UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

Establishment Record

For

FISH LAKE BOG RESEARCH NATURAL AREA

Wenatchee National Forest

Chelan County, Washington

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SIGNATURE PAGE

for

RESEARCH NATURAL AREA ESTABLISHMENT RECORD

Fish Lake Bog Research Natural Area

Wenatchee National Forest

Chelan County, Washington

The undersigned certify that all applicable land management planning and environmental analysis requirements have been met and that boundaries are clearly identified in accordance with FSM 4063.21, Mapping and Recordation and FSM 4063.41 5.e(3) in arriving at this recommendation.

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TITLE PAGE

ESTABLISHMENT RECORD
FISH LAKE BOG RESEARCH NATURAL AREA
WITHIN WENATCHEE NATIONAL FOREST
CHELAN COUNTY, WASHINGTON.

INTRODUCTION

Fish Lake Bog Research Natural Area (RNA) lies on the west end of Fish Lake (Photo 1), which is located on the east slope of the Washington Cascade Range. This RNA fulfills the need for an eastern Cascade marshland-bog, a low elevation wetland, and surrounding upland forest communities (Dyrness, et. al. 1975; WA Natural Heritage Program 1995). It provides habitat for the federally threatened bald eagle (*Haliaeetus leucocephalus*), special status animals and plants, and numerous other animal and plant species.

Fish Lake Bog has received considerable interest in, and appreciation of, its natural values from local conservation organizations and regional universities (see Hansen 1941). The area was recommended for inclusion in the RNA network prior to 1977, at which time the Regional RNA Committee requested that public use of the area be assessed to determine the appropriateness of the RNA designation (Research Natural Area Committee meeting notes, November 18, 1977). A. R. Tiedemann reported, in 1978, that current and potential public use of the area would not preclude the RNA designation and that Fish Lake Bog would be an excellent candidate for representation of wetland and bog components. In 1979, a preliminary establishment record was completed (Elvander 1979).

Fish Lake Bog RNA is not within a designated wilderness, national recreation area, or other congressionally designated areas. No Wild and Scenic Rivers occur within the RNA boundaries.

Land Management Planning

The Wenatchee National Forest Land and Resource Management Plan (USDA Forest Service 1990) allocated 106 acres of wetlands adjacent to the western end of Fish Lake as RN-1, Research Natural Area. The environmental consequences of establishing the Fish Lake Bog RNA were analyzed in the Forest Plan FEIS (USDA Forest Service 1990b). See Appendix 1 and Appendix 2 for relevant pages of these documents.

Additional analysis expanded the RNA to 241.5 acres (97.7 hectares) to include other wetland types and surrounding upland forest. A recent Environmental Assessment (EA) of eleven RNAs (USDA Forest Service 1996) evaluates the effects of establishing this expanded RNA.

OBJECTIVES

The objective of the Fish Lake Bog RNA is to provide long-term protection and recognition of the palustrine wetland/sphagnum bog ecosystem and associated upland forest communities. The RNA will serve as a reference area for the study of natural ecosystem structure and function and long-term ecosystem change. Fish Lake Bog RNA will serve as a control area for comparing the results of manipulative research and for monitoring the effects of resource management techniques and practices. The natural area will provide educational opportunities, limited by the need to preserve ecosystem values of the bog and surrounding forest.

JUSTIFICATION

Fish Lake Bog RNA was selected to represent a low elevation freshwater wetland ecosystem and low elevation sphagnum bog in the Eastern Cascade Province (Dyrness et al., 1975; Research Natural Area Committee meeting notes, April 27, 1978).

The federally threatened bald eagle is an occasional user of the lake. Establishment of the RNA will protect habitat used by the bald eagle.

The bog currently supports *Carex buxbaumii* (Buxbaum's sedge), *Carex comosa* (bristly sedge)and *Cicuta bulbifera* (bulb-bearing waterhemlock), all of which are listed as sensitive by the Regional Forester (USDA Forest Service 1991). Preservation of the bog habitat will maintain suitable habitat for these species. The mesic, upland forest portion of the RNA supports *Orobanche pinorum* (pine broomrape), which is also listed as sensitive by the Regional Forester.

PRINCIPAL DISTINGUISHING FEATURES

Fish Lake Bog RNA encompasses the biological components of Dyrness et al. (1975) and Washington Natural Heritage Program (1995) listed below in Table 1. Figure 4 shows the distribution of the terrestrial and aquatic vegetation types. See Photos 1-5.

Table 1. Biological components present in the Fish Lake Bog RNA and their priority for inclusion in the Natural Area network (Washington Natural Heritage Program 1995) .

Element	Priority*
Low elevation wetland (Eastern Cascades Province)	2
Low elevation sphagnum bog (Eastern Cascade Province)	2
Grand fir/vine maple (Eastern Cascade Province)	2
Western hemlock/Oregon grape-twinflower (Eastern Cascades Province).	2

*Priority 2. These elements are at an intermediate priority largely because they are not in as much danger of being destroyed or degraded in the near future as Priority 1 elements. These elements typically have regional distribution in Washington and few occurrences exist, in a natural condition. Priority 2 elements usually have little or no representation in existing natural areas or protected areas, but may receieve some *de facto* protection in other managed areas.

Species	Priority*
Gavia immer (common loon)	1
Martes pennanti (fisher)	2
Accipiter gentilis (northern goshawk)	3
Haliaeetus leucocephalus (northern bald eagle)	3
Picoides albolarvatus (whiteheaded woodpecker)	3
Dryocopus pileatus (pileated woodpecker)	3
Sialia mexicana (western bluebird)	3
Carex buxbaumii (Buxbaum's sedge)	3
Carex comosa (bristly sedge)	3
Cicuta bulbifera (bulb-bearing waterhemlock)	3
Orobanche pinorum (pine broomrape)	3

*Priority 1 species. Taxa are in danger of becoming extinct throughout their ranges. Populations of these taxa are at critically low levels or their habitats are degraded or deleted to a significant degree. These taxa are the highest priorities for preservation.

Priority 2 species. These taxa will become endangered in Washington if factors contributing to their population decline or habitat degradation or loss continue. These taxa are high priorities for preservation efforts.

Priority 3 species. These taxa are vulnerable or declining and could become endangered or threatened in the state without active management or removal of threats. These taxa should be important in the analysis of potential preserve sites.

See Photo 6 for photo documentation of a *Carex comosa* site within Fish Lake Bog RNA.

LOCATION

Fish Lake Bog is located on the Lake Wenatchee Ranger District, Wenatchee National Forest (Figures 1 and 1b). No other National Forest System lands are involved. The center of the RNA is at latitude 47°50' north, longitude 120°43' west. It is located in parts of sections 16 and 21, Township 27 N., Range 17 E W.M., Chelan County, Washington.

The following aerial photographs of Fish Lake Bog RNA are currently available at the Lake Wenatchee Ranger Station:

7-14-85, USDA-F, 12, 616170, 185-127
7-14-85, USDA-F, 12, 616170, 185-128
7-14-85, USDA-F, 12, 616170, 185-129

R6-277 L20547 8-13-71 (OBLIQUE)
R6-285 L20547 8-13-71 (OBLIQUE)
R6-300 L20547 8-13-71 (OBLIQUE)
R6-302 L20547 8-13-71 (OBLIQUE)

Boundary Description

The boundaries of the Fish Lake Bog RNA are more particularly described below. See Appendix 3 (Letter from Wenatchee NF Land Surveyor), which states that the following boundary is correctly described.

Beginning at a steel post tagged and numbered 202 on the north boundary of Fish Lake Bog RNA from which the M.C. section 15 and 16, T27N R17E W.M., an aluminum monument, bears N65°25'E 1737 ft. Thence along the north boundary of the RNA following the courses below to post 208, this portion of the boundary being 33 ft south of the centerline of Fish Lake Road, Forest Road No. 6202.

Column 1		Column 2	
Post 202		Post 205	
S85°03'W	571 FT	S86°01'W	166 FT
Post 203		Post 206	
N81°44'W	312 FT	N86°39'W	204 FT
Post 204		Post 207	
S83°14'W	174 FT	S74°02'W	348 FT
		Post 208	

Thence along the west boundary of the RNA following the courses below to post 227, this portion of the boundary being 25 ft. easterly of the centerline of the snowmobile trail.

Post 208		Post 218	
S26°52'W	134 FT	S28°30'W	211 FT
Post 209		Post 219	
S57°06'W	281 FT	S67°27'E	227 FT
Post 210		Post 220	
S22°12'W	250 FT	S36°55'E	298 FT
Post 211		Post 221	
S43°53'W	191 FT	S04°49'W	181 FT
Post 212		Post 222	
S31°38'E	134 FT	S32°33'E	324 FT
Post 213		Post 223	
S12°18'E	209 FT	S16°19'E	314 FT
Post 214		Post 224	
S06°14'E	377 FT	S32°38'E	252 FT
Post 215		Post 225	
S20°26'W	159 FT	S69°22'E	261 FT
Post 216		Post 226	
S08°55'E	411 FT	S46°15'E	359 FT
Post 217		Post 227	
S26°06'W	180 FT		

Thence east and northeasterly following the courses below to Post 240.

Column 1		Column 2	
Post 227		Post 234	
S68°10'E	314 FT	N50°23'E	178 FT
Post 228		Post 235	
N85°22'E	218 FT	N69°18'E	322 FT
Post 229		Post 236	
N87°00'E	344 FT	N50°58'E	205 FT
Post 230		Post 237	
N80°23'E	431 FT	N03°01'W	117 FT
Post 231		Post 238	
N37°38'E	299 FT	N08°02'E	183 FT
Post 232		Post 239	
N43°14'E	352 FT	N12°47'E	102 FT
Post 233		Post 240	
N49°55'E	169 FT		

From Post 240, the W.C.M.C. for sec. 21 and 22, T27N, R17E WM. an aluminum monument bears N39°58'E 228 FT. Thence N56°14'W 80 FT to a point on the easterly edge of Fish Lake Bog and the west edge of Fish Lake. Thence west and north along the following courses describing the easterly line of Fish Lake Bog.

Column 1		Column 2	
S57°00'W	327 FT	N26°59'E	233 FT
N73°33'W	119 FT	N22°32'E	284 FT
N62°52'W	124 FT	N16°34'E	206 FT
S10°54'W	106 FT	N14°42'E	426 FT
S40°23'W	149 FT	N13°45'E	255 FT
S81°59'W	206 FT	N02°08'W	495 FT
N67°56'W	158 FT	N02°57'W	436 FT
S71°23'W	145 FT	N56°34'W	70 FT
S74°58'W	67 FT	S89°21'W	83 FT
N02°34'W	79 FT	S60°55'W	169 FT
N14°47'E	263 FT	S33°58'W	198 FT
N24°08'E	274 FT	N74°31'W	83 FT
		N47°46'W	425 FT

To Post 202 and the point of beginning. Containing 241. 5 acres. The RNA area described contains 25.7 acres (10.4 hectares) of privately owned land in Gov. Lot 2, Sec. 16. (Figures 3 and 3b).

Area and Elevation

Total area is 241.5 acres (97.7 hectares). Region 6 is also interested in acquiring 25.7 acres of private land to add to this RNA. Elevations range from 1929 feet above sea level at the surface of the bog to 1960 feet above sea level in the southwestern portion of the RNA.

Access

Access to Fish Lake Bog is via Interstate Highway 2 and Washington State Highway 207 (Figure 1b). The RNA is 6 miles (9 km) north of Interstate Highway 2, just off Washington State Highway 207. The north and south side of the RNA may be reached on FS Roads 6202 and 6107, respectively. The Washington State Department

of Transportation maintains Lake Wenatchee Emergency Air Strip, which can be utilized by both fixed and rotary winged aircraft.

AREA BY COVER TYPES

Table 2 below summarizes the vegetation classifications of Fish Lake Bog according to Cowardin, et al. (1979), Erye (1980), Kuchler (1966), and Lillybridge, et al. (1995). Inventory work conducted by Elvander (1979) and by Lake Wenatchee Ranger District personnel and cooperators formed the basis of the classifications. During the 1992 field season, permanent ecotone transect and terrestrial vegetation plots were established. National Forest System lands total 241.5 (97.7 hectares). Private land attibutes are included in these vegetation descriptions, because Region 6 is pursuing acquisition of these lands to add to the proposed RNA. Private land total area is 25.7 acres (17.8 hectares).

Table 2. Summary of Fish Lake Bog Vegetation Cover.

Cover Type	Acres	Hectares
A. Water	**4.5**	**1.8**
B. Wetland Vegetation (Cowardin et al. 1979)		
Lacustrine, littoral, aquatic bed		
Rooted vascular, *Potamogeton* spp.	8.1	3.3
Rooted vascular, *Nuphar polysepela*	6.8	2.8
Palustrine		
Moss-Lichen wetland, moss		
Sphagnum spp.	18.3	7.4
Meesia triquetra-Carex diandra	15.4	6.2
Emergent wetland, persistent		
Typha latifolia	16.8	6.8
Eriophorum gracile-Carex limosa	80.3	32.5
Scrub-Shrub wetland, broad-leaved deciduous		
Spiraea douglasii	23.6	9.6
Forested wetland, broad-leaved deciduous,		
Alnus rubra	7.8	3.2
Populus tremuloides	0.3	0.1
Wetland Totals	**177.4**	**71.9**
C. Upland Forests		
using SAF Types (Eyre 1980)		
213, grand fir	42.3	17.1
210, interior Douglas fir	17.3	7.0
using Kuchler Types (Kuchler 1966)		
western red-cedar-western hemlock-Douglas-fir	42.3	17.1
grand fir-Douglas fir	17.3	7.0
using Forested Plant Associations (Lillybridge, et. al. 1995)		
western hemlock series	42.3	17.1
grand fir series	17.3	7.0
Upland Forest Totals	**59.6**	**24.1**
Total	**241.5**	**97.8**

PHYSICAL AND CLIMATIC CONDITIONS

The RNA is located in the bottom of a glacially derived valley. Valley elevations range from 1929 ft (588 m) above sea level to 1960 ft (598 m), a point southwest of the bog (Figure 2). Surrounding areas are steep and rugged. Adjacent ridges and peaks reach 6990 ft (1935 m). Fish Lake has a single outlet, Fish Lake Run (Figures 1b and 2), a low gradient stream that drains into the Wenatchee River.

Table 3 summarizes climactic records for Lake Wenatchee, WA. The upper Wenatchee River region lies at the interface between maritime and continental climatic influences. Weather patterns fluctuate widely between years. Summers are generally hot and dry, while winters are cool. The adjacent mountainous terrain strongly influences microclimatic conditions in the Fish Lake basin. Diurnal convective slope and valley winds are periodically strong, especially during the summer months. Cold air drainage gives rise to periodic localized cool air temperatures throughout the year. Relatively early and/or late killing frost may occur at Fish Lake. The lake surface is typically frozen for two to three months in winter.

Table 3. Climatic records for Lake Wenatchee Ranger Station, Washington (3.5 mi west of Fish Lake; elevation 1981 ft; precipitation records 1948 - 1991, temperature records 1950 - 1981).

	Mean Daily Temperature [^{o}F (^{o}C)]		Mean Monthly Precipitation [inches (mm)]	
Month	Maximum	Minimum	Rain	Snow
January	34.7 (1.5)	20.8 (-6.2)	7.6 (192)	55.2 (1401)
February	42.3 (5.7)	23.7 (-4.6)	5.2 (131)	28.7 (729)
March	48.3 (9.1)	26.4 (-3.1)	3.1 (79)	14.8 (377)
April	61.0 (16.0)	34.0 (1.1)	1.7 (43)	0.5 (12)
May	68.7 (20.4)	45.7 (7.7)	1.1 (29)	>0.1 (1)
June	80.6 (27.0)	46.9 (8.3)	1.0 (25)	0
July	81.5 (27.5)	51.1 (10.6)	0.5 (12)	0
August	84.4 (29.1)	61.7 (16.5)	0.8 (19)	0
September	73.0 (22.8)	45.1 (7.3)	1.3 (32)	0
October	60.6 (15.9)	34.7 (1.5)	3.5 (89)	0.9 (22)
November	45.7 (7.6)	31.1 (-0.5)	7.0 (179)	19.2 (487)
December	34.2 (1.2)	18.1 (-7.7)	7.9 (201)	51.0 (1296)
Annual	**59.9 (15.5)**	**37.6 (3.1)**	**40.1 (1019)**	**174.4 (4431)**

DESCRIPTION OF VALUES

Flora

The diversity of plant habitats present within Fish Lake Bog RNA gives rise to a large number of plant species. Table 2 lists the various plant habitats and their respective areas. Four rare plant species are known to occur in the RNA: *Carex comosa* (bristly sedge), *Carex buxbaumii* (Buxbaum's sedge), *Cicuta bulbifera* (bulb-bearing waterhemlock), and *Orobanche pinorum (*pine broom-rape). Appendix 4 lists vascular plant species known to occur within the RNA (nomenclature follows Little 1979; Hitchcock, et. al. 1973).

Wetland Communities

Eriophorum gracile (slender cotton-grass*) -Carex limosa* (mud sedge) emergent wetland is the most prominent wetland community within the RNA (Table 2). *E. gracile* and *C. limosa* are abundant and well-distributed throughout this type. Other species that frequently occur in this community include *Platanthera dilatata* (white bog-orchid), *Potentilla palustris* (purple cinquefoil), *Epilobium palustre* (wickup*), Menyanthes trifoliata* (buckbean), and *Rhynchospora alba* (white beakrush). Decomposed organic muck and dry leaf litter are important cover components. This community is primarily located on the bog interior (Figure 4).

The *Sphagnum* (sphagnum moss) and *Meesia triquetra* (a species of moss) -*Carex diandra* (lesser panicled sedge) moss-lichen wetland communities are closely associated with *Eriophorum gracile-Carex limosa* emergent wetland. *Sphagnum* moss-lichen wetland occurs primarily on the southern shore-ward perimeter of the bog (Figure 4). *Sphagnum* spp. are dominant. *Eleocharis palustris* (common spike-rush), *Viola palustris* (marsh violet), *Spiranthes romanzoffiana* (ladies-tresses), *Lycopus uniflorus* (northern bugleweed), *Tofieldia glutinosa* (sticky tofieldia), *Drosera rotundifolia* (round leaf sundew), *Drosera anglica* (great sundew), *Carex muricata* (muricate sedge), and *Salix pedicellaris* (bog willow) are characteristic species. *Pinus contorta* (lodgepole pine) individuals are encroaching within this community type. These trees occur in clumps of stunted, slow growing individuals. The *Sphagnum* moss-lichen wetland community occurs as discrete, insular patches on the southern interior of the bog. Smaller patches (too small to map) occur as inclusions in *Eriophorum gracile-Carex limosa* emergent wetland.

Meesia triquentra-Carex diandra moss-lichen wetland occurs toward the lake-ward edge of the bog (Figure 4) and is transitional from *Eriophorum gracile-Carex limosa* emergent wetland to *Typha latifolia* (cattail) emergent wetland. Community composition is distinguished by consistently high abundance of *Meesia triquentra* and a lack of exposed organic muck or water. Other characteristic species include *Carex diandra* and *Scheuchzeria palustris* (scheuchzeria).

Typha latifolia emergent wetland occurs on the upland to wetland ecotone and the palustrine wetland to lacustrine wetland ecotone. *Typha latifolia*, *Scirpus acutus* (bulrush), *Carex rostrata* (beaked sedge), *Phalaris arundinacea* (reed canarygrass), *Cicuta bulbifera*, *Angelica arguta* (Lyall's angelica), and *Rumex occidentalis* (western dock) are characteristic species. Small bodies of open water are an important cover component. *Carex comosa* and *Cicuta bulbifera* are most abundant in *Typha latifolia* emergent wetland. This community is likely the most seral of the palustrine wetland plant communities.

The *Spiraea douglasii* (hardhack) scrub-shrub wetland occurs primarily on the upland to wetland ecotone. Dense stands of *Spiraea douglasii* and *Cornus stolonifera* (red-osier dogwood) are nearly impenetrable. High shrub canopy cover often contributes to depauperate understory herb and sedge cover. *Equisetum fluviatile* (water horsetail), *Carex aquatilis*, and *Carex vesicaria* (inflated sedge) are characteristic species.

Alnus rubra (red alder) forested wetland occurs on the northern edge of the bog. Characteristic species are *A. rubra*, *A. incana*, *Athyrium filix-femina* (lady-fern), *Carex cusickii* (Cusick's sedge), *Lysichiton americanum* (skunk cabbage).

Upland Communities

Upland forests in the *Abies grandis* (grand fir) series, which correspond to SAF cover type 210 (Eyre 1980) and Kuchler's (1966) grand fir-Douglas fir type, occur in the southeastern and southwestern edges of the RNA. Characteristic understory species are *Acer circinatum* (vine maple), *Chimaphila umbellata* (western prince's pine), and *Clintonia uniflora* (beadlily).

Forests in the *Tsuga heterophylla* (western hemlock) series, which correspond to SAF cover type 213 (Eyre 1980) and Kuchler's (1966) western red-cedar/western hemlock/Douglas-fir type occur on the northern, western, and southern boundaries of the RNA. *Pinus contorta*, *Abies grandis*, and *Pseudotsuga menziesii* are co-dominant in early seral stands. *Thuja plicata* (western red-cedar) is regenerating in the understory. *Acer circinatum* is abundant in the understory. Because of high tree and shrub cover, understory herb cover is relatively low. Common understory species are *Berberis nervosa*, *Linnaea borealis*, and *Chimaphila umbellata*.

Past fire events, historic selective harvest activities, and the exclusion of fire have influenced upland forest stand structure and species composition. Presettlement fire return intervals were likely 10 - 15 years and 20 - 25 years, respectively, in grand fir and western hemlock forest communities (Agee unpublished data). Available evidence suggests that fire intensity was low in grand fir communities. This disturbance regime would have contributed to relatively open stands composed of large diameter Douglas fir and ponderosa pine with a lush understory of grasses, sedges and herbs. In recent years, the exclusion of fire has contributed to increased understory shrub cover and tree regeneration. The presettlement fire disturbance regime was likely more destructive in western hemlock forest communities. A relatively destructive fire event occurred at the time of European settlement.

Fauna

The U.S. Fish and Wildlife Service lists the bald eagle (*Haliaeetus leucocephalus*) as threatened. It is occasionally seen at Fish Lake.

Appendix 5 lists the bird species known to occur at Fish Lake Bog RNA. Appendix 6 lists mammal species known to occur at the bog, and Appendix 7 lists amphibian species known to occur at the RNA. No systematic survey of reptiles at the RNA has occurred. An administrative inventory of amphibian species is in progress.

Fish Lake Bog RNA provides important year-round habitat for beaver (*Castor canadensis*), river otter (*Lutra canadensis*), and muskrat (*Ondatra zibethicus*). Two beaver lodges are on the bog. One family utilizes both lodges alternately. Beavers contribute to the maintenance of early seral plant habitats in *Typha latifolia* emergent wetland. High *Carex comosa* regeneration is often associated with beaver-caused disturbance. Muskrat and river otter denning sites occur in *Typha latifolia* emergent wetland in the central, lake-ward portion of the bog.

Mule deer (*Odocoileus hemionus*) and elk (*Cervus elaphus nelsonil*) use the edge of the bog and forest stands within the RNA as calving and fawning habitat and forage on the bog. Black bear (*Ursus americanus*) use of *Alnus rubra* forested wetland is heavy in fall and spring. The RNA provides an important corridor for cougar (*Felis concolor*) dispersal from the Dirtyface Peak area to Nason Ridge and Natapoc Mountain.

Appendix 7 lists the fish species known to occur at Fish Lake. Bull trout (*Salvelinus confluentus*), proposed for listing by the U.S. Fish and Wildlife Service, may migrate up Fish Lake Run to the lake. Fish species native to Fish Lake are northern squawfish (*Ptychocheilus oregoninsis)* and sculpin (*Cottid* spp). Rainbow trout (*Oncorynchus mykiss)* may have occurred naturally at the lake; the Washington Department of Wildlife now plants them. Brown trout (*Salmo trutta)* have been planted since 1978. Brook trout (*Salvelinus fontinalis)* and kokanee (*Oncorynchus nerka)* are planted occasionally. Perch (*Perca flavescens)* are abundant and seem to have been in the lake for many years. There are small numbers *of* largemouth bass *(Micropterus salmoides)* and smallmouth bass (*Micropterus dolsmieui)* present. There is an unconfirmed report of black crappie (*Pomoxis nigromaculatus)* at the lake.

Gravel spawning habitats occur along the north shore of Fish Lake, where numerous small tributaries enter the lake. The abundant algal and aquatic vascular vegetation of the lake ecosystem are used by all fish species as cover. The bog on the west end of the lake is used by all fish species as foraging and rearing habitat and for hiding cover. Brown trout, brook trout, and perch appear to use the bog more heavily than other fish species. Macro and micro invertebrates are abundant in Fish Lake but have not been systematically documented.

Geology

The Fish Lake depression is a glacially carved trench in Chumstick Formation Sandstone. During continental ice sheet advances, the site of Fish Lake was at the confluence of three major valley glaciers: the Chiwawa, Little Wenatchee and Nason Creek gave rise to glacial flow from the north, northwest, and south, respectively. As a result, considerable energy conflict occurred in the vicinity of Fish Lake.

Glacial outwash floods carrying coarse gravels followed the present path of Wenatchee River. Gravel tended to stay along the river course; overflow water laden with silt and clay spilled into the Fish Lake depression. Gradual filling of the depression produced shallows around most of Fish Lake.

The Chumstick formation sandstones are within a "graben" (land which is being depressed while surrounding mountains are rising). The Entiat Fault Zone, three miles east of Fish Lake, is of regional geological interest. Mountains to the north and east of the RNA, Dirty Face Mountain (6989 ft) and Entiat Ridge (5600 ft), respectively, are composed of metamorphic rocks. To the south, Natapoc Mountain (3369 ft) is composed of sandstone. The summit of the mountain is the highest point of the graben sandstones.

Fish Loop Hill and Pole Ridge (on the southern and northern shores of Fish Lake) are of sandstone overlain by glacial till. Deep glacial ice carved trenches to north and south of Fish Loop Hill (now the Fish Lake basin and Wenatchee River valley, respectively). The hill is the result of glacial ice thinning that occurred in the center of the valley. On Pole Ridge the slope of the ground surface exceeds the angle of repose of unvegetated glacial

till. Numerous small gullies on the hillside have resulted from rill erosion and small debris avalanches that occurred at times when wildfire reduced vegetation cover.

The effects of glacial ice movement are prominent features of the landscape that encompasses Fish Lake Bog RNA. Though not specifically related to the development of Fish Lake Bog, it is noteworthy that the glacier, which flowed through what is now Lake Wenatchee, had three tributary glaciers: the Little Wenatchee, White River and Napeequa/Meadow Creek glaciers. In early glacial advances, the Napeequa/Meadow Creek glacier was a tributary of the Chiwawa glacier. Eventually the glacier broke through the ridge line between Meadow Creek and White River to become a tributary of the White River glacier. In subsequent glacial advances the Meadow Creek area was not glaciated.

Soils

Soils at Fish Lake Bog are derived from glacial drift and volcanic ash (USDA Soil Conservation Service undated). The principal soils are classified as Aeric Fluvaquents. Aeric Fluvaquents are present on the bog and in forested areas west of the bog. Aeric Fluvaquents consist of very deep, somewhat poorly to poorly drained soils on flood plains. They are formed in alluvium mixed with volcanic ash. These are hydric soils, formed in a reducing environment. Horizon chromas range from 1 to 2. Mottling is common in subsurface horizons. Accumulation of organic matter as muck or peat is high because of the prevalence of anaerobic conditions.

Other important soils are the Choralmont and Saska series, which occur in the southwest and southeast portions of the RNA. They consist of very deep, well drained soils on mountainsides and terraces. Soils in the Choralmont series are formed in volcanic ash and pumice over glacial till. These soils are cindery, frigid Typic Vitrandepts. Soils in the Saska series are formed in volcanic ash over glacial till. These soils are ashy over loamy-sketetal, mixed, frigid Typic Haplorthods. The occurrence of these soils coincides with areas mapped as grand fir-Douglas fir (Figure 4).

Lands

Official processes for the acquisition for 25.7 acres (10.4 hectares) of private land adjacent to the proposed RNA are ongoing. If this land is acquired, it would become part of the RNA. Private lands adjacent Fish Lake are subject to the provisions of the Washington State Shorelines Management Act (RCW 90.58).

The Cove Resort, located on Fish lake on the southwest in section 22, Township 27N, Range 17E, WM. is under a special use permit to operate on National Forest System Land. This resort has existed for approximately 50 years. Power is supplied to the resort via a cable buried in the lakebed.

Cultural

Fish Lake Bog lies within the core of a large area utilized by the Wenatchi Indians. Their general land use patterns are well recorded in the Wenatchee River system. Aboriginal burning practices in the headwaters area of the river have been documented in interviews with early Euro-American settlers and elders of the Colville Confederated Tribes. These practices may have had a significant impact on plant communities near Fish Lake. The harvesting of *Typha latifolia* and other fibrous plants may have played an important role in maintaining plant community composition and distribution in the proposed RNA. The lake is well known for its inland fishery. Small groups of Wenatchi Indians were known to establish seasonal camps on the shores of Fish Lake in the 1920's to 30's and perhaps into the 1950's. There has been no systematic inventory of cultural resources in the immediate area of the proposed Research Natural Area and there are no recorded sites in the immediate vicinity. Although traditional use is documented through anecdotal accounts, the geographic position of the lake places it in an essential resource gathering area for Native Americans. This place is still an important element of the landscape in Wenatchi territory.

Other resource values

All resource values have been adequately described in previous sections. This section is not applicable.

IMPACTS AND POSSIBLE CONFLICTS

Mineral resources
Brian Helseth, Lake Wenatchee Ranger District, Lands and Minerals Coordinator, states that no known mineral resources exist within the boundaries of the Fish Lake Bog RNA. Mineral entry would not be permitted within the RNA.

Grazing
No grazing allotments exist within the boundaries of the Fish Lake Bog RNA.

Timber
The establishment of the Fish Lake Bog RNA would preclude 63.6 acres (25.7 hectares) from timber harvest, having a minimal impact on this resource. The function of this small forest strip is to protect the bog from human intrusion on the south, west, and north sides.

Watershed Values
The east side of the bog borders on open water. The RNA would protect the bog from damage and deterioration. The gradual growth of the bog will cause it to slowly encroach on the amount of open water, but this progress will not be noticeable for many years.

Recreational Values
The lake is a major boating and fishing area. The east edge of the bog receives some impact from boaters, but it appears to be minimal. A snowmobile trail exists on the western and northern boundaries of the RNA. There will be no impact on recreational uses of the lake.

Wildlife and Plant Values
The federally threatened bald eagle is an occasional user of the lake. Establishment of the RNA will protect habitat used by the bald eagle.

The bog itself currently supports Region 6 sensitive *Carex buxbaumii, Carex comosa*, and *Cicuta bulbifera*. Preservation of the bog habitat will maintain suitable habitat for these species. The mesic, upland forest portion of the RNA supports *Orobanche pinorum*, which is also listed as sensitive by the Regional Forester. Such a forest type has a historic fire regime of frequent fires (Agee 1992). Although the effects of fire on this species are poorly understood, *O. pinorum* habitat would probably benefit from the application of fire.

Special Management Area Values
The establishment of Fish Lake Bog RNA will not impact the purposes or management for which a congressionally designated area was established. No congressionally designated areas exist within the boundaries of the Fish Lake Bog RNA.

Transportation Plans
No transportation plans will adversely impact the area.

Forest Service Road number 6202 may be transferred to Chelan County for permanent easement. This would make the county responsible for maintenance and winter access.

A low grade road bed reaches the southwest corner of the RNA. This road will be retained for emergency access and to facilitate research activities. This road will be gated just before the RNA boundary. A user maintained trail runs parallel the lake shore from Forest Service Road 6107. This trail will be obliterated and restored to a natural condition.

MANAGEMENT PRESCRIPTION

Vegetation Management
Vegetation management activities are needed to maintain ecological processes related to fire disturbance. Because of concerns for biological values of the RNA, resource objectives for adjacent Forest System Lands

and the relative close proximity of structural developments, it is not possible to allow uncontrolled fire disturbance. Thus, management practices will provide a closer approximation of the naturally occurring vegetation and the natural processes governing the vegetation than would be possible without management (FSM 4063.34). While evidence of past fire disturbance events is apparent in the RNA, our current understanding of the role of fire in some of the plant communities within the RNA is limited. In addition, prescribed fire techniques suitable for the needs of the RNA are not, at this time, sufficiently "tried and reliable." For these reasons, vegetation management through the use of fire will occur through an adaptive management strategy.

Aggressive colonizers of wetlands, such as *Myriophyllum spicatum* (Eurasian milfoil) and *Lythrum salicaria* (purple loosestrife) would threaten the very existence of the habitats for which the Fish Lake Bog RNA is established. Regular monitoring of the RNA for the presence of such species may be necessary. If such species are found, they should be controlled.

ADMINISTRATION RECORDS AND PROTECTION

Administration and protection of the Fish Lake Bog RNA will be the responsibility of the Wenatchee National Forest. The District Ranger, Lake Wenatchee Ranger District, has direct responsibility.

The Director of the Pacific Northwest Research Station will be responsible for any studies or research conducted in the area. Requests to conduct research should be referred to that office. The RNA Scientist in the Research Station is designated as the lead contact person for all such requests. The Director will evaluate research proposals and coordinate all studies and research in the area with the District Ranger. All plant and animal specimens collected in the course of research will be properly preserved and maintained within university or federal agency herbaria and museums, approved by the Pacific Northwest Research Station.

Records for the Fish Lake Bog RNA will be maintained in the following offices:

- Regional Forester, Portland, Oregon
- Forest Supervisor, Wenatchee National Forest. Wenatchee, WA.
- District Ranger, Lake Wenatchee Ranger Station. Leavenworth, WA.
- Director, Pacific Northwest Research Station. Portland, OR.
- Forest Sciences Laboratory. Wenatchee, WA.

ARCHIVING

The Portland office of the Pacific Northwest Research Station will be responsible for maintaining the Fish Lake Bog RNA research data file and lists of herbarium and species samples collected. The Forest Sciences Lab in Corvallis, Oregon is establishing a data base for maintaining research data and lists of species for all RNAs in the region. Computerized files for the RNA will be maintained at the Forest Sciences Lab.

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APPENDIX 1
WENATCHEE NF LAND AND RESOURCE MANAGEMENT PLAN APPLICABLE TO RESEARCH NATURAL AREAS

10 E. VEGETATION: RESEARCH NATURAL AREAS

Research Natural Areas (RNA's) are part of a Federal system of tracts established for non-manipulative research and educational purposes. Each RNA is a site where some features are preserved for scientific purposes and natural processes are allowed to dominate. Their main purposes are to provide: (1) baseline areas against which effects of human activities can be measured; (2) sites for study of natural processes in undisturbed ecosystems; and (3) gene pool preserves for all types of organisms, especially those which are classified as rare and endangered.

Prior to establishment, a comprehensive formal report is made. For RNA's proposed on National Forest System lands, the report is submitted to the Chief of the Forest Service for approval.

a. Established RNA's

There are two established RNA's on the Forest. Meeks Table RNA on the Naches Ranger District is 64 acres and represents the ponderosa pine/ pine grass plant community with a co-dominance of Douglas-fir. It was established on July 7, 1948, and is now within the William O. Douglas Wilderness.

Thompson Clover RNA located in Swakane Canyon on the Entiat Ranger District exemplifies a plant community characterized by Thompson Clover. It was established on February 17, 1977.

b. Formally Proposed RNA's

The Research Natural Area Committee for the Pacific Northwest has formally proposed two additional RNA's. Eldorado Creek located in the Teanaway drainage of the Cle Elum Ranger District is 1,336 acres in size and represents a plant community found on serpentine derived soils. The Eldorado Creek area was designated as a Special Area (Proposed RNA) in the Alpine Lakes Management Plan (November 2, 1981). Fish Lake Bog on the Lake Wenatchee Ranger District is a 106 acre area on the west end of Fish Lake near Lake Wenatchee. This represents a floating bog community.

Preliminary reports have been made for both of these areas; Fish Lake Bog on July 5, 1979, and Eldorado Creek on August 9, 1972. A supplemental report on the mineral character of the proposed Eldorado Creek RNA was made on November 6, 1974.

c. Recommended RNA's

The Research Natural Area Committee for the Pacific Northwest Region determined that the candidate RNA's listed in Table IV-13 represent the best examples of particular kinds of natural ecosystems in the Region and are needed to meet present and future demands. There may be some future RNA needs that can best be satisfied on the Wenatchee National Forest. When suitable new areas are identified, they will be considered for addition to the Research Natural Area inventory.

TABLE IV-13
RECOMMENDED RESEARCH NATURAL AREAS
1984

Name	Area (Acres)	Location (District)	Plant Community Exemplified
* 1. Cedar Creek	2205	Naches	Mixed old-growth conifer/ shrub forest and Pacific silver fir forest.
** 2. Icicle/Frosty Creek	784	Leavenworth	Western red cedar/western hemlock forest.
** 3. Chiwaukum Creek	1124	Leavenworth	Grand fir mixed old-growth conifer/shrub
4. Drop Creek	530	Cle Elum	Englemann Spruce/Subalpine fir forest

* Within the William O. Douglas Wilderness ** Within Alpine Lakes Wilderness

10 F. VEGETATION: ENTIAT EXPERIMENTAL FOREST

a. Current Management Program

The Entiat Experminental Forest includes 4,770 acres of Forest lands located within the Entiat River drainage northwest of Wenatchee, Washington. Research has been conducted on the area since 1957; in 1971, it was formally designated as an Experimental Forest. The Pacific Northwest Forest and Range Experiment Station and the Wenatchee National Forest cooperatively administer the area with the primary goal of providing opportunities for studying the effects of forest management and fire on vegetation, soil, and water resources. The area was selected as being representative of steep, forested watersheds occurring along the east slope of the Cascades. It consists of three similar, contiguous watersheds ranging in size from 1,168 acres to 1,393 acres, and in elevation from 1,800 feet to 7,000 feet. The mean slope is 50 percent with slopes as steep as 90 percent.

A major wildfire which burned most of the area in 1970 has had a dramatic impact on Forest vegetation. Pre-fire vegetation was primarily undisturbed, mature forest with small, subalpine grass-forb openings and bare rock. About 75 percent of the Forest was classed as ponderosa pine, with Douglas-fir the main associated species. Thickets of dense lodgepole pine occurred on wetter sites at higher elevations. Important understory species included bitterbrush, snowbrush ceanothus, pinegrass, and numerous forbs. Fifteen years after the fire, the vegetation consists of a mosaic of shrub fields intermixed with planted pine and fir, and dense, young stands of naturally-established lodgepole pine. Scattered remnants of unburned old-growth forest occur on rocky ridges and outcrops.

The original research plan for the experimental watersheds was to develop baseline information on climate and hydrology under natural conditions, then test for changes following the construction of roads and implementation of several timber harvest practices. The collection of this information and the preparation of harvest plans were nearly complete when the watersheds burned.

4. Buildings and utility systems construction and reconstruction, additions and changes, shall comply with approved site development plans.

5. The Administrative facilities management priorities are:

A. Public and employee safety and health

B. Prevention of site and interior and exterior building deterioration

C. Energy conservation

D. Minor improvements

6. Provide and manage administrative facilities sufficient to accomplish land and resource management and protection objectives of the Forest. Prepare administrative site development plans for all Forest administrative sites. Long-term development and maintenance costs will be a consideration in facilities planning.

PROTECTION

Fire Management Planning and Analysis

1. All wildfires will receive a prompt suppression response. Appropriate suppression strategies will include Control, Contain, and Confinement actions.

2. Priorities for protection will first be human life, followed by public safety and improvements.

3. If a fire escapes Initial Attack, an Escaped Fire Situation Analysis will be completed and approved by the responsible line officer. Efficiency will be emphasized.

4. The prevention of human caused wildfires will continue to be a management priority. The investment in this program will be commensurate with the values at risk.

5. Prescribed fire will be used to modify vegetation in an effort to minimize the risk of wildfires. Unplanned ignitions may be utilized if a prescribed fire plan has been developed and it is appropriate to the management area affected.

6. Prescribed fire will also be used as a resource management tool when appropriate planning indicates it is an efficient and effective option to implement. A prescribed fire that escapes is a wildfire and will receive an appropriate suppression response.

7. Develop and maintain preattack facilities in coordination with the management objectives of each specific management prescription.

Law Enforcement

1. Maintain cooperative law enforcement agreements with Chelan, Kittitas, and Yakima Counties.

Forest Pest Management

1. Survey stands for early detection of pest problems.

2. Coordinate with the Regional Forest Pest Management Unit for technical assistance.

3. Pesticide application will conform with EPA regulations and label restrictions, and will be made only after site specific evaluations have been made.

4. Utilize integrated pest management strategy to prevent unacceptable resource damage and to meet resource objectives in an economically efficient manner.

5. Manage timber to create conditions favorable for the prevention of pest damage.

RESEARCH NATURAL AREAS

1. Normal management and protection activities within RNA's are the responsibility of the Forest Supervisor. Scientific and educational uses of RNA's are the responsibility of the Pacific Northwest Forest and Range Experiment Station. Extensive research use requires a cooperative agreement between the user and the Forest Service. The Forest Supervisor and District Ranger administering the affected Research Natural Area will be informed of mutually agreed

upon activities by the Experiment Station Director. However, a scientist should visit the administering Ranger Station when beginning the studies and explain the nature, purpose, and duration of the activities. Permission for brief visits to Research Natural Areas for observational purposes can be obtained from the District Ranger. Management practices should not call attention to these areas.

BIODIVERSITY

1. Maintain or enhance biological diversity by providing or developing an ecologically sound distribution and abundance of plant and animal communities and species at the forest stand, subdrainage and Forest level. This distribution must contribute to the goal of maintaining or enhancing all native and desirable introduced species and communities.

2. Evaluate opportunities to maintain or enhance stand, subdrainage and Forest level components of biological diversity on a project by project basis as commensurate with management area direction. This evaluation will include project effects on the diversity (both visual and biological) and on wildlife and plant habitat in the subdrainage. If the project will reduce any of these components below the acceptable level as indicated by the management objectives for the sub-drainage the project may be altered to maintain diversity, or wildlife and plant habitat.

3. During project planning, areas of exceptional aesthetic value, unique wildlife or plant habitat or that contribute needed components for biological diversity may be found. These areas can be proposed through the District Ranger to the Forest Supervisor for inclusion into a prescription, special interest area or Research Natural Area (in consultation with the regional RNA committee) to preserve the appropriate area or forest ecologist and appropriate specialists will decide whether to amend the forest plan to allow a change in prescription (or classification) of the area in question. The Supervisor could also decide to protect the area until the next plan revision.

4. The most critical components of diversity (because they are relatively uncommon) include old growth and wildlife and plant habitat for rare species. Visual diversity is also an important consideration in project planning. Old growth stand in particular will often be important in the maintenance of biological diversity and aesthetic value.

Retain contiguous forest stands of later seral stages within 3rd and 4th order watersheds. Link patches of later seral stages with corridors of mid to late seral stages, such as riparian or visual corridors.

Identify subdrainages specific management objectives for fish and wildlife habitat and plants. These objectives should maintain or develop the habitat sizes, patterns and spacing essential for allowing genetic interchange and movement of species.

Where mature and old growth forest stands are managed for wildlife habitat, select and manage for stand characteristics and spatial location and size that will ensure viability of all plant and animal species closely associated with those habitats.

5. During project planning, develop site specific management prescriptions that meet objectives for biological diversity and ecosystem function. In addition to other management direction, consider the following guidelines:

Commercial forest management should provide for species diversity.

Tree species used in planting harvested units should be selected by considering site potential as indicated in plant association guides. Whenever appropriate a mixture of trees species should be planted.

Commercial and non-commercial thinning guidelines will incorporate the species diversity concept.

Vegetation management should allow for all natural species to function. None should be eliminated from the site.

MANAGEMENT PRESCRIPTION: **RN-1**

TITLE: **Research Natural Areas**

GOAL STATEMENT: Provide for; (1) Preservation of examples of all significant natural Ecosystems for comparison with those influenced by man, (2) educational research areas for ecological and environmental studies, and (3) preservation of gene pools for typical and rare and endangered plants and animals.

DESCRIPTION: Research Natural Areas (RNA) contain either examples of typical natural ecosystems or unique kinds of vegetation, animals, and land which are reserved for scientific and educational use. This use is restricted to non-manipulative and non-destructive research. On the Wenatchee National Forest there are two established RNAs: **Meeks Table** and **Thompson Clover**. Two additional areas have been studied and are candidates for addition to the system. They are: **Fish Lake**, a marsh-bog community, and **Eldorado Creek**, a montane serpentine community. Several new areas on the Forest are candidates as Research Natural areas to meet regional cell (ecosystem) needs. A Research Natural Area establishment report will be prepared for each recommended area when the Forest Plan is implemented. These reports will describe the boundaries of the areas. Until the reports are signed by the Chief of the Forest Service, the areas designated in this Plan are recommendations. They will be managed to maintain their suitability as RNAs.

RESOURCE ELEMENT	MANAGEMENT ACTIVITY	STANDARDS AND GUIDELINES	MANAGEMENT PRACTICE
RECREATION	Recreation Planning and Inventory	1. Visual Quality Objective: PRESERVATION 2. Do not plan or develop new recreation site or facilities in this prescription.	
	Cultural Resource Evaluation, Assessment and Protection	1. Forest-wide Standards and Guidelines apply. See p. IV-66	
	Facility and Site Reconstruction and Construction	1. Forest-wide Standards and Guidelines apply. See p. IV-67 and 68	
	Facility and Site Management	1. Forest-wide Standards and Guidelines apply. See p. IV-68	
	Use Administration	1. Do not encourage recreation use and prohibit use if it is damaging to the intent of the area.	
	Trail Reconstruction and Construction	1. Construct or reconstruct trails only if needed for research purposes.	
	Trail System Maintenance and Operation	1. Trail standards will be the minimum needed for essential research access.	
WILDLIFE AND FISH	Wildlife Surveys and Plans	1. Forest-wide Standards and Guidelines apply. See p. IV-80 through 83	
	Non-Structural and Structural Habitat Improvement	1. Forest-wide Standards and Guidelines apply. See p. IV-83 and 84	

RN-1

RESOURCE ELEMENT	MANAGEMENT ACTIVITY	STANDARDS AND GUIDELINES	MANAGEMENT PRACTICE
RANGE	Range Structural Improvements	1. Fence as needed to exclude livestock.	
	Range Structural Improvement Maintenance	1. Forest-wide Standards and Guidelines apply. See p. IV-89	
TIMBER	Not Applicable to this Prescription.		
WATER	Planning	1. Forest-wide Standards and Guidelines apply. See p. IV-94	
	Improvement	1. Forest-wide Standards and Guidelines apply. See p. IV-94 and 96	
	Administration and Management	1. Forest-wide Standards and Guidelines apply. See p. IV-94 and 95	
	Rights and Use Management	1. Forest-wide Standards and Guidelines apply. See p. IV-95 and 96	
SOIL	Planning and Inventory	1. Forest-wide Standards and Guidelines apply. See p. IV-96	
	Improvement	1. Forest-wide Standards and Guidelines apply. See p. IV-96	
	Administration and Management	1. Forest-wide Standards and Guidelines apply. See p. IV-97	
AIR	Planning	1. Forest-wide Standards and Guidelines apply. See p. IV-98	
	Administration and Management	1. Forest-wide Standards and Guidelines apply. See p. IV-98	
MINERALS AND GEOLOGY	Locatable Minerals	1. Propose that the area be withdrawn from entry under the 1872 Mining Law using the Forest-wide Standards and Guidelines for withdrawals. 2. After the area is withdrawn, determine if valid prior-existing rights to explore for or mine locatable minerals exist before approving such activities under Forest-wide Standards and Guidelines.	

RESOURCE ELEMENT	MANAGEMENT ACTIVITY	STANDARDS AND GUIDELINES	MANAGEMENT PRACTICE
MINERALS AND GEOLOGY (continued)	Leasable Energy Minerals	1. Determine if reasonably stipulated leasable mineral activities can be conducted in a manner that is compatible with the RNA. If so, and the area is subject to mineral leasing, then recommend a lease be issued subject to appropriate stipulations. 2. If any surface disturbing activities would be incompatible with the RNA but a "no-surface occupancy" stipulation would be technically reasonable, recommend a no-surface occupancy stipulation be attached to the lease. If the "NSO" stipulation is technically unreasonable, recommend that the lease not be issued. 3. If withdrawn from mineral leasing, ensure valid existing rights exist before approving any leasable mineral activities within these areas.	
	Common Variety Minerals	1. If removal of common variety minerals is incompatable with the RNA, do not approve disposal.	
	Recreational Mineral	1. Forest-wide Standards and Guidelines apply. See p. IV-99	
RURAL COMMUNITY AND HUMAN RESOURCES	No Special Practices.		
LANDS	Special Use Management	1. Avoid locating transportation and utility corridors in these areas.	
	Right-of-Way Grants for Roads and Trails	1. Grant appropriate rights-of-way only when alternate access is unavailable. Minimize the impact on the area when doing so.	
	Federal Energy Regulatory Commission License and Permits	1. Recommend against these uses in Research Natural areas.	
	Withdrawals, Modifications, and Revocations	1. Recommend withdrawal from mining and mineral leasing laws.	
	Property Line Location Property Boundary and Corner Maintenance	1. Forest-wide Standards and Guidelines apply. See p. IV-100	
	Landownership Planning, Land Adjustment Planning, and All Adjustment Activities	1. Retain National Forest and acquire inholding within Research Natural Areas.	
	Rights-of-Way Cost-Share Agreements	1. Forest-wide Standards and Guidelines apply. See p. IV-100	

RESOURCE ELEMENT	MANAGEMENT ACTIVITY	STANDARDS AND GUIDELINES	MANAGEMENT PRACTICE
FACILITIES	Road Construction	1. No roads will be constructed or maintained except that: a. reasonable access will be granted to landlocked inholders under the then prevailing guidelines.	
	Road Operations	1. Prohibit or eliminate road use.	
PROTECTION	Fire Prevention	1. Implement a high intensity fire prevention program as outlined in the Forest's Fire Management Action Plan.	
	Fire Suppression	1. Management of natural fires will be addressed in the Establishment Report for each specific Research Natural Area. All wildfires will be suppressed utilizing an appropriate suppression strategy. Suppression tactics which minimize physical disturbance will be used. 2. All human caused fires will be considered wildfires.	
	Fire Hazard Abatement	1. Naturally occurring fires burning within prescription will be managed in an attmept to replicate the natural fire cycle if it is appropriate to the management objectives of the Research Natural Area. 2. Prescribed burning may be used to maintain ecologic conditions (Ref: FSM 4063.41–4).	
	Preattack Facilities Development	1. The development of preattack facilities is not appropriate except on the exterior boundaries of the area where such facilities would supplement the protection of the adjacent lands.	
	Law Enforcement	1. Use special closures when necessary to protect the RNA from actual or potential damage from public use when appropriate.	
	Forest Pest Management	1. Suppress insect and disease outbreaks to meet RNA objectives. 2. Use these areas to observe insects and diseases in undisturbed areas. 3. Survey pest populations as a management strategy for adjacent resource areas.	

APPENDIX 2
FINAL ENVIRONMENTAL IMPACT STATEMENT
WENATCHEE NF LAND AND RESOURCE MANAGEMENT PLAN
APPLICABLE TO RESEARCH NATURAL AREAS

9f. VEGETATION: RESEARCH NATURAL AREAS

Research Natural Areas (RNA's) are part of a Federal system of such tracts established for non-manipulative research and educational purposes. Each RNA is a site where some features are preserved for scientific purposes and natural processes are allowed to dominate. Their main purposes are to provide: (1) baseline areas against which effects of human activities can be measured; (2) sites for study of natural processes in undisturbed ecosystems; and (3) gene pool preserves for all types or organisms, especially those which are classified as rare and endangered types.

Prior to establishment, a comprehensive formal report is made. For RNAs proposed on National Forest System lands, the report is submitted to the Chief of the Forest Service for approval.

Established RNAs

There are two established RNAs on the Forest. Meeks Table RNA on the Naches Ranger District is 64 acres in area and represents the ponderosa pine/pine grass plant community with a co-dominance of Douglas-fir. It was established on July 7, 1948, and is now within the William O. Douglas Wilderness.

Thompson Clover RNA located in Swakane Canyon on the Entiat Ranger District is 276 acres in size and exemplifies a plant community characterized by Thompson clover. It was established on February 17, 1977.

Formally Proposed RNAs

The Research Natural Area Committee for the Pacific Northwest has formally proposed two additional RNA's. Eldorado Creek located in the Teanaway drainage of the Cle Elum Ranger District is 1,336 acres in size and represents a plant community found on serpentine soils. The Eldorado Creek area was designated as a Special Area (Proposed RNA) in the Alpine Lakes Management Plan (November 2, 1981).

Fish Lake Bog on the Lake Wenatchee Ranger District is a 106 acre area on the west end of Fish Lake near Lake Wenatchee. This represents a floating bog community.

Preliminary reports have been made for both of these areas; Fish Lake Bog on July 5, 1979, and Eldorado Creek on August 9, 1972. A supplemental report on the mineral character of the proposed Eldorado Creek RNA was made on November 6, 1974.

Recommended RNAs

The Research Natural Area Committee for the Pacific Northwest Region determined that the candidate RNAs listed in Table III-34 represent the best examples of particular kinds of natural ecosystems in the Region and are needed to meet present and future demands. There may be some future RNA needs that can best be satisfied on the Wenatchee National Forest. When suitable new areas are identified, they will be considered for addition to the Research Natural Area inventory.

TABLE III-34
RECOMMENDED RESEARCH NATURAL AREAS
1984

Name	Area (Acres)	Location (District)	Plant Community Exemplified
* 1. Cedar Creek	2205	Naches	Mixed old-growth conifer/ shrub forest and Pacific silver fir forest.
** 2. Icicle/Frosty Creek	784	Leavenworth	Western red cedar/western hemlock forest.
** 3. Chiwaukum Creek	1124	Leavenworth	Grand fir mixed old-growth conifer/shrub
4. Drop Creek	530	Cle Elum	Englemann Spruce/Subalpine fir forest

* Within the William O. Douglas Wilderness ** Within Alpine Lakes Wilderness

Steps in Establishment of RNA's:

1. R-6 Research Natural Area Committee working in conjunction with the Washington Natural Heritage Plan (Department of Natural Resources, 1985) identifies the need for a site representing a specific natural ecosystem.

2. This committee then works with the area ecologist and ranger district personnel to identify several potential representative sites.

3. The committee visit and evaluates the sites and narrows the list down to the most representative site.

4. This site is then recommended through the Forest Plan for establishment as an RNA.

5. If the area is allocated as a proposed RNA by the alternative in the Forest Plan which is implemented, then an establishment report is developed. In the past, ranger district personnel have worked with personnel from the Pacific Northwest Forest and Range Experiment Station in the development of this report.

6. The approval procedure for an RNA Establishment Report is as follows:

- District Ranger - Review and Recommend
- Forest Supervisor - Review and Recommend
- Pacific Northwest Station Director - Review and Recommend
- Regional Forester - Review and Recommend
- Director of Division of Recreation - Review and Recommend
- Deputy Chief of Research - Review and Recommend
- Chief, U.S. Forest Service - Approve

7. Upon approval by the Chief, the area is designated as a Research Natural Area and will be managed accordingly.

Generally, mitigation measures that are used for vegetative attributes of limited abundance such as sensitive plants (or old growth) are those that: 1. Avoid impact by not taking a certain action or parts of an action; 2. Minimize impacts by limiting the degree or magnitude of the action and its implementation or; 3. Reduce or eliminate the impact by preservation and maintenance operations during the life of the action. Repairing, rehabilitating or restoring the affected environment or compensating for the impact by replacing or providing substitute resources or environments are generally not effective means of mitigation for sensitive plants. Finally, Forest Service policy provides management requirements for the maintenance of sensitive plants.

9(F) ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES ON VEGETATION: RESEARCH NATURAL AREAS

a.Direct and Indirect Effects of Each Alternative on Vegetation: Research Natural Areas

Research Natural Areas (RNA's) are representative ecosystems where natural processes dominate. They are areas set aside for research, preservation of gene pools for sensitive plants and preservation of "typical" communities to serve as a baseline for management activities. Management is allowed only when needed to preserve the attributes for which the RNA was established. The two existing RNA's, Meeks Table and Thompson Clover, are described in Chapter III. Four new RNA's, in addition to the two already formally proposed, are listed in Table IV-18.

Alternatives B through G and I would recommend the establishment of four new Research Natural Areas. In addition, the two RNA's that are already formally proposed will remain in all alternatives.

Forest Service policy is to support the Research Natural Area program. Areas that fill needed cells in the system that are brought to the attention of the Forest by the Pacific Northwest Research Natural Area Committee are recommended for RNA designation. The Forest follows the recommendation of the Research Natural Area Committee.

Alternatives B through G fully support the maintenance of the RNA network on the Wenatchee as recommended by the Research Natural Area Committee. Alternatives N/C, A/NFMA, H and J only partially support the recommended RNA network, with four recommended areas not being proposed. For these four areas, the consequences are that vegetation manipulation (for any management purpose) or site destruction by roading may irreversibly preclude the selection of some of these areas for RNAs in the future. However, with our policy of supporting the RNA committee recommendations, further recommendation of potential RNAs would be ongoing and lead to amendment of the Forest Plan at any time to fill needed cells in the RNA system.

Alternatives that have greater amounts of ground-disturbing activities and vegetation manipulation may result in needed cells, whose existence are at this time unknown, being lost to management activity.

TABLE IV-18
PROPOSED RESEARCH NATURAL AREAS BY ALTERNATIVE

	ALTERNATIVES										
	N/C	A	B	C	D	E	F	G	H	I	J
1. Cedar Creek 1/			X	X	X	X	X	X		X	
2. Icicle/Frosty 1/			X	X	X	X	X	X		X	
3. Chiwaukum Creek 1/			X	X	X	X	X	X		X	
4. Drop Creek			X	X	X	X	X	X		X	
5. Fish Lake Bog 2/	X	X	X	X	X	X	X	X	X	X	X
6. El Dorado Creek 2/	X	X	X	X	X	X	X	X	X	X	X

1/ Within Wilderness
2/ Formally Proposed RNA

Three of the proposed RNA's are within wilderness. The effects of the alternatives would not vary in the wilderness and are not significant. Wilderness would have priority over non-manipulative research.

The proposed new RNA (Drop Creek) is located on Table Mountain. The effects of the alternatives on this proposed RNA would be related to the management area(s) that surround it as follows:

TABLE IV-19
EFFECTS ON DROP CREEK PROPOSED RNA

	ALTERNATIVES										
Alternative	N/C	A	B	C	D	E	F	G	H	I	J
Management Area(s) Bordering the RNA	N/A	N/A	RM-1	EW-1 ST-2	RM-1	ST-2	ST-2	EW-1 ST-2	N/A	EW-1 ST-2	N/A

N/A = Not Applicable

Alternatives A/NFMA, H, N/C and J would not make any new RNA proposals, and the Drop Creek Area would be designated as EW-1, Big Game Habitat. Alternatives C, G, and I have EW-1 (Deer and Elk Habitat) and ST-1 (Scenic Travel Retention) management areas adjacent to the RNA's. Both of these management areas allow timber harvest and livestock grazing but no harvest or grazing is allowed in the RNA. Alternatives B and D have RM-1 (Intensive Range) management areas adjacent to the RNA; however, grazing by livestock is not allowed in the RNA. The RE-2a (Unroaded Non-motorized) management area in Alternatives E and F allow grazing also, but none will be allowed in the RNA's. The integrity of the new proposals for Research Natural Areas will be maintained in all alternatives except A/NFMA, H, N/C and J. That does not necessarily mean that these areas will be lost to the system. A later proposal by the Research Natural Committee or the Forest could result in these areas being proposed again in the selected alternative and the plan amended.

b. Cumulative Effects of Each Alternative

In every alternative, all RNAs are protected either by allocation as Research Natural Areas, or by their location within wilderness, with the exception of Drop Creek. The fact that Drop Creek, which is outside wilderness, is not protected in Alternatives NC, A/NFMA and H may result in a loss of the area as an RNA. However, the effect is direct and specific, not cumulative.

There are no cumulative effects of alternatives on Research Natural Areas.

c. Alternatives' Conflicts with Other Agency Plans and Policies

There are no conflicts between the effects of the alternatives and others' plans for Research Natural Areas. All alternatives contain areas formally proposed by the Research Natural Area Committee for the Pacific Northwest.

d. Mitigation Measures for Vegetation: Research Natural Areas

The Standards and Guidelines which are part of the Forest Plan contain a listing of practices which include:

1) Do not encourage recreation use and prohibit use if damaging to the area.

2) Fence as needed to exclude livestock.

3) No timber practice.

4) Exclude transportation and utility corridors.

5) Recommend withdrawal from mining and mineral leasing.

6) No roads will be constructed except reasonable access will be granted to landlocked inholders.

7) Use appropriate fire suppression strategy.

These measures should be equally effective in all alternatives in which Research Natural Areas are proposed.

10. ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES ON SOIL AND WATER

A primary objective of forest managers is to maintain soil productivity, water quality and the hydrologic balance of watershed systems. The intent of all alternatives is to manage watersheds to minimize the loss of soil productivity and to provide riparian area, stream channel and water quality conditions that would protect beneficial uses of water. Measures to achieve this intent, through preventive and mitigative measures, would be built into every alternative as Standards and Guidelines.

The following sections disclose the potential direct, indirect and cumulative effects of various allocations or management activities on soil and water resources. Descriptions are based on the analysis of those activities which have the greatest potential for effects on soil and water. Comparisons between alternatives are based on the relative amount of risk or benefit to soil and water resources from the management proposed in each alternative. Risk assessment is based on: (1) probable impact of implementation, including mitigation, (2) possible errors leading to inadequate project design, and (3) likelihood of administrative errors leading to inadequate implementation.

The cumulative effects section utilizes information from Tables F-1 through F-8 in the FEIS, Appendix F. These tables list the Forest's 25 major watersheds, providing information by alternative on the acreage in each watershed in private ownership, wilderness, National Forest lands subject to timber harvest, and unharvestable land. The cumulative effects section provides more information on long-term trends in watershed condition and a summary of the risk to soil and water resources for the various alternatives by watershed. A discussion of potential mitigation measures follows the narrative on the effects of alternatives.

APPENDIX 3
LETTER FROM WENATCHEE NF LAND SURVEYOR

United States Department of Agriculture | **Forest Service** | **Wenatchee National Forest** | **215 Melody Lane Wenatchee, WA 98801-5933 (509) 662-4335**

November 26, 1996

Re: Fish Lake Bog Research Natural Area (R.N.A.)

I have reviewed the map and description for the Fish Lake Bog Research Natural Area. The map and description used jointly will adequately describe and locate the R.N.A..

If you have questions please, give me a call.

Leland D Fischer

Leland D. Fischer, PLS.
LAND SURVEYOR

** FISH LAKE BOG **
RESEARCH NATURAL AREA

FISH LAKE BOG RESEARCH NATURAL AREA (R.N.A.), IS LOCATED IN PARTS OF SECTIONS 16 AND 21, T.27 N. R.17 E. W.M., CHELAN COUNTY, WASHINGTON. MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT A STEEL POST TAGGED AND NUMBERED 202 ON THE NORTH BOUNDARY OF FISH LAKE BOG (R.N.A.). FROM WHICH THE M.C. SEC. 15 AND 16, T.27 N. R.17 E. WM., AN ALUMINUM MONUMENT, BEARS N65°25'E 1737 FT. THENCE ALONG THE NORTH BOUNDARY OF THE R.N.A. FOLLOWING THE COURSES BELOW TO POST 208, THIS PORTION OF THE BOUNDARY BEING 33 FT SOUTH OF THE CENTERLINE OF FISH LAKE ROAD, FOREST ROAD N0. 6202.

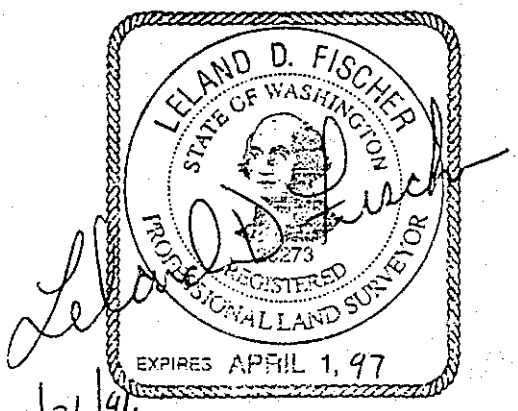
COLUMN 1		COLUMN 2	
POST 202		POST 205	
	S85°03'W 571 FT		S86°01'W 166 FT
POST 203		POST 206	
	N81°44'W 312 FT		N86°39'W 204 FT
POST 204		POST 207	
	S83°14'W 174 FT		S74°02'W 348 FT
		POST 208	

THENCE ALONG THE WEST BOUNDARY OF THE R.N.A. FOLLOWING THE COURSES BELOW TO POST 227, THIS PORTION OF THE BOUNDARY BEING 25 FT EASTERLY OF THE CENTERLINE OF THE SNOWMOBILE TRAIL.

COLUMN 1		COLUMN 2	
POST 208		POST 218	
	S26°52'W 134 FT		S28°30'W 211 FT
POST 209		POST 219	
	S57°06'W 281 FT		S67°27'E 227 FT
POST 210		POST 220	
	S22°12'W 250 FT		S36°55'E 298 FT
POST 211		POST 221	
	S43°53'W 191 FT		S04°49'W 181 FT
POST 212		POST 222	
	S31°38'E 134 FT		S32°33'E 324 FT
POST 213		POST 223	
	S12°18'E 209 FT		S16°19'E 314 FT
POST 214		POST 224	
	S06°14'E 377 FT		S32°38'E 252 FT
POST 215		POST 225	
	S20°26'W 159 FT		S69°22'E 261 FT
POST 216		POST 226	
	S08°55'E 411 FT		S46°15'E 359 FT
POST 217		POST 227	
	S26°06'W 180 FT		

THENCE EAST AND NORTHEASTERLY FOLLOWING THE COURSES BELOW TO POST 240.

COLUMN 1		COLUMN 2	
POST 227		POST 234	
	S68°10'E 314 FT		N50°23'E 178 FT
POST 228		POST 235	
	N85°22'E 218 FT		N69°18'E 322 FT
POST 229		POST 236	
	N87°00'E 344 FT		N50°58'E 205 FT
POST 230		POST 237	
	N80°23'E 431 FT		N03°01'W 117 FT
POST 231		POST 238	
	N37°38'E 299 FT		N08°02'E 183 FT
POST 232		POST 239	
	N43°14'E 352 FT		N12°47'E 102 FT
POST 233		POST 240	
	N49°55'E 169 FT		

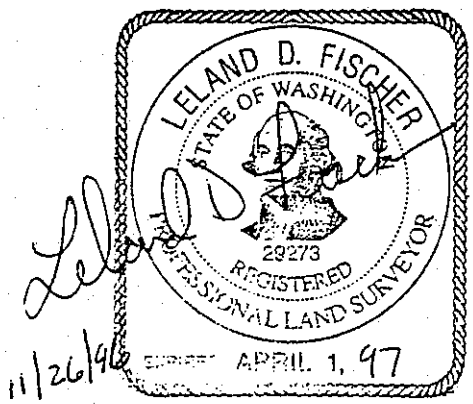


11/26/96

FROM POST 240, THE W.C.M.C. FOR SEC.21 AND 22, T.27 N. R.17 E. WM. AN ALUMINUM MONUMENT, BEARS N39°58'E 228 FT.. THENCE N56°14'W 80 FT. TO A POINT ON THE EASTERLY EDGE OF FISH LAKE BOG AND THE WEST EDGE OF FISH LAKE. THENCE WEST AND NORTH ALONG THE FOLLOWING COURSES DESCRIBING THE EASTERLY LINE OF FISH LAKE BOG.

COLUMN 1		COLUMN 2	
S57°00'W	327 FT	N26°59'E	233 FT
N73°33'W	119 FT	N22°32'E	284 FT
N62°52'W	124 FT	N16°34'E	206 FT
S10°54'W	106 FT	N14°42'E	426 FT
S40°23'W	149 FT	N13°45'E	255 FT
S81°59'W	206 FT	N02°08'W	495 FT
N67°56'W	158 FT	N02°57'W	436 FT
S71°23'W	145 FT	N56°34'W	70 FT
S74°58'W	67 FT	S89°21'W	83 FT
N02°34'W	79 FT	S60°55'W	169 FT
N14°47'E	263 FT	S33°58'W	198 FT
N24°08'E	274 FT	N74°31'W	83 FT
		N47°46'W	425 FT

TO POST 202 AND THE POINT OF BEGINNING. CONTAINING 241.5 ACRES. THE R.N.A. AREA DESCRIBED CONTAINS 25.7 ACRES OF PRIVATELY OWNED LAND IN GOV. LOT 2, SEC.16.



11/26/96

APPENDIX 4
KNOWN VASCULAR PLANTS AT FISH LAKE BOG RNA BY LIFE FORM

Names follow Little (1979) and Hitchcock, et. al. (1973).

Scientific Name	Common Name
Trees	
Abies grandis	grand fir
Acer macrophyllum	bigleaf maple
Alnus incana	white alder
Alnus rubra	red alder
Pinus contorta	lodgepole pine
Pinus monticola	western white pine
Pinus ponderosa	ponderosa pine
Populus tremuloides	quaking aspen
Populus trichocarpa	black cottonwood
Pseudotsuga menziesii	Douglas-fir
Thuja plicata	western red-cedar
Tsuga heterophylla	western hemlock
Shrubs, Subshrubs, and Vines	
Acer circinatum	vine maple
Amelanchier alnifolia	western serviceberry
Apocynum androsaemifolium	spreading dogbane
Arctostaphylos uva-ursi	kinnikinnick
Berberis aquifolium	tall Oregon grape
Berberis nervosa	Cascade Oregon grape
Berberis repens	creeping Oregon grape
Ceanothus sanguineus	redstem ceanothus
Ceanothus velutinus	snowbrush ceanothus
Chimaphila menziesii	Menzie's prince's pine
Chimaphila umbellata	prince's pine
Cornus stolonifera	redosier dogwood
Crataegus douglasii	black hawthorn
Holodiscus discolor	ocean spray
Lonicera ciliosa	trumpet honeysuckle
Lonicera involucrata	bearberry honeysuckle
Pachistima myrsinites	Oregon boxwood
Philadelphus lewisii	mock orange
Prunus emarginata	bittercherry
Prunus virginiana	common chokecherry
Pyrola asarifolia	alpine pyrola
Pyrola secunda	sidebells pyrola
Rhamnus purshiana	cascara
Rosa gymnocarpus	baldhip rose
Rubus parviflorus	thimble berry
Rubus pedatus	fiveleaved bramble
Rubus spectabilis	salmon berry
Rubus ursinus	California dewberry
Salix bebbiana	Bebb's willow
Salix geyeriana	Geyer willow
Salix pedicellaris	bog willow
Salix sitchensis	Sitka willow
Salix scouleriana	Scouler's willow
Sambucus cerulea	blue elderberry
Sambucus racemosa	red elderberry
Spiraea betulifolia var. *lucida*	shiny leaf spiraea
Spiraea douglasii var. *menziesii*	hardhack
Symphoricarpos albus	common snowberry
Vaccinium caespitosa	dwarf huckleberry
Vaccinium membranaceum	thin-leaved blueberry
Vaccinium myrtillus	low huckleberry
Vaccinium oxycoccos	wild cranberry
Viburnum edule	moosewood viburnum

Herbs

Achillaea millefolium	common yarrow
Adenocolon bicolor	trail plant
Anaphalis margaritacea	pearly-everlasting
Angelica arguta	Lyall's angelica
Antennaria microphylla	rosy pussy-toes
Arenaria macrophylla	bigleaf sandwort
Arnica cordifolia	heart-leaf arnica
Asarum caudatum	wild ginger
Aster modestus	few-flowered aster
Aster sibiricus	arctic aster
Balsamorhiza sagittata	arrowleaf balsam root
Bidens cernua	sticktight
Ceratophyllum demersum	hornwort
Calypso bulbosa	calypso orchid
Castilleja miniata var. *miniata*	scarlet paintbrush
*Cicuta bulbifera**	bulb-bearing water-hemlock
Cirsium arvensis	Canadian thistle
Claytonia lanceolata	western springbeauty
Clintonia uniflora	queen's cup
Collinsia parviflora	small-flowered blue-eyed Mary
Disporum hookeri	fairy-bell
Drosera anglica	great sundew
Drosera rotundifolia	round leaf sundew
Elodea canadensis	Canadian waterweed
Epilobium angustifolium	fireweed
Epilobium palustre	wickup
Fragaria vesca	wild strawberry
Galium trifidum var. *pacificum*	small bedstraw
Goodyera oblongifolia	rattlesnake plantain
Hieracium albiflorum	white-flowered hawk weed
Hippuris montana	mountain mare's-tail
Lathyrus pauciflorus	few-flowered peavine
Lewisia tweedyi	Tweedy's lewisia
Ligusticum gray	Gray's lovage
Lilium columbianum	tiger lily
Linnaea borealis	twinflower
Lupinus latifolius	broadleaf lupine
Lupinus polyphyllus var. *burkeii*	bigleaf lupine
Lycopus uniflorus	northern bugleweed
Lysitchiton americanum	yellow skunk cabbage
Mentha spp.	mint
Menyanthes trifoliata	buckbean
Mimulus guttattus	yellow monkey flower
Montia perfoliata	miner's lettuce
Nuphar polysepalum	spatter-dock
*Orobanche pinorum**	pine broomrape
Osmorhiza chilensis	mountain sweet-cicely
Pedicularis bracteosa	bracted lousewort
Platanthera dilatatum	white bog-orchid
Potamogeton gramineus	grass-leaved pondweed
Potamogeton natans	broad-leaved pondweed
Potamogeton praelongus	long-stalked pondweed

*Priority 3 species, WA Natural Heritage Program (1995). These taxa are vulnerable or declining and could become endangered or threatened in the state without active management or removal of threats. These taxa should be important in the analysis of potential preserve sites.

Herbs *(cont'd)*

Potamogeton robbinsii	Robbin's pondweed
Potentilla palustris	purple cinquefoil
Prunella vulgaris	self heal
Pterospora andromedea	woodland pinedrops
Rumex acetosella	sheep sorrel
Rumex occidentalis	western dock
Scheuchzeria palustris var. *americana*	scheuchzeria
Scutellaria galericulata	marsh skullcap
Smilacina racemosa	feather solomon plume
Smilacina stellata	star flowered Solomon-plume
Spiranthes romanzoffiana	ladies-tresses
Tofieldia glutinosa	sticky tofieldia
Trientalis artica	northern starflower
Trientalis latifolia	starflower
Trillium ovatum	western trillium
Utricularia vulgaris	common bladderwort
Veratrum viride	green false-hellebore
Viola adunca	early blue violet
Viola glabella	stream violet
Viola palustris	marsh violet

Graminoids

Bromus tectorum	cheatgrass
Calamagrostis rubescens	pine grass
Carex aquatilis	water sedge
*Carex buxbaumii**	Buxbaum's sedge
Carex canescens	gray sedge
*Carex comosa**	bristly sedge
Carex concinnoides	northwest sedge
Carex cusickii	Cusick's sedge
Carex diandra	lesser panicled sedge
Carex disperma	soft leaved sedge
Carex geyeri	elk sedge
Carex lasiocarpa	slender sedge
Carex muricata	muricate sedge
Carex limosa	mud sedge
Carex rossii	Ross's sedge
Carex rostrata	beaked sedge
Carex vesicaria	inflated sedge
Dulichium arundinaceum	dulichium
Eleocharis palustris	common spike-rush
Elymus glacus	blue wildrye
Eriophorum gracile	slender cotton-grass
Festuca occidentalis	western fescue
Juncus balticus	Baltic rush
Phalaris arundinacea	reed canarygrass
Puccinellia pauciflora var. *microtheca*	weak alkaligrass
Rhynchospora alba	white beakrush
Scirpus acutus	hardstem bulrush
Scirpus microcarpus	small-fruited bulrush
Typha latifolia	common cat-tail

*Priority 3 species, WA Natural Heritage Program (1995). These taxa are vulnerable or declining and could become endangered or threatened in the state without active management or removal of threats. These taxa should be important in the analysis of potential preserve sites.

Ferns and Fern Allies

Athyrium filix-femina	lady-fern
Botrychium multifidum	leathery grape-fern
Equisetum arvense	field horsetail
Equisetum fluviatile	water horsetail
Pteridium aquilinium	bracken fern

APPENDIX 5
KNOWN BIRD SPECIES AT FISH LAKE BOG RNA, SEASONAL OCCURRENCE, AND ABUNDANCE.

Names follow Terres (1987).

Seasons

Sp = Spring: March, April, May
S = Summer: June, July, August
F = Fall: September, October, November
W = Winter: December, January, February

Abundance

C = COMMON. Easy to find over large areas in suitable habitat. Found on most visits.
U = UNCOMMON. Widely scattered (or found in restricted areas) in suitable habitat.
R = RARE Very widely scattered in suitable habitat or common in a very few spots.

Scientific Name	Common Name	Seasonal Abundance			
		Sp	S	F	W
*Gavia immer**	Common Loon	U	U	R	-
Podiceps auritus	Horned Grebe	R	R	R	-
Podiceps nigricollis	Eared Grebe	C	C	R	-
Aechmophorus occidentalis	Western Grebe	U	U	R	-
Ardea herodias	Great Blue Heron	C	C	C	-
Branta canadensis	Canada Goose	C	R	C	-
Aix sponsa	Wood Duck	U	U	U	-
Anas crecca	Green-winged Teal	C	C	C	-
Anas platyrhynchos	Mallard	C	C	C	-
Anas discors	Blue-winged Teal	C	C	C	-
Anas americana	American Wigeon	C	R	C	-
Aythya valisineria	Canvasback	U	R	U	-
Bucephala clangula	Common Goldeneye	U	-	U	-
Bucephala islandica	Barrow's Goldeneye	U	U	U	-
Bucephala albeola	Bufflehead	U	U	U	-
Lophodytes cucullatus	Hooded Merganser	U	U	U	-
Mergus merganser	Common Merganser	U	U	U	-
Cathartes aura	Turkey Vulture	U	U	U	-
Pandion haliaetus	Osprey	U	U	R	-
*Haliaeetus leucocephalus***	Bald Eagle	U	R	U	U
Circus cyaneus	Northern Harrier	U	U	U	U
Accipiter striatus	Sharp-shinned Hawk	U	U	U	U
Accipiter cooperii	Cooper's Hawk	U	U	U	U
*Accipiter gentilis***	Northern Goshawk	R	R	R	R
Buteo jamaicensis	Red-tailed Hawk	C	C	C	U
Aquila chrysaetos	Golden Eagle	U	U	U	U
Falco sparverius	American Kestrel	C	C	C	U
Dendragapus obscurus	Blue Grouse	U	U	U	U
Bonasa umbellus	Ruffed Grouse	U	U	U	U
Fulica americana	American Coot	C	C	C	-
Calidris mauri	Western Sandpiper	C	-	C	-
Calidris minutilla	Least Sandpiper	C	-	C	-
Larus delawarensis	Ring-billed Gull	C	C	C	U
Larus californicus	California Gull	C	C	C	U
Otus kennicottii	Western Screech-Owl	R	R	R	R

*Priority 1 species, WA Natural Heritage Program (1995). Taxa are in danger of becoming extinct throughout their ranges. populations of these taxa are at critically low levels or their habitats are degraded or deleted to a significant degree. These taxa are the highest priorities for preservation.

**Priority 3 species, WA Natural Heritage Program (1995). These taxa are vulnerable or declining and could become endangered or threatened in the state without active management or removal of threats. These taxa should be important in the analysis of potential preserve sites.

Scientific Name	Common Name	Seasonal Abundance Sp	S	F	W
Bubo virginianus	Great Horned Owl	C	C	C	C
Glaucidium gnoma	Northern Pygmy-Owl	U	U	U	U
Strix varia	Barred Owl	R	R	R	R
Asio flammeus	Short-eared Owl	U	U	U	U
Aegolius acadicus	Northern Saw-whet Owl	R	R	R	R
Chordeiles minor	Common Nighthawk	R	C	R	-
Archilochus alexandri	Black-chinned Hummingbird	R	R	-	-
Stellula calliope	Calliope Hummingbird	C	C	-	-
Selasphorus rufus	Rufous Hummingbird	C	C	-	-
Ceryle alcyon	Belted Kingfisher	C	C	C	-
*Melanerpes lewis***	Lewis Woodpecker	U	U	U	R
Sphyrapicus nuchalis	Red-naped Sapsucker	U	U	U	-
Picoides pubescens	Downy Woodpecker	C	C	C	C
Picoides villosus	Hairy Woodpecker	U	U	U	U
*Picoides albolarvatus***	White-headed Woodpecker	U	U	U	U
Picoides tridactylus	Three-toed Woodpecker	R	R	R	R
Colaptes auratus	Northern Flicker	C	C	C	C
*Dryocopus pileatus***	Pileated Woodpecker	U	U	U	U
Contopus borealis	Olive-sided Flycatcher	U	U	U	-
Contopus sordidulus	Western Wood-Pewee	C	C	C	-
Empidonax difficilis	Western Flycatcher	U	U	U	-
Sayornis saya	Say's Phoebe	C	C	C	-
Tyrannus verticalis	Western Kingbird	C	C	C	-
Tachycineta thalassina	Violet-green Swallow	C	C	C	-
Stelgidopteryx serripennis	N. Rough-winged Swallow	C	C	C	-
Riparia riparia	Bank Swallow	U	U	U	-
Hirundo pyrrhonota	Cliff Swallow	C	C	C	-
Hirundo rustica	Barn Swallow	C	C	C	-
Cyanocitta stelleri	Steller's Jay	C	C	C	C
Nucifraga columbiana	Clark's Nutcracker	U	U	U	U
Corvus brachyrhynchos	American Crow	U	U	U	U
Corvus corax	Common Raven	C	C	C	C
Parus atricapillus	Black-capped Chickadee	C	C	C	C
Parus gambeli	Mountain Chickadee	C	C	C	C
Parus rufescens	Chestnut-backed Chickadee	R	R	R	R
Sitta canadensis	Red-breasted Nuthatch	C	C	C	C
Troglodytes aedon	House Wren	C	C	U	-
Cistothorus palustris	Marsh Wren	C	C	C	-
Cinclus mexicanus	American Dipper	C	C	C	-
Regulus satrapa	Golden-crowned Kinglet	C	C	C	U
*Sialia mexicana***	Western Bluebird	U	U	U	-
Catharus ustulatus	Swainson's Thrush	U	U	U	-
Catharus guttatus	Hermit Thrush	C	U	C	-
Turdus migratorius	American Robin	C	C	C	-
Ixoreus naevius	Varied Thrush	U	U	U	-
Bombycilla cedrorum	Cedar Waxwing	U	U	U	U
Sturnus vulgaris	European Starling	C	C	C	C
Dendroica petechia	Yellow Warbler	C	C	C	-

*Priority 1 species, WA Natural Heritage Program (1995). Taxa are in danger of becoming extinct throughout their ranges. populations of these taxa are at critically low levels or their habitats are degraded or deleted to a significant degree. These taxa are the highest priorities for preservation.

**Priority 3 species, WA Natural Heritage Program (1995). These taxa are vulnerable or declining and could become endangered or threatened in the state without active management or removal of threats. These taxa should be important in the analysis of potential preserve sites.

Scientific Name	Common Name	Sp	S	F	W
Dendroica coronata	Yellow-rumped Warbler	C	C	C	-
Oporornis tolmici	MacGillivary's Warbler	C	C	C	-
Geothlypis trichas	Common Yellowthroat	U	U	U	-
Piranga ludoviciana	Western Tanager	C	C	U	-
Pheucticus melanocephalus	Black-headed Grosbeak	U	U	U	-
Pipilo erythrophthalmus	Rufous-sided Towhee	C	C	C	-
Melospiza melodia	Song Sparrow	C	C	C	C
Zonotrichia leucophrys	White-crowned Sparrow	C	R	C	U
Junco hyemalis	Dark-eyed Junco	C	C	C	C
Agelaius phoeniceus	Red-winged Blackbird	C	C	C	-
Carpodacus cassinii	Cassin's Finch	C	C	C	R
Carpodacus mexicanus	House Finch	C	C	C	C
Carduelis pinus	Pine Siskin	U	U	U	-
Coccothraustes vespertinus	Evening Grosbeak	U	U	U	-
Passer domesticus	House Sparrow	C	C	C	C

APPENDIX 6
KNOWN MAMMAL SPECIES AT FISH LAKE BOG RNA, SEASONAL OCCURRENCE, AND ABUNDANCE.

Names follow MacDonald (1984).

Seasons: S = Spring: March, April, May
S = Summer: June, July, August
F = Fall: September, October, November
W = Winter: December, January, February

Abundance: C = COMMON. Easy to find over large areas in suitable habitat. Found on most visits.
U = UNCOMMON. Widely scattered (or found in restricted areas) in suitable habitat.
R = RARE. Very widely scattered in suitable habitat or common in a very few spots.

Scientific Name	Common Name	Seasonal Abundance Sp	S	F	W
Odocoileus hemionus	Mule Deer	C	C	C	R
Cervus elaphus nelsoni	Rocky Mtn. Elk	U	U	C	R
Ursus americanus	Black Bear	C	C	U	-
Felis concolor	Cougar	R	R	R	U
Canis latrans	Coyote	C	C	C	C
Castor canadensis	Beaver	C	C	C	C
Lutra canadensis	River Otter	C	C	C	C
Mephitis mephitis	Striped Skunk	U	U	U	U
Erethizon dorsatum	Porcupine	U	U	U	U
Procyon lotor	Raccoon	C	C	C	C
Martes americana	Pine Marten	U	U	U	U
*Martes pennanti**	Fisher	R	R	R	R
Mustela erminea	Short-tailed Weasel	U	U	U	U
Mustela frenata	Long-tailed Weasel	U	U	U	U
Glaucomys sabrinus	Northern Flying Squirrel	U	U	U	U
Tamiasciurus douglasii	Douglas Tree Squirrel	C	C	C	C
Spermophilus lateralis	Golden Mantle Ground Sql.	C	C	U	-
Eutamias amoenus	Yellow Pine Chipmunk	C	C	C	-
Eatamias townsendii	Townsend's Chipmunk	C	C	C	-
Thomomys talpoides	Northern Pocket Gopher	C	C	C	-
Clethrionomys gapperi	Red-backed Vole	U	U	U	U
Microtus pennsylvanicus	Meadow Vole	C	C	C	-
Ondatra zibethicus	muskrat	C	C	C	C
Peromyscus maniculatus	Deer Mouse	C	C	C	-
Zapus trinotatus	Pacific Jumping Mouse	R	R	R	R
Scapanus spp.	Moles	U	U	U	U
Lepus americanus	Snow Shoe Hare	C	C	C	C
Sorex vagrans	Vagrant Shrew	U	U	U	U
Sorex cinereus	Masked Shrew	U	U	U	U
Sorex pacificus	Pacific Shrew	C	C	U	U
Sorex monticolous	Dusky Shrew	U	U	U	U
Sorex trowbridgii	Trowbridge Shrew	C	C	C	-
Myotis lucifugus	Little Brown Bat	C	C	C	-
Myotis californicus	California Bat	C	C	C	-
Lasiurus cinereus	Hoary-winged Bat	U	U	U	U
Myotis yumanensis	Yuma Bat	U	U	U	U
Lasionycteris noctivagans	Silver-haired Bat	U	U	U	U

*Priority 2 species, WA Natural Heritage Program (1995). These taxa will become endangered in Washington if factors contributing to their population decline or habitat degradation or loss continue. These taxa are high priorities for preservation efforts.

APPENDIX 7
KNOWN AMPHIBIAN AND FISH AT FISH LAKE BOG RNA

Amphibian names follow Leonard, et. al. (1993)
Fish names follow Page, et. al. (1991)

Scientific Name	Common Name
A. Amphibians	
Ambystoma macrodactylum	long-toed salamander
Bufo boreas	western toad
Pseudacris regilla	Pacific tree frog
Taricha granulosa	rough-skinned newt
B. Fish	
Onchorynchus mykiss	rainbow trout
Onchorynchus nerka	kokanee
Salmo trutta	brown trout
Salvelinus fontinalis	brook trout
Salvelinus confluentus	bull trout
Perca flavescens	yellow perch
Micropterus salmoides	largemouth bass
Micropterus dolsmieui	smallmouth bass
Ptychocheilus oregonensis	northern squawfish
Cottid spp.	sculpin spp.

THIN COVE

ENVIRONMENTAL ASSESSMENT

DECISION NOTICE AND FINDING OF NO SIGNIFICANT IMPACT

THIN COVE PROJECT AREA

This Environmental Assessment describes four alternative actions to harvest timber in the vicinity of Fish Lake. Fish Lake is located on the Lake Wenatchee Ranger District of the Wenatchee National Forest. The entire project planning area is on National Forest land.

Based on the Environmental Analysis described in this Environmental Assessment, it is my decision to implement Alternative II. This alternative best meets the criteria established during the scoping process.

Alternative II does the following:

* Provides 1,000 MBF of wood products, most of which will be harvested from overstocked stand of suppressed and deteriorating trees.

* Provides an economic return of $89,652.

* Commercially thins 97 acres while providing 165 acres for wildlife habitat protection and preservation.

* 37% of area will have much of the natural and logging caused slash utilized as chippable material, reducing fuel loadings in this area.

* Recommends establishment of a 150 acre Special Interest Area for zoological reasons. This is to protect the important habitat provided for existing animal communities. This includes a wide variety of wildlife species that use the area for denning, nesting, perching, and feeding.

* A 15 acre, 2 1/2 chain protective strip will be maintained along the proposed RNA edge and Thin Cove Resort campsites.

* Snowmobiling may be curtailed for one season within the project area.

* Visual quality objective retention will be met in harvested area.

* Builds approximately 1500 feet of landing spur access.

* Will have no impacts from the adverse effects of silt and logging debris on the water quality.

* Will have no impacts from soil movement.

* Will preserve the historical, cultural values of this area.

Alternative II provides the best combination for providing a timber volume and an economic return while protecting and/or maintaining other resource values.

Alternative III differs from Alternative II in the following ways:

* Alternative III silviculturally treats more area than II, in that it commercially thins 221 acres and shelterwood harvest 26 acres.

* It produces 3,000 MBF at an economic return of 267,012.

* 94% of area will have slash accumulations treated through chip utilization and piling and burning.

* No protective areas will be maintained for key wildlife species in area.

* Competing vegetation will be silviculturally treated through establishment of new plantations.

* Several wildlife habitat trees and snags will be lost due to intense silvicultural management and woodcutting.

* Visual quality will change from its original value to a managed vigorous well spaced timber stand.

* Builds an additional 500' of landing spur access.

* Entry into Fish Lake Run boundaries will increase the adverse effects of silt and logging debris.

Alternative IV differs from Alternative II in the following ways:

* Privides 200 MBF more volume with an economic return of $107,470.

* Commercially thins an additional 22 acres.

* Builds an additional 500' of landing spur access.

* 45% of area will have slash and debris accumulations treated by chip utilization and piling and burning.

* Recommends the development of a 128 acre Special Interest Zoological Area, instead of 150 acres.

* Visual quality values will change in harvested areas to a more vigorous and managed stand.

* The commercial thin area adjacent to the Recommended Special Interest Zoological Area may impact the heron population due to the opening up of the stand and the activity.

I have determined by this environmental analysis process that this is not a major Federal Action that will significantly affect the quality of the human environment; therefore, an Environmental Impact Statement is not needed. This determination was made considering the following factors:

1. The optimum silvicultural treatment, within the bounds of management direction, issues, and concerns will be applied to the harvest area.

2. There will be no adverse effect on threatened or endangered plants or animals.

3. The visual quality objective will be met.

4. The water and air quality of the harvest area will be maintained.

5. No additional fire/fuels will be created.

6. Recreational activities will only be slightly impacted in order to provide protective measures needed for key wildlife species.

7. There are no apparent adverse cumulative or secondary effects.

The implementation of the proposed action may take place immediately.

The decision notice is subject to administrative appeal pursuant to 36 CFR 211.18. A notice of appeal must be filed within 45 days from the date of this decision record.

GLENN HOFFMAN
DISTRICT RANGER

November 21, 1986
DATE

ENVIRONMENTAL ASSESSMENT
THIN COVE PROJECT AREA

LAKE WENATCHEE RANGER DISTRICT
WENATCHEE NATIONAL FOREST
CHELAN COUNTY

AGENCY: USDA FOREST SERVICE
WENATCHEE NATIONAL FOREST
WENATCHEE SUPERVISOR'S OFFICE
P.O. BOX 811, WENATCHEE, WA 98801

RESPONSIBLE OFFICIAL: GLENN HOFFMAN
DISTRICT RANGER
LAKE WENATCHEE RANGER DISTRICT
WENATCHEE NATIONAL FOREST

ABSTRACT:
This document identifies the management consideration and resource sensitivities related to timber harvest on the Thin Cove project area. Four alternative courses of action were developed that address the issues, concerns and opportunities identified during the scoping process. The estimated effects of implementing each alternative are discussed.

INTERDISCIPLINARY TEAM MEMBERS:

Jolene Albertson	Team Leader
Heather Murphy	Wildlife Technician
Paul Schielke	Reforestation-TSI Forester

THE THIN COVE AREA

This Environmental Assessment documents the Environmental Analysis process completed by the interdisciplinary team, hereafter called the I.D. Team.

The planning area encompasses approximately 262 acres. The area is borderd by Fish Lake, Chiwawa River Road #62, County Road #22 and Section 21.

Management direction for this area is provided from the Chelan Management Plan (1974), a copy of which is available at the Lake Wenatchee District Office. The Chelan Plan allocates this area to "the sustained production of commodities and amenities". It is defined by the following statement:

> Amenities refer to the visitor days of public enjoyment and use of National Forest lands and resources including recreation, fish and wildlife, scenery, etc. Commodities refers to the commercial products harvested from National Forest land such as timber, forage, water, and minerals.

The Chelan Plan supplements direction offered by applicable laws, executive orders, and policies.

The Wenatchee National Forest Plan is at the Draft Environmental Impact Statement stage and should be finalized some time in 1987. The preferred alternative for this area is designated as "Scenic Travel - Retention" (ST-1). The goal statement for this management designation is:

> To retain or enhance the viewing and recreation experiences along scenic travel routes.

While this direction is not formally adopted, the Ranger District Management Assistants (RDMA) and ID Team feel that it is appropriate direction, consistent with direction in the Chelan Management Plan, and is not likely to change before final approval of the Forest Plan.

I. Purpose And Need For Action.

1. Utilize wood products, through thinning, in an area that is stressed from overstocking.

2. Utilization of dead and dying material will reduce fuel loads.

3. Provide wood products as part of the regular programmed harvest of National Forest timber.

4. Manage the timber resource for sustained yield of wood products production.

5. Manage present osprey, heron, deer and fishery habitat and provide for future habitat diversification needs in project area.

The Decision To Be Made:

Is this a priority area from which to harvest part of the regular programmed harvest? If so what alternative best accomplishes the goals of the identified management areas?

The scoping process involved information and views by adjacent landowners, foresters, silviculturist, wildlife technician, landscape architect, cultural resource technician, PNW Forest Sciences Laboratory and Washington State Department of Game, (refer to appendix for wildlife and public input summaries). Using this information the I.D. Team developed the following issues, concerns, and opportunities (ICO's). (Map included showing all identifiable ICO's)

1. The Thin Cove project area holds the visual quality objective of retention. Will managing the timber resource for sustained yield of wood products meet this objective?

2. The Fish Lake Bog Proposed Research Natural Area is located adjacent to the Thin Cove project area. How will timber harvest activity impact this unique environment?

3. Continuous ladder fuels and heavy fuel loadings now exists. How will timber harvesting alleviate and not contribute to what now occurs?

4. Great Blue Heron, Fisher, American Osprey, Turkey Vulture, Barred Owl, Pileated Woodpecker and Mule Deer use the Thin Cove project area for nesting, denning, perching, and migratory habitat. How will timber harvesting impact these animals' activities in the project area?

5. New access into the project area will be needed. What type of access will be developed, and how will it tie into existing roads? What measures will be taken to prohibit public use of these new developments, in order to prevent intrusion during nesting and fawning?

6. Recreational activities take place year round within and adjacent to the Thin Cove project area. How will logging and recreation coexist or is it even feasible?

7. It has been identified from public input that the area east of Road 6401 should be considered for protection as a "Wildlife Sanctuary". Is this the best alternative for wildlife or can there be a compromise between harvesting and wildlife? If such a compromise is possible what methods of harvest are most compatible? Should a "Wildlife Sanctuary" be developed, how much area is enough to meet their needs?

II. THE AFFECTED ENVIRONMENT.

This section describes the environmental components of the project area that will be affected by the proposed alternatives.

Vegetation/Timber:

The ground vegetation is dominated by vine maple, with continuity varying as shading increases and decreases. Varying amounts of the following species occur within the project area:

Serviceberry	Lupine	Bunch Grass
Wild Rose	Heart-Leafed Arnica	Pine Grass
Oceanspray	Twinflower	Sitka Alder
Scouler Willow	Wood Anemone	Ferns
Oregon Grape	Pachistima	Wild Ginger
Trillium	Queen's Cup Beadlily	

The Thin Cove project area is composed of two age classes and has a multiple size class structure. The older age class trees (120+ years) are survivors of periodic fires that occurred prior to 1920. Evidence of the fires were found in increment corings, and fire damaged snags and trees. There are varying degrees of fire scarring in these trees. Some are severely damaged while others only had branches removed. The Douglas-fir in this age class have varying degrees of mistletoe. The Grand Fir is severely infected with Indian Paint Fungus. The Ponderosa Pine are spiked top and show evidence of unsuccessful Mountain Pine Beetle attack.

The younger age class trees (approximately 65 years), became established in the 1920's. This coincides with the settlement of the area and the control of wildfire. With the exclusion of any future stand modification in the project area, these trees persisted, resulting in an overstocked stand. The entire project area ranges from moderately stocked to overstocked with trees in various size classes. Areas exist where Laminated Root Rot infection has affected stocking levels. There is considerable mortality from inter-tree competition, insect attack, root rot and mistletoe. The stress from overstocking in the Ponderosa Pine and Lodgepole Pine has put these trees in favorable condition for Mountain Pine Beetle attack. Presently evidence of incidental beetle attack can be found.

Along the riparian/aquatic areas (ie.Fish Lake Run), the above coniferous species can be found along with Big Leaf Maple, Cottonwood and Aspen. The Fish Lake Bog Proposed Research Natural Area is located along the project area's boundary, where several unique and sensitive plant species can be found.

Wildlife:

The project area is inhabited by wildlife species listed as sensitive by the Wenatchee National Forest (WNF) and/or State of Washington Department of Game. These species are Great Blue Heron, American Osprey, Turkey Vulture, and Fisher. Additional species of concern identified for this area is the Barred Owl, Pileated Woodpecker and Mule Deer. (See wildlife summary in appendix). The project area is important to the wildlife species, as it is part of the forest that provides continuity between Fish Lake, Lake Wenatchee and the Wenatchee River.

Great Blue Heron are migratory birds and tend to inhabit the Fish Lake area during their nesting period, March 1 to September 15. Herons winter in open water areas, as nearby as Leavenworth and Lake Chelan. There are approximately 10 active nests in the Thin Cove project area. This is the only known rookery in Chelan County. During monitoring of the rookery in 1985 there had been approximately 20 active nests. Rookery location in 1986 is different than that of 1985. The reason for the move is unknown, but it is suspected the move was due to some form of harrassment. During

the nesting season, the birds are extremely sensitive to activity and are easily frightened from the nest site. The area is administratively closed during nesting season. However, evidence shows an increase in public use, via snowmobile trail and powerline right-of-way. The Fish Lake herons tend to occupy large mistletoed Douglas-fir, Grand Fir and old-growth Ponderosa Pine. They prefer to occupy trees surrounded by thick, tall vegetation and dense sapling sized conifers.

American Osprey are dependent on large trees and snags for nesting, perching and feeding. They tend to utilize snags with spike tops and trees with basket tops. They prefer Douglas-fir, Ponderosa Pine and Grand Fir in the 20 inch or larger diameter range. These snags and/or trees are above the general canopy level. The Osprey tend to occupy their nests between April 1 to August 31. There are three active nests within the Thin Cove project area. Perch trees are utilized throughout the Thin Cove area, especially along Fish Lake and Fish Lake Run.

Turkey Vultures have been sited perching at Fish Lake and Fish Lake Run. There is heavy use around the bog. It is suspected they maybe nesting nearby, however a nest has yet to be located. The needs of the Turkey Vulture are similar to that of the Osprey for perching and feeding. Nesting seasons are also similar to the Osprey.

Fisher are secondary cavity users, denning in hollow trees or in the ground. Their habitat consists of dense canopied mixed conifer/hardwood species, mature old growth and riparian areas. A possible den was located with the Thin Cove project area and posted with "Wildlife Tree" protection signs. Fisher have been known to favor small plantations for hunting and feeding, especially in areas where porcupine are present.

Barred Owls were heard and seen within the Thin Cove project area boundaries in the summer of 1986. An active search was made promptly after the sitings. No nest was found. Barred Owls require dense canopies and large mature trees for nesting. Nesting and fledgling period is from March 1 to September 1.

Pileated woodpecker sitings were noted in the area. Actual habitat use was found. They tend to inhabit mature timber stands and use the larger diameter snags.

Hiding and thermal cover used by the Mule Deer is a concern within the Thin Cove project area. The project area now offers abundant cover in part by tree boles and low limbs of advanced regeneration. The largest percentage of cover is provided by the leafed out vine maple. Migrating deer wander through year round. At the same time, use by recreationists and hunters is high. Apparently the present vegetative cover provides enough security that high use by deer is still evident. Fish Lake Run, located within the project areas boundaries, provides excellent habitat for fawning does during early April through July.

Fish Lake Run which is located within the boundaries of the Thin Cove proposal is identified as a primary riparian habitat need for all the above named species along with a variety of others mentioned in the appendix. Also the stream itself supports a small cutthroat trout population.

The west end of Fish Lake is undergoing eutrophication. This area is known as Fish Lake Bog Proposed Natural Research Area. The bog is a large floating marsh comprised of sphagnum moss, bogbean, marsh cinquefoil, sundew and bog cranberry. The bog has some plant species found on the Washington State protected sensitive species list. The south edge of the bog is adjacent to the Thin Cove proposal area boundary.

Recreation:

The Thin Cove project area and the area surrounding has considerable recreation use year round. Primary use is fishing, camping, and leisure driving during the spring, summer and fall seasons. Winter months bring in snowmobilers and ice fishermen. Much of these recreational activities are associated with the Cove Resort and Lake Wenatchee Recreation Club. The Forest Service maintains a groomed snowmobile trail located within the project area.

Visuals:

The visually sensitive areas on the Thin Cove project is the foreground along roads 6401, 62, Idlewild, and Fish Lake shoreline (Refer to ICO map for locations of these areas). The entire project area has a visual quality objective of retention. Retention meaning management activities are not visually evident. There has been minimal vegetative manipulation or management activity within the project area.

There has been the construction of a powerline right-of-way and a snowmobile trail within the project area. The powerline is screened from the foreground of the road by the forest canopy and understory brush. The snowmobile trail is visible during the winter months but only where it enters and exits the Thin Cove stand. During the spring to fall season this trail is semi-screened with low lying vegetation.

Areas adjacent to the project area have had many facets of man-caused manipulation. There have been Forest Service commercial thinnings, road construction, Fish Lake Airstrip and establishment of small plantations. The adjacent landowners have cleared small portions of land for construction sites and removed or modified the vegetation for fire safety and scenic landscaping. This leaves the project area as the only portion left unmanaged or unmanipulated.

The project area is best described as a closed canopy overstory with a thick brush understory. To maintain the area at the retention visual quality level, the objective will be to maintain the "tall dark forest" appearance.

Transportation:

There is about 1.0 mile of existing road (#6401) within the project area. Approximately 1/3 of the project area is bordered by roads. All roads are maintained for public travel. Approximately 0.5 miles of these roads are for private use.

A powerline crosses through the project area. The clearing width is about 20 feet and covered by low lying vegetation. The right-of-way access is

closed to public use except during the winter when parts are open for use by snowmobilers.

Watershed:

Fish Lake Run is a Class III stream. It is the principal drainage of this area. It originates at Fish Lake and drains into the Wenatchee River. It supports a small population of trout but supplies habitat for several animal species. There appears to be no earth movement or sedimentation due to past roadings and developments.

Soils:

Principal soil type as listed in the Wenatchee Soil Resource Inventory is #37. This soil type has a moderate to high erosion hazard, a low to moderate compaction probability, and natural stability rating of III. Drainage class is well to excessively drained. Slopes are generally less than 30 percent.

Cultural Resources:

The project area has been surveyed and a culture resource report prepared. The information in the survey is administratively confidential and on file at the District Office. There will be no impact to significant sites.

III. ALTERNATIVES CONSIDERED.

This section summarizes the management alternatives developed based on identified ICO's (See Purpose and Need Section). This resulted in the following alternatives and the development of the proposed action.

ALTERNATIVE I - DEFER ACTION

Under this alternative, treatment for the Thin Cove project area would be delayed for 50 years, at which time it would be re-evaluated. This alternative will serve as a base to compare alternative management actions with.

ALTERNATIVE II -

COMMERCIAL THINNING - 97 acres
RECOMMENDED SPECIAL INTEREST ZOOLOGICAL AREA - 150 acres
NO HARVEST BUFFER - 15 acres

COMMERCIAL THINNING-

The commercial thin harvest prescription would remove half the basal area allowing approximately 1.0 MMBF of wood products to be harvested. Primary management goals are to maintain visual quality, diversify wildlife habitat, reduce fire fuel loading, and utilization of dead and dying material.

Commercial thinning will be designed for a feller/buncher operation. Thinning will become lighter as operations move closer to Fish Lake

Bog. Winching out of cut trees may become necessary as spacing becomes tighter. It is anticipated that non-sawlog material will be sold and chipped as part of the harvest operations. Harvest operations would occur during the winter season in order to minimize the impacts of activity adjacent to the Special Interest Zoological area. There will be a need to construct 3 landing sites with 3 short landing spurs (less than 500'). Temporary spurs will be closed after harvest and planted to brush and conifers in order to screen entrances.

Slash left adjacent to roadways and private property lines will be pulled into unit, piled and burned.

Crop tree species to be left will favor Douglas-fir and Ponderosa pine. Stand will be thinned from below, removing the smaller suppressed trees. There will be clearcut openings up to 1 acre in size created in order to remove dead and dying pockets of laminated root rot infected Douglas-fir. Along foreground corridors scattered pockets of sapling-pole sized trees will be left to maintain the dark forest appearance. Designated wildlife snags will be left on an average of 2-3 snags per acre. Barred owl fledglings were seen in this area in 1986. Should a nest be found during layout phase, a 5 chain non-harrassment buffer will be maintained around nest site.

It is anticipated that 20 years after harvest this area will reach maximum culmination of the mean annual growth. It will be at this time the decision should be made to regenerate the stand with a shelterwood harvest prescription and cycling on a 170 year rotation. The extended rotation length should perpetuate the tall dark forest appearance of the area. Regeneration will be by natural seeding and planting. Competing vegetation would be controlled utilizing techniques that are consistent with visual and wildlife objectives.

RECOMMENDED SPECIAL INTEREST ZOOLOGICAL AREA -

This area would be recommended for classification as a Special Interest Zoological area. The zoological character of the area would be protected to assure that it would not be precluded from a Special Interest area allocation. Management direction would follow guidelines set up by the Draft Wenatchee National Forest Plan. It is felt that this management strategy is compatible with the Chelan Management Plan. Management of these areas are aimed at preserving the features and environment of the area to be classified. Vegetative manipulation will be allowed if the purpose or need is for the benefit of the zoological species.

NO HARVEST BUFFER -

A 2 1/2 chain No Harvest, No Entry leave strip will be maintained along the Fish Lake Bog Proposed Research Natural Area boundary (high water line) and The Cove Resort Campground/Picnic area. Commercial thinning adjacent to these areas will feather into the leave strip, thus maintaining the visual quality objective of foreground retention.

ALTERNATIVE III -

COMMERCIAL THINNING - 221 acres
SHELTERWOOD HARVEST - 26 acres
NO HARVEST BUFFER - 15 acres

COMMERCIAL THINNING -

Commercial thin volume will be increased to approximately 2.5 MMBF. The management objective for the area is to maximize timber production, utilize dead and dying material, and reduction of fire fuel loadings.

Commercial thinning would be designed similar to Alternative II. Harvest operations would not be limited to the winter season. An additional landing and landing spur will be needed. Landing spurs will be blocked at entrances and allowed to naturally seed in.

Thinning guidelines will be the same as Alternative II.

Harvesting along scenic routes will be minimal in order to maintain foreground retention and screen harvest activities within the interior.

Maximum culmination of the mean annual growth would still be reached approximately 20 years after harvest. It would be at this time that the decision should be made on whether to regenerate the stand with a clearcut or shelterwood harvest prescription. For timber production and management, this area would best be managed on an 85 year rotation. Vine maple and ceanothus would be controlled utilizing available techniques at the time.

SHELTERWOOD HARVESTING -

Approximately 0.5 MMBF of wood products would be harvested. The management objective here is to maximize timber production, lower fire fuel loading, and utilize dead and dying material and regenerate stand.

Shelterwood crop trees to be left would favor disease and defect free Douglas-fir, approximately 15-20 crop trees per acre. Crop tree diameters should average 24+ inches. The area would be regenerated through a combination of natural seeding and planting. It will be dependent upon plantation survival when the 85 year rotation management cycle would begin. Shelterwood trees should be left uncut to maintain a visually appealing buffer adjacent to private land and Fish Lake shoreline.

Harvesting will be completed by feller/buncher operation. However, areas of steep broken terrain exist where tractor with winch will be needed. Access will be shared with adjacent commercial thin units.

NO HARVEST BUFFER -

Same as Alternative II.

ALTERNATIVE IV -

COMMERCIAL THINNING - 119 acres
RECOMMENDED SPECIAL INTEREST ZOOLOGICAL AREA - 128 acres
NO HARVEST BUFFER - 15 acres

COMMERCIAL THINNING -

Same as Alternative II, except volume would be increased by 200 MBF. Primary management goals are to maintain visual quality, maximize timber production and diversify wildlife habitat. Harvesting would be restricted to winter as in Alternative II. The rotation cycle would be decreased in half, 85 years. An extra landing and spur would be necessitated in order to harvest the additional 22 acres.

RECOMMENDED SPECIAL INTEREST AREA -

Same as Alternative II except area will be decreased by 22 acres.

NO HARVEST BUFFER -

Same as Alternative II.

IV. ENVIRONMENTAL CONSEQUENCES -

This section describes the effects of implementing each alternative in terms of the ICO's identified in the Purpose and Need section. Maps of each alternative are located in the Alternatives section. The economic analysis and input values are located in the Appendix.

ALTERNATIVE I - DEFER ACTION

The present plant ecosystem will continue. Mature timber loss of wood fiber will accelerate due to decay and mortality. Low vigor immature Lodgepole pine and Ponderosa pine would provide ideal conditions for mountain pine beetle infestation. Beetle populations could build up to epidemic levels and cause substantial mortality affecting even healthy trees. Laminated root rot would continue to spread in the Douglas-fir causing severe loss in all size classes. Timber growth in the remainder of the species would be lost due to competition for space.

The vine maple would persist and respond, as tree mortality made light available. Natural vegetative development would not be in place due to the exclusion of fire and the continual increase in vine maple growth.

-WILDLIFE-

Wildlife species dependent upon large dead and dying trees would benefit. Trees would continue to fade out as the years passed on creating an abundance of nesting, denning, roosting, and perching habitat. Screening and cover provided by sapling/pole sized trees would diminish as root rot, overtopping and beetles increased. The accumulation of immature timber mortality on the ground may create some impedence to deer movement, but its benefits as denning and hiding cover could be great for the small

mammal species and grouse. The increase presence of bark beetles would provide an excellant food source for several bird species. The heavy debris loadings and vine maple stimulation would create a good barrier between the Herons and human intruders.

-RECREATION-

Recreation use and values should remain the same.

-VISUAL QUALITY-

The visual character of the "tall dark forest" appearance would be maintained for many years. However, as mortality increases in the mature overstory and the suppressed understory, the appearance of the area will change to that of a low vigor forest. Along with this, the increase in fuel loadings over the next 50 years would add to the existing fuel loads. This would increase the risk of wildfire by increasing the intensity, severity and resistance to control.

The uncertainty of the area's vegetative and fire/fuel development could have a drastic impact on the visual quality of this area.

-TRANSPORTATION-

There will be no new access into the project area.

-WATER QUALITY-

There should be no change.

-SOIL MOVEMENT-

There is no evidence of past or future soil movement.

-CULTURAL RESOURCES-

There will be no change, everything will be left as is.

-AIR QUALITY-

There will be no change to air quality.

-SENSITIVE, THREATENED AND ENDANGERED SPECIES-

There will be no change or impacts in the short term aspect. However, over the longterm fire could have a devastating impact.

-ECONOMICS-

In short term, there will be no economic contribution. Over time, wood fiber would be lost through mortality and growth loss, which constitutes an irretrievable loss of resource. See economic analysis in appendix.

ALTERNATIVE II -

This alternative would best meet the needs of the wildlife and visual quality objectives of the area.

-Vegetation/Timber-

Impacts should be the same in the proposed Special Interest area as they are for the defer action alternative. The present plant ecosystem would continue. Growth and wood fiber would be lost due to overstocking in the immature understory. The mature old growth overstory would continue to fade out as years passed on and a continual source of snag trees would be made available. The lack of growth stimulation from release thinning may decrease the potential for future replacement old growth trees. Areas of Laminated Root Rot would be opened up to vine maple encroachment decreasing the possibility of new vegetation establishment. The riparian ecosystem of the Fish Lake Run would retain its unique vegetative qualities, since there will be no activity on either side of this area.

Commercial thinning in this area adjacent to the Special Interest area will increase the vigor of the immature understory. The vigorous crop trees left should develop into good shelterwood leave trees for future regeneration harvest. This particular area has the heaviest stocking levels of immature trees, through thinning much of the potential dead and dying could be utilized now. Through utilization it will be possible to lower fuel loadings greatly. The two storied canopy left after harvest should keep the vine maple in check and even allow for some natural regeneration.

The 2 1/2 chain "no harvest" strip will provide a protective screening for the sensitive Fish Lake Bog environment. There will be no change except along the edge adjacent to the harvesting where there will be some vegetative response.

-WILDLIFE-

The mammal and avian wildlife should benefit most from this alternative. Designation of 150 acres of the recommended Special Interest Zoological area would retain the majority of the existing habitat. Justification for manipulation in this area would solely be to benefit the zoological species. Mature old growth trees would be maintained for several years. However lack of growth stimulation in the immature trees will lower chances for furthur development of large mature replacement trees. The expected increase in insects will benefit several bird species. The safety zone of the riparian areas will continue to provide excellent fawning sites for the deer. Some ground impedence from jack-strawed pole size timber mortality could hamper deer migration, yet it would also supply more habitat for smaller mammals. The extra added attention created by the Special Interest area designation may have an adverse effect on the nesting and denning due to human curiosity.

The 2 1/2 chain wide, 15 acre No Harvest strip will provide extra protection from the impacts of logging. This area will continue to provide the same habitat. Feathering of the adjacent thinning unit into this buffer will also reduce impacts from abrupt stand changes.

Commercial thinning in adjacent 97 acres will create stand openings approximately 1 acre in size. These openings should provide new vegetation establishment and stimulate vine maple growth. The new sprouting will provide added diversity to already avialable food supply. The increased growth response in the vine maple will continue to provide hiding cover for the deer. Thinning from below will leave several of the more vigorous mature old growth trees remaining as alternate habitat trees. Designated wildlife snags will continue to provide habitat for the Osprey, Turkey Vulture, Barred Owl, Pileated Woodpecker and Heron. Slash pockets left untreated would provide added habitat for the small mammal species. Stimulation of growth in the immature trees should ensure future trees of large diameters and tall tree heights. The 170 year rotation cycle should continue to provide a multistoried stand essential as thermal and hiding cover for the majority of the mammal species.

-RECREATION-

Spring, summer and fall use will remain the same. Access into the Special Interest areas will be closed to the public in order to provide the non-harrassment environment needed during nesting. Fishing, camping, picnicking and leisure driving should continue on as in previous years.

Winter recreation involves two primary activities, ice fishing and snowmobiling. Ice fishing road access will be impacted by log truck traffic, only during the short periods of harvest operations. Snowmobiling will be closed for the duration of the sale and may also be hampered by designation of the recommended Special Interest area. No alternate snow trail routes are planned, logging is expected to require only one season.

-VISUAL-

Visual quality should remain the same for several years within the Special Interest area and No Harvest strip. As years progressed, the stands will become more decadent and less vigorous, yet the dark closed canopy appeal will remain the same. It is expected that the same impacts described under the defer action alternative will apply here.

Modifications would occur in the harvested areas, but it should be minimal due to the retention of mature large trees and small tree clumpings through harvestings. The alleviation of overstocking would create a vigorous understory allowing for healthy appearing trees. The increased sprouting of the vine maple will intensify the color contrast in the fall. The natural seeding in will help add to the maintenance of a multistoried stand. The dense forest scenario should continue under this alternative.

Regeneration of the stand through shelterwood harvesting would still enable the visual quality objective of retention to be met. This should be possible by retaining trees from each size class at time of harvest. Vine maple will be controlled through plantation establishment but other vegetative growth will continue. The extended rotation cycle (170 years) would allow the trees to maintain the "tall, dark forest" effect.

Landing access will be screened at entrances by natural seeding and vegetative planting alleviating any eye sores.

-TRANSPORTATION-

Access will be by short landing spurs, less than 500 feet in length. Spurs will be held to the minimum needed to correctly harvest the area.

-WATER QUALITY-

Would remain the same, there is no harvesting or entry in or adjacent to riparian areas and Fish Lake.

-SOIL MOVEMENT-

No significant impacts, harvesting to occur in winter months. Soil disturbance should be minimal due to snow pack and frozen ground.

-CULTURAL RESOURCES-

There would be no change.

-AIR QUALITY-

Air quality would be affected for short periods from smoke during slash disposal treatment operations. Slash pile burning will be restricted to periods of time when weather conditions permit adequate smoke dispersal.

-SENSITIVE, THREATENED OR ENDANGERED PLANTS AND/OR ANIMALS-

All sensitive or threatened plants have been identified as existing within the Fish Lake Bog Proposed RNA. This area will not be affected by this proposal.

All threatened and/or sensitive animal species are listed in the appendix section.

-ECONOMICS-

This alternative will contribute an estimated 1.0 MMBF toward the economic base of the community. See appendix for present net worth value.

ALTERNATIVE III -

This alternative will maximize timber production and utilization.

-Vegetation/Timber-

Commercial thin harvest area will double in size. Overstory canopy will change to a more evenly spaced, multistoried, vigorous Douglas-fir and Ponderosa Pine stand. With harvesting occurring during the growing season and without the protective snow layer, mass vegetation will be ripped out and torn up. Vegetative recovery will take longer. The riparian vegetation of Fish Lake Run will not be affected during the thinning operations, since the thinnable stand does not enter into this area. However, upon the re-entry with the regeneration prescription, the

sensitive, marshy area of the Run will probably be disturbed by the logging machinery.

Shelterwood harvesting of 26 acres will convert this stand to an even-aged, overstory of mature Douglas-fir and Ponderosa Pine. The understory will be planted to 2-0 Douglas-fir and Ponderosa Pine. The controlling of the competing vegetation will maintain a low density brush cover composed of small shrubs and forbs.

Upon the approach of the maximum culmination of mean annual growth, the entire thin cove area will be converted to having the same stand characteristics as the shelterwood area will have.

No harvest strip is the same as Alternative II.

-Wildlife-

Through this alternative great changes will be made in wildlife habitat. Loss of multistoried tree stand due to even age management. Lack of replacement habitat trees due to rotation cycle not allowing enough time for mature tree development. Protective screening and thermal cover lost due to vegetative control for regeneration establishment. However, with each rotation new sprouting and vegetative diversity is ensured creating a continual food source.

Impacts from logging would disturb the fragile environment of the Heron. These activities especially during nesting would cause the heron colony to relocate maybe even leave the Fish Lake area since much of the adjacent areas are already developed for recreation or private use.

Barred Owl, Osprey and Turkey Vulture would move on in future years for lack of perch, nesting and roosting snags. The opening of the stand would however increase the small mammal population making for better rapture hunting. There would be better visiability into these hunting areas.

Pileated woodpecker habitat would suffer due to the removal of all salvageable material with each commercial thin or regeneration harvest entry.

Deer would be impacted by the lack of hiding cover making them more vulnerable to hunters and predators. Migratory travel routes would be clear of woody debris. New sprouting and plant diversity would be favorable for foraging.

The environment of the Fish Lake Bog Research Natural Area would not be impacted by this alternative.

-Recreation-

No impacts will be made to winter recreation. Summer recreationists will have to deal with log traffic on a road that in the past was never congested, however this will only occur for one season. Fishermen and campers of the Cove Resort will be impacted by the noise of the logging activities, thus ruining their peaceful mountain experience.

-Visual-

Foreground retention will be met along public roads and Fish Lake shoreline. Appearance in the remainder of the stand will eventually change from a dark decadent forest to a healthy vigorous stand of even-aged Douglas-fir and Ponderosa Pine. With the opening up of the stand, vine maple would be released and the fall color contrast would improve the appeal of this area.

-Transportation-

Similar to Alternative II, except that an additional landing and spur would be developed.

-Water Quality-

No impacts during thinning operations. Regeneration harvests would create more debris in stream. Water temperature could change due to a loss in vegetative cover from harvest operations. Minor soil sedimentation may occur from activities adjacent to stream course.

-Soil Movement-

There should be no impacts. Slopes are moderate and erosion potential is nil.

-Cultural Resources-

Same as Alternative II.

-Air Quality-

Will be affected for short periods during the fall burning season.

-Sensitive, Threatened or Endangered Plants and/or Animals-

No plant species in the above catagories will be affected.

Threatened and/or sensitive animal species affected were discussed under wildlife, refer back for detatils.

-Economics-

This alternative will contribute an estimated 3.0 MMBF toward the economic base of the community. See appendix for Present Net Worth value.

ALTERNATIVE IV -

This alternative was developed as a compromise between timber management and wildlife/visual retention.

-Vegetation/Timber-

Timber and vegetation will be very similar to that in alternative II - commercial thinning. There will be an additional 22 acres of

vegetative/timber manipulation. The stand should remain a multistoried canopy and vegetation will continue to grow, however with the shorter rotation cycle the stand should remain vigorous. With each management application the timber stand should be growth stimulated. Vegetation will be controlled during the first five years of plantation establishment but small shrubs and forbs will be present as ground cover.

The Recommended Special Interest area will be decreased 22 acres from Alternative II. The Fish Lake Proposed RNA No Harvest buffer will remain the same.

-Wildlife-

Similar to Alternative II, except in the following. Twenty-two acres of Recommended Special Interest area will be lost to commercial thinning. Thinning in these 22 acres could cause great impacts to the Heron colony. The close proximity of the harvest activities, even during the non-nesting season, could be enough to cause the Heron to move completely out of the area. There is also great potential for the colony to relocate the rookery within the boundaries of the 22 acre unit prior to harvesting. The area will remain fairly open making for better rapture hunting and deer migration. With each entry for planting, thinning and harvesting the cover will be augmented, creating new vegetative development. Depending upon the disturbance level of each entry, there could be a significant affect on wildlife useage.

-Recreation-

Same as Alternative II.

-Visual-

The shorter harvest rotation cycle would still maintain a multistoried, multiaged stand in the commercial thin areas, but the dark closed in look will be converted to vigorous and healthy. The other two management areas will remain the same.

-Transportation-

Same as Alternative II except an addional landing and spur road would be needed to access the 22 acre parcel.

-Soil Movement-

Same as Alternative II.

-Cultural Resources-

Same as Alternative II.

-Air Quality-

Same as Alterative II.

-Sensitive, Threatened or Endangered Plants and/or Animals-

Same as Alternative II.

-Economics-

Timber volume contributed would be increased by 0.2 MMBF over that of Alternative II, in the first entry. The reduced rotation cycle will double the woods product output in the long run. Refer to Present Net Worth value in appendix.

COMPARISON OF ALTERNATIVES

Comparison Factors	I Defer Action	II Wildlife/Vis	III Timber	IV Tim/Wild/Vis
Timber Volume Produced	0 MMBF	1.0 MMBF	3.0 MMBF	1.2 MMBF
Harvest Acres	0	97	247	119
Economic Return				
Present Net Value	$0	+$ 89,652	+$ 267,012	+$ 107,470
Soil Expection Value	$0	+$ 116,947	+$ 307,227	+$ 151,838
Vegetation	No Change	Small openings created will allow for new veg. development.	Competing veg. will be controlled. Small openings would allow for new veg. development.	Same as Alt.III
Timber	Decay & Mortality would accelerate. Beetle population could become epidemic.	97 Ac Thin. 165 Ac No cut. 170 Yr. rotation cycle.	221 Ac Thin. 26 Ac SW 15 Ac No cut 85 Yr Rotatation cycle.	119 Ac Thin 143 Ac No cut. 85 Yr rotation cycle.
Fire/Fuels	Natural fuel loadings will continue to accumulate.	On 37% of area utilization of chippable material will remove much of the natural accumulations and logging slash. Small hand piles will be stacked & burned away from roads & private property. Remaining 63% same as alternative I.	94% of area same as II. Remaining area same as alternative I	45% of area same as II. Remaining area same as alternative I
Wildlife:				
Habitat	No Change	97 ac of veg. manipulation & stimulation. Remaining area same as I	247 ac same as II. Remaining area same as I.	119 ac same as II. Remaining area same as I.
Heron	No Change	150 ac Special Interest Area for wildlife protection &	Logging during nesting period and change of habitat, could	128 ac Special Interest Area 22 acres of thinning lo-

		enhancement. Maintenance of alternate nest trees. Logging only during none nesting times.	cause colony to relocate. Upon each harvest entry is the opportunity to disrupt the colony & move from the Fish Lake area.	cated directly adjacent to S.I. could cause Herons to move.
Heron (Continued)				
Osprey & Turkey Vulture	No Change	Same as Heron plus snags to be left in harvest areas.	Same as Heron. More snag habitat lose due to less protective measures.	Same as II.
Fisher	No Change	Old growth denning habitat protected by S.I. area.	Old growth denning habi- converted to even-aged, vigorous stand	Same as II.
Fish Lake Run Riparian Area	No Change	No Change	No protective measures identified, for present & future entries.	No Change
Fish Lake Bog RNA	No Change	No Change	No Change	No Change
		15 acre protective buffer strip between Bog and timber harvest activities.		
Recreation	No Change	All access into S.I. will be closed. Access to Fish Lake will be used by log trucks. Snow mobile trails closed during logging.	Noise pollution from logging activities. Truck traffic on the Cove road. 1.7% of the time.	Similar to III.
Visual Quality	Stand would appear more decadent with time, retenmay not be met in long term.	Retention met. 170 yr. rotation will perpetuate tall dark forest appearance. Retention may not be met in longterm in no entry area.	Retention met along Fish Lake shoreline. Stands will be converted to even-aged, two storied, and vigorous trees. Retention in no entry area same as II.	Similar to II, except more area will be harvested & rotation cycle shortend.

Transportation	No Change	Approx. 1500 feet of landing spur access.	Approx. 2000 feet of landing spur access.	Same as III.
Logging Systems	None	Feller/ Buncher	Feller/ Buncher & Tractor/w Winch	Same as II.
Water Quality & Soil Movement	No Change	No Impacts	Disturbance to Fish Lake Run Riparian Areas.	No Impacts
Air Quality	No Change	Short periods of smoke for one season.	Same as II.	Same as II.

Consultation With Others

1. Washington State Department of Game:
   John Musser of the game department made several field visits to provide input on Heron use and habitat needs.

2. Washington State Department of Natural Resources:
   Information on sensitive, threatened or endangered plant species that are found in the Fish Lake area.

3. Henry Maekawa - Forest Landscape Architect:
   Provided input on minimizing impacts to the foreground corridors along Cove Resort road and Fish Lake.

4. Written solicitation for input from adjacent landowners generated many letters of concern and approval. Majority of input concerned the Great Blue Heron, Osprey, and the Fish Lake Run environment. Much of the public favored the development of a wildlife sanctuary in the area between Fish Lake Run and Idlewylde road.

5. Merle Wishnofske - Leavenworth Ranger District Wildlife Biologist:
   Input was given on protection of the Fish Lake Run riparian area and on location of Fisher den.

6. Sarah Green - Ecologist: Pacific Northwest Research Center, Corvalis, OR
   A brief letter was recieved pertaining to the development and management direction for the proposed Fish Lake Bog Research Natural Area.

7. Paul Edgerton - Ecologist: Pacific Northwest Forest Sciences Laboratory:
   Gave input on several areas of concern. Identified the need to develop the Special Interest Area at this time of the Forest Planning process. Suggested creating more plant diversity within the harvest area by creating up to 1 acre size openings. Proposed mitigative measures to protect the Fish Lake Bog RNA environment.

SCOPING SUMMARY FOR THIN COVE PREFERRED ALTERNATIVE

The following is a summary of the ICO's and thier mitigating measures to accomplish the Thin Cove preferred Timber Sale alternative.

1. The Thin Cove project area holds the visual quality objective of Retention. Will managing the timber resource for sustained yield of wood products meet retention?

   Action: The extended rotation cycle (170 years), along with the leaving of mature overstory trees should maintain the multistoried, tall, dark forest appearance. Foreground corridors will be rehabilitated through vegtative plantings should incidental openings be created through harvestings.

2. The Proposed Fish Lake Bog Research Natural Area is located adjacent to the Thin Cove project area. How will timber harvest activity impact this unique environment?

   Action: There should be no impacts from this proposal. A 2 1/2 chain buffer in which no cutting will be done, will be maintained between the cutting area boundary and the Bog boundary. In addition harvesting will be feathered out from the buffer with cutting being lightest adjacent to the buffer.

3. Continuous ladder fuels and heavy fuel loadings now exists. How will timber harvesting alleviate and not contribute to what now occurs?

   Action: Through the use of a feller/buncher and incorporating an on site chipper, the non-sawlog material will be utilized for chip material. Past use of this machinery has shown a clean end product. Any heavy concentrations that may occur next to roads or private land will be pulled back, piled and burned. Landing slash will be scattered.

4. Great Blue Heron, Fisher, American Osprey, Turkey Vulture and Mule Deer use the Thin Cove project area for nesting, denning, perching, fawning, and migratory habitat. How will timber harvesting impact these animals activities?

   Action: The major high use areas will be protected by the recommended Special Interest area and the Fish Lake Bog RNA. Within the harvest area alternate habitat trees and snags will be maintained. New vegetative development will occur in openings and old vegetation should respond to increased sunlight, which should benefit as increased cover and food diversity.

5. New access into the project area will be needed. What type of access will be developed, and how will it tie into existing roads? What measures will be taken to prohibit public use of these new developments, in order to prevent intrusion during nesting and fawning?

   Action: Access will be kept to the minimum needed to access the landings. Short spurs less than 500 feet will be developed. At end of harvest, spurs will be blocked by earthen barriers and entrances planted with conifers and fast growing vegetative species. Spurs will be allowed to naturally seed in.

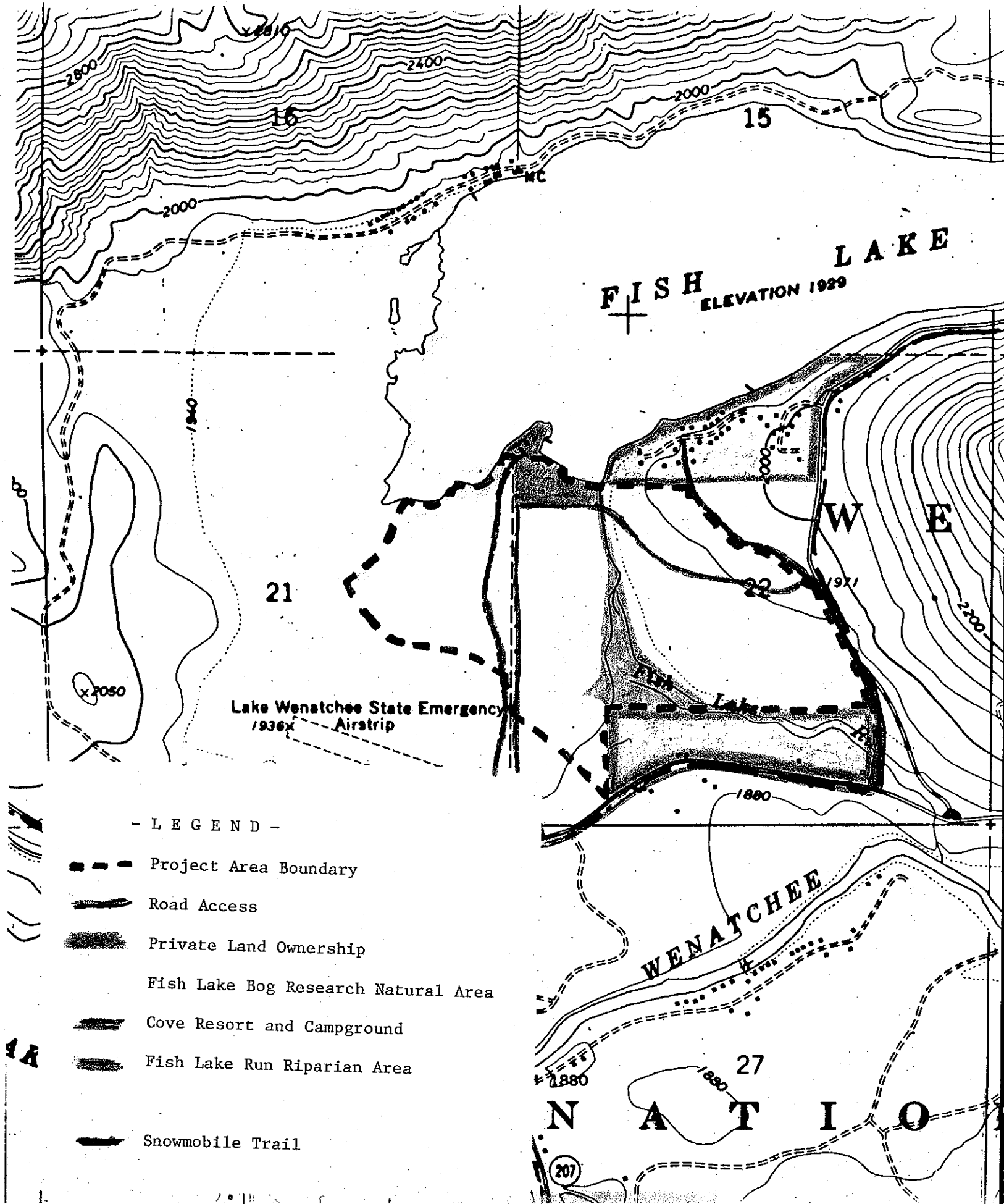
6. Recreational activities take place year round within and adjacent to the Thin Cove project area. How will logging and recreation coexist?

   Action: Only winter recreational activities will be hampered. Logging traffic will be present on the Cove Resort road, signs will be posted and roads will be kept clear of obstructions. Logging noise will impact the tranquillity experianced by the lake fishermen. Snowmobiling within the harvest area will be closed for a season.

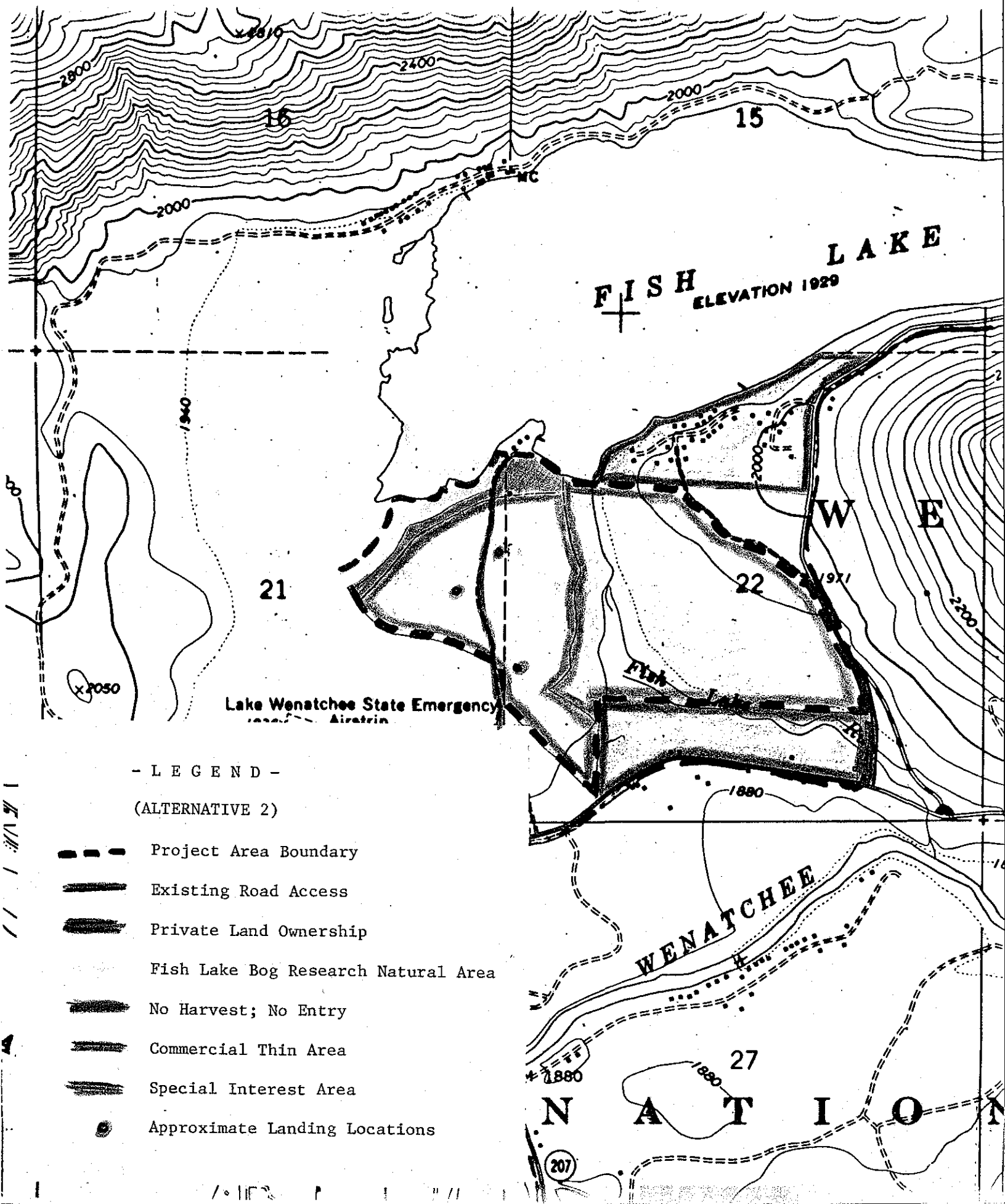
7. It has been identified from public input that the area east of Road 6401 should be considered for protection as a "Wildlife Sanctuary". Is this the best alternative for wildlife or can a compromise between timber and wildlife be made? If such a compromise is possible what methods of harvest are most compatiable? Should a "Wildlife Sanctuary" be developed how much area is enough to meet their needs?

   Action: This alternative sets aside 150 acres for a recommended Zoological Special Interest area. The boundaries were developed through guidelines set by the Wenatchee National Forest and the Washington State Game Department, for management of Heron, Fisher, Osprey, Vulture and deer habitat. The 97 acres of commercial thinning was developed after the Special Interest area boundaries were identified. The harvestable area also incorporates mitigative measures to perpetuate use in this area.

THIN COVE PROJECT AREA



THIN COVE PROJECT AREA

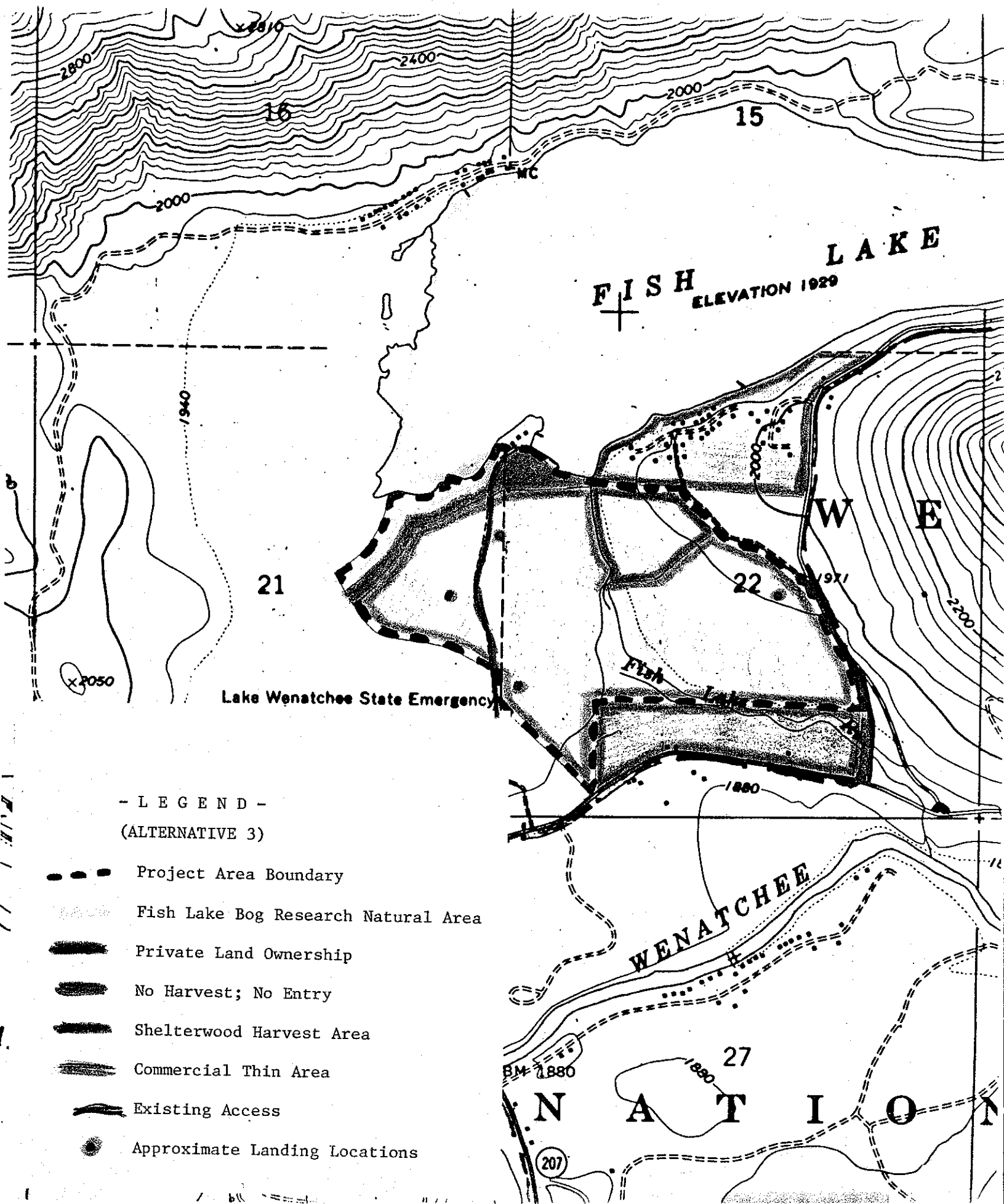


- L E G E N D -

(ALTERNATIVE 2)

- Project Area Boundary
- Existing Road Access
- Private Land Ownership
- Fish Lake Bog Research Natural Area
- No Harvest; No Entry
- Commercial Thin Area
- Special Interest Area
- Approximate Landing Locations

THIN 2OVE PROJECT AREA

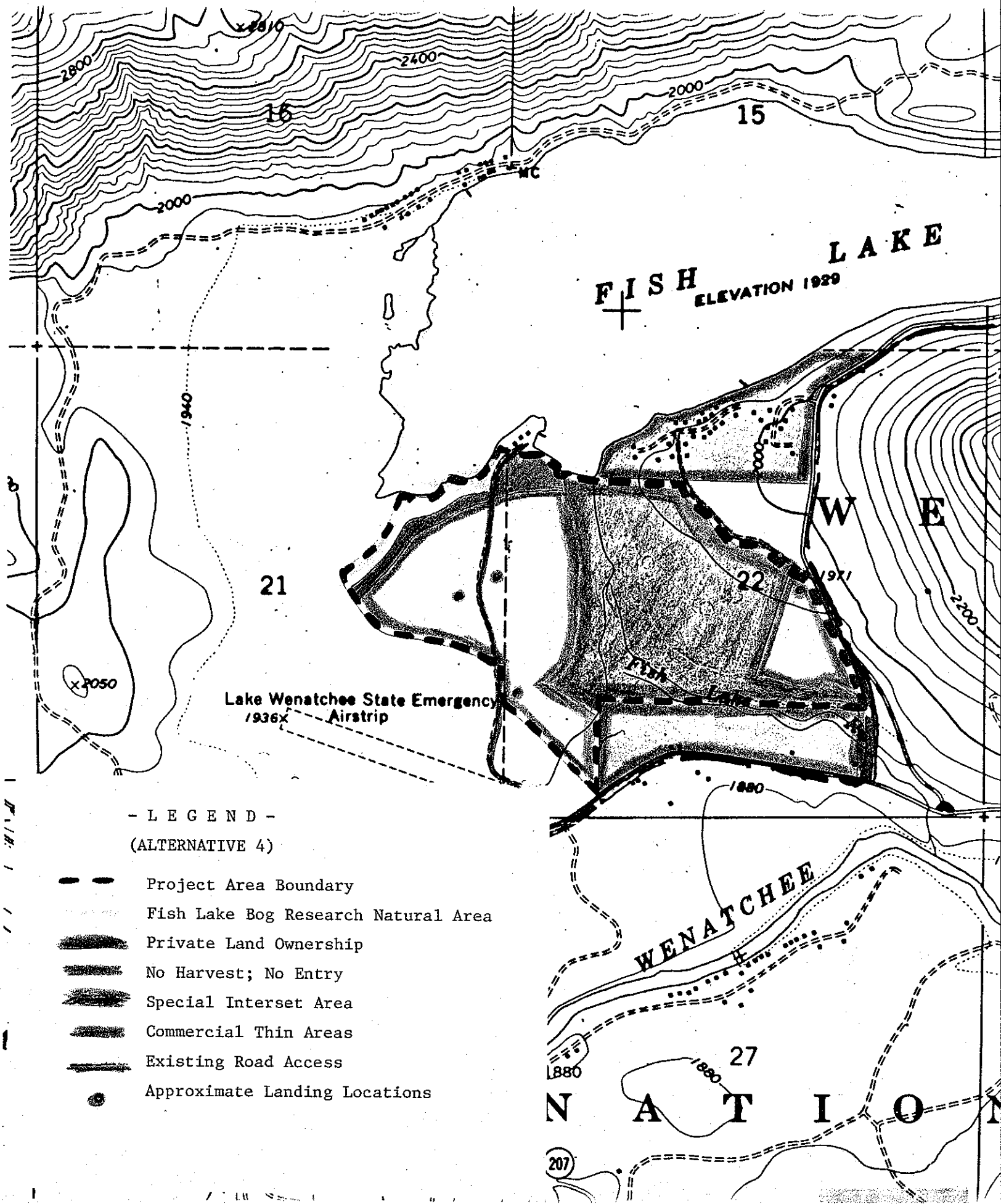


- L E G E N D -

(ALTERNATIVE 3)

- Project Area Boundary
- Fish Lake Bog Research Natural Area
- Private Land Ownership
- No Harvest; No Entry
- Shelterwood Harvest Area
- Commercial Thin Area
- Existing Access
- Approximate Landing Locations

THIN COVE PROJECT AREA



- L E G E N D -

(ALTERNATIVE 4)

- Project Area Boundary
- Fish Lake Bog Research Natural Area
- Private Land Ownership
- No Harvest; No Entry
- Special Interset Area
- Commercial Thin Areas
- Existing Road Access
- Approximate Landing Locations

PRELIMINARY ECONOMIC ANALYSIS

All values derived from present cost guides and district averages.

Activity	Unit of Measure	Cost Per Unit
EA - Layout - Eng.	MBF	10.00
Temp. Road Const.	Mi.	1500.00
Temp. Road Reconst.	Mi.	1000.00
Log Cost (Stump-Truck)	MBF	33.00
Haul & Maintenance	MBF	21.00
Manufacturing	MBF	207.00
Timber (Ave. for all species)	MBF	370.00
Slash/Brush Disposal	MBF	4.00 1/
Planting/Rehabilatation	MBF	220.00 2/
Precommercial Thinning	MBF	120.00 3/

1/ Chipper logging will reduce large amounts of slash, however extra hand work will be needed along property lines and roadways.

2/ Includes cost of planting and purchasing seedlings.

3/ Includes cost of layout.

THIN COVE PRESENT NET WORTH ANALYSIS

ALTERNATIVE 1		ALTERNATIVE 2		ALTERNATIVE 3		ALTERNATIVE 4	
NO ACTION		COMM. THIN 97 AC		SHELTERWOOD 26 AC COMM. THIN 221 AC		COMM. THIN 119 AC	
YR	ACTIVITY	B(+)	C(-)	B(+)	C(-)	B(+)	C(-)
0	LAYOUT		10,000		30,000		12,000
1	ROADS		289		722		722
1	STUMP-TRUCK-MILL		51,948		155,844		62,338
1	MFG		199,134		597,402		238,961
1	TIMBER	355,940		1,067,820		427,128	
1	SP - BD		3,898		11,544		4,618
2	PLANT/REHAB.		1,019		5,296		1,019
PRESENT BENEFIT VALUE		355,940		1,067,820		427,128	
PRESENT COST VALUE			266,288		800,808		319,658
PRESENT B/C RATIO VALUE		1.34		1.33		1.34	
PRESENT NET VALUE		89,652		267,012		107,470	
DISCOUNT RATE		4%		4%		4%	

ALL VALUES DERIVED FROM INCLUDED ECONOMIC ANALYSIS WORKSHEETS.

One of the concerns identified during the scoping process was if the project area would be manageable for sustained yield of timber, after all management constraints were met. The following adjustments to the Present Net Worth were made using Soil Expectation Value (SEV). SEV measures the financial Present Net Worth (PNW) of a timber stand over a infinite series of rotations, beginning with bare ground. This provides a measure of the inherent economic suitability of the land for timber production. It disregards the value of timber currently growing on the site. Once computed the values are compounded over the length of rotation and are applied to the PNW. For indepth value computation refer to Economic Analysis Worksheets included.

After SEV application to PNW the results are as follows:

Activity	ALTERNATIVE 1 No Action	ALTERNATIVE 2 COMM. THIN 97 AC	ALTERNATIVE 3 COMM. THIN 221 AC SHELTERWOOD 26 AC	ALTERNATIVE 4 COMM. THIN 119 AC
Rotation Length		170 yrs.	85 yrs.	85 yrs.
Discount Rate		4%	4%	4%
Present Net Worth*		$ 131,149	$ 334,390	$ 157,090
SEV Benefits		+ 2,135	+ 21,571	+ 18,080
SEV Costs		- 16,337	- 48,734	- 23,332
PRESENT NET WORTH ADJUSTED BY SEV		**+ 116,947**	**+ 307,227**	**+ 151,838**

* Present Net Worth includes the one time Cost/Benefits for shelterwood regeneration harvest in Alternatives 2 & 4.

WILDLIFE INPUT SUMMARY

During the Thin Cove scoping process several pages of wildlife information was gathered pertaining to the proposed project area. Information came from the Washington State Department of Game, local property owners, and district wildlife technician. (All information generated by this proposal can be found in the Lake Wenatchee District files.)

The following analysis summarizes the information received.

A. Animals within the Thin Cove project area found on the Washington State Special Animal Species List:

Animal Species	Status
Great Blue Heron	Proposed Monitor
American Osprey	Proposed Monitor
Fisher	Proposed Sensitive
Turkey Vulture	Proposed Monitor
Barred Owl	
Pileated Woodpecker	

B. Animal species of concern found within the project area:

Mule Deer - fawning and hiding cover.

C. Discription of habitat needs and use in the project area.

Great Blue Heron - Approximately 20 active nests were located in 1985. nest trees used are primarily old growth, mistletoe infected Douglas-fir, Grand Fir, and the occassional Ponderosa Pine. Thick understory vegetation is needed for ground screening of nest trees. Heaviest use in the project area tends to occur from March 1 to September 15. In the spring of 1986 the birds relocated and the number of nests diminished by approximately 50%. They moved further into the Thin Cove project area. It is suspected that the move may have occured due to nest harrasement. Heron carcasses were found near old nest trees.

American Osprey - They need large trees and snags for nesting, perching and feeding. They tend to utilize snags with spike tops and trees with basket tops. Acceptable species include Douglas-fir, Ponderosa Pine and Grand Fir greater than 20 inches diameter and above the general canopy level. Three active nests were found adjacent to Fish Lake Run.

Fisher - One Fisher den found adjacent to Heron nesting area. They are secondary cavity nesters, denning in hollow trees or in the ground.

Their habitat needs include dense canopied mixed conifer/hardwood species, mature old growth, and riparian areas.

Turkey Vulture - Presently use the project area for feeding and perching. The same habitat needs identified for the Osprey also applies for this raptor. It is suspected that nesting is occuring near the project area, but has yet to be located.

Mule Deer - They are using the project area for fawning in the spring and migratory hiding cover spring through fall. Thick understory vegetation needed for screening from roads and trails. Dense overstory canopy provides thermal cover during the hotter months. Fawning tends to occur adjacent to riparian areas.

Barred Owl - In the summer of 1986, the owls were called and they responded. Later that evening calls were followed and 3 fledglings were found. Barred owls tend to occupy mature old growth trees but nests have also been spotted in smaller pole sized trees. An active search was made several days later, but no nest was found. Feathers and scat were discovered in the area proposed for commercial thinning.

Pileated Woodpecker - Tend to occupy areas that contain a multi-layered canopy and trees of several age classes. Mature trees in overstory are well into the mature growth stage. Species of trees used in the project area are live cedar and douglas-fir.

Fish Lake Run - This streamcourse is found within the project area and has been identified as a primary use riparian area for the above species plus beaver, pileated woodpecker, raccoon, bear, and river otter.

Fish Lake Bog Research Natural Area - This is a large marsh/floating bog adjacent to the Thin Cove proposed project area. The bog is a highly used forage area for the Osprey, Great Blue Heron, Turkey Vulture, and Beaver. The Forest Service maintains Wood Duck nest boxes and Canadian Geese platforms within the bog. The bog itself is comprised of many sensetive plant species.

D. Protection and/or enhancement needs identified from the scoping process:

Great Blue Heron -

* No new access within 1/4 mile of nesting areas.
* Harvest activity within 1/4 mile of nesting areas should be prohibited during the nesting period, March 1 to September 15.
* Alternative nest sites should be developed and protected from harvest.
* All new access should be closed at the completion of harvest.
* A 5 chain no entry should be maintained around nesting areas and proposed alternative nest areas.
* Plant Rosa Spp. along existing recreation trails to reduce summer use.

American Osprey -

* All protection and/or enhancement needs identified for the Heron also apply to the Osprey.
* Provide perch and feeding snags throughout project area, especially along Fish Lake, Fish Lake Bog and Fish Lake Run.

Turkey Vulture -
* Same as Osprey.

Fisher -
* Protect den from any activity.
* Maintain riparian habitat for feeding needs.

Mule Deer -
* Maintain riparian area for fawning needs.
* Provide sufficient thermal cover.
* Provide sufficient hiding cover with vegetative screening. Hiding cover is defined as 90% of the deer being hidden from human view at 200 feet or less (100 feet during fawning), specifically along roadways.

Barred Owl -
* If nest is found, a 5 chain radius no entry boundary should be maintained around the nest site,
* Harvest activity should be restricted within a 300 acre habitat area during nesting and fledgling period, March 1 to September 1.
* Maintain a close canopy within 300 acres of habitat.

Pileated Woodpecker -
* Protect all use trees.

Fish Lake Run -
* Retain cover within 600 feet for fawning.
* No activity within 2 chains of Run, and 5 chains of Run when nest sites are found.
* Alternate wildlife snags and trees should be protected within the Run for future needs.
* No increase of public access. Plant Rosa Spp. to reduce spring/summer access on skid trails and snowmobile trails.
* Existing access should be closed during nesting period.

Fish Lake Bog Research Natural Area -
* No Timber Practices allowed within the bog boundaries.
* 2 1/2 chain No Harvest boundary will be maintained from the edge of the proposd RNA.
* 2 chains of light cutting (10 x 10 spacing) adjacent to No Harvest area boundary.

Additional Protections and/or Enhancements -
* Skid trails and roads leading into nesting areas, Fish Lake Bog and Fish Lake Run should be barricaded and rehabilitated.
* Any areas of riparian vegetation should not be entered if necessary they should be entered lightly following Fish Lake Run protection needs.
* Two perch trees per acre should be maintained within harvestable areas, as well aas a variety of hard and soft defective dead or live trees.
* A minimum of two slash piles per acre should be left unburned for wildlife species dependent on woody debris.
* Opening of up to 1 acre in size should be created for forage diversity. Natural openings will occur as root rot is cut out.
* When possible leave large downed material for small mammal species.

WILDLIFE SPECIES LIST

The following mammals and birds hvae been found to use the Thin Cove Project Area.

MAMMALS

Mule Deer	Northern Flying Squirrel	Vagrant Shrew
Elk	Douglas Tree Squirrel	Masked Shrew
Black Bear	Golden Mantle Ground Squirrel	Little Brown Bat
Cougar	Yellow Pine Chipmunk	California Bat
Coyote	Townsends Chipmunk	Hairey Winged Bat
Beaver	Northern Pocket Gopher	Yuma Bat
River Otter	Red Backed Vole	Silvery Haired Bat
Striped Skunk	Meadow Vole	Pacfic Shrew
Porcupine	Deer Mice	Dusky Shrew
Raccoon	Pacfic Jumping Mice	Trowbridge Shrew
Fisher	Broad Hand Mole	Snow Shoe Hare
Pine Marten	Short Tailed Weasel	Long Tailed Weasel

BIRDS

Great Blue Heron	Sharp Shinned Hawk	Bufflehead
American Osprery	Red Tailed Hawk	Hooded Merganzer
Turkey Vulture	Blue Grouse	Wood Duck
Great Horned Owl	American Kestral	Common Merganzer
Pygmy Owl	Chestnut Backed Chickadee	Common Golden Eye
Barred Owl	Black Capped Chickadee	Yellowthroat
Pileated Woodpecker	Mountain Chickadee	Canadian Geese
Downy Woodpecker	House Sparrow	Bald Eagle
Hairy Woodpecker	Common Flicker	Stellar's Jay
Western Robin	Yellow Bellied Sapsucker	Raven
3-toed Woodpecker	Varied Thrush	

SPECIAL, SENSITIVE, THREATENED AND ENDANGERED PLANTS

The following plant species have been found to exist within the Proposed Fish Lake Bog Research Natural Area.

Cicuta bulbifera - Bulb-bearing water-hemlock

Spagnum sp. - Spagnum moss

Drosera rotundifolia - Sundew

Lathyrus nevadensis spp - laceolatus var puniceus

PUBLIC INPUT SUMMARY

In November 1985, the Lake Wenatchee Ranger District of the Wenatchee National Forest notified approximately 120 local property owners and/or taxpayers, on the proposal to harvest timber in the southwest sections along Fish Lake. The Thin Cove Timber Sale would cover approximately 255 acres and harvest an estimated 1.5 million board feet of wood products.

The informational letter provided a listing of opportunities, concerns, and objectives which the Thin Cove proposal may generate. Those who were contacted were asked to respond with their comments by December 15, 1985. At this time, the Environmental Assessment and Decision Notice were projected for February, 1986.

A total of 17 responses were received on the Thin Cove Timber Sale proposal. All responses were from adjacent landowners.

The following analysis summarizes the public input received in respect to the informational letter.

I. Comments in favor of the proposed timber sale:

# of Responses	Comments
3	Commercial Thinning a good proposal for the area.
2	The possibility to reduce fire fuel loadings and decrease the chances of wildfire occuring.
1	Supports the objective of timber management in the area.
1	The forest is a renewable resource.
9	Aware of the effort put out by the Forest Service to control logging, prevent damage and fire, protect wildlife and rehabilitate.
9	Would prefer to see timber harvest under the control and guidence of the present Lake Wenatchee personnel.

II. Concerns created by the proposed timber sale.

# of Responses	Comments
11	No method of timber harvesting would be compatible with the Osprey and/or Heron population.

13	Osprey population and habitat should be protected
13	Heron population and habitat should be protected.
1	Salvage only in this area.
1	Lack of proffesionalism in slash clean up.
1	Available firewood should go only to local residents.
11	No new road access.
11	No improvements to existing roads.
1	Revenue from sale of timber would not benefit Fish Lake residents.
11	Fisher habitat should be protected.
1	Heron population should be reduced not enhanced or protected.
1	Disruption of snowmobile trail use.
1	Would prefer to see summer logging.
1	Will visual quality be maintained?
10	Protect Fish Lake Bog Research Natural Area and Fish Lake Run.
1	Revenue from timber sale should be used to clean up Fish Lake.
1	Would prefer to see snowmobile access closed at all times. It appears to have had an impact on the Osprey and Heron.
1	Timber clearing could create new access into nesting areas.
2	No cutting should be allowed within 400 feet of Fish Lake Run and Fish Lake Bog.
1	No cutting should be allowed within 400 feet of nesting areas.
1	No clearcuts.
9	Past history of commercial thinning (IE. Chiwawa Loop and area adjacent to Midway

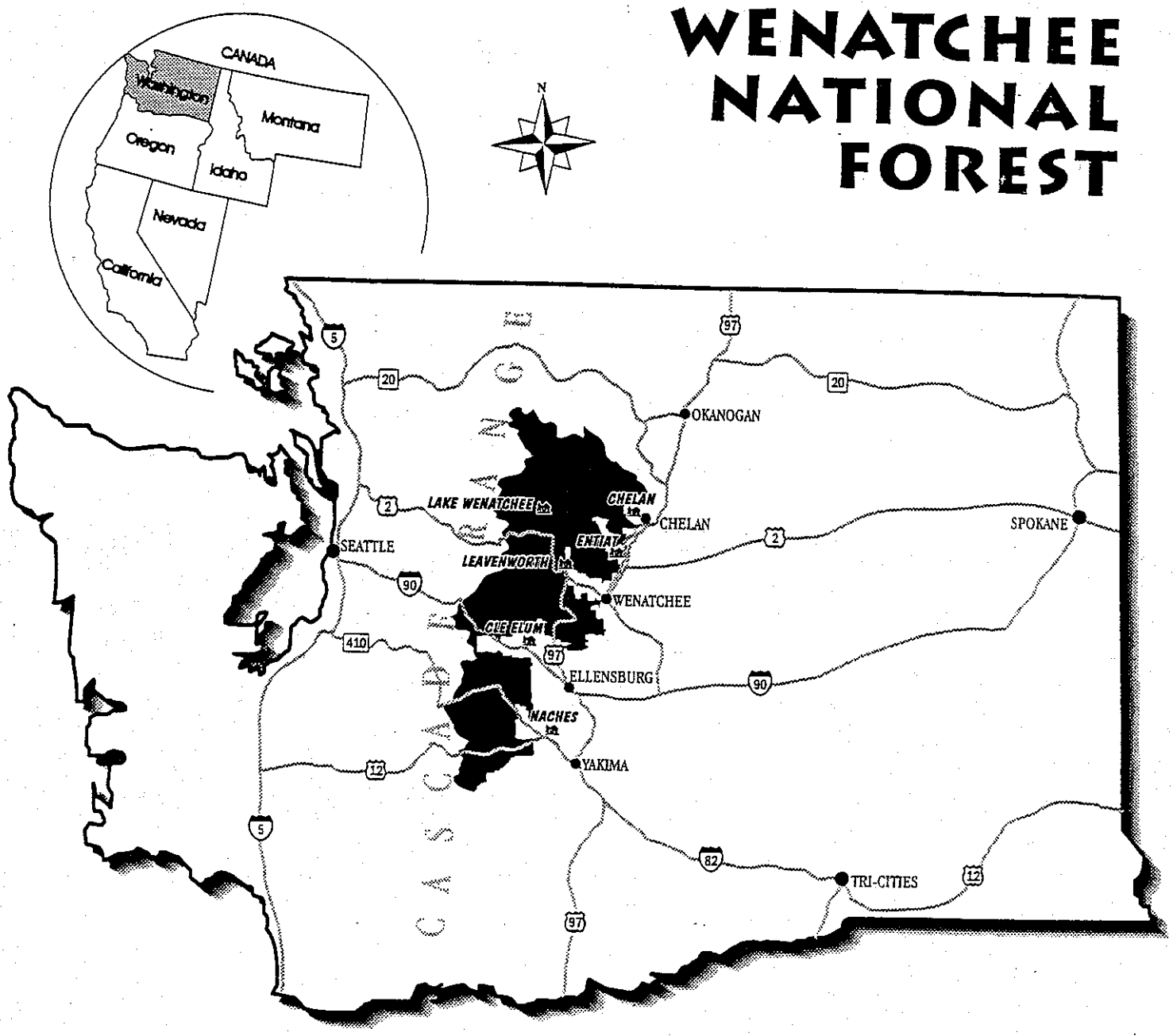
	grocery) has not been impressive or acceptable.
9	There is no reliable period of time in which Heron are not present in this area.
9	Timber stand as is provides the best habitat for a multitude of wildlife species.
9	Use by off road vehicles on powerline easement has had a significant effect on the heron. Timber harvesting would be devastating.
9	Past Forest Service policy was to restrict vehicles into this area in order to enhance the Osprey, Heron and Fisher habitat. To propose logging activities in this area seems contradictory of past policy.
9	Removal of perch/nest trees by loggers or wood cutters.
9	Fire potential will increase with logging slash and new access to careless recreationists.
9	No road construction should be made across Fish Lake Run.
9	Intent of Forest Service is good but will it provide the quality of habitat that exists now.
9	It is felt that after all necessary measures were taken, there would be no areas left to harvest timber.

III. Opportunities created by the proposed timber sale.

# of Responses	Comments
9	Now is the time to consider turning the area east of cove road, north to Idlewild road and Fish Lake, west of 311 road and south to private property boundary into a Wildlife Sanctuary or protected area.

FIGURE 1. VICINITY MAP

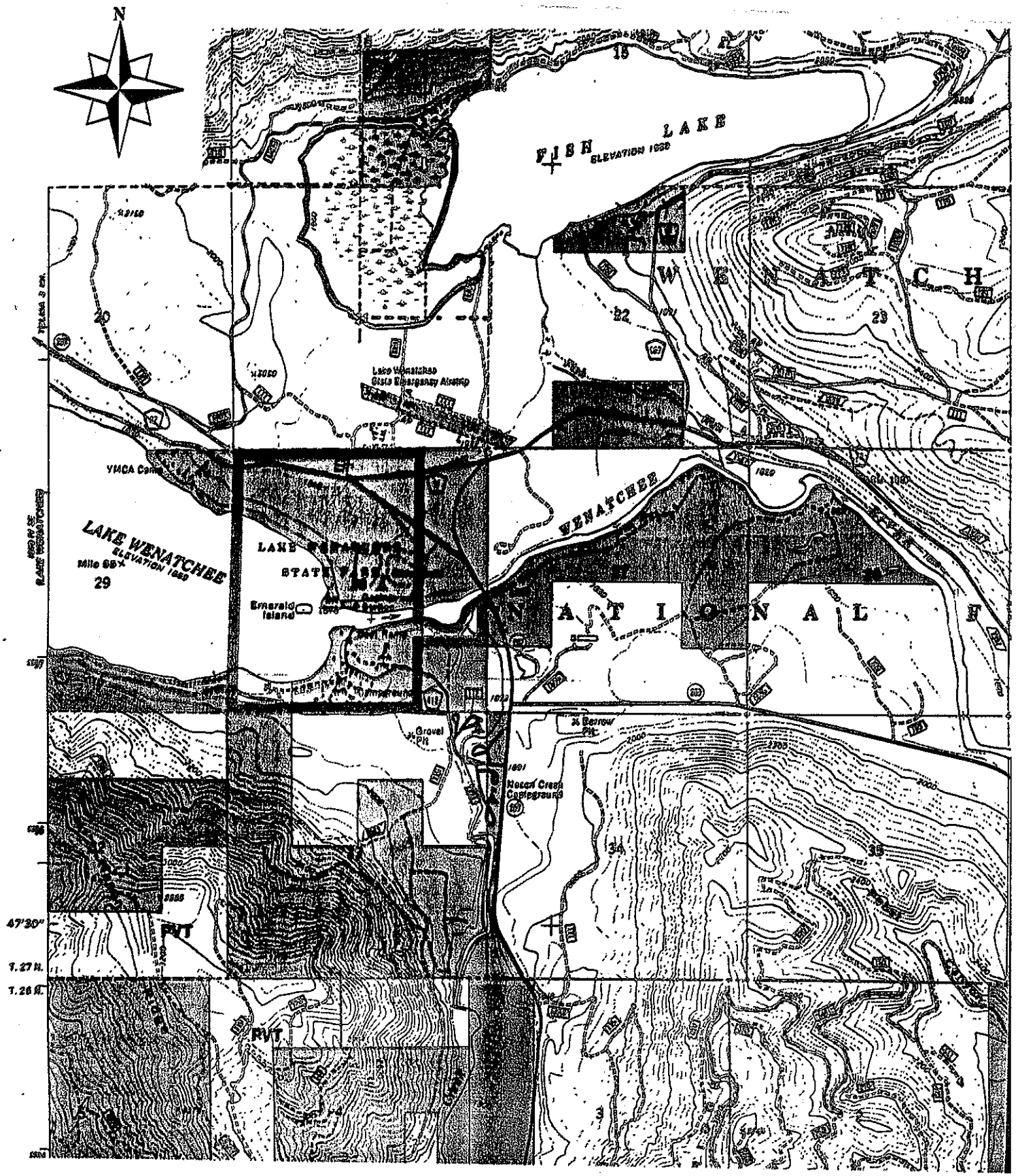
WENATCHEE NATIONAL FOREST

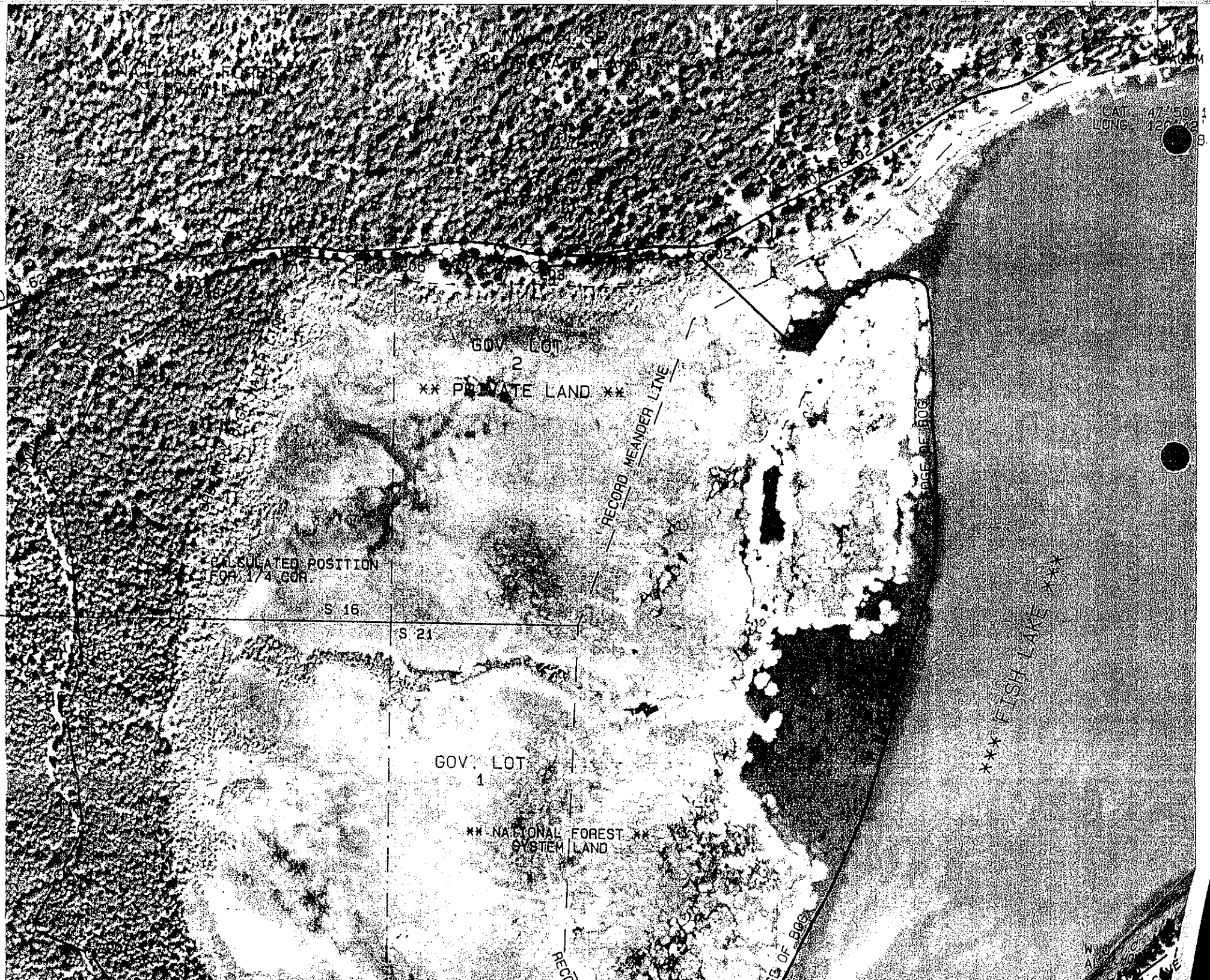


WASHINGTON

RANGER DISTRICT OFFICE

Figure 2. Contour map for the area around Fish Lake Bog RNA.
2 inches = 1 mile.




LAT. 47°50'
LONG. 120°
GOV. LOT
2
** PRIVATE LAND **
RECORD MEANDER LINE
CALCULATED POSITION
FOR 1/4 COR.
S 16
S 21
GOV. LOT
1
** NATIONAL FOREST **
SYSTEM LAND
FISH LAKE
EDGE OF BOG

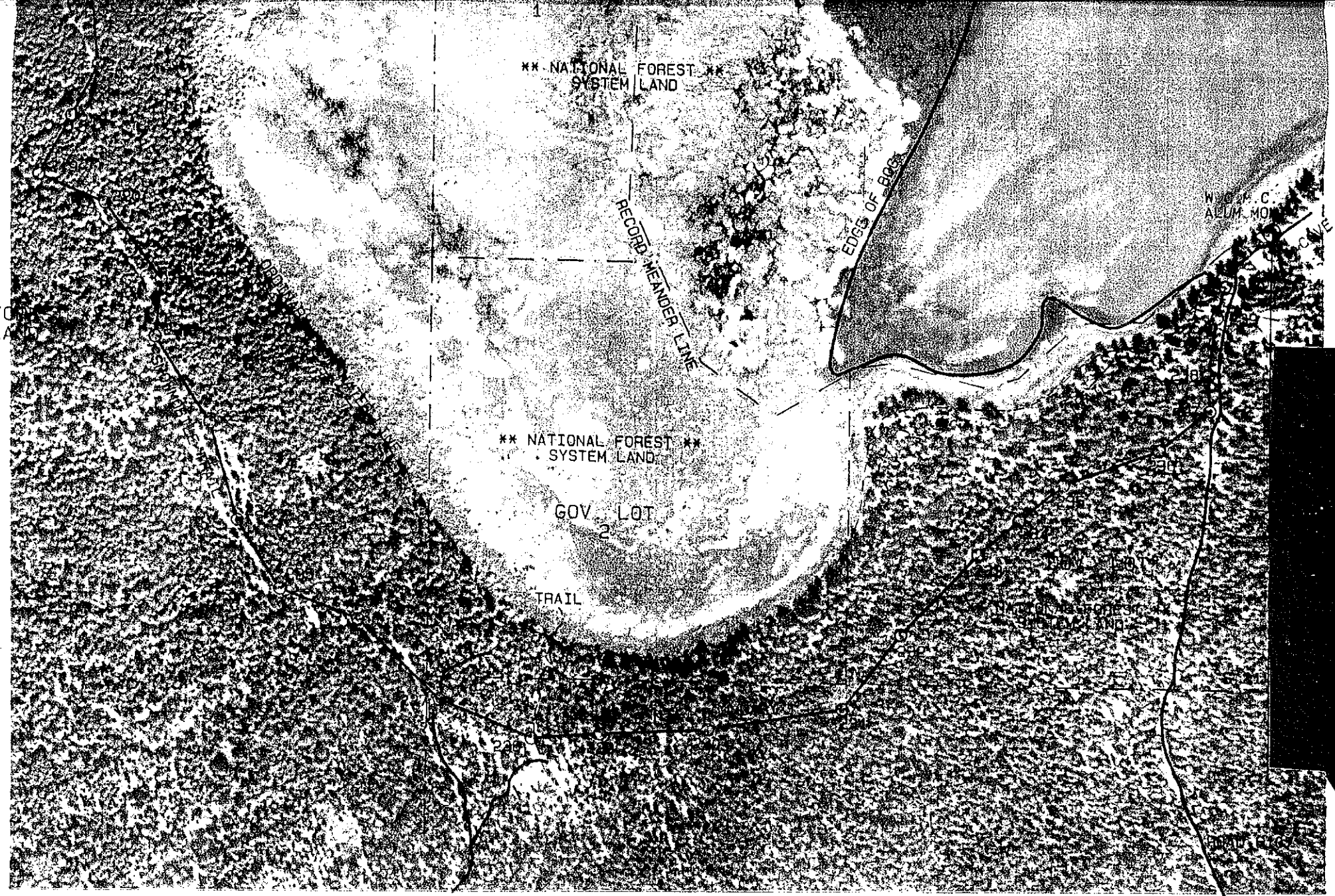


Figure 3b. Boundary map overlaying aerial photo for Fish Lake Bog RNA. 1 inch = 400 ft.

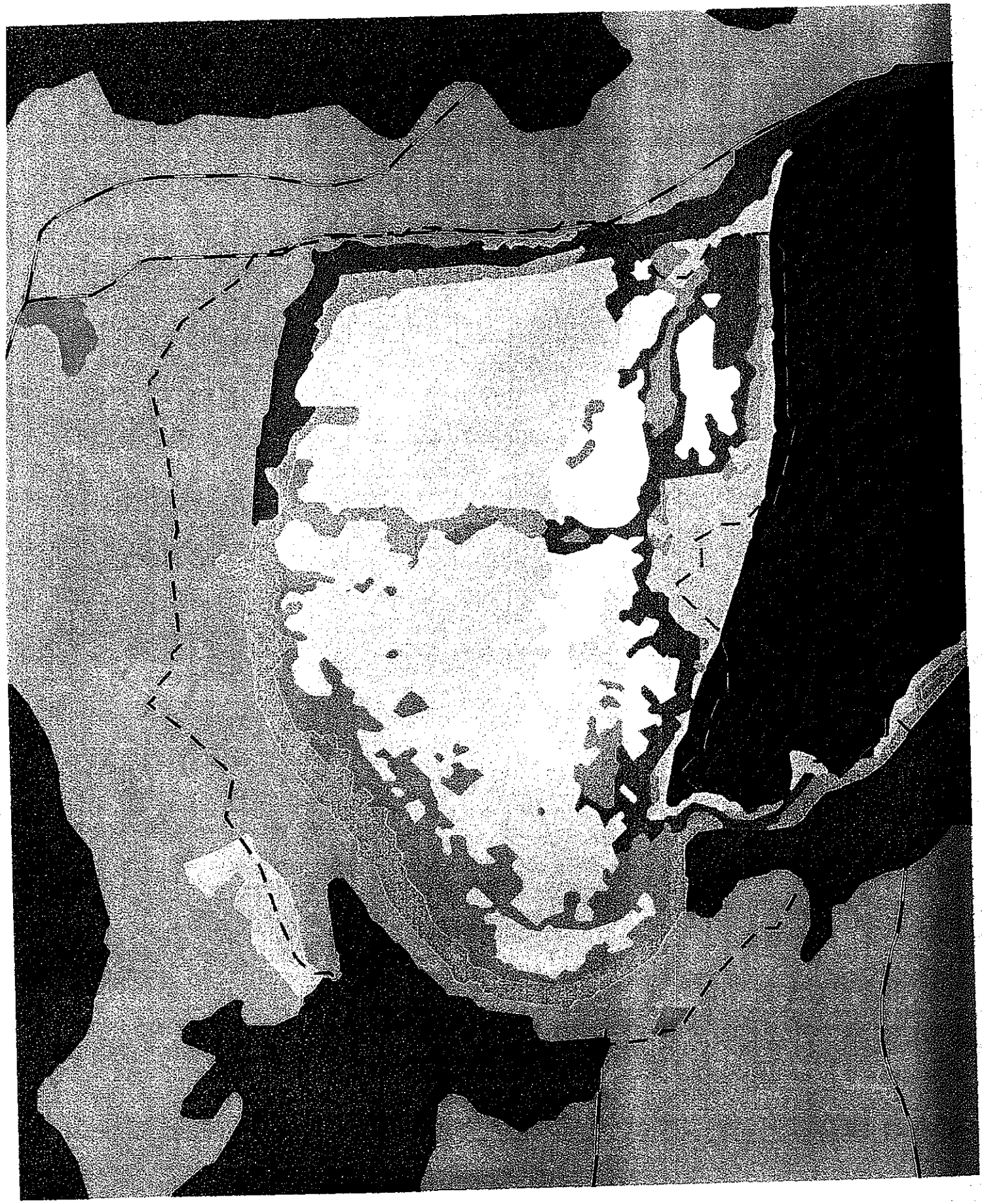


Figure 4: Fish Lake Bog RNA

Vegetation Cover Types

(after Kuchler 1966 and Cowardin, et. al. 1979.)

Wetland

Lacustrine, littoral, aquatic bed

- rooted vascular, ***Potamogeton spp.***
- rooted vascular, ***Nuphar polysepalum***

Palustrine

Moss - lichen wetand, moss

- ***Sphagnum spp.***
- ***Meesia triquentra - Carex diandra***

Emergent wetland, persistent

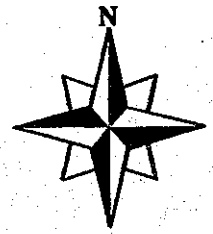
- ***Typha latifolia***
- ***Eriophurum gracile - Carex limosa***

Scrub - shrub wetland, broad leaved deciduous

- ***Spiraea douglasii***

Forested wetland, broad leaved deciduous

- ***Alnus rubra***
- ***Populus tremuloides***



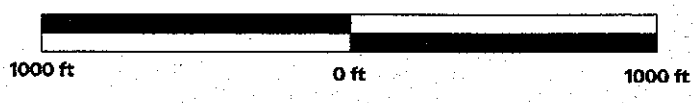
Upland

- K-2, Western Redcedar, Western Hemlock, Douglas fir forest
- K-3, Grand fir, Douglas fir forest

Other

- Disturbed ground
- Water
- Analysis Area
- Roads

Scale



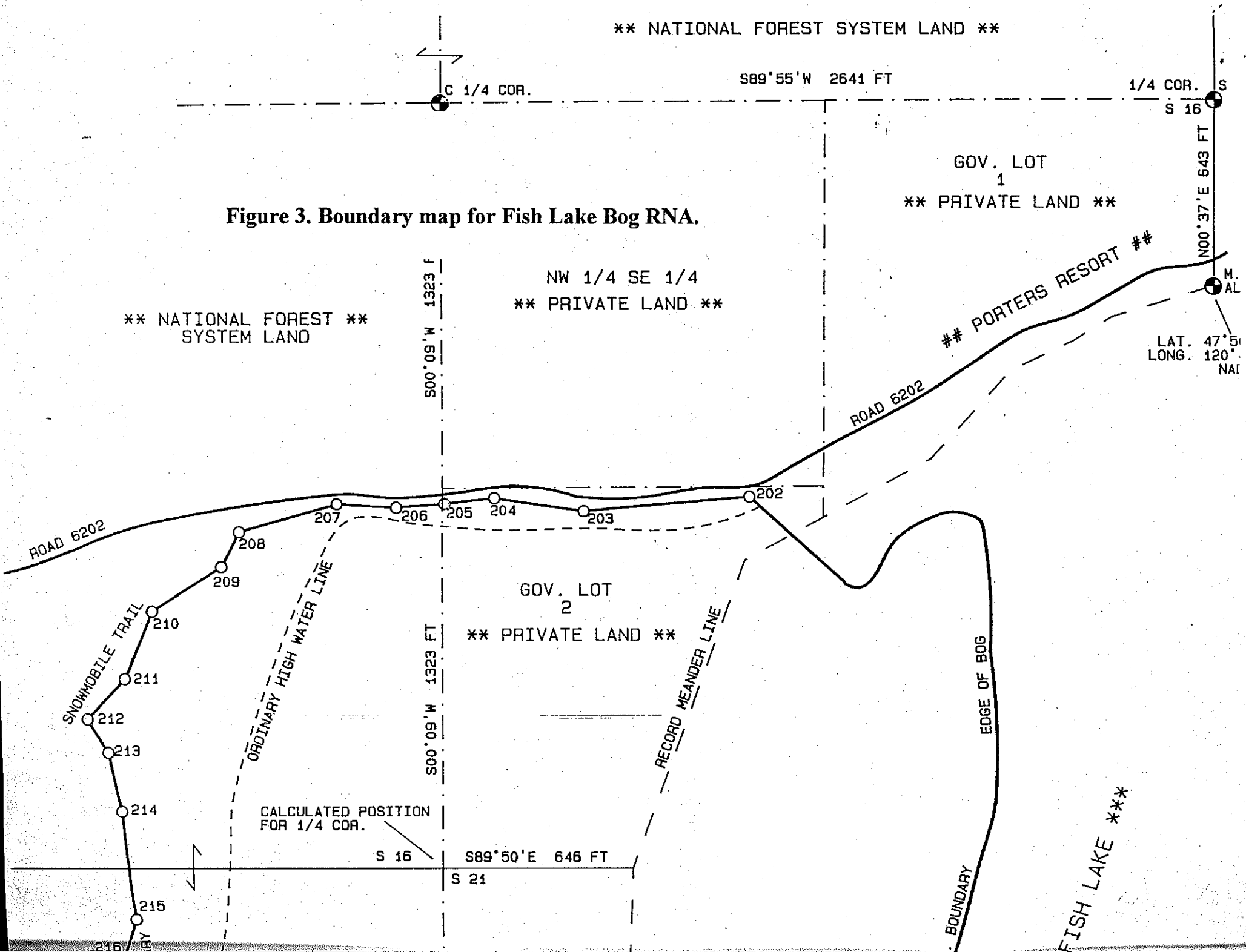
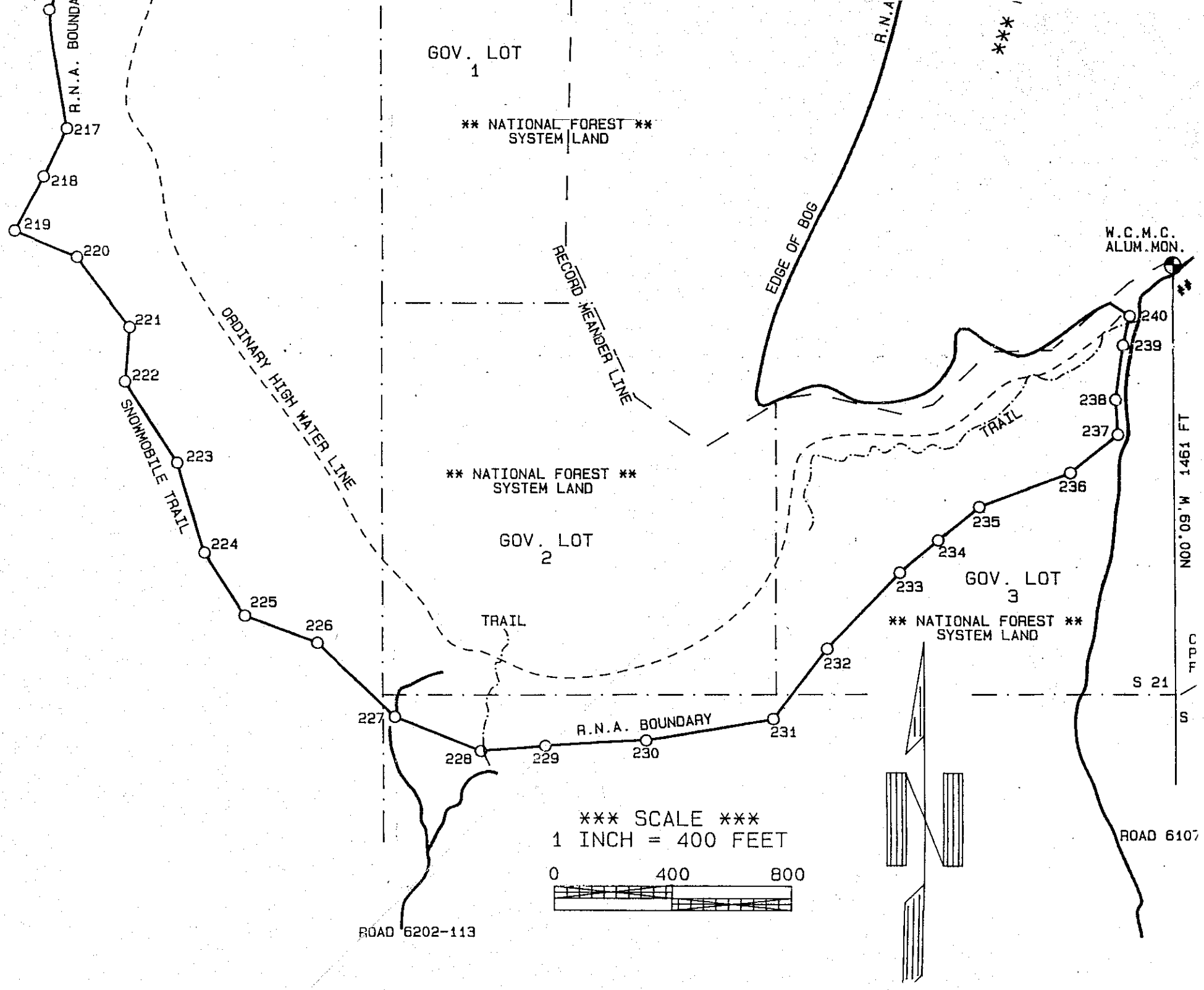


Figure 3. Boundary map for Fish Lake Bog RNA.


R.N.A. BOUNDARY
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
GOV. LOT 1
GOV. LOT 2
GOV. LOT 3
** NATIONAL FOREST ** SYSTEM LAND
** NATIONAL FOREST ** SYSTEM LAND
** NATIONAL FOREST ** SYSTEM LAND
ORDINARY HIGH WATER LINE
RECORD MEANDER LINE
EDGE OF BOG
SNOWMOBILE TRAIL
TRAIL
TRAIL
R.N.A. BOUNDARY
W.C.M.C. ALUM.MON.
N00°09'W 1461 FT
S 21
*** SCALE ***
1 INCH = 400 FEET
0
400
800
ROAD 6202-113
ROAD 6107

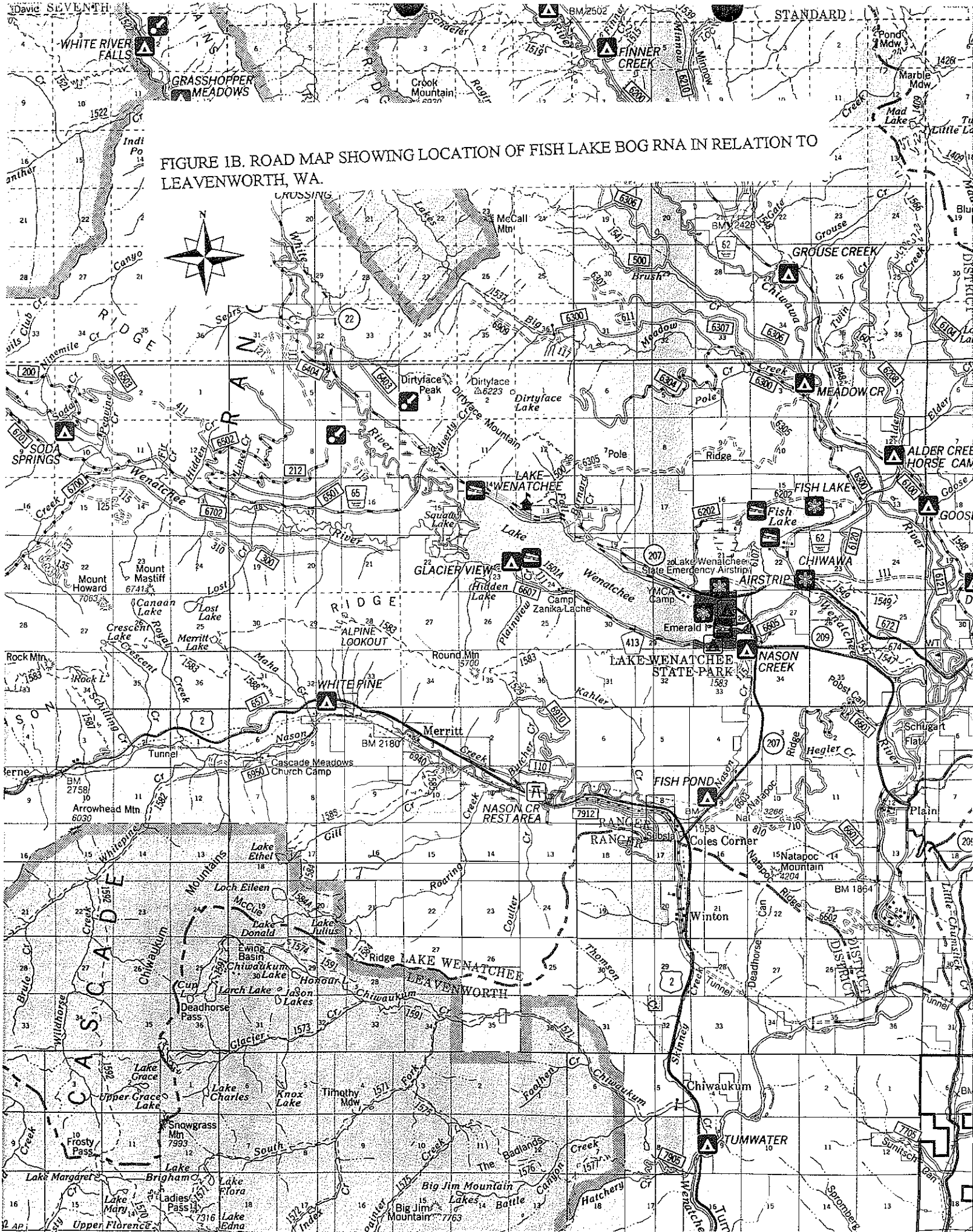
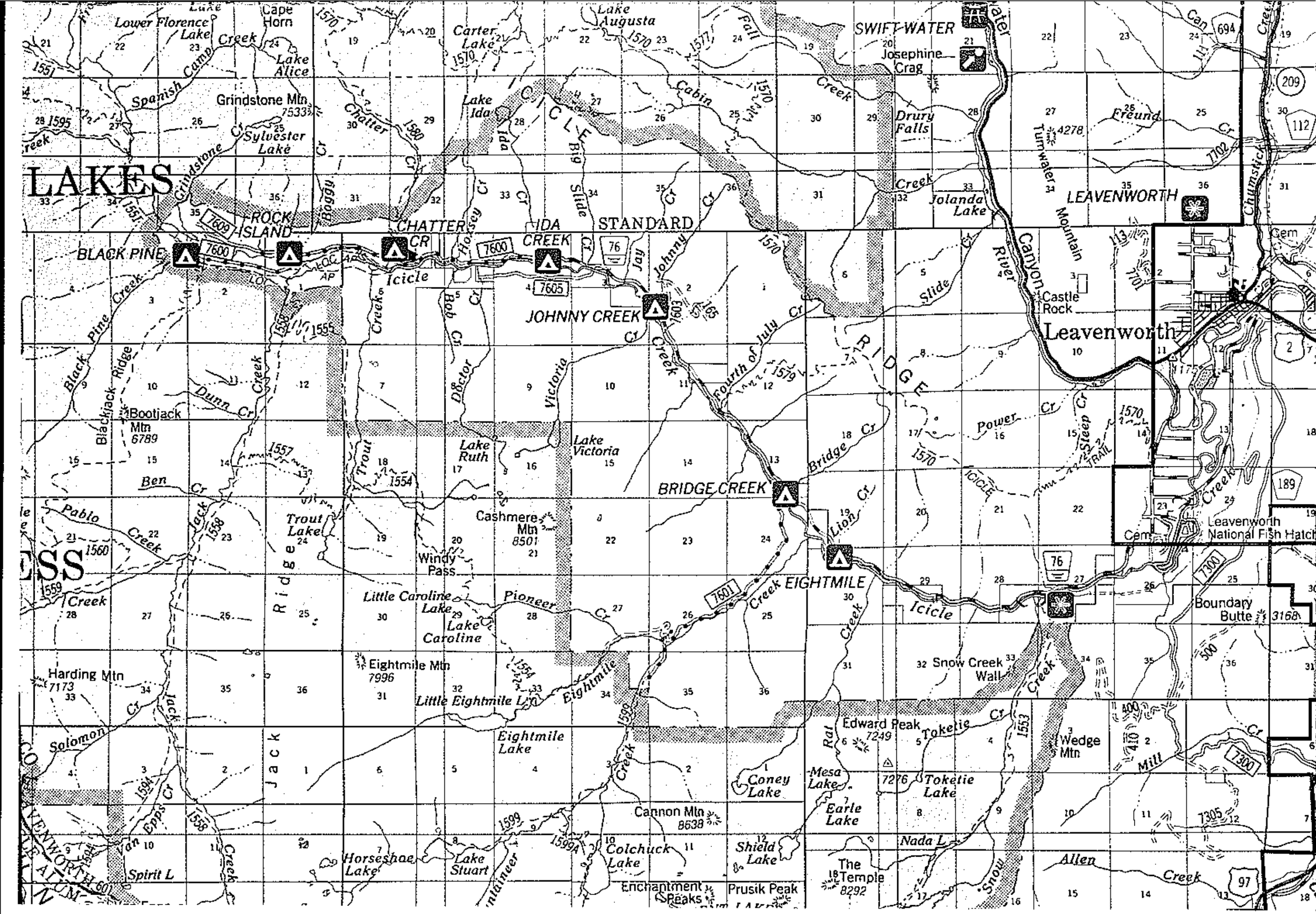
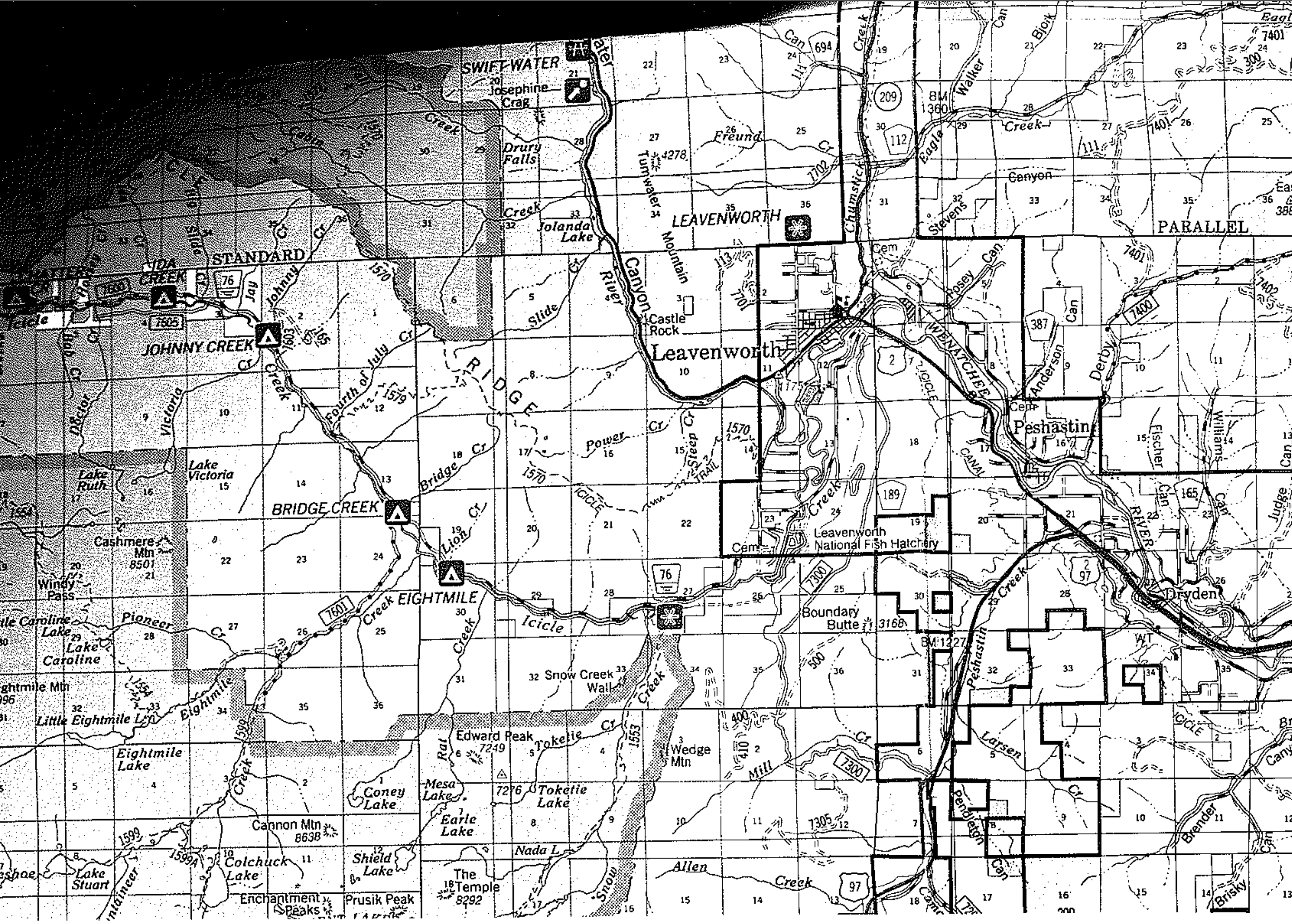


FIGURE 1B. ROAD MAP SHOWING LOCATION OF FISH LAKE BOG RNA IN RELATION TO LEAVENWORTH, WA.


LAKES
ESS
Lower Florence Lake
Cape Horn
Lake Alice
Spanish Camp Creek
Grindstone Mtn 7533
Sylvester Lake
Carter Lake
Lake Augusta
Lake Ida
ICICLE
Cabin Creek
SWIFT WATER
Josephine Crag
Drury Falls
Tumwater Mountain
Freund Cr
Jolanda Lake
LEAVENWORTH
BLACK PINE
ROCK ISLAND
CHATTER CR
IDA CREEK
STANDARD
Icicle
JOHNNY CREEK
Fourth of July Cr
RIDGE
Castle Rock
Leavenworth
Black Pine Creek
Blackjack Ridge
Bootjack Mtn 6789
Dunn Cr
Trout Creek
Doctor Cr
Victoria
Lake Ruth
Lake Victoria
Bridge Cr
Power Cr
Sleep Cr
BRIDGE CREEK
Lion Cr
Cashmere Mtn 8501
Trout Lake
Pablo Creek
Ben Cr
Windy Pass
Little Caroline Lake
Lake Caroline
Pioneer Cr
EIGHTMILE
Leavenworth National Fish Hatch
Cem
Boundary Butte 3168
Harding Mtn 7173
Eightmile Mtn 7996
Little Eightmile L
Eightmile
Snow Creek Wall
Edward Peak 7249
Toketie Cr
Wedge Mtn
Mill Cr
Solomon Cr
Jack
Eightmile Lake
Coney Lake
Mesa Lake
Toketie Lake
Earle Lake
Cannon Mtn 8638
Horseshoe Lake
Lake Stuart
Colchuck Lake
Shield Lake
Nada L
Allen Creek
Spirit L
The Temple 8292
Enchantment Peaks
Prusik Peak
Snow Creek



SWIFT WATER
Josephine Crag
Drury Falls
Jolanda Lake
Tumwater Mountain
Freund
LEAVENWORTH
Chumstick
Walker
Eagle
Creek
Stevens
Canyon
PARALLEL
STANDARD
IDA CREEK
JOHNNY CREEK
Johnny Cr
Jay
Slide
Fourth of July Cr
RIDGE
Castle Rock
Leavenworth
Rosey Can
WENATCHEE
ICICLE
Anderson Can
Derby
Peshastin
Fischer
Williams
Victoria
Doctor
Lake Ruth
Lake Victoria
Bridge Cr
BRIDGE CREEK
Lion Cr
Power Cr
Steep Cr
TRAIL
Leavenworth National Fish Hatchery
Cashmere Mtn
8501
Windy Pass
Pioneer
Little Caroline Lake
Lake Caroline
EIGHTMILE
Creek
Icicle
Boundary Butte
3168
Dryden
RIVER
Peshastin Creek
Eightmile Mtn
Little Eightmile L
Eightmile
Snow Creek Wall
Edward Peak
7249
Toketie Cr
Wedge Mtn
Mill Cr
Larsen Cr
Eightmile Lake
Coney Lake
Rat
Mesa Lake
Toketie Lake
Earle Lake
Cannon Mtn
8638
Nada L.
Shield Lake
Colchuck Lake
Lake Stuart
The Temple
8292
Enchantment Peaks
Prusik Peak
Allen Creek
Pendleton Can
Brender
Brisky
Judge

AD MAP SHOWING LOCATION OF FISH LAKE BOG RNA IN RELATION TO
H, WA.