SNOHOMISH COUNTY
PUD
PUBLIC UTILITY DISTRICT NO. 1

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January 31, 1997
PUD 20380

Ms. Lois D. Cashell, Secretary
Federal Energy Regulatory Commission
825 North Capitol Street NE
Washington, D.C. 20426

Dear Ms. Cashell:

RE: Henry M. Jackson Project - FERC No. 2157
Project 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. This detailed plan for management of the Spada Lake Tract above elevation 1460 MSL is submitted as a required supplement to the Wildlife Habitat Management Plan (WHMP) 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 Federal Energy Regulatory Commission (FERC) "Order Approving with Modification Revised Wildlife Habitat Management Plan (issued May 19, 1989)". This supplemental plan has been prepared in cooperation with the U.S. Fish and Wildlife Service (USFWS), the Washington Department of Fish and Wildlife (WDFW), and the Tulalip Tribes. The Washington Department of Natural Resources (DNR) was consulted regarding this plan.

The WHMP proposed detailed management prescriptions for the Spada Lake Tract up to elevation 1460 MSL and proposed to manage lands surrounding Spada Lake for wildlife, if and when they were obtained from the U.S. Forest Service in a pending land exchange. It was stated that detailed plans would be prepared in consultation with the resource agencies upon acquisition and management emphasis would " be for black-tailed deer, with due regard for other species" (page 3-115).

The District/USFS land exchange was completed on February 28, 1991. During the 1990 and 1991 FERC required annual report meetings, the co-licensees and resource agencies agreed to goals for this supplemental plan 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. A preliminary draft supplemental plan was submitted to the resource agencies in March 1994. Following approval to move ahead, a more detailed plan was prepared and presented to the agencies in March 1996. Phone and written comments were obtained from the resource agencies. The resource agencies' comments on the Plan are favorable and supportive (see Supplemental Plan Appendix A).

Therefore, the Jackson Project licensees respectfully request approval by the FERC of the enclosed Spada Lake Tract Supplemental Plan as part of the Project's already approved Wildlife Habitat Management Plan.

Very truly yours,

N. Craig Thompson
Assistant General Manager
Snohomish County PUD No.1

Clair Olivers
Director of Public Works
City of Everett

Enclosures - Original plus 7 duplicate copies of Jackson Project Wildlife Habitat Management Plan Supplement for the Spada Lake Tract.

Distribution List: Charles Klinkenberg, FERC, Portland
Gary Engman, Washington Dept. Fish and Wildlife
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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 1997

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1.0 INTRODUCTION

This detailed plan for management of the Spada Lake Tract above elevation 1460 feet mean sea level (MSL) is submitted as a required supplement to the Wildlife Habitat Management Plan (WHMP) 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 Federal Energy Regulatory Commission (FERC) "Order Approving With Modification Revised Wildlife Habitat Management Plan (issued May 19, 1989)". This supplemental plan has been 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.

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 is covered by the Recreation Plan (District and City, 1991). It was agreed that detailed 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 this supplemental plan. Also, the District obtained approximately 196 acres directly adjacent to Spada Lake from DNR, which will be included in this supplemental plan. The total number of acres for Spada Lake Tract is approximately 3,683. The total number of acres included in this supplemental plan is approximately 1745 (Acreage's are estimates based on various project documents - see Table 2-1 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 this supplemental plan (Section 1.2) and a report outline. Also, it was agreed that specific management prescriptions will be developed for units selected for improvements through the year 2005 and that details will be planned for remaining units in future ten-year plans.

1.2 GOALS OF THE SUPPLEMENTAL PLAN

The goals of this supplemental plan 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 will be 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 4.0, Habitat Management Objectives and Enhancement Methods. Management of these lands must be consistent with the Recreation Plan for Spada Lake (District and City 1991) 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 obtained via State Hwy. 2, the Sultan Basin Road and DNR easement roads. The entire 3,683-acre tract was recently 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 are described in the WHMP. The tract now includes an additional 1,745 acres of upland and wetland for which the co-licensees have prepared detailed management plans and which are the subject of this supplemental plan. Management of vegetation/land below 1,460 feet MSL will be included in this and future ten-year plans, with management of adjacent vegetation/lands when it is logical and appropriate. This management will be 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 Plan.).

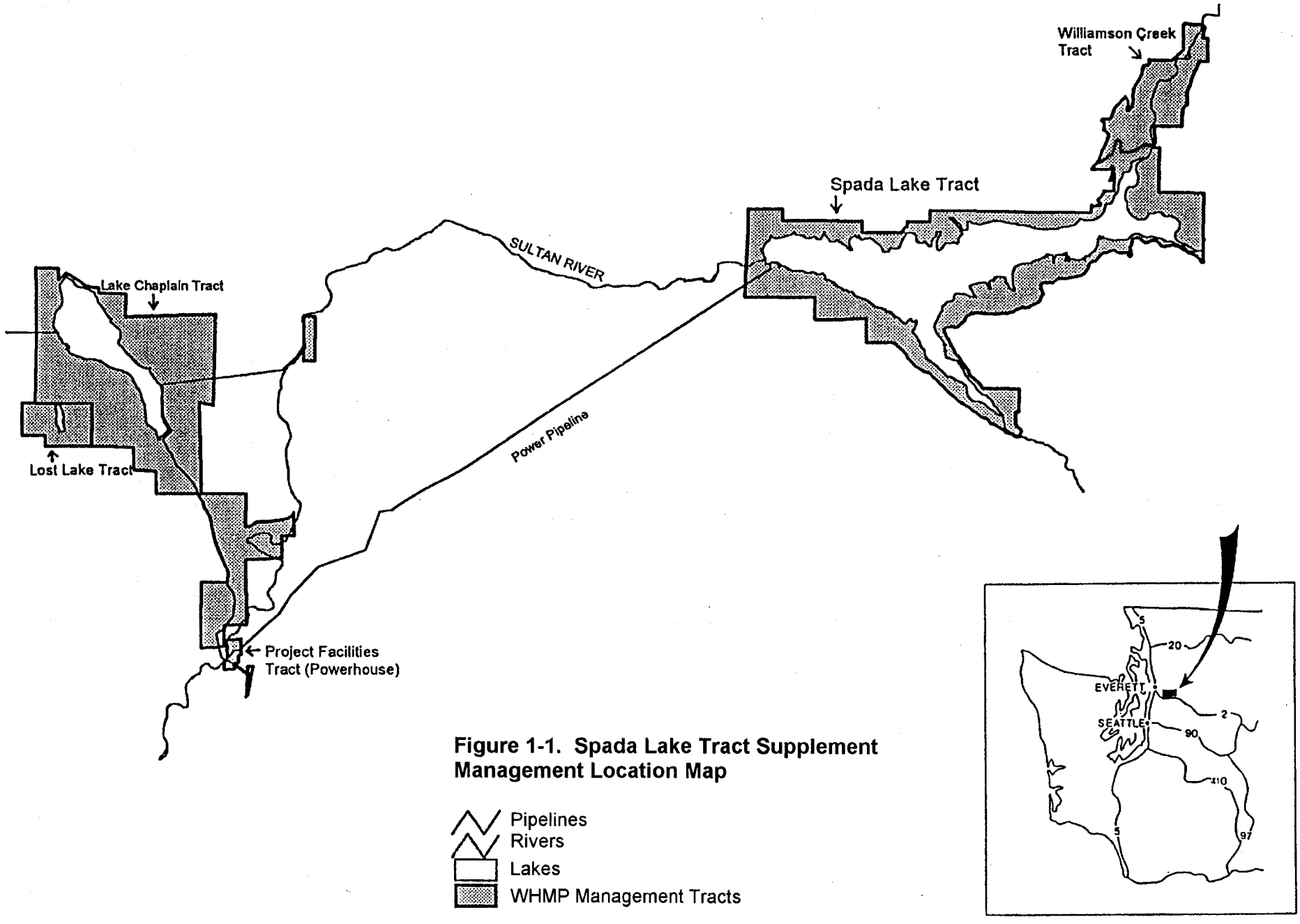

Figure 1-1. Spada Lake Tract Supplement Management Location Map

Pipelines
Rivers
Lakes
WHMP Management Tracts

1.4 APPROACH AND ORGANIZATION

The approach of this supplemental plan is similar to the approach described in the WHMP, Section 1.4. The management area has been divided into management units and detailed prescriptions are described through the year 2005. General objectives are described for management through 2060, the life of the WHMP. Detailed prescriptions will be prepared for ten year periods. Preparation of these ten-year plans will be initiated three years prior to the starting date of implementation. For example, preparation of the plan for 2005-2015 will be initiated in 2002 to insure a smooth transition into implementation.

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. This supplemental plan is designed to do so. The goals of this supplemental plan are clearly 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.

Existing habitat conditions are described in Section 2.0. A summary of the management plan and management unit descriptions are provided in Section 3.0. Habitat management objectives and enhancement methods for the Spada Lake Tract Supplement are described in Section 4.0. Detailed management prescriptions are provided through the year 2005 in Section 5.0. The monitoring program and schedule are described in Section 6.0 and 7.0, respectively. Cost estimates and references are provided in Sections 8.0 and 9.0, respectively. Stand identification numbers for all stands in the management area are shown on Attachment 1 (map pocket).

Sections 5.0, 7.0, and 8.0 will be the sections that will be modified when the new ten-year plans are prepared. Other sections may be modified as needed.

2.0 DESCRIPTION OF EXISTING CONDITIONS

2.1 VEGETATION

Vegetation cover types in the management area and stand numbers mentioned within this ten-year plan are shown in Figure 2-1. 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, Douglas-fir, western red cedar, red alder, bigleaf maple and black cottonwood. Most of the Spada Lake Tract was logged in the early 1960s, and is now dominated by 30 to 40 year old stands of pure conifer, mixed forest and deciduous forest. Existing stands are the result of planting and natural regeneration. There are patches of old growth forest and wetland areas within the tract. A list of existing vegetation cover types and acreage's, as currently mapped, are provided in Table 2-1.

Stands in three cover types - early successional conifer (ES), closed canopy sapling/pole conifer (CS), and mixed forest (MF) - were evaluated for potential future forest management practices (Harza 1995). Visual walk-through exams were used to provide a general description of the stand characteristics, including species composition, size classes, access, and resource-related constraints on management practices. Table 2-2 identifies stands of the three cover types that were described during visual walk-through exams. A summary of observations of these cover types is described in this section. In addition to the stands listed in Table 2-2, one old growth stand was briefly reviewed while accessing adjacent stands. Observation of the old growth stand characteristics and deciduous forest characteristics are also described. Visual exams within the closed canopy sapling/pole conifer cover type suggest that there is a wide variation of stand characteristics within this mapping category. Three types of stands within this cover type were observed and are described separately.

Detailed stand exams, consisting of measurements of stand attributes at sample plots distributed throughout the stand, were conducted on seven of the stands (Table 2-3). Measurements obtained in these stands were then used to calculate growth and yield projections for the stands under different management scenarios, and the results were used to prescribe treatment programs for specific stands, and to develop treatment schedules and cost/revenue estimates (Harza 1995).

Spada Lake

1000 0 1000 2000 3000 4000 5000 Feet

Figure 2-1. Spada Lake Tract Supplement Vegetation Cover Types

ES Early Successional Forest
OS Open-Canopy Sapling/Pole Coniferous Forest
CS Closed-canopy Sapling/Pole Coniferous Forest
SS Small sawtimber Coniferous Forest
OG Old-growth Coniferous Forest
MF Mixed Deciduous/Coniferous Forest
DF Deciduous Forest
RF Riparian Forest
SB Mixed Shrub/Brush
GM Grass/Meadow
WL Wetland
NV Non-Vegetated
SL Slides

TABLE 2-1. EXISTING COVER TYPES AND ACRES[a] WITHIN THE SPADA LAKE TRACT

Cover Type	Cover Type Code	Acres
Early Successional	ES	126
Open-Canopy Sapling/Pole Coniferous Forest	OS	21
Closed Canopy Sapling/Pole Coniferous Forest	CS	884
Small Sawtimber Coniferous Forest	SS	25
Large Sawtimber Coniferous Forest	LS	4
Old Growth	OG	218
Mixed Deciduous/Coniferous Forest	MF	528
Deciduous Forest	DF	55
Riparian Forest	RF	10
Mixed Shrub/Brush	SB	9
Grass/Meadow	GM	1
Wetland	WL	6
Non-Vegetated	NV	73
Slides	SL	12
Subtotal		**1,972**
Open Water	OW	1,692
Total		**3,664**[a]

[a] The acreage's in this table differ slightly from the acres stated in Sections 1.1 and 1.3 because of the various sources of information and different methods used to calculate acreage's over the past 20 years. The figures in this table were calculated using GIS. These will be used in the future and modified as appropriate. Note that total acreage for the Spada Lake Tract identified from historical documents used for Section 1.0 and this table only differ by 19 acres.

TABLE 2-2. VISUAL WALK-THROUGH EXAM UNITS

Stand No.	Cover Type Code	Management Unit
9-001	CS	East
9-008	MF	East
9-025	CS	East
9-032	CS	East
9-071	CS	East
9-080	CS	East
9-090	MF	East
9-036	CS	Old Growth
9-120	CS	Old Growth
9-127	ES	Old Growth
9-133	ES	Old Growth
9-149	ES	Old Growth
9-160	ES	Old Growth
9-107	CS	South Shore
9-111	CS	South Shore
9-121	CS	South Shore
9-137	ES	South Shore
9-153	ES	South Shore

TABLE 2-3. DETAILED STAND EXAM UNITS

Stand No.*	Cover Type Code	Acres	Management Unit
9-025	CS	81	East
9-048	CS	113	East
9-036	CS	46	Old Growth
9-120	CS	35	Old Growth
9-160	ES	31	Old Growth
9-107	CS	45	South Shore
9-108	MF	20	South Shore

* Primary stand number within detailed exam unit.

2.1.1 EARLY SUCCESSIONAL CONIFER

All the early successional (ES) stands observed were adequately stocked with conifer reproduction. The ages of these stands range from 6 to 15 years old. The species mix appeared to be dominated by western hemlock (approx. 50 percent) and Douglas-fir, with equal amounts of Pacific silver fir and western red cedar. The cedar is present probably because of the proximity of the old-growth stands as a seed source. Spacing was mostly clumped with alder and salmonberry present in high disturbance zones. Average crown closure was below 50 percent for all stands, except for stand 9-160, and 9-137 which were approximately 60 percent. Wildlife forage was present in all stands and included huckleberry, salmonberry, and various forb species. Logging left some woody debris in these areas which should remain for another 50 years.

2.1.2 CLOSED CANOPY SAPLING/POLE CONIFER STANDS

Almost all of the closed canopy conifer (CS) stands observed were significantly overstocked. Stand densities ranged from approximately 300 trees per acre in Stand 9-1 to 2,400 trees per acre in Stand 9-38. Many of these stands have an average size which is on the boundary between pole and small sawtimber, approximately 8-10 inches average diameter at breast height (dbh). Many small diameter stems (less than 4 inches dbh), both live and dead, are present in the understory as a result of tree suppression. Stand ages range from 30-35 years, with heights averaging 50-70 feet. The species composition was dominated by western hemlock with Douglas-fir and/or Pacific silver fir. Species dominance appeared 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 was most evident in stands with stem densities exceeding 500 trees per acre. Three separate stand types were observed within this cover type category and are described below. These types are distinguished by the stand density, average diameter, and the amount of understory vegetation present within the stand.

Closed Canopy Sapling/Pole Conifer, Type 1

This type of stand has not been previously thinned and has little to no understory vegetation present. Tree diameters average 6 inches dbh and growth is very slow. Stand densities generally range from 1,000 to 2,000 trees per acre. Diameter growth has slowed significantly within the past 10 years due to over-competition between 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 the old growth harvest.

Closed Canopy Sapling/Pole Conifer, Type 2

This type of stand has been thinned previously, yet crown expansion has resulted in canopy closures 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. Thinnings were estimated to have occurred from 10 to 20 years ago with a residual tree spacing of approximately 8 to 10 feet, although areas within some stands were left untreated. Increment core samples were taken to identify growth trends since stand establishment. Increases in diameter growth occurred immediately after the thinning treatments, but growth has decreased significantly in recent years. Depending on the age of the stand and its spacing, the average stand diameter was classified as either pole or small sawtimber size (approximately 6-10 inches average diameter). Therefore, treatments would be considered either a late precommercial or early commercial thinning. 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. Significant amounts of slash are still present in most stands. Some shrubs, such as vine maple are still present although infrequent.

Closed Canopy Sapling/Pole Conifer, Type 3

This type of stand was thinned 6 to 10 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. We encountered one stand (9-107, on the east side of Recreation Site #3) fitting this description. The stand has a crown closure of approximately 40 percent, with abundant huckleberry, thimbleberry, and salmonberry vegetation present in the understory. There is still abundant slash present on the ground that may hinder movement of deer through the stand. This appears to be an ideal stand density to maintain a good quantity of forage for several decades, although sign of deer browse was not readily apparent.

2.1.3 MIXED FOREST

All stands of this type were a mosaic of deciduous and closed canopy conifer stands. A true mixed stand of conifers growing intermingled with red alder did not occur often. However, some areas had conifer saplings less than 10 feet tall growing beneath the deciduous overstory. This stand type consists mostly of scattered patches of red alder growing adjacent to closed canopy conifer stands. Black cottonwood and bigleaf maple did occur in some areas such as Stand 9-129. The deciduous patches ranged in size from a half-acre to 5 acres, while the minimum 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 forest stands were estimated to be 30-35 years of age.

2.1.4 DECIDUOUS FOREST

This cover type is predominantly found within the East Management Unit with red alder as the dominant tree species. Alder is a relatively short-lived species, maturing at 60-70 years with a maximum age of approximately 100 years. Bigleaf maple was present in some stands but not common throughout the stand. The age of these stands is approximately 30-35 years old. Observed tree sizes ranged from 6-16 inches dbh and 60-80 feet tall. Spacing is fairly uniform and averages 10-15 feet. Conifer regeneration, mostly western hemlock, is present under most stands and ranges from 5-20 feet in height. Understory vegetation consists of thimbleberry, salmonberry, devils club, and huckleberry. The quantity of understory vegetation is greater here than in any of the conifer and mixed forest stands. These stands have a park-like quality, where the overstory trees are widely spaced and the understory shrub vegetation is generally open. Large woody debris (>24 inches) was absent from most stands, although some areas had medium to small (< 24 inches) woody debris.

2.1.5 OLD GROWTH

Formal visual exams were not conducted in these areas, but casual observations identified the following characteristics. The stands consist predominantly of large (> 24 inches dbh) western red cedar and western hemlock. Pacific silver fir and Douglas-fir were not present in the amounts observed in the adjacent younger stands. The overstory trees are widely spaced with forage, regeneration, large (>24 inches) woody debris, and snags abundant within most interior areas. Western red cedar was the most common snag species. There are some areas of dense conifer understory, but these are adjacent to roads or previous harvest units. Some areas mapped within this cover type may be better classified as large sawtimber due to past selective harvest practices which have removed the larger trees.

2.2 RECREATION SITES

Recreation activity on the Spada Lake Tract is limited by water-quality, project facility protection needs, and physical conditions. Day-use areas developed around Spada Lake include picnic areas, boat launches, scenic overlooks, access roads and sanitation facilities. Developed recreation sites are shown in Figure 2-2. Boat launching by the public is allowed only at designated recreation sites.

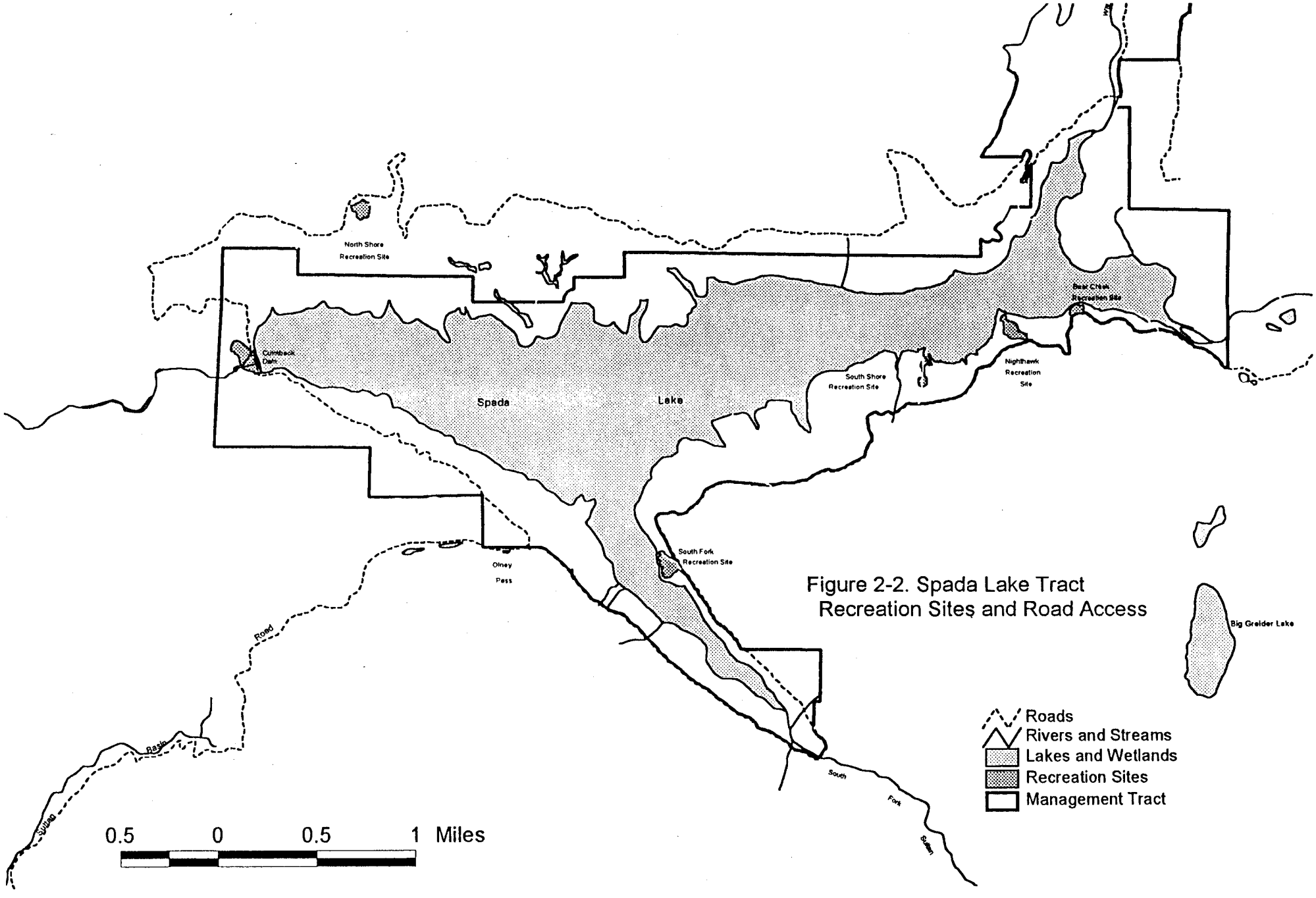

Figure 2-2. Spada Lake Tract
Recreation Sites and Road Access

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 provides access across the South Fork of the Sultan River and forms much of the southern boundary of the Tract. The other fork leads northwest to Culmback Dam, eventually connecting with a road on DNR property slightly north of the northern boundary of the Tract, and leading to the Williamson Creek Tract. These gravel roads are maintained, although it is uncertain at this time whether the road on the north side of the Spada Lake Tract will be maintained in the future. 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

3.0 SUMMARY OF THE MANAGEMENT PLAN AND MANAGEMENT UNIT DESCRIPTIONS

The Spada Lake Tract Lands in this supplemental plan have been divided into three different management units based on vegetation, soils, accessibility and management objectives (Figure 3-1). Snag and coarse woody debris management will be conducted on approximately 587 acres (Figure 3-2) through the year 2005 (See Sections 4.3, 4.4, and 7.0). This first detailed ten-year plan advances precommercial thinning on approximately 464 acres and commercial thinning on approximately 140 acres (Figure 3-3) to improve wildlife habitat. Detailed management objectives, enhancements methods and stand prescriptions are provided in Sections 4.0 and 5.0. A summary of management on each of the three management units follows.

3.1 OLD GROWTH MANAGEMENT UNIT

This unit contains all of the old growth in the Spada Lake Tract (Figure 3-1). The goal for this management unit is to preserve and enhance old growth. Management will consolidate the relativity 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 3-2) 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 Section 4.1.3). The high-quality wetland at the northeast corner of this unit will be protected as described in Section 4.3.

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 will be conducted on the stands shown in Figure 3-3 and as described in the stand prescriptions in Section 5.0. Portions of the stands currently labeled as closed-canopy sapling/pole coniferous forest, mixed forest and early successional forest shown in Figure 2-1 could be selectively harvested at some time beyond this ten-year plan. Factors considered prior to recommending any type of selective harvest would include the potential for promoting old growth characteristics (See Section 4.1.2 of this supplemental plan).

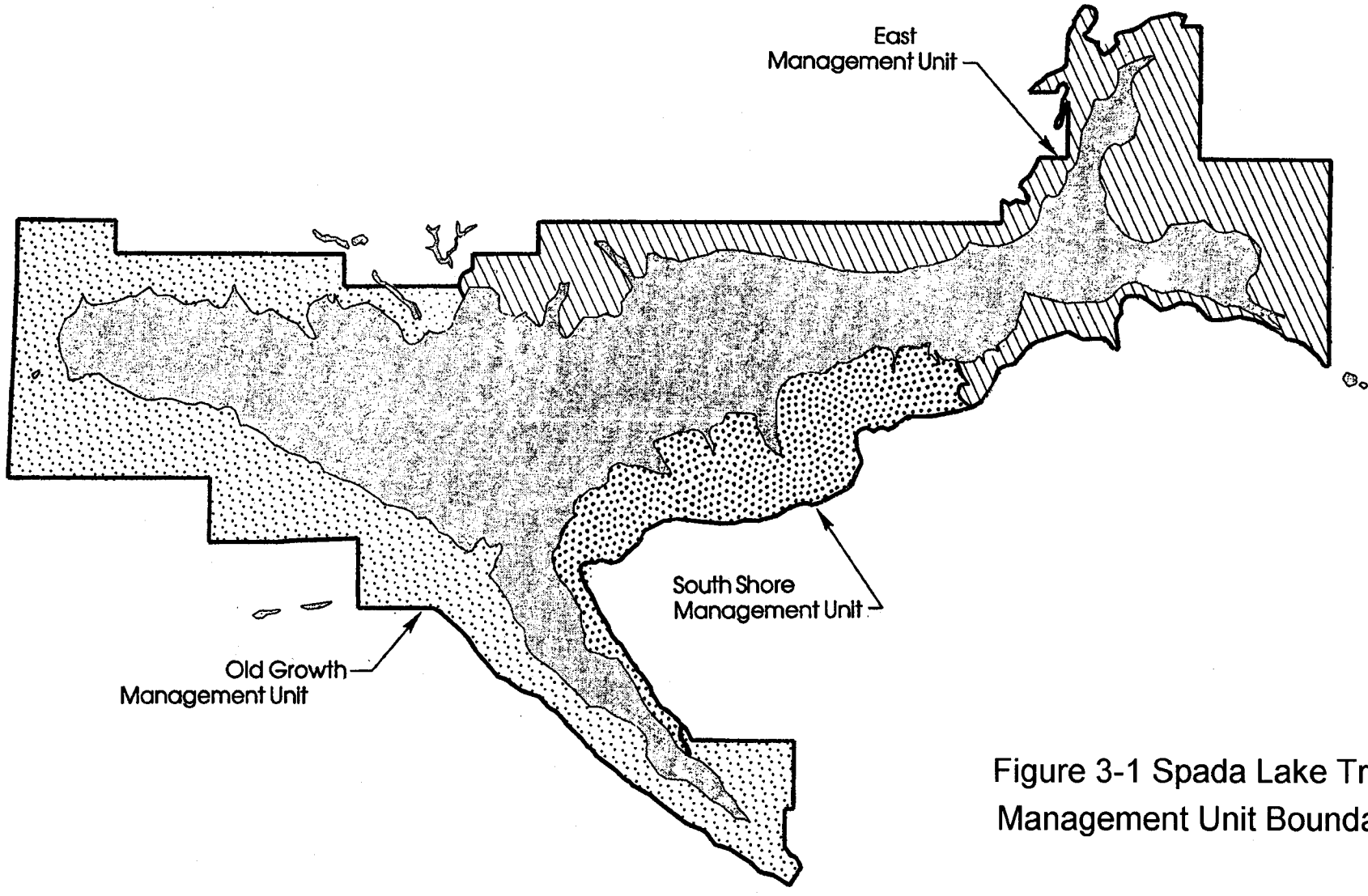

Figure 3-1 Spada Lake Tract
Management Unit Boundaries

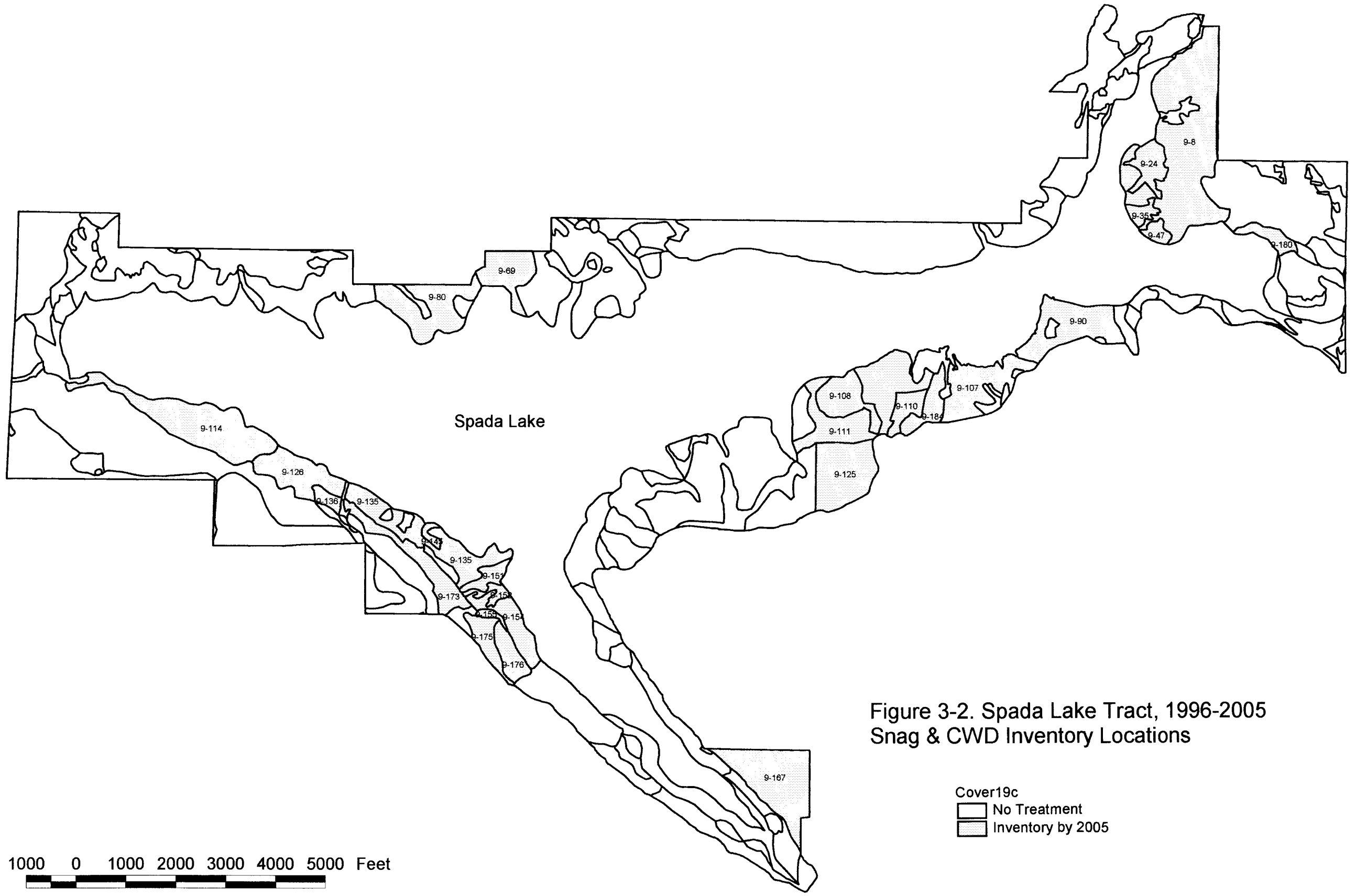

Figure 3-2. Spada Lake Tract, 1996-2005
Snag & CWD Inventory Locations

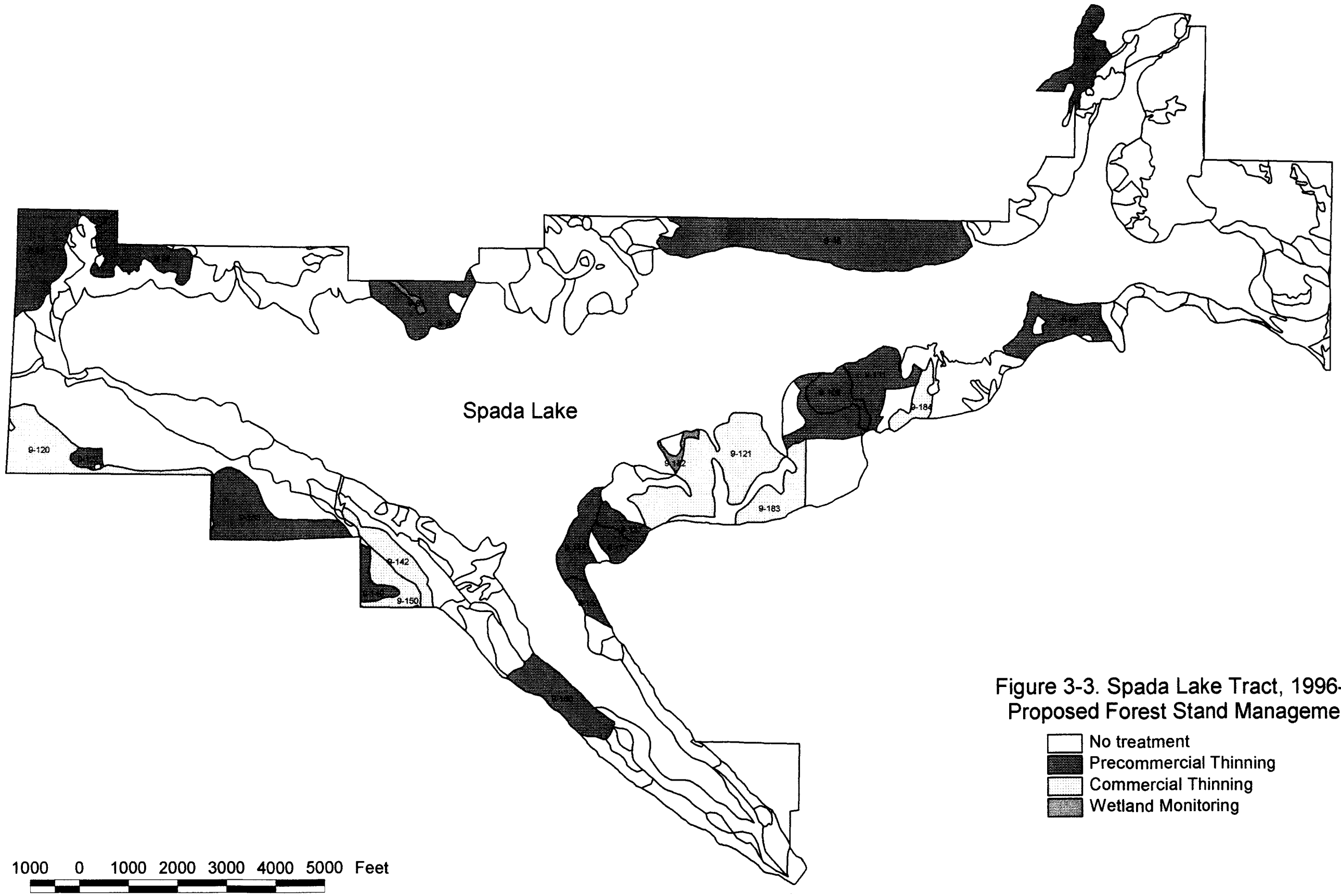

Figure 3-3. Spada Lake Tract, 1996-2005
Proposed Forest Stand Management

- No treatment
- Precommercial Thinning
- Commercial Thinning
- Wetland Monitoring

3.2 EAST MANAGEMENT UNIT

This 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 closed-canopy sapling/pole coniferous forest 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 forest will be managed as described in Section 4.1.3. 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 Section 4.2. Snag management and coarse woody debris management will be implemented in areas shown in Figure 3-2.

Precommercial thinning in closed-canopy sapling/pole coniferous forest will be conducted as shown in Figure 3-3. Selective harvest could occur in future ten-year plans as described in Section 4.1 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 South Shore Management Unit consists mostly of closed-canopy sapling/pole coniferous forest and mixed forest stands (Figure 3-1). Access and the width of land from the road to the reservoir will allow for more management flexibility with this unit than in other units. Therefore, the management objective for this unit will be to produce habitat for species that use earlier forest successional stages.

The desirability of precommercial thinning to enhance stands for deer and other wildlife species was assessed in 1995. Precommercial and commercial thinning in early successional stands and closed canopy sapling/pole coniferous forest will be conducted in areas shown in Figure 3-3. Selective harvest may occur in future ten-year plans as described in Section 4.1.1.

Mixed forest characteristics will be retained for as long as feasible, as described in Section 4.1.3. Mixed forest and closed-canopy sapling/pole stands which appear to have been precommercially thinned are scheduled for snag and coarse woody debris inventories as shown in Figure 3-2.

4.0 HABITAT MANAGEMENT OBJECTIVES & ENHANCEMENT METHODS

4.1 FOREST VEGETATION MANAGEMENT

Objectives and enhancement methods of forest vegetation management in this supplemental plan were selected to meet the plan goals described in Section 1.2. Many of the objectives and enhancement methods are similar to those described in the WHMP, Section 2.1 and the Standard Operating Procedures for the WHMP (in prep). Variations from and clarification of those objectives and management techniques are described in this section.

4.1.1 SECOND GROWTH CONIFEROUS FOREST MANAGEMENT

Second growth coniferous forest on the tract currently includes early successional forest, open canopy sapling/pole, closed-canopy sapling/pole and small saw coniferous forest (Table 2-1 and Figure 2-1). Many of the forested stands in the Spada Lake Tract are very similar in species composition, size class, and density due to past management practices. Second-growth conifer stands in the Tract are significantly overstocked and closed canopies have caused reductions in understory forage production. Forage is expected to be a limiting factor for deer for many years, without a reduction of canopy closure. Silvicultural prescriptions have been developed to manage stands as wildlife habitat by improving forage conditions, among other features.

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 (See Section 4.1.2 of this supplemental plan); and 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 the stand or not thinning it. 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.

The enhancement methods for early successional and edge species will include precommercial thinning and selective harvest. 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 forage species in understory. Selective harvest may include any type of harvest from a light commercial thin to seed tree cut. Objectives of selective harvest may be 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.

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. 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 5.0 for detailed prescriptions.

As second growth stands mature, selective harvest may occur depending 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. Selective harvest (probably a commercial thin) may be performed 45 to 50 years after the approximate year of stand origin. Early commercial (small log) thinning will be considered. A more aggressive selective harvest might be performed 70 years after the year of stand origin. 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 minimum size of green tree retention areas should be ¼ acre per 5 acres harvested and enough trees to ensure that adequate snag trees will be available (See Section 4.5 of this supplemental plan). If green tree retention areas are thinned an adequate number of replacement snags must be ensured, which may require more than ¼ acre of green tree retention area per 5 acres harvested. 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 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.

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 5.0 for a detailed prescription of proposed treatments for individual stands within the Spada Lake Tract.

EARLY SUCCESSIONAL STANDS:

No Treatment

Without treatment the stands would develop in much the same way as the existing untreated closed canopy sapling/pole stands have developed. Once the overstocked portions of these stands attain canopy closure (at around 15-25 years of age, or approximately the next 10 years), diameter growth will begin to slow, crown width and height will begin to decrease, and by age 30 will appear as an overstocked sapling/pole stand. Based upon other examples in the Spada Lake area, forage presence will also start to decline after canopy closure and become sparse by age 30.

Initial Treatment

All early successional stands are scheduled for treatment within the next 5-year period. Treatments should consist of precommercial thinning to maintain an open canopy and to allow continued understory vegetation growth. At this time it does not appear that thinning will create an excessive amount of slash that would need special treatment.

Early successional stands are generally thinned to closer spacing (higher stand densities) than sapling/pole sized stands because younger/smaller trees require less growing space than older/larger trees. A uniform spacing guideline is used for early successional stands that are not within the Old Growth Management Unit (See Section 3.1 and Figure 3-1). This prescription will thin trees from within all canopy levels, although canopy differentiation is not significant in stands this young.

The early successional stands within the Old-Growth Management Unit (Section 3.1 and Figure 3-1) will emphasize treatment options to enhance late successional stand characteristics. This includes multi-species stands with a diverse vertical canopy structure and an understory shrub layer. To attain these characteristics at an earlier age, these thinnings should include species selection criteria, variable density spacing, and thinning proportionally within all height classes. This will help maintain a balance between developing a late successional stand structure and maintaining forage. Species selection criteria should emphasize the retention of cedar throughout the unit to accomplish several objectives. First, it provides an opportunity to enhance vertical canopy structure since cedar is a slow growing shade tolerant tree. It will also help restore the species diversity that existed in the previous old-growth stands. Western hemlock is the most abundant species so it should be thinned more heavily than other species to help maintain a balanced distribution of species through time.

Stands within the South Shore Management Unit (Section 3-3 and Figure 3-1) will differ only in the goal to manage wildlife species that use early forest succession stages. Prescriptions for these stands will identify ways to maintain forage production as the stands grow. The thinning criteria used in the Old Growth Management Unit to achieve a diverse canopy structure, such as proportional height and variable density thinning, may not be applied in the South Shore Management Unit. Instead, thinning will be conducted in a uniform pattern of 14 by 14 foot spacing (220 trees per acre) to allow continued forage production. Specific stand prescriptions are provided in Section 5.0.

Potential Subsequent Treatments

Scheduling of subsequent treatments will require monitoring of the stands as they develop. The treatments referenced above will be followed only by a commercial thinning entry in approximately 30 years depending on the individual site conditions. Future treatments should be scheduled when canopy closure reaches 80 to 90 percent. Stands should be briefly reviewed every 10 years to monitor conditions such as disease, windfall, canopy closure, or general vigor which may influence treatment timing. The ultimate goal is to produce a vigorous, healthy, and biologically diverse stand with ample forage.

CLOSED CANOPY SAPLING/POLE CONIFER:

No Treatment

Under this option, treatment would be delayed allowing natural mortality to thin the stand, and for natural rates of successional change to occur. Change to stand characteristics such as diameter and height growth, and influences to species composition will occur at a much slower rate than if treated. These stands may remain overstocked with little understory vegetation for an additional 50 to 80 years. Forage for deer and other wildlife will remain low and/or decline further for the same time period since crown closure will remain around 100 percent. The development of an overstocked stand and the reduction of tree crown area has several implications on future management options. The ability of the stand to release once thinned and the windfirmness of the stand will be reduced. The windfirmness of a stand may be an important evaluation factor if future commercial thinnings or partial cut treatments are proposed at a later time.

Initial Treatment

As with any treatment, the long and short term management of these sites should be oriented toward meeting the wildlife objectives of the Management Unit. The following discussion describes the general treatments identified for closed canopy sapling/pole stands. Section 5.0 contains the prescriptions and proposed treatments for each of the stands reviewed.

Sapling/pole sized stands are generally thinned to wider spacing (lower stand densities) than early successional stands because older/larger trees require more growing space that younger/smaller trees. A uniform retention tree spacing guideline is used for sapling/pole stands that are not within the Old Growth Management Unit. Since there are many suppressed understory trees in these stands, most treatments emphasize a thinning from below to provide more growing space for the overstory trees.

The level of stocking reduction on the initial entry should be coordinated with management objectives and the scheduling of potential future treatments. If a future commercial entry is not feasible due to management objectives or site constraints, a wide spacing precommercial thinning should be considered for a stand improvement treatment. This will result in temporarily larger slash accumulations, but also has a greater potential to maintain understory forage over a longer time. Because of current stand densities and tree sizes, the opportunity to increase vertical canopy structure is limited until healthy, vigorous understory conifers are present. The potential for sun scalding to occur after treatment is low due to a greater quantity of trees thinned from the understory.

Type 1 Stand: The chance of increasing forage production is likely to be low in the near future in these stand types due to the near or complete absence of understory vegetation at this time. Any treatment would create significant amounts of slash, possibly hindering animal movement for 10 years unless some form of slash treatment is conducted. Slash treatment may include mechanical or hand piling, lopping trees into shorter sections to reduce slash height, or using the material in alternative markets such as firewood. The fire hazard potential will be high due to slash presence and recreational use of the area. The cost of hand piling is likely to be high without the removal of the larger diameter stems (6 to 8 inch dbh) from the site. Commercial harvest of the larger stems is proposed in areas that are easily accessible.

Type 2 Stand: The chance of increasing forage production in these stands in the near future is higher than Type 1 Stands, due to small pockets of understory vegetation present in the stands. Any treatment would create significant amounts of slash, possibly hindering animal movement for 5-10 years depending on the current slash loading and stand density. Most of these stands have tree diameters large enough (> 6 inches dbh) to be merchantable in alternative markets or used commercially for chips or small saw logs. Commercial use of this material is proposed in areas that are accessible from existing or abandoned roads using a combination of tractor and/or small cable logging equipment. Slash treatment may include mechanical or hand piling, whole tree yarding, or lopping trees into shorter sections to reduce slash height. A moderate fire hazard potential will exist in stands which do not receive slash treatment in addition to the commercial removal.

Type 3 Stand: No silvicultural treatments are currently proposed for this stand (9-107) in the present 10 year management plan since forage is currently present (this stand will be inventoried for snags and coarse woody debris). The stand should be re-evaluated for the next 10-year planning period.

Potential Subsequent Treatments

Monitoring will be required to evaluate stand development and the timing of subsequent treatments. Both treated and untreated stands should be briefly evaluated every 10 years to assess stand condition and health. Information on changes to stand characteristics due to treatment/non-treatment should be documented to aid in an adaptive management program. Various types of commercial treatments could then be identified and scheduled to maintain forage within the stand, species diversity, and canopy structure where appropriate.

Stands that are precommercially treated will be followed by a commercial thinning entry in approximately 30 years, depending on the individual site conditions. Future treatments should be scheduled when canopy closure reaches 80 to 90 percent. The ultimate goal is to produce a vigorous, healthy, and biologically diverse stand with ample forage. Treatment objectives, as

appropriate for the Management Unit, should be used in the commercial entry to emphasize continued forage presence and/or late successional stand characteristics.

As tree diameters within these stands increase after treatment, there may be a sufficient number of trees available for creating snags in the future. Snags could be created now in most stands (except Type 1 stands) by treating some of the largest trees.

4.1.2 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 3.2 and Section 7.0 for stands inventoried during this ten-year plan) to determine if they contain the target densities of snags and coarse woody debris identified in Sections 4.5 and 4.6 of this supplemental plan.

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 thinning in those stands that are accessible to logging equipment, and creation of coarse woody debris and snags.

Prescriptions for stands in the Old Growth Management Unit may appear similar to other Management Units, but minor differences are present. Stands within the Old Growth Management Unit are thinned using guidelines that will maximize the 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.

4.1.3 MIXED AND DECIDUOUS FOREST MANAGEMENT

Mixed and deciduous forests will be managed as specifically described in Section 5.0 of this supplemental plan. Overall objectives are to preserve these stands where feasible, with no clear cutting. Some of these stands are mixed or deciduous forests because of moist soils or other edaphic conditions (e.g., riparian) that preclude conifers from becoming dominant and they will remain as mixed or deciduous forest 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 snag and coarse woody debris 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.

MIXED FOREST:

Most mixed forest stands consist of a mosaic of conifer and deciduous patches rather than a true mixture of conifers and hardwoods. Forage 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 stands which are accessible are proposed for treatment in conjunction with the closed-canopy sapling/pole coniferous forest stands. The southeast shoreline area (including stands 9-90, and 9-108) is an example of this type of treatment planning.

No Treatment

Without treatment, the deciduous portions of most of the 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.

Initial Treatment

Treatment of these sites can follow the prescriptions for deciduous stands or closed canopy sapling/pole conifer stands depending on the portion of the mosaic being treated. Thinning of the conifer portions is currently recommended to enhance understory forage. Some of these areas may also require slash treatment. Treatment to maintain mixed forest condition should focus on maintaining hardwood regeneration.

Where the site is predominately conifer (<30% deciduous), of merchantable size, and accessible (such as stand 9-90), a commercial thin is proposed. Sites like this were determined to more closely follow criteria for the closed-canopy sapling/pole coniferous forest cover type designation. Therefore, logging systems, stand density, and slash treatment will be prescribed similar to the stands in the closed-canopy sapling/pole coniferous forest cover type description.

Where the stand is inaccessible, or the stand contains precommercial size material, canopy gaps may be produced within the conifer areas. These areas are less likely to restock to red alder without soil disturbance, so planting would be required to maintain a mixed forest condition. Manual piling on the edge of the opening is the most feasible means of slash treatment for this type of prescription.

Potential Subsequent Treatments

These stands should be evaluated every 10 years to identify if stand conditions remain as desired. Undesirable conditions would include the reduction of forage under closed canopy conifer areas, or increased conifer regeneration within deciduous areas. Each of these conditions could be treated by subsequent thinning of conifer trees. Another commercial treatment should be considered 20 to 30 years after the initial treatment.

Where the mix of deciduous and conifer species is more equal (such as stand 9-108), a commercial thinning with group selection is proposed, provided the stand is accessible. Openings are prescribed for 2 acres in which some soil disturbance or scarification is desired to expose bare mineral soil, thereby promoting alder regeneration. Openings will be positioned away from stream courses to prevent sedimentation. The placement of openings within the conifer patches is recommended. Use of tractors or feller bunchers is preferred on suitable sites to minimize cost and create disturbance. Where cable logging is proposed, openings designed to facilitate yarding (angled toward the yarding corridor) and minimize cost is recommended. Openings should be planted with a mix of bigleaf maple and black cottonwood to sustain deciduous conditions longer than pure alder stands would provide. This is possible due to the longer life spans of these species relative to alder. The number of openings will be dependent upon the suitability of the stand conditions (water quality and soils) but the standard criteria will be for one 2 acre opening per 10 acres. Conifers between openings will be thinned to a density of 150 trees per acre (17 by 17 foot). The intent of this treatment is to maintain a mixed forest mosaic condition. Treatment can be carried out in conjunction with adjacent closed-canopy sapling/pole coniferous forest stand treatments.

The elevation limit for bigleaf maple in the Cascade range in Washington is approximately 1,500 feet (Minore and Zasada, 1990) and black cottonwood

and bigleaf maple are present only in a few locations within the Spada Lake Tract. Survival of planted seedlings should be tested prior to prescribing their extensive use for a treatment.

Information on changes to stand characteristics due to treatment/non-treatment should be documented to aid in an adaptive management monitoring program. Various types of commercial treatments could then be validated or adjusted to schedule treatment intervals which maintain forage, species diversity, and canopy structure where appropriate.

DECIDUOUS FOREST:

No Treatment

Areas within this cover type currently do not require treatment to increase wildlife forage. Without treatment, red alder will remain dominant in the short term. However, in the long term these stands will eventually develop a conifer understory. Some stands in the Williamson Creek area currently have a conifer understory. It is estimated that the overstory in these stands will begin to develop mixed forest conditions in approximately 30 years. Stands without a conifer understory will eventually develop through the same process, although over a longer time period (approximately 60 years in the future). 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.

Initial Treatment

There are several alternatives available for maintaining deciduous stand conditions. Any of the following alternatives may be used, but each is dependent upon site-specific conditions present in each stand.

1) Alder regeneration can be obtained by using a group selection harvest method and exposing bare mineral soil during harvest. Alder will recolonize this area if limited conifer seed is available in the immediate vicinity and bare mineral soil is exposed during harvest. Commercial alder harvest could start in the stands near Williamson Creek at the present time, however, greater forage improvements could be made by treating the adjacent mixed forest stands.

2) Interplanting of black cottonwood or bigleaf maple is recommended on some sites (non riparian zones) as an alternative to the group selection harvest. Both of these species have longer life spans and different crown characteristics than alder. This will help maintain a deciduous forest condition over a longer time period and create a more diverse canopy structure.

3) Precommercial thinning of conifer regeneration is a procedure that will delay successional change within the stands. Treatment to understory conifer regeneration will prevent conifer invasion and changing of the overstory composition over time. This option is most suitable for isolated areas, however repeat treatment may be necessary approximately every 20 years. It will be most economical to coordinate implementing this treatment with adjacent stand treatments.

Potential Subsequent Treatments

Scheduling of subsequent treatments should be evaluated by monitoring long-term stand development. At this time, alternatives 1 and 2 (described above) are recommended for the Williamson Creek area. Stands in which only understory regeneration is treated (alternative 3 described above) will require repeat precommercial thinning treatments approximately every 20 years to maintain a deciduous forest condition over the long term. Stands should be evaluated every 10 years to identify if stand conditions remain as desired. Undesirable conditions would include the mortality of cottonwood or maple seedlings, or an increase in conifer regeneration.

Information on changes to stand characteristics due to treatment/nontreatment should be documented to aid in an adaptive management monitoring program. Various types of commercial or noncommercial treatments could then be validated or adjusted to schedule treatment intervals which maintain forage, species diversity, and canopy structure where appropriate.

4.1.4 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 selective harvest, protecting desirable forage species during harvest, replanting trees at low densities, and seeding harvested units with grasses and forbs.

4.2 BUFFER ZONE MANAGEMENT

4.2.1 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 1450 foot elevation point. (Note: all distances in this supplemental plan are horizontal distances). 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[b]. 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 1450 foot elevation. 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.

Next boxes or platforms may be placed in the Spada Lake buffer zone if the habitat appears suitable.

4.2.2 STREAMS

Buffer zones will be established around streams and rivers on the Spada Lake Tract. 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. 2-11), 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 1 waters (Sultan River)[c] , at least 200 feet wide along Type 2 and 3 streams and at least 100 feet wide along Type 4 and 5 streams (stream types as defined by DNR stream classification system dated 1992 and DNR Water Type Emergency Rule dated Nov. 14, 1996). 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 4 and 5 buffer zones is strongly discouraged, unless it is possible to designate a narrow corridor 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.

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[b] 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 "Conservancy" designation, 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.

[c] The Shoreline Management Master Program 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.

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

4.3 WETLANDS AND WETLAND BUFFER ZONE MANAGEMENT

Management of wetlands on the Spada Lake Tract will consist 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 (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. 2-11), except for the changes described in this section.

The buffer zone surrounding the wetland north of Spada Lake (Stand 9-85; Figure 3-3), will be 500 feet wide on District property. The size of the buffer zones surrounding the wetland on the west side of the Southfork arm (not shown on the map) and the wetland between the road and the Recreation Site 4 parking lot (Stand 9-182; Figure 3-3) will be determined by the District's wildlife biologist prior to any forest vegetation management activities, based on the criteria described in the following paragraph.

The size of buffer zones around wetlands not identified at the time this plan was prepared, including forested wetlands, will be dependent on the functional value of the wetland including habitat quality, water quality, hydrology, operational feasibility and the specific site conditions. In general, the goal is to protect the wetlands by not cutting trees, running equipment or yarding logs through the area. In all cases, these

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. Wetlands and their adjacent buffer zones will be monitored as described in Section 6.2 and 6.3 of this supplement.

4.4 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, important 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.

4.5 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 (in prep). Exceptions and clarifications are described herein.

During the initial ten-year planning period snags will be inventoried (Figure 3-2) and new snags will be created in selected areas, following the guidelines in the WHMP and in the WHMP annual reports. Priority will be 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. 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. 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.

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, heavily bear-damaged trees with little current or future commercial value may be marked and retained during the silvicultural activity. Subsequently, these marked trees may be topped. 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.

4.6 COARSE WOODY DEBRIS MANAGEMENT

Opportunities to manage coarse woody debris on the Spada Tract lands are dependent on forest stand condition and age, and will increase as forest stands mature. During the initial ten-year planning period coarse woody debris will be inventoried in conjunction with snag inventories (Figure 3-2). Coarse woody debris may be created in inventoried stands based on need, size of trees and scheduled snag creation in the same stand. 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 (in prep). 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 will 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.

4.7 ROADS

Precommercial thinning on Spada Lake Tract stands will be conducted using the existing road system. No reconstruction is proposed to assist precommercial thinning. Construction or reconstruction of roads and landings may be required if merchantable timber is harvested on the Spada Lake Tract. If it becomes necessary to construct or reconstruct roads or landings, they should be located and designed by a qualified forest engineer with input from a soil scientist. The District's wildlife biologists and City staff will participate in the planning and the forest engineer and biologists shall 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. Spur roads that will not be in 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.

Harza Northwest (1995) addressed the feasibility of reconstructing abandoned roads for use in forest management on the Tract. Most of the abandoned roads tie into a main road that is located under water at the bottom of the reservoir. The use of these abandoned roads now will require logs to be hauled uphill and onto the current road network (Figure 2-2). The Harza Northwest report identified how these roads can potentially be tied into the existing road network, the level of reconstruction needed for their use, and any new construction required. However, the recommendations of this report must be thoroughly field-verified before a final decision can be made on the suitability of abandoned roads for future use. No firm decisions on forest stand management prescriptions should be made, where road construction is indicated, until such field verification has been performed.

Roads that are open to the public and recreation sites in the Spada Lake Tract must be protected from extreme fire hazard, due to slash accumulations in adjacent harvest units. Abatement, isolation or reduction measures may be required for stands adjacent to roads and recreation sites (WAC 332-24-380 through 385).

4.8 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 the construction of roads, can lead to an increase in sedimentation to 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:

4.8.1 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.

4.8.2 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.

4.8.3 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.

4.9 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. 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.

5.0 MANAGEMENT PRESCRIPTIONS

The selection of stands for treatment 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 was 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. Next, the feasibility of accessing a stand was weighed against the benefits of treatment. Larger stands with an abandoned road system were given a higher priority over smaller stands that were inaccessible or on steep, unstable slopes. Other considerations included future use of the road system for other treatments, amount of reconstruction required, and the potential impacts to water quality or slope stability.

Stand growth and yield modeling projections were used to evaluate timing and the benefits of different treatment regimes (Harza 1995). As described in Section 4.1.1, the level of stocking reduction should be coordinated with plans for future entries. The management prescriptions in Section 5.0 may be modified if on-site studies show that planned future entries are not feasible.

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.

Commercial thinnings are prescribed at either 17 by 17 foot spacing to leave approximately 150 trees per acre, or at variable spacing to leave 150 trees per acre. Commercial thinning to 17 by 17 foot spacing is expected to provide adequate light penetration for understory forage production.

The stands recommended for the most immediate treatment include those that fall within the closed canopy sapling/pole conifer, and early successional conifer cover types. They currently have high stand densities, contain some 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 ranked for treatment based upon evaluation of stand characteristics, potential for forage improvement, water quality, and economic feasibility. The treatment areas often differ from existing cover type mapping. They most often consolidate portions of the existing cover types to define a logical treatment area. 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/wetland present and its value for water quality protection and wildlife habitat (See Sections 4.2 and 4.3). The location of stands proposed for treatment is shown in Figure 3-3.

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 50-80 years if left untreated. Untreated stands are more likely to continue to deteriorate. The potential to meet objectives such as snag recruitment and creating late successional stand characteristics is also reduced without treatment. The stands recommended for initial treatment beyond 10 years are those that are not expected to show significant improvement if treated sooner. The long-term management plan also includes commercial treatments to stands that received precommercial treatment during the short-term management period. These treatments have been described in the previous section.

This report should be considered the beginning of an ongoing process and not a final plan. In order to implement this management plan, additional detailed planning needs to be completed. The detailed planning should include a logging system and transportation analysis (LSTA). This analysis identifies logical treatment units and road access for all the land suitable for forest management within the Spada Lake Tract. Logical treatment units may consist of several cover types and are based on the topography, access, and potential future logging systems. This analysis will require field evaluation to verify the soil types, feasibility of road locations and proposed logging systems. Additional work for individual treatment areas will include the preparations necessary for final stand layout. This requires field review of stands to clarify resource constraints, identification of stream/wetland buffers, and marking the final location of treatment areas on the ground. This information will be used to prepare a detailed logging or treatment plan necessary for the completion of a forest practices application and/or a silvicultural treatment contract. The City of Everett also will review final detailed site specific prescriptions for potential impacts to water quality.

Stand management prescriptions are provided through the year 2005 for this ten-year plan. 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 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, based on additional information that may be obtained from the LSTA.

The following prescriptions direct the management of stands on the Spada Lake Tract. 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 4.0.

5.1 OLD GROWTH MANAGEMENT UNIT PRESCRIPTIONS

Stand #: 9-036, 037	**Stand Review:** Detailed Stand Exam		
Area: 45 ac.	**Date of Origin:** 1965	**Site Index:** not available	
Management Unit:	Old Growth		
Management 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 and mixed forest stands. 4. Provide wildlife habitat and aesthetic buffer between the reservoir and the road.		
Cover Type:	Closed canopy sapling/pole coniferous forest		
Stand Description:	The cover type in this area consists of a closed canopy sapling/pole coniferous forest most resembling the Type 1 CS cover type. The stands are overstocked with 600 trees per acre or more. Most of the area has not been precommercially thinned and consists of 60% western hemlock, 25% Douglas fir, 10% red alder, and 5% Pacific Silver fir. Tree diameters range from 3 to 19 inches dbh. Average stand crown closure 85%. Very little forage is present, but gaps within the canopy and adjacent thinned areas show that forage production can be readily increased. Stand 9-36 contains several patches of alder, mostly within stream draws and abandoned road locations, which will be retained under the prescribed treatment. The forage in stand 9-36 is dying back, therefore overstory treatment is recommended to maintain and improve the understory condition.		
Understory Cover:	Huckleberry, salmonberry, vine maple, devils club, deer fern, and various forbs.		
Special/Unique Features:	Cedar historically present within the stand.		
Stand Objectives:	Increase species diversity and diameter growth. Promote forage species, and multi-storied canopy. Retain alder composition within stand where feasible.		
Constraints:	Minimize damage to advanced regeneration during thinning.		
Access:	DNR easement and road reconstruction from main road may be required for commercial thinning.		
Silvicultural Recommendations:	Late precommercial thin from below to reduce stocking to 220 trees per acre (14 foot by 14 foot average spacing) or fewer. Produce some canopy gaps to encourage understory development. Select bear damaged trees for removal or snag and coarse woody debris creation. The precommercial and commercial thinning treatment for this area would maintain forage development in the understory for the long-term. The slash treatment for the precommercial thin will consist of cutting slash into shorter lengths (6-10 feet) to reduce load height, and piling in areas of heavy accumulation (greater than 1.5 foot load height). Consider commercial thin 20 years later, reducing stocking to approximately 20 foot by 20 foot average spacing. Stands are probably not flat enough for ground-based yarding.		
Schedule:			
1996 - 2000	Precommercial thin to 220 trees per acre.		
2001 - 2005			
2016-2020	Consider commercial thinning, reduce stocking to 20 x 20 spacing.		

Stand #: 9-038	**Stand Review:** Aerial Photo	
Area: 28 ac.	**Date of Origin:** 1960	**Site Index:** not available
Management Unit:	Old Growth	
Management 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 and mixed forest stands. 4. Provide wildlife habitat and aesthetic buffer between the reservoir and the road.	
Cover Type:	Closed canopy sapling/pole coniferous forest	
Stand Description:	Overstocked stand estimated at 2,000 trees per acre. Species composition is 90% western hemlock and 10% Pacific silver fir, with diameters ranging from 1 to 8 inches dbh. The stand averages 85% crown closure. Very little forage present in the understory	
Understory Cover:	Dead huckleberry	
Special/Unique Features:	Large slide area along west stand boundary	
Stand Objectives:	Improve understory forage production. Promote a multi-storied canopy. Protect water quality and slope stability.	
Constraints:	Slope stability	
Access:	Main road	
Silvicultural Recommendations:	Treat the northwest corner of stand (to the topographic break) with Stand 9-037. Do not fell any trees within 100 feet of the slide area. Late precommercial thin to reduce stocking to 14 foot by 14 foot spacing between 100 and 150 feet of the slide area, and 20 foot by 20 foot spacing elsewhere. Prior to felling trees, evaluate stability of all areas under consideration for thinning. The precommercial thinning treatment for this area would restore forage development in the understory. Consider slash treatment consisting of cutting slash into shorter lengths (6-10 feet) to reduce load height, and piling in areas of heavy accumulation (greater than 1.5 foot load height).	
Schedule:		
1996 - 2000	Precommercial thin to 20 x 20 foot spacing.	
2001 - 2005		

Stand #: 9-120	Stand Review: Detailed Stand Exam	
Area: 41 ac.	Date of Origin: 1965	Site Index: not available
Management Unit:	Old Growth	
Management 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 and mixed forest stands. 4. Provide wildlife habitat and aesthetic buffer between the reservoir and the road.	
Cover Type:	Closed canopy sapling/pole coniferous forest (Type 2)	
Stand Description:	Overstocked (500 tpa) stand of 65% western hemlock, 15% Douglas-fir, 15% Pacific silver fir, and 5% red alder. Tree diameters ranging from 4 to 15 inches dbh. Stand was precommercially thinned approximately 1985. Average stand crown closure 90%. Understory forage present in low amounts throughout the stand, and is dying out. Gaps in the overstory and adjacent thinned areas indicate that forage production can be readily increased. The presence of cedar provides the opportunity to increase structural diversity.	
Understory Cover:	Huckleberry, vine maple, deer fern, and various forbs.	
Special/Unique Features:	Adjacent to old growth patch.	
Stand Objectives	Reduce western hemlock species composition and improve understory forage production.	
Constraints:	A few high gradient streams are present that should be protected with buffer zones.	
Access:	Right of way over DNR or USFS. The existing access roads in this unit should be evaluated for future use. The selected road will require minor reconstruction. Alternatively, adjacent landing on USFS property would be well suited to whole tree yarding by helicopter from this stand.	
Silvicultural Recommendations:	Evaluate feasibility of commercial thinning. Cable or helicopter yarding may be required to avoid damaging stream buffer zones, however, cable-yarding may be difficult due to stream locations. Split yarding (i.e. yarding away from buffer zones) may be considered if landings can be located on each side of the buffer zone. Commercial thin from below to reduce stocking to 150 trees per acre (17 foot by 17 foot average spacing) or fewer. Remove mostly western hemlock to improve species mix. Produce some canopy gaps to encourage understory development. Select bear damaged trees for removal or snag and coarse woody debris creation. Slash load can be reduced by whole-tree yarding the commercial sized trees.	
Schedule:		
1996 - 2000	Consider commercial thin .	
2001 - 2005		

Stand #: 9-127	**Stand Review:** Visual Walk-Through Exam	
Area: 5 ac.	**Date of Origin:** 1989	**Site Index:** not available
Management Unit:	Old Growth	
Management 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 and mixed forest stands. 4. Provide wildlife habitat and aesthetic buffer between the reservoir and the road.	
Cover Type:	Early successional coniferous forest	
Stand Description:	Sapling stand composed of 30% western hemlock, 30% Pacific silver fir, 30% Douglas-fir, and 10% w. red cedar. Stand diameters range from 1 to 3 inches dbh. Average stand height is 8 feet, with a crown closure of 10%. Forage is currently present in moderate amounts.	
Understory Cover:	Forage and shrub vegetation present throughout.	
Special/Unique Features:	Adjacent to old-growth forest.	
Stand Objectives:	Retain existing species composition.	
Constraints:	none	
Access:	Abandoned road grade ends at this stand. No plan to improve road for precommercial thinning.	
Silvicultural Recommendations:	Precommercial thin within 5 years to reduce stocking to approximately 300 trees per acre, or 12 foot by 12 foot spacing. Western red cedar should be retained within these stands to provide species and future structural diversity. It does not appear that the slash load in this stand will be a significant problem as the trees are small. A commercial treatment should be conducted in a future 10-year plan, in conjunction with 9-120 in order to maintain forage production.	
Schedule:		
1996 - 2000	Precommercial thin.	
2001 - 2005		

Stand #: 9-133, 149	**Stand Review:** Visual Walk-Through Exam	
Area: 54 ac.	**Date of Origin:** not available	**Site Index:** not available
Management Unit:	Old Growth	
Management 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 and mixed forest stands. 4. Provide wildlife habitat and aesthetic buffer between the reservoir and the road.	
Cover Type:	Early successional coniferous forest	
Stand Description:	Sapling stand composed of 60% western hemlock, 5% Pacific silver fir, 30% Douglas-fir, and 5% western red cedar. Average stand diameter of 1 inch, height of 8 feet and crown closure of 40%. Forage is currently present in moderate amounts.	
Understory Cover:	Forage and shrub vegetation present throughout stand.	
Special/Unique Features:	Adjacent to old-growth forest	
Stand Objectives	Reduce western hemlock species composition.	
Constraints:	Stand adjacent to ownership boundary, will require boundary survey. Slope failures present in unit.	
Access:	Would need to open road running along ownership boundary for future commercial thinning.	
Silvicultural Recommendations:	No timber management is proposed in the areas of slope failure in 9-133. The following is proposed for the remainder of this unit and 9-149. Precommercial thin in approximately 5 to 8 years to reduce stocking to approximately 220 trees per acre, (14 foot by 14 foot spacing), or less. Some pockets of 50 trees per acre could be left to provide forage. Western red cedar should be retained to provide future structural diversity. A commercial treatment utilizing cable yarding may be conducted in the southern (higher elevation) portion of 9-133 and in 9-149 approximately 30-40 years after the initial treatment in order to maintain forage production.	
Schedule:		
1996 - 2000	Precommercial thin.	
2001 - 2005		

Stand #:	9-135, 140, 141, 145, 148, 151, and 152 (See Figure 2-1)	Stand Review:	Visual Walk-Through Exam
Area:	51 ac.	**Date of Origin:**	1960	**Site Index:**	not available
Management Unit:	Old Growth
Management 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 and mixed forest stands. 4. Provide wildlife habitat and aesthetic buffer between the reservoir and the road.
Cover Type:	Closed canopy sapling/pole coniferous forest with some patches of mixed and deciduous forest.
Stand Description:	Overstocked (500-600 tpa) stands with diameters ranging from 4 inches to 14 inches dbh similar to the Type 2CS cover type described previously. The stands consist predominantly 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 in stream draws. Average stand crown closure is 95%. Little forage is present except within openings or under the deciduous pocket.
Understory Cover:	Huckleberry, salmonberry, devils club, bramble, sword fern.
Special/Unique Features:	Adjacent to shoreline.
Stand Objectives	Reduce stand density in conifer portions of the stand. Improve forage production.
Constraints:	Slope stability and road access. 500' shoreline buffer zone.
Access:	Old mine to market road must be investigated to confirm suitability for use in hauling logs. Road contains a series of switchbacks leading downslope to stands 9-135 and 9-154. Road grade averages 10% (adverse haul), and was not designed for hauling logs. The radius of switchbacks is smaller than desired, and would have to be redesigned to accommodate a logging truck.
Silvicultural Recommendations:	Option 1. If road access and slope stability allow, consider commercial thinning from below to reduce stocking to approximately 150 trees per acre, or an average 17 foot by 17 foot spacing. Variable spacing thin to create stand openings in patches. Consider cutting slash to 8 foot lengths and/or create slash piles to reduce slash load height. Retain higher tree densities adjacent to stream channels for bank stability. The creation of canopy gaps is recommended to encourage development of vertical canopy structure and understory growth. Thinning will require the use of a small skyline cable or helicopter. A treatment variation recommended for stand 9-135 includes group selection to maintain deciduous patches. The slash load is expected to be moderate in this stand due to whole tree yarding of the commercial size material. Where heavier accumulations occur it can be reduced by cutting slash into smaller lengths. Option 2. If future commercial thinning is not feasible, precommercial thin, removing trees less than 4 to 5 inches diameter, to hasten the stand thinning process. Reduce stand density to approximately 200 trees per acre.
Schedule:	
1996 - 2000	Option 2 or precommercial thinning.
2001 - 2005	
2005+	Option 1 or commercial thin.

Stand #: 9-142, 150	Stand Review: Visual Walk-Through Exam	
Area: 34 ac.	Date of Origin: 1965	Site Index: not available
Management Unit:	Old Growth	
Management 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 and mixed forest stands. 4. Provide wildlife habitat and aesthetic buffer between the reservoir and the road.	
Cover Type:	Closed canopy sapling/pole coniferous forest	
Stand Description:	Overstocked (300-400 tpa), previously thinned stand of western hemlock and Douglas-fir with diameters ranging from 6 inches to 10 inches dbh. Average stand crown closure is 90%. Little forage is present except within openings or along the road edges.	
Understory Cover:	Huckleberry, bramble, sword fern.	
Special/Unique Features:	Adjacent to old-growth stand.	
Stand Objectives:	Encourage development of a multi-storied canopy structure. Improve understory forage composition.	
Constraints:	Steep slopes.	
Access:	Adjacent to main road and old landing.	
Silvicultural Recommendations:	Commercial thin from below to reduce stocking to approximately 150 trees per acre, or an average 17 foot by 17 foot spacing. Variable spacing thin to create stand openings in patches. Consider cutting slash to 8 foot lengths and/or create slash piles to reduce slash load height. This treatment will improve stand growth and open up the overstory to increase understory forage production. Thinning can be conducted using a small skyline cable system. The slash load is expected to be moderate, and can be reduced by whole tree yarding of the merchantable trees.	
Schedule:		
1996 - 2000		
2001 - 2005	Commercial thin	

Stand #: 9-160	**Stand Review:** Stand Exam	
Area: 31 ac.	**Date of Origin:** 1982	**Site Index:** not available
Management Unit:	Old Growth	
Management 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 and mixed forest stands. 4. Provide wildlife habitat and aesthetic buffer between the reservoir and the road.	
Cover Type:	Early successional coniferous forest	
Stand Description:	Dense (1,900 tpa) sapling stand composed of 50% western hemlock, 30% western red cedar, 5% Douglas-fir, and 5% red alder. Average stand diameter of 1 inch, height of 15 feet, and crown closure of 60%. Forage currently is present in moderate amounts.	
Understory Cover:	Forage and shrub vegetation is present throughout stand.	
Special/Unique Features:		
Stand Objectives	Reduce stand density to maintain forage composition. Reduce western hemlock composition.	
Constraints:	500' shoreline buffer. Stream draws possibly contributing sediment to lake.	
Access:	Adjacent to main road.	
Silvicultural Recommendations:	Variable density precommercial thinning at the time of canopy closure to reduce stocking to average 220 trees per acre. Retain higher densities in stream draws to protect stream bank stability, and avoid felling any slash into streams. Western red cedar should be retained within this stand to provide species and future structural diversity. It does not appear that the slash load in this stand will be a significant problem as the trees are small. A light commercial thinning should be conducted approximately 30-40 years after the initial treatment in order to maintain forage production, but retain canopy closure of 60-70 percent. Trees should be yarded up to main road, or helicopter yarded to waste areas on the east side of the South Fork.	
Schedule:		
1996 - 2000		
2001 - 2005	Precommercial thin by 2004.	

5.2 EAST MANAGEMENT UNIT PRESCRIPTIONS

Stand #: 9-001	**Stand Review:** Visual Walk-Through Exam		
Area: 25 ac.	**Date of Origin:** 1960	**Site Index:** 110	
Management Unit:	East		
Management Objectives:	1. Retain, promote, and protect riparian habitat and mixed forest if feasible. 2. Provide a buffer between the reservoir and the adjacent property. 3. Conifer forests will be allowed to mature. 4. Emphasize limited disturbance in conjunction with the Williamson Creek Tract.		
Cover Type:	Closed Canopy Pole/Small Sawtimber Coniferous Forest		
Stand Description:	Overstocked (250-300 tpa), closed canopy pole/small sawtimber. Species composition is 90% western hemlock, 8% Pacific silver fir, 2% western red cedar with diameters ranging from 6 to 20 inches dbh (average stand diameter 8 inches dbh). Tree heights averaging 70 feet with a crown closure of 90 %. Forage species are present but dying out due to overstory cover.		
Understory Cover:	Vine maple and huckleberry.		
Special/Unique Features:	Williamson Creek Old Growth management unit adjacent to stand. Large cedar historically present in the stand.		
Stand Objectives:	Reduce hemlock composition. Protect cedar regeneration. Retain alder within stand where feasible.		
Constraints:	Access through cut bank, steep slopes, slope stability. Slope stability of landing must be confirmed.		
Access:	Access to this stand will require reconstructing an abandoned road grade from the switchback on the main road, and will involve reconstruction of cut bank and switchback. The main road was redesigned approximately 10-20 years ago, and in the process cut off the former road grade to access these stands. The abandoned road begins at a level that is higher than the main road due to the main road being cut down when it was redesigned. A short steep grade (favorable haul) will be required to connect to the abandoned road. Feasibility of road access must be investigated prior to advancing this stand for future harvest. If road access is not possible or reasonable helicopter thinning will be considered.		
Silvicultural Recommendations:	If road access or helicopter logging proves feasible, commercial thin (variable spacing) from below in 5 to 10 years to reduce stocking to approximately 150 trees per acre. Produce some canopy gaps within upper half of unit to encourage understory development. Higher stand densities should be maintained in the lower portion of the stand (below 1,800 feet) to insure slope stability. Select bear damaged trees for removal or snag and coarse woody debris creation. Consider cutting slash to minimum lengths of 8 feet to reduce slash load height. Thinning will require the use of a live skyline cable system with a small mobile yarder. The slash load should not be significant considering the existing density of the stand.		
Schedule:			
1996 - 2000			
2001 - 2005	Consider commercial or precommercial thinning.		

Stand #: 9-048	**Stand Review:** Stand Exam		
Area: 112 ac.	**Date of Origin:** 1960	**Site Index:** not available	
Management Unit:	East		
Management Objectives:	1. Retain a forested buffer between the reservoir and the adjacent property. 2. Retain existing mixed forest characteristics for as long as feasible. 3. Manage conifer stands for forest interior species.		
Cover Type:	Closed canopy sapling/pole coniferous forest		
Stand Description:	Overstocked (1,200-1,400 tpa avg. similar to Type I CS) but with a variety of density levels and size classes. Species composition is 70% western hemlock, 25% Douglas-fir, 4% red alder, 1% western red cedar with diameters ranging from 1 to 18 inches dbh. Tree heights average 55 feet, with a stand crown closure of 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 inches dbh) while the mid to lower elevation consists of small sawtimber size trees with a suppressed understory.		
Understory Cover:	Huckleberry, salmonberry, thimbleberry, devils club, swordfern		
Special/Unique Features:	Shoreline along south boundary of stand. Large cedar historically within stand.		
Stand Objectives	Promote old growth structure, species diversity.		
Constraints:	500' shoreline buffer zone. Steep slope and loose erosive soils in this area indicate that road construction (See Access) could be a significant source of sediment to Spada Lake.		
Access:	New road construction would be required from main road entering at northeast corner of stand. One and a quarter miles of heavy new road construction across DNR ownership with steep slopes would be required to access the abandoned road grade within the stand. New road construction will depend in part on DNR policy for the Pilchuck NRCA. Reconstruction of road grade would be necessary across the length of stand.		
Silvicultural Recommendations:	The diameter distribution is heavily skewed toward smaller trees, with the larger trees having good crowns and appearing windfirm. A thinning from below will remove primarily western hemlock trees up to 7 inches dbh. Western red cedar understory trees and western hemlock seedlings growing in canopy gaps should be retained during thinning. These will help create multi-layered stand characteristics as the stand develops. Red alder should also be retained where it occurs to maintain some mixed forest conditions in the stand. Variable spacing precommercial thin from below within 5 years to reduce stocking to appropriately 150 trees per acre. This treatment is expected to create a large slash load. Consider cutting slash to 8 foot minimum lengths to reduce slash load height. Pile slash in the areas of heavy accumulations to reduce travel restrictions. A future thinning treatment should not be required in this stand to maintain understory forage production. Stand density should be evaluated in 50-60 years to determine if a partial cut overstory harvest is feasible. The economic viability of helicopter harvest should also be re-evaluated at that time.		
Schedule:			
1996 - 2000	Precommercial thin.		
2001 - 2005			

Stand #: 9-080	**Stand Review:** Visual Walk-Through Exam	
Area: 33 ac.	**Date of Origin:** 1960	**Site Index:** not available
Management Unit:	Old Growth	
Management Objectives:	1. Retain a forested buffer between the reservoir and the adjacent property. 2. Retain existing mixed forest characteristics for as long as feasible. 3. Manage conifer stands for forest interior species.	
Cover Type:	Closed canopy sapling/pole coniferous forest	
Stand Description:	Overstocked (1,000 tpa) stand of 60% western hemlock, 10% Pacific silver fir, and 30% Douglas-fir with diameters ranging from 6 inches to 10 inches dbh. Average stand crown closure is 95%. Little forage is present in the understory except within or adjacent to openings.	
Understory Cover:	Vine maple, Huckleberry	
Special/Unique Features:	Wetland (9-85) located in the center of the stand.	
Stand Objectives:	Reduce stocking and encourage multi-storied canopy	
Constraints:	Access around the 200 foot wetland buffer and 500 foot shoreline buffer.	
Access:	DNR easement for future commercial thinning.	
Silvicultural Recommendations:	West of wetland: Late precommercial thin to approximately 220 trees per acre with variable spacing (14 foot by 14 foot average spacing). Pile slash to decrease slash load. East of wetland: Late precommercial thin to approximately 220 trees per acre (14 foot by 14 foot average spacing). Consider future commercial thin, yarding to the access road which would need to be reconstructed or helicopter logging.	
Schedule:		
1996 - 2000	Precommercial thin.	
2001 - 2005		

Stand #: 9-090	**Stand Review:** Visual Walk-Through Exam		
Area: 32 ac.	**Date of Origin:** 1960	**Site Index:** not available	
Management Unit:	East End		
Management Objectives:	1. Retain, promote, and protect riparian habitat and mixed forest if feasible. 2. Provide a buffer between the reservoir and the adjacent property. 3. Conifer forests will be allowed to mature.		
Cover Type:	Mixed deciduous/coniferous forest		
Stand Description:	Coniferous forest portions of stand are overstocked with approximately 1,400 trees per acre. Species composition is 90% western hemlock, and 10% Pacific silver fir with diameters ranging from 1 to 10 inches dbh. Average stand crown closure is 90%. Forage is present in small amounts under canopy openings only. Deciduous forest patches consist of 60% red alder (Avg. 10 inches dbh) with small conifers (4-8 inches dbh). Average stand crown closure is 50% in deciduous patches.		
Understory Cover:	Vine maple, huckleberry, trailing bramble, devil's club, deer fern.		
Special/Unique Features:	Recreation site in middle of area.		
Stand Objectives:	Reduce stocking in coniferous portions of stand to increase forage production.		
Constraints:	500' shoreline buffer, proximity to recreation site, wetland in this stand		
Access:	Adjacent to main road		
Silvicultural Recommendations:	Evaluate the feasibility of future commercial thinning. If commercial thinning is ruled out, precommercial thin to 150 trees per acre. The slash load created by any thinning may be substantial. Alternatives, such as lopping slash to minimum lengths (6-10 feet), whole tree yarding, and slash piling to reduce the slash load created during thinning is of prime importance. Non-merchantable piles near roads could be designated for firewood. Areas that are not accessible, or are within shoreline or riparian buffers, will benefit from additional slash treatment. This may consist of cutting slash into shorter lengths (6-10 feet) to reduce load height, and piling in areas of heavy accumulation (greater than 1.5 foot load height). This will provide travel ways for deer and habitat for small mammals.		
Schedule:			
1996 - 2000	Precommercial thin by 2005.		
2001 - 2005			

5.3 SOUTH SHORE MANAGEMENT UNIT PRESCRIPTIONS

Stand #: 9-108	**Stand Review:** Detailed Stand Exam	
Area: 18 ac.	**Date of Origin:** 1960	**Site Index:** not available
Management Unit:	South Shore	
Management Objectives:	1. Manage for early forest succession stages. 2. Retain existing mixed forest characteristics for as long as feasible.	
Cover Type:	Mixed deciduous/coniferous forest	
Stand Description:	Some scattered patches of red alder growing amidst dense conifer thickets. Coniferous forest portions of stand are overstocked with densities exceeding 1,200 trees per acre, although a portion was precommercially thinned 15 years ago to approximately 600 trees per acre. Smallest conifer patch is 3 acres, deciduous patches range from 0.5 to 5 acres.	
Understory Cover:	Huckleberry, deer fern, and salmonberry.	
Special/Unique Features:		
Stand Objectives:	Reduce stocking in coniferous portions of stand to increase forage, retain hardwoods	
Constraints:	500' shoreline buffer, rolling terrain, unstable area north of old DNR access road may preclude future commercial thinning entries.	
Access:	Abandoned road along south edge of unit requires reconstruction for future commercial thinning.	
Silvicultural Recommendations:	Evaluate feasibility of access for future commercial thinning. Precommercial thin in conifer thickets to approximately 150 trees per acre along with 9-111.	
Schedule:		
1996 - 2000	Precommercial thin in conifer thickets (See schedule for 9-111).	
2001 - 2005		

Stand #: 9-111	**Stand Review:** Visual Walk-Through Exam	
Area: 47 ac.	**Date of Origin:** not available	**Site Index:** not available
Management Unit:	South Shore	
Management Objectives:	1. Manage for early forest succession stages. 2. Retain existing mixed forest characteristics for as long as feasible.	
Cover Type:	Closed canopy sapling/pole coniferous forest	
Stand Description:	Previously thinned stand is overstocked with approximately 800 trees per acre. Species composition is 70% western hemlock, and 20% Pacific silver fir, and 10% red alder with diameters ranging from 6 inches to 10 inches dbh. Average stand crown closure is 80%. Little forage is present in the understory except within or adjacent to openings in overstory.	
Understory Cover:	Huckleberry, salmonberry, devil's club, bramble, and sword fern present in openings.	
Special/Unique Features:		
Stand Objectives:	Retain alder within stand area where feasible, reduce conifer density to improve forage.	
Constraints:	500 foot shoreline buffer	
Access:	See 9-108. Some road reconstruction necessary with a possible new road spur needed.	
Silvicultural Recommendations:	Conduct precommercial thinning to approximately 150 trees per acre, along with 9-108.	
Schedule:		
1996 - 2000	Precommercial thin along with 9-108.	
2001 - 2005		

Stand #: 9-121, 183, 184	**Stand Review:** Detailed and Visual Walk-Through Exam	
Area: 109 ac.	**Date of Origin:** 1960	**Site Index:** not available
Management Unit:	South Shore	
Management Objectives:	1. Manage for early forest succession stages. 2. Retain existing mixed forest characteristics for as long as feasible.	
Cover Type:	Closed canopy sapling/pole coniferous forest	
Stand Description:	Overstocked (1800-2000 tpa) stand of 20% western hemlock and 80% Pacific silver fir with diameters ranging from 1 to 8 inches dbh. Average stand crown closure is 95%. Little forage is present except within or adjacent to openings in the overstory.	
Understory Cover:	none	
Special/Unique Features:	Adjacent Recreation Site 3 in 9-107.	
Stand Objectives:	Reduce stocking to increase forage production.	
Constraints:	500' shoreline buffer, rolling topography, steep grade of old access road.	
Access:	Roads require reconstruction from main road. Feasibility of adverse haul to main road must be confirmed.	
Silvicultural Recommendations:	Variable space commercial thin from below to reduce stocking to approximately 150 trees per acre, or 17 foot by 17 foot spacing. Cable yarding will probably be required in all areas, and must be planned to avoid damage to stream buffer zones. Western half of stand 9-121 and stand 9-183 may be yarded to main road rather than reconstruct access road. The slash load created by any thinning may be substantial on these sites. Alternatives, such as lopping slash to minimum lengths (6-10 feet), whole tree yarding, and slash piling to reduce the slash load created during thinning may be considered. Non-merchantable piles near roads could be designated for firewood. Areas that are not accessible, or are within shoreline or riparian buffers, will benefit from additional slash treatment. This may consist of cutting slash into shorter lengths (6-10 feet) to reduce load height, and piling in areas of heavy accumulation (greater than 1.5 foot height). This will provide travel ways for deer and habitat for small mammals.	
Schedule:		
1996 - 2000		
2001 - 2005	CT if access and yarding system are feasible.	

Stand #: 9-137, 9-144(Part), 177	**Stand Review:** Visual Walk-Through Exam	
Area: 23 ac.	**Date of Origin:** Approximately 1987 (9-137) and 1960 (9-144 and 9-177)	**Site Index:** not available
Management Unit:	South Shore	
Management Objectives:	1. Manage for early forest succession stages. 2. Retain existing mixed forest characteristics for as long as feasible.	
Cover Type:	Early successional coniferous forest (9-137), closed canopy sapling coniferous forest (9-144 and 9-177).	
Stand Description:	9-137 is a sapling stand composed of 30% western hemlock, 30% Pacific silver fir, 30% Douglas-fir, and 10% western red cedar. Average stand diameter of 1 inch, height of 15 feet, and crown closure of 40%. Forage currently is present in moderate amounts. Stands 9-144 and 9-177 are older coniferous stands with crown closure greater than 80%. Forage is very sparse.	
Understory Cover:	Forage and shrub vegetation including huckleberry is present throughout 9-137, but is sparse in 9-144 and 9-177.	
Special/Unique Features:	Residual western hemlock and cottonwood trees remain from past harvest at east edge of stand 9-137.	
Stand Objectives:	Retain existing species composition and maintain/enhance forage production.	
Constraints:	500' shoreline buffer. Mistletoe infection present in adjacent area.	
Access:	Adjacent to main road.	
Silvicultural Recommendations:	Precommercial thin now to reduce stocking to approximately 14 x14 foot spacing (220 trees per acre or fewer). Favor red cedar for retention. Evaluate benefits of "weeding" out trees <4-5 inches diameter in the near future, to reduce competition with retention trees in 9-144 and 9-177.	
Schedule:		
1996 - 2000	Precommercial thin by 1999.	
2001 - 2005		

Stand #: 9-153	**Stand Review:** Visual Walk-Through Exam	
Area: 8 acres	**Date of Origin:** not available	**Site Index:** not available
Management Unit:	South Shore	
Management Objectives:	1. Manage for early forest succession stages. 2. Retain existing mixed forest characteristics for as long as feasible.	
Cover Type:	Early successional coniferous forest	
Stand Description:	Sapling stand composed of 60% western hemlock, 30% Douglas-fir, 5% Pacific silver fir, and 5% western red cedar. Average stand diameter of 1 inch, height of 8 feet and crown closure of 40%. Stand density is estimated to be between 500 and 1,000 trees per acre.	
Understory Cover:	Abundant forage and shrub vegetation present throughout stand, including salmonberry, thimbleberry, huckleberry and alder.	
Special/Unique Features:	Adjacent to recreation site, shoreline buffer zone.	
Stand Objectives	Reduce western hemlock species composition.	
Constraints:	500' shoreline buffer. Stand adjacent to Recreation Site 2, will require care in preventing slash loading from being visible. Potential fire hazard to recreation site. 100 foot road buffer zone required.	
Access:	Adjacent to main road.	
Silvicultural Recommendations:	Precommercial thin just prior to canopy closure to approximately 17 x 17 foot spacing (150 trees per acre). Favor red cedar for retention.	
Schedule:		
1996 - 2000	Precommercial thin.	
2001 - 2005		

6.0 MONITORING PROGRAM

Monitoring objectives and activities will be the same as described on page 4-1 of the WHMP. Specific procedures will follow the WHMP and standard operating procedures developed for guiding implementation of the WHMP. Methods may be changed or adapted as new information becomes available or if other methods or less intensive inventories are more practical.

6.1 FOREST VEGETATION MANAGEMENT

Selected stands (among those identified as potential stands for treatment in Figure 3-3) will be inventoried before precommercial thinning or selective harvesting occurs to determine structural characteristics and species composition to guide management techniques. Changes in species composition, density, and understory resulting from management will be described over time. Methods will follow Standard Operating Procedures (in prep) developed for the WHMP.

6.2 WETLAND AND STREAMSIDE BUFFER ZONES AND GREEN TREE AREAS

Buffer zones and green tree leave areas will be monitored as described on pages 4-10 and 4-11 in the WHMP and the SOP. Information gathered will be used to plan future buffer zones and green tree areas.

6.3 WETLAND MANAGEMENT

Photo documentation stations will be established in the three wetlands which have been identified (Section 4.3) and will be monitored every three years (See the schedule in Section 7.0). Procedures for photo documentation will be as described in the wetland monitoring SOP.

6.4 SNAG MANAGEMENT

Initial snag inventories will occur in areas shown in Figure 3-2 and according to the schedule in Section 7.0. 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 that described on pages 4-2 and 4-3 of the WHMP and the Snag Management SOP with the following exceptions and additions. Ten-year snag monitoring, as described in the WHMP, will take place during the future ten-year plans because ten years will not have elapsed since the time of the initial inventory. 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).

6.5 COARSE WOODY DEBRIS MANAGEMENT

Initial coarse woody debris inventories will occur in areas shown in Figure 3-2 and according to the schedule in Section 7.0. Coarse woody debris inventory and monitoring methods will be the same as on pages 4-4 and 4-5 of the WHMP and in the SOP with the following exceptions and additions. Coarse woody debris will be sampled concurrently with snags. Ten-year coarse woody debris monitoring described in the WHMP will take place during future ten-year plans because ten years will not have elapsed since the time of this initial inventory. In addition to the monitoring described in the WHMP, a sample of created coarse woody debris will be revisited every three years to assess condition and use.

6.6 NEST BOXES AND PLATFORMS

Nest boxes and platforms (Section 4.2 and 4.3) will be monitored and maintained as described in the WHMP on pages 4-14 and 4-15 and in the SOP.

6.7 REPORTING

Reports on this supplemental plan will be prepared and submitted as part of the required reports for the WHMP.

7.0 SCHEDULE

Table 7-1. Schedule for implementation and Monitoring activities, 1996-2005.

	1996-2000		2001-2005	
Implementation Activity:	Stands	Acres	Stands	Acres
Precommercial Thinning	36	43	1	25
	37	3	90	32
	38	28	160	31
	48	112		
	80	33		
	108	18		
	111	47		
	127	5		
	133	46		
	137	9		
	144 (Part)	6		
	149	8		
	153	8		
	177	10		
Commercial Thinning	120	41	121 (Part)	30
			142	19
			150	15
			183	24
			184	11
Snag/CWD Inventory	114	51	8	106
	126	24	24	12
	135	33	35	5
	136	4	47	4
	145	2	69	19
	151	6	80	33
	152	4	90	32
	154	15	107	28
	155	2	108	18
	167	43	110	8
	173	20	111	47
	175	10	125	33
	176	10	180	7
			184	11

TABLE 7-1. SCHEDULE FOR IMPLEMENTATION AND MONITORING ACTIVITIES, 1996-2005 (CONTINUED)

	1996-2000		2001-2005	
Monitoring Activity:	Stands	Acres	Stands	Acres
Monitor Wetlands	85 182	2 4		
Forest Vegetation Management	To be determined during detailed harvest unit planning.		To be determined during detailed harvest unit planning.	
Snag and CWD Monitoring	Every three (3) years following creation.		Every three (3) years following creation.	
Wetland and Streamside Buffer Zones and Green Tree Areas	Monitor annually as developed.		Monitor annually as developed.	
Wetland Management	Establish photo document stands for selected wetlands, 1998.		Monitor selected wetlands in 2001 and 2004.	
Nest Boxes and Platforms	Monitor annually as established.		Monitor annually as established.	
Reporting	Submitted with annual reports for the WHMP.		Submitted with annual reports for the WHMP.	

8.0 COST ESTIMATES

TABLE 8-1. COST SUMMARY FOR IMPLEMENTATION ACTIVITIES, 1996-2005.

ACTIVITY/UNIT	ACRES	Net revenue or (cost) 1995 Dollars	Assumptions
Commercial Thinning	140	$6,918	a) 6000BF/acre harvested b) no new road construction c) cable- or helicopter yarding
Precommercial Thinning	464	($92,800)	Heavy thinning @ $200/acre
Snag/CWD Creation	587	($82,180)	a) 2 snags/acre @ $50/snag b) CWD trees girdled @ base c) 4 CWD trees/acre @ $10/tree
Total Cost		($168,062)	

9.0 REFERENCES

DNR. Undated. Forest Soil Summary Sheets. State Soil Survey: Report for the NW Area Forest Land Management Division.

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 417p.

Harza Northwest. 1995. Final Report on the Forest Management Plan for the Spada Lake Tract of the Jackson Hydroelectric Project. Bellevue, WA 72 pps + Appendices.

Public Utility District No. 1 of Snohomish County and the City of Everett, Washington. 1988. Wildlife Habitat Management Plan, Henry M Jackson Hydroelectric Project, 3 Volumes. Paging various.

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Washington State Department of Natural Resources, Forest Practices Division. 1993. Washington Forest Practices Board Manual. Page M-51.

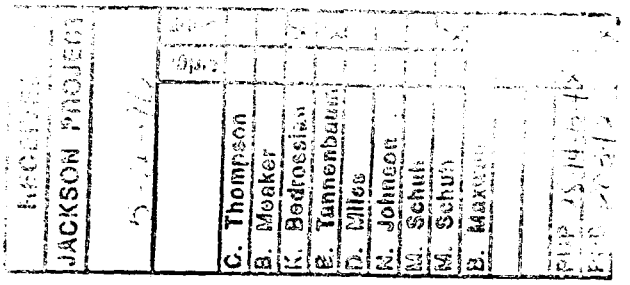
APPENDIX A: AGENCY COMMENTS

WASHINGTON STATE DEPARTMENT OF
Natural Resources

Ph: (360) 856-3500

JENNIFER M. BELCHER
Commissioner of Public Lands
KALEEN COTTINGHAM
Supervisor

April 15, 1996



Public Utility District #1
Bernice Tannenbaum - Jackson Project
Box 1107
Everett, WA 98206

RE: Comments on the Wildlife Habitat Management Plan Supplement for the Spada Lake Tract

Dear Bernice:

I would like to thank you for the opportunity to attend the meeting on March 27, 1996, and to comment on the plan.

First, I would like to encourage you in your efforts to manage the forest properties around Spada Lake. Sound management can produce many benefits to the PUD, wildlife, and provide for a healthy forest in the future.

Some specific comments on the plan can be divided into three categories, harvest systems, reforestation, and access.

Harvest Systems:

The analysis of ground based systems impact on soils should extend beyond the concern for soil erosion. Some research has shown that damage from some ground based yarding can reduce the Site Index Class one grade. That is, the potential soil productivity for future forest growth can be reduced significantly by improper yarding methods, yet not cause erosion. In some instances it may be very appropriate to use a non-ground based yarding system on less than 20 percent slopes to protect soil productivity.

The general recommendation would be to not utilize rubber tired skidders or tractor skidders and favor cut to length harvesters with forwarders in thinnings and shovel yarding in final harvest operations.

The use of cable yarding systems should be reexamined to include systems which are capable of operating with intermediate supports and locking drop carriages. These systems are readily adaptable to thinnings and can operate without the need for proper deflection and large tailholds required by high lead and skyline systems. These systems basically function similar to a ski lift.

NORTHWEST REGION I 919 N TOWNSHIP ST I SEDRO-WOOLLEY, WA 98284-9333 I *FAX: (360) 856-2150* I *TEL: (360) 856-3500*

Most of the sites addressed in this report do not have the potential for sufficient deflection to allow for high lead systems to function without considerable soil disturbance. Large tailholds to support skyline systems simply do not exist in many of the areas discussed for harvest. Generally these systems require a large, sound, old-growth stump or tree to support the weight of the cable and the forces placed on it.

Cable yarding systems also have the potential to damage existing forest stands on adjoining lands due to line whip. This damage could be unacceptable in certain areas, such as NRCA's.

The plan does not analyze the potential of using helicopter yarding systems. Given the conditions in the Spada Lake Tract, this would have been one of the first alternatives I would have explored. This harvest system has many advantages from an economic, environmental, and ease of operation point of view.

Many of the sites identified for potential harvest could be done with smaller helicopters. Economically, this means that the cost of yarding material to the landing would be less if the cost of road construction and maintenance, and the high productivity of the helicopter systems were factored in. The existing roads could be utilized as landings which further enhances the productivity of the operation.

Many of the environmental concerns expressed in this plan would be greatly minimized by this harvest method. Soil disturbance and long term impacts from road construction to water quality are greatly reduced.

From an operational perspective, the greatest expenses of harvest unit design in this area is road location and engineering, followed by harvest method analysis. The use of helicopter systems tremendously reduces the complexity of these considerations.

A final comment on harvest systems. The use of whole tree yarding is mentioned as a passible alternative. While this does present some unique opportunities, it also results in a large accumulation of slash at landing sites. This accumulation needs to be addressed, as it has been our experience that it can become a significant fire hazard. Some examples of ways of dealing with this issue include burning, chipping and spreading, and trucking off site.

Regeneration:

My experience in the Spada Lake area and the Sultan Basin as a whole is that artificial reforestation, specifically with Douglas fir, is difficult and expensive. Most of the units harvested by the DNR have been naturally reforested. This area has very heavy natural seeding of Western Hemlock, with Red Cedar and assorted hardwoods also occurring. Many sites which were planted, became Western Hemlock stands anyway because of the prolific natural seeding. The recommendation is why fight mother nature and try utilized natural reforestation.

Access:

Access on road systems should be carefully examined for need. All other alternatives should be explored first. New road construction is a potentially hazardous enterprze and should be undertaken with the utmost reluctance. Once roads are constructed, maintenance can be a very high cost item. The risk of significant damage to many resources does not greatly reduce over time once a road has been built.

If I can answer any questions or provide information to assist you on your endeavour to adopt a management plan in the Spada Lake area, please feel free to contact me.

Sincerely,

Allen McGuire
Monroe Unit Forester

AMcG:ts

cc: Greg Ariss
Jean Williams
Lisa Egtvedt

8/ts1456.mis

PUD 26540
PNP 28-10-15-4

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April 22, 1996

Dear Bernice:

I have reviewed the 1995 Annual Report for the Jackson Project Wildlife Management Program and the draft Wildlife Habitat Management Plan Supplement for Spada Lake. The revised Annual Report substantially addresses the concerns that I expressed in my letters of March 28 and July 27, 1995.

I appreciated the cumulative summary presented in Section 4. The snag data are presented well in table 1, which documents areas that do and do not meet WHMP size and number goals. Out of 27 stands listed, 14 had been fully inventoried. Of those, eleven (78%) met WHMP goals. It is apparently still too early to assess the success of snag creation efforts, including decay processes, use by primary excavators, and the likelihood of blowdown. A review of this information should eventually be included in annual reports. It would be nice if alternate methods of snag creation, including direct inoculation with heart rot, could be compared over time.

The new method of evaluating CWD amount, recruitment, and survival was developed using suggestions from the agency reviewers. I think this method will provide useful data in the future. I found the comparison of results using line intercept vs. plot measures to be interesting. It would be nice to see more comparative data like this, but this is more a question of academic interest than a management imperative.

There has not yet been a satisfactory method of evaluating deer browse developed for this project. A method that combines accuracy, repeatability, and ease and speed of use is difficult to find or develop. I will be very interested to see what you come up with.

Other parts of the WHMP appear to be quite successful, including revegetation, nesting boxes, and osprey nest platforms.

The draft Wildlife Habitat Management Plan Supplement for the Spada Lake tract is very detailed and appears appropriate. The monitoring methods for Spada Lake will follow the monitoring protocols developed for the WHMP. The Spada Lake supplement specifically mentions revisiting the snags every 3 years to assess condition and use. The standard operating procedure for this assessment is still in development and was not available at the time of the March 27 meeting.

The WHMP Annual Report and, to a lesser extent, the Spada Lake Supplement, illustrate

that it is difficult to manage for wildlife and timber at the same time. Even though wildlife is nominally given a predominate place in management decisions in the WHMP, the importance of timber production is reflected in the structure of the Annual Report, which is primarily a timber harvest activity report with additional information on wildlife issues. All of the Spada Lake Supplement is devoted to timber management, with only the briefest mention of monitoring the effects of the timber management plan on wildlife habitat effectiveness. It might be preferable to change the emphasis of annual reports so that wildlife-related issues (including snag and CWD inventories, revegetation monitoring, and nesting success) are presented first and in detail, while timber-related issues (including harvest and road scheduling) are presented secondarily and in less detail.

Sincerely,

Julie Stofel

Julie Stofel
Wildlife Biologist

RECEIVED		
JACKSON PROJECT		
4-26-96		
	Orig.	Copy
C. Thompson		
B. Meaker		
K. Bedrossian		X
B. Tannenbaum		X
D. Miles		
N. Johnson		
M. Schuh		
M. Schutt		X
B. Maxwell		
D. Farwell-City		X
PNP 28-14-15-4	X	
PUD 30340		X

United States Department of the Interior

FISH AND WILDLIFE SERVICE
North Pacific Coast Ecoregion
Western Washington Office
3704 Griffin Lane SE, Suite 102
Olympia, Washington 98501
(360)753-9440 Fax: (360)753-9008

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M. Schuh		
M. Schutt		X
B. Maxwell		
PNP 28-14-15-4	X	
PUD 20344		X

April 30, 1996

Mr. Bruce Meeker
Jackson Project Manager
Snohomish County Public Utilities District
P.O. Box 1107
Everett, WA 98206-1107

Re: Jackson Hydroelectric Project (FERC # 2157)
Wildlife Habitat Management Plan - Annual Report and Wildlife Habitat Management Plan Supplement for the Spada Lake Tract

Dear Mr. Meeker:

The U.S. Fish and Wildlife Service (Service) has reviewed the referenced annual report, transmitted with your March 14, 1996, letter. We offer the following comments for your consideration.

When the Wildlife Habitat Management Plan (WHMP) was developed, it was anticipated that by the time the fifth and final annual report was prepared, the implementation of the wildlife improvement measures would be well established, with little further need for refinement. The Service does not believe this level of progress has been reached. The annual reports and associated meetings have been very useful for discussing the effectiveness of the previous years wildlife mitigation efforts and the wildlife measures and timber harvest plans proposed for the current year, making changes to the (WHMP) and for resolving problems and differences in interpretation, e.g., blowdown in green tree areas. The implementation of the (WHMP) is still evolving and methods to monitor the effectiveness of specific mitigation measures are still being refined. In addition, adjustments in the size and boundary of timber harvest units, timing of harvest of specific units, and stand management practices have occurred and can be expected to occur in the future. For these reasons, the Service requests the City of Everett (City) and the Snohomish Public Utilities District continue to prepare annual reports and to hold meetings to discuss the effectiveness of measures implemented to date, and whether any changes or remedial measures needed to be taken in the current year.

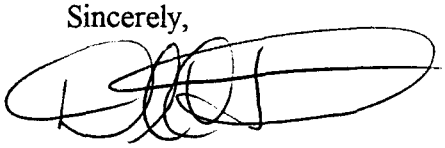
The Service concurs with the coarse woody debris prescriptions, as contained in Exhibit 1 (General Procedures for Managing Coarse Woody Debris on Harvest Units) of the 1995 Wildlife Annual Report. Exhibit 1 represents a compromise and provides greater definition with regard to the number and size of decay class 1 and 2 logs to be left on site following timber harvest.

The Service does not object to the application of biosolids (sludge digested by bacteria) on stands 2035 and 2040 at Horseshoe Bend, proposed for 1996, based on the information provided by the City at the March 27, 1996, annual meeting. According to City representatives, the biosolids have been determined to be safe, i.e., low in heavy metals and free of pathogens, and would not require the application area to be closed to public entry. The Service objected to the City's late 1980's proposal because of wildlife concerns and the one year closure requirement. Besides the increased production of wood fiber, the biosolid application is expected to increase deer forage in the understory, increase protein content of the forage, accelerate stand stratification and attainment of a multistoried canopy, and accelerate the growth rates of dominant and codominate trees. The effect of the biosolids application needs to be evaluated with the results available for review and discussion at the next annual meeting. Our continued acceptance regarding the use of biosolid fertilization on wildlife habitat management lands will depend on it resulting in actual improvements to the wildlife habitat and it not being a factor with precluding public access.

We have reviewed your March 22, 1996, draft (WHMP) Supplement for the Spada Lake Tract. We are comfortable with the supplemental plan, with the exception of the schedule for implementation, which has yet to be provided. Given the great variety of site conditions and the inability of the plan to address in detail the management prescriptions to be implemented at each site, we understand that a considerable amount of flexibility is needed in the plan. The supplemental plan seems to provide a good framework from which to begin implementing habitat improvement measures at the Spada Lake Tract. Additional planning, monitoring, evaluation, and continued coordination with the Service and other resource agencies and the Tribes are expected.

We appreciate your efforts in preparing the annual reports and addressing our concerns. Please contact Mr. Gwill Ging of my staff at (360) 753-6041 if you have questions regarding this letter.

Sincerely,



David C. Frederick
Supervisor

gg/jmc
FERC 2157/Jackson Hydroelectric Project

[An original letter sent to Clair Oliver, Everett Public Works]

c: FERC, Wash., D.C. (Lois Cashell)
FERC, Portland (Arthur Martin)
WDFW, Mill Creek (Gary Engman)
Tulalip Tribes, Marysville (Julie Stofel)

PHONE MESSAGE

FROM: Gwill Ging, U.S. Fish & Wildlife Service, Olympia, WA 360-753-6041
TO: Bernice Tannenbaum
DATE: Dec. 9, 1996
SUBJECT: Spada Supplemental Plan schedule

Gwill stated that the schedule for the Spada Supplemental Plan looked okay to him. He wasn't planning on writing his comment to us, and this phone message could serve as his comment on the schedule.