetlands, only native, non-invasive species should be planted. The DNR's non-native wetland plant species list will be consulted for this purpose (DNR 1993, as updated). Planning should be coordinated with the City of Everett Public Works Department water quality staff to ensure that no compromise to water quality in Spada Lake would result.

Activities to be prohibited in wetland buffer zones are similar, except thinning of trees might occur to improve wildlife habitat. Snag and coarse woody debris creation may occur in these areas. Nest boxes and platforms may be placed in wetlands and their buffer zones if the habitat appears to be suitable. Recreational activities should not be encouraged within wetlands or their buffer zones. Specifically, no hiking trails or fishing access points should be placed in these areas.

Buffer zones will be established around open water wetlands on the Spada Lake Tract at a minimum to current Forest Practices standards. Smaller open water wetlands should also have buffer zones, unless it would be disadvantageous to wildlife to do so, for example, if there is a high probability of blow down. Buffer zones should be maintained through the life of the WHMP (2060). The objectives and management will be the same as that described in Section 2.2. of the WHMP (p. 2-1 I), except for the changes described in this section.

The buffer zone for the wetland north of Spada Lake (Stand 9-85; Figure 2-1), will be 500 feet wide on District property. Other wetlands located on the South Shore and East Management Units (Figure 2-1) will have appropriate buffer zones determined prior to any forest vegetation management activities. At a minimum, Forest Practices Board rules will apply to the wetlands, but District biologists will consider whether additional protection is warranted, on a case-by-case basis, by evaluating the wetland’s functional value, including habitat quality, water quality, hydrology, operational feasibility and the specific site conditions. Significant wetlands were evaluated on the Spada Lake Tract during 2004-2006 using the Washington State Wetland Functional Rating System (Hruby 2004). Results available at the time of this Supplemental Plan are in Appendix 2.

The size of buffer zones around wetlands not identified or mapped at the time this plan was prepared, including forested wetlands, will depend on the functional value, as described in the paragraph above. In general, the goal in forested wetlands is to protect the wetlands by not cutting trees, running equipment or yarding logs through the area, and in all cases the wetlands will receive at least the minimum protection required under the Forest Practices Board rules. These wetlands will be examined on a case-by-case basis to determine whether protection beyond Forest Practices rules is needed. The District's wildlife biologists will determine the appropriate wetland buffer zone size as wetlands are discovered during field work or when forest vegetation management is considered. Wetlands and their adjacent buffer zones will be monitored as described in Section 6.2 and 6.3 of this supplement.

5.6 UNIQUE WILDLIFE HABITATS

Unique wildlife habitats of Federally and State listed threatened, endangered, or candidate or priority species will be protected under this supplemental plan. Examples of these habitats will include, but not be limited to nesting or den sites, talus, cliffs, important wildlife movement corridors, communal roost sites and regularly used perches and foraging areas. Artificial features, such as osprey nest platforms, will be included under this provision. Forest practices and other habitat management activities will allow suitable buffer zones around unique habitat features, as determined by current guidelines available from the U.S. Fish and Wildlife Service, the Washington Department of Fish and Wildlife, the scientific literature, and the District biologist's knowledge of the specific site. Restrictions on activities in the vicinity of these sites during critical seasons should be imposed in order to reduce disturbance to wildlife species. Details of this prescription will be determined for each stand in which management activities are proposed, as part of stand layout.

5.7 SNAG MANAGEMENT

Snag management objectives and methods will be the same as described in the WHMP, Section 2.3 (pp. 2-12 through 2-15) and the Snag Management Standard Operating Procedures (District 1997). Exceptions and clarifications are described herein.

Table 2.2 in the WHMP provides minimums for number of snags per acre, diameter and heights. In practice, when selecting snags the mean or larger of diameter classes should be targeted and snags should be made as tall as possible. Smaller snags will not be substituted for larger snags, but instead trees will be allowed to grow to provide larger snags in the future. If sufficient large trees are not available to meet target densities, then fewer snags may be provided, and the attempt should be made to remedy the deficit at the time of the next snag inventory. Exceptions to this rule will occur in stands scheduled for precommercial or commercial thinning during the current planning period where large bear-damaged trees are present. At the time of setup for the thinning, bear-damaged trees with little current or future commercial value may be retained as snags. Such trees should not be used to calculate stand density or spacing of retention trees. The number of bear-damaged trees to be dedicated to snag creation will have to be determined as each unit is set up for harvest.

Opportunities for snag creation on the Spada Tract lands will be limited for several decades because most of the forest stands are too young to contain many suitable large trees. During the period covered by the 1997 Supplement, snags were inventoried in some forest stands (Figure 2-4) and new snags were created in selected areas, following the guidelines in the WHMP and in the WHMP annual reports. Priority was given to areas that will not be harvested, stands that have been

previously thinned and areas that have the best potential for benefits to wildlife if snags are created.

The focus of snag management activity for the present 10-year plan is stands accessible from the south Shore road because it is possible that the DNR will abandon this road during this period. Inventories and snag creation in stands not scheduled in this ten-year plan will be conducted during future ten-year plans until all mitigation lands are eventually included in the snag management program.

5.8 COARSE WOODY DEBRIS MANAGEMENT

Opportunities to manage coarse woody debris (CWD) on the Spada Tract lands are dependent on forest stand condition and age, and will increase as forest stands mature. CWD logs were not inventoried during implementation of the 1997 Supplement because most trees fell below the threshold size used on WHMP lands (16" diameter at large end). It is expected that opportunities for coarse woody debris creation will be very limited in second-growth stands during the first few decades of this supplemental plan. Inventories and coarse woody debris creation in stands not scheduled for this ten-year plan will be conducted during the future ten-year plans until all mitigation lands are eventually included in the coarse woody debris management program. Management objectives and methods for coarse woody debris in stands which will be harvested are the same as described in the WHMP, Section 2.4 (pp. 2-16 through 2-17) and the Coarse Woody Debris Management Standard Operating Procedures (District 1998). Exceptions and clarifications are specified herein.

The number of logs left after harvest will depend on the type and method of harvest with a goal of leaving 6 to 10 logs per acre from decay class 1 or 2. Logs with a minimum diameter of 24 inches and minimum length of 20 feet will be left. If logs of that size do not exist, the largest size trees in the unit may be used to create coarse woody debris (without compromising snag trees), unless the District's wildlife biologists determine that another course of action would be better for wildlife. The desirability of leaving large live trees for the future stand will be considered. Logs may be selected from individual trees or several logs may be selected from the same trees(s) to achieve the target density.

5.9 NEST BOXES

Duck nest boxes and floating nest platforms that were placed during the 1990s-mid-2000s were rarely been used by waterfowl on the Spada Lake Tract, apparently because habitat/forage conditions do not support many breeding birds. Therefore, no expansion of the waterfowl nesting management program is planned for the 2006-2015 planning period. As the existing boxes and platforms are damaged or deteriorate, we will decide whether to repair or replace them, and nest box designs that benefit other cavity-nesting species that are more abundant on the tract will be substituted for duck nest boxes.

5.10 ROADS

Precommercial thinning on Spada Lake Tract stands will be conducted using the existing road system; no reconstruction is proposed to assist this activity. The District commercially thinned portions of several stands in 2003/4 without road construction after determining that the costs of road reconstruction and new construction were much greater than the value of the timber in these stands. This decision does not preclude future construction or reconstruction of roads and landings, if the decision is made to harvest merchantable timber in the future, especially if timber prices increase. If the District decides to construct or reconstruct roads or landings, they should be located and designed by a qualified forestry professional (i.e. a forester or forest engineer who has successfully completed a slope stability training session conducted by DNR or other similar organization), with input from a soil scientist as needed. The District's wildlife biologists and City staff will participate in the planning and the forest engineer and biologists will oversee the construction to insure that wildlife habitat values are protected and that proper construction techniques designed to protect water quality are used. Permanent roads constructed or reconstructed for forest management activities will be gated to restrict public access by vehicles, and will be properly maintained or abandoned and documented in the District's RMAP. Spur roads that will not be used in the future will be abandoned upon completion of use. New road construction and landing construction will not occur on soils that are rated as "very unstable" for slope stability when disturbed and rated "severe" under "road construction, cut slope, fill and sidecast hazard" (DNR, Forest Management Division, undated). Extreme care must be taken for any reconstruction and maintenance of existing roads located on the above-listed soil classifications.

5.11 LOGGING SYSTEM CONSTRAINTS

The most significant effect of forest management activities on soils and water quality in the Spada Lake Tract is the potential for increased soil erosion. Exposure of the soil to rain through the removal of vegetative cover or road construction can lead to an increase in sedimentation of lakes and streams if appropriate management practices are not followed. The DNR soils maps will be field -verified by a soils scientist as part of the feasibility study for each stand. Where the soils appear to be suitable for forest practices, the potential for increased sediment production can be reduced by implementing appropriate practices during road construction and logging and the selection of the appropriate logging system for the site. These include, but are not limited to the following:

5.11.1 GROUND-BASED LOGGING

Ground-based logging systems such as but not limited to tractor skidders, rubber tire skidders, and shovel yarders, can cause disturbance to the soil via displacement,

compaction, puddling, erosion, channeling of surface water, and disturbance of understory vegetation which exposes the soil to direct rain and surface runoff.

Ground-based logging should not be conducted during periods when the soils are wet or on slopes which exceed 20 percent for extended distances. Shovel yarding should maintain a mat of slash under the machine tracks to reduce soil disturbance and compaction. In general, due to the sensitivity of the soils in the Spada Lake Tract to disturbance, ground based logging systems should only be used on sites (soils) where it can be documented that soil erosion potential is equal to or less than a cable or aerial logging system. There should be no ground based logging within buffer zones.

5.11.2 CABLE LOGGING

Cable logging systems including hi-lead and skyline yarding systems, may be more suitable on most stands in the Tract. Since the movement of this equipment is very time consuming, the operators try to maximize the number of logs that can be yarded along a single cable corridor. This results in many logs being dragged across the same path creating a disturbance similar to a plowed furrow. On slopes, this cleared path concentrates surface runoff and increases soil erosion. Soil erosion from these corridors also reduces the productivity of the site for growing trees. Soil erosion can be minimized by using the appropriate logging system and best management practices (BMP's). Skyline cable systems that provide full suspension of the logs while yarding can reduce soil disturbance. Full suspension can not be achieved in all terrain conditions, however; and must be evaluated during sale layout. The termination of yarding corridors in close proximity to streams should be avoided to reduce direct sedimentation. The amount of downhill yarding, which can concentrate surface runoff at the road and landing, should be minimized. Whole tree yarding, by dragging the tree tops and branches and suspending the stem of the tree, can be used to reduce the impact and protect the soil during yarding.

5.11.3 HELICOPTER LOGGING

Yarding of hand-felled trees by helicopter will be explored as an alternative to ground-based or cable yarding systems in stands where road access, slope stability and soils are significant concerns. Helicopter logging would eliminate the need for road construction, however; a suitable landing with road access must be available in reasonable proximity to make this method cost effective. Helicopter logging across Spada Lake may pose a risk to water quality; the chief concern would be the impact of a helicopter falling into the lake.

5.12 COORDINATION WITH OTHER LAND USES ON DISTRICT LAND

Protection of water quality and wildlife habitat quality have the highest priority on land management covered by this supplement. Recreation needs that are part of the District’s FERC license obligation will also have a high priority. Other uses of

wildlife mitigation lands are generally not encouraged, but alterations may be allowed with proper coordination in planning and construction. Some examples of other land uses include clearing of trees for scenic overlooks, and waste sites for road repair spoils. The District's wildlife biologists with assistance from City staff, will participate in site selection, planning and construction of these and other such features to ensure that wildlife habitat values and water quality are not comprised.

Management adjacent to recreation sites will include consideration of aesthetics and fire danger associated with those areas. Precommercial thinning and harvesting may be allowed up to the recreation sites, but abatement, reduction, or isolation measures may be required pursuant to WAC 332-24-380 through 385. Additional measures such as piling or chipping and removal of debris may be required immediately adjacent to recreation sites to preserve the viewshed.

6.0 MANAGEMENT PRESCRIPTIONS

The selection of stands for treatment under the 2006 Supplement has taken into consideration the existing stand conditions, silvicultural options, wildlife habitat, soils, water quality, logging, engineering, and transportation access. The availability of forage, access, and stand density were used to identify stands that would benefit from treatment. If forage was available in low amounts and/or in a state of decline, these stands were given a higher priority. If the stand had no forage and the tree diameters were too large to precommercially thin, or too small to commercially thin (economically), the stand was given a lower priority. Potential impacts to water quality and slope stability were considered, as was the likely status of the road system in the future.

The stands recommended for the most immediate treatment include those that fall within the closed canopy sapling/pole conifer, and small sawtimber cover types, and were not treated under the 1997 Supplement. They currently have high stand densities, contain remnants of understory forage, and have the greatest potential for habitat improvement. These stands have been grouped into treatment areas based upon cover type, current condition, and treatment type. They have been proposed for treatment based upon evaluation of stand characteristics, potential for forage improvement, water quality, and economic feasibility. The treatments are intended for the upland forested portions of the areas described and not for wetland or stream areas. The management and designation of wetland and stream buffer areas will be identified during the field layout portion of implementing proposed treatments. Buffers for these areas will be based on the type of stream or wetland present and its value for water quality protection and wildlife habitat. The location of stands proposed for treatment is shown in Figure 2-3.

Long-term management objectives of most young closed canopy coniferous forest stands would be accomplished if short-term treatment plans are completed. Past neglect of young conifer stands within the Spada Lake Tract has created a condition where immediate treatment is more beneficial to long term objectives than delaying

treatment. Stand conditions are unlikely to improve within the next 40-70 years if left untreated. The potential to meet objectives such as snag recruitment and creating late successional stand characteristics is also reduced without treatment. Some stands recommended for initial treatment beyond 10 years are not expected to show significant improvement if treated sooner, for example, stands that received precommercial treatment during the 1996-2005 management period may be commercially treated under a future supplemental plan.

Stand management prescriptions are provided through the year 2015 for this ten-year plan, subject to constraints described in Section 4. Specific prescriptions will change in future ten-year plans, but the basic objectives of management on these units will remain the same, unless it is determined through the Jackson Project relicensing process, or by the District's biologists in conjunction with the wildlife agencies and the City of Everett that a different course of action would be more beneficial to wildlife and the protection of water quality.

Implementation of future activities will depend on approval of subsequent ten-year plans. The result of future field reconnaissance and management planning may indicate that some stands scheduled for treatment in this supplemental plan should be treated differently, or not at all. Prescriptions developed for this plan are subject to change.

Prescriptions are organized by management unit and are intended to be used in conjunction with information provided in other sections of this plan, particularly the enhancement measures in Section 5.0.

6.1 OLD GROWTH MANAGEMENT UNIT

Stand #:	9-36, 37, 38, 42, 64, 67, 79	**Stand Review:**	Detailed, Visual, and Aerial Photo	**Unit:**	Old Growth
Acres:	195.7	**Year of Origin:**	1960-67	**Site Index:**	WH 80-110
Objectives:	1. Preserve and enhance old growth. 2. Allow second growth stands to mature and manage to promote old growth characteristics. 3. Consolidate old growth patches by incorporating second growth mixed/mosaic forest stands.				
Cover Type:	Closed-canopy sapling/pole (9-38) and small-sawtimber (9-36, 37, and 64) coniferous forest; remainder all mosaic or mixed deciduous/coniferous forest				
Description:	Stand 9-38 resembles the Type 1 CS cover type. A late precommercial thinning was conducted in the 9-36 and 9-37 in 2002, accelerating the transition from the closed-canopy sapling/pole stand condition to small sawtimber.				
Understory:	Various species and amounts depending on canopy closure				
Special Features:					
Stand Objectives:	Increase species diversity and diameter growth. Promote forage species, and multi-storied canopy. Retain alder composition within stand where feasible.				
Constraints:	Slope stability concerns				
Access:	Walk in from P-5000 Road and North Shore Road				
Silvicultural Recommendations:	No timber management is proposed for the slide area north of the reservoir dam. Create snags and gaps according to WHMP guidelines for snags and black-tailed deer forage. Review necessity and opportunity for additional, larger snags and gaps in 10-20 years after initial treatment in order to maintain forage production and provide hiding/escape cover.				
Schedule:					
2006-2010					
2011-2015	Create snags/gaps as determined necessary by review. Monitoring				

Stand #:	162, 168 and 169	**Stand Review:**	Detailed, Visual, and Aerial Photo	**Unit:**	Old Growth
Acres:	32.7	**Year of Origin:**	1960-67	**Site Index:**	WH 80-110
Objectives:	1. Preserve and enhance old growth. 2. Allow second growth stands to mature and manage to promote old growth characteristics. 3. Consolidate old growth patches by incorporating second growth mixed/mosaic forest stands. 4. Provide wildlife habitat and aesthetic buffer between reservoir and the road.				
Cover Type:	Closed-canopy coniferous (9-168), mosaic or mixed deciduous/coniferous forest (9-162, 9-169)				
Description:	Stand 9-168 is similar to mosaic stands, but contains insufficient deciduous cover.				
Understory:	Various species and amounts depending on canopy closure				
Special Features:	Adjacent to old-growth forest				
Stand Objectives:	Increase species diversity and diameter growth. Promote forage species, and multi-storied canopy. Retain alder composition within stand where feasible.				
Constraints:	Slope stability concerns				
Access:	South Shore road				
Silvicultural Recommendations:	Create snags and gaps according to WHMP guidelines for snags and black-tailed deer forage. Review necessity and opportunity for additional, larger snags and gaps in 10-20 years after initial treatment in order to maintain forage production and provide hiding/escape cover.				
Schedule:					
2006-2010	Create snags/gaps in 9-162, 168 and 169 before South Shore road closure.				
2011-2015	Create snags/gaps elsewhere as determined necessary by review.				

Stand #:	9-80	**Stand Review:**	Visual, Aerial Photo	**Unit:**	Old Growth
Acres:	33	**Year of Origin:**	1960-67	**Site Index:**	tbd
Objectives:	1. Allow second growth stands to mature and manage to promote old growth characteristics.				
Cover Type:	Small sawtimber coniferous forest				
Description:	Precommercially thinned prior to late 1980's, except for 2+ acre unthinned patch adjacent to wetland. Understory is scarce.				
Understory:	Vine maple, huckleberry				
Special Features:	Wetland (9-85) in center of the stand.				
Stand Objectives:	Increase species diversity and diameter growth. Promote forage species, and multi-storied canopy.				
Constraints:	Wetland buffer and shoreline buffer				
Access:	Abandoned. Access by boat.				
Silvicultural Recommendations:	Consider precommercial thinning of patch adjacent to wetland. Snag-gap creation				
Schedule:					
2006-2010	Create snags/gaps. Consider late precommercial thinning				
2011-2015	Monitoring				

Stand #:	9-120	**Stand Review:**	Detailed, Visual, and Aerial Photo	**Unit:**	Old Growth
Acres:	41	**Year of Origin:**	1960-67	**Site Index:**	WH 100
Objectives:	1. Allow second growth stands to mature and manage to promote old growth characteristics. 2. Consolidate old growth patches by incorporating second growth mixed/mosaic forest stands.				
Cover Type:	Small sawtimber				
Description:	Overstocked (450 tpa) stand of 65% western hemlock, 15% Douglas-fir, 15% Pacific silver fir, and 5% red alder. Tree diameters range from 7 to 17 inches dbh. Stand was precommercially thinned approximately 1985. Average stand crown closure 90%. Understory forage sparse throughout stand. Cedar pockets present.				
Understory:	Huckleberry, vine maple, deer fern, forbs				
Special Features:	Adjacent to old-growth forest				
Stand Objectives:	Increase species diversity and diameter growth. Promote forage species, and multi-storied canopy. Retain alder composition within stand where feasible.				
Constraints:	High gradient streams must be protected with buffer zones				
Access:	Reconstruct access road.				
Silvicultural Recommendations:	If economic conditions permit, consider commercial thinning with gap creation on 16 acres identified by Hitchcock (2001)				
Schedule:					
2006-2010	Create snags/gaps. Consider commercial thinning.				
2011-2015	Monitoring				

Stand #:	9-127,133 and 149	**Stand Review:**	Aerial Photo	**Unit:**	Old Growth
Acres:	46	**Year of Origin:**	≈1989	**Site Index:**	WH 90
Objectives:		1. Allow second growth stands to mature and manage to promote old growth characteristics. 2. Consolidate old growth patches by incorporating second growth mixed/mosaic forest stands.			
Cover Type:		Closed-canopy sapling/pole coniferous forest			
Description:		This cover type has transitioned from an early successional stand condition to a closed-canopy sapling/pole most resembling the Type 2 CS cover type. Average canopy closure is approaching 85%. Forage is present and can be maintained with timely precommercial thinning.			
Understory:		Unknown			
Special Features:		Adjacent to old-growth forest			
Stand Objectives:		Reduce western hemlock species composition			
Constraints:		Contract crews will need to walk uphill into these stands from the lower elevation roads. Cut trees must be placed on the ground to ensure rapid decomposition and minimize hindrance of animal movement.			
Access:		Abandoned – would need to re-open the SL-P-5811 and SL-W-3010 roads for future commercial thinning.			
Silvicultural Recommendations:		No timber management is proposed in the areas of slope failure of 9-133. Elsewhere, precommercial thin to reduce stocking to ≤ 220 trees per acre (14-foot by 14-foot average spacing), employing variable density thinning techniques. Western red cedar should be retained to provide future structural diversity. Commercial thinning, utilizing cable yarding equipment, may be conducted approximately 30 years after initial treatment in order to maintain forage production. Similarly, canopy gaps may be created without the necessity of road construction.			
Schedule:					
2006-2010		Consider precommercial thin in 9-133. Otherwise, snag/gap creation.			
2011-2015		Consider recommercial thin in 9-127, 149. Monitoring			

Stand #:	9-135, 148, 151, 152	**Stand Review:**	Detailed, aerial photo, visual	**Unit:**	Old Growth
Acres:	46	**Year of Origin:**	≈1960s	**Site Index:**	WH 90
Objectives:	1. Allow second growth stands to mature and manage to promote old growth characteristics. 2. Consolidate old growth patches by incorporating second growth mixed/mosaic forest stands. 3. Provide wildlife habitat and aesthetic buffer between reservoir and the road.				
Cover Type:	Primarily small sawtimber with closed-canopy sapling/pole.				
Description:	In areas not commercially thinned in 2003, stands are overstocked. The stands consist primarily of western hemlock and Douglas-fir, with small amounts of western red cedar, and Pacific silver fir (less than 15 percent). Pockets of deciduous trees are present. Little forage is present except within openings or under the deciduous canopy.				
Understory:	Huckleberry, salmonberry, devils club, *Rubus spp,* sword fern				
Special Features:	Adjacent to old-growth forest; marbled murrelet habitat				
Stand Objectives:	Increase species diversity and diameter growth. Promote forage species, and multi-storied canopy. Retain alder composition within stand where feasible.				
Constraints:	Road reconstruction, marbled murrelet seasonal restrictions, slope stability. Shoreline BZ.				
Access:	Old road contains several switchbacks leading downslope to stands that were not thinned in 2003.				
Silvicultural Recommendations:	If economically and environmentally feasible to reconstruct old road, consider commercial thinning of portions not harvested from South Shore Road in 2003 (9-135, 148). Snag/gap creation with or without commercial thinning				
Schedule:					
2006-2010	Create snags/gaps. Consider commercial thinning				
2011-2015	Monitoring				

6.2 EAST MANAGEMENT UNIT

Stand #:	9-48	**Stand Review:**	Detailed	**Unit:**	East
Acres:	112	**Year of Origin:**	1960	**Site Index:**	WH 110
Objectives:		1. Retain a buffer between the reservoir and the adjacent property. 2. Retain existing mixed forest characteristics for as long as feasible. 3. Manage conifer stand for forest interior species.			
Cover Type:		Closed-canopy sapling/pole coniferous forest			
Description:		This cover type has transitioned from closed-canopy sapling/pole to the small-sawtimber stand condition. More than125 merchantable Douglas-fir trees per acre, ranging in diameter from 8-24 inches, comprise about 60% of stand stocking. Average canopy closure is 90%. Forage species are present in the understory but dying out due to overstory cover. The upper elevation consists of dense small diameter trees (6-8 inch diameters) while the mid to lower elevation consists of small to large sawtimber- size trees with a suppressed understory.			
Understory:		Huckleberry, salmonberry, thimbleberry, devil's club, swordfern			
Special Features:		Shoreline along south boundary of stand. Large cedar historically within stand.			
Stand Objectives:		Promote old growth structure, species diversity			
Constraints:		500-foot shoreline buffer zone. Steep slope and loose erosive soils in this area indicate that road construction could be a significant source of sediment to Spada Lake.			
Access:		Abandoned – reconstruction is not justified environmentally or economically			
Silvicultural Recommendations:		Helicopter harvest is potentially feasible, provided that clumps of high-value Douglas-fir are targeted. Logs would be flown to Site 3 and trucked over the South Shore system. Harvest objective would be to create canopy gaps, up to ¼ acre, at mid to lower elevations with the expectation that understory forage and structural complexity would increase in response.			
Schedule:					
2006-2010		Commercial gap harvest by helicopter yarding to South Shore road.			
2011-2015		Monitoring			

Stand #:	9-90	**Stand Review:**	Visual	**Unit:**	East
Acres:	33	**Year of Origin:**	1960	**Site Index:**	WH 110
Objectives:	1. Retain a buffer between the reservoir and the adjacent property. 2. Retain existing mixed forest characteristics for as long as feasible. 3. Manage conifer stand for forest interior species.				
Cover Type:	Mosaic deciduous/coniferous forest				
Description:	The conifer patches in this mosaic resemble the Type 1 CS cover type with average canopy cover exceeding 90%. Forage is present in the deciduous patches and generally absent elsewhere. Stem diameters range from 6-10 inches in the conifer patches. Suppression mortality is ongoing in densely-stocked conifer patches.				
Understory:	Sword fern, vine maple, salmonberry, huckleberry – all sparse within conifer patches.				
Special Features:	Shoreline along north boundary of stand				
Stand Objectives:	Increase stem diameters for future creation of large-diameter snags				
Constraints:	500-foot shoreline buffer zone				
Access:	Main road				
Silvicultural Recommendations:	Snag/gap creation. Stem size increase can be accelerated with precommercial thinning; however, this would create a large quantity of slash that may pose a fire hazard next to the South Shore Road and Rec. Site 4.				
Schedule:					
2006-2010	Snag/gap creation				
2011-2015	Monitoring				

Stand #:	9-1, 15, 22, 32, 33, 52	**Stand Review:**	Visual and Aerial Photo	**Unit:**	East
Acres:	73.2	**Year of Origin:**	1960	**Site Index:**	WH 80-111
Objectives:	1. Retain a buffer between the reservoir and the adjacent property. 2. Allow second growth stands to mature and manage to promote old growth characteristics. 3. Consolidate old growth patches by incorporating second growth mixed/mosaic forest stands.				
Cover Type:	Closed-canopy sapling/pole (9-1), small-sawtimber (9-32 and 52); remainder all mosaic or mixed deciduous/coniferous forest				
Description:	Coniferous forest stands range from Type 1 CS to Type 2 CS cover type; the later transitioning from ES and OS.				
Understory:	Various species and amounts depending on canopy closure				
Special Features:	9-1 is adjacent to Williamson Creek Old Growth Management Unit. Others are adjacent to Spada Lake shoreline.				
Stand Objectives:	Increase species diversity and diameter growth. Promote forage species, and multi-storied canopy. Retain alder composition within stand where feasible.				
Constraints:	500-foot shoreline buffer zone. 9-1 emphasis on limited disturbance in conjunction with the Williamson Creek Tract.				
Access:	North Shore Road abandoned – reconstruction is not justified environmentally or economically. Access the stands by boat.				
Silvicultural Recommendations:	In 9-1, confine canopy gap creation within upper half of stand. Create snags and gaps according to WHMP guidelines for snags and black-tailed deer forage. Review necessity and opportunity for additional, larger snags and gaps in 10-20 years after initial treatment in order to maintain forage production and provide hiding/escape cover.				
Schedule:					
2006-2010					
2011-2015	Create snags/gaps as determined necessary by review. MMonooMonitoring.				

Stand #:	9- 41, 46, 51, 54, 60, 68, 70, 72, 92	**Stand Review:**	Visual and Aerial Photo	**Unit:**	East
Acres:	102.9	**Year of Origin:**	1960	**Site Index:**	WH 80-111
Objectives:	1. Retain a buffer between the reservoir and the adjacent property. 2. Allow second growth stands to mature and manage to promote old growth characteristics. 3. Consolidate old growth patches by incorporating second growth mixed/mosaic forest stands.				
Cover Type:	Closed-canopy sapling/pole (9-46, 54, 72), and large sawtimber (9-51) coniferous forest; remainder all mosaic or mixed deciduous/coniferous forest				
Description:	Coniferous forest stands range from Type 1 CS to Type 2 CS cover type; the later transitioning from ES and OS. Stand 9-51 was previously mistyped.				
Understory:	Various species and amounts depending on canopy closure				
Special Features:	Several stands are adjacent to Spada Lake shoreline.				
Stand Objectives:	Increase species diversity and diameter growth. Promote forage species, and multi-storied canopy. Retain alder composition within stand where feasible.				
Constraints:	500-foot shoreline buffer zone.				
Access:	North Shore Road abandoned – reconstruction is not justified environmentally or economically. Access stands by boat.				
Silvicultural Recommendations:	Create snags and gaps according to WHMP guidelines for snags and black-tailed deer forage. Review necessity and opportunity for additional, larger snags and gaps in 10-20 years after initial treatment in order to maintain forage production and provide hiding/escape cover.				
Schedule:					
2006-2010	Create snags/gaps in 9-41, 46, 51, 54, 68, 70, 72 and 92 as determined necessary by review.				
2011-2015					

Stand #:	9- 25, 39, 71, 83, 86, 97, 180,186	**Stand Review:**	Visual and Aerial Photo	**Unit:**	East
Acres:	140.7	**Year of Origin:**	1960	**Site Index:**	WH 80-111
Objectives:	1. Retain a buffer between the reservoir and the adjacent property. 2. Allow second growth stands to mature and manage to promote old growth characteristics. 3. Consolidate old growth patches by incorporating second growth mixed/mosaic forest stands. 4. Provide wildlife habitat and aesthetic buffer between reservoir and the road.				
Cover Type:	Closed-canopy sapling/pole (9- 71, 86 and 186), small-sawtimber (9-25); remainder all mosaic or mixed deciduous/coniferous forest				
Description:	Coniferous forest stands range from Type 1 CS to Type 2 CS cover type; the later transitioning from ES and OS.				
Understory:	Various species and amounts depending on canopy closure				
Special Features:	Several stands are adjacent to Spada Lake shoreline.				
Stand Objectives:	Increase species diversity and diameter growth. Promote forage species, and multi-storied canopy. Retain alder composition within stand where feasible.				
Constraints:	500-foot shoreline buffer zone.				
Access:	Access 9-83, 86, 97, 186 from South Shore Road. Access 9-25, 39, 71, 180 by boat.				
Silvicultural Recommendations:	Create snags and gaps according to WHMP guidelines for snags and black-tailed deer forage. Review necessity and opportunity for additional, larger snags and gaps in 10-20 years after initial treatment in order to maintain forage production and provide hiding/escape cover.				
Schedule:					
2006-2010	Create snags/gaps in 9-86, 97 and 186 before South Shore road closure.				
2011-2015	Create snags/gaps in remaining stands as determined necessary by review.				

6.3 SOUTH SHORE MANAGEMENT UNIT

Stand #:	9-144	**Stand Review:**	Visual	**Unit:**	South Shore
Acres:	20	**Year of Origin:**	1960	**Site Index:**	WH 110
Objectives:		1. Manage for early forest successional stages. 2. Retain existing mixed forest characteristics for as long as feasible.			
Cover Type:		Closed-canopy sapling/pole coniferous forest			
Description:		This stand is an anomalous Douglas-fir plantation with characteristics resembling the Type 1 CS cover type. With diameters range from 6-14 inches, this stand is a marginal candidate for commercial thinning. Average canopy closure exceeds 90% and forage is only sparsely present.			
Understory:		Huckleberry, salmonberry, thimbleberry, devil's club, swordfern			
Special Features:		Shoreline along north boundary of stand.			
Stand Objectives:		Promote structural complexity			
Constraints:		500-foot shoreline buffer zone. Steep slopes must be reviewed for presence of potentially unstable landforms.			
Access:		Main road			
Silvicultural Recommendations:		Commercial thinning is potentially feasible, provided that sufficient numbers of chip-n-saw logs can be produced. Reduce stocking to ≤150 trees per acre (17-foot by 17-foot average spacing), employing variable density thinning techniques. Otherwise, precommercial thin by felling or girdling. If felling methods are employed, cut slash into shorter lengths (6-10 feet) to reduce load height and pile in areas of heavy accumulation.			
Schedule:					
2006-2010		Commercial thin by cable yarding methods, if possible, before South Shore road is abandoned. Otherwise, precommercial thin to reduce stocking and encourage understory re-initiation.			
2011-2015		Monitoring			

Stand #:	9-129, 131, 147, 164, 177, 178, and 181	**Stand Review:**	Visual and Aerial Photo	**Unit:**	South Shore
Acres:	59	**Year of Origin:**	1960	**Site Index:**	WH 110
Objectives:		1. Manage for early forest successional stages. 2. Retain existing mixed forest characteristics for as long as feasible.			
Cover Type:		Closed-canopy sapling/pole (9-131 and 177); remainder all mixed deciduous/ coniferous forest.			
Description:		Coniferous forest stands typify Type 2 CS cover type. Precommercial thinning was conducted in part of 9-177 in previous planning period.			
Understory:		Various species and amounts depending on canopy closure			
Special Features:		Stands adjacent to Spada Lake shoreline			
Stand Objectives:		Create conifer snags according to WHMP guidelines.			
Constraints:		500-foot shoreline buffer zone.			
Access:		Main road			
Silvicultural Recommendations:		Create snags according to WHMP guidelines. Review necessity and opportunity for additional, larger snags in 10-20 years after initial treatment in order to maintain and enhance cavity nesting habitat.			
Schedule:					
2006-2010		Create snags before South Shore road closure if deemed necessary by review.			
2011-2015					

Stand #:	9-121	**Stand Review:**	Detailed, Visual	**Unit:**	South Shore
Acres:	74	**Year of Origin:**	1960	**Site Index:**	WH 110
Objectives:					
Cover Type:		Small sawtimber coniferous forest			
Description:		Overstocked in eastern portions that were not commercially thinned in 2004. 20% western hemlock and 80% Pacific silver fir. Little forage is present.			
Understory:		Very sparse			
Special Features:		Shoreline along north boundary of stand.			
Stand Objectives:		Reduce stocking to promote forage production. Promote structural complexity			
Constraints:		500-foot shoreline buffer zone. Rolling topography, lacustrine soils, water crossing, steep grade of old access road.			
Access:		Reconstruct old access road from South Shore Road.			
Silvicultural Recommendations:		Reconsider commercial thinning of eastern half of stand (see Hitchcock 2001 report) if economic and environmental constraints permit. Cable yarding will be required.			
Schedule:					
2006-2010		Commercial thin by cable yarding methods, if possible, before South Shore road is abandoned. Snag/gap creation throughout entire unit.			
2011-2015		Monitoring			

7.0 MONITORING PROGRAM

Monitoring objectives and activities are based on methods described in page 4-1 of the WHMP. Specific procedures will follow the standard operating procedures developed for guiding implementation of the WHMP, and additional procedures will be developed for newer methods such as gap creation.

7.1 FOREST VEGETATION MONITORING

Untreated stands should be briefly evaluated every 10 years to assess stand condition, understory condition, cover type changes and health. Treated stands and a subset of canopy gaps will be monitored annually to determine whether these treatments are accomplishing management objectives. This monitoring will evaluate overstory species diversity and structure, and understory conditions before and after treatment, including the results of thinning and snag/gap creation. Information on changes to stand characteristics due to treatment vs non-treatment should be documented to aid in an adaptive management program. Existing monitoring procedures in the Forest Vegetation Management Standard Operating Procedures (District 1998) will be used and the SOP will be updated to accommodate these objectives. At a minimum, treated stands will have photodocumentation stations established that are revisited annually.

7.2 WETLAND MONITORING

Photo documentation stations will be monitored every three years using procedures described in the Wetland Management SOP (District, in prep.) Additionally, wetlands will be evaluated using the Washington State Wetland Rating System for Western Washington (Hruby 2004).

7.3 SNAG MONITORING

Natural and created snags will be monitored at ten-year intervals to ensure that the snag requirements specified in the WHMP, Table 2.2 are being met. Snag inventory and monitoring methods will be the same as described on pages 4-2 and 4-3 of the WHMP and the Snag Management SOP (District 1998). In addition to the monitoring described in the WHMP, a sample of created snags will be revisited every three years to assess condition and use (see Snag Management SOP).

7.4 NEST BOXES AND PLATFORMS

Nest boxes and platforms will be monitored and maintained as described in the WHMP on pages 4-14 and 4-15, as modified in Section 5.9 of this management plan. The Waterfowl Nest Boxes SOP (District 1998).will be revised to reflect the changes described in Section 5.9.

7.5 REPORTING

Reports on activities conducted under the 2006 Supplement will be prepared and submitted as part of the required reports for the WHMP.

8.0 SCHEDULE

The schedule for implementation and monitoring activities, 2006-2015 will be prepared in the second draft of this document.

Table 8-1. Schedule for Implementation and Monitoring Activities, 2006-2015

	2006-2010		**2011-2015**	
***Implementation Activity*:**	Stands	Acres[1]	Stands	Acres[1]
Precommercial Thinning	9-133	60.0	9-127,149	13.6
Commercial Thinning	9-48, 80, 121, 135, 144, 148	260		
Snag Inventory/Gap Creation	9-41, 46, 51, 54, 68, 70, 72, 80, 86, 90, 92, 97, 121, 129, 131, 135, 147, 148, 162, 164, 168, 169, 177, 178, 181, 186	337.5	9-1, 15, 22, 25, 32, 33, 39, 52, 36, 37, 38, 42, 64, 67, 71, 79, 83,	375.3
Snag Monitoring	Previously treated units (see Sec 2.6.3)	438.5	Previously treated units	tbd
Nest Boxes and Platforms	Monitor annually per Section 5.9	tbd	Monitor annually per Section 5.9	tbd
Forest Stand Monitoring	Previously thinned units (see Sec. 2.6.1 and 2.6.2) plus stands with additional treatments	210	Previously thinned units (see Sec 2.6 and 2.6.2) plus stands with additional treatments	tbd
Wetland Monitoring	Established photo-doc sites	6+	Established photo-doc sites	tbd
Reports	Submitted with annual reports for the WHMP		Submitted with annual reports for the WHMP	
[1]Actual acreage treated may be less due to operational and regulatory constraints, or inadequate tree size/distribution.				

9.0 COST ESTIMATE

Table 9-1. Cost Summary for Implementation Activities, 2006-2015

Activity/Unit	Acres	Net revenue or (cost) 2006 Dollars	Assumptions
Commercial thinning	100	tbd	Cable yarding w/ minor road reconstruction; no helicopter yarding
Precommercial thinning	70	($14,000)	Large tree thinning @$200/acre
Snag/gap creation	600	($75,000)	a) 5 snags/ac @$25/snag
Total Cost		($89,000)	

10.0 REFERENCES

Beggs, L.R. 2004. Vegetation response following thinning in young Douglas-fir forests of western Oregon: Can thinning accelerate development of late-successional structure and composition? M.S. thesis submitted to Oregon State University. Corvallis, OR 95pp.

Carey, Andrew B. 2003. Biocomplexity and restoration of biodiversity in temperate coniferous forest: inducing spatial heterogeneity with variable density thinning. Forestry, Vol. 76, No. 2: 127-136.

Carey, Andrew B. and Robert O. Curtis. 1996. Conservation of biodiversity: a useful paradigm for forest management. Wildlife Society Bulletin 24(4): 610-620.

District and City 1988. Wildlife Habitat Management Plan, Henry M. Jackson Hydroelectric Project, FERC No. 2157. Public Utility District No. 1 of Snohomish county and City of Everett, Washington. 3 volumes. Paging various.

District and City. 1991. Recreation Plan for the Henry M. Jackson Hydroelectric Project, FERC No. 2157. Public Utility District No. 1 of Snohomish County and City of Everett, Washington. 30 pp. plus appendices.

District and City. 1997. Wildlife Habitat Management Plan Supplement for the Spada Lake Tract. Henry M. Jackson Hydroelectric Project, FERC No. 2157. Public Utility District No. 1 of Snohomish County and City of Everett, Washington. 61 pp. plus appendix

Dragovich, J.D., R.L. Logan, H.W. Schasse, T.J. Walsh, W.S. Lingley, Jr., D.K. Norman, W.J. Gerstel, T.J. Lapen, J.E. Schuster, and K.D. Meyers. 2002. Geologic Map of Washington – Northwest Quadrant. Washington Division of Geology and Earth Resources, Geologic Map GM-50.

Duncan, S. 2002. Canopy gaps and dead tree dynamics: poking holes in the forest. PNW Science Findings No. 43. USDA Forest Service, Portland, OR, 6 pp.

Hruby, T. 2004. Washington State Wetland Rating System for Western Washington Revised. Ecology Publ. #04-06-025. Washington State Department of Ecology.

Franklin, J.F. and C.T. Dyrness. 1973. Natural Vegetation of Oregon and Washington. U.S. Forest Service General Tech. Rep. PNW-8. Portland, OR. 417 pp.

Franklin, J.F. and T.A. Spies. 1991a. Composition, function, and structure of old-growth Douglas-fir forest. General Technical Report PNW-GTR-285. USDA Forest Service, Portland, OR.

Franklin, J.F. and T.A. Spies. 1991b. Ecological definitions of old-growth Douglas-fir forests. General Technical Report PNW-GTR-285. USDA Forest Service, Portland, OR.

Gray, Andrew N. and Thomas A. Spies. 1996. Gap size, within-gap position and canopy structure effects on conifer seedling establishment. Journal of Ecology, 84: 635-645.

Harza Northwest, Inc. 1995. Wildlife Habitat Evaluation – Final Report. Report prepared for Public Utility District #1 of Snohomish County, Washington. 72 pp. plus appendices.

Haynes, Richard W., technical coordinator. 2003. An analysis of the timber situation in the United States: 1952 to 2050. General Technical Report PNW-GTR-560. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 254 pp.

Hitchcock, Mark. 2001. Jackson Project Timber Stand Management. Report prepared for Public Utility District #1 of Snohomish County, Washington. 8 pages plus appendices.

Hitchcock, Mark. 2003. Letter to Bernice Tannenbaum, Snohomish P.U.D. #1, summarizing data from exam of stand 9-48. Bow, WA. 2 pages plus map.

Hitchcock, Mark. 2004. Wildlife Habitat Management Plan Supplement Review, Spada Lake Tract. Report prepared for Public Utility District #1 of Snohomish Co., Washington. 31pp.

Rapp, Valerie. 2002. Restoring complexity: second-growth forests and habitat diversity. PNW Science Update Issue No. 1. USDA Forest Service, Portland, OR, 12 pp.

APPENDIX 1

COVER TYPE CHANGES BY STAND

STAND NO.	OLD COVER CODE	OLD ACRES	NEW COVER CODE	NEW ACRES
9-1	CS	24.68	CS	24.68
9-2	MF	15.41	RF	15.41
9-3	OW	0.24		
9-4	MF	0.03		
9-5	RF	1.78	RF	1.78
9-6	OW	0.00		
9-7	OW	1.19	OW	1.46
9-8	MF	106.14	MO	106.85
9-9	ES	0.04		
9-11	SL	5.53	RK	5.53
9-13	SB	0.57	SB	0.57
9-14	OW	1687.62	OW	1717.08
9-15	MF	8.78	MF	8.78
9-16	SL	0.42	SB	0.42
9-17	ES	0.67		
9-18	DF	4.05	DF	4.05
9-19	NV	0.77	DF	0.77
9-20	DF	1.18	DF	1.18
9-21	SL	0.60	DF	0.60
9-22	MF	17.64	MO	17.64
9-23	SL	0.00		
9-24	DF	12.14	DF	12.14
9-25	CS	75.31	SS	75.31
9-26	OS	3.76	OS	3.76
9-27	SB	0.88	SB	0.88
9-28	SB	0.39	SB	0.39
9-30	SB	0.29	SB	0.29
9-31	SB	0.25	SB	0.25
9-32	CS	6.56	SS	6.56
9-33	MF	13.92	MO	13.92
9-34	SB	0.48	SB	0.48
9-35	DF	4.49	DF	4.49
9-36	CS	42.94	SS	42.94
9-37	CS	3.27	SS	3.27
9-38	CS	27.85	CS	27.85
9-39	OS	8.94	CS	8.94
9-40	MF	1.80		
9-41	CS	44.82	MO	47.89
9-42	MF	43.52	MF	43.52
9-43	ES	0.01	ES	0.01
9-44	SB	0.53	SB	0.53
9-45	CS	0.41		
9-46	ES	8.46	CS	8.46
9-47	CS	4.26	SS	4.26
9-48	CS	112.48	SS	112.48

STAND NO.	OLD COVER CODE	OLD ACRES	NEW COVER CODE	NEW ACRES
9-49	SS	0.86		
9-50	NV	0.97	NV	0.97
9-51	SS	8.13	LS	8.13
9-52	CS	1.48	SS	1.48
9-53	SL	0.54	SL	0.54
9-54	CS	3.04	CS	3.04
9-55	SL	0.58	SL	0.58
9-56	OS	6.74	RK	6.85
9-57	SL	0.41	SL	0.41
9-58	SB	2.39	RK	2.39
9-59	OG	6.57	OG	6.57
9-60	MF	1.57	MF	1.57
9-61	SB	0.23		
9-62	CS	0.04		
9-63	NV	1.19	DF	1.46
9-64	CS	32.02	SS	32.02
9-65	OS	0.17	OS	0.17
9-67	MF	36.14	MF	36.14
9-68	MF	6.54	MF	6.54
9-69	MF	18.96	MF	18.96
9-70	CS	20.04	MF	20.04
9-71	CS	17.64	CS	17.70
9-72	CS	3.81	CS	3.81
9-73	NV	6.83	WL	6.83
9-74	OS	1.38	OS	1.38
9-75	SL	0.85	SL	0.85
9-76	GM	0.57	GM	0.57
9-77	GM	0.27	GM	0.27
9-78	ES	0.11		
9-79	DF	2.85	MF	2.85
9-80	CS	32.90	SS	32.90
9-82	MF	0.06		
9-83	MF	11.73	MO	11.73
9-85	WL	2.45	WL	2.45
9-86	MF	6.25	CS	6.25
9-87	NV	3.16	NV	3.16
9-88	DF	3.05	DF	3.05
9-89	SS	4.08	SS	4.08
9-90	MF	31.82	MO	33.42
9-91	MF	2.54	MF	2.54
9-92	MF	3.90	MF	3.90
9-93	SL	3.05	DF	3.05
9-94	MF	5.94	MF	5.94
9-95	DF	18.55	DF	18.55
9-96	RF	5.22	RF	5.22
9-97	MF	2.30	MF	2.30
9-98	OW	1.04	OW	1.04
9-99	NV	10.96	NV	10.96
9-100	OG	11.78	OG	11.78

STAND NO.	OLD COVER CODE	OLD ACRES	NEW COVER CODE	NEW ACRES
9-101	CS	1.60		
9-102	MF	0.36	MF	0.36
9-103	NV	0.50	DF	0.50
9-104	RF	1.87	RF	1.87
9-105	NV	8.56	WL	8.56
9-106	SS	1.38	SS	1.38
9-107	CS	28.46	SS	28.46
9-108	MF	17.72	MO	17.72
9-109	OW	1.62	OW	1.62
9-110	MF	8.39	MF	8.39
9-111	CS	47.72	SS	47.72
9-112	OG	122.34	OG	122.34
9-113	NV	0.55	DF	0.55
9-114	CS	51.31	CS	51.31
9-117	RF	0.93	RF	0.93
9-118	DF	0.62	DF	0.62
9-119	MF	2.75	WL	2.75
9-120	CS	41.38	SS	41.75
9-121	CS	73.86	SS	73.86
9-123	NV	0.37		
9-124	CS	7.79	MF	7.79
9-125	CS	32.92	CS	32.92
9-126	MF	23.71	MO	23.71
9-127	ES	5.07	OS	5.07
9-128	MF	19.17	MF	19.17
9-129	MF	18.71	MF	18.71
9-130	NV	0.30	NV	0.30
9-131	CS	2.98	CS	2.98
9-133	ES	46.08	CS	46.08
9-134	NV	1.33	DF	1.33
9-135	MF	33.27	MO	35.76
9-136	OG	3.91	OG	3.91
9-137	ES	9.07	CS	9.07
9-139	MF	2.98	MF	5.52
9-140	CS	0.93		
9-141	CS	1.56		
9-142	CS	18.83	SS	18.83
9-143	SB	0.44	RK	0.44
9-144	CS	20.39	CS	20.39
9-145	CS	2.29		
9-146	SB	0.25		
9-147	MF	3.09	MF	3.09
9-148	CS	2.92	SS	2.92
9-149	ES	8.49	OS	8.49
9-150	CS	14.74	SS	14.80
9-151	CS	6.39	SS	6.39
9-152	MF	3.94	MF	3.94
9-153	ES	7.58	MF	7.58
9-154	CS	15.47	SS	15.47

STAND NO.	OLD COVER CODE	OLD ACRES	NEW COVER CODE	NEW ACRES
9-155	MF	1.94	MF	1.94
9-156	MF	0.02		
9-157	NV	0.04		
9-158	NV	6.15	NV	6.15
9-160	ES	30.97	CS	30.97
9-161	NV	31.80	OW	
9-162	MF	22.57	MO	24.99
9-163	CS	2.59		
9-164	MF	17.46	MF	17.81
9-165	CS	9.20	MO	15.16
9-166	GM	0.35		
9-167	OG	42.87	OG	42.87
9-168	ES	5.31	CS	5.31
9-169	MF	2.30	MF	2.30
9-170	DF	8.59	DF	8.59
9-171	CS	2.42		
9-172	SB	2.14	SB	2.14
9-173	OG	20.47	OG	20.47
9-174	LS	3.75	LS	3.75
9-175	SS	10.27	SS	10.27
9-176	OG	10.05	OG	10.05
9-177	CS	9.59	CS	9.59
9-178	ES	3.76	MF	3.76
9-179	MF	4.11		
9-180	MF	7.43	MF	7.43
9-181	MF	3.17	MF	3.17
9-182	WL	3.76	WL	3.76
9-183	CS	23.84	SS	23.84
9-184	CS	11.11	SS	11.11
9-185	MF	0.38	MF	0.38
9-186			CS	2.34
9-187			SL	0.74
TOTAL		**3664.10**		**3664.10**

APPENDIX 2

WETLAND RATING FORM SUMMARY

			Washington Wetland Rating System		Cowardin System
Wetland #	**Name/Location**	**Wetland Size**	**Wetland Class**	**Functional Rating**	**Classification**
		(ac.)			
1	South Shore Recreation Site Wetland (west of boat launch)	9.1	Lake fringe	III	lacustrine, littoral, aquatic bed (small portion) and emergent (majority of site), artificially flooded
2	Lost Lake Wetland, edge of lake	25.6	Bog/Depressional	I	palustrine moss-lichen, emergent and broad-leaved evergreen shrub/scrub, and palustrine forested needle-leaved (minor part of site), saturated
3	Lost Lake Tract, SW corner	7.4	Depressional	II	palustrine emergent persistent, and shrub-scrub broad-leaved deciduous, seasonally or semipermanently flooded
4	South Shore Road Wetland (Between Rec. Sites 3 & 4)	2.6	Riverine	I	palustrine emergent, shrub-scrub broad-leaved deciduous and evergreen, and needle-leaved forested, permanently flooded (beaver dam)
5	Chaplain Creek Marsh	47.2	Riverine	I	palustrine aquatic bed, emergent persistent, and palustrine shrub-scrub broad-leaved deciduous, permanently flooded (beaver dam)
6	Williamson Creek Wetland 1, (east of road)	3.7	Depressional	II	palustrine emergent, deciduous shrub-scrub, seasonally flooded, seasonally flowing stream
7	**Williamson Creek arm, South Wetland**	**4.7**	**Lake fringe**	**III**	**lacustrine littoral, aquatic bed (varies with lake level), emergent, broad-leaved decuduous shrub-scrub, artifically flooded**

			Washington Wetland Rating System		Cowardin System
Wetland #	**Name/Location**	**Wetland Size**	**Wetland Class**	**Functional Rating**	**Classification**
8	**North Fork Arm Wetland**	**6.8**	**Lake fringe**	**III**	**lacustrine littoral, aquatic bed (varies with lake level), emergent, broad-leaved decuduous shrub-scrub, broad-leaved decidous forested, artifically flooded**
9	**Upper South Shore Recreation Site Wetland**	**2.9**	**Riverine**	**III**	**palustrine emergent, broad-leaved deciduous shrub-scrub, permanent and seasonally flooded (beaver dam)**
10	**North Shore Wetland**	**3.1**	**Riverine**	**II**	**palustrine aquatic bed, emergent, broad-leaved deciduous shrub-scrub, permanently and seasonally flooded (beaver dam)**
BOLD type indicates wetlands studied in 2005.					