1991 ANNUAL PROGRESS REPORT

WILDLIFE HABITAT MANAGEMENT PROGRAM

for the

HENRY M. JACKSON HYDROELECTRIC PROJECT

FEDERAL ENERGY REGULATORY COMMISSION
Project Number 2157

Submitted by

PUBLIC UTILITY DISTRICT NO. 1 OF SNOHOMISH COUNTY

and

THE CITY OF EVERETT, WASHINGTON

March 1992

Table of Contents

LIST OF FIGURES AND TABLES

1.0 INTRODUCTION

The 1991 Annual Progress Report on the Wildlife Habitat Management Plan for the Henry M. Jackson Hydroelectric Project is submitted in response to the Federal Energy Regulatory Commission (FERC) Order Approving With Modification Revised Wildlife Habitat Management Plan (issued May 19, 1989). Public Utility District No. 1 of Snohomish County (District) and the City of Everett (City) are co-licensees in the Project.

This annual report describes activities conducted during 1991 and summarizes activities anticipated for 1992. Activities, procedures and schedules described in this report are based on the Wildlife Habitat Management Plan (WHMP) submitted to FERC on May 25, 1988. Problems or changes needed during the course of the WHMP implementation are discussed and updated schedules are presented. A draft of this report was submitted for comments to the U.S. Fish and Wildlife Service (USFWS), the Washington Department of Wildlife (WDW), the Washington Department of Natural Resources (DNR), the U.S. Forest Service (USFS), and the Tulalip Tribes. The USFS no longer intends to actively monitor progress on the WHMP (see letter in Section 6.2).

2.0 SUMMARY

Major tasks accomplished during 1991 include: US Forest Service/District land exchange at Spada Lake, DNR/District land exchange at Williamson Creek and Spada Lake, DNR/City land exchange at Lake Chaplain, contracting final harvest and road construction for three Lake Chaplain units, installation of waterfowl nesting platforms in Lake Chaplain and Lost Lake, precommercial thinning at Lost Lake, and continuation of the snag management program, completion of revegetation design and first reseeding of pipeline ROW. The District hired another full-time wildlife biologist to work on the WHMP in November 1991.

Tasks scheduled for 1992 include: completion of road construction, final harvest, and replanting at the three Lake Chaplain units, completion of the Spada Lake supplement to the WHMP, layout and contract award for commercial thinning at Lake Chaplain, continuation of the snag management program, implementation of monitoring activities, revegetation of Lake Chaplain sites, powerhouse site, and additional reseeding of pipeline ROW.

3.0 WORK COMPLETED DURING 1991

3.1 LAND ACQUISITION

The U.S. Forest Service/District land exchange was completed on February 28, 1991, as described in the 1990 Annual Report. The DNR/District land exchange was completed on June 28, 1991. Through these exchanges the District acquired 3,520 acres (net) from the U.S. Forest Service and 629.5 acres from the DNR (Figure 1). An outline of the Spada Lake supplement to the WHMP, (for USFS lands above 1460 feet) was prepared (Appendix A).

The City and DNR pursued the Lake Chaplain land exchange (Figure 2). The City Council approved the exchange on December 30, 1991, and the DNR Board approved it on January 7, 1992. Transfer of the property was recorded on March 12, 1992. With this exchange, all of the acreage covered by the WHMP in the Lake Chaplain Tract has been acquired by the City.

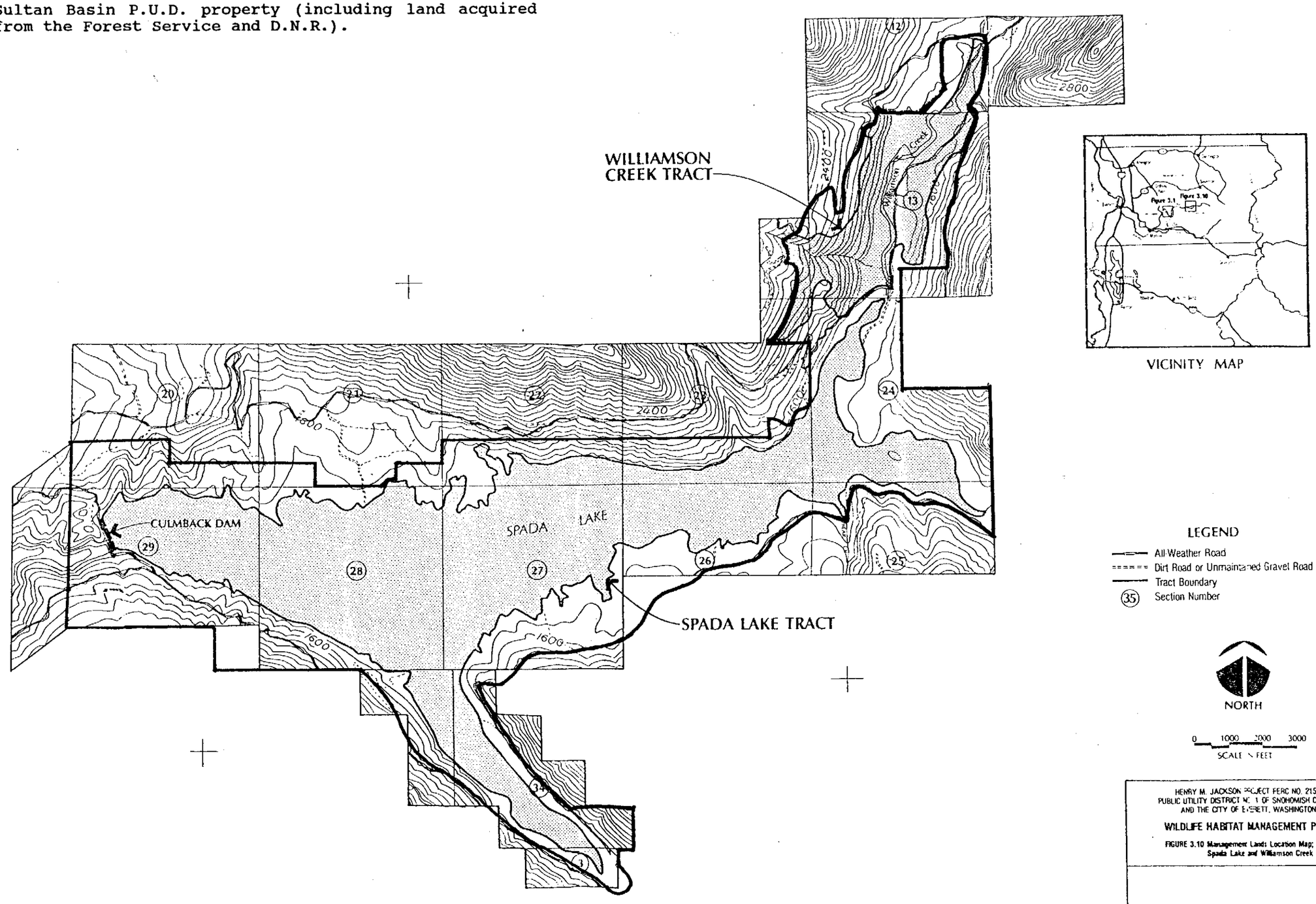
3.2 LAND USE DECISIONS AND ACTIVITIES

In an effort to preserve the wildlife habitat value of the Lost Lake Tract, the co-licensees have established, and agency representatives have agreed, that public access will be hike-only, without designated trails.

High-water levels during winter months in the wetland north of Lost Lake have resulted in some drainage toward Lake Chaplain. After the City expressed concern over potential contamination of the reservoir from this drainage, it was decided that water level changes in Lost Lake would be limited to a level that would eliminate drainage to the north, and all drainage would be directed to the southeast through an established wetland/stream complex. An existing culvert under the access road southeast of the lake had been plugged by a beaver dam, preventing such drainage.

A concrete ford was constructed in the access road where it crosses this drainage, and the new high-water limit was established. As a result, the maximum lake level is now approximately six inches below the low-water level measured in September 1991, and the water level of the wetland downstream from the ford has risen. Permanent photo stations were established to document any changes in wetland vegetation that may result from changes in water levels.

Figure 1. Sultan Basin P.U.D. property (including land acquired from the Forest Service and D.N.R.).



HENRY M. JACKSON PROJECT FERC NO. 2157
PUBLIC UTILITY DISTRICT NO. 1 OF SNOHOMISH COUNTY AND THE CITY OF EVERETT, WASHINGTON

WILDLIFE HABITAT MANAGEMENT PLAN

FIGURE 3.10 Management Lands Location Map; Spada Lake and Williamson Creek Tracts.

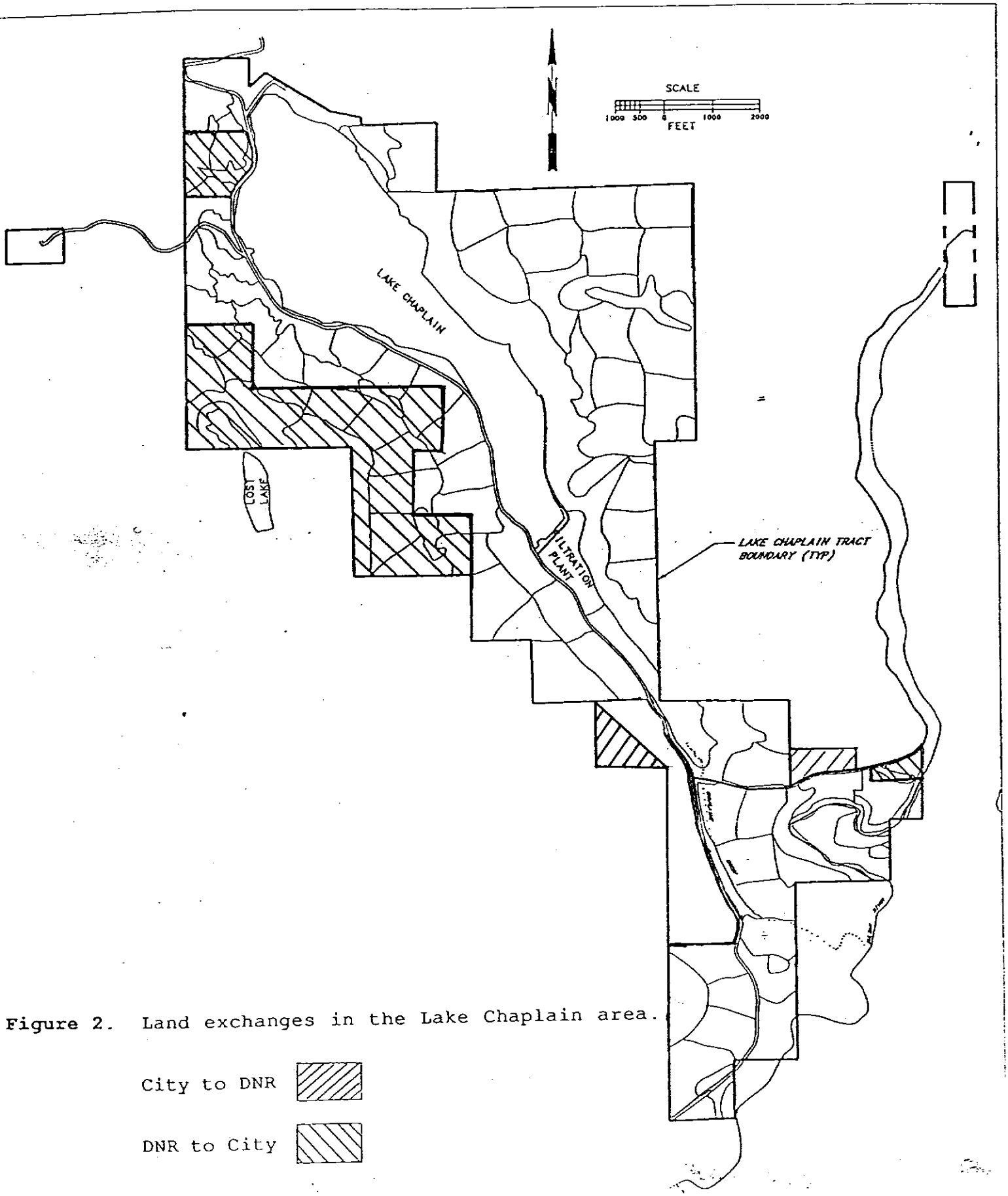


Figure 2. Land exchanges in the Lake Chaplain area.

City to DNR

DNR to City

3.3 FOREST VEGETATION MANAGEMENT

Intensive timber harvest has occurred, or is planned in the near future, on privately-owned lands adjacent to the northern and western sides of the Lake Chaplain and Lost Lake tracts (Figure 3). Within the next year or two it is expected that large recent clearcuts will border the tracts on these sides. When the WHMP was in preparation (1985-86) it was understood that some final harvest would take place on neighboring properties, but the timing and magnitude of future harvests could not be predicted.

The WHMP provides sufficient flexibility for responses to forest cover changes on adjacent land, within the objectives of the plan. The co-licensees will try to avoid placing a final harvest unit immediately adjacent to a neighboring clearcut until such time as the neighboring stand develolps a minimum of hiding cover for black-tailed deer. This could be done by using strategies such as adjusting schedules and boundary locations of final harvest units, creating buffer zones, substituting commercial thinning for final harvest, or substituting harvest units.

One Lake Chaplain final harvest unit scheduled in the WHMP for 1990 is adjacent to a recent clearcut. In response, the co-licensees modified the shape of the unit (Figure 4, Unit 2) to provide a buffer zone between the harvested areas. The preferred buffer zone width would have been 600 feet; however, due to the access road location, only 115 feet could be provided at the narrow end.

3.3.1 Final Harvest

The City secured an easement from DNR to construct an access road to harvest units scheduled for 1990 in the WHMP on the northeast side of Lake Chaplain (Figure 4). Road construction and final harvest of Units 1, 2 and 3 was initiated in December. At present, construction of the access road to Units 2 and 3, and the access road to Unit 1 has been completed, and also harvest of Unit 1. The access road to Units 2 and 3 (Figure 4) passes within the prescribed buffer zone of the wetland area in Section 31. It proved very difficult to identify a road alignment that would not trespass on the buffer zone due to constraints of soil types, watercourses and slopes in this area. The actual alignment in this section utilizes an old railroad grade, and therefore there is no decrease in the size of the wetland. Agency representatives toured this area on March 11, 1992, and did not comment on the construction adjacent to the wetland.

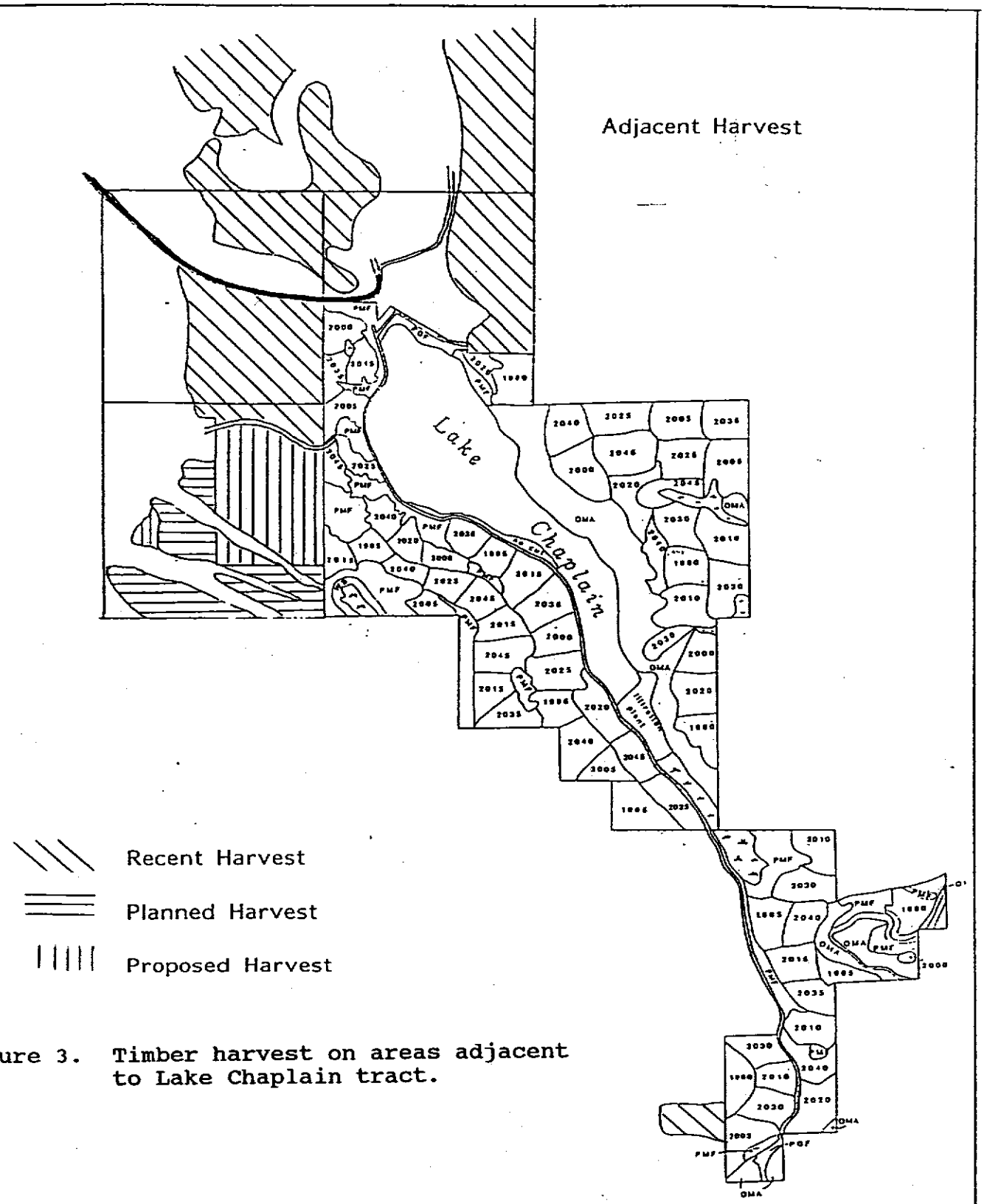


Figure 3. Timber harvest on areas adjacent to Lake Chaplain tract.

Revised Harvest Plan

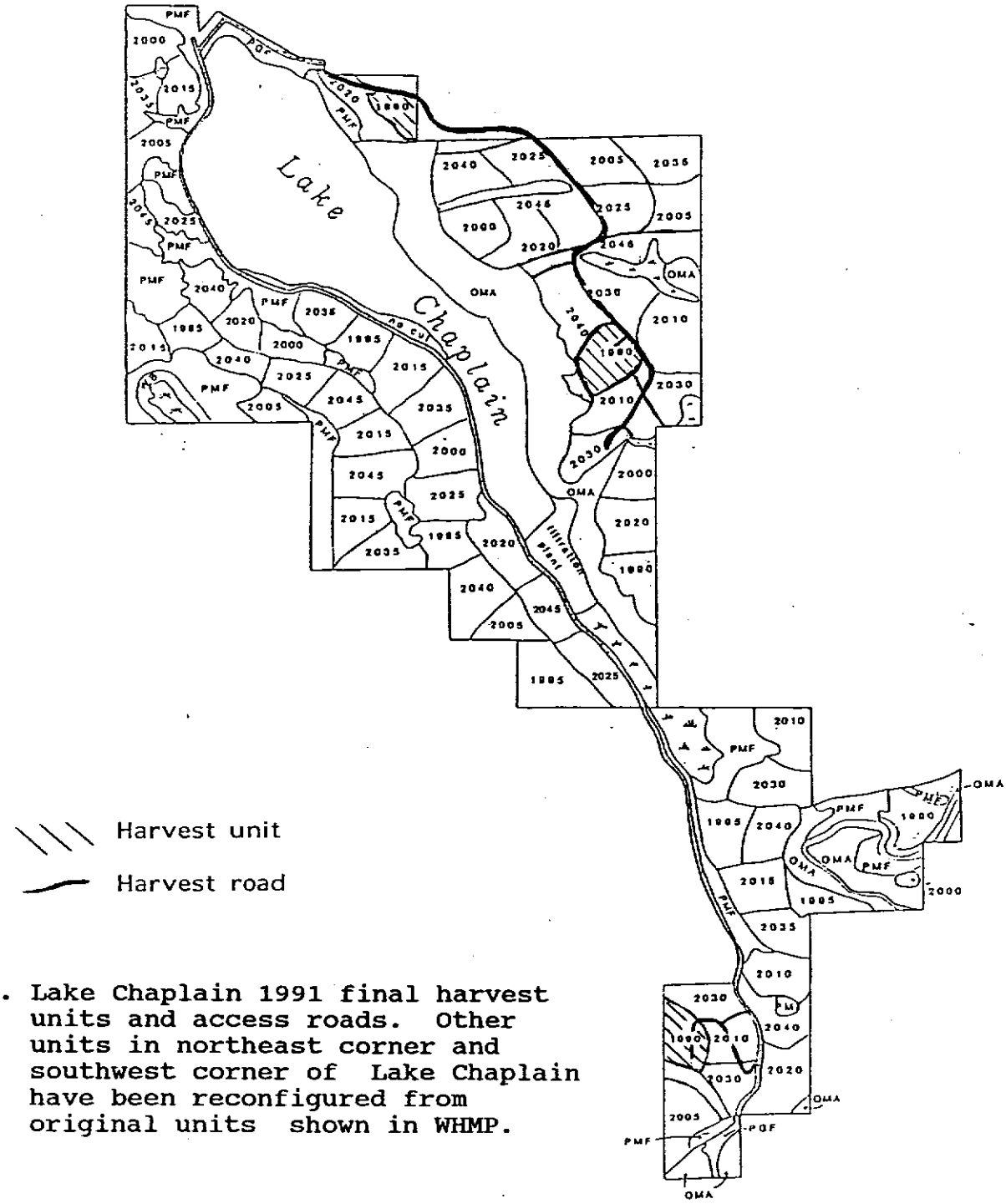


Figure 4. Lake Chaplain 1991 final harvest units and access roads. Other units in northeast corner and southwest corner of Lake Chaplain have been reconfigured from original units shown in WHMP.

The contractor plans to complete harvest of Units 2 and 3 during April 1992. The status of the two additional 1990 final harvest units scheduled in the WHMP remains unchanged; as described in the 1990 Annual Report, one of the units is located in the DNR exchange lands and the other will be accessed from a planned DNR road. It is expected that these units will be harvested within the next four years, which is within the range permitted by the WHMP.

3.3.2 Precommercial Thinning

Forty-six acres of a closed canopy sapling stand at the Lost Lake Tract were precommercially thinned in July 1991 (Figure 5). The acreage was reduced slightly from the 54 acres specified in the WHMP in order to utilize old skid trails on the western edge as the cutting unit boundary.

The selection of retention trees was based on several criteria. Overall spacing was to average about 18 feet, and all hardwoods except alder were retained, regardless of spacing. For conifers and alders, the largest, best-formed trees were selected using the following ranking in areas with alder canopy: western red cedar and Douglas fir (most favored), hemlock, alder. In areas with hemlock canopy, the ranking was as follows: Douglas fir and red cedar (most favored), alder, hemlock. All snag trees were retained. Photodocumentation stations were established following the thinning.

The slash resulting from the thinning is very thick due to the large size of the trees and density of the stand. It will probably require five or more years for thinned areas to be penetrable by larger animals such as deer. To provide short-term access, two strips approximately 150 feet wide were left unthinned, and 4-foot wide trails were cut across the unit at 200 foot intervals.

3.4 SNAG MANAGEMENT

Snag trees were inventoried in nine different forest stands with total acreage of approximately 335 acres (Figure 6). The stands were selected for inventory in areas where snag trees could be created in 1991 without conflict with other activities, and where property lines and harvest unit boundaries had been marked in the field. All of these stands are second growth, ranging from 77 years to 54 years since stand origin. The stands comprise 60-year rotation forest (both conifer and mixed), and

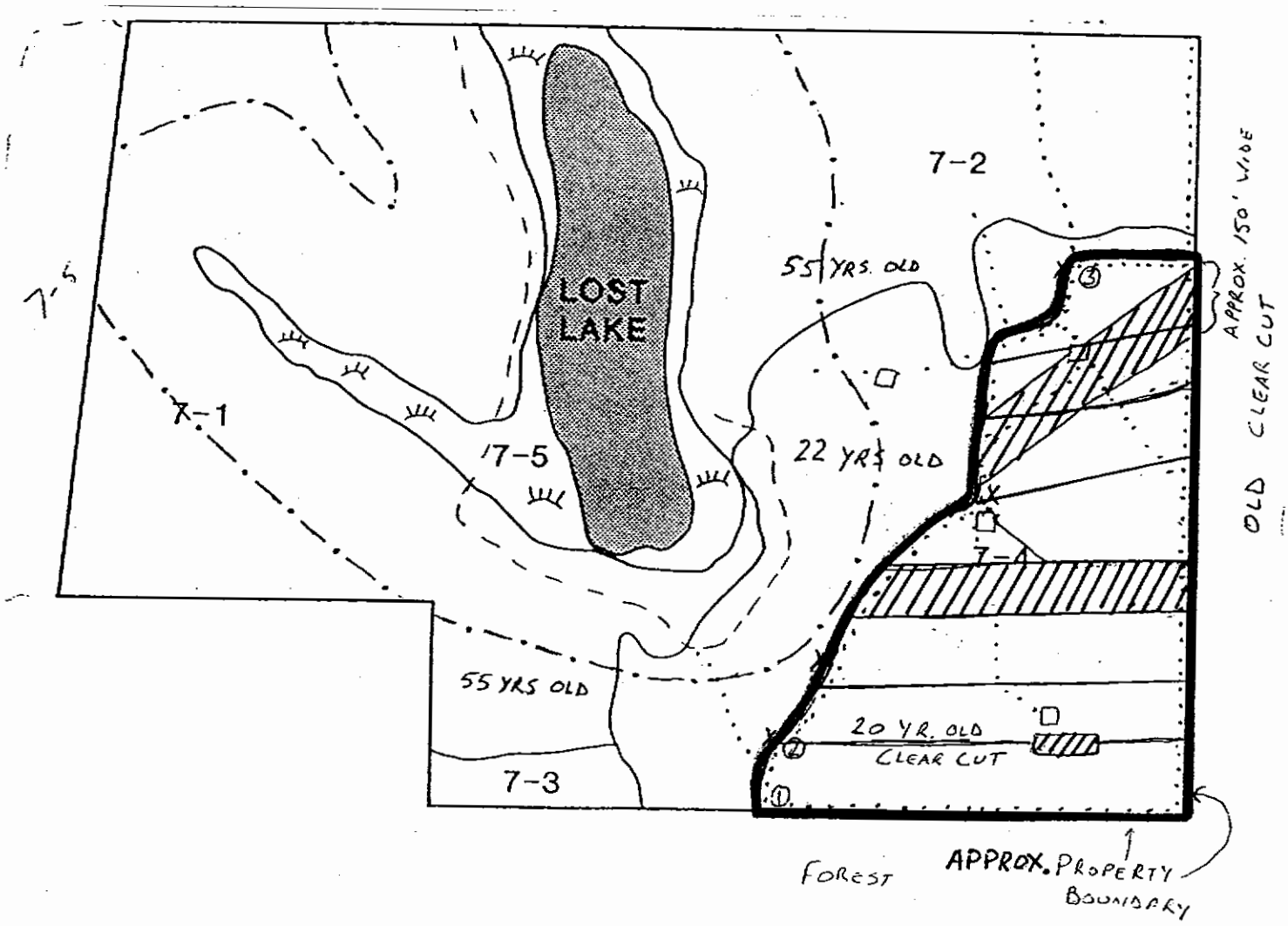
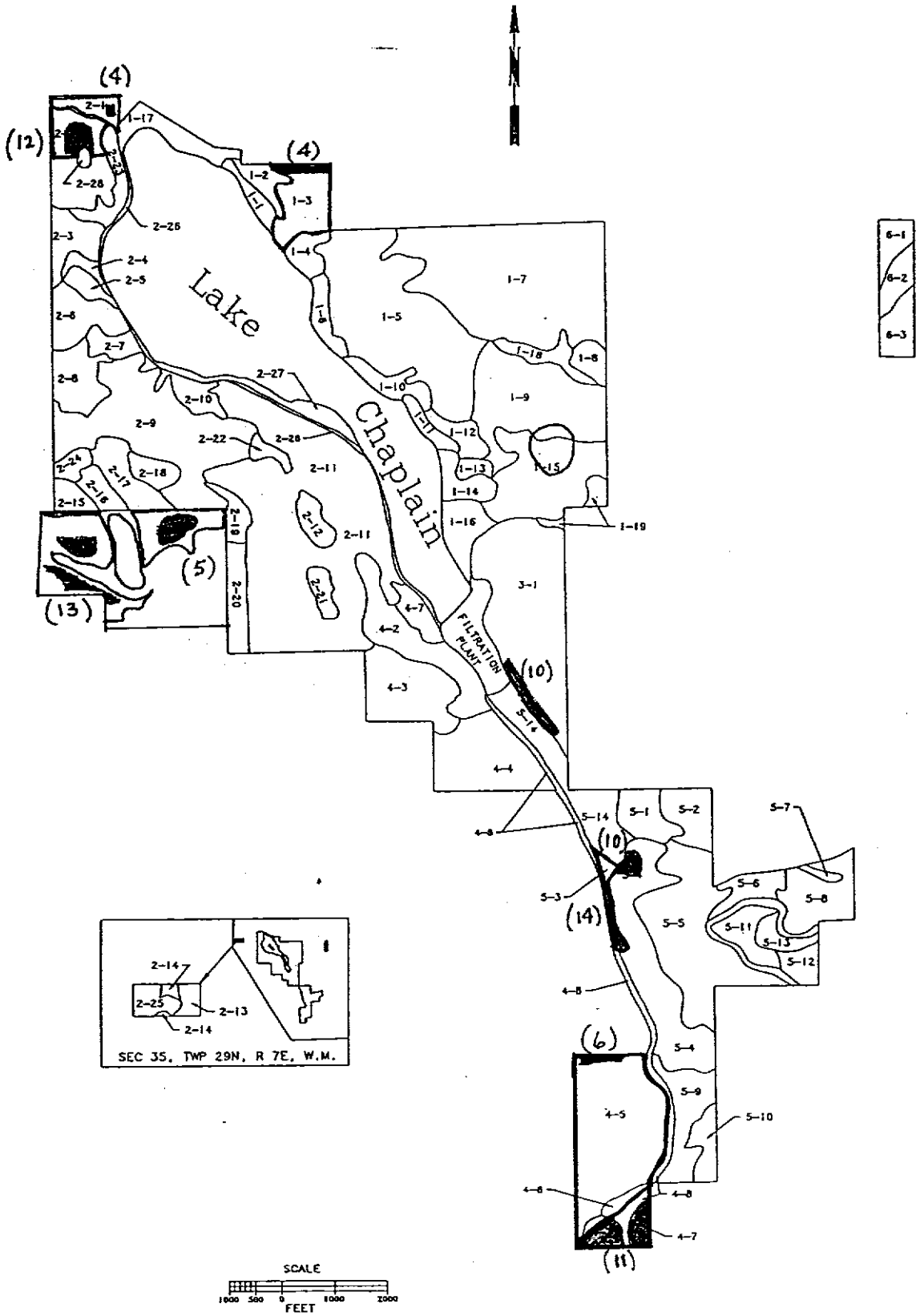


Figure 5. Lost Lake Pre-commercial Thin.

- X photo documentation station
- ⓘ stem count plot
- --- access road (4WD)
- ▬▬ cleared trails
- —·— wetland buffer boundary
- ▯ old landing
- - - foot path
- ▬▬ thinning unit boundary
- wetland
- ▨ un-thinned area

Figure 6. Locations of snag inventories (by stand) and created snag trees.



permanent mixed forest. The sampling procedure adapted from USFS vegetation structure survey procedures, is described in Appendix B. Results of the inventory are summarized by size class and decay class in Figure 7, and compared with target numbers from Table 2.2 of the WHMP. Details of the snag inventory in each stand are listed in Table 1.

Comparisons of the existing inventories and target numbers in the various classes reveal that the inventories of existing snags are deficient in several classes. However, it should be recalled that the WHMP permits substituting larger snags for smaller snags. For example, the inventory of hard, tall (greater than 40 feet in height) snags in the 15 inch (minimum dbh) and 17 inch classes satisfies the requirement for 15 inch hard snags that are 20-39 feet in height. There is no net deficiency in 15 inch hard snags of intermediate height. After making additional adjustments of this sort, it is clear that the inventory of existing and created hard snags satisfies almost all deficits for hard snags (Figure 8). The inventory is deficient primarily in the soft 15 inch class from 20-39 feet in height, and the soft 17 inch class under 20 feet in height.

In terms of primary cavity nesting species, 100 percent of the snag needs of the red-breasted sapsucker, downy woodpecker and pileated woodpecker are currently met in these stands, but only 50 percent of the needs of the common flicker, and very few of the hairy woodpecker, are met.

Fifty-nine trees were topped and de-limbed in six stands, including those that were inventoried (Figure 6). Thirty trees were created in 1990 in four stands. The characteristics of snag trees created in 1990 and 1991 are listed in Table 2. As in 1990, snags created in 1991 were loosely clustered, ranging from 55 to 400 feet from each other. In 1991, alders were topped in addition to conifers in the hope that they will decay more rapidly.

The snag management program relies on creating snags to remedy the deficits, and retaining existing snags wherever possible. Snag creation takes place primarily in permanent forest stands, buffer zones, green tree retention areas associated with harvest units, and within harvest units, where possible. Snag creation alone would reduce the deficit of soft snags by 20 percent within the next few years as the snags created in 1990 and 1991 decay. However, most snags within 1991 harvest units could not be saved, which adds to the deficit. We will evaluate the acreage of future harvest units that offer opportunities for retaining snags, and develop an estimate of projected losses due to timber harvest for the next five years.

Figure 7. Comparison of existing snag inventory and WHMP target numbers by size and decay class. Created snags are not included in the inventory.

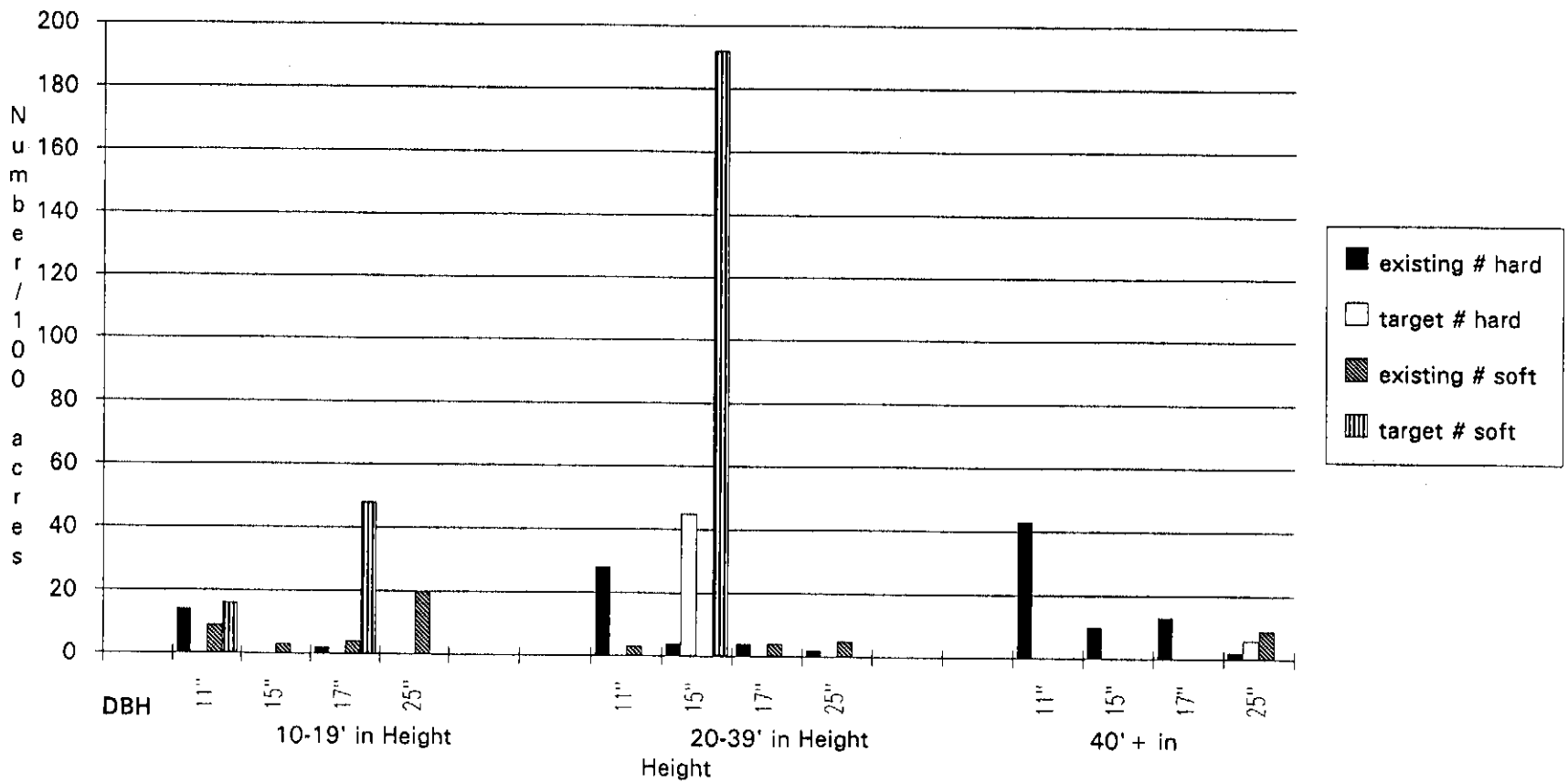


Table 1. Existing natural snags listed by stand and decay class. (Not per 100 acres).

	acreage		10-19' in Height				20-39' in Height				40' + in Height				
	surveyed	DBH	11"	15"	17"	25"	11"	15"	17"	25"	11"	15"	17"	25"	TOTAL
Stand 1-3		Hard					1				4				5
	4.2 ac.	Soft					1							1	2
Stand 1-9		Hard					4		2		3	3	2		14
	6.3 ac.	Soft			2	2								1	5
Stand 2-1		Hard					1						1		2
	2.11 ac.	Soft	1												1
Stand 2-2		Hard					1				3	1			5
	4.2 ac.	Soft													0
Stand 4-5		Hard					2				3	1			6
	5.6 ac.	Soft				1				2					3
Stand 4-7/4-8		Hard	6		1		2	1			5		1	1	17
	5.6 ac.	Soft				1									1
Stand 4-8/5-3		Hard					1					1	1		3
	4.2 ac.	Soft		1		4				2					7
Stand 7-1N&S		Hard	1				1				2				4
	10.83 ac.	Soft	1											2	3
Stand 7-2		Hard						1		1	4				6
	6.3 ac.	Soft	1			1									2
		TOTAL	10	1	3	9	14	2	2	5	24	6	5	5	86

Total acreage surveyed = 49.34 acres (1990 & 1991).

Total acreage sampled = 335 acres (1990 & 1991).

Figure 8. Evaluation of deficiencies in snag inventory by size and decay class. Existing and created snags were subtracted from target numbers.

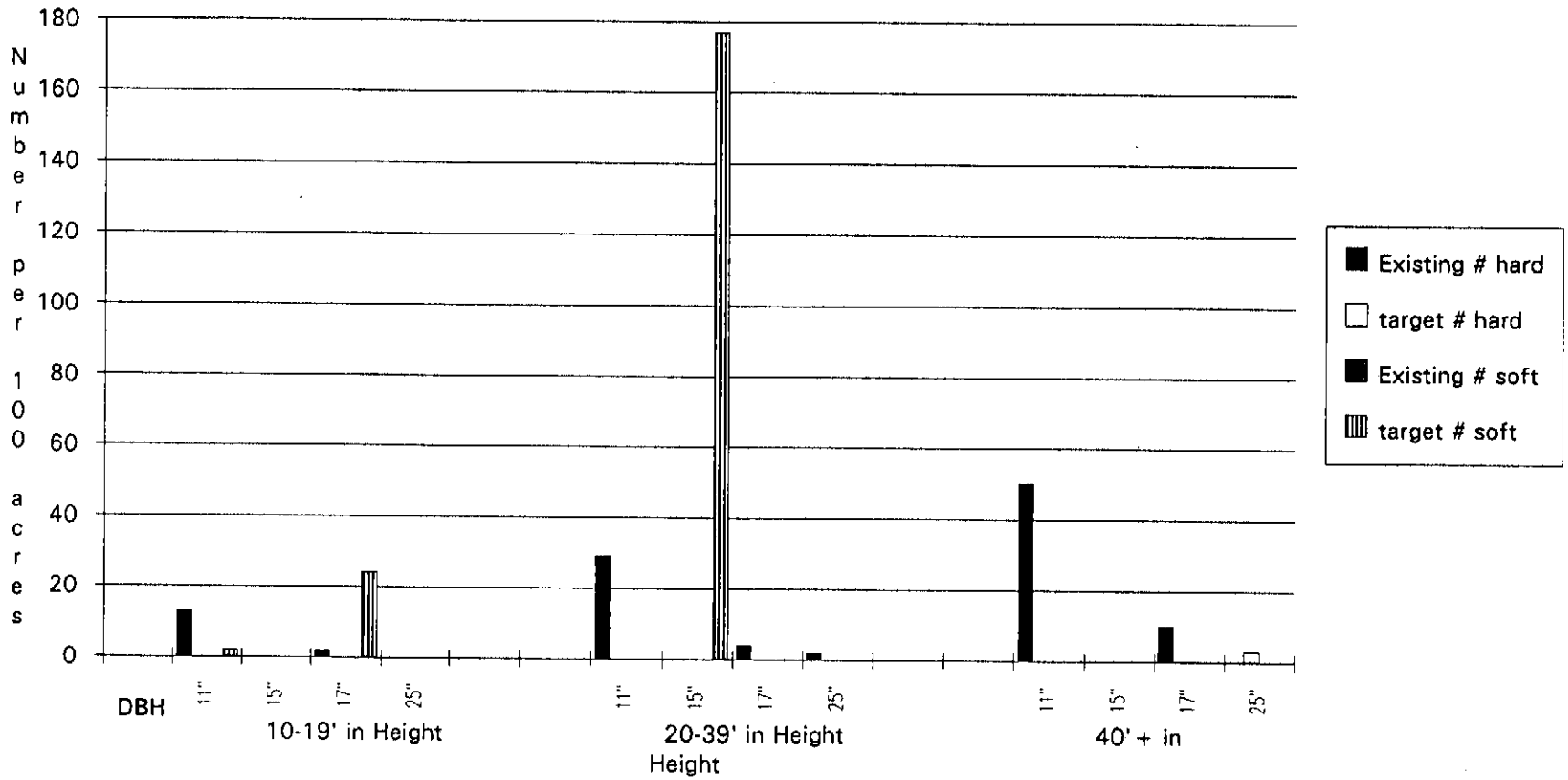


Table 2. Characteristics of created snags,				
	by stand (1990 & 1991data).			
Stand 1-3		Snag yr. = 1990		Age = 1
TAG#	SPECIES	DBH	HEIGHT	COND/USE
#121	Douglas-fir	19	50	Hard/no
#122	Douglas-fir	19	55	Hard/no
#123	Douglas-fir	24	50	Hard/yes
#124	Douglas-fir	21	45	Hard/no
Stand 3-1		Snag yr. = 1990		Age = 1
TAG #	SPECIES	DBH	HEIGHT	COND/USE
#113	Hemlock	19	50	Hard/no
#112	Douglas-fir	18	50	Hard/no
#114	Douglas-fir	22	55	Hard/yes
#115	Douglas-fir	29	60	Hard/no
#116	Hemlock	14	50	Hard/no
#117	Douglas-fir	16	50	Hard/no
#118	Douglas-fir	17	50	Hard/no
#111	Douglas-fir	19	55	Hard/no
#119	Hemlock	19	45	Hard/no
#120	Hemlock	22	45	Hard/no
Stand 4-5		Snag yr. = 1990		Age = 1
TAG #	SPECIES	DBH	HEIGHT	COND/USE
#128	Douglas-fir	20	55	Hard/yes
#125	Douglas-fir	26	60	Hard/no
#127	Douglas-fir	20	60	Hard/no
#126	Douglas-fir	27	65	Hard/no
#129	Douglas-fir	23	60	Hard/no
#130	Hemlock	19	60	Hard/no
Stand 5-4		Snag yr. = 1990		Age = 1
TAG #	SPECIES	DBH	HEIGHT	COND/USE
#108	Hemlock	15	50	Hard/no
#107	Douglas-fir	23	60	Hard/no
#110	Hemlock	23	55	Hard/no
#106	Hemlock	19	40	Hard/no
#109	Hemlock	19	40	Hard/no
#105	Douglas-fir	22	55	Hard/yes
#104	Douglas-fir	21	60	Hard/no
#103	Hemlock	19	40	Hard/no
# 102	Douglas-fir	20	40	Hard/no
# 101	Douglas-fir	20	65	Hard/no

Table 2. (cont.)				
Stand 2-1		Snag yr. = 1991		Age = 0
TAG #	SPECIES	DBH	HEIGHT	COND/USE
#173	Hemlock	16	50	
#174	Alder	23	45	
#175	Alder	16	45	
#176	Alder	23	55	
Stand 2-2		Snag yr. = 1991		Age = 0
TAG #	SPECIES	DBH	HEIGHT	COND/USE
#172	Hemlock	13	50	
#170	Douglas-fir	19	55	
#171	Hemlock	16	40	
#169	Douglas-fir	22	55	
#165	Hemlock	20	55	
#166	Hemlock	19	40	
#167	Douglas-fir	18	55	
#168	Hemlock	18	50	
#164	Hemlock	21	40	
#163	Hemlock	16	45	
#162	Douglas-fir	22	65	
# 161	Hemlock	22	45	
Stand 4-7/4-8		Snag yr. = 1991		Age = 0
TAG #	SPECIES	DBH	HEIGHT	COND/USE
#145	Douglas-fir	18	60	
#146	Douglas-fir	19	55	
#147	Douglas-fir	20	60	
#148	Douglas-fir	18	45	
#149	Douglas-fir	19	55	
#150	Douglas-fir	16	40	
#151	Douglas-fir	17	65	
#152	Hemlock	18	45	
#153	Douglas-fir	24	75	
#154	Douglas-fir	16	60	
#155	Douglas-fir	22	45	

Table 2. (cont.)				
Stand 4-8/5-3		Snag yr. = 1991		Age = 0
TAG #	SPECIES	DBH	HEIGHT	COND/USE
#131	Douglas-fir	19	65	
#132	Hemlock	21	55	
#133	Hemlock	17	45	
#134	Douglas-fir	27	55	
#135	Douglas-fir	14	95	
#136	Douglas-fir	21	55	
#137	Hemlock	19	50	
#138	Douglas-fir	18	45	
#139	Douglas-fir	21	60	
#140	Alder	15	55	
#141	Douglas-fir	20	60	
#142	Douglas-fir	18	55	
#143	Hemlock	19	55	
#144	Hemlock	20	50	
Stand 7-1		Snag yr. = 1991		Age = 0
TAG #	SPECIES	DBH	HEIGHT	COND/USE
#177	Douglas-fir	24	45	
#178	Douglas-fir	20	45	
#179	Hemlock	22	60	
#180	Douglas-fir	20	55	
#181	Douglas-fir	18	45	
#182	Hemlock	15	55	
#183	Hemlock	16	45	
#184	Hemlock	16	40	
#185	Hemlock	16	40	
#186	Hemlock	18	40	
#187	Hemlock	19	55	
#188	Hemlock	18	45	
#189	Hemlock	20	50	
Stand 7-2		Snag yr. = 1991		Age = 0
TAG #	SPECIES	DBH	HEIGHT	COND/USE
#156	Alder	15	50	
#157	Hemlock	13	65	
#158	Alder	16	55	
#159	Alder	15	50	
#160	Alder	15	50	
	TOTAL = 89 created snags (1990 & 1991).			

3.5 REVEGETATION

The horticultural consultant concluded his design work on all sites scheduled for revegetation work in the WHMP, and submitted recommendations in a series of reports (Appendices C-1 through C -5). The reports cover the transmission line ROW, power pipeline ROW, powerhouse site, the north end of Lake Chaplain, Chaplain Marsh, and test plots on the shoreline of Spada Lake. The District will use these recommendations to plan revegetation work, subject to modifications required by operational constraints, such as water quality considerations.

The recommendation for the transmission line ROW was overseeding with a grass/forb mix[1] and fertilizing. This work was done in October 1991.

The recommended treatment for the pipeline ROW differs substantially from the prescription of the WHMP. Because of construction disturbance and poor soil quality, alder has become well established, and few other shrub species would be expected to survive. The horticulturist recommended spending several years initially to develop a grass/forb layer that would amend and improve the soil, and permit other shrub species to grow in the future. Three options were outlined in this report. The most intensive treatment involved mechanical removal of the alder layer, including roots, importation of topsoil, and hydroseeding. The least intensive treatment consists of reseeding repeatedly without site preparation. The more intensive treatments would be very costly relative to the size of the treatment area and the expected benefits in habitat quality. Therefore, the District has decided to initially implement the option of reseeding annually for up to four years and observing the results.

Treatment areas on the pipeline ROW (i.e. the portions not occupied by maintenance roads and facilities) were divided into two sections. The 1991-2 treatment area includes about 14.8 acres located between the microwave site near the powerhouse and a fence across the ROW near the Sultan Basin Road. In October 1991 four acres in the treatment area were seeded with the grass/forb mix used on the transmission ROW. The remaining treatment area is currently subject to off-road vehicle abuse, and it was decided not to seed in this area until the vehicle access can be controlled. A plan is under development to install gates that will prevent access to the ROW; after the installation, this area will be reseeded.

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[1]Seed mix consists of 6.25 lb (per acre) perennial ryegrass, 6.25 lb annual ryegrass, 4 lb Alta tall fescue, 2.5 lb creeping red fescue, and 6 lb birdsfoot trefoil.

The horticulturist's recommendations for the north end of Lake Chaplain, Chaplain Marsh, and the powerhouse site consist of shrub and/or tree planting, plus seeding the same grass/forb mix used on the transmission ROW. Planting specifications and site plans (Appendix D) were prepared in 1991, and attempts have been initiated to locate nursery-grown plant material. Sufficient plant material (Douglas fir and western red cedar seedlings) has been found for the north end of Lake Chaplain in time for spring 1992 planting.

It has proven more difficult to locate the native shrub species recommended in the consultant's reports for Chaplain Marsh and the powerhouse site, but it is anticipated that sufficient plant material will be located in time for planting in the fall of 1992. Detailed specifications for test plots at Spada Lake have not been drawn up yet.

3.6 FLOATING NEST PLATFORMS

Floating nest platforms suitable for use by loons were placed in Lake Chaplain and Lost Lake in March 1991, as described in the 1990 Annual Report. Monitoring visits were made from the opposite side of each lake at least three times per month from late March to mid-July. Loons were observed in Lake Chaplain throughout the spring, summer and fall of 1991, but there was no observed use of the platforms. No loons were observed in Lost Lake, and the only use of these platforms was by loafing Canada geese on one occasion. Procedures, described in Appendix E, were subsequently developed for use in future years.

3.7 NEST BOXES

The two wood duck nest boxes previously installed at Lost Lake were monitored in 1991 following procedures adapted from standard operating procedures of Pacific Power & Light's Merwin Hydroelectric Project. The procedure consisted of a maintenance visit in February, a breeding visit in April, an occupancy visit in May, and a productivity visit at fledging time, as determined by results of previous visits. A clutch of 8 eggs was found in one box on April 24. The box was re-checked on May 24, and a female hooded merganser was flushed from the box. A final check was made on May 30, in which the box contained 9 cold eggs. No adult mergansers were seen on this visit, and it is assumed that the eggs were abandoned. To reduce the likelihood that monitoring causes nest abandonment, the procedures have been modified to eliminate visits in May, and to check the boxes in June instead. Procedures are outlined in Appendix E.

3.8 OSPREY NEST PLATFORM

The osprey nest platform at Lost Lake was monitored three to four times per month from April to July from the opposite side of the lake. Ospreys were seen on the platform on two occasions in August, but otherwise did not use it for nesting. The nest at Lake Chaplain, approximately 1-1/4 mile away, was used this year by a pair of ospreys who raised one chick through fledging. If the ospreys observed at Lost Lake were the same birds that nested at Lake Chaplain, they may have adopted the Lost Lake platform as an alternate nest site, in which case it is unlikely that a new pair would be permitted to use it for nesting. Procedures, described in Appendix E, were subsequently developed for future use.

3.9 MANAGEMENT TOOLS

Implementation of the Geographic Information System (GIS) for the wildlife management plan began in late 1991. To date, the data base design has been completed, user applications have been specified, and data capture has begun.

3.10 MONITORING

3.10.1 Deer Forage Monitoring

The WHMP prescribes monitoring of the production and utilization of deer forage to document the benefits of enhancement measures (associated with timber harvest), and to help evaluate how long the increase in production persists after overstory cutting. The WHMP called for comparisons between results obtained on mitigation lands and results from control stands under typical commercial management. Since the preparation of the WHMP, however, forest industry practices have converged on the standards outlined in the WHMP, (with the exception of maximum size of clearcut units). Public and private lands surrounding the mitigation lands have been intensively harvested in the past few years, with the result that the Lake Chaplain and Lost Lake units are becoming surrounded by recent clearcuts. Due to the increasing isolation of mitigation lands from other forested tracts, and the availability of forage off the mitigation lands, results could well show the same use of forage on mitigation lands as on adjacent harvested lands, and increased usage of remaining forested stands. These results could occur independent of any of the WHMP management activities, and would be difficult to interpret.

A more valuable comparison could be made of the mitigation lands under WHMP-prescribed management versus the same stands in an unmanaged condition, which has been the case prior to implementation of the WHMP. We will document and compare forage production and utilization in closed-canopy units under 60-year rotation with the same units post-harvest or post-thinning. Measurements will be made over a 20-year period post-harvest to help fine-tune the forest succession model, and to modify the harvest schedule if necessary.

The method described in the WHMP for estimating production is a transect-based line intercept method that uses percent cover of grasses, forbs and shrubs as an estimate of production (biomass). Utilization was to be qualitatively estimated. Deer forage monitoring procedures were researched extensively in 1991 through literature review and consultation with specialists. Options for monitoring forage production range from qualitative "ocular" assessments whose value is a function of the experience of the observer, to direct biomass measurements that depend less on observer judgement but are very labor-intensive. On the advice of specialists, we have selected objective quantitative methods that do not require much observer judgement, but which can be done in reasonable time.

The methods are described in Appendix F. Forage availability is measured on 5 square-meter circular plots, in which height and percent cover are recorded for the most abundant shrub and forb species in the area, including those that are known to be palatable to deer. These values will be used in place of estimates of production, as described in the WHMP. Notes are recorded for each plant that appears to have been browsed. Forage utilization is not directly measured, aside from these notes, because we have not found a satisfactory quantitative method in the literature for measuring utilization of forb plants. Instead, use of the area by deer is measured on the basis of pellet group counts on transects.

Results of pre-harvest forage production measurements and deer pellet group counts on the 1991 units are listed in Table 3. No comparison data are available yet from these units post-harvest.

3.10.2 COARSE WOODY DEBRIS

Coarse woody debris in 1991 final harvest units was given a cursory examination before harvest. The inventory of large logs in Unit 1 appeared to be sparse in one area, but generally adequate. The inventory in Unit 2 appeared to be

Table 3. Deer forage availability and deer use of 1991 harvest units, pre-harvest.

Harvest Unit # 1.			Survey date: 1/21/92

Number of vegetation plots:20
Number of pellet transects:10
Frequency = the number of plots on which the subject was found.

Shrub species

Casc. Oregon grape	Avg. Ht. 1.50	Avg. Cover % 18.38	Frequency 8/20	comments
	Std Dev. 0.53	Std Dev. 27.42		
Salal	Avg. Ht. 0.75	Avg. Cover % 6.13	Frequency 8/20	
	Std Dev. 0.27	Std Dev. 3.44		
Low Huckleberry	Avg. Ht. 0.60	Avg. Cover % 1.80	Frequency 5/20	
	Std Dev. 0.22	Std Dev. 0.45		
scarce species			Frequency	
Red Huckleberry			3/20	
Vine Maple			2/20	

Herb species

Sword fern	Avg. Ht. 2.13	Avg. Cover % 30.50	Frequency 20/20	
	Std Dev. 0.40	Std Dev. 16.89		
Pacific blackberry	Avg. Ht. 0.60	Avg. Cover % 1.20	Frequency 5/20	
	Std Dev. 0.22	Std Dev. 0.45		
scarce species			Frequency	
Lady fern			3/20	
Holly-fern			1/20	
Bracken fern			2/20	

Regeneration species

Hemlock	Avg. Ht. 7.00	Avg. Cover % 1.50	Frequency 2/20	
	Std Dev. 4.24	Std Dev. 0.71		
Cedar	5.00	2.00	1/20	

Table 3 (cont.)

Harvest Unit # 1 (cont.)

Pellet count

	Frequency
3 groups total	2/10

(one transect contained 2 groups)

1 group. Near Red Huckleberry w/path around it.
1 group. No evidence of use nearby.
1 group. No evidence of use nearby.
The 2 latter groups both possibly on wildlife trail.

Table 3 (cont.)

Harvest Unit # 2.			Survey date: 1/27/92

Number of vegetation plots:30
Number of pellet transects:15
Frequency = the number of plots or transects on which the subject was found.

Shrub species

Low Huckleberry	Avg. Ht. (ft.)	Avg. Cover %	Frequency	comments
	0.50	1.85	13/30	
	Std Dev. 0.00	Std Dev. 1.41		
scarce species			Frequency	
Casc. Oregon Grape			3/30	
Vine Maple			2/30	
Red Huckleberry			2/30	
Salal			1/30	

Herb species

Sword fern	Avg. Ht. (ft.)	Avg. Cover %	Frequency	comments
	1.61	20.84	19/30	
	Std Dev. 0.68	Std Dev. 19.64		
Holly-fern	Avg. Ht. (ft.)	Avg. Cover %	Frequency	comments
	0.58	3.69	13/30	
	Std Dev. 0.19	Std Dev. 3.71		
Lady-fern	Avg. Ht. (ft.)	Avg. Cover %	Frequency	comments
	0.50	2.00	6/30	
	Std Dev. 0.00	Std Dev. 1.55		
scarce species			Frequency	
GRASS			2/30	

Regeneration trees

	Avg. Ht. (ft.)	Avg. Cover %	Frequency	comments
	none		0/30	

Pellet groups

			Frequency	
	none		0/15	

Table 3 (cont.)

Harvest Unit # 3.		Survey date: 1/28/92

Number of vegetation plots:26
Number of pellet transects:13
Frequency = the number of plots or transects on which the subject was found.

Shrub species

Low Huckleberry	Avg. Ht. (ft.) 0.54	AvCovr% 2.25	Frequency 12/26	comments 2 plants had been slightly eaten.
	Std Dev. 0.14	Std Dev. 1.22		

scarce species	Frequency
Vine Maple	3/26
Salal	1/26
Red Huckleberry	1/26

Herb species

Holly-fern	Avg. Ht. (ft.) 0.57	AvCovr% 12.86	Frequency 7/26	comments
	Std Dev. 0.19	Std Dev. 23.14		
Swordfern	Avg. Ht. (ft.) 1.23	AvCovr% 13.82	Frequency 11/26	comments
	Std Dev. 0.68	Std Dev. 15.20		

scarce species	Frequency
Lady-fern	2/26

Regeneration trees

	Avg. Ht. (ft.)	AvCovr%	Frequency	comments
Hemlock	0.25	3.00	6/26	

Pellet groups

			Frequency
	none		0/13

excessive, and in Unit 3 appeared to be adequate. The 1991 timber harvest contract specified that all existing downed logs be left in place, but did not require that additional, merchantable logs be left.

A quantitative inventory was subsequently performed on nine stands, including the three final harvest units. The sampling procedure, which was adapted from USFS vegetation structure survey procedures, is described in Appendix B. Results of the inventory are presented in Table 4.

The WHMP procedures for ensuring that an adequate supply of coarse woody debris is retained post-harvest need to be refined. No pre-harvest inventory is specified in the WHMP, and the prescription for leaving large logs post-harvest is unclear. At present, our plan is to re-sample the 1991 units one year post-harvest, and compare values obtained (both pre- and post-harvest) with values reported in the literature. Appropriate targets for coarse woody debris on managed units will then be identified. The existing inventory on all harvest units will be sampled pre-harvest, compared with the targets, and specific prescriptions will be developed for inclusion in timber harvest contracts to remedy any deficits. More detailed inventory and monitoring prescriptions will be developed in 1992.

Table 4. Inventory of coarse woody debris.

	transect		10-19' in Length				20+' in Length					Total volume*
Stand #	length	Diameter	10"	16"	24"	28+	10"	16"	24"	28+	TOTAL	(cubic ft./ac.)
Stand 1-3	600'	Hard					3				3	1,472
		Soft								1	1	
Stand 1-9/1	900'	Hard	1								1	10,505
		Soft							1	6	7	
Stand 2-1	300'	Hard							1		1	1,897
		Soft								1	1	
Stand 2-2	600'	Hard										2,158
		Soft				2						
Stand 4-5	800'	Hard					1				1	1,081
		Soft	1						2	2	5	
Stand 4-7/4	800'	Hard					1	1			2	1,860
		Soft			1					3	4	
Stand 4-8/5	600'	Hard						1			1	2,304
		Soft		2				1	1	1	5	
Stand 7-1	2320'	Hard					2				2	12,672
		Soft					2	1	2		5	
Stand 7-2	900'	Hard	1	1		1	4	2			9	1,616
		Soft		1	1						2	

* Total volume for hard and soft woody material combined.

4.0 WORK PLANNED FOR 1992

4.1 FOREST VEGETATION MANAGEMENT

4.1.1 Harvest Units

The 1991 final harvest units will be replanted in March-April 1992 with Douglas fir seedlings, western red cedar seedlings, and cottonwood cuttings. It appears it will not be possible to obtain sufficient western red cedar seedlings for all three units, and additional seedlings will be obtained for planting in the spring of 1993. The replanting prescription will be as follows:

Unit 1 - 275 Douglas fir/acre, 25 western red cedar/acre, plus 25 cottonwood at north end of unit and 25 cottonwood at south end. Seed mix at 14 lbs/acre.

Unit 2 - 225 Douglas fir/acre, 25 western red cedar/acre. Seed mix at 14 lbs/acre.

Unit 3 - 250 Douglas fir/acre, 25 western red cedar/acre, plus 25 cottonwood along south boundary. Seed mix at 14 lb/acre.

The units will be reseeded with a grass/forb seed mix[2] wherever bare soil is present. Logging road rights-of-way will be reseeded with the mix used in 1991. No fertilizers will be applied.

The WHMP (Table 2.1) listed a number of native and introduced grass and forb species that are desirable for forage enhancement of forest lands. Some of them, especially the grasses, clovers and trefoils, are readily available from commercial sources. However, most of the forb species are not available without contracting with seed collectors prior to the summer of the year in which the revegetation work is planned. We will attempt to acquire seeds of several native forb species during 1992 for application on harvest units.

Final harvest layout for units scheduled for 1993 will

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[2]Seed mix for harvest units consists of 2 lbs (per acre) dwarf orchardgrass, 2 lbs red fescue, 6 lbs mixed clover/acre, and 4 lbs birdsfoot trefoil. Ryegrass has been omitted from this mix because it is feared that its use will encourage a rodent population that will damage tree seedlings. However, up to 4 lbs per acre of ryegrass may be added to Unit 2, where rodent damage is not expected to be a serious problem.

be planned in 1992 (Figure 9).

4.1.2 Commercial Thinning

Commercial thinning of 4 units in the Lake Chaplain Tract, with a total of about 88.7 acres, was scheduled for 1990 in the WHMP (Figure 9). One of these units will not be scheduled for actual implementation because of unsuitable slope/soil conditions, and one unit will be thinned, if conditions are suitable, once access (via a planned road on DNR property) becomes available. The City's forester, with assistance from District biologists, will evaluate the potential of including the two remaining units in a 1992 sale.

Two additional units, with a total of approximately 50 acres, have been identified as candidates for 1992 commercial thinning (Figure 9). Although not scheduled in the WHMP for commercial thinning, these units have appropriate soil and topography, an access road can be constructed economically this year, and the wildlife habitat values of the units would benefit from the treatment. The units have been roughly laid out in the field. Actual sizes are to be determined, but they will not exceed 26 acres each.

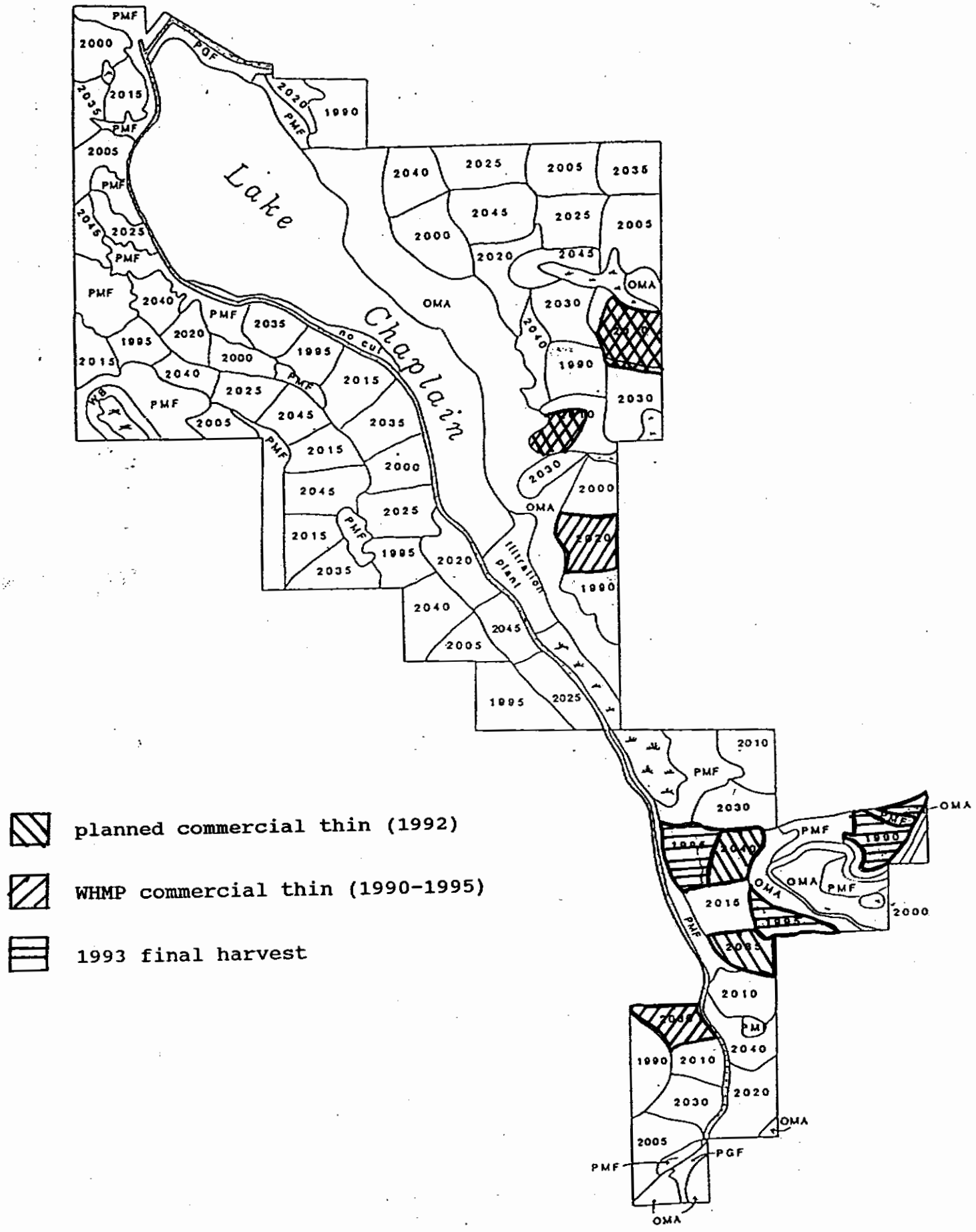
The prescription for commercial thinning is under consideration at present. One agency representative recommended developing a thinning prescription that would result in increased structural diversity within stands (i.e. a multi-layered canopy), (see Appendix G). The WHMP specifically prescribed leaving 60 percent canopy closure, with the objectives of increasing understory development and tree growth rates, but did not offer a recommendation on achieving canopy-level structural diversity. Producing a multi-layered canopy within thinned stands will be examined on a site-by-site basis, and implemented if feasible.

4.2 SNAG MANAGEMENT

Inventory of existing natural snags in the Lake Chaplain and Lost Lake Tracts will continue in 1992. As in 1991, areas to be inventoried will be selected on the basis of property line mapping and field reconnaissance and reconfiguration of harvest units. Planned inventory areas for 1992 are shown in Figure 10.

Snags will be created around the three 1991 harvest units, and in buffer zones, green tree areas, and permanent mixed forest in the inventory areas. Approximately 300 acres are expected to be incorporated into the snag management program in 1992. Based on data on snag deficiencies from Figure 8, trees in the 15 inch and 17 inch classes will be selected.

Figure 9. Planned commercial thins at Lake Chaplain.



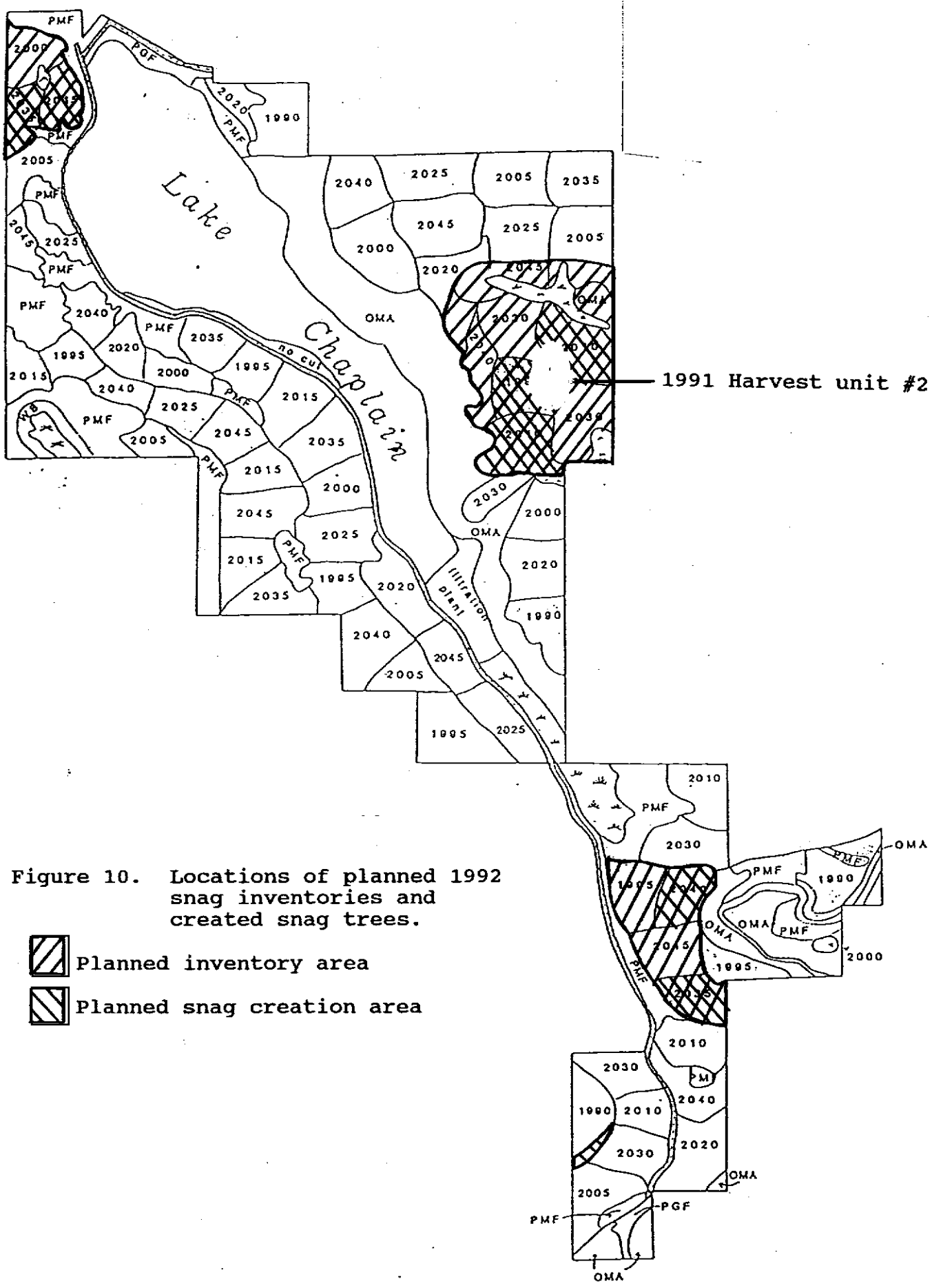


Figure 10. Locations of planned 1992 snag inventories and created snag trees.

Planned inventory area

Planned snag creation area

4.3 REVEGETATION

The powerhouse site and two sites at Lake Chaplain will be planted in 1992 according to specifications listed in Appendix D. A row of Douglas fir and western red cedar seedlings will be planted at the north end of Lake Chaplain (Stand 1-17) in spring 1992. The edge of Chaplain Marsh (Stand 4-8) will be replanted in the fall with a mixture of arborvitae and native shrub species. The purpose of these plantings is to provide visual screening between the Lake Chaplain road and the lake and marsh.

Small "islands" of mast trees, crabapple trees and native shrubs will be planted at the powerhouse site (Stand 8-4) in fall 1992. The grassy areas comprising most of the powerhouse site will be fertilized to maintain productivity of the grasses. The objective of this treatment is to enhance forage and hiding cover for species represented by black-tailed deer, ruffed grouse and black-capped chickadees.

All areas planted with trees and shrubs will also be reseeded with a grass/forb mix similar to the mix used in 1991 (see Section 3.5).

4.4 FLOATING NEST PLATFORMS

Floating nest platforms will be placed in Lake Chaplain and Lost Lake in March 1992 in approximately the same locations used in 1991. Observations will be made during the loon nesting season following the procedure in Appendix E.

4.5 NEST BOXES

Nest boxes will be monitored following the procedure in Appendix E.

4.6 OSPREY NEST PLATFORM

Two osprey nest platforms will be installed at Spada Lake in April 1992. These platforms, plus the Lost Lake platform, will be monitored during the osprey breeding season following the procedure in Appendix E.

4.7 MANAGEMENT TOOLS

Complete implementation of the GIS for the wildlife management plan is expected by May 1992. The system will consist of project data bases, vendor software with customized user-friendly interfaces, and customized applications. Among other functions, applications will automate the production of maps and tabular reports, provide control over screen displays, allow queries of the data base regarding selected geographic features, perform analyses, and facilitate data entry and editing.

4.8 MONITORING

Monitoring of bird nest structures, deer forage, snags and coarse woody debris will continue as described in this report and the WHMP. Methods will be developed for monitoring green tree clumps and buffer zones, and monitoring will begin in areas established as part of timber harvest in 1992. Vegetation plantings will be monitored every four months by District biologists.

4.9 WHMP SUPPLEMENT FOR SPADA LAKE

A supplement to the WHMP, covering lands above 1460 feet elevation in the Spada Lake Tract, will be prepared in 1992 in consultation with the resource agencies. Lands in this tract will be inventoried and subdivided into management units. A forest succession model that includes various management techniques will be developed for these lands. Specific management prescriptions will be developed for units selected for improvements through the year 2005. Remaining units will be planned at a future date.

The management goals for these lands are as follows:

- Preserve water quality and aesthetics.
- Enhance second growth forest, primarily for deer.
- Preserve old growth, riparian, and wetland habitat and enhance where feasible.

5.0 SCHEDULE OF ACTIVITIES FOR 1992 TO 1995

Activities scheduled for the period 1992 to 1995 are reported, by management unit, in Table 5.

TABLE 5 - ACTIVITY SCHEDULE FOR 1991 THROUGH 1996

YEARS

Activity	1991 Stands	1991 Acres	1992 Stands	1992 Acres	1993 Stands	1993 Acres	1994 Stands	1994 Acres	1995 Stands	1995 Acres
Final Harvest[1]	1-3, 1-9, 1-15, 4-5	84			3-1, 5-4, 5-8, 5-5	73			2-9, 2-11, 4-4, 4-3, 4-2	72
Commercial Thin[1]			1-9, 1-15 4-5, 2-13	75						
Precommercial Thin	7-4	46								
Snag Management Program		335		355		320		294		257
Monitoring										
•Floating Platforms	Lost Lake Lake Chaplain		Monitoring as in 1991		Monitoring as in 1991					
•Osprey Platforms	Lost Lake		Lost Lake Spada Lake		Lost Lake Spada Lake		Lost Lake Spada Lake		Lost Lake Spada Lake	
•Nest Boxes	Lost Lake		Lost Lake		Lost Lake		Lost Lake		Lost Lake	
•Deer Forage			1-3, 1-9 1-15, 4-5		Monitoring as in 1992		Monitoring as in 1992		Monitoring as in 1992	
•Green Tree Areas					1-3, 1-9 1-15, 4-5					
•Buffer Zones					1-3, 1-9 1-15, 4-5					
•Coarse Woody Debris	1-3,1-9 1-15,4-5		1-9,1-15 4-5, 2-13		3-1, 5-4, 5-8, 5-5				2-9, 2-11 4-2, 4-3, 4-4	

[1]Set-up and contract. Contractor will have 12 months to complete harvest.

TABLE 5 - ACTIVITY SCHEDULE FOR 1991 THROUGH 1996

YEARS

Activity	1991 Stands	Acres	1992 Stands	Acres	1993 Stands	Acres	1994 Stands	Acres	1995 Stands	Acres
Reveg. Plan										
•Test Plantings			9-10							
•Tree/shrub Plantings			1-17, 4-8, 8-4	73			8-3			
•Grass Seeding	8-3, 8-5	15	8-3	25	8-3	up to 40				
•Fertilization	8-3, 8-5									
Debris Removal			9-1 thru 9-10							
Spada Lake Supplemental Plan			To be determined							

6.0 AGENCY COORDINATION

The District submitted a draft version of this report to representatives of the resource agencies and the Tulalip Tribes for their review. A meeting was held on March 11, 1992, to discuss progress in 1991 and future plans for WHMP activities. A field trip to the Lake Chaplain and Lost Lake tracts followed the meeting.

Minutes of the meeting are attached in Appendix G, and also copies of letters sent by agency representatives in response to the draft report.