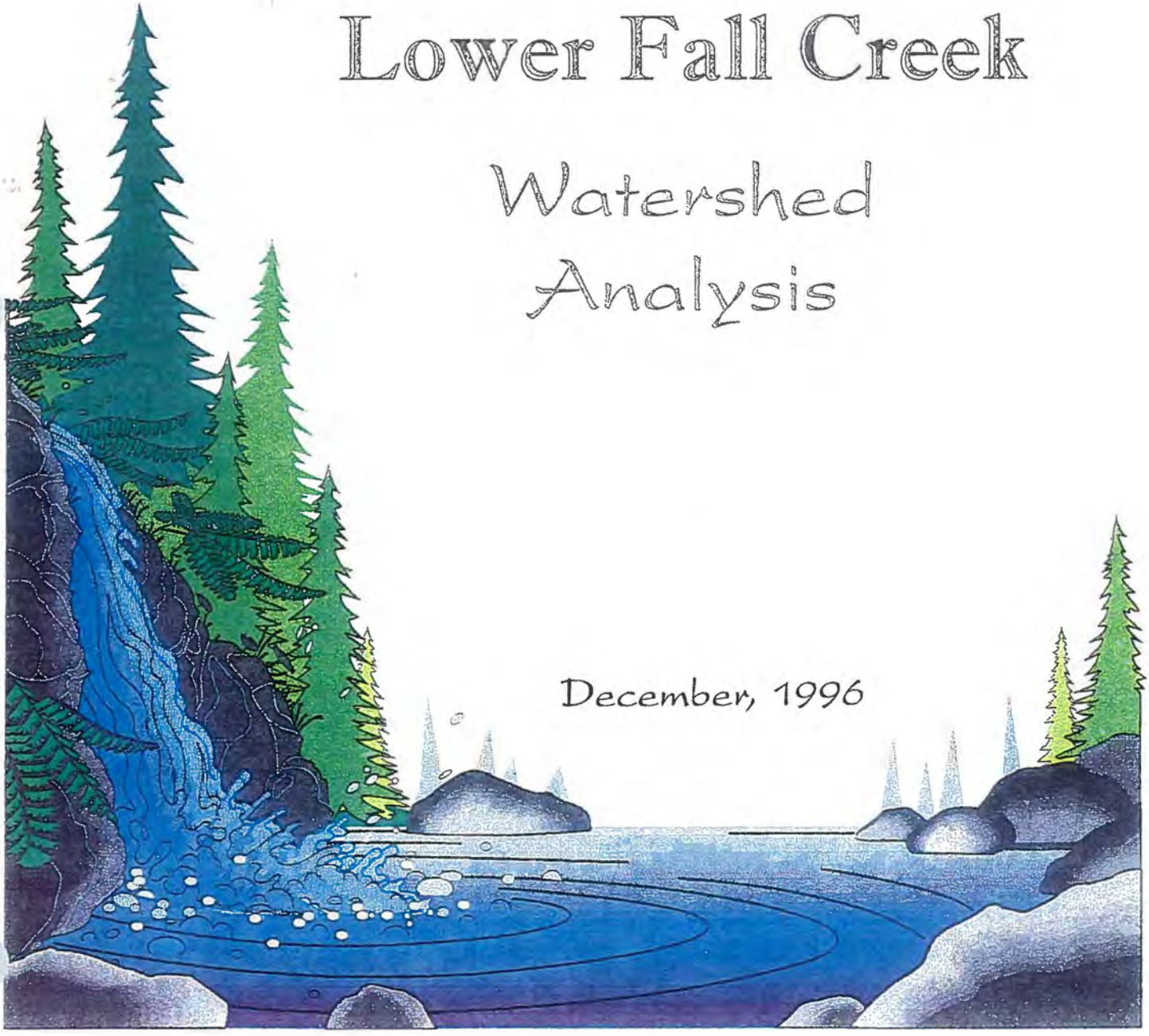
Interagency

Winberry and Lower Fall Creek

Watershed Analysis



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Winberry/Lower Fall Creek Watershed Analysis
Interagency Core Team

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TABLE OF CONTENTS

CHAPTER 3 26

LIST OF FIGURES

List of Tables

List of Maps

INTRODUCTION

The Winberry/Lower Fall Creek watershed analysis examines Winberry Creek, Fall Creek Lake (referred to in this document as Fall Creek Reservoir), and approximately three and one half miles of Fall Creek below Fall Creek Dam with its associated drainages. The area is a subwatershed of Fall Creek watershed and is located in Lane County, about 15 miles southeast of Eugene near the communities of Lowell and Fall Creek *(see Map 1).* The analysis area is approximately 69 square miles or 43,890 acres in size; major features are delineated in *Map 2* and a shaded relief is shown on *Map 3.*

From a regional perspective, the analysis area is located within the following geographic area:

Region:	Pacific Northwest
Subregion:	Lower Columbia
Basin:	Willamette River
Subbasin:	Middle Fork Willamette

This watershed analysis was performed at the subwatershed and drainage scale.

The area is a mixture of private and governmental ownerships, with the largest single parcel of land managed by the Willamette National Forest, Lowell Ranger District. Fall Creek Reservoir and its adjacent lands are managed by the US Army Corps of Engineers as the Fall Creek Lake Project. The Bureau of Land Management, McKenzie Resource Area (Eugene District), has scattered lands in the western portion of the watershed. Private forest products companies comprise the other large landowners in the area. Agriculture lands and rural residential properties constitute most of the remaining lands in the Winberry and Lower Fall Creek basins *(see Map 4).* Specific land allocations can be found in *Table 1* and *Map 5.*

The Winberry/Lower Fall Creek watershed supports a wide range of uses and provides a variety of commodities to local residents. Demands on the watershed are varied: furnishing local businesses with forest products, providing recreational opportunities, contributing towards flood control, and providing agricultural and rural residential properties for local residents. Both natural processes and land use activities have shaped the landscape into its present form. This document analyzes the processes which determined landscape changes over time, and recommends watershed management activities from an ecosystem point of view while providing needed resources to surrounding communities. Such an approach may make it possible to sustain the diversity and productivity of the watershed. This is not a decision document, but rather a guide for government agencies to maintain or enhance ecosystems in the watershed.

Direction for management of US Forest Service (USFS) and Bureau of Land Management (BLM) lands in the watershed is provided by the Record of Decision (ROD) of April, 1994 and the Final Supplemental Environmental Impact Statement (FSEIS) on Management of Habitat for the Late Successional and Old Growth Forest Related Species Within the Range of the Northern Spotted Owl (USDA, USDI, 1994). This FSEIS is popularly known as the Northwest Forest Plan and has amended the

Willamette National Forest Land and Resource Management Plan (USDA, 1990). Hereafter, both the Northwest Forest Plan and the previously mentioned FSEIS will be referred to as the Northwest Forest Plan or NWFP. The Eugene District BLM Record of Decision and Resource Management Plan was finalized after completion of the Northwest Forest Plan and is consistent with it (ROD/RMP, 1995). The Army Corps of Engineers (COE) management is based on their Master and Operational Management Plans.

Table 1. Land Allocations in Winberry/Lower Fall Creek Watershed

Land Allocations	Acres	% of Agency	% of Watershed
USFS (22,661 acres)		% of USFS	52%
• LSR 100 (owl core reserves)	1,341	5%	3%
• Riparian Reserves	10,128	44%	23%
• Other Forest Plan Withdrawn	2,394	10%	5%
• Matrix	9,098	37%	21%
BLM (2,842 acres)		% of BLM	7.06%
• LSR 100 (owl core reserves)	128	5%	0.29%
• Riparian Reserves	1,010	36%	2%
• Bald Eagle Habitat Area (BEHA)	331	12%	0.75%
• Other Withdrawn Allocations	9	0.003%	0.02%
• Matrix:			
◊ General Forest Mgmt Area (GFMA)	1,104	39%	3%
◊ Connectivity Block (CON)	260	9%	1%
COE (3,441 acres)		% of COE	8%
• Reservoir	1,757	50%	4%
• Other Lands	1,684	50%	4%
Other Public Agencies (369 acres)			0.08%
Private (14,577 acres)			34%
• Industrial	10,810	*NA*	25%
• Other Private	3,767	*NA*	9%
Total	**43,890**		

This analysis provides responsible officials with more comprehensive information upon which to base land management decisions. It is based on existing data and additional information was not collected but rather identified as "data needs." Two public meetings were convened to provide a forum for public concerns.

The Federal Guide for Watershed Analysis: *Ecosystem Analysis at the Watershed Scale* (Version 2.2) provides guidance for the process. This analysis will include:

- A general understanding of the ecological conditions and processes occurring in the watershed,
- A list of restoration projects to enhance the ecosystem and close the gap between current conditions and the range of natural conditions,
- Future access and travel management opportunities,
- Identification of recreation uses and trends, and
- Guidelines for future decisions regarding the provision of commodities to benefit local communities.

In accordance with direction outlined in the *Ecosystem Analysis at the Watershed Scale,* this analysis is comprised of the following components:

- **Characterization** *(Chapter 1)*
  describes the unique or particularly important characteristics of the watershed,
- **Issues and Key Questions** *(Chapter 2)*
  describes various concerns and opportunities existing in the watershed and identifies which require further consideration for the best current and future decisions,
- **Reference and Current Conditions** *(Chapter 3)*
  discusses the current watershed condition, presented in relationship to reference conditions,
- **Interpretations** *(Chapter 4: this section provides a response to the Key Questions)*
  explains similarities, differences or trends between reference and current conditions, and what factors affect the capability of the watershed to achieve management objectives (presented in relation to the issues and key questions), and
- **Recommendations** *(Chapter 5)*
  identifies management opportunities that could move the system towards reference conditions or management objectives.

Appendix A defines acronyms used in the document. *Appendix B-F* contain more detailed information separated by functional area. All maps pertinent to the document are found following the Bibliography.

CHAPTER 1
CHARACTERIZATION

The purpose of this section is to place the Winberry/Lower Fall Creek watershed in context within the river basin and province, and to briefly analyze and describe its dominant physical, biological, and social features.

PHYSICAL DOMAIN

GEOLOGY

Winberry Drainage is located within the Western Cascades physiographic province, at the northwest boundary of the Basin and Range Province. It consists of rocks which range in age from approximately four to forty million years formed during the Eocene through Pliocene epochs *(see Map 6)*. Elevation ranges from 600 feet at the confluence of Fall Creek and Little Fall Creek to 4,969 feet above mean sea level (msl) on top of Saddleblanket Mountain.

A dendritic drainage pattern is typical due to the volcanic geology. The most extensive and oldest rock formation in the area has been called the Little Butte Series (Peck, *et. al.*, 1964). Its age is estimated from early Oligocene to early Miocene and the formation is believed to range from 5,000 to 10,000 feet in thickness. The Little Butte Series is comprised of pyroclastic volcanic rocks (such as tuff, lapilli tuff, welded tuff and breccia) and, to a lesser extent, lava flows with small intrusions of andesite and basalt *(shown on Map 6)*. Deep colluvial and residual soils developing on moderate slopes are usually high in clay content and cohesive, with slope failures common in both soil and bedrock materials. On steep slopes, streams become deeply incised, attesting to the massive and easily erodable nature of the bedrock.

Stream gradients are high, ranging from above 20% in the upper portions of the watershed to less than two percent in the lower reaches of Winberry Creek and Fall Creek (below the reservoir). High stream gradients produce high energy streams which carry a large volume of sediments to Winberry Creek. Here, the stream gradient decreases and deposition occurs upstream of small geologically constrained areas or behind large woody debris. Fine suspended sediment, derived from the erosion of pyroclastic rock, tends to stay in suspension for long distances.

EROSION PROCESSES

Mass wasting, hillslope and road-related land movements are the dominant erosional processes within the watershed. Mass wasting is the downslope movement of soil and rock material through a variety of landslide movement mechanisms. The presence of weak, erosive rock on steep slopes provides ideal conditions for land movement, particularly in the eastern portion of the analysis area. Under natural conditions, sediment and wood

delivered to streams are essential elements of channel geometry and ultimately form fish habitat. Hillslope erosion occurs on moderate to steep slopes where detachable soils with low soil strength are exposed to rainfall and overland flow, creating gullies and rills.

A mass wasting potential for the Winberry drainage was developed by classifying the landscape into areas with a High, Moderate, or Low potential for mass wasting and subsequent sediment delivery to streams. Thirty-three percent of the area was identified as having high potential; most is located on steep sideslopes near ridgetops *(see Map 9)*. The predominant types of landslides are shallow, rapid slides and debris torrents *(see Map 10)*.

The relative potential of hillslope-related surface erosion for the Winberry drainage was analyzed by developing a soil erosion potential map based on topography (slope steepness) and soil erodability (soil K-factor) *(see Map 7)*. Forty-eight percent of the analysis area is in the High Erosion Risk Class. Road related failures are often related to timber harvest, primarily associated with sidecast road construction on steep slopes and, to a lesser extent, cutbank failures, stream-crossing failures, headwall-crossing failures, and poor road drainage. Aerial photo inventory of landslides for the period of 1949 to 1995 suggest that road-related failures accounted for 63% of all landslides; approximately 22% of these resulted in sediment delivery to streams.

Hydrology

The Winberry/Lower Fall Creek drainage has a maritime climate characterized by mild temperatures and a long frost-free growing season. Winters are wet with prolonged cloudy or overcast periods. Summers are typified by high pressure systems producing fair, dry weather for extended periods of time. Annual precipitation ranges from 45 inches in the west to 70 inches in the east *(see Map 13)*. Most of the precipitation occurs between October and April. The western lowlands are in a rain-dominated precipitation zone. Approximately sixty percent of the watershed is in the transient snow zone (1,500 - 4,200 feet elevation) with only three percent in the snow zone above 4,200 feet *(see Map 11)*.

The most prominent hydrologic feature in the watershed is Fall Creek Reservoir, primarily created for flood control. The reservoir has two main arms: the northern arm associated with Fall Creek and the southern arm fed by Winberry Creek. During full pool, the Fall Creek arm is approximately six and a half miles long and the Winberry arm about three and a half miles long. Maximum depth at full pool is an estimated 160 feet near the dam. Construction of the Fall Creek Dam was completed in October, 1965 and operations began in 1966. The dam is located on Fall Creek, 7.2 river miles upstream from the confluence of Fall Creek and the Middle Fork of the Willamette River.

Water Quality

Primary beneficial uses of water in the analysis area are aesthetics, aquatic life and water-contact recreation. Water is also used for irrigation and domestic purposes; 20 water right permits are currently on record with the Lane County Watermaster. The majority of these permits pertain to water diverted from Fall Creek below the reservoir.

Many more permits have been recorded for locations downstream from the analysis area. There are no Bureau of Reclamation contracts for agricultural water supply obligated from Fall Creek Reservoir (COE, 1989).

During summer months, weekly samples are collected from the reservoir to test for coliform at various recreation sites; levels have always been within acceptable limits. Algal blooms have occurred in the past, reducing water clarity and impacting aesthetics. Recreational boating and wind-generated waves contribute to shoreline erosion, which is most pronounced along the north shore of the Fall Creek arm. Suspended sediment due to wave action is a concern aesthetically; however it has little impact on water-contact recreation.

Downstream from the reservoir, Fall Creek is proposed for listing by the Oregon Department of Environmental Quality (DEQ) as a Water Quality Limited stream (pursuant to Section 303 (d)(1) of the Clean Water Act) due to elevated summer temperatures. Based on data collected between 1990 to 1994 at the USGS gaging station on Lower Fall Creek (14151000), maximum late-summer water temperatures were between 65.4 and 67.1 degrees Fahrenheit (the state standard is 64°F). If Fall Creek is formally listed as Water Quality Limited and considered a high priority stream, the DEQ would develop Total Maximum Daily Loads (TMDLs) and a management strategy. Restricted use of the water could be a result of final 303 (d) listing.

In the eastern portion of the watershed, water temperatures in several streams are higher than the state standard of 64°F based on data collected by the USFS between 1991 and 1995. *Map 16* shows Fall Creek, Fall Creek Reservoir and Winberry Creek, all on the DEQ list of *Waterbodies of Concern.* Fall Creek below the reservoir is on this list due to flow modification and sediment; the reservoir and Winberry Creek are listed due to public concern about excessive suspended sediment levels (turbidity). These streams and the reservoir were identified in the 1988 Oregon Statewide Assessment of Non-point Sources of Water Pollution, indicating that water quality may impact the beneficial uses discussed earlier. This listing does not require data as does the Water Quality Limited list (303(d)).

ROADS

Lowell Ranger District of the Willamette Forest manages almost half of the analysis area. The remainder is primarily comprised of multiple private holdings. Major land owners are Weyerhaeuser and Giustina, with numerous smaller ownerships. It is assumed that the majority of roads within private holdings were constructed to access timber and that this road system is consistent with roads constructed on federal lands. However, aerial photos show that private land is more extensively roaded due to tractor-logging in the 1950s. These roads are probably not maintained to the extent of roads within the national forest system.

Historically, the US Forest Service (USFS) and Bureau of Land Management (BLM) emphasized timber management, resulting in a large road system to access timber and

other forest resources. Timber sale revenue paid for the majority of past road construction and road maintenance. However, timber harvest has declined with the current shift toward ecosystem management. This shift has caused a reduction in funds for road maintenance. A consequence is that most roads are no longer annually inspected for maintenance requirements and deficiencies are not corrected. As a result, many roads and drainages have become obstructed, roads often channel water along wheel ruts instead of flowing into drainage structures, and many shoulders built by side-cast construction are slumping. Together, the cumulative results are a road system at risk of failure. This was dramatically illustrated during the 1996 flood event, a three to five year flood event for the area (USGS, unpublished records). Three debris torrents and four road slumps in the headwaters of Winberry are directly attributable to the lack of road maintenance.

Both BLM and USFS access and travel management policy dictates that all roads remain open unless some overriding reason for closure exists. District and Forest policies reflect this commitment to retain open travel corridors unless otherwise designated. However, changes in forest management have seriously reduced the federal agencies' operating budgets and their ability to maintain such an extensive system. Some roads may be removed from the system; others closed until future access is needed; and many will be kept at the lowest possible maintenance level.

BIOLOGICAL DOMAIN

TERRESTRIAL

VEGETATION

Winberry/Lower Fall Creek watershed is located near the community of Lowell in the southern Willamette Valley. There are no late successional forest habitats in this area, a result of intensive forest and agricultural practices. The natural forest landscape is fragmented due to past management practices. Federal lands retain some tracts of late successional and old-growth forests. These mature forest blocks provide valuable habitat within the watershed and connectivity to surrounding watersheds.

Forested lands are in the Douglas-fir and Western Hemlock forest series. These series are commonly found on low to mid-elevations throughout the Central Oregon Cascades. The most common associates with Douglas-fir and western hemlock are western red cedar, incense cedar, sugar pine, and western white pine. Associated hardwood species include bigleaf maple, red alder, chinquapin, and madrone.

FIRE AND FUELS

Fire has played an important role in determining the species, density and age of vegetation in this area. Recently, the type of fire has changed from natural fire

occurrences to prescribed fire used to reduce post-harvest, logging debris. Natural fires continue to occur, although their significance in the watershed has greatly diminished.

Fuel loading has also changed over time. Prior to the arrival of European settlers, fuels were primarily modified by the forces of nature, including disease, insect infestation, wind events, and natural fires. In addition, local Native Americans manipulated fuel loading by using fire to clear unwanted vegetation from the forest floor. During the past 75 years, the fuel loading of this area was greatly altered by timber harvest, post-harvest activities and active fire suppression.

BOTANY

At the western edge of the watershed, the Willamette Valley ecosystem comes into contact with the Western Cascade mountain ecosystem forming a region of high botanical diversity. It includes US Army Corps of Engineer (COE) land where the rare giant helleborine and a hybrid iris are tracked due to their limited distributions. The watershed headwaters also support high biodiversity. Here, meadows provide habitats for unique species including Cusick's checkermallow, Umpqua swertia and Thompson's mistmaiden.

Special habitats include rock outcrops and gardens common in the Tire Mountain area, wet meadows surrounding Saddleblanket Mountain and the drier beargrass meadows of Sourgrass Mountain. In the western part of the watershed, Mt. Salem (BLM) features a large meadow complex at its summit.

The most common noxious weeds are Scotch broom and tansy, although Canada thistle, bull thistle and St. John's-wort are also prevalent. Exotic species dominate the Fall Creek Reservoir in the emergent vegetation area of the draw-down zone and have potential to move up the Winberry watershed.

Habitat for riparian and old-growth Survey and Manage Species (ROD, 1994) is very scattered and distributed in small patches, but populations do exist. Very little habitat for these species is found in the lower reaches of the analysis area.

WILDLIFE

Wildlife habitats within the watershed are moderately diverse with both natural and human induced habitat complexes. Over 300 vertebrate wildlife species are found or have the potential to exist here. The vast majority of federal lands are in some stage of forested seral development. Fall Creek Reservoir contributes human-made habitat for foraging bald eagles, western pond turtles, osprey, and many species of waterfowl, but has eliminated some natural riparian conditions. Small private holdings and intensively managed commercial timberlands provide an abundance of small agricultural tracts and early seral forest conditions in the lower half of the watershed.

The Alpine ridge region at the east end of the watershed has unique forested habitats consisting of mixed true fir and Douglas-fir. These higher elevation areas are

interspersed with Sitka alder patches and both dry and mesic meadows, often used as summer range and calving grounds by Roosevelt elk.

The first intensive amphibian surveys, conducted in late summer/fall of 1995, found two previously undocumented amphibian species in the watershed. These are the tailed frog and the torrent salamander, both Appendix J2 species of concern.

On federal lands, extensive surveys for northern spotted owls have established the presence of approximately 14 activity centers within the watershed. Although approximately 50.2% of the watershed is considered suitable habitat, most occurs on federal lands and is extensively fragmented. It is not anticipated that this condition will improve in the future. In the upper watershed, 3,748 acres are designated as critical habitat for the northern spotted owl.

The analysis area lies approximately midway between LSR RO219 in the north and RO222 to the south. Since the land is designated as matrix, its importance lies in maintaining adequate dispersal and connectivity corridors between these two LSRs. This is essential to the success of the Northwest Forest Plan and the Late Successional Reserve strategy.

AQUATIC

ANADROMOUS FISHERIES

Fall Creek and Winberry Drainages are within the Middle Fork Willamette Subbasin, located at the head of the Willamette River. Spring chinook are native to Fall Creek and Winberry Creek; winter and summer steelhead were introduced.

Construction of Fall Creek Dam in 1965 stopped anadromous fish migration above the reservoir. Adults returning to Fall Creek are trapped and relocated above the reservoir. Currently adults are only released in Fall Creek, although future releases in Winberry Creek are expected. Smolt passage, as with most dams in the region, is a limiting factor for anadromous runs. Research conducted by ODFW in 1991 indicated that alteration of reservoir head and discharge levels during a large portion of the smolt outmigration could result in higher survival of smolts passing through the dam. The COE implemented this plan resulting in an increased number of returning adult salmon to Fall Creek Dam during the last three years. The Oregon Department of Fish and Wildlife has stocked spring chinook pre-smolts in the reservoir since 1966. Winter and summer steelhead returns are low.

AQUATIC HABITAT AND OTHER FISH SPECIES

Common fish found in the Winberry/Lower Fall Creek Watershed include rainbow trout, cutthroat trout, longnose dace, speckled dace, and several species of sculpin. *Map 39* shows known fish distribution on USFS lands. North and South Fork Winberry Creeks are high-gradient, incised streams. High, flashy winter and spring flows are common in this geographic area. Riparian vegetation is characterized by large conifers which

eventually fall into the stream channel. Quality habitat and channel stability are dependent on the presence and availability of large woody debris (Sedell, et al., 1988).

Warm water fish species of Fall Creek Reservoir include: crappie, largemouth bass, bullhead, large scale suckers, chiselmouth, dace, redside shiner, and sculpin. ODFW stocks 15,000 legal-sized rainbow trout each year as part of the mitigation plan for fish losses due to the presence of Fall Creek Dam. ODFW does not currently manage the lake for warm water gamefish. Resident cutthroat trout enter the reservoir from upstream tributaries and comprise a small component of the fish population.

Native fish commonly found below the reservoir include rainbow and cutthroat trout, longnose dace, speckled dace, sculpin, largescale suckers, whitefish, northern squawfish, redside shiners, and lamprey. Spring chinook, along with winter and summer steelhead, migrate through the area. Exotic fish, such as brown bullhead, largemouth bass and crappie, escape from the reservoir and have been observed below the dam in Fall Creek, although no major populations are thought to exist there (Wade, personal communication). Rainbow trout stocked in Fall Creek move downstream with salmon smolts in the fall. These hatchery fish are often fished downstream from the dam and reach lengths of 14-18 inches.

Oregon chub is an endangered minnow indigenous to the Willamette Valley. The largest populations are found in the Middle Fork Willamette River; populations have not been observed in Fall Creek.

Fall Creek Dam has severely altered stream channel characteristics in Lower Fall Creek. Unnatural flow regimes, the loss of sediment and debris transport have caused the channel to downcut and degrade. Floodplain interactions and riparian vegetation have changed with channel incising and rural development along the stream.

SOCIAL DOMAIN

The Winberry drainage has attracted people for at least 8,000 years. Lush stands of conifers provide shade, shelter, food, and fuel for those using the drainage. A broad valley floor at the confluence of Fall and Little Fall Creeks gives way to steep sided canyons. The ease of travel along ridge tops attracts humans; Alpine and Winberry ridges are no exception.

Native American tribes using this area prior to European settlement were the Kalapuya, Molala and later the Klamath. The earliest Euro-American settlements in Lane County were in Pleasant Hill and Lost Valley during the 1840s. Five families made claims in the Winberry/Fall Creek area in 1850 (Heritage Resource Associates, 1982). Although some serious attempts at gold mining occurred from 1925-1937, companies relied heavily on speculation and neither Winberry, Beacon nor North Winberry Creeks yielded much gold (Breim, 1937).

Today much of Winberry drainage is forested, offering shade, shelter, food, and fuel for visitors. The western portion of this watershed is a popular destination for recreation users, primarily due to its low elevation and proximity to the Eugene/Springfield

metropolitan area. Access is by US Highway 58 and paved county roads. The western portion, a mix of federal and private lands, supports heavy seasonal recreation use, timber management, small scale agriculture, and rural residents. Recreation and tourism are increasing in importance as a source of economic stability to small communities as timber harvest declines (COE, 1991). Long-term local residents and those moving into the area may not share the same values regarding land management practices.

The city of Lowell has seen an increase in single family dwellings over the past two years. One local light industry has expanded, but most residents do not work in Lowell. Traffic on the road between Lowell and Springfield has increased noticeably during the morning and evening hours.

The watershed naturally divides into three distinct recreation zones: lower Fall Creek (below the dam), Fall Creek Reservoir and Winberry Creek drainage. Many factors influence recreation use, including weather, reservoir water level, proximity and accessibility to local population, seasonal increases of users, and land management practices.

Below Fall Creek Dam, Fall Creek flows 7.2 miles before merging with the Middle Fork of the Willamette River. Tufti Wildlife area, just below the dam, offers views of local wildlife, such as Western Pond turtles, deer and neotropical song birds. For many years, Drinkwater Landing, 0.5 river miles below Fall Creek Dam, has been used for picnics, bank fishing, swimming, wading, and boat launching. Lane County operates a small day-use area on Fall Creek, at river mile 5.5, and recreation use there is minimal. Public access is extremely limited because most of the river below the dam is bordered by privately owned residences or farms.

Fall Creek Reservoir is located 23 miles southeast of Eugene, nestled in the western foothills of the Cascade Range. The US Army Corps of Engineers (COE) has the primary management responsibility for the Fall Creek Lake Project, which is ideally suited for water-based recreation such as water skiing, swimming, boating, and fishing. Current recreation use averages more than 250,000 visitors per year, with 75% occurring from Memorial Day through Labor Day. Since 1974, COE surveys have consistently shown that 80% of the visitors to Fall Creek Reservoir come from the greater Eugene-Springfield metropolitan area. Seven recreation areas border the reservoir. Cascara Campground, with 50 sites, is located on the upper end of the Fall Creek arm. Four small dispersed day-use areas are spread out along the northern shoreline. Lane County leases and operates the North Shore Boat ramp and Winberry Park, both popular boat launching and day-use areas.

Sky Camp is located on the peninsula between the Fall and Winberry Creek arms. It is a unique facility in an ideal natural setting, and provides a full range of resources for study. This youth education camp is managed by School District 52, under a cost sharing agreement with the Corps.

Green Mountain, above the upper Fall Creek arm, is occasionally used as a launch site by para-sail/hang-glide enthusiasts.

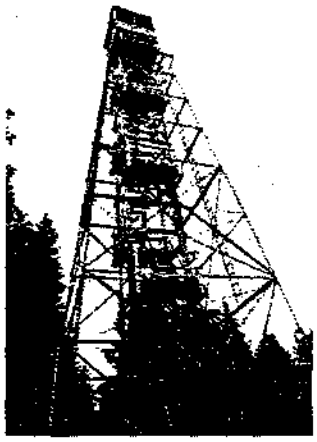
Above the Winberry arm of Fall Creek Reservoir, four miles of private bottomland borders Winberry Creek before reaching the USFS boundary. BLM and private timber lands extend up the valley sides. Public access in this area is limited, with the exception of the Nelson Creek drainage, which accesses BLM managed lands to the north.

The Willamette National Forest encompasses the remainder of the watershed. Most of the people using this area are seeking a more primitive experience. Winberry campground and seven dispersed sites provide solitude in a forested setting. All, with the exception of Little Blanket Shelter, are in riparian reserves.

Although Winberry Creek is not known for outstanding kayaking, both lower Fall and Winberry Creeks are run in the winter during high water. Local boaters are attracted to the quick access, often after work; important during short winter days (Reed, personal communication).

The watershed contains 15.75 miles of trail, most of which are located in upland areas. None were designed for mountain bike use and are showing wear as their popularity increases. The Tire Mountain Trail is categorized as Class I (no timber harvesting within 300 feet), and receives more mountain bike use as the biking population increases locally and the trail is advertised in bike guides and magazines.

Saddleblanket Lookout, a State Historic Preservation site, is the highest point in the watershed and has biological, recreational and historic significance. A former fire lookout sits on top of the mountain, and is accessed by the Saddleblanket trail. It is currently standing but in a state of disrepair. Located on the north side of the mountain, Little Blanket shelter was constructed in the 1930s by the CCC as a shelter for forest workers.



CHAPTER 2
ISSUES AND KEY QUESTIONS

ISSUE 1: TERRESTRIAL HABITAT

Relevant Conditions and Processes

- Alteration of vegetation across the landscape.

Key Questions

1. *How have differences in land ownership and management contributed to changes in the vegetation?*

   Indicators: fragmentation/connectivity, land allocation, land ownership, historic and current seral stages, amount of interior habitat (?)

2. *How have historic management activities affected known populations and habitats of T&E/C3 species, noxious weeds and big game or other wildlife species of concern?*

   Indicators: T&E/C3 species distribution and abundance, special habitats, noxious weeds, big game

3. *How has fire suppression affected vegetation? How and where does fuel loading contribute to the potential for catastrophic fire?*

   Indicators: historic and seral stages, fire history, fuel loading

4. *How does the Winberry/Lower Fall Creek watershed contribute in providing connectivity between adjacent watersheds and Late Successional Reserves?*

   What opportunities might provide or enhance late successional forest habitat for dispersal/movement of terrestrial plant and wildlife species and where are they found?

   Indicators: fragmentation/connectivity, amount of interior habitat, T&E/C3 species distribution and abundance, historic and current seral stages, big game

5. *How has the introduction of non-native species affected the native plants and animals in the watershed?*

   Indicators: noxious weeds, roads, exotic species

Issue 2: Riparian Habitat

Relevant Conditions and Processes

- Changes of riparian habitat function - vegetation changes
- Effects of altered flood levels on floodplains, wetlands and hardwood dominated areas

Key Questions

1. *How have different land use patterns (ex. agriculture, roads, timber harvest) impacted riparian habitat and function above and below the reservoir? What is its importance to federal land managers?*

   Indicators: land allocation, land ownership, historic and current seral stages, roads, channel and floodplain condition, wetlands

2. *How do the riparian reserves (and other withdrawn allocations) currently function as habitat and dispersal corridors for terrestrial and riparian species? What are future trends?*

   Indicators: historic and current seral stages, species distribution and abundance, marten/pileated areas

3. *What opportunities exist for riparian enhancement?*

   Indicators: Riparian seral condition

Issue 3: Aquatic Habitat and Species

Relevant Conditions and Processes

Changes in channel geomorphology and condition such as:

- Downcutting, loss of meander pattern, loss of sediment transportation due to reservoir
- Changes in species diversity and habitat (including herpetiles)

Key Questions

1. *How and where have past management activities (ex. timber harvest, road construction, instream salvage) affected channel complexity above and below the reservoir?*

   Indicators: historic and current seral stages, distribution of riparian seral condition, land allocation, land ownership, reservoir operations, historic fish abundance, channel conditions, changes in stream classification, landslide frequency and distribution, reservoir fish counts, geomorphic processes

2. *Where is the best quality aquatic habitat located, and can these areas be further enhanced or protected?*

   Indicators: channel conditions, distribution of riparian seral condition, reservoir operations, landslide frequency and distribution

3. *How have management activities affected aquatic species (including anadromous and resident populations)? What are the future trends?*

   Indicators: land allocation, land ownership, reservoir operations, relative abundance of species, historic fish abundance, reservoir fish counts

Issue 4: Water Quality and Quantity

Relevant Conditions and Processes

- Changes in stream temperatures
- Landslide frequencies
- Flow condition

Key Questions

1. *What are the implications of applying current state water quality standards on future management of Federal lands in the watershed?*

   Indicators: *distribution of riparian seral condition, water temperature, flow (timing of peak and minimum), road conditions and density (ex. sedimentation), fertilization*

2. *How have reservoir operations affected downstream beneficial uses of water?*

   Indicators: water temperature, flow extremes (timing of peak and minimum)

Issue 5: Timber Harvest

Relevant Conditions and Processes

- Landscape vegetative patterns (ex. tree stocking, maturity and growth)

Key Questions

1. *Where could future harvests occur on federal lands? What acres are available for harvest?*

   Indicators: historic and current seral stages, land allocation, land ownership, big game, special habitat, hydrologic recovery *(from Willamette NF Plan),* Northwest Forest Plan Standards/Guides (15% Late Successional Forest Threshold)

2. *How can silvicultural prescriptions enhance ecosystem process and functions and mitigate impacts to other resources?*

   Indicators: fragmentation/connectivity, amount of interior habitat, historic and current seral stages, land allocation, big game, riparian areas, landslide frequency and distribution, recreation visitor days (RVD)

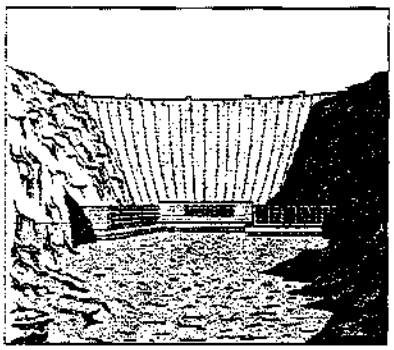
3. *How is federal timber management (BLM) affected by private land management?*

   Indicators: historic and current seral stages, land allocation, land ownership, big game, distribution of riparian seral condition

Issue 6: Reservoir

Relevant Conditions and Processes

- Loss of original stream processes
- Water level fluctuations in the reservoir
- Lack of vegetation causing erosion
- Exotic fish and plants
- Migratory barrier
- Aspect, wind direction and recreational boating impacts on shoreline erosion



Key Questions

1. *What are the effects of operation on anadromous fish, wildlife and recreation? What opportunities exist for reducing conflicts while maintaining ecosystem process and function?*

   Indicators: species distribution and abundance, noxious weeds, water temperature, number of returning adult fish, juvenile fish survival of passage, regulated flow, recreation visitor days, recreation use patterns (location, amount, type of use), public comments, fish mortality

2. *What is the extent of shoreline erosion and what opportunities exist for its stabilization?*

   Indicators: reservoir operations, recreation use patterns, wind direction, shoreline aspect

ISSUE 7: HUMAN USES

Relevant Conditions and Processes

- Increased demand and use due to statewide population increases and more urban residents

Key Questions

1. *How will current and future management practices affect human use of the watershed (upstream and downstream of the reservoir)?*

   Indicators: land allocation, land ownership (public access), recreation use patterns, public comments, requests for special use permits

2. *What management practices are available to enhance or protect recreation opportunities in the watershed? How could future recreation trends affect ecological processes?*

Indicators: land allocation, land ownership, recreation use patterns, public comments, requests for special use permits, recreation trends

CHAPTER 3
REFERENCE AND CURRENT CONDITIONS

PHYSICAL DOMAIN

GEOLOGY

Winberry/Lower Fall Creek analysis area is the second largest drainage in the Fall Creek subwatershed. It has 43,890 acres and encompasses the entire Winberry subwatershed as well as the reservoir portion of Fall Creek subwatershed. The analysis area has been subdivided into five drainages *(see Mylar Overlay)*. The largest is South Reservoir with 13,439 acres; Brush Creek is the smallest with 2,620 acres.

An east-west trending ridge divides the upper portion into South Fork Winberry Creek and North Fork Winberry Creek. There are two main tributaries on South Fork Winberry Creek: Cabin Creek and Monterica Creek. North Fork Winberry Creek has three main tributaries: Blanket Creek, Traverse Creek and Brush Creek. Just east of the USFS boundary, the North and South Forks of Winberry Creek combine to form mainstem Winberry Creek. Its main tributaries between the national forest boundary and Fall Creek Reservoir are Alder Creek and Nelson Creek. Numerous unnamed tributaries enter Fall Creek Reservoir during full pool. Fall Creek flows from the reservoir, collects a few unnamed tributaries and joins Little Fall Creek three miles below the reservoir, where the analysis area ends.

Igneous extrusives such as tuffs, lapilli tuffs, tuffaceous sedimentary pyroclastics, and lava flows predominate. Igneous intrusive rocks account for less than 1% of the watershed. Distribution estimates of extrusive rock types range from 75-80% pyroclastic origin and 20-25% lava flows (Peck and others, 1964, Sharrod, 1991). Spatially, the older rocks are predominately tuffs and tuffaceous sedimentary rocks and tend to be found at lower to middle elevations. Younger rocks are predominantly basaltic or andesitic lava flows and are generally found at higher elevations, such as Saddleblanket Mountain and Alpine Ridge.

Emplacement of numerous dioritic-dacitic intrusions between ten and three million years ago resulted in thermal and hydrothermal alterations of the inplaced rocks. This alteration produced an increase in clay minerals, now found in the soils of many areas. Hydrothermal activity is also responsible for weathering many flow rocks, resulting in decreased strength and rapid degradation when used as crushed aggregate. Some of these have been used in the past, resulting in marginal aggregates that degraded quicker than expected and generated more fines than acceptable.

Hydrothermal activities were responsible for the mobilization and subsequent deposition of most quartz, agate and jasper found throughout the watershed at lower and middle elevations. Some of these silica deposits were utilized by the indigenous people for tools such as projectile points, scrapers, knives, etc. Today this material is frequently found at

cultural resource sites and is referred to by archeologists as *"cryptocrystalline silica"* (CCS). The BLM has a few mining claims located on cryptocrystalline silica deposits north of Horn Butte.

The volcanoes that produced these rocks have weathered away and created the landscape seen today, which is almost entirely erosional. The older, less altered rocks in the lower portion of the watershed have weathered longer and at a more uniform rate, resulting in flatter ground and thicker soils at lower elevations. These are the areas most prone to landflows and rotational failures. Some of the higher ridges are examples of *"inverted topography"*, where lava flows filled stream valleys and were left as topographic highs when surrounding pyroclastic rocks eroded more quickly. These areas and steep stream sides are the most prone to debris failures.

Soils

The following discussion of soils found in the watershed requires the reader to have a working knowledge of the nomenclature of the Willamette National Forest Soil Resource Inventory (SRI) and the Soil Conservation Service Survey of Lane County Soils (SCS). The SRI was written in 1973 and its maps revised in 1990. The map revision has not been field verified *(see Map 7)*.

To simplify the analysis of soils, the 1990 SRI soil and SCS mapping units within the watershed have been grouped into five categories. These categories are based on similar soil properties and expected behavioral response to management activities *(See Table 2)*.

Category 1 consists of 1990 SRI mapping units 25, 35 and mapping unit complexes which include 100% of Units 25 and 35, i.e., 255. Typically, these soils are on gentle to moderately hummocky sideslopes (5-40%), deep (6-12+ feet), clayey, and sometimes associated with earthflow geomorphology.

Although this landform includes past large-scale earth movements, it is usually stable in its current slope geometry, with the exception of localized areas such as road-cuts and stream channels. In-place shear strength can be low to high depending on the moisture content, but the remolded strength (such as in roadfills and subgrades) tends to be low. During construction controlled compaction techniques are required and the material is not allowed to saturate. It is often necessary to exclude the surface and subsurface water from these soils to maintain a stable road prism. Due to these soils' low permeability, overland flow of water commonly results in sag ponds and supports hydrophytic vegetation and habitat for aquatic and amphibian animals.

Category 2 consists of SRI complexes which include at least 50% of the mapping units in Soil Category 1. The behavior of soils in this category is similar to that outlined for Category 1, but the frequency of occurrence is limited to 50-60% of the mapping area. Landforms tend to be slightly steeper than Category 1 and are often associated with draws and swales on midslopes (*to simplify the map, these two categories have been combined)*.

Category 3 is 100% of SRI mapping units and complexes, characterized by steep terrain with shallow rocky soils (depth to bedrock is 0-3 feet). This category is more likely to have high surface and subsurface erosion potential and exhibit the highest number of road and harvest related failures. The sediments produced are typically coarse-grained. Harvest related slope failures tend to result from the loss of root strength after timber harvest and often occur where water concentrates.

Category 4 consists of SRI complexes which include at least 50% of the mapping units described in Category 3. The behavior of these soil types is similar to those outlined in Category 3, but at a lesser frequency.

Category 5 consists of the remaining SRI units and complexes. This category represents a wide range of geomorphic settings which tend to be more stable.

The preceding soil categories were first used in the Geology/Soils section of the 1993 Lowell Ranger District Watershed Assessment (pp. 90-99), by Mark Leverton, South Zone Geotechnical Leader. The reader is referred to this document for a more detailed discussion.

Table 2. SRI and SCS Mapping Units by Soil Category

Soil Category	Definition of SRI Soil Categories	SRI/SCS Mapping Units
Category 1	nearly 100% clayey soils	**SRI:** 22, 25, 35 255 **SCS:** 1A, 11C, 12E, 15E, 33, 36D, 41E, 43C, 43E, 52B, 52D, 58D, 58F, 63C, 66D, 69E, 77B, 80F, 80G, 81D, 83B, 89C, 89D, 89E, 102C, 104E, 104G, 108C, 108F, 121B, 121C
Category 2	at least 50% clayey soils	**SRI:** 23, 33, 235, 251, 252, 253, 254, 256, 335, 353, 356 **SCS:** 107C, 89F
Category 3	nearly 100% steep ground and shallow soils	**SRI:** 1, 2, 3, 8, 16, 21, 31, 61, 201, 202, 203, 204, 210, 301, 302, 310, 315, 316, 444, 601, 602, 603, 610 **SCS:** 16H, 40H, 65G, 65H, 72G
Category 4	at least 50% steep ground and shallow soils	**SRI:** 161, 168, 212, 213, 214, 215, 216, 304, 305, 313, 332, 441, 517, 604, 605, 606, 607, 608, 614, 515, 616, 617 **SCS:** 11F, 16F, 71G, 99H
Category 5	all others	all others

Erosion

In order to evaluate the assumptions behind the soil behavior categories and evaluate trends, data were collected to determine the following:

1. Slope failure frequency for each subwatershed by failure type *(See Table 3),*
2. Slope failure frequency for each Soil Category by failure type *(See Table 4),* and
3. Miles of road in each Soil Category on sideslopes greater than 50% for each drainage *(See Table 5 and Table 6).*

The bulk of data relating to the type, frequency, location, aspect, and most likely impacted stream(s) came from the examination of four sets of aerial photos 1949/1955, 1967, 1990, and 1995. The remaining data came from a combination of data from the Lowell Ranger District Watershed Improvement Needs report (1995), Lowell Ranger District district-wide assessment (1994), and personal communication with Larry Tennis, Lowell Ranger District Road Manager.

Using aerial photos as a data source for slope failures has accuracy limitations and gives a biased picture of actual ground conditions. The easiest failures to recognize were debris failures associated with newly constructed roads and clearcut harvest units. Cutslope failures were difficult to distinguish from large road cuts and small borrow sources. Small to medium rotational failures were extremely difficult to recognize in unmanaged areas. It is important to remember that this data is biased toward increasing the percentage of failures attributed to management activities, rather than those occurring in unmanaged areas. The latter are difficult or impossible to see due to the forest canopy, the small scale (limiting size of what is identifiable) and examination time constraints. However, though percentages may not reflect absolute accuracy, the trends, conclusions and recommendations based on these data are correct and meaningful.

Prior to logging and road building, slope failures were typically assumed to be landflows on shallow slopes with deep soils and debris slides on steep sideslopes having thinner soils. The age of these failures is unknown, but presumably they are hundreds of years old, judging by the age of trees growing on top of these slope movements; large scale landflows and landslides may be thousands of years old. Aerial photo analysis found no failures on unmanaged ground. The Oregon State Geology Map shows two areas of landslide deposits; one in the North Fork Winberry watershed and one on private lands west of the Forest Service boundary *(see Map 6).* On Forest Service lands, the 1973 SRI map identifies three landflows or slump areas; one in North Fork Winberry drainage (also identified on the Oregon State Geology map), one in Upper South Fork drainage and one at the confluence of the North and South Fork drainages.

The SRI also identifies unstable areas associated with steep shallow soils characterized by Soils Categories 3 and 4. Signs of recent movement are not seen on aerial photos. Debris slides are found along steeper stream sides and the higher, steeper mountainsides. One debris slide is found along Cabin Creek, one on the upper reaches of South Fork Winberry Creek and the most recent occurred in 1990 along Blanket Creek. These debris slides are visible on the 1967 and 1990 sets of aerial photos. The few remaining failures on unmanaged ground are scattered throughout the watershed.

Of these, it was not possible to determine if they occurred on all sets of aerial photos. Still, it is valid to say that the number of failures on unmanaged ground is basically the same, or has only slightly increased during the past 50 years.

After logging began, new failures identified were associated with road construction and timber harvesting. Of 46 failures, 29 are road related and 17 are related to harvest *(See Table 3 and Table 4)*. The majority of these occurred in road fill slopes built when sidecast road construction on very steep ground was standard practice. Sidecast construction on steep slopes was phased out during the late 1970s and early 1980s. The rate of fill failures typically decreases in the second or third year following an initially higher failure rate, since the most unstable areas tend to fail first. This rate continues to decrease for a few years and then generally levels off, as small failures along the outside edges develop due to settlement of typically poorly compacted fill edges and incorporated rotting organic debris.

Table 3. Failure Types by Drainage

Drainage	Road	Harvest	Unmanaged	Total
North Fork Winberry Creek	2	3	0	5
Brush Creek	3	0	0	3
Upper S. Fork Winberry Creek	15	9	0	24
Lower S. Fork Winberry Creek	5	1	0	6
South Reservoir	3	4	0	7
North Reservoir	1	0	0	1
TOTAL	29	17		46

Table 4. Failure Types by Soil Category

Soil Category	Road	Harvest	Unmanaged	Total
Category 1	1	1		2
Category 2	0	0	0	0
Category 3	21	10	0	31
Category 4	6	5	0	11
Category 5	1	1	0	2
TOTAL	29	17		46

Although 55% sideslope is usually used as the limit on which typical fills can be constructed, information available from GIS required definition of steep ground to be "greater than 50%." For this watershed analysis, it is thought that the 5% difference does not have a significant effect on slope failure distribution.

Table 5. Miles and Percentage of Roads on Sideslope by Drainage

Drainage	Road on Sideslopes				
	Miles < 51%	% < 51%	Miles ≥ 51%	% ≥ 51%	Total Miles
North Fork Winberry	46.0	99.6%	0.2	0.4%	**46.02**
Brush	17.5	98.4%	0.3	1.6%	**17.8**
Upper South Fork Winberry	51.3	84.2%	9.6	15.8%	**60.9**
Lower South Fork Winberry	20.6	90.6%	2.1	9.4%	**22.7**
South Reservoir	89.3	97.3%	2.7	2.5%	**91.8**
North Reservoir	54.5	98.9%	0.6	1.1%	**55.1**
TOTAL	**279.2**		**15.2**		**294.4**

Table 6. Miles and Percentage of Roads on Sideslopes by Soil Category

SRI Soil Category	Road on Sideslopes				
	Miles < 51%	% < 51%	Miles ≥ 51%	% ≥ 51%	Total Miles
1	106.9	35.3%	0.6	0.2%	**107.5**
2	40.4	13.7%	0.3	0.2%	**40.7**
3	25.8	8.5%	9.4	3.1.6%	**35.2**
4	37.0	12.2%	3.1	1.0%	**40.1**
5	69.0	23.4%	1.9	0.6%	**70.9**
TOTAL	**279.1**	**94.9%**	**15.3**	**5.1%**	**294.4**

The erosion potential for each Soil Category was determined by averaging the surface and subsurface erosion potential using SRI erosion potentials. Category 3 had the highest erosion potential, followed by Categories 4, 1, 2, and 5 *(see Table 7and Map 7)*. Based on the gradation of SRI soils comprising the Soil Categories, Categories 1 and 2 can be expected to yield the greatest percentage of fine-grained sediments; Categories 3

and 4 can be expected to yield the greatest volume of coarse grained sediment, while Category 5 produces a mixture of both at a more moderate rate.

Table 7. Erosion Rating of SRI Soil Categories

Rating	Soil Category	Surface and Subsurface
Least	5	Low to Moderate
Second	1	Moderate
Third	2	Moderate to Moderately/High
Fourth	4	Moderate/High to Severe
Highest	3	Moderate/High to Very Severe

The watershed has approximately 294 miles of road. South Reservoir has the most with 99 miles. North Fork Winberry, Upper South Fork Winberry and North Reservoir have about equal numbers of approximately 46-60 miles. Brush and Lower South Fork Winberry have between one and 23 miles of road each. Table 9 shows the Soil Category distribution by drainages in acres. Table 10 shows the percentage of drainages in each Soil Category.

Sixty three percent of recognized slope failures are road-related; 91% of these occur in Categories 3 and 4, which feature steep sideslopes and shallow, coarse-grained soils. These soils represent 33% of the watershed. Twenty five percent of the watershed contains roads built on these soils, of which four percent are on slopes greater than 50% *(see Table 8)*. All slope failures recognized during photoanalysis occurred on managed ground.

Table 8. Road Distribution by Drainage

Drainage	% of total roads in drainage	% on sideslopes > 50%
North Fork Winberry Creek	15%	0.1%
Brush Creek	6%	0.1%
Upper South Fork Winberry Creek	20%	3.2%
Lower South Fork Winberry Creek	8%	9.4%
South Reservoir	33%	2.5%
North Reservoir	18%	1.6%
TOTAL	100%	16.9%

Table 9. Soil Category Distribution by Drainage (acres)

	Soil Category				
Drainage	1	2	3	4	5
North Fork Winberry Creek	1217	2341	514	1250	1122
Brush Creek	725	570	250	1041	33
Upper South Fork Winberry Creek	484	2200	3080	1445	1402
Lower South Fork Winberry Creek	405	765	2110	1330	302
South Reservoir	5913	359	855	1566	4290
North Reservoir	4494	13	399	50	1564

Table 10. Percentage of Drainage in Each Soil Category

		Soil Category				
Drainage	Total %	1	2	3	4	5
North Fork Winberry Creek	100%	19%	36%	8%	19%	17%
Brush Creek	100%	28%	22%	10%	40%	1%
Upper South Fork Winberry Creek	100%	6%	26%	36%	17%	16%
Lower South Fork Winberry Creek	100%	8%	16%	43%	27%	6%
South Reservoir	97%	44%	3%	6%	12%	32%
North Reservoir	83%	57%	0%	5%	1%	20%

Reservoir

Wind and recreational boating are the main sources of waves contributing to shoreline erosion in Fall Creek Reservoir. Winds are generally westerly and affect shorelines with a west, north or south aspect. Waves from recreational boating affect the shoreline most when boats are close to shore. On busy weekends, waves impact the shoreline from all angles, but are most erosive in narrow areas of the reservoir.

Slope of the foreshore also plays an important part in the erosive power of waves. The gentler the foreshore slope the less power a wave exhibits on the shoreline. Shoreline composition determines the actual amount of erosion that takes place. For example, if the shoreline is composed of soft material such as clays, then the erosion will be substantial. If, however, the shoreline is bedrock then the erosion rate will be less.

Current erosional areas and the amount of shoreline erosion in the reservoir were analyzed using a survey conducted by George Hill, Park Ranger for the Army Corps of Engineers. This survey identified shoreline erosion in the reservoir and categorizes it as "Low, Medium or High" *(see Map 8)*. Table 11 summarizes the survey data.

Table 11. Shoreline Erosion Categories of Fall Creek Reservoir

Erosion Rating	Low	Medium	High	Total
Number of Sites	5	14	8	27
Length (feet)	1800	13,500	7,950	22,950
Percent of Shoreline	.02%	12%	7%	19%
Average Shoreline Height (feet)	3	3.8-5.2	3.75-9.25	
Foreshore Slope	moderate	moderate	mod-steep	
Exposure/Aspect	S / SE / N	all	all	
Wave Action	low-moderate	moderate	high	
Dominant Substrate	clay/gravel/rock	all types	breccia/rock/clay	

George created the shoreline erosion rating system based on his knowledge of the area, having worked at Fall Creek Reservoir during the past 14 years. Annual lowering of the reservoir six feet during peak recreation use might contribute to wave erosion of saturated clayey soils on cutslopes. Whether or not this occurs could be identified by completing area surveys and recording observations of changes in erosional rates during recreational high use periods.

HYDROLOGY

Stream Flow Conditions

Reference Conditions (Pre-Reservoir)

Stream flow fluctuations responded to both rainfall and snow melt; the latter extended relatively high flows into late spring. Annual precipitation in the watershed ranged from 45 inches per year in the western portion to 70 inches in the east. A marked decline in stream flow during the summer months was typical both in reference and current conditions. This low stream flow impacted fisheries, recreation, irrigation, and domestic use along Fall Creek and Winberry during the turn of the century. The largest historical flood in Fall Creek occurred in December, 1861. Peak discharge during that storm was estimated at 29,000 cfs, based on very limited information. The second largest flood

occurred in February, 1890 with an estimated peak discharge of 27,000 cfs. Considering bankfull conditions (a 1½-year event storm) are approximately 10,000 cfs, these historical storms undoubtedly damaged crops or settlements located adjacent to Fall Creek. These flood volumes exceeded any subsequent flood events.

Current Conditions (Post-Reservoir)

The natural flow of Fall Creek and the lower three miles of Winberry Creek has changed significantly from historic conditions due to the installation of Fall Creek Reservoir. Construction of the reservoir was completed in October, 1965 and operations began in 1966. Reservoir water levels typically range in elevation from 830 feet at full pool to 728 feet at minimum pool. The reservoir surface area is roughly 1860 acres at full pool, with an approximate volume of 125,000 acre-feet and a shoreline extending about 22½ miles. Near the dam maximum depth at full pool is an estimated 160 feet.

The annual cycle of seasonal wet/dry periods requires evacuation of the reservoirs in this area to provide temporary water storage during storm events and seasonal increases in precipitation. The sequence of reservoir draw-down is negotiated annually in the spring during COE discussions and public meetings. The last reservoir draining to streambed occurred in the fall of 1987. In 1995, Fall Creek Reservoir was one of the reservoirs used to augment flow in the mainstem Willamette River during summer and early fall, and was drawn down to an elevation of 694 feet.

Average Discharge

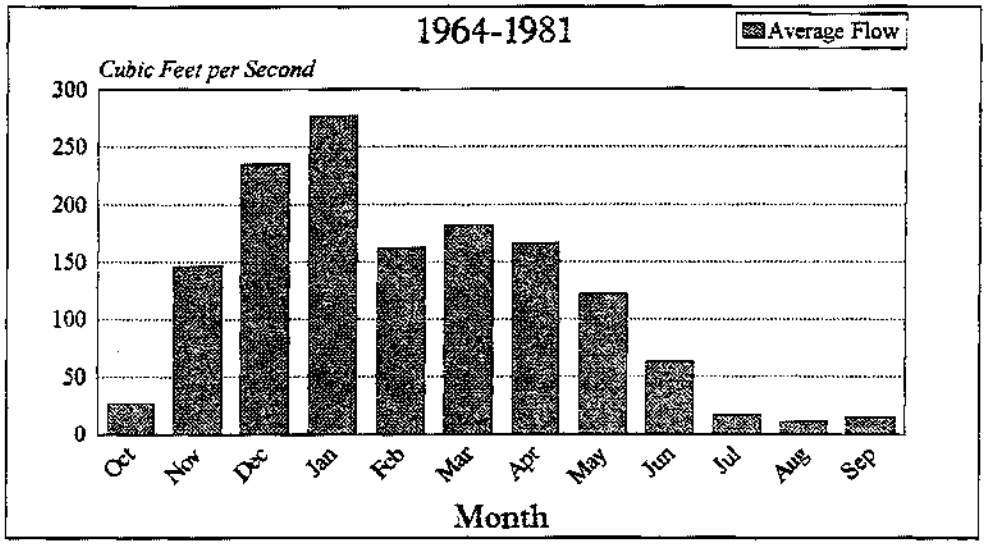
Reference Conditions (Pre-Reservoir)

Average discharge for Winberry Creek was 118 cfs, or 85,490 acre-ft/yr from a drainage area of 44 square miles *(see Table 12)*. These statistics are presumed to reflect both reference and current conditions, since this creek remains unregulated. Average monthly stream flow is illustrated in Figure 1.

Table 12. Winberry Watershed Total Yield and Peak Flows

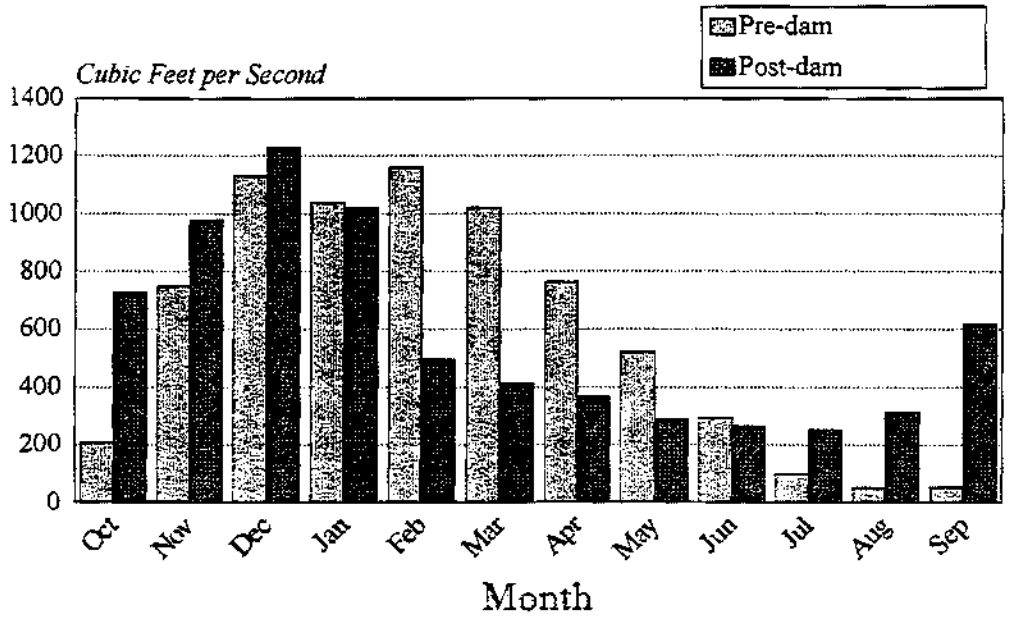
	Fall Creek		Winberry Creek
	Upper Fall Creek USGS Station 14150300	**Lower Fall Creek** USGS Station 14151000	**Winberry Creek** USGS Station 14150800
Total Yield	299,200 acre-ft/yr	422,400 acre-ft/yr (adjusted since Jan., 1965)	85,490 acre-ft/yr
Maximum Recorded Flow	12,100 cfs	24,700 cfs	4500 cfs
Minimum Recorded Flow	16 cfs	1.5 cfs	1.5 cfs
Average Recorded Flow	413 cfs (1963-1987)	583 cfs (1936-1987) (adjusted since Jan., 1965)	118 cfs (1963-1981)

Figure 1. Average Monthly Discharge - Winberry Creek



On Lower Fall Creek, the average annual discharge prior to reservoir construction was 583 cfs, or 422,400 acre-ft/yr, from a drainage area of 186 square miles. Upstream from the confluence of Winberry Creek and Fall Creek, the average discharge of Fall Creek was calculated at 413 cfs, or 299,200 acre-ft/yr from a drainage area of 118 square miles. Data from Fall Creek and Winberry gaging stations indicates that seventy percent of the water flowing into Lower Fall Creek entered the system from Upper Fall Creek rather than Winberry Creek before the reservoir existed *(see Map 15).*

Figure 2. Lower Fall Creek Average Monthly Discharge



Current Conditions (Post-Reservoir)

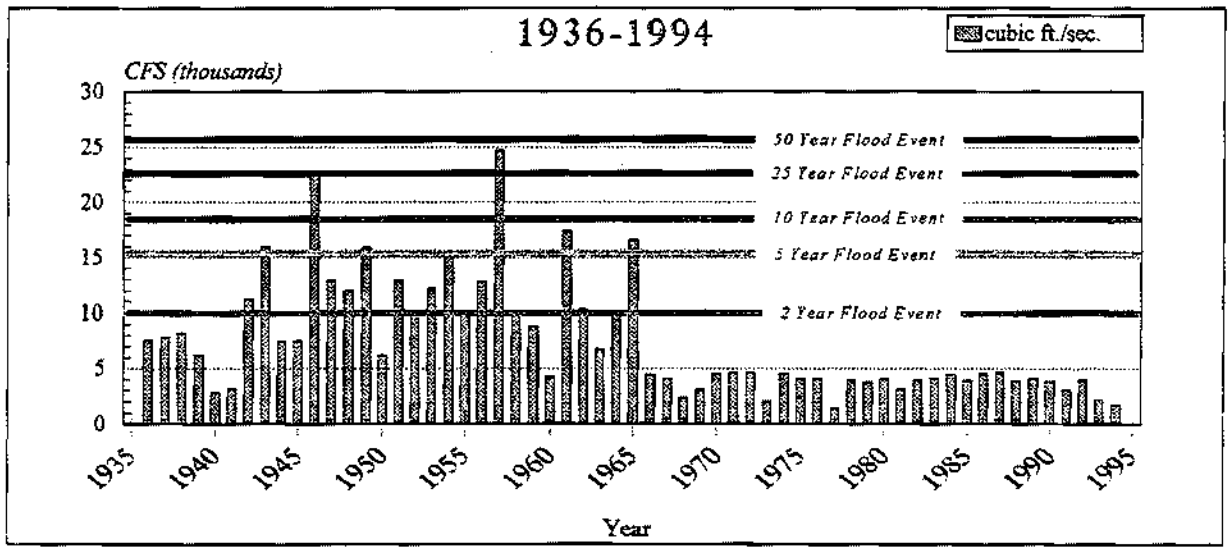
Figure 2 compares average monthly discharge of Lower Fall Creek before and after construction of Fall Creek Dam. Dramatic differences highlight the current seasonal changes in flow resulting from operation of the reservoir. Stream flows in the late summer and early fall have increased in Lower Fall Creek due to timed release of water from the reservoir. On the other hand, stream flows in late winter and early spring are lower than reference conditions due to filling of the reservoir.

Instantaneous Peak Flow

Reference Conditions (Pre-Reservoir)

Instantaneous peak flow is defined as the highest water level measured at a gaging station on a single day. A *recurrence interval* (RI) is the probability that a certain magnitude flood event will occur over a given period of time. Significant flood events in the analysis area occurred in water years 1943, 1946,1949, 1957, 1961, and 1965. The instantaneous peak flow for a five-year flood event on Lower Fall Creek during historic times is estimated at 15,200 cfs. During the 1964 flood, instantaneous peak flow was 16,600 cfs; therefore this flood was slightly higher than a five-year event at this location. The highest instantaneous peak flow ever measured on Lower Fall Creek was on December 11, 1956 at 24,700 cfs. The storm was nearly a 50-year flood event for that channel *(see Figure 3).*

Figure 3. Instantaneous Peak Flow - Lower Fall Creek



Since Winberry Creek has not been regulated, data collected between 1964-1981 is presumed to generally reflect pre-dam conditions for that stream. In Figure 4, instantaneous peak flow data shows that many two- and five-year flood events and one ten-year event (1964 flood) have occurred at the gaging station location. During the

1964 flood, the instantaneous peak flow measured was 4,500 cfs, greater than a ten-year flood event and less than a 25-year flood event.

Current Conditions (Post-Reservoir)

USGS created statistical estimates for 2, 5, 10, 25, 50, and 100 year flood events for the gaging station locations in the analysis area, shown in Table 13. The volume of water typical for a historical two-year event (10,000 cfs) on Lower Fall Creek has not occurred since operation of the reservoir began in 1966. Numerous flow events greater than a two-year event have been recorded along Winberry Creek. Three storm events measured there were greater than or equal to a five-year event during the period of record *(see Figure 4)*.

Table 13. Instantaneous Peak Flows from USGS Equations

Recurrence Interval (Years)	Exceedance Probability	Upper Fall Creek (1964-1987)	Lower Fall Creek (1936-1965)	Winberry Creek (1964-1981)
1.25	80%	4,210 cfs	6,430 cfs	1,080 cfs
2	50%	6,590 cfs	10,000 cfs	1,740 cfs
5	20%	9,890 cfs	15,200 cfs	2,860 cfs
10	10%	12,000 cfs	18,500 cfs	3,740 cfs
25	4%	14,700 cfs	22,800 cfs	5,030 cfs
50	2%	16,500 cfs	25,900 cfs	-- 0 --
100	1%	-- 0 --	28,900 cfs	-- 0 --

Figure 4. Instantaneous Peak Flow - Winberry Creek 0.75 Miles Above Reservoir

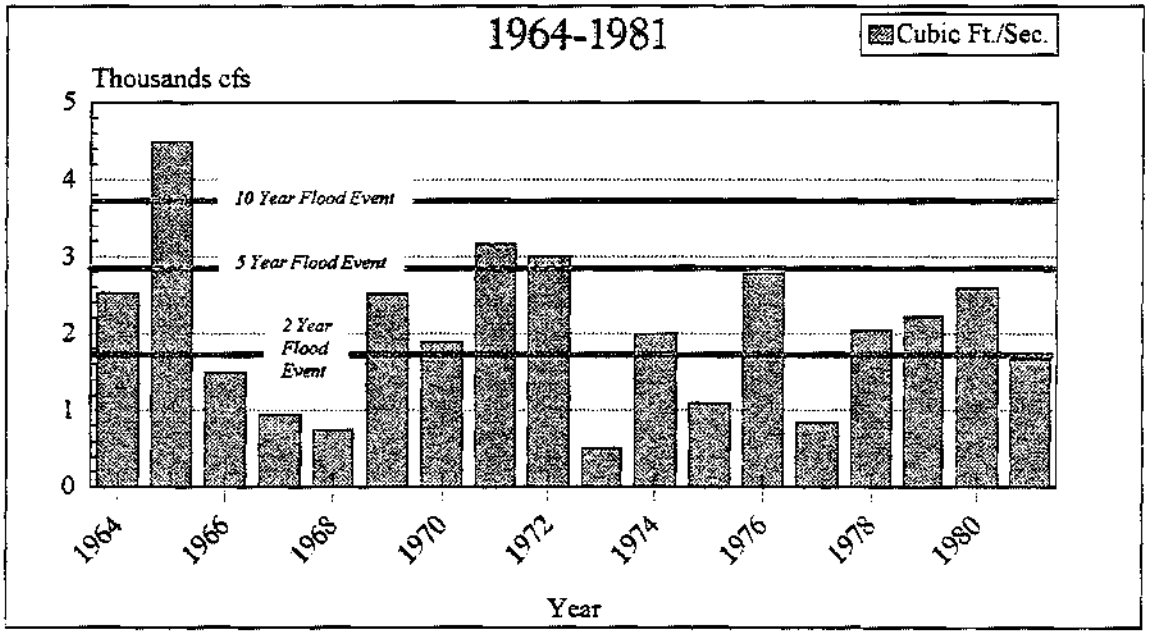
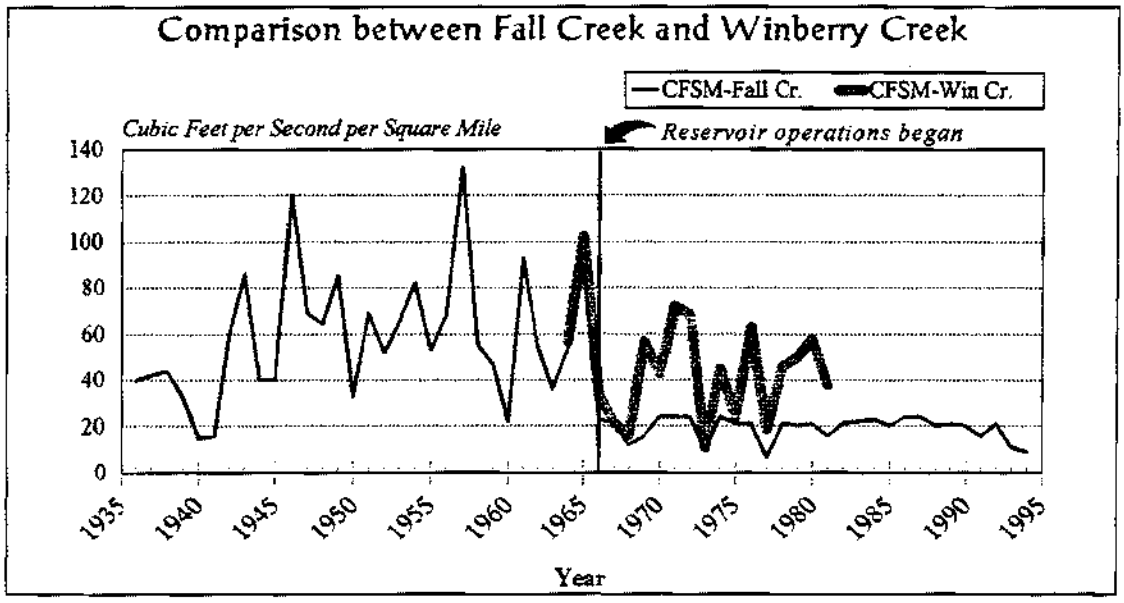


Figure 5 compares the instantaneous peak flows of Fall Creek and Winberry Creek. Notice that Winberry Creek continues to exhibit natural fluctuations in water volume, whereas Lower Fall Creek flow is managed to prevent such fluctuations and potential flooding.

Figure 5. Instantaneous Peak Flow



Minimum Flow

Historically, average minimum flows on Lower Fall Creek ranged from 50 to 100 cfs during July through September. Following completion of the Fall Creek dam, average minimum flows between July and September ranged from 250 to 600 cfs (USGS data). At the same time, minimum flows measured on Winberry Creek were between 10 and 15 cfs, and are presumed to remain the same currently.

Rainfall/Runoff Characteristics

Runoff characteristics of a watershed are evaluated based on the amount of precipitation an area receives, water retention properties of the soil, aspect, drainage density, elevation, road density, and vegetation. The effects of timber harvesting and road construction on local hydrology is being studied by researchers, but is not easily quantified. Research in western Oregon has indicated that the majority of larger peak flows have resulted from snowmelt during rainfall. R. D. Harr (1981) found that in watersheds within the zone of transient shallow snowpacks, higher peak flows were up to five times more prevalent from rain-on-snow storm events than from rain only. Not surprisingly, a higher number of landslides occurred during rain-on-snow storms than from rain storms alone. Not only are the uplands altered during these events due to landsliding, but streams also carry large amounts of sediment and deposit woody debris in the channels. Channel morphology can be altered due to bank undercutting, downcutting of the stream bed and redistribution of sediment in the channel.

Nearly 60% of the Winberry watershed is within the transient snow zone, situated between 1500 feet and 4200 feet in elevation *(see Map 11)*. The transient snow zone exhibits a high potential for runoff under conditions such as warm wind and rain following a period of snow accumulation. Aspect influences the type of vegetation growing on the site, local precipitation patterns, snowmelt, and wind exposure. South and west slopes respond to snowmelt much more quickly than north and east aspects. About 58% of the Winberry watershed has a south or southwest aspect *(see Map 12)* with precipitation ranges from 45 inches per year below the reservoir to a maximum of 70 inches per year on the eastern edge *(see Map 13)*.

Groundwater storage capacity is directly related to the type and depth of soil and bedrock. Relatively shallow soils are less prone to storing water and have the potential of being the greatest contributors to increased stream flow during high runoff events. Deep soil areas generally have the ability to store water and contribute to the maintenance of base flows. *Base flow* is defined as the sustained or fair-weather runoff found in a drainage. In the Winberry watershed, Soil Category 1 is considered to have a low runoff rate, a high water retention capacity (due to deeper thickness and higher clay content) and is important in sustaining base flow. Soil Category 2 tends to occur on steeper terrain than Category 1, and has a moderate runoff rate, moderate water retention capacity (>50% clay soil) and contributes both to base flow and overland flow. Soil Categories 3 and 4 are found on steep terrain and have coarser sediments such as broken rock, sand and silt and are shallower than Categories 1 and 2. These soils have a high runoff rate, low water retention capacity (due to grain size) and contribute primarily to overland flow.

Vegetation affects surface runoff by changes in the evapotranspiration rates. Closed or dense canopies can intercept some precipitation by absorption before it reaches the ground. Dense stands of timber also probably protect an accumulated snowpack from rapid melting by reducing the amount of light and wind in the understory.

Table 14. Drainage Density for Each Drainage

Drainage	Stream Length (mi.)	Catchment Area (mi^2)	Density (mi/mi^2)
Brush Creek	31.2	4.1	7.6
Lower South Fork Winberry	55.9	7.7	7.3
Upper South Fork Winberry	89.0	13.5	6.6
North Reservoir	54.4	12.3	4.4
South Reservoir	88.7	21.0	4.2
North Fork Winberry	76.2	10.1	7.5
Total Winberry/ Lower Fall Creek Watershed	**395.4**	**68.6**	**5.8**

Basins with high drainage density are characterized by a finely divided network of streams with short lengths and steep slopes. In contrast, a basin with low drainage density is less strongly textured. Stream lengths are longer, valley sides flatter and the streams further apart. Table 14 shows the drainage density for each drainage in the Winberry analysis area. Drainage density is controlled by bedrock type, its resistance to erosion, amount of precipitation, and vegetative cover. Not surprisingly, the highest drainage densities are found on the steeper topography of the eastern half of the watershed.

Reference Conditions

In the early 1900s, a significant portion of the watershed was burned by a wildfire, resulting in the establishment of young timber stands in the Mt. Salem, Horn Butte and South Fork of Winberry Creek areas, all within the transient snow zone. Although no data is available, stream flows were probably impacted by vegetation changes in these areas as the snow pack was more exposed to wind and warmer temperatures on south or southwest facing slopes. Accounts of early floods were very sketchy, but researchers have tried to correlate significant storm events with temperature and snowpack estimates to determine if snowmelt contributed significantly to flood magnitudes. In a study conducted by R. D. Harr (1981), many of the significant floods impacting the Willamette Valley resulted not only from copious amounts of precipitation but also because the snowpack in the Western Cascades melted rapidly during these storm events. The two largest floods noted in the Fall Creek area (December, 1861 and February, 1890) fit this storm profile. Since very few roads were in the area historically, their influence on increasing stream flow was not thought to be significant.

Current Conditions

Table 15 lists current vegetation by seral stage within the rain-dominated, transient snow and snow zones of the analysis area. Of primary interest here, are lands with a south or west aspect that have been harvested during the last 30 years (stand initiation seral stage) and falling within the transient snow zone. These areas are thought to be more prone to producing higher, quicker runoff during rain-on-snow storm events, which contribute to increased peak flow in the stream system. Approximately 32% of the watershed is in the stand initiation seral stage and about 60% of these stands are situated within the transient snow zone. Most of these acres (80%) have a south or west aspect. Combining these criteria and using GIS, it is estimated that 15.5% of the Winberry watershed has young stands of timber having a south or west aspect within the transient snow zone *(shown on Map 14)*. Of these acres, 77% are managed by the federal government. As shown on *Map 14,* these areas in the upper reaches of the Upper South Fork Winberry and Brush Creek drainages coincide with Category 3 soils which have high run-off rates and may be especially prone to landsliding.

Table 15. Summary of Snow Zones by Seral Stage*

Seral Stage	Stand Initiation	Stem Exclusion	Understory Reinitiation	Late Successional Old Growth	Reservoir	Non-forested	Total
Rain	💧						
Acres	5,324	5,370	1,960	295	1,687	1,300	15,936
% of Rain	33.4%	33.7%	12.3%	1.9%	10.6%	8.2%	100%
% of WA	12.1%	12.2%	4.5%	0.7%	3.8%	3.0%	36.3%
Transient	💧/❄						
Acres	8,496	5,587	6,867	5,583	0	92	26,624
% of Transient	31.9%	21.0%	25.8%	21.0%	0.0%	0.3%	100%
% of WA	19.4%	12.7%	15.6%	12.7%	0	0.2%	60.7%
Snow	❄						
Acres	119	207	83	783	0	136	1,328
% of Snow	9.0%	15.6%	6.3%	58.9%	0.0%	10.3%	100%
% of WA	.03%	0.5%	0.2%	1.8%	0	0.3%	3.0%
All Zones	💧	💧/❄	❄				
Total Acres	13,939	11,163	8,910	6,661	1,687	1,528	43,889
% of WA	31.8%	25.4%	20.3%	15.2%	3.8%	3.5%	100%

*Private and Federal lands combined

Certainly road construction has altered the timing and magnitude of stream flow in comparison to reference conditions. Streams within the watershed have been "extended" from reference conditions due to the direct routing of surface water from road ditches to stream crossings. The sizable road system has probably increased the area's potential peak flows, but this is not easily quantified. Using current GIS information, the average road density for the watershed is 4.175 miles of road per square mile. Table 16 gives the road density by drainage. It has not been determined what percentage of the road system is connected to the stream system and how this "extension" increases stream density in the watershed.

Table 16. Road Density by Drainage

Drainage	Roaded miles/ square mile
Brush Creek	4.3
Lower South Fork Winberry	2.9
Upper South Fork Winberry	4.0
North Reservoir	4.6
South Reservoir	4.7
North Fork Winberry	4.5
Average	4.175

WATER QUALITY

Reference Conditions (Pre-Reservoir)

During the early 1900s, heavy logging took place in the Winberry Valley. Logs were sluiced down Winberry Creek when stream flows were high enough to move them (COE, 1982). At this time, a steep and very rough road provided access to the Winberry Ranger Station located near the Willamette National Forest boundary. This road could have contributed to suspended sediments in the stream system, but it was probably insignificant compared to the practice of transporting logs down Winberry Creek. Slope failures also introduced sediment into the waterways, but data to quantify the extent of such an impact to water quality is unavailable.

In the early 1920s, mineral prospecting along Winberry Creek sparked an influx of mining interest in the valley. Pacific Gold Company established operations on North Winberry Creek at its confluence with Brush Creek. Placer gold mining could have produced suspended sediment during active operations. The area never produced much gold but gold was not the only metal sought there. According to early residents, globules of pure quicksilver or mercury were frequently found on North Winberry Creek (COE, 1982). Under current state standards, mercury is considered a toxic compound; however there are no reports of mercury in this area from recent times.

Water quality was degraded during the mid 1950s when a reported fecal coliform contamination occurred on Fall Creek, resulting from malfunctioning septic systems (Jerry Dilley, personal communication). All beneficial uses were detrimentally impacted by the contamination, especially fishing and water contact recreation.

Water temperatures at the Winberry gaging station in 1964 reached a high of 68° F for at least a week during that summer. The following year temperatures were as high as 75°F in Winberry Creek, probably resulting from impacts to the stream system by the 1964 flood. The removal of down wood and riparian vegetation damaged by the

flooding probably contributed to the increased amount of radiant heat reaching the creek at the time.

Current Conditions (Post-Reservoir)

Current water quality conditions are evaluated on the basis of water resource usage. Standard parameters have been identified by the Oregon State Department of Environmental Quality (DEQ) to determine the quality of water required for those uses. These parameters list the acceptable limits of various conditions found in the stream system, such as water temperature, sediment and bacteria. *Beneficial use* is defined as

> *"an instream public use of water for the benefit of an appropriator for a purpose consistent with the laws and the economic and general welfare of the people of the State and includes, but is not limited to, domestic, fish life, industrial, irrigation, mining, municipal, pollution abatement, power development, recreation, stockwater, and wildlife uses."* (OAR 690-400-010)

For example, beneficial uses of salmonid spawning and rearing and resident fish are found throughout the watershed and are shown on *Map 38.* Water contact recreation (boating) occurs primarily in Fall Creek Reservoir. Table 17 displays the beneficial uses of water in the Winberry watershed with applicable state water quality parameters.

The State of Oregon, as directed by the Clean Water Act and the EPA, is responsible for protecting the quality of rivers and other bodies of water in the public interest. The Oregon Administrative Rules (Chapter 340, Division 41) list the beneficial uses associated with each river and standards of monitored parameters. The Oregon Department of Environmental Quality (DEQ) is the State agency responsible for enforcing these standards.

Beneficial uses of surface water identified in this watershed include:

- Aesthetics
- Salmonid Spawning and Rearing
- Resident Fish and Aquatic Life
- Water Contact Recreation
- Water Contact Recreation - Boating
- Fishing
- Water Supply

Beneficial uses most likely affected by federal government management activities in this watershed are: resident fish and aquatic life, salmonid spawning and rearing, and water contact recreation-boating. A summary of conditions and trends for beneficial uses and associated water quality parameters follows in Table 17.

Table 17. Water Quality Parameters Related to Beneficial Uses

	Beneficial Use						
Parameter	Aesthetics	Resident Fish & Aquatic Use	Salmonid Spawning & Rearing	Water Contact Recreation	Water Contact Recreation - Boating	Fishing	Water Supply
Dissolved Oxygen		Not less than 6 mg/liter	Oct 1-May 31: Not < 11 mg/l unless intergravel DO > 8.0 mg/l. The DO criteria is 9.0 or where barometric pressure, altitude, and naturally occurring temperature preclude attainment of 11 or 9 mg/l standard, then DO levels shall not be < 95% saturation.				
Bacteria				Average of 200 per 100 ml; maximum of 400 per ml			
Acceptable Range pH		6.5-8.5		6.5-8.5			
Temperature (maximum value)		64°F	64°F (June 1- Sept 30) 55°F (Oct 1-May 31)				
Turbidity		no more than 10% cumulative increase					
Nutrients (maximum value)	0.1 mg/l total phosphorus			0.1 mg/l total phosphorus		0.1 mg/l total phosphorus	
Algae (maximum value)	0.015 mg/l *chlorophyll a*			0.015 mg/l *chlorophyll a*		0.015 mg/l *chlorophyll a*	0.015 mg/l *chlorophyll a*
Aquatic Weeds	See #1 below				See #1 below	See #1 below	
Habitat - Flow Modification		See #2 below	See #2 below				
Sedimentation		See #3 below	See #3 below				

1. Fungi or other growths having a deleterious effect on stream bottoms, fish or other aquatic life, or which are injurious to health, recreation or industry shall not be allowed.
2. The creation of tastes or odors or toxic or **other conditions that are deleterious to fish or other aquatic life,** or affect the potability of drinking water or the palatability of fish or shellfish shall not be allowed.
3. The formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, recreation or industry shall not be allowed.

Aesthetics

Algae was reported in a small pond near Brush Creek resulting from a road-related landslide. This small accumulation of algae was confined to the pond and did not enter any other waterway, thereby having little impact on the overall aesthetics of water in the analysis area.

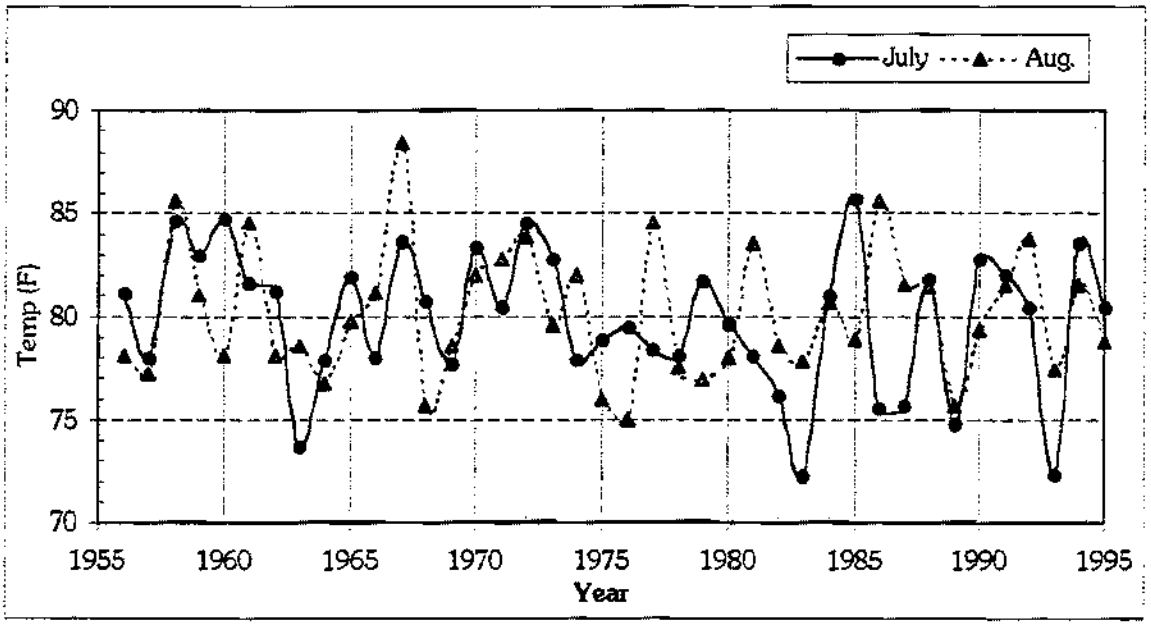
In Fall Creek Reservoir, algal blooms due to nutrient enrichment have occasionally been reported. The COE considers the reservoir a mesotrophic water body, having some nutrient enrichment, but this has not been a significant aesthetic concern to the agency or the public. Sampling conducted by the COE in 1990 indicated that measured *chlorophyll a* fell well below state standards. Small populations of aquatic weeds found in the reservoir are not considered detrimental to the aesthetic qualities of the lake.

Salmonid Spawning and Rearing

Temperature

The beneficial use standard for salmonid habitat requires that a moving seven-day average of daily maximum stream temperature should not exceed 64°F during June 1 through September 30. Between October 1 and May 31, the standard requires that a moving seven-day average of daily maximum stream temperature does not exceed 55°F. Since most data analyzed was in hard-copy format, a rolling seven-day average was not computed. Instead the period of time most likely to exceed the standard was targeted for analysis. This period, called *"peak week"*, refers to the warmest seven consecutive days of the summer. In this case, the peak week was determined by visual examination of daily records.

Figure 6. Average Daily Maximum Air Temperatures at Lowell



Research has shown that stream temperatures are highly correlated with air temperatures (DEQ 1995). A forty year record of summer air temperatures at Lowell shows that July and August are the warmest months with highest stream temperatures, consistently *(see Figure 6)*. The air temperature graph provides a longer term aid in interpreting stream temperature data. Differences between warm and cool years are apparent and there is no obvious trend of increasing or decreasing temperatures during the period of record.

Data collected on Fall Creek below the dam indicates that during 1990-1994, several periods of seven or more consecutive days had temperatures exceeding the new salmonid state standard of 64°F between June 1 and September 30. This led the DEQ to list this waterbody as Water Quality Limited (DEQ 303(d)). Data from 1994 indicates that temperatures exceeded the 55°F standard in October, which is the beginning of spawning season. During the summer months, Fall Creek Reservoir stratifies thermally. Reservoir waters below 30 feet in depth have been measured at less than 64°F while the upper 30 feet are typically warmer than 64°F.

Results from water temperature analysis during the peak week for a 17 year period of record at the USGS gaging station on Winberry Creek are displayed in Figure 7. Data reflects the cumulative influences of multiple factors affecting water temperature throughout the watershed, including stream elevation, orientation and geometry, groundwater inflow, shading, and bottom substrate. Peak week temperatures on Winberry Creek have been 4 to 14 degrees above the summertime standard every year during the period of record, and are close to the theoretical upper limit based on the maximum mean air temperature associated with basin elevation (DEQ 1995). Analysis of the data also indicates that during the period of record, peak week temperatures in Winberry Creek occasionally exceeded the 55°F maximum in the first weeks of October and middle to late May *(see Figure 8)*.

Figure 7. Peak Week Water Temperatures in Winberry Creek

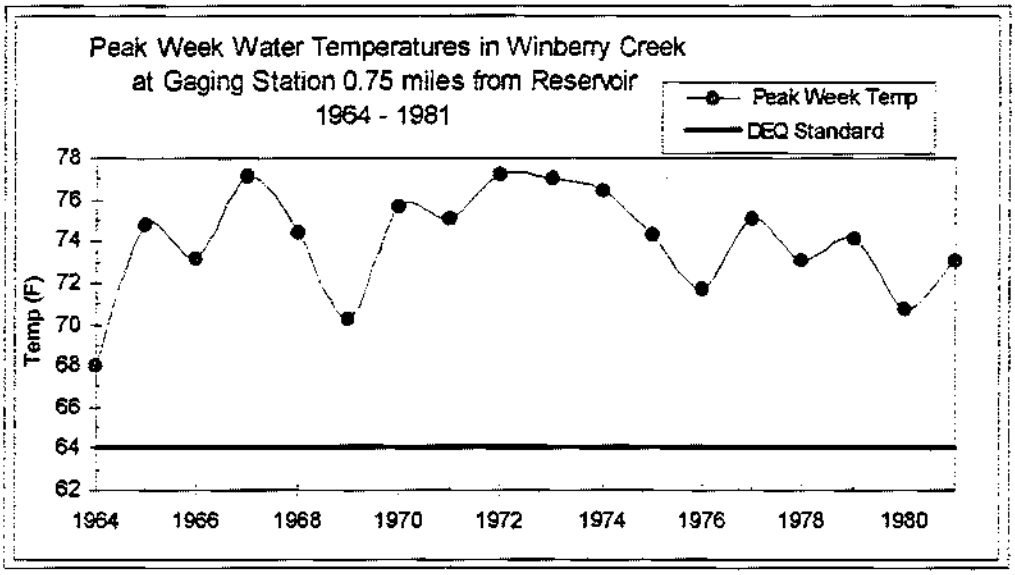
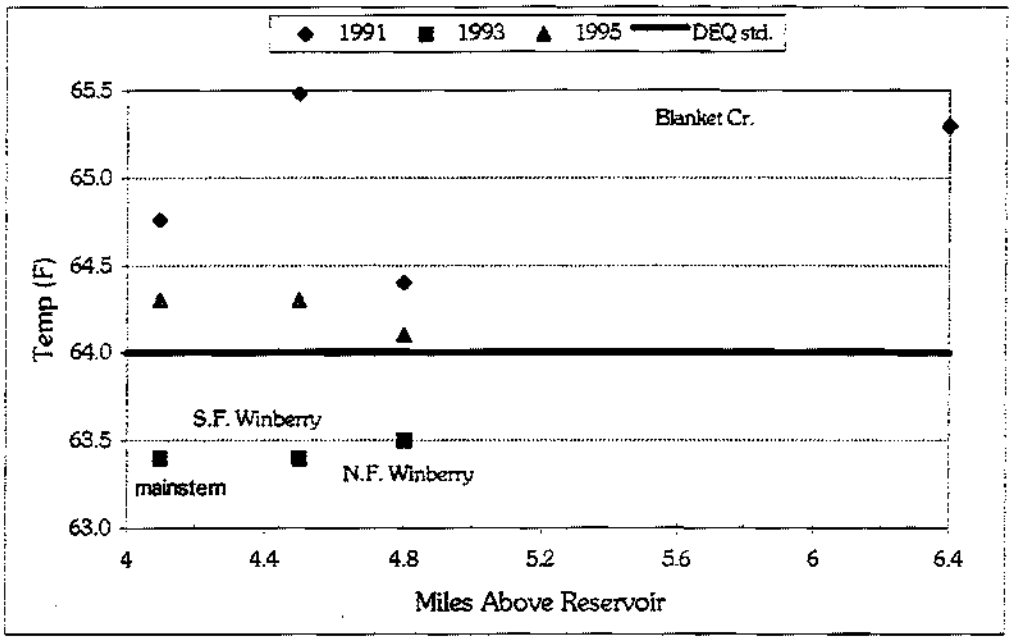


Figure 8. Recent Peak Week Water Temperatures in Winberry Watershed

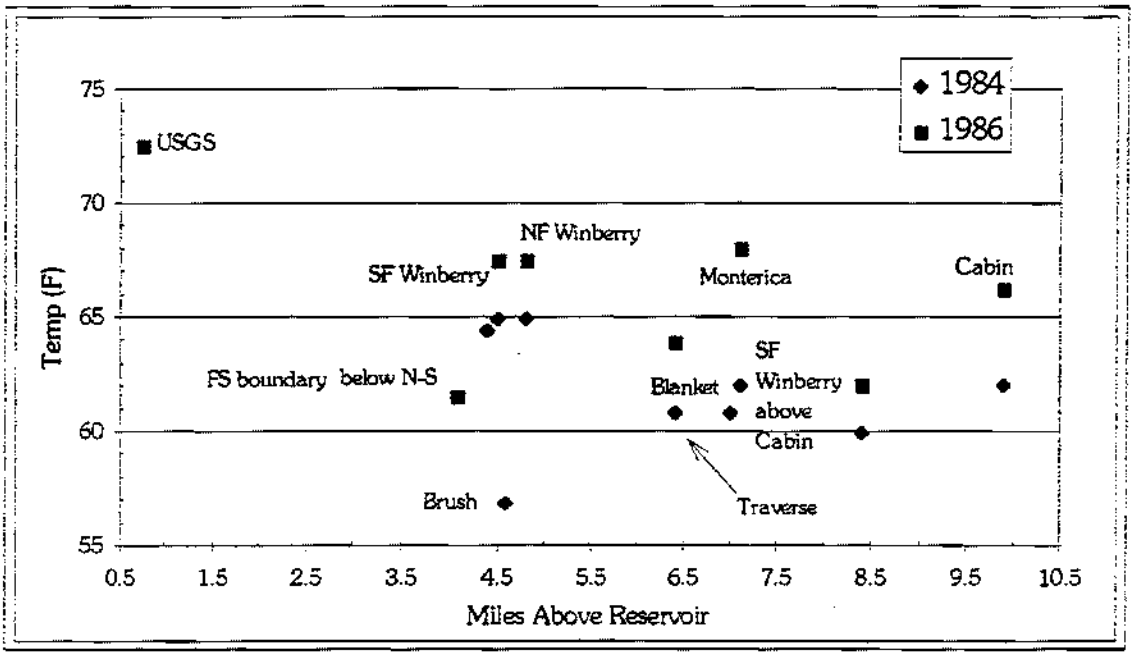


The effects of the 1964 flood on shading, channel geometry and substrate have likely contributed to elevated water temperatures during this period of record. However, during the summer of 1964 before the flood, peak week temperature exceeded the standard by four degrees. Temperatures remained elevated as flood effects presumably diminished over the next fifteen years. Future monitoring at this location, now 32 years post-flood, would help determine if additional factors are continuing to elevate water temperatures above the seasonal standards.

Summer water temperature data was collected by the USFS at several locations *(see Map 15)* during the past 12 years. This information was obtained along South Fork Winberry, North Fork Winberry, mainstem Winberry at the USFS boundary, and Blanket Creek. These sites are generally in close proximity to each other and show similar peak week temperatures in a given year. Data indicates that all sites slightly exceed the summer temperature standard except perhaps in such cool years as 1993.

Additional data is displayed below in Figure 9. Although not relevant to the current regulatory standard, the daily maximum water temperature is a useful indicator of spatial variation in the thermal regime of a watershed. Data presented are from 1984 and 1986, when monitoring by the USFS was most extensive in the Winberry watershed. These years include both a cool (1984) and a warm year (1986). In 1984, all temperatures fell between 60-65°F with the exception of Brush Creek, which was considerably cooler. In 1986, higher temperatures occurred throughout the watershed with somewhat more variability among locations.

Figure 9. Single Daily Maximum Temperatures in Winberry Watershed



Flow Modification

Under Oregon law, all water is owned by the public with some exceptions, and users must obtain a permit or water "right" to use water resources. The State water laws are based on the principle that the first person to obtain a water right on a stream is the last to be shut off in times of low stream flows. If a conflict between users develops, the date of priority determines who may use the available water. If the water rights in conflict have the same priority date, domestic use and livestock watering have preference over other uses. The Water Resources Commission sets minimum stream flows and approves instream water rights for fish protection, to minimize the effects of pollution, or to maintain recreational uses. Minimum stream flows and instream water rights, like all water rights, have a priority date and cannot affect use of water with a senior priority date. An instream Water Right having a priority date of May 24, 1962 was established along Lower Fall Creek for the State of Oregon, Water Resources Department for the right to 40 cfs throughout the year to support aquatic life. Many other water rights along Fall Creek have earlier priority dates. There are several water rights on the mainstem of Winberry Creek as well. Because critical late summer flows on Fall Creek are actually higher than historical summer flow, operation of the reservoir may reduce the concentration of pollution by augmenting the flow, thereby benefiting aquatic life.

Sediment

Currently there is no indication that anadromous salmonids use Winberry Creek and its tributaries for spawning. Therefore, it is not anticipated that winter sedimentation would affect these salmonids detrimentally in this portion of the watershed. Downstream,

however, sediment delivery to Fall Creek could impact all salmonids during winter months when spawning occurs in the lower end of the watershed.

Particle size is important when considering the impacts caused by sedimentation. Silt-sized material is detrimental if it coats the eggs or suffocates the emerging fry. On the other hand, silt and sand accumulating in the streambed can be advantageous for building structure in the riparian zone providing for coarser material deposition (cobbles and gravels). Currently there is no data to prove that sediment (suspended or deposited) is a problem in the watershed. Observations made by the public and reported to the DEQ suggest that sedimentation is a concern and for that reason Winberry Creek (including North and South Forks), Fall Creek Reservoir and Fall Creek are considered by the DEQ to be "Waterbodies of Concern" *(see Map 16)*. Excessive sedimentation in Brush Creek was noted by Forest Service personnel during summer stream surveys; however no sediment sampling was conducted at that time. Elsewhere in the watershed, areas underlain by Soil Classes 1 and 2 are considered potential sources of fine sediments that could enter stream systems.

Resident Fish and Aquatic Life

Dissolved Oxygen and pH

Dissolved oxygen and pH levels have not been identified as a concern in the streams of this watershed. In the reservoir however, (during the summers of 1966 and 1967) hydrogen sulfide formed in cold water at the bottom of the lake which caused a significant fish-kill when the lake was drawn down in late summer. The decomposition of organic debris which accumulated prior to water impoundment was believed to be the cause. After these organic materials decomposed, a continuous improvement in the oxygen content of reservoir waters was observed, and the situation did not reoccur. In 1984, data was collected at several locations in the lake, indicating that both pH and dissolved oxygen levels were within state standards.

Temperature

Based on information collected by the USGS at its Lower Fall Creek gaging station, the DEQ has proposed listing Fall Creek below the reservoir as a Water Quality Limited stream (303(d)) due to elevated late summer temperatures *(see Map 16)*. When water quality standards are not met, the DEQ initiates a process to correct the problem. As part of this procedure, DEQ must set total maximum daily loads (TMDLs) establishing the total amount of a pollutant which can be assimilated by a given waterbody without violating the water quality standard. USGS data indicates that during 1990-1994 daily maximum temperatures on at least seven consecutive days each year exceeded the current state standard of 64°F (Andy Schaedel, DEQ, personal communication, and USGS records). During these years temperatures ranged between 65-67.1°F in August and September for this segment of the Fall Creek system.

Fall Creek Reservoir stratifies thermally during the summer months but probably does not impair resident fish populations. Data collected since 1980 generally indicates that during August and September, water temperatures in the upper 20-30 feet of the

reservoir exceed the state standard of 64°F for resident fish populations, while waters below 30 feet in depth are less than 64°F.

In the streams to the east, summer temperature data was collected by the USFS along South Fork Winberry, North Fork Winberry, mainstem Winberry (at the USFS boundary), and Blanket Creek. Several periods consisting of seven or more consecutive days had average water temperatures exceeding 64°F, as shown previously in Figure 8.

Turbidity/Suspended Sediment

Recreational boating and wind-generated waves contribute to shoreline erosion in the reservoir, which is most pronounced along the Fall Creek arm. Suspended sediment in the reservoir is somewhat of a visual concern and the reservoir has been added to the DEQ list of Waterbodies of Concern. No data is required for waterbodies to be added to this list. Other Waters of Concern for sedimentation in the watershed include Fall Creek below the reservoir, and Winberry Creek (including North and South forks to the headwaters). These waterbodies are illustrated on *Map 16.*

Road-related surface water run-off and erosive soils have probably contributed sediment to the Brush Creek stream system. Where Soil Categories 1 & 2 exist, the introduction of fine sediments to the stream system could be anticipated. Landslides are more frequent in areas underlain by Soil Categories 3 & 4, such as in the Upper South Fork Winberry drainage. The coarse deposition created by a landslide event typically travels a shorter distance but scours the channel to bedrock, destroying fish habitat along the way. Restoration projects along South Winberry Creek have created pools, and provided for the natural deposition of coarse sediment, thereby improving fish habitat in those areas.

Water Contact Recreation, Boating, and Fishing

In the summer, the water in Fall Creek Reservoir is sampled for fecal coliform at several recreation sites, and these levels have always been within acceptable limits. On USFS land, water is sampled for fecal coliform at the Winberry Campground on a regular basis and state standards have always been met. No samples have been collected from BLM managed lands. Water samples collected from the reservoir have exhibited acceptable pH test results.

In the past blue-green algal blooms have occurred in the reservoir, reducing water clarity. Aquatic weeds have not been a problem within the reservoir.

Water Supply

There are 20 surface water right permits on record with the County for lands within the analysis area. Most of these pertain to water use for irrigation directly from Fall Creek, below the reservoir. As previously mentioned, the State of Oregon Water Resources Department was issued the right to 40 cfs throughout the year for the purpose of supporting aquatic life. With regard to the other permits, it is unlikely that any of these users are utilizing this water for drinking. In any case, DEQ's ambient monitoring

program is not designed to assess water quality potability and it is assumed that some level of treatment is required to provide potable water.

Monitoring data addressing water quality in tributary streams for private domestic water uses is unavailable.

TRANSPORTATION

The Winberry/Lower Fall Creek Watershed has a total of 294.37 miles of road in four governmental and many private jurisdictions. Roads are managed by the USDA Forest Service, Bureau of Land Management, Lane County, the Army Corps of Engineers, and various private landowners.

Transportation system development of the Winberry/Lower Fall Creek Watershed began in 1911 during the horse and buggy era. At that time, the system consisted of user-made trails and unsurfaced buggy roads. Demand for roads in the National Forest led to the implementation of various federal legislative acts beginning in 1906 and continuing through 1921. In the latter year, $4,400,000 was appropriated for construction of forest development roads. At about the same time an "improved road" was constructed on the Middle Fork of the Willamette River. Road building continued at a slow pace until the early 1950s, when a demand for timber and recreation access to public land spurred a dramatic increase. Roads constructed from 1950 to 1980 were characterized by engineering principles based on "least cost," where excess excavation was sidecast below road grade rather than hauled and stored at a waste site. Water intercepted by road construction was collected, routed under or along the road, and forgotten. This practice, while efficient in road construction and maintenance, was not necessarily beneficial to the land, water quality or fisheries resources. This period of rapid road development resulted in the construction of about 85% of the watershed road miles with later construction was limited to short, local roads.

Currently, most of the system is 14 - 44 years old and starting to show edge cracking, a result of sidecasting procedures used during construction, and slumping of old fills caused by buried woody material. To complicate the situation, the designed life span of corrugated metal pipes (CMPs) is twenty years and much of the system is older than this. In the past, roads proposed for timber haul under the timber sale program were field checked for deteriorated CMPs and failing pipes were replaced using purchaser credit. With a reduced timber sale program, this funding source is not as readily available and it is expected that a number of existing culverts will fail, some catastrophically, adding sediment to an already stressed system of streams.

On roads within Forest Service jurisdiction, approximately 102.60 miles of existing roads can accommodate use with a passenger car or high clearance vehicle, 22.56 miles are closed or can be closed and 13.82 miles are decommissioned roads. For this report, *decommissioned* means that drainage structures have been removed, the road has been ripped, seeded and fertilized, berms have been added to direct and control water runoff, and the road has been blocked with an earthen berm. If all gates were opened, drivable

road miles would total 125.16. About 54.54 miles of these roads are in Riparian Reserves.

A recent field investigation of stream crossing culverts on perennial streams for 18% of the **Fall Creek** watershed, indicated that nine of 38 crossings surveyed would not pass a 100-year event with its accompanying debris load (SEIS, 1990). Assuming that neighboring Winberry Creek has the same flow regime, 24% of its stream crossings would also not accommodate a 100-year event. While this direct interpolation is probably inaccurate, it can be assumed with some degree of accuracy that the failure rate in Winberry Creek (with its roughly 120-240 culverts) would be in the range of 30-70 culverts. Obviously the watershed needs examination to determine the exact number of culverts that would not survive a 100-year event.

This same field inventory showed that only two of the 38 crossings were armored with riprap to prevent damage from overtopping. The study indicated that 15 culverts (39%) were in high risk of overtopping; unfortunately, none were armored. In addition, 27 of the 38 culverts (71%) did not enable fish passage. Again, by interpolation, this data seems to indicate that 39% of culverts in Winberry watershed have a high risk of overtopping and as many as 30-70 pipes (71%) in Class III and II streams would not provide for fish passage. Linking this data to stream surveys would assist in determining which culverts have a high priority for retro-fitting in order to facilitate fish passage.

Production of Fine Sediments

Due to winter timber haul, roads in this watershed are generally surfaced with a sufficient depth of rock to support haul under adverse weather conditions. However, much of that rock is of poor quality, which contributes to increased sedimentation both during road use and when roads are not in use. Studies conducted by Burroughs and Foltz, Intermountain Research and Development, show that all roads produce and transport sediment, but roads having traffic produce up to six times the amount of sediment as roads where traffic is eliminated. Those same studies show that sediment can be reduced by 50% when using central tire inflation (CTI) during commercial haul. Further, as rutting occurred during use, sediment production increased 2.9-13.3 times. This effect can be reduced by timely maintenance, but maintenance can also produce 1.32 times more sediment. The effect of both use and maintenance on the production of fine sediment can be eliminated by closure of roads when appropriate.

While the data in Table 18 was compiled for roads under Forest Service jurisdiction, it can be assumed that trends for non-Forest Service roads would be consistent. Though the rest of the road system is not under Forest Service jurisdiction, it was primarily constructed for the same purpose: access for the removal of timber. Assuming this, one can interpolate that like miles of road should exist outside Forest Service jurisdiction. See *Map 17* for USFS road surface types and *Map 18* for USFS road maintenance levels.

Table 18. Surface Type by Subwatershed: Roads under Forest Service Jurisdiction

Paved Surface Type			***Aggregate Surface Type***		
Drainage	**Inside RRA**	**Outside RRA**	**Drainage**	**Inside RRA**	**Outside RRA**
Upper South Fork Winberry Creek	0.00	0.00	Upper South Fork Winberry Creek	16.31	25.52
Lower South Fork Winberry Creek	0.83	0.15	Lower South Fork Winberry Creek	7.14	9.90
Brush Creek	0.03	0.00	Brush Creek	6.42	8.53
North Fork Winberry Creek	0.08	0.00	North Fork Winberry Creek	16.79	19.60
South Reservoir	0.35	0.28	South Reservoir	0.20	0.73
North Reservoir	0.00	0.00	North Reservoir	0.00	0.00
TOTALS	1.29	0.43	**TOTALS**	46.86	64.28
GRAND TOTAL	**1.72 Miles**		**GRAND TOTAL**	**111.14 Miles**	

Improved Surface Type			***Native Surface Type***		
Drainage	**Inside RRA**	**Outside RRA**	**Drainage**	**Inside RRA**	**Outside RRA**
Upper South Fork Winberry Creek	1.66	7.35	Upper South Fork Winberry Creek	0.41	2.45
Lower South Fork Winberry Creek	0.53	1.31	Lower South Fork Winberry Creek	0.03	0.34
Brush Creek	0.18	1.32	Brush Creek	0.42	0.90
North Fork Winberry Creek	2.28	4.20	North Fork Winberry Creek	0.84	1.66
South Reservoir	0.04	0.20	South Reservoir	0.00	0.00
North Reservoir	0.00	0.00	North Reservoir	0.00	0.00
TOTALS	4.69	14.38	**TOTALS**	1.70	5.35
GRAND TOTAL	**19.07 Miles**		**GRAND TOTAL**	**7.05 Miles**	

RRA - Riparian Reserve Area

BIOLOGICAL DOMAIN

TERRESTRIAL

VEGETATION

The forest landscape pattern in the Winberry watershed is highly fragmented, mainly attributed to human activity during this century. Presently, the oldest large intact tracts of late successional and old-growth forests within the watershed are found on USFS lands. Multiple ownerships naturally resulted in many different management regimes. Management activities began in the 1930s and have reduced the average age, complexity and stand size of the forest. Many acres are now in earlier seral stages and do not provide historic levels of forest diversity, wildlife habitat or stand structure.

The predominant forest climax series found within the Winberry watershed is western hemlock. The western hemlock forest series represents warm, moist conditions and lies between the lower, drier Douglas-fir series and the higher Pacific silver fir series. Precipitation varies between 45-70 inches annually, with temperatures slightly below freezing in the winter to 90-100°F during the summer. The Douglas-fir and Pacific silver fir series are also represented in the watershed, but to a much lesser extent.

Plant associations (or communities) are classified within forest series, and are defined as generally discrete, recurring collections of plant species that maintain stable populations over a long period. *Plant association* describes the potential, or climax plant communities: the vegetation that would eventually occupy a site in the absence of disturbance. For more information and descriptions of the plant associations, refer to the Willamette National Forest Plant Association and Management Guide (Hemstrom, *et. al.*, 1987).

In the western hemlock series, Douglas-fir is the dominant species, growing with western hemlock and western redcedar. Common associates include incense cedar and western white pine. Hardwood associates include bigleaf maple, red alder, vine maple, chinquapin, and madrone. Other plant species represented in this series are dwarf Oregon grape, salal, rhododendron, swordfern, vanilla leaf, Oregon oxalis, twinflower, and redwoods violet.

Historic Range of Variability

The idea of the "range of historic variability" acknowledges that ecosystems are not static but rather vary over time and space. The dynamic nature of ecosystems exemplifies the need to consider ranges of conditions under natural disturbance regimes, rather than single points in time. A key assumption of this concept is that when systems are "pushed" outside the range of historic variability there is a substantial risk that biological diversity and ecological function may not be maintained.

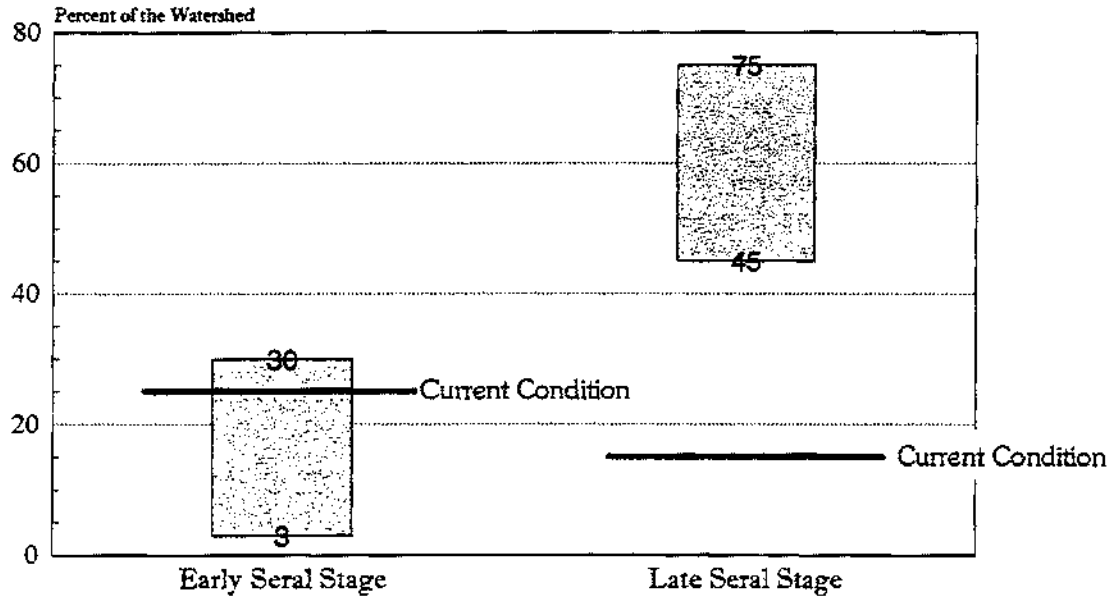
In 1993, the Pacific Northwest Region undertook an assessment of the historic range of variability for a number of key ecosystem elements; elements believed to be crucial to

ecosystem health and sustainability. This analysis was completed at the subbasin scale and is referred to as REAP (Regional Ecological Assessment Project, USDA, 1993). The assessment was designed to gain a "first approximation" or "coarse filter" analysis of ecological sustainability of Northwest National Forests. Many assumptions and limitations are inherent in the assessment. However, the apparent patterns and trends are valuable in establishing baseline information to land managers.

The historic range of variability was reconstructed for the time period of 1600-1850 *(See Figure 10).* Various fire history studies from the central Oregon Cascades were used to determine the ranges of seral conditions.

The historic range of variability for early seral conditions was estimated to be 3-30% and for late seral conditions to be 45-75%. Numbers expressed are a percentage of the total subbasin area of the Middle Fork of the Willamette River within the forest series of western hemlock. Currently, seral conditions are estimated at 25% in the early seral stage and 15% in the late seral stage *(shown in Figure 10 as lines).*

Figure 10. .Historic Range of Variability (1600-1850)



Reference Conditions

The pre-European settlement forest consisted of mature conifers that were long lived and exposed to infrequent catastrophic disturbances such as major windstorms or stand replacement fires. These fire patterns created a mosaic of large blocks containing early seral habitat interconnected with large blocks of late successional habitat. Early records (c. 1860) also tell of grass savannas with scattered Douglas-fir, oak and ponderosa pine at the interface of the Willamette Valley and Winberry/Fall Creek watershed. Native Americans created these savanna by repeatedly burning grasslands in the valley and

foothills to improve big game habitat. Over time this burning practice created a landscape of annual grasses and isolated trees *(see Fire Regimes, page 61).*

The chosen reference year for natural conditions is 1900 due to minimal impact on the landscape from a developing local population. Landscape information was developed from State of Oregon forest cover maps and USDA Forest Service data.

In 1900, mature and old-growth forest covered more than 50% of the watershed in large undisturbed tracts. Younger forests and early regenerating stands were intermixed in those areas having more frequent exposure to fires, primarily near the valley. These forest stands evolved through natural processes and were therefore unevenly stocked, containing many snags and downed trees *(see Table 19 and Map 19).*

Table 19. Reference Seral Condition, 1900

Seral Classes	Forestry Board Seral Classes*	Area Acres	Area %
Stand Initiation 0-30 years	Cut-over Areas Not Re-stocking, Burned Areas Not Re-stocking, Brush	12,765	29.1%
Stem Exclusion 31-80 years	Cut-over Areas Re-stocking, Burned Areas Re-stocking	3,806	8.4%
Understory Reinitiation 81-200 years		2,921	6.7%
Late Successional Old-growth >200 years	Merchantable Timber	21,816	49.7%
Non -Forest	Non-Forest	2,682	6.1%
Total		**43,890**	**100%**

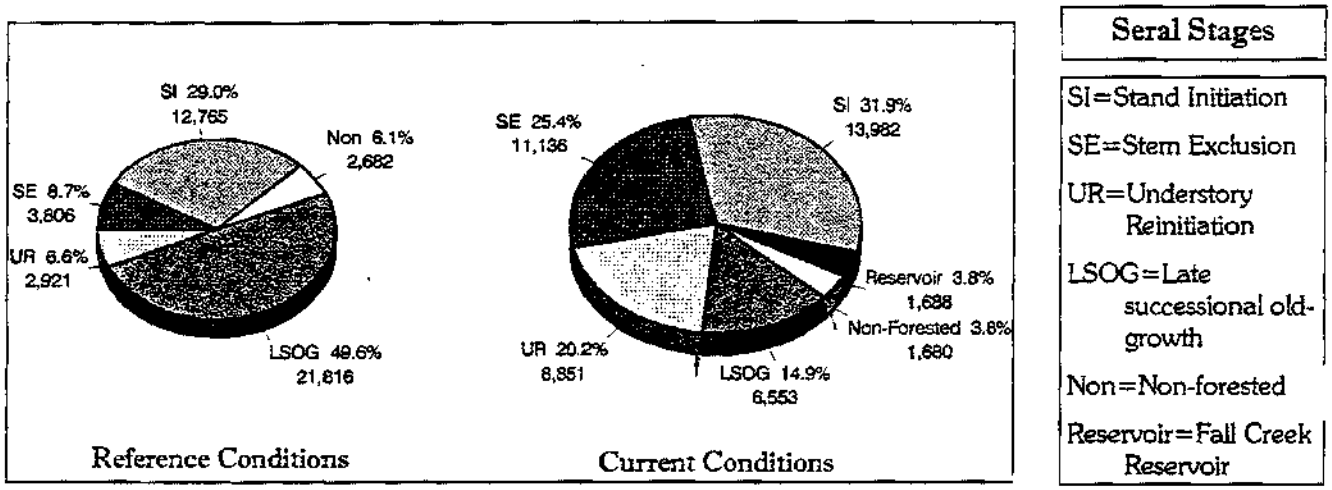
* Information source cited on *Map 19,* 1900 Vegetation Map.

Current Conditions

Forest seral conditions are descriptive labels for the four major stand developmental stages as described by Oliver and Larson (1990). These stages are related to tree age, size and forest structure. A stand will begin in stand initiation (SI), progress through stem exclusion (SE), understory reinitiation (UR), and climax as an old-growth stand (LSOG-late successional old-growth). These seral conditions are used as general descriptive guides. Appendix C, page 193, has a more complete description of seral stage development.

Currently, only 35% of forested area in the watershed is in mid- and late successional forests or understory reinitiation and late successional old-growth. Fifty seven percent of the area is in early and young seral condition, stand initiation or stem exclusion stages. These younger stands are forest plantations well stocked through silvicultural management activities, but lacking snags or downed logs and associated diversity. For a comparison between reference and current seral conditions in the watershed, see Figure 11. Acreages for current seral stages are shown in Table C- 1 (Appendix C) on page 195. Current seral stage conditions for federal lands are shown in Figure 12.

Figure 11. Seral Stage Comparison between Reference & Current Conditions

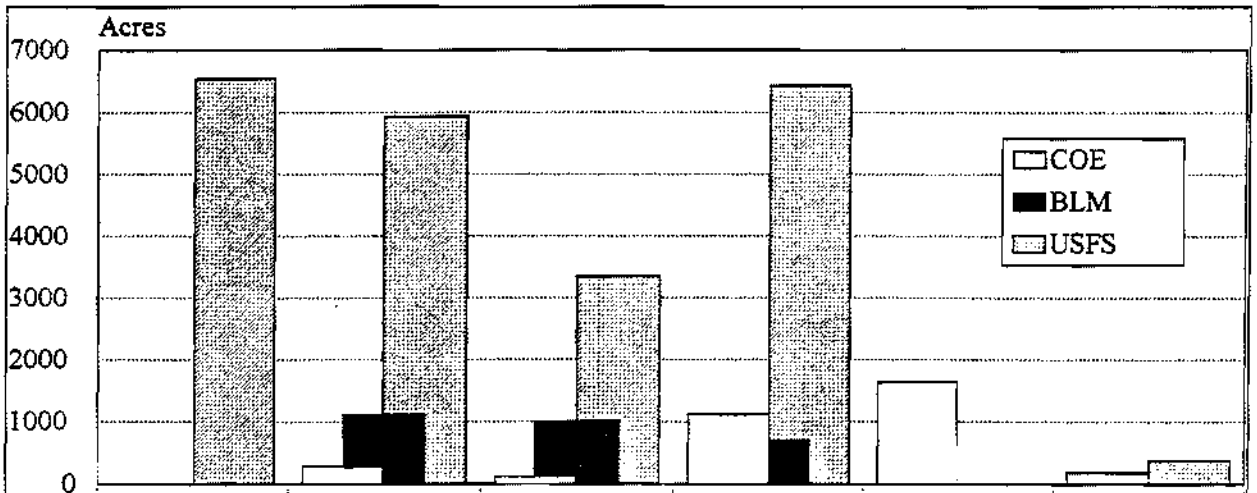


Federal Lands

The largest single contiguous area in the watershed is managed by the USFS. It is located at the east end and includes the headwaters of Winberry Creek. BLM holdings are intermixed with lands owned by several private forest products companies. Traditionally, both federal agencies have managed their lands based on a multiple use policy emphasizing timber management. The US Army Corp of Engineers (COE) manages Fall Creek Reservoir and lands directly adjacent to the reservoir. Management directive for reservoir operation is flood control, recreation and fisheries.

The watershed analysis unit is divided into six drainages with ownerships not limited to federal agencies. Figure 13 shows the proportion of federally owned lands within these drainages by agency. Table C- 2 (Appendix C), page 195, details the amount of federal lands within the watershed. Drainages are comprised of differing forest seral stages resulting from dissimilar naturally occurring conditions and different management actions by the administering agency. Seral stages for federally owned land are shown in Table C- 3 (Appendix C), page 196.

Figure 12. Federal Land Current Seral Stage Condition



	LSOG	UR	SE	SI	Reservoir	Non-Forest
COE	0	276	112	1119	1641	168
BLM	7	1113	1012	702	0	8
USFS	6537	5926	3340	6422	0	371

Figure 13. Federal Ownership by Drainage

	Brush Ck	Lower S Fk W	N. Reservoir	N Fk Win	S. Reservoir	Upper S Fk W	Reservoir
COE	0	0	1068	0	607	0	1641
BLM	14	0	756	0	2072	0	0
USFS	2604	4622	0	6443	316	8611	0
Other	0	291	4768	0	10026	0	0

Timber Harvest

Timber harvest on USFS and BLM lands began in the 1940s. The first timber sales sold by the USFS took place in the North Fork of Winberry Creek and the upper end of Cabin Creek, within the Upper South Fork Winberry drainage. The Government Land Office (GLO), predating the BLM, was the managing agency for O & C (Oregon & California Railroad) and PD (Public Domain) lands at the time *(for further discussion refer to Chapter 4, Issue 5, Key Question 3, page 156).* The first timber sales administered by the GLO in the watershed occurred at about the same time. Table 20 shows the combined harvest activity of both agencies for each decade of sale activity.

Table 10. Federal Harvest by Decade

Decade	Acres	% USFS & BLM
1935-1945	722	2.8%
1945-1955	1,096	4.3%
1955-1965	2,448	9.6%
1965-1975	2,689	10.6%
1975-1985	1,913	7.5%
1985-1995	2,559	10.0%
Total	11,427	44.8%

Future Timber Harvest

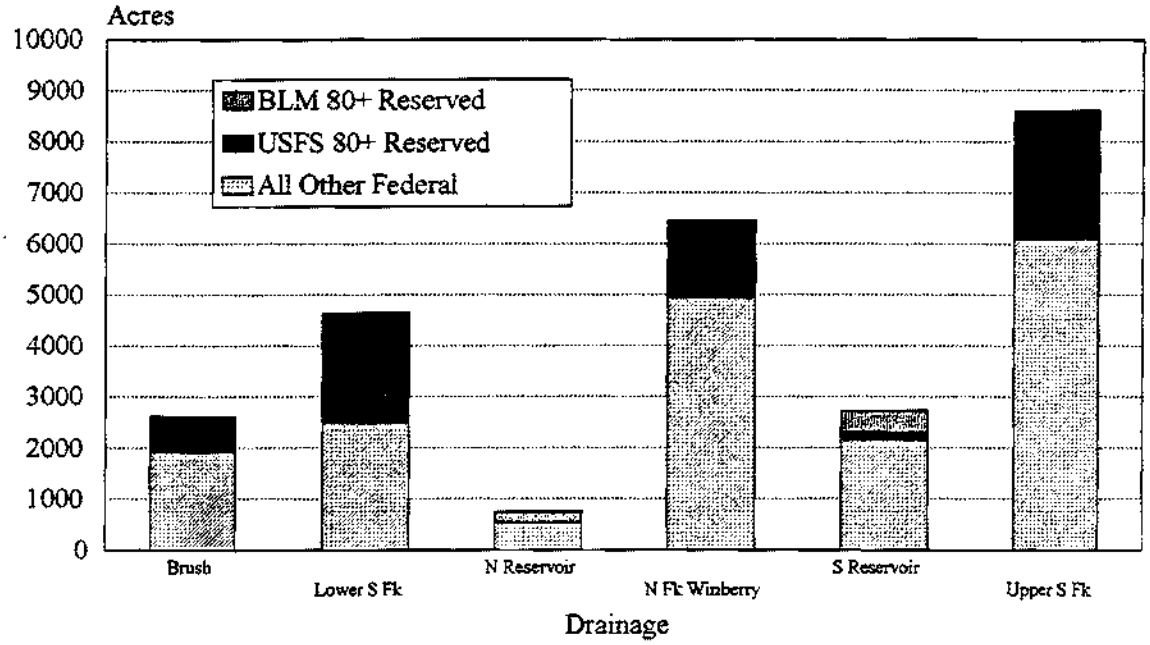
The predominant land use allocation for the watershed is matrix. Future timber harvests on USFS and BLM will adhere to the NWFP and the Willamette Forest Plan (USFS), or the Resource Management Plan (RMP) for the Eugene District BLM, June, 1995. Currently the USFS has 3,715 acres available for harvest in "commercial forest land" and the BLM has 639 acres in "general forest management" and 200 acres in "connectivity." These acres, comprised of trees 60 years and older, are suitable for regeneration harvest and exclude all withdrawn lands from the general forest management base. In the watershed, these areas represent approximately 41% and 47% of the available land base for the USFS and BLM, respectively. The remaining matrix acres are managed plantations that will provide future commercial thinning and harvest volume.

Retention of Old Growth Fragments

The distribution of old growth stands throughout the landscape is an important component of ecosystem diversity and plays a significant role in providing for biological and structural diversity across the landscape. Isolated remnant old-growth patches are ecologically significant in functioning as refugia for a host of old-growth associated species, particularly those with limited dispersal capabilities unable to migrate across

large tracts of younger stands. Isolated patches may function as refugia where old-growth associated species are able to persist until conditions become suitable for their dispersal to adjacent lands.

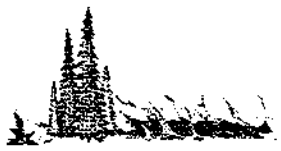
Figure 14. Reserved Forested Acres (80+ Years) on Federal Land



The NWFP standards and guidelines (S & Gs) are designed to identify these old growth stands and reserve 15% for refugia within the watershed. Figure 14 and *Map 28* show all acres on USFS and BLM presently reserved having a stand age of 80+ years. These stands are in Riparian, 100-acre LSR and Bald Eagle Habitat Reserves, all long-term withdrawn areas. A more detailed view of actual acreage involved can be found on *Map 20* and in Table C- 4 (Appendix C), page 197.

In order to harvest timber older than 80 years, the S & G stipulates that a minimum of 15% of the federal land base should be composed of timber aged 80+ years located in reserved areas. Currently, existing reserve acres 80 years and older compose 29.5% of federal lands in the watershed. Thus, almost twice the amount of older forest acres exist in reserves than required by the NWFP.

Fire Regimes



Reference Conditions

The lower reaches of Winberry/Lower Fall Creek watershed (west of USFS boundary) were typical of a low-severity, high-frequency fire regime as described by Agee (1981). Low-severity fire regimes are associated with frequent fires of low intensity where most

of the dominant trees are adapted to resist low-intensity fires. Natural, or in this case human-cased, fire cycles are usually less than 25 years (Agee 1981).

Due to the high frequency of fires, oak savanna and prairie grasslands dominated this area. Oak woodlands were an important feature in the culture of indigenous people.

> *"Annual firing of the prairies and underburning of the forest were intentionally utilized by native people throughout the Willamette basin to increase the range and abundance of game and edible and useful plants"* (Winkler 1984).

Observation of these areas shows no existence of sentinel old growth (bastard growth), large dilapidated snags or extended remnants of large fire-killed logs. This indicates a frequent fire return and eventual consumption of such fuels.

Current seral stage maps of the Winberry/Lower Fall Creek watershed show no significant tree stands exceeding 200 years in age west of the USFS boundary. This is consistent with surveys completed in 1854 -1855, only ten years after the first settlement and about the same time as cessation of aboriginal burning in the Willamette valley basin (Morris, 1934; Cole, 1977; Burke, 1979).

The upper reaches of the analysis area (east of USFS boundary) were typical of a high-severity, low-frequency fire regime. A high-severity fire regime is characterized by infrequent crown or severe surface fires usually resulting in total mortality of trees in the stand. Such fires are associated with drought years, east-wind, or other synoptic, low-humidity weather patterns, coupled with an ignition source such as lightning (Huff and Agee, 1980; Pickford, *et. al.,* 1980). Fire return intervals have never been calculated in these forests because the intervals between fires are long and may not be cyclic (Agee and Flewelling, 1982).

In the eastern portion of the watershed fires were infrequent. Fire records from 1949-1995 show that this area averages only one lightning fire every two years. These records are consistent with the number of lightning ignitions per year identified by Agee and Flewelling for the McKenzie River drainage, just north of this area (1983).

Typically, lightning storms here are accompanied by thundershowers. Precipitation occurring with the lightning ignition source keeps fire spread to a minimum. Fire records from 1949-1995 show that lightning fires in this area averaged 0.17 acres in size. More than half the lightning fires in this area occurred during 1949 through 1969, before the Winberry drainage was heavily roaded.

Native burning in this area was limited to escaped campfires (Burke, 1979; Minore, 1984). Researchers assert that some huckleberry areas were intentionally burned in order to increase berry yields (French, 1966). These burns would have been conducted just after the huckleberry harvest, from mid-July to early August. Timber fuel moisture conditions generally do not allow for rapid spread and erratic fire behavior during that time of year. Without these conditions, fire would not become a stand replacing event.

Current Conditions

With the elimination of aboriginal burning in the lower portion, the entire watershed is now in a high-severity, low-frequency fire regime. Historical fire records show that fire occurrence is low for the entire analysis area. Fire records for land protected by the Oregon Department of Forestry (ODF) date back to 1932. Records for USFS began in 1949; a summary of these fire records appears in Table 21. For a more complete breakdown of fire activity by decade, see Appendix B, Table B- 3 and Table B- 4, pg. 192.

Table 21. Summary of Fire Activity 1932 - Present

Protection Agency	ODF/LRFD			USFS		
	Number	%	Acres	Number	%	Acres
Lightning Fires	21	17%	3.6	23	55%	3.89
Human Caused Fires	102	83%	349.83	19	45%	28.51
Total Fires	**123**		**353.43**	**42**		**32.4**
Average per Year	**2.1**		**2.8**	**0.9**		**0.77**

Under ODF and LRFD (Lowell Rural Fire District) protection, the total acreage burned includes a fire in 1938 which started north of the analysis area and consumed 500 acres; half were inside the analysis area. Inclusion of this fire in the data raises the average fire size to 2.8 acres per fire. If this fire were not considered, the average fire size in this area would be a more realistic 0.8 acres per fire.

Although lightning accounts for 17% of the total fires occurring on ODF/LRFD protected lands and 55% on USFS lands, it has little effect on the percentage of acres consumed (1.02% on ODF/LRFD lands and 12.01% on USFS lands). Generally lightning storms in this area are accompanied by thundershowers which tend to keep fires small.

The Winberry/Lower Fall Creek area averages 3.0 fires per year consuming an average of 3.57 acres per year. This figure, however, does not reflect normal fire size for this area due to the 1938 fire mentioned above. The greater number of fires in the ODF/LRFD protected area can be attributed to the higher frequency of people using and living in this area.

Fire Suppression Responsibility

Fire suppression responsibilities for the analysis area are divided between the Oregon Department of Forestry (ODF), Lowell Rural Fire District (LRFD), and the USDA Forest Service. Forest Service responsibility begins at the USFS boundary and provides fire suppression on 22,641 acres or approximately 52% of the Winberry/Lower Fall Creek Watershed.

Lowell Rural Fire Department is responsible for fire suppression on 960 acres (approximately two percent of the analysis area) covering the following areas:

- lands adjacent to Jasper-Lowell Road, Place Road and Big Fall Creek Road,
- Jasper-Lowell Road from the top of Unity hill to milepost seven,
- Place Road extending from the junction with Jasper-Lowell Road to Milepost 3, and
- Big Fall Creek Road extending east ¾ mile from the Jasper-Lowell junction.

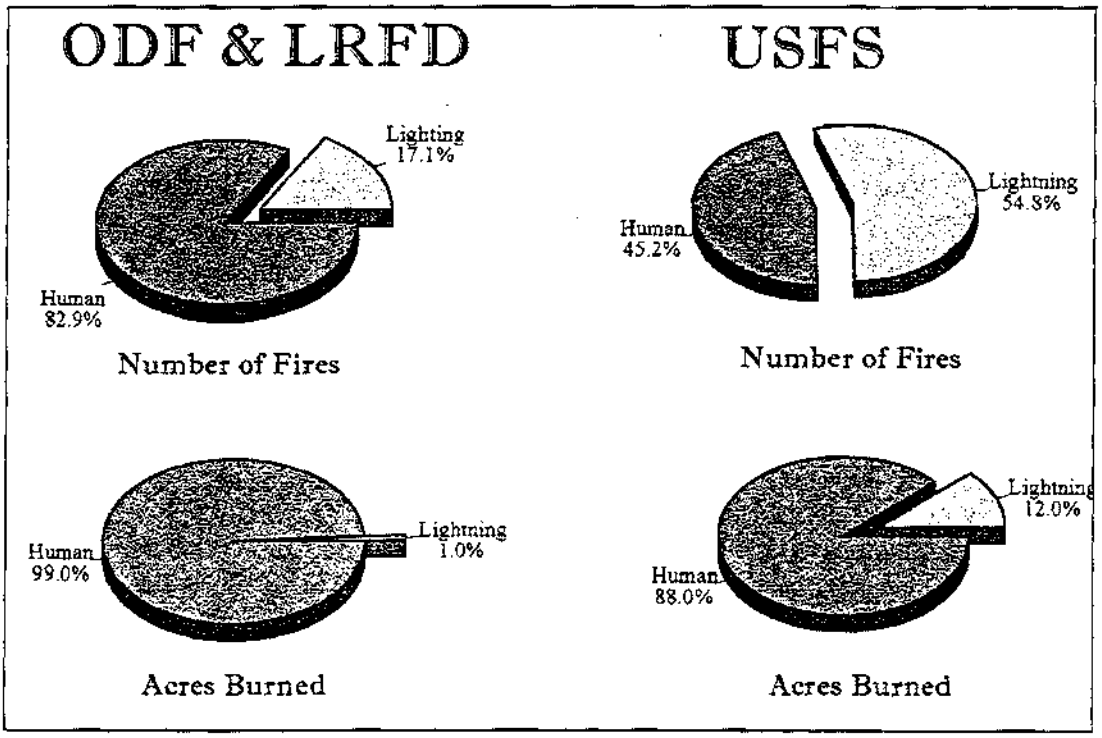
LRFD is responsible for fire suppression on 960 acres or approximately 2% of the total analysis area.

Oregon Department of Forestry is responsible for fire suppression on lands west of the USFS boundary and surrounding the LRFD area. They provide fire suppression on 19,845 acres or approximately 46% of the analysis area.

Currently, reciprocal agreements between the Forest Service and Oregon Department of Forestry are in place to assist one another in the initial attack of wildland fires. In addition, ODF has a mutual aid agreement with LRFD. However, there is currently no agreement for mutual aid between the USFS and LRFD.

The percentage of fires and acres burned are summarized in Figure 15. Complete charts may be found in Table B- 3 and Table B- 4 on page 192.

Figure 15. Percentage of Fires and Acres Burned by Protected Areas



FUELS

Average fuel loading for seral stages were calculated using PNW photo series (PNW-51, PNW-105 and PNW-GTR-258) *(see Table 22).* Maximum acceptable fuel loadings set by the Willamette National Forest Standards and Guidelines are shown in Table 23.

Table 22. Average Fuel Loading by Seral Stage

Seral Stage	Stand Age (years)	0-3" Fuels (tons/acre)	3-9" Fuels (tons/acre)	9-20" Fuels (tons/acre)
Stand Initiation	0-30	7.15	12.1	11.75
Stem Exclusion	31-80	6.6	6.7	11.7
Understory Reinitiation	81-200	3.8	5.0	18.5
Late Successional Old Growth	201	3.8	5.0	30.0

Table 23. Maximum Acceptable Fuel Loadings from Willamette NF Standards & Guides

Allowable Down Woody Material			
Diameter (small end)	Tons/Acre	Pieces/Acre	Length
0" - 3"	7-11	NA	NA
3" - 9"	8-12	NA	NA
9" - 16"	18-20	NA	NA
> 16"	NA	8-15	> 20 feet

From a fuels perspective, the two seral stages of concern are those of stand initiation and late successional old-growth. As shown in Table 22, fuel loading in the stand initiation stage falls within the allowable range of 7-11 tons/acre for 0-3" fuels, as set by the Willamette National Forest S & G *(see Table 23).* While tonnages falling within the range of allowable down woody material may be cause for concern, mitigating measures are not necessarily required to reduce fuel loading. Rather, these areas need to be mapped and monitored. Often these higher fuel loadings result from silvicultural prescriptions, and will be relatively short-lived (3-6 years).

In 9-20" fuels, the late successional old-growth seral stage exceeds fuel loading limitations delineated by the Willamette S & G *(see Table 22 and Table 23).* Excessive fuel loading in this category is the result of wind-cast limbs, tops and overall decay of the timber stand. This additional fuel loading does not increase the overall fire danger but rather the intensity of a fire, should one begin.

Reference Conditions

Stand initiation accounted for 29.3% of the total area (12,763 acres) during reference conditions. This seral stage had lower overall fuel tonnages than currently, due to present silvicultural practices. With no clear record it is impossible to determine what those tonnages might have been; therefore current tonnages were used for determination of fuel loading. Late successional old-growth accounted for 50.2% of the total analysis area. Present tonnages should be consistent with reference conditions for this seral stage.

The other two seral stages, stem exclusion and understory reinitiation, did not have fuel loadings that met or exceeded the Allowable Down Woody Material Standard. These seral stages accounted for 15.2% of the total analysis area; stem exclusion at 8.5% and understory reinitiation at 6.7%.

Current Conditions

The overall area in stand initiation seral stage has increased from a reference condition of 12,763 acres (29.3%) to 16,609 acres (38.2%). Late successional old-growth has decreased significantly from a reference level of 21,814 acres (50.2%) to 6,551 acres (15.0%). The combined area of concern has decreased overall in the analysis area from 79.5% to 53.2% of the total area. Table B- 1 in Appendix B, page 191, shows a comparison between reference and current seral condition by drainage.

Fuels Treatments

Fuels in harvested areas have traditionally been treated for hazard reduction using prescribed fire. Treatments have included dozer piling and burning, grapple piling and burning, hand piling and burning, burning of slash concentrations, and broadcast burning. In a very few cases (<1%), fuels were left untreated.

On federally controlled lands the majority of harvest units are treated by prescribed broadcast burning. Until 1986, broadcast burns primarily occurred between July 15 and September 30. During summer burns fuel consumption was high, completely consuming the majority of fuels <9". Summer burning was costly, most units requiring burning crews, holding crews and extensive mopping. Resource damage, in the form of burned timber lands ("slop-overs"), soil damage and wildlife tree mortality, was not uncommon.

In 1986 the Oregon Smoke Management Plan banned most smoke-creating fuels treatment from July 1 to September 30. The majority of broadcast burns now occur during the spring months of March through June. Consumption of fuels 0-3" is still significant enough to reduce fire hazard and allow for reforestation, but spring burning significantly reduces the risk of resource damage to soil and timber due to excessive heat.

BOTANY

Sensitive and Rare Plants

Reference Conditions

Human use of the watershed was concentrated in the lowland riparian areas where the Fall Creek Dam currently sits and along ridgeline trail systems used by seasonally nomadic tribes (Alpine and Tire Mountain Trails). All the USFS sensitive plants and COE species of concern found in the Winberry/Lower Fall Creek Watershed may have been encountered by Native Americans or early settlers, but there are no accounts of their use as either medicinal or food plants or as grazing forage.

Current Conditions

No plant species listed as Threatened or Endangered or Candidates by the USFWS occur on the Willamette National Forest. The Regional Forester has developed a list of additional species designated as "sensitive." The Region's Sensitive Species Program is designed to manage rare species and their habitats to prevent a need for federal listing at a future date. Sensitive species are vulnerable due to low population levels or significant threats to habitat (USFS, R-6 Forest Service Manual). The BLM has a similar program called Bureau-Sensitive Species. The COE also maintains a list of rare plant species and monitors population trends. Table 24 and *Map 24* display sensitive and rare plants found in the analysis area.

Table 24. Sensitive Plants of the Winberry/Lower Fall Creek Watershed

Species	Populations	Ownership	Impacts
Romanzoffia thompsonii	3	USFS	Skid road, Trails
Frasera umpquaensis	1	USFS	Adjacent Trail
Epipactis gigantea	1	COE	Adjacent Road
Iris tenax x Iris chrysophylla	1	COE	Adjacent Road

Three populations of *Romanzoffia thompsonii* are located within the analysis area. This species is an annual mistmaiden, found in rock gardens and rock outcrops. Sites always have an abundance of water in the springtime; Thompson's mistmaiden is only found associated with seeps, blooming while they run (April through June, depending on elevation). Soil development is minimal and usually composed of gravel or scree with soil found in small pockets within rocky crevices. The substrate on which the plant survives is often a moss mat, most commonly *Bryum miniatum*, found with monkeyflowers, plectritis and blue-eyed marys in the plant association called a rock garden.

All populations of *Romanzoffia* are within the "matrix" Northwest Forest Plan Allocation. Two populations are in "general forest" and one in a "Special Wildlife Habitat" (9D)

designation. All populations are found in special habitats, treated in the Willamette NF LRMP under forestwide standard and guideline FW-211. These habitats and their ecotones will be maintained.

This species is greatly dependent on the hydrologic regime; populations would be devastated if their habitats were to undergo a loss of or change in the water flow pattern. Two of the populations are accessible by the Tire Mountain Trail. The third is adjacent to a skid road in the vicinity of Sourgrass Mountain.

The second sensitive plant in this watershed is Umpqua swertia, *Frasera umpquaensis.* Swertia is a tall member of the gentian family associated with high elevation mesic meadows. This population is unique due to its large size (greater than 5,000 plants) and range of habitats. Like most *Frasera* populations on the Willamette NF, it is found in mesic meadow edges adjacent to timber, gaining a measure of canopy coverage. Common associates include coneflower, bracken fern, cow parsnip, and false hellebore. Some rogue plants (<5% of the population) grow in the middle of beargrass meadows; another part of the population grows in a dry blue wildrye-California brome meadow.

This entire population is in matrix allocation, located in the Special Wildlife Habitat designated for Sourgrass Mountain. A small part of the population is directly affected by a portion of Alpine trail.

An Interagency Conservation Strategy for Umpqua swertia designated this population as one of three on the Forest to be monitored (Cripps, 1993). A burn was prescribed in 1994 for the lower meadow on Sourgrass Mountain, in part to see how this plant species, with its large underground caudex, would respond to a low intensity burn. Plants were counted in circular plots before and after burning. Vegetative individuals remained constant (no significant difference between years). Flowering seemed to be enhanced, but not significantly. Another purpose for the burn was to see if fire would eliminate some of the young tree seedlings moving into the meadow. Unfortunately, the burn was so light that it did not carry into the canopy of the young trees. Other methods may be necessary to slow succession of this meadow to a forested site.

A third species of interest in the analysis area is *Epipactis gigantea*, a member of the Orchid family. This plant grows about three feet tall and has purplish-green petals with a prominent basal lobe. It grows along streams and river beds, associated with such hydrophilic species as sedges and rushes. It seems to prefer lower elevations, found at less than 1,000 feet on the four sites located on COE land.

The Fall Creek Reservoir population was discovered in 1989. It is located in Unit B: Tufti Wildlife Area of the Willamette Valley Project Master Plan for Resource Use for Fall Creek Lake. Monitoring is necessary since a heavily used trail and high water levels during the summer are mentioned as potential threats to the population.

The final unique species tracked by the COE is a hybrid between *Iris tenax* and *Iris chrysophylla.* This population actually occurs on a Lane County Road right-of-way in the Fall Creek Reservoir area. BLM botanists from the Eugene and Salem Districts, working at the confluence of the Willamette Valley/Western Cascade Mountain ecosystems, know of other populations. This hybrid may be a natural phenomenon

along this confluence largely overlooked by the local botanical community. An inventory is necessary to determine the true rarity of this hybrid.

The Fall Creek Lake population is found in Unit F: Peninsula Point. It has been monitored for presence or absence since its discovery in 1990. Plants have been mapped, photographed and pressed. A more rigorous monitoring protocol was slated for 1995. The author drove around the reservoir in April and found two populations; the one cited above and a second along the north shore of the reservoir on Big Fall Creek Road.

Rare and Unique Plants

The Willamette NF also tracks rare and unique species having the potential to be listed as Sensitive. These species may be associated with disappearing habitats or may be common elsewhere and at the edges of their range on the Willamette. They make a major contribution to the overall biodiversity on the Forest. The Willamette Forest Plan directs the Botany Program to create a Forest Watch List for such species (USDA, 1990) *(see Table 25).*

A number of these species are found in the Winberry/Lower Fall Creek watershed. Corydalis is found in perennially running seeps under a mountain alder canopy. The other species, Oregon bluebells and Cusick's checkermallow, prefer mesic meadow habitats (Hitchcock and Cronquist, 1973).

Table 25. Rare and Unique Plants Found in Winberry/Lower Fall Creek Watershed

Populations Species	Status List	Total on Willamette
Corydalis caseana var. cusickii	W[1]	1
Mertensia bella	W	2
Sidalcea cusickii	W	15

[1] Watch List, Oregon Natural Heritage Program, taxa of concern, but not currently threatened or endangered.

Surveys for sensitive and rare plants have occurred on eight percent of National Forest land within the watershed. Although no Bureau sensitive species have been documented on BLM land, potential habitat exists for *Aster vialis*, the wayside aster, *Cimicifuga elata*, tall bugbane, and the valley floor endemic *Horkelia congesta*, shaggy horkelia. USFS lands provide potential habitat for many sensitive plant species *(see Table 26).*

Table 26. Rare Plant Species with Potential to Occur in Winberry Watershed

Potential Species	Common Name	Ownership
Cimicifuga elata	Tall bugbane	BLM, USFS
Aster vialis	Wayside aster	BLM
Horkelia congesta	Shaggy horkelia	BLM
Asplenium septentrionale	Grass fern	USFS
Astragalus umbraticus	Woodland milkvetch	USFS
Botrychium minganense	Mingan's moonwort	USFS
Botrychium montanum	Mountain moonwort	USFS
Carex livida	Pale sedge	USFS
Lewisia columbiana var. columbiana	Columbia lewisia	USFS
Ophioglossum pusillum	Adder's tongue	USFS
Pellaea andromedaefolia	Coffee fern	USFS
Poa laxiflora	Loose-flowered bluegrass	USFS
Polystichum californicum	California swordfern	USFS
Wolffia columbiana	Columbia watermeal	USFS

Survey and Manage Species

Reference Conditions

Most of the species designated as survey and manage are associated with old-growth and riparian habitat. An assumption is made that the number of populations of a given species located in the Winberry/Lower Fall Creek watershed was higher historically due to recent fragmentation of old-growth and riparian habitat by timber management and related activities such as road construction. This has resulted in a loss of interior habitat necessary for the maintenance of some old-growth as well as riparian species (compare *Map 19, Reference Seral Condition (1900)* to *Map 23, Interior Habitat).*

Current Conditions

The Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (USDA, USDI, 1994b) contains a list of species, called survey and manage species, that must be considered when planning projects. A large list of old-growth dependent species was created and effects of alternatives on each species were analyzed by experts during the EIS process (results appear in Table C3 of the Northwest Forest Plan).

Botanical survey and manage elements include lichens, bryophytes (mosses and liverworts), fungi, and vascular plants. Forestwide and regionwide surveys of these species have been or are being initiated this fiscal year; information is incomplete or unavailable. The biological importance of these species is just being discovered. Fungi provide food for flying squirrels, the prey base of spotted owls, as well as voles, squirrels, mice, and other small mammals (Maser, et al., 1978). Lichens provide a food source for deer and elk during winter when grass and shrubs are unpalatable or buried by snow (Thomas and Toweill, 1982). They are also used by flying squirrels, red-backed voles and woodrats (Maser, et al., 1985). Lichens, which contain cyanobacteria as their "algal" symbiont, make nitrogen available in forests where it is a limiting nutrient (USDA, *et. al.*, 1993). Bryophytes are important reservoirs for water and nutrients (USDA, *et. al.,* 1993) and account for approximately 20% of the total biomass and 95% of the photosynthetic biomass in the forest understory (Binkley and Graham, 1981). Bryophytes are important food sources for invertebrates and are used as nesting materials for mammals (USDA, *et. al.*, 1993).

Lichens are organisms composed of both a fungus and an alga or a cyanobacterium. A number of nitrogen-fixing lichens are found throughout the Forest and are old-growth dependent (Pike, *et al.,* 1975; Lesica, *et al.,* 1991). Although many exact locations are not known, such lichens as *Lobaria oregana* and *Lobaria pulmonaria* have been recorded by the District Botanist in Winberry Campground and other places in the watershed. These species are epiphytes, so they require retention of standing tree clumps to maintain a suitable microclimate and provide for dispersal (USDA, 1994a). Their dispersal capability is extremely limited (USDA, 1993). Other lichen species of interest are riparian and closely correlated with hardwood tree species.

No known survey and manage fungi or vascular plants occur in the watershed. *Allotropa virgata*, the candystick, has the potential to occur here. This is a mycotrophic species, a plant with no chlorophyll, which requires an association with another plant for food. The candystick is often found in the Douglas-fir series, and may be associated with hemlock, fir and lodgepole pine elsewhere. This species is not restricted to old-growth, but the largest populations occur there. It does not tolerate competition and is never abundant. The plant prefers dry, well-drained soils and abundant coarse woody debris (UDSA, 1994a).

Compared to historic patterns, current conditions for riparian species in this watershed are poor *(see Table 27 and Map 22).* Seventy to eighty percent of the stream miles in North and South Reservoir respectively, are in early seral stages, indicating very few, if any, trees adjacent to the stream and no interior microclimate or habitat for epiphytic species. Riparian habitat on Forest Service land is also poor in the North Fork Winberry, Brush Creek and Upper South Fork Winberry drainages. Not only is a high proportion in early successional stages, but high quality habitat is also highly fragmented, thereby inhibiting its function as a corridor for dispersal and movement.

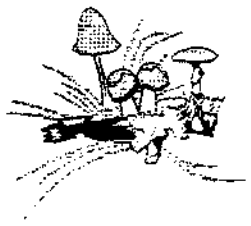


Table 27. Current Riparian Miles in Early Seral Stage

Drainage	Riparian Miles in Early Seral Stage (0-80 Years)
North Reservoir	69%
South Reservoir	79%
North Fork Winberry	60%
Brush Creek	52%
Lower South Fork	13%
Upper South Fork	49%

Habitat for late successional survey and manage species has also changed dramatically. The seral stage of late successional old-growth (200+ years) has decreased from 50.2% of the watershed in 1900 to its current level of 15% *(see Figure 11, pg. 58)*. The distribution of old-growth interior habitat has also changed a great deal *(compare Map 19 Reference Seral Condition (1900) with Map 22, Interior Habitat)*.

Special Habitats

Reference Conditions

Based on seral stage conditions in 1900, it is fair to assume that special habitats occurred in at least the same, but probably greater amounts than today. Dry meadow complexes, mesic meadows, rock cliffs, outcrops, and talus slopes all appear in varying amounts. The majority of unique habitats seem to surround the upper reaches of the watershed, with the exception of rock gardens and dry meadows found throughout. On lands not managed by the USFS, a few large meadow complexes exist, such as the ones found on Mt. Salem's summit. Reoccurring anthropic fires maintained dry open meadows and prevented conifer encroachment. The hydrologic regime was probably such that wet and mesic meadows, ponds and sumps developed over time and remained as sources of unique native vegetation and habitats for some special habitat species obligates. The Winberry Divide and Alpine Ridge area probably functioned as a north/south ridgeline corridor for movement of both plant and animal species.

Stands in the 1900s were more structurally complex than today. Without human-caused influence, natural disturbance was the controlling force of stand structure and diversity in the watershed. Theoretically, north slope and riparian areas, where intense fire disturbance was not as common as on south slopes, had higher levels of dead and down wood than those stands with recurring fire and disturbance patterns. Less intense, yet more commonly reoccurring fires in uplands and south slopes might have maintained coarse wood at lower than current levels, especially with the onset of fire suppression in the early 1900s.

Special habitats were used by Native Americans for food resources (ex. Camas bulbs from mesic meadows and wild onion from dry rock gardens). Selective harvest allowed a continual supply. Using fire as a hunting tool, Native Americans in the western Cascades manipulated special habitats. Fires may have been purposely started in meadows to lure deer and elk in to forage.

Current Conditions

Special habitats contribute to the overall biodiversity across the landscape and are important for plants and wildlife. For the most part, these areas are non-forested and include meadows, rock outcrops, ponds, and talus slopes. Some special habitats, such as swamps and mineral deposits, are forested.

Approximately three percent of the Winberry/Lower Fall Creek Watershed is comprised of special habitats. The Willamette NF has recognized the significance of these sites in its standard and guideline FW-211 (USDA, 1990). This S & G states that these sites will be maintained or enhanced (repaired) and they will be buffered to the ecotone edge.

Special habitats were mapped and assigned general habitat types in the USFS portion of the analysis area using aerial photo interpretation (*see Map 25*). Information for habitats on BLM and COE land is incidental. The most prevalent special habitat in this watershed is the dry meadow, which accounts for approximately 100 acres of the watershed. Dry meadows are concentrated in the Joe's Peak, Cabin Creek and Monterica Creek areas. Dry rock gardens are more common around Tire Mountain and Winberry Mountain. Extensive hardwood patches are found throughout the South Fork of Winberry drainage. Other common special habitats include shrub alder and vine maple, which shroud the upper portions of mountains surrounding the watershed. The Saddleblanket area seems to be encircled by wetter meadows and the Sourgrass area by drier meadows.

Table 28 depicts location and acreage of special habitats currently present. Preserving or "reclaiming" special habitats is crucial to maintaining biodiversity across the landscape in the Pacific Northwest. Various wildlife species have evolved over time to be either partially or totally dependent on these habitat types for a portion or all of their life histories. Some land slugs are suspected to be dependent on rock slides or talus slopes for a major portion of their life histories. Perennial or intermittent ponds are crucial to the reproduction and larval development of many frogs and salamanders. These ponds also provide a source of insect forage for many species of bats and passerine birds. Winberry Pond is an excellent example of unique perennial pond habitat impacted by past timber harvest practices. Dry meadow complexes are important foraging areas for kestrels and great gray owls because they support small mammal prey species such as gophers and voles. Snags and coarse woody debris serve as homes for many primary and secondary cavity-nesting birds and are important for a long list of wildlife species.

Insects and fungi are decomposers of dead wood, which eventually contributes to long-term site productivity. Marten use dead and down wood for foraging, denning and nesting.

Table 28. Special Habitats of Winberry/Lower Fall Creek Watershed

Habitat Type	Acreage	Number in Watershed
Rock Garden	14.65	6
Mesic Meadow	47.96	1
Sitka Alder	76.08	13
Rock Outcrop	7.06	3
Dry Meadow	95.85	23
Wet Meadow	9.25	2
Hardwoods	5.36	4
Shrub Talus	72.69	12
Opening in Canopy	12.17	3
Pond	2.85	1

It is evident that past management activities have affected special habitats. Until the early 1900s, fire played an active role in maintaining the mesic meadow complexes, such as those found in the Cloverpatch Butte area. Although geology indicates shallow soils and a low potential for conifer establishment in this area, it is possible that since the advent of fire suppression, these meadows have started to experience ingrowth and encroachment of conifers, thus affecting habitat availability for certain wildlife species.

Roads and managed stands have affected many types of special habitat. GIS information was used to determine if habitat features intersect roads and/or managed stands; the results are found in Table 29. Roads intersect with rock gardens, mesic and dry meadows as well as shrub alder. Timber harvest units surround the only pond and affect most rock outcrops and shrub alder habitats within the watershed. To a lesser extent, these harvest units have also affected mesic and dry meadows, dry rock gardens and shrub talus *(see Table 29).*

The 1990 Willamette NF LRMP directs the Forest to "maintain or enhance" special habitats. This management guide outlines a methodology for analysis of environmental factors necessary for maintenance of each habitat and aids in formulating site-specific prescriptions for these areas (Dimling and McCain, 1992).

Table 29. Acres of Roads and Managed Stands Intersecting Special Habitats

Habitat Type	Acreage Affected	
	Roads	Managed Stands
Rock Garden	83%	17%
Mesic Meadow	20%	50%
Sitka Alder	31%	77%
Rock Outcrop	0%	67%
Dry Meadow	26%	26%
Wet Meadow	0%	0%
Hardwoods	0%	0%
Shrub Talus	0%	25%
Canopy Opening	0%	0%
Pond	0%	100%

Noxious Weeds

Reference Conditions

Noxious weeds have increased in abundance since the turn of the century. Established weed species have been present in the watershed for years. Scotch broom was introduced as an ornamental shrub and an erosion control agent in the 1920s (Miller, 1995). St. John's-wort, probably a garden escapee, has been a medicinal herb for many centuries. Thistles traveled west as contaminants in alfalfa and other crop seedbags and came to Portland in the ballast of sea-faring vessels (Forcella and Harvey, 1988). Most of these species would have been considered newly invading species in the 1930s. Knapweed, toadflax and giant knotweed were probably not found anywhere on the forest.

Current Conditions

The Willamette NF initiated an Integrated Weed Management Program in 1993. The Forest Plan S & G directs that sites be identified and analyzed for the most effective control methods based on site-specific analysis of weed populations (USDA, 1993a). Control efforts on COE and BLM are just beginning. They currently use manual, biological and mechanical control methods. The BLM is restricted from using chemicals until an environmental analysis is completed.

The highest priority species for treatment are new invaders, i.e. those weeds in early stages of invasion which have not naturalized to the point of resource damage. No new invaders are found in the Winberry Watershed. Other weeds found on the Forest are

termed "established infestations." These weeds have spread to the point where eradication is impossible and resource damage is unacceptable. Established weeds include Canada thistle, bull thistle, tansy ragwort, Scotch broom, and common St. John's-wort.

The most common established weed is Scotch broom, which may be found on any disturbed site but is most commonly associated with clearcut logging units, landings and logging roads. Scotch broom competes with young conifers in plantations. This species is found throughout the area. Other weed species associated with plantations include Canada thistle, bull thistle and tansy. Due to lack of sunlight all are generally outcompeted in moderately young (40 year) forest plantations. St. John's-wort can be found in these sites, but is also common in meadow habitats which often harbor natural soil disturbers such as groundhogs and mountain beavers. St. John's-wort, once established, has the ability to outcompete native species, causing a severe reduction in biological diversity of the site, especially in rock garden habitats found within the watershed.

Due to the sheer amount of acreage these infestations cover, treatment methods are limited primarily to biological control for most of the land area. This type of control involves the use of insects which naturally feed on the plant or its seeds, eventually causing an equilibrium in population numbers. A section of the Federal Department of Agriculture, APHIS, is responsible for the testing and release of biological control agents. Testing must be conducted because insects are imported from the weed's place of origin (usually Europe or Asia) and effects on native flora must be examined.

Records of biological control releases indicate that insects have been released in Winberry/Lower Fall Creek Watershed since 1988 *(see Table 30)*. Seed weevils and flea beetles have been released for Scotch broom and tansy respectively.

The USFS plans on making a concerted effort to keep Scotch broom and other weeds out of some of unique areas such as special habitats, riparian areas, sensitive and rare plant and animal habitats, just to name a few. Control methods include mechanical mowing along the roadside and manual clipping or pulling of weeds.

Other non-native species of concern in the watershed include two species found along the Fall Creek Reservoir: reed canarygrass and Himalayan blackberry. Reed canarygrass is a native of Eurasia which has been used for soil stabilization and erosion control purposes in wet places. Though this species might be perfect for reservoir revegetation (it is the most common species in the draw-down zone), it is extremely invasive and would outcompete native riparian vegetation if allowed to travel upriver.

Blackberry is another Eurasian species making its way up in elevation from the Willamette Valley. This species is dispersed, for the most part, by birds. It also has the potential to outcompete native vegetation in riparian areas. Unlike non-natives invading clearcuts, riparian areas rarely provide a very closed canopy stage, which would shade out the weed. Presence of hardwoods guarantees openings in the canopy so some sunlight reaches the forest floor.

Table 30. Biological Control Releases on Lower Middle Fork Noxious Weed Populations

Target Weed	Insect	Year	Location
Scotch broom	*Apion fuscirostre*	1990	19S 2E Sec 19
		1990	20S 2E Sec 2
		1990	20S 1E Sec 11, 12
Tansy	*Longitarsus jacobaea*	1988	19S 2E Sec 20,29
	(root-eating flea beetle)	1989	20S 2E Sec 10

WILDLIFE

Riparian Habitats

Reference Conditions

Wildlife species associated with aquatic and riparian habitats were probably much more abundant and widespread historically than they are today. Intact riparian areas with cooler water temperatures, low sediment and imbeddedness levels, and higher levels of snags and coarse woody debris provided optimal conditions for aquatic and riparian-associated wildlife species. Amphibians, such as the tailed frog and torrent salamander, requiring cool, moist habitat conditions benefited from extensive areas of riparian late successional forest both in the northwest and in this watershed. Harlequin ducks and wood ducks, strong aquatic and riparian obligates, were probably more abundant before the influence of European settlers began. Their abundance is directly related to healthy aquatic and riparian systems which provide foraging and nesting habitat. Beaver, river otter, mink and muskrat most likely occurred in greater numbers during the early 1900s, again due to healthy riparian and aquatic systems. With the conversion of a substantial portion of the lower end of Fall Creek corridor to agricultural land, Fall Creek Reservoir and young forested conditions, available habitat for these riparian-associated mammals has been greatly reduced.

Coarse Woody Debris

Coarse woody debris (CWD) levels in the watershed contributed to a healthy riparian system. Natural recruitment from adjacent late successional forest stands provided coarse woody debris for foraging, hiding and denning cover, benefiting a number of wildlife species such as the American marten, pileated woodpecker and clouded salamanders as well as many invertebrate species. Woody debris recruitment from the terrestrial into the aquatic system was a fairly healthy ongoing process providing an important habitat component to the riparian and aquatic system. As logging and stand

management increased in the watershed, activities such as fuels treatment by slash burning and removal of snags and other non-merchantable material, road construction through riparian areas with minimal or no restrictions, and stream cleanout substantially reduced those components which provided optimal microhabitat conditions for many organisms.

Current Conditions

Riparian Reserves

The riparian reserve strategy within the northern spotted owl range was developed to provide late successional forest conditions over time to protect aquatic habitat and provide for dispersal of several terrestrial vertebrate species including the spotted owl, red tree vole and American marten. Table 31 depicts current conditions of the riparian reserve network in the watershed by showing how much of the reserve network has been impacted by past management activities. This analysis was completed using acres as the unit of measurement, thereby increasing the accuracy of the total amount of riparian reserve acres impacted.

Map 22 spatially displays impacts to the reserve network by past management activities. The reserve network displayed in this map also includes other withdrawn allocations that contribute late successional forest conditions for dispersal.

Winberry Pond, a unique pond within the analysis area, is located approximately one mile east of the confluence of North Fork Winberry and Traverse Creeks. It is approximately one acre in size and potentially plays host to a number of wildlife species such as the red-legged frog and northwestern pond turtle. Young, managed stands completely encircle the pond, thereby impacting it's ability to function as it did historically.

Table 31. Current Seral Stage Condition of Riparian Reserves on Federal Lands

Seral Stage	Stand Initiation 0-30 years	Stem Exclusion 31-80 years	Understory Reinitiation & Late Successional Old-Growth
Brush Creek	37.8%	18.2%	44.0%
North Winberry	35.3%	22.7%	42.0%
Upper South Fork	28.8%	16.4%	54.8%
Lower South Fork	18.6%	1.10%	80.4%
South Reservoir	55.4%	28.2%	16.4%
North Reservoir	54.9%	15.6%	29.5%
Total	**41.1%**	**19.0%**	**39.9%**

Fall Creek Reservoir

Fall Creek Reservoir, constructed in 1965, inundated 1,820 acres of agricultural, forest and stream riparian habitats. The annual fluctuations in reservoir water level to support flood control and recreational use have created a fairly sterile condition for aquatic dependent wildlife. The high recreation use during the warmer spring and summer months is affecting the use of the reservoir by those wildlife species using lake habitats for all or portions of their life history.

A number of wildlife species are known or suspected to use the reservoir and US Army Corp of Engineer (COE) lands immediately adjacent to the reservoir. These include the Northern bald eagle, Western pond turtle, osprey, Northern spotted owl, red-legged frog, wood duck, red tree vole, pallid bat, Yuma bat, fringed myotis, clouded salamander, sharptail snake, and various waterfowl species using the reservoir as a stopover during seasonal migration. A synopsis of current conditions for these reservoir species is addressed in *"Species of Concern"*, page 86.

Non-Native Species

Non-native species do occur in the watershed and potentially affect wildlife species populations. Warm-water fish, such as bass introduced into the reservoir, potentially impact successful recruitment of young pond turtles into the population due to predation or competition for a very limited food supply resulting from annual water fluctuations. Bullfrogs also affect both turtle and amphibian survival and recruitment into adult populations by predation.

The starling, a non-native avian species from England, is known to out-compete purple martin for nesting locations in cavities. Purple martin are associated with larger rivers and lakes, essential as foraging areas for insects. Nest sites are generally located immediately adjacent to their foraging areas. Although suitable purple martin nesting habitat has been reduced in the watershed due to snag removal and fire suppression, the opportunity to increase potential nesting sites does exist through snag creation and nest box placement adjacent to the reservoir and lower end of Fall Creek. Ideally, this would occur synonymous with holding starling levels in check.

Upland Habitats

Reference Conditions

Big Game

The Columbia white-tailed deer *(Odocoileus virginianus leucurus),* is currently listed as threatened by the US Fish and Wildlife Service. The two main population densities occurring in the Northwest are along the lower Columbia River in Washington and in Douglas County near Roseburg. The species prefers oak woodland/grassland ecotones and riparian habitat in coniferous forests. Historically, it was suspected to occur throughout the lowlands in and adjacent to the Willamette Valley. The low end of the watershed, historically composed of more oak savanna habitat and brushy river bottomlands, was probably prime habitat for this species. Due to clearing and

agricultural development on brushlands in river valleys and lower foothills, the range of this species has been drastically reduced.

A historical perspective for Roosevelt elk population levels in western Oregon presented by the Oregon Department of Fish and Wildlife (ODFW, 1992) indicates that the species was numerous and widely distributed in western Oregon prior to the arrival of European settlers. During the late 1800s, market hunting for elk and human encroachment on elk range substantially reduced elk population levels to a few small herds along the coast and in the Cascades by 1900. In 1909, the Oregon State Legislature banned elk hunting in the state. This closure continued until 1938, when hunting was reopened on a limited basis. During the closure period, elk populations recovered substantially due to some transplanting efforts but mainly by virtue of an increase and expansion of remnant elk populations. Population trends continued to rise into the 1960s with a dip in numbers occurring in the 1980s. Overall trends have been on the rise in western Oregon up to the present.

The Fall Creek Watershed Analysis (1995) modeled big game for the watershed. Modeling indicated that habitat conditions in the early 1900s were capable of supporting more abundant big game populations than current habitat. The Winberry/Lower Fall Creek watershed typifies these historic habitat conditions. This would suggest that big game populations were higher in the past, although historical records and information do not support this. The model used has been built and structured around management activities and responses of big game to these activities. The fact that historical vegetation was comprised of large tracts of optimal habitat coupled with very low open road densities created high habitat values in the modeling process. The Winberry/Lower Fall Creek watershed, composed primarily of federal matrix and industrial forestlands, is primarily targeted for timber production. As long as adequate thermal conditions are maintained in the watershed, it should support target population levels developed in conjunction with ODFW.

Connectivity, Dispersal and Interior Habitat Conditions

Reference vegetative conditions, reconstructed in GIS using stand year of origin information *(see Map 19),* depicts a watershed comprised substantially of late successional forest habitat. Although relatively more acres of younger stands existed in 1900 in the Winberry/Lower Fall Creek Watershed compared to Fall Creek, this is a snapshot in time where seral conditions were probably completely different 500 years prior to this reference point. These stands were also contiguous, supplying large amounts of interior habitat for species such as the spotted owl, red tree vole, American marten, goshawk, Cooper's hawk, pileated woodpecker, fisher, vaux's swift, olive-sided flycatcher, Hammond's flycatcher, Townsend's warbler, band-tailed pigeon, and numerous amphibian species. Not only were these and many other species able to breed and reproduce, but they were also able to move, disperse and migrate without major landscape barriers. This provided for well distributed populations of late successional forest dependent species in the watershed. With the onset of European American influence and habitation, suitable habitats for these species started to decline. This was largely due to increased forest fragmentation resulting from logging and

roadbuilding, degradation of aquatic and riparian conditions and increased forest fire suppression.

Since only 29.1% of the watershed was estimated as an early seral stage condition (stand initiation), early seral stage dependent or contrast species could be more abundant today than they were in 1900. Species abundance in Winberry Creek in 1900 might have been complimented by higher or lower numbers in adjacent watersheds, based on size and location of natural disturbances across the landscape.

The Winberry Creek drainage, a major east/west riparian corridor, could have been instrumental in facilitating movement and migration of riparian dependent species (as well as other species) between the Willamette River lowlands and the North Fork of the Middle Fork Willamette by way of Windy Pass.

Snags and Coarse Woody Debris

Habitat components such as snags and coarse woody debris were more abundant in forested stands during the early 1900s. Levels varied in different portions of the watershed based on historic disturbance patterns. Burning by indigenous tribes in the lower portions of the watershed (including the lower half of South Fork Winberry Creek and the lower Winberry and Fall Creek areas) kept coarse woody debris levels lower than probably occurred under normal disturbance patterns. The upper end of the watershed, where older stands occur, probably had higher levels of snags and CWD due to its limited fire history and existing old-growth stand components. This is probably still true today.

➢ *Note: Special Habitats are addressed in the Botany section.*

Current Conditions

Big Game

The watershed is relatively low in elevation, most lying within big game winter range. Currently, 16.7% (7,047 acres) lies within summer range and 83.3% (35,042 acres) lies within winter range. Summer/winter range division was delineated using the 3,000 feet elevation contour as a base and then adjusting this line based on aspect, slope, topography, and general knowledge of big game use *(see Map 26)*. Main areas of documented activity for Roosevelt elk are:

1. Saddleblanket and Sourgrass Mountains, considered high use summer range habitat,
2. the north side of Tire Mountain near the end of the 5824 road system, and
3. the Horn Butte area.

The Willamette NF Land and Resource Management Plan directs management of big game habitat in its standards and guidelines. It requires habitat analysis using four habitat components: forage quality, cover quality, road densities, and the spatial arrangement of forage and cover areas relative to each other. These parameters are evaluated using the *Model to Evaluate Elk Habitat in Western Oregon* (Wisdom, 1987). Modeling is accomplished for previously designated Big Game Emphasis Areas

(BGEAs). There are five BGEAs in the analysis area, varying from low to high emphasis, based mainly on elk use and habitat condition of the area. Habitat conditions using the Wisdom model have been analyzed on Forest Service lands. Private, COE and BLM lands are not mandated to manage habitat using Wisdom model habitat variables *(refer to Table 32 for a summary of BGEAs, their size and emphasis ranking).* Modeling was completed using the current vegetation layer in GIS in conjunction with Paradox and HEI West programs.

Table 32 displays current conditions of the BGEAs found within the USFS portion of the watershed. As shown, Cabin Creek is the only high BGEA in the watershed. There are some high use areas within BGEAs having an overall rating of moderate or low. These include the area north of Tire Mountain at the end of the 5824 road system and the Saddleblanket area at the upper end of North Fork Winberry Creek. On non-Forest Service lands, Horn Butte provides habitat for a herd using the area between the two reservoir arms in the lower end of the watershed. It is common to see this herd above the Winberry arm and below the USFS boundary, using private agricultural lands for winter grazing. This area is known as Reed's Ranch. *Map 27* depicts overall road configuration in the watershed with emphasis on federal land ownership. This illustrates a fairly extensive road closure/obliteration program on USFS lands.

Seasonal migration and elk movement crosses boundaries between summer and winter ranges and watersheds. It is suspected that elk using the Saddleblanket/Sourgrass area move downslope to the northwest and use lower Portland, Rubble, Andy, and Timber Creeks, or move down into the North Fork of the Middle Fork Willamette River drainage. The south side of Winberry Divide is considered high use winter range for some elk using the Winberry/Lower Fall Creek Watershed.

Table 32. Big Game Habitat Effectiveness Values for Current Conditions in the Watershed
(Standards and Guidelines from Willamette NF LRMP)

Habitat Condition	Forage Quality	Cover Quality	Road Density	Size & Spacing	HEI	Forest S & G's HEI	Comments
Brush Creek Total Ac: 2,824	.42	.58	**.39**	.64	.50	.5	Road density slightly below S & G of .4
North Fork Winberry Total Ac: 6,334	.47	.61	**.39**	.81	.55	.5	Road density slightly below S & G of .4
Lower South Fork/ Monterica Total Ac: 4,651	.35	.52	.52	.88	.54	↑	
Cabin Creek Total Ac: 4,098	**.47**	.54	**.44**	.92	**.56**	.6	Forage & Road Density Variables below S & G of .5 HEI below Forest Plan .6
Upper South Fork Winberry Total Ac: 4,391	.53	.65	.44	.75	.58	.5	

Note: ↑ -- should show increasing trends over time.
Bold numbers indicate values below Standard & Guideline levels.

Late Successional Forest Connectivity and Wildlife Dispersal Habitat

The Northwest Forest Plan provides for late successional forest dependent wildlife species movement and dispersal by designation of no-harvest riparian reserves adjacent to Class I-IV streams. Its intent is to maintain healthy riparian systems and provide areas of refuge, movement and dispersal for many riparian-associated species as well as terrestrial-associated species. In addition to riparian reserves, other lands set aside within the matrix portion of the watershed would complement riparian reserves by providing additional dispersal habitat. These include 100-acre spotted owl core areas within the matrix portion, designated no-harvest LRMP allocations and unsuited lands currently providing dispersal conditions. The Northwest Forest Plan also directs that the previously established American marten/Pileated woodpecker network revert to matrix lands unless analysis shows a need to retain certain areas over the short or long term to provide certain habitat conditions.

With adoption of the Northwest Forest Plan, the 50-11-40 strategy delineated in the FSEIS (1992) was no longer required. This strategy required every quarter township to maintain at least 50% of the area in stands averaging 11 inches DBH and 40% canopy closure. The USFWS remains concerned with dispersal conditions, not only within the LSRs but also between LSRs. Consultation with the USFWS is required when habitat removal or degradation is planned in ¼ townships below the 50-11-40 threshold. *(Refer to Northern Spotted Owl, page 88, for a discussion on dispersal conditions for the spotted owl.)*

On BLM lands, the strategy is to provide 640 acre connectivity blocks (designated by legal section) managed on 150 year rotations. Twenty five to 30% of these blocks should be maintained in late successional forest at any point in time. In this watershed, Section 3 (T19S R1E) just north of Horn Butte is designated as a connectivity block. The main objective was to provide connectivity and islands of diversity scattered throughout matrix lands. The position of this connectivity block on the landscape suggests that it would be prudent to consider potential connectivity between this section and USFS lands to the east. Its value as a connectivity block would be enhanced if it were connected to larger blocks of existing or potential late successional forest.

Further areas of concern are the major ridgetops bordering the watershed. Ridgetops can be main travel and dispersal corridors for many wildlife and plant species. Alpine Ridge, the divide between Winberry Creek and the North Fork of the Middle Fork Willamette River, is a main elk travel route and potential calving area during the summer months. As a result of the riparian reserve strategy in the ROD, ridgetops may be impacted from concentrated harvest activities in the future, thereby reducing effectiveness of these primary routes as main travel and dispersal corridors.

The data in Table 33 shows current conditions of no-harvest allocations by depicting the percentage of these allocations meeting late successional forest conditions. *Map 28* displays this information spatially. *Maps 29* through *32* show the projected change in these conditions during the next 80 years and identify potential areas of concern.

Table 33. "No-Harvest" Allocations on Federal Lands by Drainage Currently Meeting Late successional Forest Conditions

Subdrainage	Late Successional Forest Habitat (>80 Year)
Brush Creek	50%
North Winberry	43%
Cabin Creek/Upper South Fork	57%
Lower South Fork/Monterica	86%
South Reservoir	40%
North Reservoir	40%
Total	56%

Marten/Pileated Woodpecker Areas

On page C-3 of the Northwest Forest Plan for Amendments to the Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl, Item Two states:

> *"Administratively withdrawn areas that are specified in current plans and draft plan preferred alternatives to benefit American marten, pileated woodpecker, and other late successional species are returned to the matrix unless local knowledge indicates that other allocations and these standards and guidelines will not meet the objectives for these species."*

Presently, three areas (757 acres) are designated for martens within the matrix portion of the watershed and two areas (679 acres) are allocated for the pileated woodpecker. Current condition of these areas and their overlap with other reserve land allocations is described below:

- PWHA #397 - ***Brush Creek*** (338 acre core with a proposed foraging area of 318 acres): This core is partially overlapped by a 100 acre LSR for spotted owl master site #2886. Existing condition of 11-40 in this ¼ township is 42.6%.
- PWHA #408 - ***Saddleblanket Mtn.*** (Unknown Acreage): This core is entirely within the Saddleblanket Mountain Special Wildlife Habitat Area 9D allocation. This is a no-harvest allocation unless necessary to improve wildlife habitat conditions.
- MHA #416 - ***Blanket Creek*** (204 acre core with a proposed foraging area of 327 acres): Approximately 90% of this core and foraging area is overlapped by two 100 Ac. LSRs for spotted owl master site #'s 0065 and 2856. Existing condition of 11-40 in this ¼ township is 43.0%.
- MHA #424 - ***Sourgrass Mtn.*** (595 acre core): Lies entirely within the Sourgrass Mountain Special Wildlife Habitat Area 9D allocation. This is a no programmed harvest allocation.

- MHA #437 - ***Tire Mtn.*** (213 acre core): 50% overlap with the 100 acre LSR for master site # 0054. Existing condition of 11-40 for this ¼ township is 69.1%.

The five marten and pileated woodpecker habitat areas cover approximately 1,300 acres. With the exception of the Brush Creek pileated woodpecker core, these areas exhibit substantial overlap with other withdrawn land allocations.

Snag and Coarse Woody Debris Levels

Snag and coarse woody debris levels vary substantially within the watershed. Modeling was completed using a spreadsheet program developed by Matt Hunter (1990) designed to determine snag densities based on current snag levels in both managed and natural stands. This information was developed using local knowledge of stands in the watershed, past harvest history of managed stands, and recent wildlife tree retention requirements in harvested stands. The analysis was completed in each of the four PSUB clusters and on federal lands in the North and South Reservoir drainages. This gives a general view of the current condition of snag levels. More site-specific project planning and analysis might reveal some minor differences in these figures due to more refined analysis. Stand exams have recently been completed on 256 acres of COE lands, specifically in the Peninsula Unit (South Shore of the Fall Creek arm). Results indicate snag levels were at or above 100% for primary cavity excavator populations.

Table 34 depicts current snag levels (notice assumptions used to develop snag percent levels in natural stands). Current direction in the LRMP provides snags to support 40% potential populations of primary cavity excavators on USFS and BLM matrix lands. These snags should be at least 18 inches in diameter and 40 feet tall. Monitoring of snag levels should be completed at the subwatershed level.

Table 34. Estimated Current Snag Levels in the Watershed

Subdrainage	% Snag Level
Brush Creek	41.2%
North Winberry Creek	37.0%
Cabin Creek/Upper South Winberry	45.8%
Lower South Winberry/Monterica	54.6%
BLM	21.8%

Assumptions: **USFS** stands were assigned a current snag level based primarily on year of origin. Managed stands harvested between 1930 and 1986 were assigned a value of 0; between 1986 and 1991, a value of 20; and recent harvest units with better wildlife tree retention, a value of 40%. Older natural stands were assigned percent values between 10 and 90 based on year of origin.

BLM natural stands were assigned values of 20% to 60% based on year of origin and a value of 0% was assigned to all managed stands.

Non-native Species

In the lower end of the watershed where agricultural lands and human habitation are common, non-native domestic feline species are suspected to have an effect on successful reproduction of some neotropical migrant species such as American goldfinches and hummingbirds due to predation.

Forest fragmentation could have an effect on local abundance of some avian species. The juxtaposition of forest seral conditions can subject some forest-dwelling bird species to the effects of brood parisitism by the brown-headed cowbird. Brown-headed cowbirds are suspected to occur within the watershed, although their preferred habitat probably occurs in the lower end of the watershed where scattered trees are interspersed with grassland vegetation and agricultural lands (DeGraaf, 1995). Past Breeding Bird Survey routes on the Willamette NF revealed a low abundance of cowbirds (Sharp, 1992). Neotropical species that could be impacted by brood parasitism are the willow flycatcher, solitary vireo, yellow warbler, and McGillivray's warbler. These species are common hosts to cowbird eggs and are potentially on the decline in Oregon.

Species of Concern: Current Conditions

The following are threatened, endangered and sensitive species known or suspected to occur within the watershed. Included in the discussions of each is current information on status and survey history, and future potential occurrence for listed species based on vegetation trends and land allocations in the Northwest Forest Plan. Also included are species of interest or concern, documented or suspected to occur in this watershed. Refer to *Table D- 2*, page 201, in *Appendix D* for species currently listed under the Endangered Species Act. Also listed are those recently included as Category 2 species (USFWS, Animal Candidate Review, Nov. 1995).

American Peregrine Falcon *(Falcon peregrinus anatum)*

Status: Federal: *Endangered*
State: *Endangered*
Indicator species for endangered species habitat.

Current Status and Survey History: No active peregrine nest sites are known to exist within the watershed. In the Pacific states, preferred peregrine falcon nesting sites are sheer cliffs 150 feet or greater in height (Willamette National Forest DEIS, 1987). In 1981, the Oregon Department of Fish and Wildlife completed an aerial reconnaissance of cliffs on the Forest and identified those with nest site potential. None were located on the Lowell Ranger District. In 1991, another aerial survey for peregrine nesting sites was conducted by Joel Pagel. Only one site on the district, in the Portland Creek drainage, was identified as having moderate potential for nesting.

The peregrine falcon feeds almost exclusively on birds, many of which are associated with riparian zones and large bodies of water. Presence of the reservoir provides potential foraging sources for the bird.

In 1995, ground field reconnaissance was conducted to assess potential sites for peregrines. The district has expanded the list of potential sites to five, and monitoring these sites will continue in subsequent years. All sites are within the LSR located in Fall Creek, with one exception found on the boundary between LSR and matrix. No potential peregrine nesting habitat exists in the Winberry/Lower Fall Creek Watershed.

Future trends in habitat and occurrence: The potential exists for peregrines to forage above and adjacent to the reservoir. With potential nest sites identified in the Fall Creek Watershed, the reservoir could prove to be a preferred foraging area for birds nesting in surrounding areas.

Northern Bald Eagle */Haliaeetus leucocephalus/*

Status: Federal: *Threatened*
State: *Threatened*
Indicator species for endangered species habitat.

Current Status and Survey History: There are no known bald eagle nest sites within the watershed although potential nesting habitat exists in areas adjacent to Fall Creek Reservoir. It has been documented that the Eagle Rock pair, nesting above Dexter Reservoir, uses Fall Creek Reservoir as a foraging area especially during the late winter and early spring while nesting, and before recreational activity increases on the reservoir. The BLM has designated 533 acres as Bald Eagle Habitat Areas (BEHA) distributed in three separate areas of the watershed. The COE manages lands that completely encircle the reservoir. Although almost all the timbered stands are younger and would not currently support nesting activity, such potential does exist in the future. Currently nesting activity is not known to occur in these areas; however the potential exists since a portion of the designated BEHAs on BLM lands are currently in late succesional old-growth condition.

Anthony, *et. al.* (1982), recorded that in the Pacific recovery area, resident bald eagle habitat requirements include a nest site in an uneven-aged (multi-storied) stand with old-growth components. Nest trees are usually larger than those trees in surrounding stands (USFS, 1987) and have thick, stout limbs which can support nests weighing in excess of several hundred pounds and up to ten feet in diameter. These nests are located near bodies of water which support an adequate food supply (USFWS, 1986). The majority of nests in Oregon are located within half a mile of a body of water; the mean distance of nests in the Cascade Mountains is 470 yards. All forest lands within 1.1 miles of the shoreline surrounding a major body of water can be considered potential bald eagle nesting habitat (USFS, 1987).

Future trends in habitat and occurrence: The lower end of the watershed does contain potential nesting habitat. With the BLM BEHA set-aside lands and COE lands providing

numerous perch sites and future nesting habitat, the potential does exist for bald eagles to take up residence in the watershed. This would be contingent on a prey base in the reservoir and lower Fall Creek adequate for a nesting pair.

Northern Spotted Owl *(Strix occidentalis caurina)*

Status: Federal: *Threatened*
State: *Threatened*
R-6: Sensitive

Current Status: There are 18 known spotted owl activity centers within the watershed. Of these, 14 are located on USFS lands, one on BLM lands and three on private lands. No known spotted owl activity centers occur on COE lands. USFWS addresses habitat removal adjacent to activity centers using *"Incidental Take"* thresholds, commonly known as *"Take." "Take"* is defined as:

1) Removal of suitable habitat where remaining habitat is below 40% within a 1.2 mile radius of the activity center, *OR*
2) Removal of suitable habitat where remaining habitat is below 500 acres within a 0.7 mile radius of the activity center.

Table 35 displays breakdown of activity centers by land allocation and numbers below *"Take"* thresholds *(refer to Table D- 1, page 199, in Appendix D for complete information on "Take" analysis and reproductive history of these activity centers).*

Table 35. Number of Spotted Owl Activity Centers Above or Below "Take" Thresholds

Activity Centers	USFS	BLM	TOTAL
Greater than 40%	10	0	10
30% to 40%	3	0	3
Less than 30%	0	1	1
TOTAL	13	1	14

All USFS matrix and BLM activity centers are protected by designated 100-acre cores, with the exception of a recently discovered activity center on South Fork Winberry Creek located while conducting protocol surveys for spotted owls in the Berry Patch Planning Area. This nesting pair is currently protected with a 70-acre core but does not have 100-acre core status.

By definition, suitable spotted owl habitat ranges from mature stands with a developing second story and some larger overstory trees, snags and coarse wood to old-growth stands with a component of large diameter trees, snags, downed logs and decadent, decaying trees. These stands would meet nesting, roosting, foraging, and dispersal requirements of the spotted owl. Federal lands currently support 13,633 acres (50.2%)

of suitable spotted owl habitat within the watershed. This figure differs from the amount of late successional forest (62.6%) present in the watershed. The difference originates in the GIS layer used to compute acres. Late successional forest was computed from the vegetation layer and suitable owl habitat was calculated from the district spotted owl habitat layer. Refer to Table 36 for a summary of suitable and capable acres by land ownership.

Critical Habitat: Critical Habitat Unit OR-18 currently overlaps the upper end of the watershed. Approximately 8.5% of the watershed is within this critical habitat unit.

The figures in Table 36 are based on suitable habitat entered into the GIS OHAB layer for USFS lands. Information for BLM and COE lands was input using aerial photos or their GIS information. Ninety-two percent of this land is currently growing or capable of growing suitable spotted owl habitat. Overall, 50.2% currently exists as suitable habitat on federal lands *(see Map 35)*.

Table 36. Acres of Suitable Owl Habitat by Ownership

Allocation	Suitable	Capable	Not Capable	% Suitable
USFS	12105	10689	371	53.1%
BLM	1528	1304	9	53.9%
COE	0	1532	1912	0%
TOTALS:	13633	13525	2292	50.2%

Protocol survey status in the watershed: Over the years, spotted owl survey history has been somewhat fragmented on USFS lands in the watershed. Prior to 1990, one calling station was designated at a proposed unit and many suitable stands between units were not surveyed. Nevertheless, many activity centers were located in the watershed and subsequent years' surveys for timber and non-timber related projects have updated locations and produced more sites. From 1990 to present, survey focus has shifted geographically from the northern and upper portions of the watershed to the southern and upper portions. Some areas currently under survey have met survey protocol effort historically but due to the time separating survey efforts and since historical surveys were not all conducted under optimal conditions, these areas are being resurveyed for proposed timber projects. BLM lands have had very intensive survey work completed on all of their lands in the watershed. This has been accomplished in conjunction with demographic studies occurring in the area. Private lands adjacent to BLM ownership were also surveyed to support this demographic study. Presently, BLM lands are still under intensive surveys. *(See Table 38 for Summary of Spotted Owl Protocol Surveys by Land Designation.)*

Dispersal Habitat (11-40) Condition in the Watershed: Table 37 displays percent of acres meeting the 11-40 condition within watershed boundaries. *Map 33* depicts values of 11-40 in those drainages. The basic assumption underlying the analysis was that all stands of at least 40 years old met 11-40 conditions. Table 38 displays 11-40 conditions on federal lands by ¼ townships overlapping the watershed. *Map 34* depicts ¼ township conditions in the watershed by color.

Table 37. Current Spotted Owl Dispersal (11-40) Conditions within the Watershed

Subwatershed	% Dispersal
Brush Creek	53%
North Fork Winberry	53%
Cabin Creek/Upper South Fork Winberry	57%
Lower South Fork Winberry/Monterica	79%
North Reservoir	4%
South Reservoir	11%

Table 38. Current Spotted Owl Dispersal (11-40) Conditions on Federal Lands

Legal Location	11-40 Ac. (Total Ac.)	%	Geographic Area
T18S R1E SW	BLM	28%	Little Fall Cr.-Big Fall Cr. Divide
T18S R1E SE	BLM	80%	Deer Mtn. Little Gold Cr.
T19S R1E NE	BLM	80%	Bear Mtn. Horn Butte
T19S R2E NW	2306 (5416)	42.6%	Upper Brush/Minnehaha
T19S R2E NE	2530 (5598)	45.2%	Upper N. Fork Winberry
T19S R2E SW	3849 (5519)	69.7%	Lower S. Fork Winberry
T19S R2E SE	2420 (5630)	43.0%	Blanket Cr./ Saddleblanket Mtn.
T19S R3E SW	2525 (5617)	45.0%	Upper Cabin Cr.
T20S R2E NW	2973 (4750)	62.6%	Small Portion-Middle S. Fk. Winberry
T20S R2E NE	3792 (5485)	69.1%	Joe's Peak/ Tire Mtn.
T20S R3E NW	2653 (5415)	49.0%	Sourgrass/Upper S. Fk. Winberry

Table 39. Spotted Owl Protocol Summary by Land Designation

Year	Land Ownership	Type of Survey	% Watershed Surveyed	
			3X	6X
Pre-1989	USFS	Opportunistic visits- surveyed historical sites. No area or broadcast protocol work completed.		
	BLM	Unknown		
	Private	None completed		
1989	USFS	Area under old protocol completed. Work accomplished late in the season but activity centers were found.	36%	
	BLM	Unknown		
	Private			
1990	USFS	Most intensive work completed in planning areas with revised protocol.	3%	35%
	BLM	Unknown		
	Private			
1991	USFS	Extensive work completed in planning areas.	0%	48%
	BLM	All BLM lands surveyed 6 times		100%
	Private	Some private lands surveyed in conjunction with BLM surveys		10%
1992	USFS	Most work completed for timber support and seasonally restricted activities.	52%	12%
	BLM	All BLM lands surveyed 6 times		100%
	Private	Some private lands surveyed in conjunction with BLM surveys		10%
1993	USFS	Surveys completed in planning areas and trail construction near South Winberry Creek. Some activity centers visited to update status	36%	0%
	BLM	All BLM lands surveyed w/ 6 visits protocol		100%
	Private	Private lands surveyed in conjunction w/ BLM surveys. Amount of private land surveyed beyond BLM surveys: *Unknown.*		10%
1994	USFS	Less emphasis on planning areas. Work completed to support trail construction and thinning operations.	11%	0%
	BLM	All BLM lands surveyed w/ 6 visit protocol		100%
	Private	Some private lands surveyed in conjunction w/ BLM. Other private land survey efforts: *Unknown.*		10%
1995	USFS	Surveys conducted to support Carpet Hill Planning area.	22%	0%
	BLM	All BLM lands surveyed w/ 6 visit protocol.		100%
	Private	Some private lands surveyed in conjunction w/ BLM. Other private land survey efforts: *Unknown.*		10%
1996	USFS	Berry Patch Planning area called to 6 visit protocol. Completing Carpet Hill Planning Area.	22%	10%
	BLM	100% 6 visit protocol in progress.		In process
	Private			

Harlequin Duck (Histrionicus histrionicus)

Status: Federal: Candidate Category 2
State: Sensitive
R-6: Sensitive

Current Status and Survey History: Rivers, streams, and creeks are primary feeding and breeding habitat for harlequin ducks during the breeding season. Birds winter on the coast where they feed on a wide variety of sea life and then move into fresh water river and stream systems in the spring to breed and rear young. They are known to prefer stream reaches typically ten meters wide, with rocks, logs and an adequate food supply of benthic invertebrates.

Surveys for Harlequin ducks were conducted in 1992 and 1993 on USFS lands with the most extensive survey completed in 1993. North Fork Winberry was surveyed from the forest boundary up the creek for approximately three miles. South Winberry was surveyed from its confluence with North Fork Winberry to the confluence of Cabin Creek. This survey was conducted in 1993 and limited to that year due to budget constraints in subsequent years. No ducks were observed during these surveys.

Future Habitat Trends: Survey results indicated approximately eight miles of potential nesting and rearing habitat present for the Harlequin duck on federal lands in the watershed. Another 6-7 miles of suitable stream habitat exists below the USFS boundary on private lands although potential nesting habitat adjacent to the stream has been impacted from timber harvest and agricultural land development. With the amount of stream enhancement work previously accomplished in the North Fork and South Fork Winberry drainages, it is likely that Harlequins use the watershed for breeding and rearing. A direct correlation exists between stream restoration activity and increased macroinvertebrate abundance in those areas. There is concern that increased human demand and activity in riparian areas could affect Harlequin duck behavior and breeding success. Continued monitoring is needed to determine trends of use and breeding success.

Common merganser *(Mergus merganser)* [12].

Status: None

Current Status and Survey History: The common merganser is associated with larger moderate-gradient streams, primarily at lower elevations. A small percentage of these ducks are found on federal lands. Larger streams and rivers located on private lands tend to provide habitat or potential habitat for the vast majority of merganser populations within the South Willamette Valley. Common merganser's primary prey is fish; thus an adequate fishery is required for the presence of this bird.

Future habitat trends: This species has been documented in the lower 2/3 of the watershed. Winberry Creek and Lower Fall Creek are suitable areas for the duck to forage. Being a cavity nester, there is concern that inadequate nesting habitat could

restrict the bird's numbers. State Forest Practices guidelines and riparian reserve protection should provide adequate habitat for the merganser in the future.

Great gray owl *(Strix nebulosa nebulosa)*[12].

Status: USFS Survey and Manage Species

Current Status and Survey History: The great gray owl is primarily a northern arboreal forest owl and is relatively uncommon west of the Cascades. It is the largest, but not heaviest owl of the northern forest. Great grays inhabit densely forested edge habitat where exposure to direct sunlight and predators is minimized. This owl is associated with natural meadows, meadow complexes and recently harvested stands where small ground dwelling mammals, primarily voles and pocket gophers, are abundant. The owl's foraging strategy includes perching on low limbs, usually seven to twelve feet high, on the edge or in the interior of natural openings and preying upon small mammals as they surface. Dense stands adjacent to these foraging areas may be necessary to facilitate efficient utilization of energy in transporting prey to the young or female during nesting. Few studies have been completed on the west side of the Cascades and habitat requirements are still in question.

The great gray owl has often responded to individuals conducting spotted owl surveys in the watershed. One historical resident location was established in the Joe's Peak area due to multiple response during the past several years. Follow-up attempts to locate the pair and determine nesting/reproductive status have been unsuccessful. In the spring of 1996, a program with the Lowell High School was established to construct a number of great gray owl platforms for placement in potential habitat areas on the district. Joe's Peak, where the historical responses were clustered, was one such area for platform placement. Other potential areas exist in the watershed, though no great gray owl responses have been elicited elsewhere. The meadow complexes in the Sourgrass/Saddleblanket area, Joe's Peak and Mount Salem all show potential due to adjacent natural meadows or meadow complexes. Protocol surveys are currently underway in conjunction with the Berry Patch and Carpet Hill Planning Areas.

Future habitat trends: Great gray owls west of the Cascades are thought to inhabit similar stands as Northern Spotted Owls. Since the majority of the watershed is designated as matrix, agricultural or industrial forest lands, potential habitat for the great gray owl will be marginal. Protection buffers surrounding any known owl locations will be implemented. Special habitat buffers adjacent to natural meadows or meadow complexes should provide some foraging and nesting habitat. As stands are harvested, foraging habitat will become available, but it is uncertain whether the owl will use these areas in conjunction with adjacent available nesting habitat. Opportunities do exist to improve nesting conditions by placing constructed nest platforms in areas where great gray owl potential is highest. Meadow complexes in the watershed should be assessed to determine the degree of meadow encroachment and whether prescribed fire will aid in retarding or halting the encroachment process.

Goshawk *(Accipiter gentilis)*

Status: Federal: Candidate Category 2

Current Status and Survey History: Goshawks inhabit forested areas throughout the northern hemisphere and in the Pacific Northwest, where they use mountainous coniferous forests. This bird, one of three Accipiter hawks suspected to occur in the watershed (along with Cooper's and Sharp-shinned hawks), is a very aggressive hunter generally foraging within the canopy for small mammals and birds. There is growing concern that timber harvest and related activities are causing the decline of goshawk populations, although there is little research and monitoring information that adequately addresses this issue in the Northwest. Mature and old-growth forests with closed canopies are often selected for nesting, although the birds have been documented to nest in younger managed stands with closed canopies.

Surveys were conducted in a number of potential stands in 1993. This was a "one shot" effort due to budget constraints in subsequent years. The stands surveyed were Lower Brush Creek, Lower and Middle Cabin Creeks, and Upper and Middle South Fork Winberry Creek. No responses were elicited from this survey effort.

Future habitat trends: There is a moderate to low potential for goshawks to exist within the watershed in the future. With land allocations and ownership favoring timber harvest, goshawk habitat, in the form of larger contiguous stands of late successional and old-growth forests will not be available. Minimum fragmentation with corridor retention should maintain some contiguous stands in the short term. Survey efforts should be reestablished in the watershed to locate and protect birds potentially using these more contiguous late successional areas.

Pacific Western Big-eared Bat *(Corynorhinus townsendii townsendii)*
(also known as Townsend's Big-Eared Bat)

Status: Federal: Candidate Category 2
State: Sensitive
R-6: Sensitive

Current Status and Survey History: Although Pacific Western Big-eared Bats are the most characteristic bat in caves of the western US, the small amount of historical population data indicates a decline in numbers. Caves and cave-like structures are critical habitat for these bats as hibernacula in winter and as roosts for summer nursery colonies (Perkins, 1987). Pacific Western Big-eared Bats are also known to roost in the bark crevices of large snags.

Historical evidence indicates the presence of isolated populations of Pacific Western Big-eared Bats in Lane County and on private land adjacent to the Willamette NF (Perkins, 1987). A general survey of Lane County and the Willamette NF was conducted by Perkins during the summer and winter of 1983-84. In Lane County, hibernacula of this bat were found on private land adjacent to the Willamette NF and near Bohemia Mines on and adjacent to the Umpqua NF (Perkins, 1987). Three recent Pacific Western Big-

eared Bat sites have been recorded on the Lowell Ranger District; two of these within the watershed. One is a natural cave that was buffered from timber harvest activity during planning and presale activities of the Winery Timber Sale. The second is the old Winberry mine shaft at the extreme western edge of the USFS portion of the watershed. A single bat was tracked to a quarry on the north shore of Fall Creek Road in August of 1996 by Dave Waldien during his graduate field research. No known mine or cave locations exist on private or BLM lands in the watershed.

Future habitat trends. The above mentioned cave and mine sites should be protected in the future. Any subsequent sites discovered in the watershed should be protected from site alteration by timber harvest, recreation, etc. Substantial foraging habitat does exist for this and other species of bats in the watershed; therefore habitat components to enhance roosting opportunities should be developed. This could be in the form of providing large snag and bridge habitat.

California Wolverine *(Gulo gulo luteus)*

Status: Federal: Candidate Category 2
State: Sensitive
R-6: Sensitive

Current Status and Survey History: At the present time, no wolverine studies have been conducted in the Cascades. The most recent and comprehensive study was in northwestern Montana, conducted by Hornocker and Hash (1981) during 1972-1977. Wolverines appear to be extremely wide-ranging, and unaffected by geographic barriers such as mountain ranges, rivers, reservoirs, highways, or valleys. For these reasons, Hornocker and Hash (1981) conclude that wolverine populations should be treated as regional rather than local.

Wilderness or remote country where human activity is limited appears essential to the maintenance of viable wolverine populations. High elevation wilderness areas appear to be preferred in summer, which tends to effectively separate wolverines and humans. The greatest impacts on the potential of land to support wolverines in the Pacific Northwest are largely due to forest fragmentation, settlement and access (Banci, 1994). Wolverine populations on the edge of extirpation usually have been reduced to areas of habitat which have not been developed, extensively modified or accessed by humans through roads and trails. The perception of the wolverine as a high elevation species usually coincides with areas of increased human disturbance and loss of habitat, restricting them to wilderness and inaccessible areas. In winter, wolverines move to lower elevation areas which are snowbound with very limited human activity. Wolverines make little use of young, thick timber and clear-cuts (Hornocker and Hash, 1981).

Lowell Ranger District is relatively low in elevation with few areas unimpacted by human activities. Most of the area has been fragmented and large blocks of intact mature timber stands are rare. There are no known sightings of wolverine on the district correlating with known habitat requirements described above.

Future habitat trends: With major land allocations and ownership delegated to timber harvest, the potential for the watershed to provide suitable habitat for the wolverine is very low.

White-footed Vole *(Phenacomys albipes / Arborimus albipes)*

Status: Federal: Candidate Category 2
State: Sensitive
R-6: Sensitive

Current Status and Survey History: Very little is known about the natural history of the White-footed Vole. *Phenacomys* is thought to be one of the most primitive of living Microtines and unable to withstand much competition. Preferred habitat seems to be moist areas near small streams in mature timber or pole-sized regeneration stands (Maser, 1966). Specific studies of the White-footed Vole have not been accomplished, and all trappings of this vole have been accidental. It is suspected, if such studies were undertaken, this vole might be more prevalent than is currently believed (Verts, personal communication).

Two specimen of the White-footed Vole have been collected on or near the Willamette NF. One was found near Vida; the other on the Blue River District. It is thought that this is the easternmost extent of their range (Maser, 1966). Most of the known specimen of *P. albipes* in Oregon are west and north, primarily near the Pacific Coast.

Surveys for the White-footed Vole have not been conducted on the District or within the watershed. Voles are known to favor riparian associated habitat, although they have also been found in a variety of other forest conditions including logged areas. Due to the lack of information on habitat preference for the vole, it is not clear what impact the future harvest activity will have on local abundance of the vole in the watershed. Riparian reserve allocations, in conjunction with other withdrawn lands, should provide for this primarily riparian associated species.

Pacific fisher *(Martes pennanti pacifica)*.

Status: Federal: Candidate- Category 2

Current Status and Survey History: The fisher has the potential to occur within the watershed although surveys have not been undertaken to document its presence at this time. They prefer a closed canopy environment with diverse stand structure including large diameter snags and trees with cavities for use as denning sites. Highly diverse stands with adequate amounts of coarse woody material are important in providing foraging habitat for the fisher. They are associated with low and mid-elevation forests of the western hemlock zone. The fisher has been affected by past logging and forest fragmentation, along with increased human access and disturbance patterns in western forests.

Future habitat trends: Very little is known about relationships between fishers and their habitat in the Pacific Northwest but it is suspected that fisher populations have declined

on federal lands due to loss of habitat from forest fragmentation and removal of CWD and snags from cutting units and adjacent natural stands. On the westside of the Cascades the fisher shows a higher affinity for low-mid elevation hemlock forests than the American marten. Hence its chances of maintaining a presence in the Winberry watershed are somewhat compromised due to current harvest designations. Withdrawn allocations could provide potential natal/denning sites but without more information on fisher habitat preferences, it is unclear whether withdrawn allocations, in combination with 11-40, will be adequate for the fisher to maintain a presence or recolonize areas of the watershed.

American marten */Martes americana/* (12).

Current Status and Survey History: The marten is another carnivore potentially occurring within the watershed. The species shows a strong preference for large patches of late successional forest which include adequate amounts of larger coarse woody debris in various decay classes. No surveys for the species have been conducted but suitable habitat does exist.

Future habitat trends: The marten is more abundant and has a wider distribution in the Northwest than the fisher. More information is available on its ecology and habitat preference. The marten shows a strong affinity for late successional forest habitat with its associated components of snags and CWD in various decay classes. They are also strongly associated with forested riparian habitat. The withdrawn allocations (over 50% of federal lands in the watershed) could provide for adequate marten foraging and dispersal in the future. Current condition of these areas requires some time for riparian habitat on federal lands to recover. Eventually, habitat will become available for foraging and dispersal, especially in the higher elevations which marten are more likely to be found.

Oregon red tree vole */Phenacomys longicaudus/* (C-3 & 12)

Current Status and Survey History: The red tree vole is the smallest and least studied of the arboreal rodents of Douglas-fir forests in the Pacific Northwest. They feed exclusively on conifer needles. They are strictly arboreal and may spend their entire life in tree tops. Logging and loss of late successional habitat has had an effect on vole populations in the northwest due to fragmentation and loss of old-growth habitat. The vole's main predator is the spotted owl. Spotted owl pellet analysis in the H. J. Andrews Experimental Forest indicates that the vole constitutes 13% of the spotted owl diet.

The Regional Ecosystem Office has recently issued a memorandum (10/96) adopting interim guidance for the red tree vole consistent with page C-5 of the Northwest Forest Plan Standards and Guidelines. The intent is to provide short term direction for survey and management of the vole in 1997 and 1998. This guidance identifies two screens that would trigger the need for vole surveys prior to ground disturbing activities. The first screen stipulates that at least 10% of the land in a fifth field watershed must be in federal ownership before habitat analysis is required. In addition, if federal ownership is less than 10% and lands are not connected to federal lands in adjacent watersheds, then

management of red tree voles is not required. If these conditions are met, the second screen identifies a potential red tree vole habitat threshold that is required to defer survey requirements. This habitat threshold specifies that a minimum of 40% of federal land within a fifth field watershed is forested and

a) has greater than 60% canopy closure,

b) has an average DBH (diameter at breast height) of 10" or greater and

c) these stands can be maintained through the end of the year 2000.

If these criteria are met, then site specific surveys would not be required.

For federal lands in the Winberry watershed, Table 41 depicts current red tree vole habitat conditions as defined in the guidance document. *Map 36* displays this information spatially. It is important to note that COE lands were not officially included in the management strategy adopted in the NWFP. However, these lands are important in providing late successional forest conditions for a number of species adjacent to the reservoir. The red tree vole has the potential to inhabit these lands. COE lands were included in potential habitat totals.

Red tree vole Analysis Assumptions:

1. USFS and BLM potential red tree vole habitat equals stands greater than 40 years in age. All stands were assumed to have 60% canopy closure except for selected stands on USFS lands that have been thinned recently to below the 60% level.
2. All ACE lands were considered potential red tree vole habitat.

Future habitat trends: The red tree vole shows an affinity for late successional old-growth forests, although it can also be found in older managed stands. Human-caused or natural disturbances (ex. fire, wind, disease) would tend to greatly reduce local populations of this species. Since the watershed consists of private industrial lands and federal matrix allocations, there is a concern that the watershed could become so fragmented, it would present a potential barrier to dispersal of this species between no-harvest allocations.

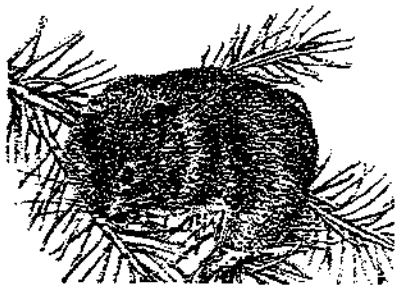


Table 40. Current Red Tree Vole Habitat Conditions in the Watershed

Subdrainage	Non-Potential Habitat (Acres)	Potential Habitat (Acres)	Total Acres	% Potential Habitat
Brush Creek				
USFS	1,228	1,376	2,604	52.8%
BLM	2	13	15	86.6%
Lower South Winberry/ Monterica				
USFS	772	3,850	4,622	83.3%
North Reservoir				
USFS	3,288	3,156	6,444	49.0%
BLM	437	319	756	42.2%
COE	1,353	1,065	2,418	44.0%
South Reservoir				
USFS	47	269	316	85.1%
BLM	555	1,517	2,072	73.2%
COE	598	425	1,023	41.5%
Upper South Fork				
USFS	3,713	4,898	8,611	56.9%
North Winberry Creek				
USFS	3,288	3,156	6,443	48.9%
Totals:				
USFS		16,705	29,040	57.5%
BLM		1,849	2,843	65.0%
COE		1,490	3,441	43.3%
Grand Totals		20,044	35,324	56.7%

Note: The totals shown depict acres and percentages calculated based on total capable acres of USFS, BLM and ACE lands in the Winberry watershed.

Other mammals:

Five species of bats, listed as species of concern and identified in Appendix J2 of the FSEIS, are suspected to occur within the watershed. They are listed in Table D- 2, page 201, in Appendix D. Habitat requirements vary among the species. The hoary and silver-haired bats are migratory species that could be present during summer months. Both are associated with late successional old-growth forests when roosting and foraging.

The fringed, long-eared and long-legged *Myotis* species tend to use large trees and snags for roosting habitat. These three species also use caves, old mines and rock crevices as winter hibernacula sites.

Future habitat trends: The preponderance of harvest allocations and private lands will inhibit development of well distributed late successional forest habitat conditions for these species. Green tree retention guidelines will help in providing additional roost sites within matrix allocation of federal lands. Protection buffers adjacent to ponds and wetlands will also aid in protecting potential foraging areas.

The two known mine/cave sites could provide potential roost/winter hibernacula for the three myotis species. These should be inventoried and monitored to determine species activity by time of year. Bridges along the mainstem of Winberry Creek and downstream from Fall Creek Dam provide potential roost sites for some bat species. Surveys will be completed to identify potential sites before ground disturbing activities are implemented USFS and BLM lands.

COE lands adjacent to the reservoir have the potential to provide present and future roosting opportunities. The COE plans to conduct a bat inventory in 1997/1998. It will consist of capture and identification of bats and surveying bridges, ponds and the dam on COE lands.

Red-legged Frog */Rana aurora/*

Status: Federal: Candidate Category 2
State: Sensitive
R-6: Sensitive

Current status and survey History: The red-legged frog is a pond frog which inhabits reservoirs, lakes and the slow-moving water of streams, most commonly in wooded areas. Breeding waters utilized by these frogs vary considerably, but generally have certain requirements. These include permanent or temporary waters with little or no flow, which must last long enough for metamorphosis to occur and must contain sturdy underwater stems for egg attachment (Nussbaum, *et. al.,* 1983). During the non-breeding season, red-legged frogs have been found in moist forest situations 600-900 feet or more from any standing water (Nussbaum, *et. al.,* 1983).

Red-legged frogs are usually found below 2,700 feet in elevation. While they are more common in the Coast Range, they may be found in the western Cascades. Only one known potential breeding site occurs on USFS lands. This is in the Winberry pond which encompasses approximately one acre. The site is an ideal breeding location for the frog, although harvest activity has removed the natural timber stands around the entire pond. These managed stands are 10-35 years old. This has impacted the pond's ability to function as a unique special habitat, due to reduced shading and altered hydrologic flow in the area. There is a high probability that non-native species do not occur at this site due to its isolation from human influence and settlement.

The COE has identified three ponds on their lands which currently support red-legged frog reproduction. Information is from annual monitoring of these sites by COE employees.

Northwestern Pond Turtle */Clemmys marmorata marmorata/*

Status: Federal: Candidate Category 2
State: Sensitive
R-6: Sensitive

Current Status and Survey History: The northwestern pond turtle inhabits marshes, sloughs, moderately deep ponds, and slow-moving portions of creeks and rivers, and prefers rocky or muddy bottoms with aquatic vegetation (watercress, cattails, etc.). Fairly extensive surveys and monitoring of the turtle has been conducted in the reservoir. Telemetry work by the COE and ODFW in 1993 and subsequent studies have indicated an adult biased population of turtles in the reservoir itself. The turtles use both the Fall Creek and Winberry Creek arms of the reservoir. and appear to overwinter and nest on adjacent lands. Two sites are documented below the dam and are managed for Northwestern pond turtles. One is the spillway pond, having an estimated population of 40 individuals with an apparently healthy population structure and successful juvenile recruitment (Beal, personal communication). The other is the Tufti pond in the Tufti Special Wildlife Area below the dam. This pond's population is estimated at 20 individuals. Nesting areas have been identified adjacent to these two ponds below the dam. The ponds and associated nesting areas are currently managed as sensitive habitat by the COE.

One known potential breeding site exists on USFS lands. This is the Winberry pond mentioned above in relation to the red-legged frog. Turtles are suspected to use the pond but positive species identification has not been successful up to this point. As mentioned, this is an ideal area due to its isolation from human impacts and influence beyond the past timber harvest. No known breeding sites occur on BLM lands.

Future habitat trends: Suspected poor juvenile recruitment in the reservoir population resulting in a highly biased adult population points to eventual extirpation of this population unless measures are undertaken to prevent this. The reservoir draw-down occurring in late summer promotes growth of vegetation below full pool but also inhibits development of foraging habitat for the turtle. This altered flow regime also affects potential turtle use of the creek below the reservoir. Most COE emphasis, in the form of habitat protection and non-native species removal, is on the two "healthier" populations occurring in ponds below the dam. If northwestern pond turtles are identified in the Winberry pond, measures should be taken to protect the aquatic and adjacent upland conditions from future disturbance.

Tailed Frog */Ascaphus truei/*[12].

Status: Federal: Candidate Category 2
State: Protected, Sensitive/vulnerable

Current Status and Survey History: The Tailed Frog is a riparian associated late seral species normally found in permanent, fast-flowing, rocky, cold-water streams and headwaters in coniferous forests. Although tailed frogs are normally found in or near streams during rainy weather, they have been known to forage 25 or more meters away from water (Nussbaum, *et. al.,* 1983). Average clutch size is 50 to 60 eggs and in some Cascade populations females breed only in alternating years (Leonard, *et. al.,* 1993). In the Oregon Western Cascades, tailed frogs have a one-to-three year larval period, possibly longer depending on climatic conditions, thus contributing to their relatively low reproductive ability.

Amphibian surveys were conducted in the watershed on USFS lands in 1995. The effort included sampling of many streams in various areas of the upper watershed. These included Brush Creek, Monterica Creek, Cabin Creek, Upper North Fork Winberry and a number of tributaries flowing into Upper South Fork Winberry Creek. Presence was confirmed in the upper reaches of Cabin Creek and in numerous tributaries to Upper South Fork Winberry north of Tire Mountain. It is suspected that the occurrence of this species is more widespread in the upper watershed than findings indicate.

Surveys for tailed frogs have not been conducted on BLM lands.

Future habitat trends: Tailed frogs, a riparian associated species, should show stable trends within the watershed as impacted riparian areas develop into late successional forests. This will provide increased protection from siltation and higher stream temperatures and also provide corridors for immigration to streams with more favorable conditions in the future. The major concern for the tailed frog is a degrading road system and the increasing potential for road failures with the accompanying degradation of associated aquatic habitat.

Clouded Salamander */Aneides ferreus/*[12].

Status: State: Sensitive/undetermined status

Current Status and Survey History: Clouded salamanders are normally found in large woody material (LWM), preferably Douglas-fir, and stumps of varying decay previously inhabited by ants, termites, and other invertebrates (Leonard, *et. al.,* 1993). They require permanent dampness, rotting logs necessary for specific invertebrates, and rocky or woody debris, such as large Class III and IV Douglas-fir logs with sloughing bark, for cover. Once a large log or woody debris has decayed to the point of moisture loss, the salamander must abandon its habitat. Clouded salamanders are dependent upon a continuous supply of suitable large, rotting logs or snags.

Occurrence of this species is probably related to old-growth stands where adequate levels of large rotting logs are present. This species has not been documented in the watershed although it is suspected to occur in stands with adequate down woody

material. It could also be present in managed stands where yarding of all material was not completed, leaving old logs as potential habitat. It is suspected that with more adequate survey efforts for terrestrial amphibians, the clouded salamander would be found in the upper ½ of the watershed.

Future habitat trends: Existing and developing late successional forests within riparian reserves and other withdrawn allocations should provide some habitat for this species in the future. The forest matrix green tree retention guidelines should provide some opportunities for terrestrial salamanders although it is doubtful that the altered temperature and moisture regimes of harvested stands, even with CWD provisions, will be conducive to terrestrial amphibian habitation until these stands develop into a closed canopy situation. As the matrix becomes more fragmented, populations of these terrestrial amphibians could be restricted mainly to undisturbed no-harvest allocations.

Oregon Slender Salamander *(Batrachoseps wrighti)* (12).

Status: State Sensitive/undetermined status

Current Status and Survey History: Oregon slender salamanders are most commonly found in mature Douglas-fir forests on western slopes of the Oregon Cascades (Nussbaum, *et. al.,* 1983). An endemic species to Oregon, this salamander dwells in moss-covered logs, rotting stumps and under rocks or pieces of bark near spring seeps. In late spring and early summer they retreat vertically to a subterranean existence, thereby maintaining suitable moisture regimes. The watershed is in the southern edge of its range but no documented sightings exist. This salamander, living a primarily subterranean existence, is not extremely effective in terrestrial movement and some natural barriers may prevent dispersal. It is suspected that more intense terrestrial surveys would yield evidence of this species in the watershed.

Future Habitat Trends: Although this species is not documented in the watershed, its habitat exists. Historical harvesting activities have removed habitat components necessary for suitable Oregon slender salamander habitat, primarily large logs in varying decay classes and late successional overstory forest conditions providing sufficient moisture regimes. In spite of matrix standards and guidelines, the lack of suitable habitat, increased forest fragmentation and lack of adequate amounts of larger logs in varying decay classes could prevent this species from becoming well distributed throughout the watershed in the future.

Cascade torrent salamander *(Rhyacotriton cascade)* (12).

Status: State Protected, Sensitive/vulnerable

See Southern torrent salamander

Southern torrent salamander */Rhyacotriton variegatus/*[12].

Status: Federal: Candidate Category 2
State: Protected, Sensitive/vulnerable

Current Status and Survey History: Good and Wake's recent revision of the family and genus of Torrent Salamanders in 1992, divided the "Olympic Salamander" into four distinct species not fully accepted by all authorities (Leonard, *et. al.,* 1993). Two of the species which may occur in this watershed are the Southern and Cascade torrent (seep) salamanders. These species can be separated by range, subtle morphological characteristics, and slight differences in life history. *Rhyacotriton* spp. normally occur in or near permanent, cold streams and seeps in association with talus, small rocks, and gravel, often in late seral forest streams with moss capped rock rubble. Torrent salamanders are mostly aquatic and their habitat appears to be restricted to riparian zones. These species are sensitive to activities impacting headwater areas and seeps, such as logging and road building, which increase sedimentation and/or water temperatures in their coarse substrate habitat areas.

There are no documented sightings within the watershed confirming *R. variegatus* or *R. cascadae.* Surveys in 1995 throughout the watershed have confirmed the presence of torrent salamanders. They were found in Upper Brush Creek, Upper North Fork Winberry and numerous tributaries south of Upper South Fork Winberry Creek. This population of salamanders has some peculiar morphological characteristics. Currently the species has not been identified. Specimens from this species have characteristics of both the Southern and Cascade torrent salamanders, and voucher specimens have been submitted for genetic testing and identification. This population is located between the current range of both the Southern and Cascade torrent salamander and identification may provide support or oppose the current taxonomy of this genus.

Future habitat trends: Most cold water undisturbed perennial streams are likely to contain this variety of torrent salamander. As riparian-associated salamanders, the Southern and/or Cascade torrent salamanders will likely have extensive habitat in the future with the provisions of riparian reserves. As with the tailed frogs, there is considerable concern regarding road construction and older road failures due to reduced road maintenance and decreased accessibility (ex. a plugged culvert with associated road failure could deplete a large reach of prime aquatic and associated riparian habitat).

Arthropods

No arthropods, as listed on Table C-3 of the Northwest Forest Plan, are suspected to occur within this watershed.

Mollusks

Current Status and Survey History: Of the mollusks listed in Table C-3 of the Northwest Forest Plan and Appendix J2, only two species may occur. *Prophysaon coeruleum* is a land slug which could occur in coniferous forests from low to mid-elevations. The

southern Willamette valley is at the southern end of its range and all historic locations have been absorbed by urban development. There are no known sightings on the Willamette NF. *Prophysaon dubium* is another land slug associated with riparian areas and rock slides. Rock source development could have an effect on this species. Both are survey and manage species requiring surveys prior to implementation of ground disturbing activities in 1999 or thereafter.

Future Habitat Trends: Riparian and Special Habitat protection will be important in protection of potential habitat for these species in the future. Surveys will be labor intensive and should provide information to protect discovered sites. Anticipated impacts to matrix lands between the reserves would suggest that the potential for populations to maintain themselves exists only within designated reserves.

Species Of Interest

Osprey *(Pandion haliaetus)*

Current Status and Survey History: Six known osprey nests are found adjacent to Fall Creek Reservoir. All sites have been documented as active at some point in time during the past several years. With the put-and-take fishery, enough forage seems to be available to support a number of nest sites around the reservoir. It also appears that the high recreational use of the reservoir has not had a significant detrimental effect on ospreys using the drainage.

Future Habitat Trends: The Fall Creek corridor will be monitored in future years to update activity and presence of osprey, especially at known nesting sites.

Band-tailed pigeon *(Columba fasciata monilis)*

Current Status and Survey History: The Pacific coast population of the band-tailed pigeon has a distribution farther north and west than any other race of this species (Pacific Coast Band-tailed Subcommittee, 1994). Although somewhat lacking in uniform monitoring techniques, various state and federal surveys suggest a significant decline between 1972 and 1993. Habitats for the pigeon have been affected by past management activities, especially logging. It is unknown what importance the watershed serves in providing unique habitat conditions for this pigeon.

Future Population and Habitat Trends: With the industrial land ownership and matrix designation on federal lands, future use of the watershed by the pigeon will be reduced. It is important that any sighting information is collected and used in protecting sensitive areas used during nesting and rearing of young.

AQUATIC

Anadromous Fish

Reference Conditions

Spring chinook are the only anadromous fish native to the Middle Fork Willamette River (Connolly, *et. al.*, 1992). Winter and summer steelhead were introduced in 1953 and 1981, respectively. The summer steelhead are a stock from Skamania in Washington State while the winter steelhead are from the Santiam River, a tributary of the Willamette. Oregon Department of Fish and Wildlife is currently managing the Middle Fork Subbasin for natural and hatchery production of winter steelhead and spring chinook.

Oregon Department of Fish and Wildlife poisoned Fall Creek and Winberry Creek with rotenone just prior to reservoir operations in 1965 (COE, 1965). The purpose of this chemical treatment was to eliminate undesirable fish species competing with anadromous fish. Populations of coarse scaled sucker, northern squawfish and redside shiners were removed. Constant flow rotenone stations were located just below the confluence of North and South Fork Winberry Creeks, on Winberry Creek just above the reservoir, within the Fall Creek Watershed and the Fall Creek Arm of the Reservoir.

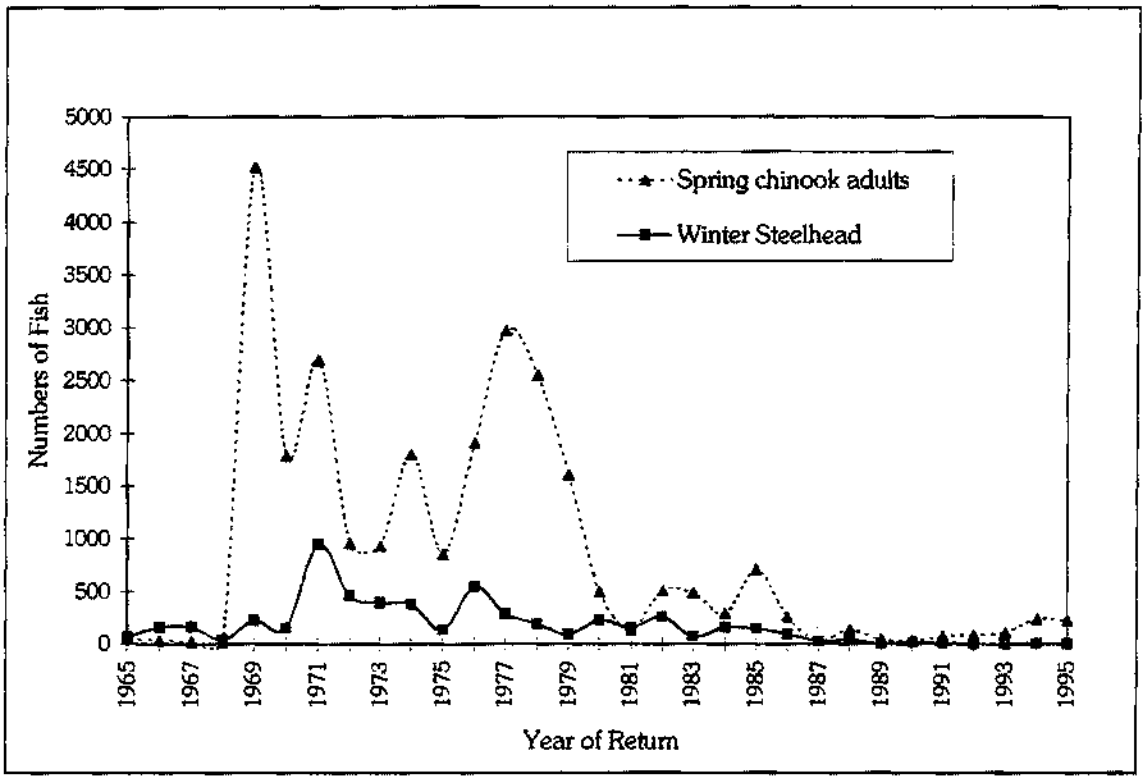
Prior to construction of Fall Creek Dam, an estimated 450 spring chinook and 75 winter steelhead migrated above the dam site (USDI FWS, 1962). Following construction, returning adult salmon and steelhead were trapped at the new facility. Spring chinook were taken to McKenzie and other state hatcheries where they were spawned; additional chinook and steelhead were also transported upstream from the dam and released in Winberry and Big Fall Creeks. Hatchery incubated chinook eggs were grown to 200-400 fish to the pound prior to release into Fall Creek Reservoir. Fish reared to smolt size and became downstream migrants in four to five months. These reservoir-reared fish, as well as naturally spawning fish transported above the dam, migrated back to Fall Creek as adults. In 1969, 4,696 fish were retrieved at the trapping facility, including 178 precocious males called "jacks" (ODFW, 1992). This attractive result did not persist, however. During the 1970s returning adults averaged about 2,000 fish each year (range 850-2,900). **Error! Reference source not found.** shows a dramatic drop in the numbers of returning adults beginning in 1980, averaging about 265 fish each year through 1995 (range 33-701).

In the 1960s and 70s, draw-down operations for flood control were initiated in early July and the reservoir was brought to minimum flood control pool (728 feet by September 1). In addition, the pool was annually drained to streambed to flush smolts, competitor and predatory species downstream.

Current Conditions

Adult spring chinook returns to Fall Creek have shown a slight upward trend for 1994, 1995 and 1996. This increase in adult returns might have resulted from the modified

Figure 16. Anadromous Fish Returns to Fall Creek



draw-down schedule suggested by ODFW in 1991. In that year, ODFW tested a modified draw-down scenario resulting in improved survival of downstream migrating juvenile salmonids. The reservoir was not drawn down to streambed as in previous years but a large proportion of migrants passed through the regulating outlets under low head and discharge conditions. This practice was continued each year, although to a lesser extent, due to impacts on water quality and recreation uses downstream. Today, the reservoir is drawn down beginning in July, from an elevation of 830 feet at full pool to 824 feet by August 15. By Labor Day (Sept. 2, 1996) the pool will be brought to 815 feet in elevation. After Labor Day, discharge is raised to 1200 cfs to lower the reservoir below minimum flood control pool, elevation 710 feet, by October 15. At this point discharges are lowered to bring the pool to 694 feet by the end of October. This scenario allows more downstream migrating salmonids to pass through the regulating outlets at low head and discharge, which has been shown to support higher survival of these fish.

In 1990 and 1991, ODFW found that the reservoir produced healthy spring chinook smolts and estimated that about 250,000 smolts of the one million initially released survived and were passed downstream through the regulating outlets. An estimated 163,000 downstream migrants survived passage through the outlets to continue their migration to the ocean in 1991.

Inland Fish Species

Reference Conditions

Trout numbers were high in Winberry and Fall Creeks until ODFW poisoned the stream prior to dam construction. Previously, catching the daily limit of 30 fish was easily accomplished, according to local anglers (Hueka, personal communication).

Data regarding other native inland fish such as dace, sculpin, large scale suckers, redside shiners, whitefish, northern squawfish, lamprey, and Oregon chub is unavailable.

Current Conditions

Rainbow and cutthroat trout are found throughout the watershed, with cutthroat trout favoring the upper reaches. Species distribution is known on USFS administered lands and is displayed on *Map 39.*

The Oregon chub, a federally listed endangered minnow, has no known populations residing in the watershed. A project to introduce Oregon chub to a pond below Fall Creek Dam is currently underway.

Reservoir Fish Species

No current information exists for reservoir fish species diversity and population numbers. Warm water gamefish, especially largemouth bass, seem to be doing well in the reservoir. Reports of 2-4 pound bass catches have been noted.

The proliferation of exotic as well as native predators could significantly affect the survival rate of chinook rearing in the reservoir.

Channel Conditions

Lower Fall and Lower Winberry Creeks

Reference Conditions

The mainstems of Lower Fall Creek and Lower Winberry Creek (downstream from Forest Service administered land) were meandering channels that were not entrenched. Gravel deposition was believed to be common as meander point bars. High flows dissipated out onto the floodplain where fines were deposited. Large wood also played an important role, forming log jams which scoured out pools, dissipating energy and provided hiding cover for fish species. Riparian vegetation on the floodplain was thought to be alders and other hardwoods; larger conifers were found upslope. Rosgen (1994) developed a stream classification system based on some of the parameters mentioned above, which is used to assist land managers in determining whether streams are functioning properly. In this classification system Lower Fall Creek and Lower Winberry Creek were defined as a type 'C' channel. This stream type was considered a response area since the majority of deposition occurred here.

Settlement began in Fall Creek during the 1850s. The flatter terrain was converted to agriculture lands. The main road built along Fall Creek somewhat channelized the stream. In addition, other activities such as timber harvest, instream salvage and upslope road construction resulted in the loss of large woody debris in the channel and caused channel downcutting to bedrock in many places.

Current Conditions

The channel has incised and is now moderately entrenched, loosing much of its meander pattern. It is now a wide, flat, shallow stream with poor channel complexity. The Rosgen channel classification has changed from a type 'C' channel to an 'F' channel *(see Map 40).* No stream inventories were conducted in this part of the watershed.

Upper Winberry Creek

Reference Conditions

Land management activities such as timber harvest, road building and agriculture have changed aquatic habitat conditions. Prior to these activities, westside cascade streams tended to have intact riparian areas with large conifers. As these trees fell and provided down woody material, they enhanced channel stability and stream complexity (Sedell, *et al.,* 1988), both important factors in providing a healthy aquatic habitat. This wood helps form the stream channel, scours out pools, dissipates flow, retains nutrients, traps substrate (such as spawning gravels and cobbles where macroinvertebrates live), and provides cover habitat. Large wood deposited on floodplains and in off-channel areas is also important, providing protective cover for juvenile fish during winter high flows (Everest, *et al.,* 1985). Large wood is an essential component of the stream system, particularly in the western Cascades.

Other impacts and changes to the stream have resulted in channel widening and reduced sinuosity. Such impacts are due to several factors such as building roads within riparian areas, stream channelization, removing riparian trees, and removal of instream large woody material. This large wood normally adds stability (Dose and Roper, 1994), dissipating channel energy and allowing the stream to interact efficiently with the floodplain.

Road ditches directly influence streams by increasing overland flows and depositing fine sediment into the channel. These ditches essentially act as intermittent channels. The higher flows can potentially increase bankcutting within the channel, creating even more erosion and fine sediment concerns. Fine sediments fill in between cobbles and gravels embedding the stream channel which ruins spawning and macroinvertebrate habitat. A high concentration of fines within spawning gravels can result in the reduction of available habitat or suffocation of eggs. Trout feed on macroinvertebrates; therefore a decrease in available macroinvertebrate habitat results in limited food availability.

Rosgen stream classifications *(Map 40)* in this area are predominately limited to 'A' and 'B' channel types. 'A' types are highly entrenched, with steep channel gradients and

little meander patterns. These are the source and transport reaches (providing debris and moving it downstream). 'B' channel types function primarily as transport reaches, although deposition does occur, particularly if large wood is present to trap debris.

The number of channel-width pools per mile and pieces of instream large woody material per mile are two parameters commonly collected during inventories to assess habitat conditions. The desired condition for these parameters varies depending on channel width and valley and channel geomorphology. Material such as large wood or boulders enables the channel to scour out pools and provides cover habitat. A healthy riparian habitat of large conifers supplies the channel with future recruitment of needed down wood. PACFISH (1994c) indicates a desired condition of channel-width pools per mile based on channel width, increasing the number of pools desired as channel width decreases. This model works fairly well for low gradient streams, but has limitations in high gradient streams; however, it is the most current reference available. The survey only recognizes pools that are channel-width and longer than they are wide. This eliminates much of the pool habitat in the higher gradient, stairstep habitat, where pools tend to be shorter than their width. Another limitation is its subjectivity. One surveyor can identify a pool and another may lump the same pool into part of a riffle. Pools cannot actually be counted, as is the case for large wood. However, even with this subjectivity there is some value in comparing available pool habitat for the streams surveyed.

The desired condition of instream large woody material in PACFISH (1994c) is measured at 80 pieces per mile for all streams.

The Willamette National Forest Plan provides guidelines for low and high gradient streams. Low gradient streams should have 105 pieces of large woody material per mile, with a diameter greater than 25 inches and longer than the stream width. At least 50% of the channel in high gradient reaches should be influenced by large wood. One pool per 5-7 channel widths should exist in streams with 0.5-2% channel gradient.

The Aquatic Conservation Strategy in the Northwest Forest Plan recognizes that conditions can be site-specific and not similar throughout the region. Reference conditions for the number of pools and large woody material per mile have not been established. However, impacts from management activities have created a current condition with considerably fewer pools and pieces of large woody material than would be found in a pristine condition.

Current Conditions

Inventories have shown an overall lack of large woody material throughout the watershed. Pool habitat is limited and width-to-depth ratios are high. Many of the streams have been downcut and scoured to bedrock. Some of these conditions have improved due to Instream Aquatic Habitat Improvement Projects. *Map 41* highlights the areas where these projects have occurred.

Stream inventories were conducted to assess existing aquatic conditions. These surveys were completed on South Fork Winberry (surveyed in 1992), Cabin Creek (surveyed in 1990), North Fork Winberry (surveyed in 1995), Traverse Creek (surveyed in 1995), Blanket Creek (surveyed in 1995), and Brush Creek (surveyed in 1995) *(see Map 42)*. Some specific characteristics for the streams surveyed are found in Table 41. A more detailed report is found in the stream inventory folders and Appendix E. Figure 17 indicates Pools/Mile counted during stream inventory compared to PACFISH desired conditions. Comparisons between existing and PACFISH (1994c) large woody debris conditions are displayed in Figure 18.

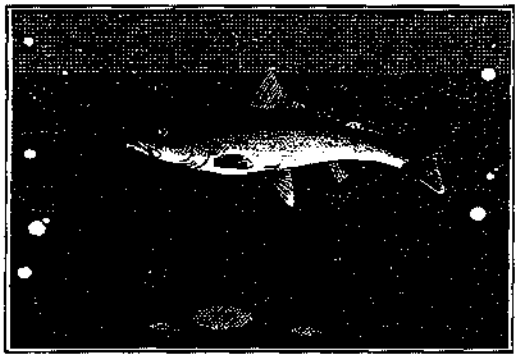
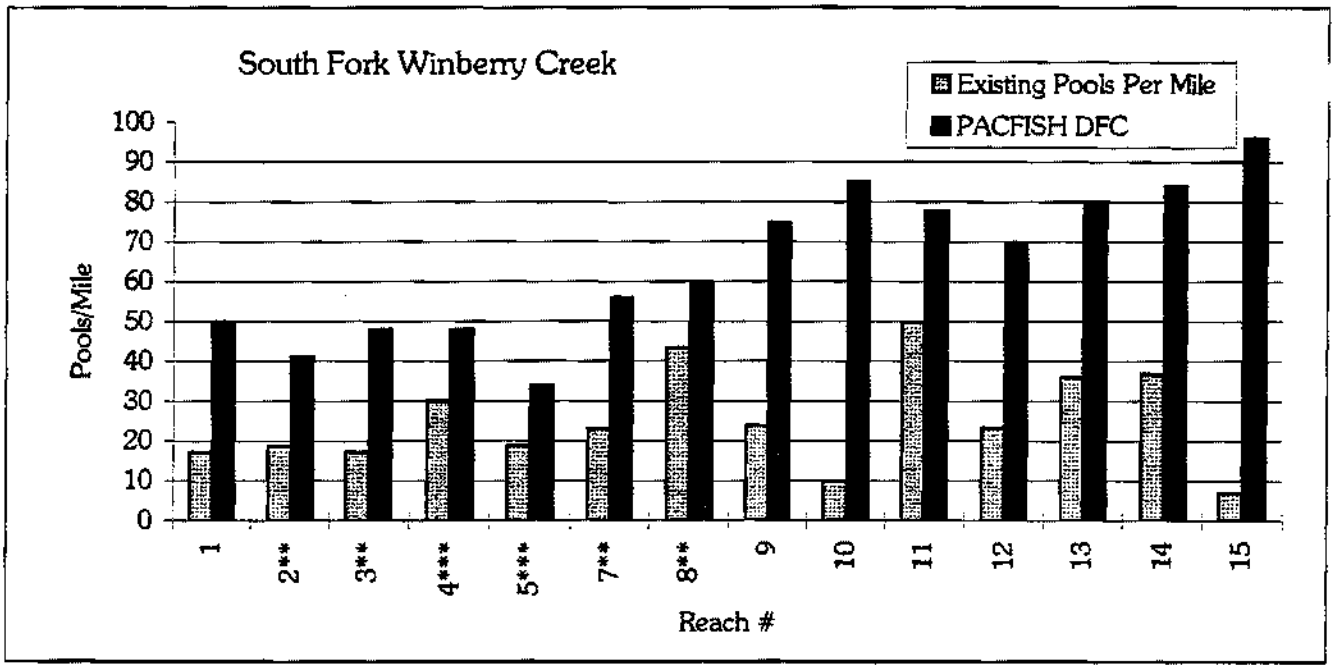
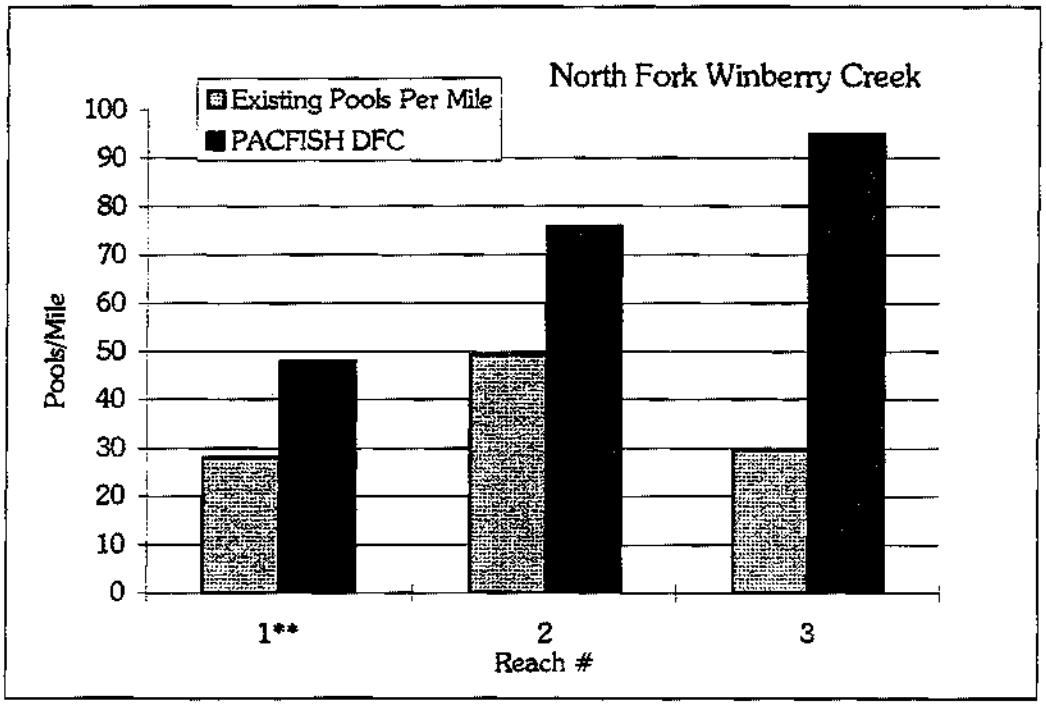


Figure 17. Pools/Mile by Drainage



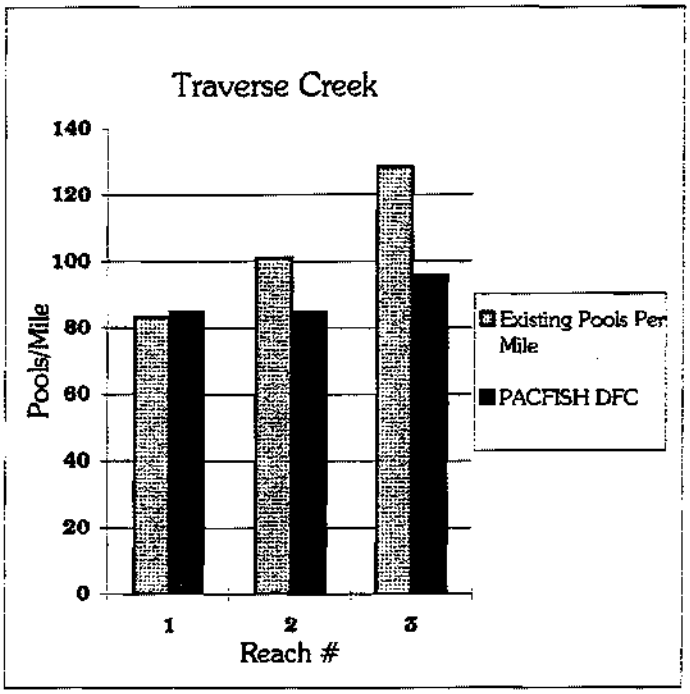


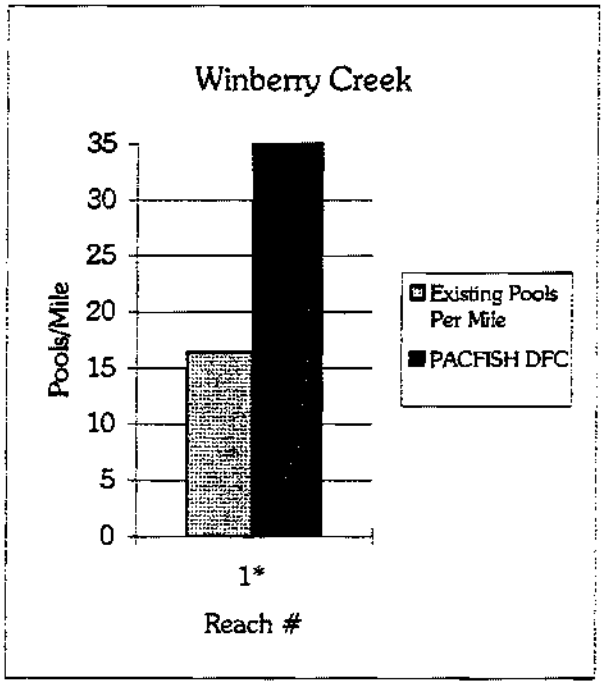
* Instream structures were installed for part of the reach..

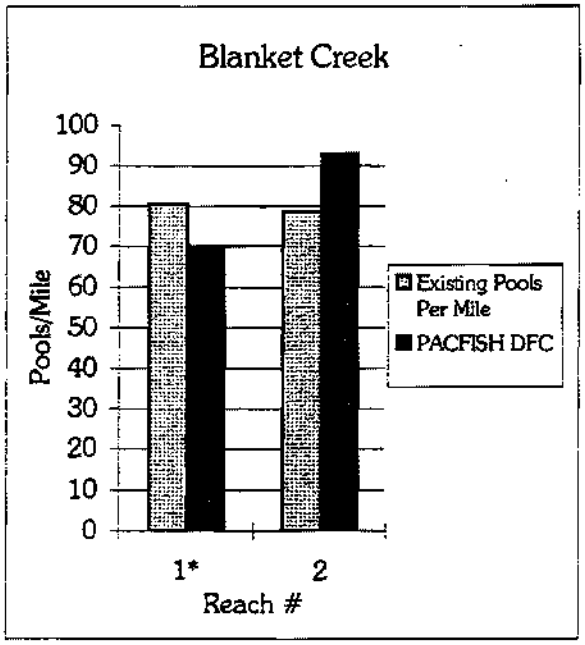
** Instream structures were installed throughout the reach.

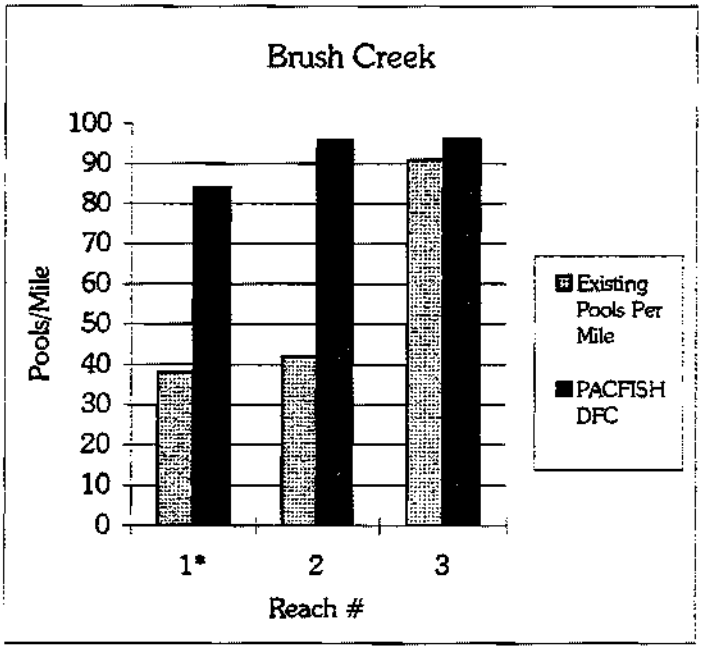
*** Instream structures were installed after the data was collected.

Figure 17. Pools/Mile by Drainage (continued)



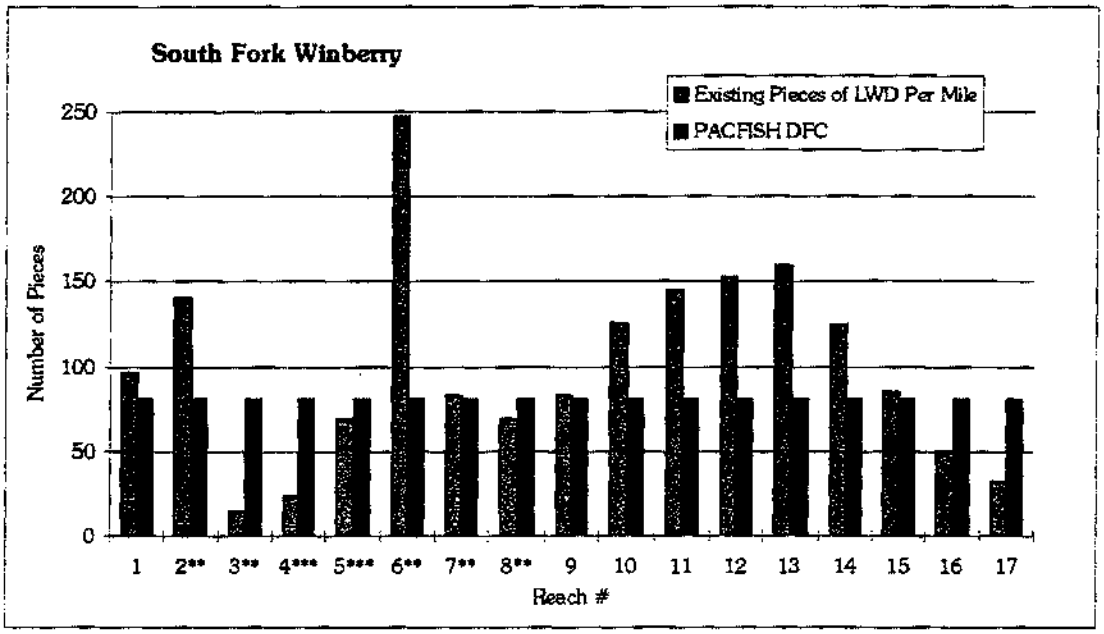




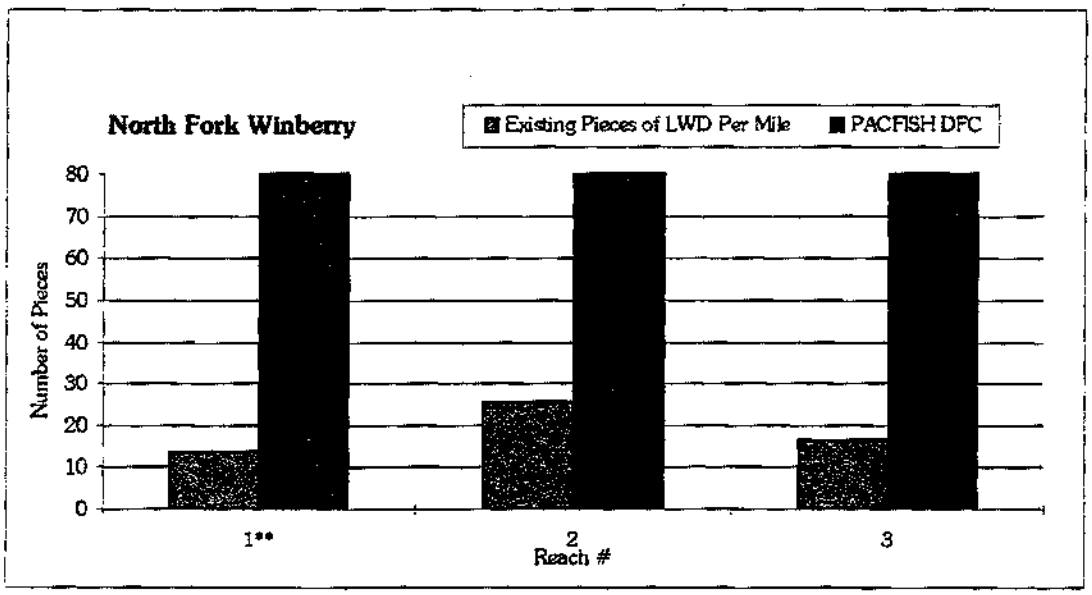


* Instream structures were installed for part of the reach..
** Instream structures were installed throughout the reach.
*** Instream structures were installed after the data was collected.

Figure 18. Large Woody Debris/Mile by Drainage



Note: Counted pieces of LWD followed a different protocol during time of South Fork Winberry Survey.

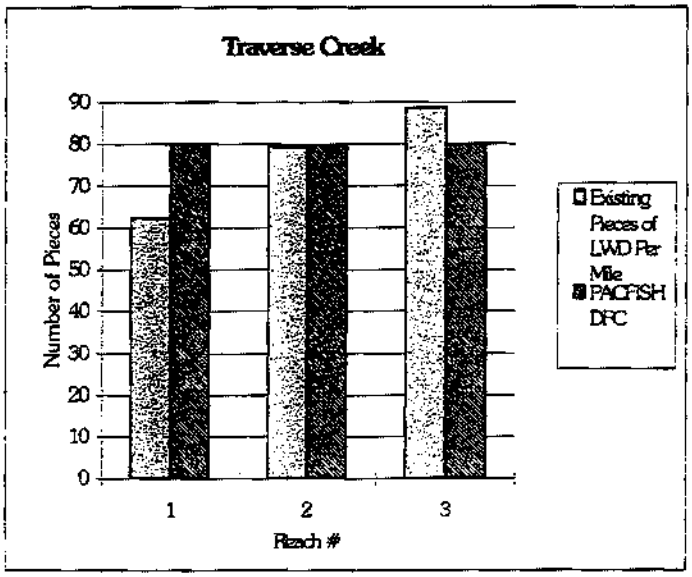


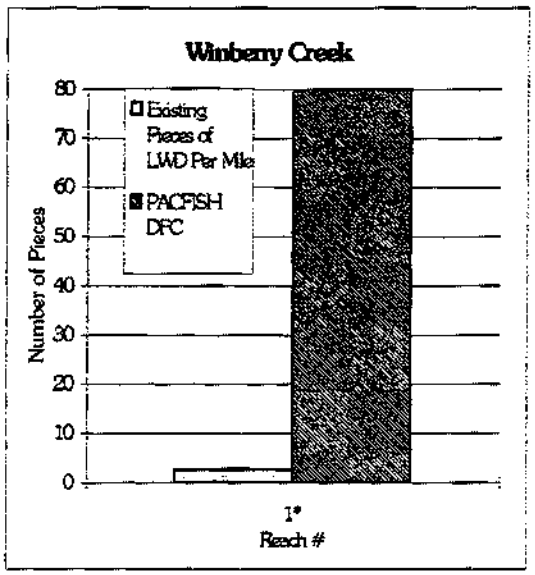
* Instream structures were installed for part of the reach, wood may be <12-24" & <25' long.

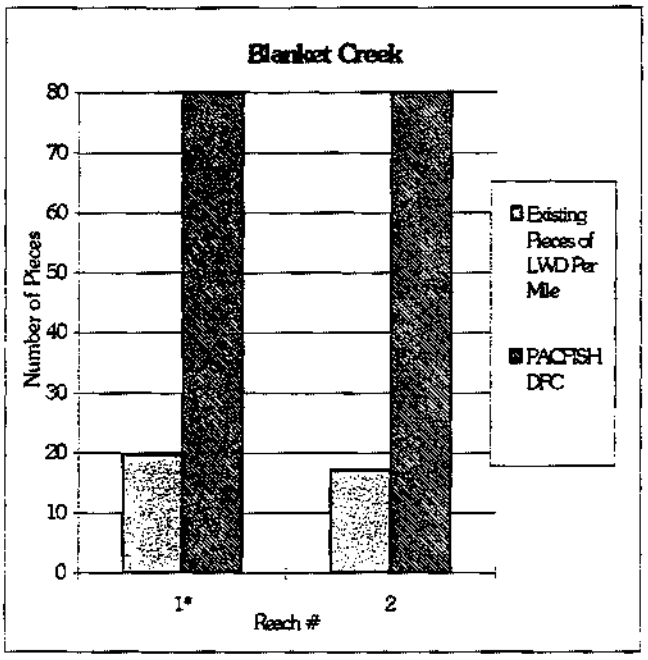
** Instream structures were installed throughout the reach, if number are still low it is because much of the wood is <12-24" & <25' long.

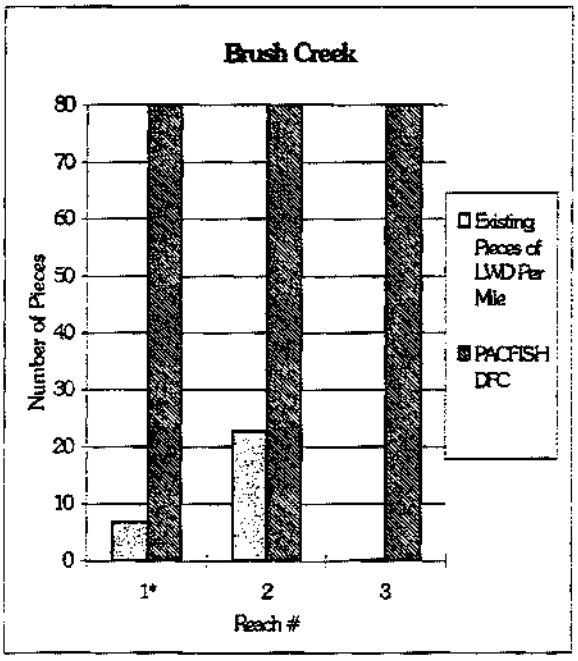
*** Instream structures were installed after the data was collected.

Figure 18. Large Woody Debris/Mile by Drainage *(continued)*









* Instream structures were installed for part of the reach, wood may be <12-24" & <25' long.
** Instream structures were installed throughout the reach, if number are still low it is because much of the wood is < 12-24" & < 25' long.
*** Instream structures were installed after the data was collected.

Table 41. Stream Inventory of Channel Condition

Winberry Creek	
Reach	1*
Rosgen Channel Type	B Cobble/Gravel Some areas scoured to bedrock
Pool Habitat	16.4/mile Installed structures increased pool habitat, but still low
Large Woody Debris	2.7 pieces/mile Many pieces too small to count, but still effective; 46.5/mile in the small range
Riparian Condition	*Inner zone:* hardwoods 15' *Outer zone:* 75% large trees; 25% small trees Road within Riparian Reserve
Fish	Rainbow, cutthroat, dace and sculpin; a couple of 10-12" trout observed Good spawning habitat
* *(Note: part of stream had instream structures installed prior to survey)*	

North Fork Winberry Creek			
Reach	1**	2	3
Rosgen Channel Type	B Cobble/Gravel Some areas scoured to bedrock	B (Starting to change to A) Cobble/Gravel Small Boulders also common	A Cobble/Gravel Fines embed cobbles
Pool Habitat	28.1/mile Installed structures increased pool habitat	49.3/mile Moderate amount	29.7/mile Low amount
Large Woody Debris	13.5 pieces/mile Many pieces too small to count, but still effective	25.5 pieces/mile No installed structures	16.5 pieces/mile No installed structures
Riparian Condition	*Inner zone:* hardwoods 44' *Outer zone:* 64% large trees, 36% small trees Road within Riparian Reserve	*Inner zone:* hardwoods 40' *Outer zone:* 47% large trees, 43% small trees Road within Riparian Reserve for 1st 0.5 mile	*Inner zone:* hardwoods 7' *Outer zone:* 30% large trees, 18% small trees, 52% sapling pole Road within Riparian Reserve
Fish	Rainbow, cutthroat and sculpin; several 8-10" trout observed. Many fry above and below confluence of Minnehaha Creek	Rainbow and cutthroat Road 1802 is a migration barrier; Road 1816 is barrier to smaller fish	Rainbows and cutthroat 30' falls at end of reach ended fish use
** *(Note: instream structures installed prior to survey)*			

Table 42. Stream Inventory of Channel Condition/*continued*/

Brush Creek			
Reach	1*	2	3
Rosgen Channel Type	A (B at times) Cobble/Gravel Fines embed cobbles	A Cobble/Gravel Fines embed cobbles	Aa+ Cobble Lots of deposition and braided channels.
Pool Habitat	38.1/mile Low amount but existing pools are deep and high quality for size of stream	42.1/mile Low amount but existing pools are deep and high quality for size of stream	Pools were more common than reaches below
Large Woody Debris	6.8 pieces/mile Some pieces too small to count, but still effective Installed structures for 1st 0.2 miles	22.8 pieces/mile Many pieces too small to count, but still effective	Pieces of wood were very small
Riparian Condition	*Inner zone:* hardwoods 24' *Outer zone:* 86% large trees, 11% small trees Road within Riparian Reserve causing some slides. Large slide from road at river mile 0.5 dammed channel creating a pond.	*Inner zone:* hardwoods 19' *Outer zone:* 79% large trees, 21% small trees Clearcut with no buffer at top of reach has created increased erosion. Blowdown is common.	*Inner zone:* hardwoods 15' *Outer zone:* 100% sapling pole Clearcuts on both sides. Lots of mass wasting and bank cutting.
Fish	Primarily cutthroat; few rainbow and sculpin. Slide at river mile 0.5 may currently be a migration barrier. Many fry at beginning of reach.	Cutthroat Most under 6" Reach ended at a large debris jam; also the end of fish use.	No fish

Blanket Creek		
Reach	1*	2
Rosgen Channel Type	B Cobble/Small Boulder	A Bedrock/Cobble
Pool Habitat	80.6/mile High amount	78.6/mile High amount though long bedrock riffles are common
Large Woody Debris	19.7 pieces/mile Many pieces too small to count Installed structures for 1st 3/4 of the reach. Small diameter but very effective.	17.1 pieces/mile Some pieces too small to count or out of bankfull criteria to be counted, but still effective. Two large log jams; hardly any of these pieces were included in the count.
Riparian Condition	*Inner zone:* hardwoods 45' *Outer zone:* 100% large trees	*Inner zone:* hardwoods 28' *Outer zone:* 42% mature trees, 56% large trees
Fish	Primarily cutthroat; some rainbow Fry to 8" Most found in pools of installed structures	Cutthroat Less than 3" and 3-6" Few observed 13' falls and 70' falls both migration barriers. 70' falls is at end of reach and ends fish use.

** (Note: part of stream had instream structures installed prior to survey)*

Table 42. Stream Inventory of Channel Condition*/continued/*

Reach	1	2	3
Rosgen Channel Type	B Small Boulder	B Small boulder/Cobble	B Cobble/Gravel
Pool Habitat	83/mile Pools are deep and good quality Many pocket pools in riffles	101/mile Many pools Step pool habitat, upper 1/3 of reach	128/mile
Large Woody Debris	62.4 pieces/mile Several jams	79.4 pieces/mile Lots of wood in jams Heavy silt deposits above Many smaller pieces	87.7 pieces/mile Many smaller pieces
Riparian Condition	*Inner zone:* hardwoods 20' *Outer zone:* 73% large trees, 27% small trees	*Inner zone:* hardwoods 20' *Outer zone:* 36% mature trees, 29% large trees, 35% small trees A lot of mass wasting and bank erosion throughout earthflow	*Inner zone:* hardwoods 20' *Outer zone:* 34% mature trees, 33% large trees, 26% small trees, 7% sapling pole Clearcut on both sides for upper 1/2 of creek with little to no buffer Little erosion
Fish	Primarily cutthroat, some rainbow Several at 6-8" Most found in pools	Cutthroat and rainbows Road 1802.158 is a migration barrier Many falls; most are not migration barriers	Cutthroat Culverts are possible migration barriers. Road 1802 and reach end at Road 1802.157. End of fish use is another 1/2 mile above reach end

South Fork Winberry Creek — Note: LWD/Mile was counted differently from recent surveys

Reach	1**	2**	3**
Rosgen Channel Type	B Cobble/Small Boulder	B Cobble/Small Boulder	B Bedrock/Small Boulder
Pool Habitat	17.1/mile Installed structures have increased pools	18.6/mile Installed structures have increased pools	17.1/mile Few pools of high quality; good pocket pools in riffles
Large Woody Debris	96.1 pieces/mile	140.4 pieces/mile	15.2 pieces/mile Very low in wood
Riparian Condition	*Inner zone:* hardwoods 50' *Outer zone:* 100% large trees	*Inner zone:* hardwoods 45' *Outer zone:* 75% large trees, 25% small trees	*Inner zone:* hardwoods 30' *Outer zone:* 50% mature trees, 50% large trees
Fish	Cutthroat, rainbow, dace, sculpin Many trout fry	Cutthroat, rainbow, sculpin Not too many fry. A few at 8-10"	Cutthroat, rainbow, sculpin Not too many fry. A couple at 8-10"

** *(Note: instream structures installed prior to survey)*

Table 42. Stream Inventory of Channel Condition/*continued*/

South Fork Winberry Creek /continued/			
Reach	4***	5***	6**
Rosgen Channel Type	B Bedrock/Cobble	A Bedrock/Cobble	B Bedrock/Gravel Large floodplain scoured to bedrock
Pool Habitat	30/mile No high quality pools	18.8/mile Few pools of high quality	Low No deep high quality pools
Large Woody Debris	23.4 pieces/mile Very low in wood	64.1 pieces/mile	248 pieces/mile Installed structures are trapping substrate and increasing quality of habitat
Riparian Condition	*Inner zone:* hardwoods 40' *Outer zone:* 100% large trees	*Inner zone:* hardwoods 75' *Outer zone:* 50% mature trees, 50% large trees	*Inner zone:* hardwoods 175' *Outer zone:* 50% mature trees, 50% large trees
Fish	Cutthroat, rainbow, sculpin	Cutthroat, rainbow, sculpin 15' falls	Cutthroat, rainbow, sculpin 2 beaver dams Many fish sighted, mostly cutthroat Side channel habitat available
Reach	8**	9	10
Rosgen Channel Type	A Gravel/Cobble	A Cobble/Gravel Not much bedrock or fines	A Gravel/Cobble
Pool Habitat	43.3/mile	23.8/mile	10/mile
Large Woody Debris	70 pieces/mile Installed structures created plunge pools, glides and trapped fines	83 pieces/mile Several log jams	125 pieces/mile Two very large jams (180') causing bank erosion and subsurface flows
Riparian Condition	*Inner zone:* hardwoods 120'	*Inner zone:* hardwoods 50' *Outer zone:* 20% mature trees, 20% large trees, 60% small trees	*Inner zone:* hardwoods 35' *Outer zone: 33%* large trees, 67% sapling pole Clearcuts on both sides
Fish	Cutthroat, rainbow, sculpin Primarily cutthroat	Cutthroat, rainbow, sculpin Many trout at 8", primarily cutthroat	Cutthroat, rainbow, sculpin Beaver pond near end of reach with lots of algae

** *(Note: instream structures installed prior to survey)*

*** *(Note: Instream structures were installed after survey)*

Table 42. Stream Inventory of Channel Condition*/continued/*

South Fork Winberry Creek *(continued)*			
Reach	**11**	**12**	**13**
Rosgen Channel Type	A Gravel/Cobble	A Bedrock/Gravel	A Gravel/Cobble Channel meanders more
Pool Habitat	50/mile	23.3/mile	36/mile
Large Woody Debris	145 pieces/mile Low amount of wood for 1st half of reach; increasing in 2nd half	153 pieces/mile 3 jams	160 pieces/mile 13 jams
Riparian Condition	*Inner zone:* hardwoods 50' *Outer zone:* 100% sapling pole Clearcuts on both sides Large mass wasting at end of reach	*Inner zone:* hardwoods 50' *Outer zone:* 100% large trees Adjacent clearcut on right bank adds a lot of wood	*Inner zone:* hardwoods 25' *Outer zone:* 40% large trees, 60% small trees Adjacent clearcut on right bank adds a lot of wood
Fish	Cutthroat Reach ends at 8' falls Side channel habitat	Cutthroat	Cutthroat Many trout at 8" 7' falls
Reach	**14**	**15**	**17**
Rosgen Channel Type	A Gravel/Cobble Stairstep habitat	A Bedrock/Cobble Scoured to bedrock	A Sand/Gravel
Pool Habitat	36.7/mile	Data limited	3.3/mile
Large Woody Debris	125 pieces/mile Lots of LWD	50 pieces/mile	32 pieces/mile
Riparian Condition	*Inner zone:* hardwoods 50' *Outer zone:* 100% sapling pole Clearcuts on both sides	Sapling pole riparian	Seedling/shrub and sapling pole riparian Marshy in areas with no beaver activity
Fish	Cutthroat Reach ends at 28' falls Beavers	No fish	No fish

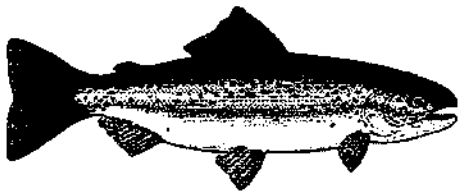


Table 42. Stream Inventory of Channel Condition/*continued*/

Cabin Creek			
Reach	**1**	**2**	**3**
Rosgen Channel Type	A Bedrock/Small Boulder Scoured to bedrock	A Gravel/Bedrock/Boulder Scoured to bedrock	A Bedrock/Small Boulder
Pool Habitat	13.8/mile	11.8/mile	18.5/mile
Large Woody Debris	Low Majority of wood is in 6 jams; 2 span the channel	Moderate Majority of wood is in 5 jams; 2 span the channel	Low 1 log jam
Riparian Condition	100% Mature trees	100% Mature trees	75% Mature trees 25% Small trees
Fish	Cutthroat, rainbow Mostly cutthroat	Cutthroat, rainbow Mostly cutthroat	Cutthroat 50' falls at beginning of reach is end of fish use
Reach	**4**	**5**	**6**
Rosgen Channel Type	A Boulder/Cobble	A or B Sand/Gravel Gradient flattens out	A Gravel/Cobble
Pool Habitat	No channel wide pools	No channel wide pools	No channel wide pools
Large Woody Debris	Very high 8 log jams; one is 300' long and 35' high	High 8 jams; 3 span channel Blowdown	High 9 jams
Riparian Condition	100% Small trees	100% Mature trees	Clearcut on right bank for first 1,000'; single row of trees as a buffer. Rest of riparian is mature trees.
Fish	No Fish	No Fish	No Fish
Reach	**7**		
Rosgen Channel Type	A Gravel/Cobble Scoured to bedrock		
Pool Habitat	No channel wide pools		
Large Woody Debris	High		
Riparian Condition	100% Mature trees		
Fish	No Fish Two large falls (76' and 56')		

Riparian

For the purpose of this analysis, delineated drainages were used. These include North Reservoir, South Reservoir, North Fork Winberry, Brush Creek, Lower South Fork Winberry, and Upper South Fork Winberry *(see Map Overlay)*.

Lower Fall and Lower Winberry Creeks

Reference Conditions

Lowland valley riparian vegetation was predominantly Oregon ash, black cottonwood, red maple, and willow. These areas were converted to agricultural and rural residential properties. Upslope, in the forested sections, riparian areas were similar to those on USFS land, although conditions were drier. *Map 21* displays the reference seral condition for riparian areas. Seventy four percent of the riparian areas in the North Reservoir drainage were estimated to be in a late seral condition. The South Reservoir drainage was impacted by a fire, thought to have resulted from traditional Native American burning, leaving only 37% in a late seral condition.

Current Conditions

Figure 19 and *Map 22* indicates the existing seral condition of riparian trees separated into 0-80 years old (stand initiation and stem exclusion) and >80 years old (understory reinitiation and late successional old-growth) for all streams within each of the delineated drainages. The South Reservoir and North Reservoir drainages have a high percent of riparian areas in a young seral condition. Table 42 identifies the seral condition along fish bearing and non-fish bearing streams.

Figure 19. Existing Riparian Seral Condition

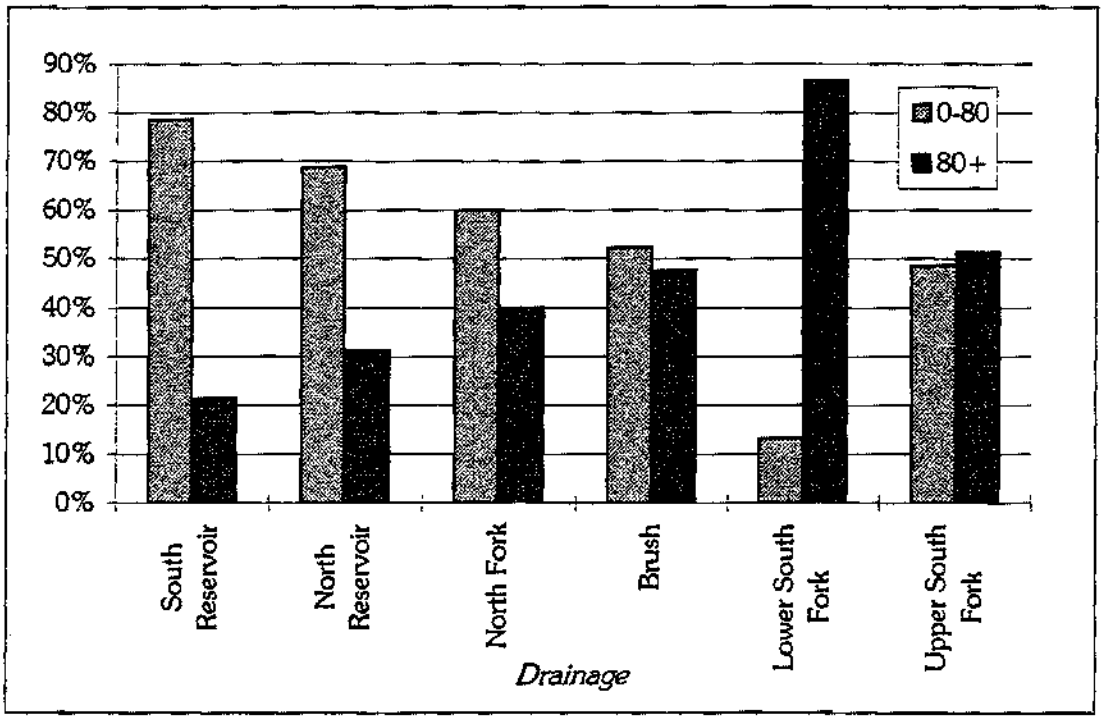


Table 42. Existing Seral Condition of North and South Reservoir

Drainage	Fish Bearing		SI/SE (0-80)	UR/LSOG (80+)
North Reservoir	Fish Bearing	(3.49 miles)	74%	26%
	Non-Fish Bearing	(33.25 miles)	68%	32%
South Reservoir	Fish Bearing	(18.44 miles)	71%	29%
	Non-Fish Bearing	(59.27 miles)	81%	19%

Upper Winberry

Reference Conditions

In pristine conditions riparian vegetation would primarily consist of large conifers. As seen on aerial photos prior to the 1964 flood event, few hardwoods were present in the Upper Winberry Watershed. The range of natural variability for seral condition throughout the watershed is 3-30% for early seral and 45-75% for late seral (USDA, 1993). A snapshot-in-time was determined for 1900 in the Winberry Creek Watershed. Previously, a fire reduced the late seral stage to only 5% in the Lower South Fork Winbery drainage. This fire was thought to result from traditional Native American burning in the lower part of the watershed, which then continued up the drainage into Upper Winberry. The late seral condition of 86% for North Fork Winberry and Upper South Fork Winberry best depicts a typical non-managed condition without recent fire impacts. *Map 21* displays the reference seral condition for riparian areas.

Current Conditions

Riparian areas adjacent to fish bearing sections of Brush Creek and Lower South Fork Winberry consist almost entirely of trees greater than 80 years old *(see Figure 19, Table 43 and Map 22).* Fish bearing reaches of North Fork Winberry and Upper South Fork Winberry are generally adjacent to riparian habitat in early seral conditions. The riparian areas adjacent to perennial or intermittent non-fish bearing streams tend to be in an earlier seral condition in drainages, with the exception of Lower South Fork. Overall, the majority of riparian trees in the Lower South Fork drainage are over 80 years old.

Table 43. Existing Seral Condition of Upper Winberry Drainage

Drainage	Fish Bearing		SI/SE (0-80)	UR/LSOG (80+)
North Fork Winberry	Fish Bearing	(11.72 miles)	46%	54%
	Non-Fish Bearing	(58.63 miles)	63%	37%
Brush	Fish Bearing	(2.0 miles)	0%	100%
	Non-Fish Bearing	(29.02 miles)	56%	44%
Lower South Fork	Fish Bearing	(7.14 miles)	3%	97%
	Non-Fish Bearing	(48.77 miles)	15%	85%
Upper South Fork	Fish Bearing	(7.18 miles)	33%	67%
	Non-Fish Bearing	(78.52 miles)	50%	50%

Geomorphology/Landslides

Reference Conditions

The steep rugged debris slide terrain found throughout the majority of the upper watershed are prone to landslides *(see Map 9)*. Areas of particular concern include Upper South Fork Winberry Creek, Cabin Creek and tributaries entering Blanket Creek. These areas provide course sediment and large wood which is deposited in lower gradient reaches. Earth flows found in the headwaters of Brush Creek, upper and mid North Fork Winberry Creek, Blanket Creek, Traverse Creek, and the middle south side of South Fork Winberry Creek (downstream form the Cabin Creek confluence) are sources of fine sediment *(see Map 10)*. Failures or siltation from roads tend to be a concern here since much of the deep soil consists of clay and remains suspended in the water column.

Current Conditions

Several large slides have occurred within the Upper Winberry drainage. Cabin Creek and an unnamed tributary (upper South Fork on the eastern edge of Section 7) blew out in 1964 during the large flood event, depositing significant debris in South Fork Winberry Creek. Blanket Creek failed in 1990 due to a storm event resulting in a plugged culvert which scoured much of the channel to bedrock. More recently, an unnamed tributary in the upper end of Winberry Arm (on the north side in Section 9) slid into Fall Creek Reservoir. This appeared to originate from a harvest unit.

SOCIAL DOMAIN

Archaeological and historic research suggests that a combination of human interaction and natural forces shaped the landscape and changed its character significantly during the last 150 years (Baxter, 1986; Minor, *et. al.*, 1987).

At the time of European exploration at least two tribes, the Kalapuya and Molala, are thought to have traveled through this watershed. Later, the Klamath visited the Lowell area on their way to the Willamette Valley.

Epidemic diseases and social dislocation following the arrival of fur trappers, explorers and settlers resulted in the near extinction of local tribes between 1790 and 1840. Many descendants of local tribes are currently part of the Siletz, Grande Ronde, Warm Springs, and Klamath reservations.

HISTORIC HUMAN IMPACTS

Settlement

An 1888 map of Lane County, shows townships extending from the Willamette Valley to the lower portions of Fall Creek and Winberry Creek, with "Unsurveyed Mountains" to the east. Winberry Creek was referred to as "Wimble Creek" and a low pass on the ridge between Winberry and Lookout Point, still retains the name "Wimble Pass."

The Donation Act of 1850 and the Homestead Act of 1862 allowed settlers to acquire public domain lands. These Acts enticed a number of families to move into the narrow bottomland east of Lowell. Four of the five first settlers (Drinkwater, Lewis, Fothergill, and Penland) were from England and Wales. Restless pioneers, none remained in the area by 1900 (COE, 1982).

The first roads into this area were constructed in the 1850s. At the confluence of Little Fall Creek and Fall Creek, Tay had the first Post Office in the area in 1853. In 1893, the Post Office of Egypt was established along the north bank of Fall Creek directly below Green Mountain (at the north end of what is now Fall Creek Reservoir). However, it was discontinued after one year of service. A school and church were also located there. In 1906, another Post Office was established at Winberry (junction of Winberry and Fall Creeks); it served until 1933 (COE, 1982).

In the mid-1900s the only town in the reservoir area was Winberry. Two small sawmills operated just upstream of the present dam. Located immediately below the dam, the Unity Grade School served the area's children with a two room school, housing eight grades and two teachers (COE, 1989).

The area experienced relatively few changes during the early and mid 1900s. In 1961, construction of the dam and creation of Fall Creek Reservoir changed the area, but it has retained much of its rural character although much of its history is obscured beneath Fall Creek Reservoir. Some long time residents remain in the area and are a valuable resource in the historical reconstruction of the area.

US Forest Service

A 1902 government survey said the Winberry area was more valuable for timber than agriculture (Briem, 1937). In response the Cascade Forest was created by an executive order in 1907, becoming the Willamette National Forest in 1933. The Winberry Administrative site (a small cabin) was established on the south bank of Winberry Creek in 1907. Beginning in 1912, the Forest Service permitted grazing allotments in the Winberry drainage. The Forest Service embarked on a ground patrol system of fire detection in the early 1900's. Using rangers on horseback they covered a system of trails and vantage points connected to ranger stations by telephone lines.

During this time the USFS accelerated trail construction, first building the Fall Creek Divide trail (1918-20) to connect West Boundary Station with the Fall Creek and Winberry Creek guard stations; then constructing the North and South Fork Winberry trails (1920-23) which joined the Alpine trail at Elk Camp and Sourgrass Mountain, respectively. These forest "paths" provided better access to permitted grazing allotments in the Winberry drainage, and on Saddleblanket, Sourgrass and Tire Mountains. From 1933 to 1937, many trails were built by the Civilian Conservation Corps (CCC). Based in the Fall Creek CCC camp, located about three miles upstream from the current dam, this labor force of about 60-70 workers constructed a system of trails, bridges, shelters, guard stations, lookout towers with their associated buildings, and ranger stations. The camp was later converted to the Lane County 4-H Club, but was covered by water when the reservoir was filled.

Bureau of Land Management

In western Oregon, public lands were granted to the Oregon and California Railroad Company in the late 1800s to support the construction of a railroad and telegraph line from California to Portland, Oregon. When the O & C Railroad Company violated the terms of this grant, these lands were returned to federal ownership as O & C Revested Lands in 1937. Most of this area is currently managed by the BLM.

Logging

The 1870s saw an increase in logging activity in the Pacific Northwest. Most of the timber harvested prior to 1900 was processed in small mills close to the forest. Earliest harvest units were located in the lower part of Winberry Creek and tended to be 50-150 acre clearcuts, with scattered clumps of seed trees. Reforestation was accomplished by natural regeneration.

J. B. Hills was responsible for logging the major portion of the Winberry Valley (1910) (Briem 1937). Timber was decked and sluiced down Winberry Creek. Using large creeks was the quickest and surest method of transporting huge logs from forest to mill (Briem, 1937). Natalie Reid, residing at the last private landholding west of the forest boundary, stated that the tall bank by her house was used as a log storage site. Loggers would wait until winter and then set a blast in the pile to start logs rolling into the creek.

One log mass took 40 days and six hours to pass under the present Unity bridge and 60-70 days to reach the Springfield mill (Briem, 1937).

In 1936-37, about three million board feet of Douglas-fir was logged from private lands. In the 1940s, federal timber began to be harvested in earnest. The 1960s through 1980s brought an era of intensive road construction and timber harvest. These harvest units averaged 20-50 acres in size and were dispersed across the landscape to provide timber and develop road systems. The harvest rate for federal lands averaged 7.5% of the watershed area per decade, but has declined in recent years. To date, approximately 45% of the watershed has been harvested. Most of the drainage has been designated as matrix, and timber production will remain the major management focus.

Recreation

Due to poor road access and private lands, recreational use of the area was very minimal until the 1950s. Total visitation for the Willamette National Forest in 1966 was 1,650,200 and increased by 75% in 1982 to 2,887,400 *(see Table F-1 in Appendix F).* It is thought that use of the Winberry watershed increased at approximately the same levels. Public use areas at Fall Creek Reservoir were opened for recreational activities in 1966. First year attendance was only 37,000 visitors. However, the following year visitation rose to 218,000 visitors. Visitation stayed within this range until its peak in 1974-75 at nearly 400,000 visitors, although there is some question as to the accuracy of these peak figures.

CURRENT HUMAN IMPACTS

Recreation

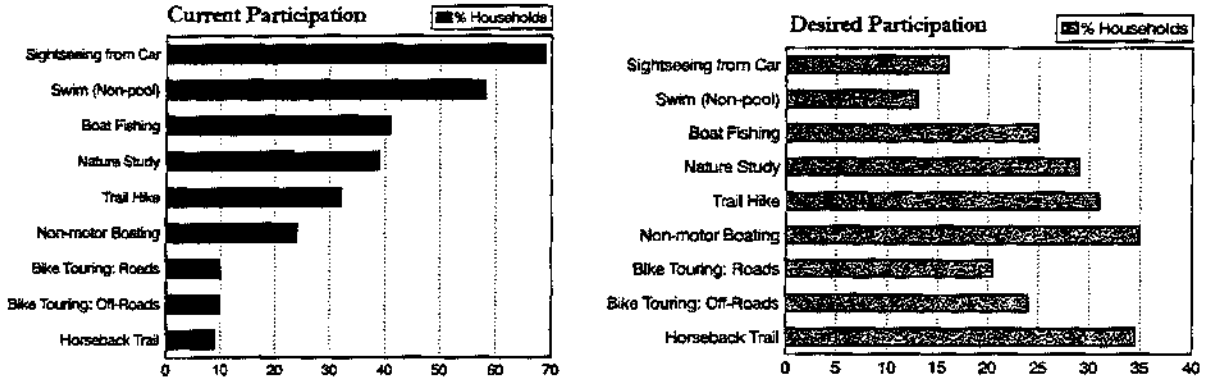
Natural resources and unique characteristics have affected the type and availability of outdoor recreation opportunities. The three zones (Lower Fall Creek, Fall Creek Reservoir and Winberry Creek drainage) are influenced by weather, seasonal user influxes, reservoir water levels, proximity/accessibility to local population, and land management practices.

A major source of visitor information is the Corps of Engineers Natural Resource Management System (NRMS). Visitation data for Fall Creek Reservoir, compiled by the COE, dates back to 1964 and is fairly extensive. USFS visitation records are sporadic and limited in scope, particularly in recent years. However, inconsistent methods and procedures produce variable results. Consequently, the statistics alone frequently need modification, using proven visitation estimation procedures, field experience and observation. The *visitor use market area*, geographical areas supplying visitors to the watershed, is an important consideration for determining recreation use patterns. Surveys from 1974 and 1976 consistently show the Greater Eugene-Springfield Metropolitan Area accounts for approximately 80% of Fall Creek visitors.

Trends indicate that the desire for dispersed recreation opportunities will continue growing at a steady rate. The Oregon State Comprehensive Outdoor Recreation Plan

(SCORP) identifies current and desired participation in dispersed activities *(see Figure 20). Desired participation* refers to activities that one or more persons in the household would like to enjoy but in which they are not currently active. There is a "...desire for more natural or primitive settings..." and "...a tendency for recreationalists to prefer more natural or primitive settings than they recently used" (SCORP, 1994). The population of the Willamette Basin has more than doubled since 1941, placing increasing pressures on the recreational resources of the region *(see Table F-2, Appendix F).*

Figure 20. Current and Desired Participation in Dispersed Activities (from SCORP)



Long-term growth in population, tourism, and recreation will likely increase the demand for recreational opportunities, with visitation expected to increase at a rate of 20-25% during the next 25 years.

The continued growth and development of the region has necessitated a more comprehensive management of resources on federal lands. Consequently, numerous plans and studies have been completed to guide natural resource/land management activities. Potential conflicts among competing recreation user groups and between recreation use and land/resource management activities will continue to challenge land managers.

Lower Fall Creek

Below Fall Creek Dam, Fall Creek flows 7.2 miles to its confluence with the Middle Fork of the Willamette River. Private lands border this section, consisting of small farms and private residences typical of the rural character of the lower Fall Creek Valley. Consequently public access is extremely limited.

Lane County operates a small day-use picnic area on Fall Creek at river mile 5.5, which is open to vehicles only during the summer months. The area has picnic tables and foot access to the stream, with parking for 3-4 cars. Recreational use of this site is minimal.

Drinkwater Landing is situated on the south bank of Fall Creek Reservoir, approximately 0.5 miles below Fall Creek Dam. The site of a former USFS log scaling station, it is currently in the initial stages of renovation and redevelopment by the COE. Proposed

construction includes defined parking areas, elimination of excess asphalt from log scaling site, closure of the old road adjacent to the creek, installation of a multi-agency interpretive kiosk, improvement of boat (canoe/kayak) launch area with interpretive signs, placement of additional picnic tables, and minor landscaping. Its location at the road junction below Fall Creek Dam is ideal for a multi-agency interpretive site, as a gateway to the diverse recreational opportunities and natural resources that lie ahead as the visitor travels Fall Creek and Winberry Creek Roads.

The Tufti Wildlife Area is located immediately downstream of the dam on both sides of Fall Creek. Most of the land was disturbed by construction of the dam. Tufti Wildlife Area is managed for its unique wildlife with minimal manipulation of land and vegetation. The unit receives low levels of wildlife viewing and hiking; facilities are limited to trails and a parking lot. The area includes a wetland/pond of approximately 10 acres supporting a variety of small mammals, pond turtles and waterfowl. The gradual sloping areas below the dam are generally open and vegetated by upland grasses. The combination of grasses, deciduous shrubs and trees and Douglas-fir provides excellent habitat for a variety of upland game birds, songbirds, predators, and other non-game species. A recently constructed trail along the north bank of Fall Creek provides improved access for anglers

Fall Creek Reservoir

Fall Creek Reservoir and Dam were constructed by the COE, which has primary management responsibility at the project. The total project area is 3,537 acres, with 1,757 acres of lake surface at full pool. The reservoir is located 23 miles southeast of the Eugene-Springfield area, in the western foothills of the Cascade Range. With two long narrow arms and 22 miles of shoreline, it is ideally suited to water-based recreation such as water skiing, swimming, boating, and fishing. Current recreation use averages 250,000 visitors per year. Fall Creek Reservoir is listed fifth among the 13 reservoirs of Willamette Valley Projects, reflecting its priority for recreation. Recently, however, early water releases for maintenance of winter steelhead runs and early summer draw down for passage of salmon smolts in the fall, have conflicted with the availability of recreation opportunities and their associated use. This is especially pronounced during dry years.

Recreation Sites

For reference, see Table F-3, Appendix F.

1. The **North Shore Boat Ramp** is operated by Lane County and is situated adjacent to the north abutment of Fall Creek Dam. This facility was completed in 1968 and modified in 1974. This free area is a popular boat launching site, with concrete block vault toilets, picnic tables, and paved parking. A low water boat ramp located here, provides access down to minimum pool and receives use year-around. Illegal OHV use associated with the low water ramp, is an occasional problem during winter months. Informal swimming is popular along the shore in the summer. The summer season experiences a high level of use, with a full parking lot on most weekends. Visitation

averages 3,500 visitors/month in summer. Conceptual plans for development exist; however none is expected in the immediate future.

2. **Winberry Creek Park** is also operated by Lane County. This park is situated on the South Shore of the lake near the dam and is popular for boat launching, swimming, and picnicking. It receives heavy day use during the recreation season, averaging 7,000 visitors per month. Winberry Park was initially completed in 1969 and further improved in 1972/73 by the COE. In recent years, a $3.00 per car entrance fee was instituted during the summer season. Park gates are generally closed from October through April. A contract park host/caretaker resides at the park year-round, which has resulted in a significant reduction in vandalism. The park encompasses about 81 acres and offers a full range of modern facilities: paved roads, parking for 125 cars and 90 cars with boat trailers, two-lane concrete ramp with courtesy dock accessing mid-level pool, renovated restrooms, swim beach, universally accessible fishing dock, and improved grounds facilities. A plan for development of a full service campground with 25 individual and 25 group sites has been suspended since the early summer draw-down schedule was initiated. It is not considered economically feasible to undertake any further development of this facility under current draw-down conditions.

   The **Vermilion Unit** is immediately adjacent to Winberry Creek Park. Vermilion absorbs overflow use during peak use days and is used by recreationists wishing a less crowded experience. There are no formalized facilities provided. It is the only area close to Winberry Creek Park with the resource base to provide for future recreation development.

3. **Cascara Campground** is located on the upper end of the Fall Creek arm and has received heavy use as a free campground for many years. However lack of design, uncontrolled use and overcrowding impacted the natural resources and contributed to negative behaviors among users. From 1985-1989 gradual changes were implemented to control use and protect the environment and public. In 1990 a shift to comprehensive management was initiated to protect the natural resources and provide a safe and healthy environment for public recreation. The campground was completely redesigned and upgraded to better accommodate visitors. Improvements included: an improved road system, 50 improved campsites, water distribution system, entrance booth with camp hosts and fee collection, and an improved swim beach and boat ramp. Six sites are scattered along the reservoir shoreline in a separate, wooded area and provide a more natural camping experience. Campers at these sites may have their boat moored directly at their campsite.

   In addition to these improvements, camping was restricted to designated campgrounds and the remaining dispersed areas were converted to day-use only. These actions, in conjunction with contract law enforcement from the Oregon State Police and increased Park Ranger presence, helped to control past problems. In 1996, the USFS and COE cooperated to share the services of an Oregon State Police (OSP) officer to cover the Fall Creek area. Visitors have frequently expressed their appreciation for the increased level of safety at their favorite recreation sites.

The Fisherman's Point unit of Cascara Campground (formerly a free-use area) has been converted to a group camping area by reservation. This type of recreational use is consistently in high demand.

4. **Sky Camp** is a youth educational camp managed by Lane County School District No. 52 under a cost sharing agreement with the Corps. It is located in a natural setting, providing a full range of natural resources for environmental study. A central lodge is available for food preparation, dining space, meeting rooms, and leaders' quarters. The Chalets, located a short distance from the lodge, serve as living space for people during their stay. A boathouse and several miles of nature trails are in place. The school district plans the construction of several additional chalets and interpretative trails, site development, and outdoor teaching facilities. This unit has a variety of vegetative types including grassland, coniferous forest and mixed deciduous/coniferous forest with second growth Douglas-fir as the dominant species. Several small wetlands serve as outdoor study areas. Sky Camp is used by a wide variety of wildlife compatible with moderate levels of human activity. Often, songbirds, black tail deer and sometimes a cougar are seen in the area.

Dispersed Use

Seven dispersed sites located around the reservoir provide opportunities for picnicking, swimming and fishing. These areas have portable toilets, picnic tables, primitive boat launches, and provide a more secluded and natural camping experience. Five of the areas are located along the North Shore of the Big Fall Creek arm, including Free Meadow, Lakeside I and Lakeside II. Two of the areas are gated for walk-in use only; the others have gates closed from dusk to 8:00 A.M. Prior to 1990, there were few enforced camping restrictions and use occurred wherever access allowed. The conversion of these areas to "day-use only" has controlled anti-social behavior and prevented site deterioration.

Throughout the rest of the project, hiking, horseback riding, fishing, swimming, and picnicking are popular activities. On Green Mountain above the upper Fall Creek arm of the reservoir, a para-sail/hang-gliding launch point receives occasional use by enthusiasts of this sport.

Recreation Demand

As early as 1970, land use planning by Lane County produced the Subarea Planning Process, which made specific and general recommendations relating to the Upper Willamette Valley. Citizen input for the watershed study area indicated a strong desire to maintain the rural character of the valley and to prevent residential sprawl, diversification of the timber-based economy and to preserve the existing quality of natural environment along rivers for public use. This planning process designated the land in the lower half of the watershed as "Conservation, Recreation and Open Space," which recognizes the high value of the area for public use or preservation in its natural state.

The COE estimate of visitor use has nine activity classifications, which comprise Fall Creek Reservoir's user profile *(see Table F-4 & F-5 in Appendix F)*. The three leading uses at Fall Creek Reservoir are boating, water-skiing and swimming, but camping,

picnicking and fishing are also popular. Demand for recreational opportunities is projected to increase at approximately the same rate as the population of Lane County, with special emphasis on dispersed use. Projected visitation levels for Fall Creek Reservoir are shown in Table F-6, Appendix F. These projections are based on the assumption that development of facilities will progress according to demand; however this is unlikely at Fall Creek Reservoir due to economic considerations.

The Willamette Basin Review (COE, 1991) states that the reservoir has a high capability for future expansion of camping and other recreation facilities. The capability of the area to sustain continued development is limited, based on social resource capacity, financial and policy regulation constraint and designated resource use objectives that conflict with recreational use. Corps policy currently allows recreation development only when a qualified non-federal public entity agrees to cost-share 50% and assumes operations and maintenance. The estimated existing practical use for Fall Creek Reservoir is approximately 246,600 annual recreation days, which is the current level of use. Since further development is unlikely, the maximum practical use level may be regularly exceeded, with the potential for resource deterioration and curtailed visitor enjoyment.

Winberry Creek Drainage

Most of the people using the National Forest are seeking a more primitive experience. Winberry campground provides solitude in a forested setting. Thirty-nine percent of households questioned by the Oregon Parks and Recreation Department participate in tent camping, with an additional 20% not currently active but who desire to tent-camp. Most recreational use of Forest Service land is on the Tire Mountain, Saddleblanket, Jones, and Station Butte Trails. According to the SCORP, twice as many people want to participate in off-road biking (mountain biking) than are currently doing so (Oregon Parks and Recreation Department, Policy and Planning Division, 1994). A mountain bike trail guide and mountain bike race on the Tire Mountain trail increased visibility of mountain biking and accelerated the amount of use these trails currently receive. Portions of these trails are in the Eugene to Pacific Crest Trail system, primarily targeted for long distance users such as horse riders. As the trail is finished, and more people become aware of it, use is expected to rise. The SCORP identifies horseback riding on trails as the second most desired activity people wish to participate in (Oregon Parks and Recreation Department, Policy and Planning Division, 1994).

Although Winberry Creek is not known for outstanding kayaking, a stretch is included in the latest edition of Soggy Sneakers:

> *"It is one of the better runs of moderate difficulty that help one become accustomed to creek boating."* (Willamette Kayak and Canoe Club, 1994)

Beginning kayakers or canoeists often run Lower Fall Creek, below Fall Creek Dam during high winter water. Winberry is attractive to local boaters, because they can reach it quickly after work: of importance during short winter days (Jim Reed, personal communication).

In the fall, hunters establish camps on dispersed sites and logging spurs. The Winberry drainage is fairly popular with local hunters, and many people drive the roads in search of game during hunting season. Recent road closures to protect wildlife have affected access for some disabled hunters.

Most of the established dispersed sites recorded in the 1977 Code-A-Site inventory are not visible today; all but one of the sites in use today were not recorded then. Site R, the one common in both 1977 and 1995 inventories, has an increased number of tent and vehicle parking spaces and site impacts have changed from *moderate* to *heavy.* Also, firewood availability has decreased from *available* to *scarce* reflecting an increased use of the site. Both recreationists and homeless have contributed to the condition of this site.

Social

Earning a living in marginal foothill valleys like Winberry has always been difficult. Homesteads here were referred to as "stump farms," as it took years of labor to remove root systems after cutting the trees (COE, 1982). In the 1880s, the principal occupation was raising stock. People cleared land, built houses and barns, planted orchards, and cultivated fields to feed cattle and themselves. Of the five original 1850 homesteaders, none were in the area by 1900 (COE, 1982). Two examples of the hard existence are found in a 1959 issue of the Lane Reporter:

> *"Alice Inman says that in her day, the kids earned all their school money picking hops"* (AD Hyland hop yard in Lowell) *"for three or four weeks in the summer,"* and *"Ole Neet...can remember when all the cash the family had was what the family earned during hop season"* (Tom Straub, 1959).

Basically, isolation precluded any effective economic development beyond mere subsistence living.

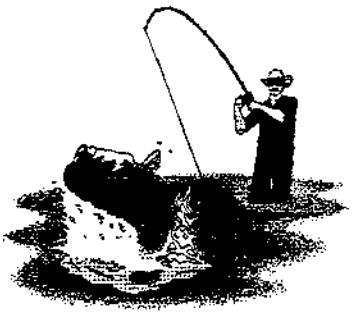
Not much has changed during the past century. Although the Lowell Census District population, which includes Fall Creek and Winberry Creek drainages, is considered 100% rural, only three percent actually lived on farms in 1990. Eight percent of the employed labor force earned a living by farming, fishing or forestry. Even today, few residents are able to support themselves solely from the local area. This is reflected by the fact that 93% of the labor force (16 years and older) have a mean travel time of 27.2 minutes between home and work (equivalent to travel time between Eugene/Springfield and Lowell). Since the decline of timber harvesting from the National Forests, local forestry workers have to travel farther from home to find work in their profession, or change professions.

As harvest is currently concentrated on National Forest matrix lands, timber jobs are expected to remain stable, although at greatly reduced numbers from the 1970s and 1980s. It is doubtful whether many local residents will benefit directly from timber-related jobs in the Winberry/Lower Fall Creek watershed area.

Timber harvest practices on private lands affects timber harvest patterns on adjacent federal lands. This in turn may have an indirect effect on Winberry residents. The

residents are getting older (Natalie Reid, personal communication) and few people have moved in from outside the area (Betty Wysong, personal communication). Many older people tend to depend on fixed incomes. If county taxes are raised to replace timber receipts, these people may be displaced. The number of low priced (<$200) rental units has dropped since the 1980 census, and higher rents and mortgage payments (>$500) have increased. These combined factors make it difficult for long-time residents to remain, and for their children to stay in the area (especially if their occupation follows family tradition). "If outside changes hadn't happened, we would've been able to live like we have..." for the past 50 years (Natalie Reid, personal communication).

Easier access to Winberry also impacts local residents. For example, paving the road during the mid 1960s brought more people into the Winberry drainage, looking for fire wood, Christmas trees and a place to recreate (Natalie Reid, personal communication). One city couples' picnic lunch in the woods was disrupted, when they were asked to leave a front lawn on private property! (Betty Wysong, personal communication). Increased access, population and publicity would change the flavor of the Winberry neighborhood. It is already less friendly and "open" than before the dam was built, mainly due to an increase of "outsiders", who do not always respect private property or anything beyond their immediate needs and desires (Natalie Reid, personal communication). Actions implemented (or not implemented) by the COE, USFS and BLM will affect the local residents. This should be recognized during the planning stages, and steps taken to weigh the benefits of specific actions.



CHAPTER 4
INTERPRETATIONS

ISSUE 1: TERRESTRIAL HABITAT

Key Questions

1. *How have differences in land ownership and management contributed to changes in the vegetation?*

The lower Winberry bottomland was originally settled as population in the Willamette Valley increased. Much of the eastern half of the drainage was deeded to private ownership. During this settlement period some timber harvesting occurred, primarily for local use. The Eugene/Springfield timber companies expanded their development of the area for commercial timber harvests in the 1940s with the country's increased demands for timber. Timber harvesting continued to increase until its peak in the 1980s.

The USFS, BLM and private industries have harvested many acres of mature timber during the last 50 years. Many dispersed clearcuts, an extensive road system and intensive forestry practices have altered the natural conditions of the watershed. This demand upon the forest system has resulted in less snag diversity, coarse woody debris levels and large dominant green trees. Plantation management and wildland fire control have reduced the average stand age, complexity and stand structure in the Winberry drainage.

Historically federal forest lands have been guided by a multiple use concept. This difference in management objectives between federal and private forest lands has reserved many areas within federal ownership for other uses. Wood products, wildlife, fisheries, recreation, and social concerns have resulted in federal forests that serve a multitude of goals.

During the last ten years a greater difference has been developing between federal and private forested lands. For example, on federal forests herbicide use was discontinued in the early 1980s. This has resulted in young plantations with less conifer trees and more hardwood and shrub species. In addition, timber sales within the last five years have reserved green trees within harvest units for cavity nesting bird use. These two changes in management have developed young seral forests very different from private industrial lands of a comparable age.

2. *How have historic management activities affected known populations and habitats of T&E/C3 species, noxious weeds and big game or other wildlife species of concern?*

The majority of sensitive plant species were located while surveying for project-level analyses. Thus, only a portion of the watershed in federal ownership has been adequately surveyed for rare plant species. We may never know about rare species on

private land unless landowners share this information. A few of the premier wildlife species have been extensively monitored, such as the spotted owl and bald eagle. Information is lacking on numerous species, including those recently listed under the ROD as Survey and Manage, such as the red tree vole and great gray owl. Some amphibian surveys have provided information on species presence, yet abundance is still in question.

Romanzoffia thompsonii

Populations are stable. Two of the populations are near trails but do not seem to have been adversely impacted by recreational traffic. This plant's habitat is considered 9D (Special Wildlife Habitat) under FW211 so there should be no impact to populations in Matrix land allocations.

Frasera umpquaensis

Existing Winberry population is stable and reproducing. The population is visited on a yearly basis to ensure no major population decline. A very small part of the population is in and adjacent to the Alpine Trail. At present, there is little use and hikers remain in the middle of the trailbed on this section. Major changes in use patterns such as mountain bike racing could adversely affect part of the population as soils seem highly erodable.

Epipactis gigantea

Population is stable and monitored annually. There are no immediate threats at this time; however, since it grows along a heavily used fishing trail, impact to the population should be monitored.

Iris tenax and Iris chrysophylla

Monitoring plots were initiated in 1995 and status of the Fall Creek population will be assessed after a couple of field seasons.

Northern Spotted Owl

Of the 14 activity centers known on federal lands in the watershed, four are below "take" thresholds: one on BLM land and three on USFS land. No known activity centers occur on COE lands. The two sites occurring on private lands are protected with 70 acre cores but are not required to manage for suitable acres within the provincial home radius. 31.1% of the watershed (50.2% of federal lands) currently provides suitable spotted owl habitat. The vast majority of this occurs on USFS lands in the upper half of the watershed. Quarter Township analysis indicates that dispersal habitat (11-40) conditions are fairly poor. Six of the 11 ¼ townships overlapping the watershed and including federal lands are currently below the 50% threshold. These areas coincide with historic harvest activity. From upper Brush Creek to upper Cabin Creek and Upper South Fork

Winberry, there is a concern about providing adequate dispersal conditions in a north/south direction between adjacent LSRs.

It should be noted that 11-40 analysis completed by drainage produced different results. The Brush Creek and North Fork Winberry Creek drainages indicate dispersal conditions above the 50% level. This reflects better habitat conditions in the lower portions of these drainages whereas the ¼ township analysis includes more forest lands harvested in past years. A discrepancy in the 11-40 analysis could exist since it was analyzed at the forest level and discrepancies may exist between the forest vegetation layer and the watershed vegetation layers.

The upper end of the watershed is currently proposed as critical habitat under the Endangered Species Act. The USFWS Biological Opinion issued for the NW Forest Plan states:

> *"Alternative 9, with its combination of LSRs, MLSAs, RRs and matrix prescriptions should enable critical habitat to perform the biological function for which it was designated"* (USDI, 1994).

Standards and guidelines in the NWFP allows this critical habitat to function as intended. With 57% of the watershed existing as agricultural, private industrial or federal matrix, the major activity within the watershed will be some form of timber harvest. It is anticipated that the spotted owl will not be able to maintain a viable presence in this watershed in the future.

Western Pond Turtle

The Winberry pond on USFS lands has the potential to provide excellent conditions and habitat for a population of turtles somewhat isolated from human impacts and non-native species. Monitoring should continue at this pond. A fairly healthy population exists in the two ponds on COE lands below Fall Creek Dam. There is concern that the population in the reservoir itself is adult-biased due to poor juvenile survival. This results from recreational impacts, predation by and competition from non-native species (such as bass and bullfrog), and human impacts to overwintering and nesting sites. Natural succession of open meadow habitat adjacent to the reservoir also contributes to the loss of habitat.

Bald Eagle

The use of the reservoir for foraging by the Eagle Rock pair nesting above Dexter reservoir is documented. This seems to occur mainly during the "off" recreational season from October through April. Recreational activity during the high use summer months impact the eagles' use of the reservoir. Three separate BLM areas have been set aside as bald eagle habitat areas. Some of the forested lands within these BEHAs is currently considered suitable nesting habitat for the eagles while some only exists as potential habitat. The COE lands immediately adjacent to the reservoir also show potential in providing future nesting habitat. These lands could be managed to enhance growth of trees and provide a nesting component in the future. Close proximity to the

reservoir and surrounding roads might deter eagles from nesting on COE lands due to recreational disturbance in the summer months. Warm water game fish and the put-and-take fishery in the reservoir are providing forage opportunities for the eagle pair. It is unclear whether the reservoir could support a separate nesting pair of eagles, as forage and disturbance are potential limiting factors.

C3 Species

The future of C3 species is going to differ dramatically between federal and non-federal ownership areas. The eastern part of the watershed should show a continuing improvement in the integrity of riparian reserves, which are an essential part of maintaining species viability in the NWFP. These areas not only function as refugia from which species may disseminate but also as corridors along which plant and animal species can travel. Approximately half the riparian reserves in North Fork, Brush Creek and Upper South Fork Winberry are in early seral stage and will not function as desired for the next 80 years. Seventy to eighty percent of riparian reserves in the western part of the watershed are in early seral stages and projections are that these levels will be maintained through the next 80 years, assuming that harvest levels and demand for private timber will remain stable into the future.

Habitat for old-growth associated C3 species will diminish in the future. Seral stage trends are drastically different than historically. In 1900, late successional old-growth habitat was three times more prevalent (50% vs. 15%). Due to demand for large diameter trees on private land and the matrix allocation on federal land, it is assumed the amount of late successional old-growth will continue to decrease. This reduction will result in the loss of habitat for species requiring large blocks of interior habitat. Such species will be largely confined to blocks found within special wildlife habitat areas, 100 acre owl cores, and intact riparian areas. To maintain these species in the refugia, some mitigation measures can be taken *(see Recommendations, page 167).*

Great Gray Owl

One historic site in the watershed has been documented on USFS lands. Numerous responses have been elicited in this area over a number of years although nesting status has yet to be determined. Suitable great gray owl exists in the form of natural meadows and young clearcuts. The upper end of the watershed provides suitable nesting and foraging habitat due to natural meadow complexes adjacent to Saddleblanket and Sourgrass Mountains. The Joe's Peak area and Mt. Salem also have the potential to provide suitable habitat conditions.

Red Tree Vole

Approximately 57% of federal lands currently exist as potential red tree vole habitat. Based on interim guidance, this level is well above the minimum threshold of forty percent. Currently 29.5% of the late successional forests that exist in the watershed are in no-harvest allocations. This percentage will increase over time as the forested stands in no-harvest allocations develop into potential and suitable red tree vole habitat.

Surveys for red tree voles are not currently required in this watershed and no mandatory management requirements will be implemented.

Big Game Habitat

Overall trend is positive for big game habitat in the watershed. Matrix and industrial land designations should provide future potential forage and cover requirements for deer and Roosevelt elk. Modeling results and current watershed conditions point to a few concerns that should be addressed. The Cabin Creek high emphasis area shows forage value below desirable levels and open road densities slightly higher than desirable levels. In the past, the Cabin Creek area has been addressed with aggressive road closures, although other opportunities should be identified. Open road densities are also high for the Brush Creek and North Winberry moderate emphasis areas. Any opportunities to close roads seasonally or permanently in these areas should be identified. The lower end of the watershed does provide good habitat conditions for big game. If industrial lands continue fast-paced harvest activities, adequate thermal cover could become a limiting factor in this area. BLM ownership and their reserved lands could prove very important in providing cover and security for big game west of USFS lands.

Snags and Coarse Woody Debris

Preliminary snag modeling using some applied assumptions indicates overall low snag levels in the North Winberry Creek (37%) and BLM lands (21.8%) in South Reservoir drainages. This is associated with historically high harvest rates in these drainages without any snag retention in the harvest units. Without good information on coarse woody debris (CWD) levels in the watershed, assumptions can only be made based on known stand conditions and associated snag levels.

Generally, CWD levels are presumed to be low on BLM and USFS lands where historical logging activity removed most dead and down wood. Younger natural stands occurring in the lower half of the USFS portion are also low in CWD levels because they are at an age where natural recruitment is just beginning. This is especially true in the Winberry Mountain/Monterica Creek area where personal observations indicate very even-aged stands with low levels of CWD on the ground. This, of course, is more related to the fire history of these stands than to management activities. Some area salvage activities have occurred in these natural stands, reducing snag and CWD levels in areas immediately accessible from existing roads.

On BLM lands, snag contracts were awarded in the mid-1950s to actually cut snags prior to any management activity in many stands. Generally speaking, the upper end of the watershed, containing a majority of the remaining old-growth forests, probably has higher CWD and snag levels due to the age of these stands. More surveys are needed to verify these assumptions. There is concern that inadequate CWD levels in portions of the watershed may impact populations of dispersing terrestrial amphibians depending on adequate CWD levels for a major portion of their life histories. Areas in which major harvest activities ocurred in addition to historic fires from native American burning may present barriers to movement, dispersal and establishment.

Special Habitats

Special habitats were identified using aerial photo interpretation: field visits are necessary to determine exact compositions of habitat and management effects. Prescriptions for habitat restoration should be written during project-level planning and analysis.

Various types of vegetation manipulation and associated road building have affected special habitats. The most influential effect has been of roads on rock gardens and managed stands on mesic meadows, rock outcrops and ponds. Harvesting impacts on habitat edges include reduction of hiding and thermal cover for wildlife, reduction of shade for species intolerant of direct sunlight, a general change in the microclimate, and potential changes in hydrology, which could affect plant species distribution and composition. Building roads adjacent to or through these habitats results in elimination of meadow habitat causing a reduction in overall size, providing habitat favorable for noxious weeds, alteration of hydrology if culverts are incorrectly placed or plugged, and dissection of contiguous habitat potentially disallowing migration and dispersal of plant and/or animal species. Other dry habitats such as rock outcrops, shrub talus, dry meadows, and rock gardens have not been as seriously altered. Fire suppression and exclusion could affect these dry meadows by reducing productivity, general health and allowing conifer encroachment.

There are three known roosting/hibernacula sites for the Townsend's big-eared bat within the watershed. One is a natural cavesite where presence of this species was verified in 1990. The geology of lower South Fork Winberry/Monterica Creek is conducive to providing more cave locations, although additional sites are not known at this time. Timber planning and more site-specific reconnaissance could reveal additional cave habitat requiring appropriate no-harvest buffers.

The future trend for special habitats is stable, with Willamette National Forest Land and Resource Management Plan Standard and Guideline FW211 protecting both dry and wet sites. Special habitats on private lands are not protected. Little habitat occurs on BLM or ACE lands.

Noxious Weeds

Road construction and maintenance have been the most important factors contributing to the spread of noxious weeds, since road maintenance acts as a constant disturbance agent disallowing succession and maintaining early seral, pioneer conditions conducive to weedy species. Roadsides act as corridors where weeds may travel from one disturbed site to another, such as in managed stands and quarries.

Established infestations of Scotch broom, tansy, ragwort, Klamath weed, Canada thistle, and bull thistle are found throughout the watershed. These species are restricted to roadsides and managed stands but some species, such as Klamath weed and thistles, are actively migrating into dry meadow habitat such as dry rock gardens of the Tire and Winberry Mountain complexes. Weed species in natural habitats have the effect of

lowering overall biodiversity of a site as they outcompete natural vegetation. This can adversely affect wildlife populations which depend on native plant species for survival.

No new invaders appear in the watershed, a feature unique to the Willamette NF, and if at all possible, they should be kept out. However, established weeds such as Scotch broom, tansy, thistles, and St. John's wort will continue to spread wherever soil disturbance occurs (i.e., in managed stands, roadsides and quarries).

Management of established populations should be prioritized due to budget constraints and the cost of manually controlling these weedy species *(see Recommendations, page 176)*.

3. How has fire suppression affected vegetation? How and where does fuel loading contribute to the potential for catastrophic fire?

The effects of fire suppression in the watershed can most easily be measured by the amount of forest in stand initiation seral stage. A high percentage of stand initiation in reference conditions would suggest an active fire presence. Reference conditions showed 12,763 acres or 29.3% of the watershed in this stage, growing to 16,609 acres or 38.2% currently. Stand initiation stages resulted from fire under reference conditions and as a consequence of harvest under current conditions. However, the cause is not relevant; rather, the overall distribution of seral stages is of importance.

Late successional old-growth showed a dramatic decrease over time due to harvest, not large stand replacing fires.

Lack of aboriginal burning rather than increased fire suppression has played a dramatic role in affecting the vegetation in this watershed. The most evident change has been an increase in understory reinitiation and stem exclusion seral stages. Without repeated native burning stand initiation aged trees were allowed to grow. Stem exclusion seral stage has increased from 8.5% of the watershed to 18.8%, while understory reinitiation seral stage has increased from 6.7% to 22.0%.

Recent fire history (1932-1995 for ODF protected lands and 1949-1995 for the USFS protected lands), shows that while lightning fires account for a significant number of fires they burn a very small amount of total acreage consumed by wildfires. This would indicate that for the period of record human-caused fires were a greater factor in shaping vegetation than lightning fires.

Stand initiation and late successional old-growth seral stages have been identified to have the most potential for catastrophic, high intensity fires. Fuel loading for fuel size class 0-3" are within the allowable down woody material delineated in the Willamette National Forest Standard and Guidelines (i.e., for stand initiation). Fuel loading for fuel size class 9-20" exceed the allowable down woody material identified in Standards and Guidelines. All other fuel size classes are below the standards of allowable down woody material.

Stand initiation seral stage currently has an artificially higher fuel loading in the 0-3" fuels due to present day silvicultural practices. This increased fuel loading is often short lived (3-6 years) as size of fuel degenerates quickly.

4. *How does the Winberry/Lower Fall Creek watershed contribute in providing connectivity between adjacent watersheds and Late successional Reserves?*

   What opportunities might provide or enhance late successional forest habitat for dispersal/movement of terrestrial plant and wildlife species and where are they found?

The health and maintenance of this watershed is important for providing a suitable and functioning link between the Fall Creek LSR RO219 and the Middle Fork LSR RO 222. More than half the watershed is currently owned by private landowners and timber industries. This puts more emphasis on federal lands to provide healthy dispersal habitat for various plant and wildlife species.

Riparian reserves currently function well below desired conditions in a large portion of the upper half of the watershed. Fifty-three percent of the riparian reserves in Brush Creek and 61% in North Winberry occur in stands less than 80 years old. Dispersal (11-40) conditions range between 42% and 45% in the ¼ townships that include these drainages. Interior habitat conditions are also low for the Brush Creek, North Fork Winberry and Upper South Fork drainages with values of 17.4%, 11.4% and 19.2% respectively. Red tree vole habitat is at minimum desired levels based on draft protocol guidelines. Past management practices have created this fragmented landscape which is potentially a barrier to plant and wildlife dispersal.

Ridgetop habitat is also important for movement and dispersal of plants and wildlife. The main Alpine Ridge at the upper end of the watershed is a travel corridor for big game and maintenance of adequate cover for travel and movement would enhance their security.

In the short term, until riparian reserves develop into suitable dispersal and late successional forest habitat, it is important to develop strategies that maintain dispersal corridors with lower timber harvest priorities or alternative harvest prescriptions. *Map 37* depicts current or potential dispersal corridors identified on USFS and BLM lands that could provide dispersal avenues as an interim strategy until riparian reserve allocations recover. This map also identifies and prioritizes timber harvest areas in the watershed based on dispersal and movement concerns *(see Chapter 5, page 170, for a discussion of these proposed dispersal avenues).*

BLM lands in the South Reservoir drainage include a connectivity block that will eventually be isolated from the more contiguous lands to the east unless harvest scheduling on BLM matrix lands is carefully managed, taking connectivity issues into account. Scheduling could facilitate the maintenance of dispersal corridor connectivity back to USFS lands in the Brush Creek and Boundary Creek (Fall Creek Watershed) drainages.

5. How has the introduction of non-native species affected the native plants and animals in the watershed?

Plants

Numerous non-native species have moved into the watershed, either by direct planting (ex. reed canarygrass for bank stabilization along Fall Creek Reservoir or birdsfoot trefoil along roadsides as a part of erosion control seed mix) or by natural spreading. Most species (ex. Oxeye daisy, climbing nightshade) are early seral, pioneer species which, like noxious weed species, thrive in constantly-disturbed habitats. Often they have seeds that are wind dispersed (ex. Dandelion or cat's ear dandelion).

The true threat of these species is not to the forested landscape but to non-forested special habitats. Unfortunately, most meadow habitats feature bunchgrass-forming species which maintain large gaps of open ground for weedy species' seeds to land and germinate. Since we will continue to create regeneration harvest units and their associated roads throughout the watershed, a constant supply of travel corridors for these species will be available. Special habitats should be assessed at the project level for restoration opportunities. An attempt to use native species for revegetation efforts, in reservoir bank stabilization projects as well as roadside seed mixes, should be made.

Animals

In the watershed, a number of terrestrial animal non-native species could potentially impact the native fauna. Starlings have become a very prolific invader in the lower portions of the watershed adjacent to more developed lands. They are not found in upland forested habitats. They can outcompete purple martin for potential natural nest sites, such as snag cavities. Since the martin is rare in the watershed due to lack of existing nesting habitat, this isn't a major concern at this time. In the future, as the COE and other landowners create or provide a snag component, this could become a problem and active management of the starlings could become necessary. For example, some available purple martin nest box designs preclude use by starlings.

Brown-headed cowbirds, although a native species, are suspected to occur in the watershed in artificially high numbers due to agricultural development and fragmentation of forested habitats. A number of species possibly affected by its brood parasitism behavior include the willow flycatcher, solitary vireo, yellow warbler, and McGillivray's warbler. These species have been documented as common hosts of the cowbird and are potentially on the decline in Oregon. More survey information is needed to determine brood parasitism effects on Neotropical migrants.

Domestic cats impact native avian species by predation to a greater extent than often realized. Increased human population of the lower end of the watershed coincides with an increase in domestic cat populations and subsequent increases in predation on native fauna. Species possibly most affected are the American goldfinch, hummingbirds and a number of reptile and amphibian species.

Issue 2: Riparian Habitat

Key Questions

1. *How have different land use patterns (ex. agriculture, roads, timber harvest) impacted riparian habitat and function above and below the reservoir? What is its importance to federal land managers?*

Lower Fall Creek And Lower Winberry

Land use below Fall Creek Reservoir has developed as predominantly agriculture and rural residential. As mentioned in Chapter 3, Fall Creek was thought to have had a more elaborate meander pattern and was more interactive with its floodplain. Riparian trees were believed to have been large hardwoods such as red alder, Oregon ash, black cottonwood, and big leaf maple. Road construction and settlement of the area began in 1850. This resulted in a more channelized stream with little or no trees left along riparian areas. Once forestry practices started upstream from the reservoir, the channel itself was used to move logs downstream to mills. This activity contributed to channel downcutting and had a large impact on the reduction of floodplain interaction. Today, the riparian area along Fall Creek is limited to a few large trees immediately adjacent to the stream. Future trends are expected to be similar along the mainstem of Fall Creek.

Above the dam but below USFS administered lands, land use patterns are primarily related to forestry with some agricultural (mainly pasture) and rural residential development. Riparian management on BLM lands is consistent with the Northwest Forest Plan (NWFP, 1994) and the Aquatic Conservation Strategy, protecting both fish bearing and non-fish bearing streams. Private forestry practices adhere to the Oregon State Forest Practice Act.

Using different GIS databases and with different emphasis on riparian management for small intermittent streams, not all the small streams in the North and South Reservoir drainages have been identified. Stream data for USFS administered lands is considered more complete. Considering the data available, conditions in the North and South Reservoir drainages are similar. The reference condition in 1900 indicates that a traditional Native American induced fire impacted the South Reservoir drainage. By now, this drainage should have recovered to a late successional stage; however, only 21% is currently in a late seral condition. The North Reservoir drainage is in a similar condition with only 31% found in a late seral stage.

Thirteen percent of these streams in the North and South Reservoir drainages are on BLM administered land. Sixty four percent of the riparian area on BLM administered land is less than 80 years old and the remainder (36%) is older than 80 years. The North Reservoir does not have any fish bearing streams adjacent to BLM lands, but within the South Reservoir 64% of the fish bearing streams (3.09 miles) along BLM land are in a seral condition greater than 80 years old.

The lack of late seral trees has opened riparian areas resulting in elevated stream temperatures, primarily during summer months. Thus, the cool moist micro climates of

riparian areas have been altered, negatively impacting plant and animal habitat. Large trees also play an important role in eventually providing down woody material, important in creating habitat for both terrestrial and aquatic species, as well as providing channel stability.

Road density for North and South Reservoir drainages is similar, with an average of approximately 4.66 miles/square mile. The data in this portion of the watershed is somewhat limited since much of the acreage is privately owned, so the actual density is probably higher. Of known roads, 35.6% (55.2 miles) are within riparian reserves. Riparian reserves are defined in the NWFP. In this area the BLM has estimated riparian reserves to be 420 feet wide along each side of fish-bearing streams (a total of 840 feet) and 210 feet along each side of non-fish bearing streams. Roads adjacent to stream channels impact riparian areas by allowing more sediment and sunlight to reach the stream, reducing areas for future recruitment of large woody material, restricting channel movement and decreasing available habitat for some terrestrial plants and animals.

Some private land owners have right-of-way agreements with the BLM. These agreements existed prior to the NWFP and allow private landowners to legally build roads across BLM lands. This may negatively impact riparian reserves on BLM. Otherwise, future land management activities are expected to maintain and enhance riparian reserves on BLM administered lands. In contrast, private forestry lands will have a small buffered area along fish bearing streams (20 foot no-cut, then thinned to a certain basal area for a total of 50-100 feet depending on the size of the stream). Non-fish bearing streams on private land will have no riparian protection, leaving the majority of riparian areas in an early to young seral condition. Road densities on private lands are also anticipated to increase as more areas are harvested. Some of these new roads may also impact riparian areas.

The lack of riparian conifer trees and future recruitment of large woody debris may result in poor channel stability, particularly in the steep tributary streams. As seen on the 1995 aerial photos, a recent landslide occurred in the South Reservoir drainage, where an unnamed tributary sluiced out within a harvest unit. Events such as this may continue if unstable soils and non-fish bearing streams continue to have minimal protection on private land. The riparian protection along streams in BLM areas will essentially act as island refugia for terrestrial and aquatic plant and animal species. Habitat and water temperatures should improve in these areas, but are not expected to have a significant positive impact on the overall condition of the North and South Reservoir drainages. Instead, positive impacts will be localized and directly affect specific areas by providing some habitat retention and possible enhancement through restoration opportunities.

Upper Winberry (Forest Service Administered Land)

Forestry is the major land use that has altered riparian conditions. Prior to forestry practices, the majority of riparian areas, usually not impacted by fires, were in a late seral condition. Using 1900 as a reference year skews the expected natural condition as it shows riparian areas to be predominately in early seral stages. This was the result of a stand replacing fire in the area at the turn of the century rather than true riparian

reference conditions. Generally, riparian trees would predominantly be in a late seral stage unless a fire was to occur. In this case, since fire frequency in the area is so low (approximately 300-500 years) and a large fire had occurred near the turn of the century, the current seral condition would be expected to be largely in a late seral stage. However, current conditions indicate that much of the riparian reserve area is in an early seral stage.

Seral conditions within riparian reserves were categorized by the percentage of trees in early, young or late seral stage. Riparian reserves along fish bearing streams (340 feet on each side) are twice as wide as those along non-fish bearing streams (170 feet on each side). Averaging all fish bearing and non-fish bearing streams together, North Fork Winberry, Brush Creek and Upper South Fork Winberry all have a high amount of riparian areas in an early or young seral condition (60%, 52% and 49%, respectively), while Lower South Fork Winberry has the highest amount in a late seral condition. Table 44 summarizes the late, young and early seral conditions found within each drainage.

Table 44. Late, Young and Early Seral Conditions by Drainage

Drainages	Areas of Late Seral	Areas of Early and Young Seral
North Fork Winberry	Lower North Fork Winberry Creek, Minnehaha Creek and Lower Blanket Creek	Upper reaches of North Fork Winberry, Traverse Creek, Tributary North of Traverse Creek and Upper Blanket Creek
Brush	Lower fish-bearing reaches of Brush Creek	Upper reaches and headwaters of Brush Creek
Lower South Fork Winberry	Mainstem of South Fork and Monterica Creek	Sections along tributaries
Upper South Fork Winberry	Lower reaches of Cabin Creek	Upper Cabin Creek and tributaries, Upper South Fork Winberry

The Lower South Fork drainage was impacted by a fire at the turn of the century. Land management activities, such as timber harvest, have been minimal along riparian reserves in this drainage. Roads have been the main impact to riparian areas; 20.3 miles in this drainage are located within riparian reserves. Approximately 39% (54 miles) of all roads in upper Winberry are found within riparian reserves. Few new roads are expected to be constructed within riparian reserves.

Impacts from harvesting riparian trees are discussed above. In compliance with the NWFP and Aquatic Conservation Strategy, riparian management has recently changed on USFS and BLM administered lands. The importance of protecting riparian habitat along both fish bearing and non-fish bearing streams has been recognized. Most of these riparian areas have been impacted by tree harvest and down woody debris removal. The reduction of conifers within riparian zones has reduced future recruitment

for much needed down woody material on the forest floor and in stream channels, impacting the habitat of both terrestrial and aquatic species. Down large woody debris also plays an important role in channel stability. If riparian areas along both fish and non-fish bearing streams continue to be maintained or enhanced, habitat and channel stability conditions are expected to improve.

2. *How do the riparian reserves (and other withdrawn allocations) currently function as habitat and dispersal corridors for terrestrial and riparian species? What are future trends?*

As discussed in *Issue 1*, the current condition of riparian reserves is poor in a large portion of the watershed. The lower half of the watershed, consisting mainly of private industrial timberlands and developed agricultural lands, will continue to play a very minimal role in maintaining or improving the health of riparian reserves. This emphasizes the importance of healthy riparian reserves on federal lands in this watershed. More than 70% of the riparian areas in the North and South Reservoir drainages have been impacted by management activities and are found in stands less than 80 years old. In these two drainages, impacts on BLM and COE lands are less.

On USFS land, lower South Fork Winberry/Monterica Creek is the least impacted drainage; 13% of its riparian reserves are in an early seral condition. Approximately half of the riparian reserves in Brush Creek, North Fork Winberry and Upper South Fork Winberry occur in stands less than 80 years old.

Other withdrawn allocations designated in the watershed provide high quality late successional forest habitat. These are unmapped 100 Ac. LSRs, Special Wildlife Habitat Areas, and special habitat buffers. In total, 13,714 acres have been withdrawn from timber harvest. The BLM connectivity block also provides additional quality habitat since 25%-30% of this area will be maintained in late successional forest condition at any point in time. In addition, stands will be harvested on a 150 year rotation, which will aid in providing a dispersal/refugia element in this portion of the watershed.

Overall, the riparian reserve network is functioning well below expected standards identified in the NW Forest Plan. Future trends indicate eventual recovery of this network on federal lands, although this will take many decades. In the meantime some interim strategies will serve to support terrestrial plant and wildlife movement and dispersal until the riparian reserve network becomes functional.

3. *What opportunities exist for riparian enhancement?*

See Chapter 5, Recommendations, page 173 and 176.

Issue 3: Aquatic Habitat and Species

Key Questions

1. *How and where have past management activities (ex. timber harvest, road construction, instream salvage) affected channel complexity above and below the reservoir?*

Lower Fall Creek and Lower Winberry

This portion of the watershed has been heavily impacted. Much of the channel has been scoured to bedrock, resulting from its historic use in transporting logs downstream. Instream tree salvage and fewer trees growing in riparian areas reduce down wood potential and maintain this degraded channel condition. Large woody material is needed in the channel to capture debris and sediment for channel aggradation (building up deposition). Without large woody debris jams, sediment and woody material continues to move downstream. As a result, the channel becomes wider, is more entrenched, looses floodplain interaction and has less meander.

It is expected that current riparian condition on private land will not improve. In addition, private land owners may salvage future instream large woody debris. In a healthy system, the flatter, low gradient reaches of lower Fall Creek and lower Winberry Creek should function as 'C' channel (response reaches) where alluvial deposition occurs. However, currently they function as 'F' channels, exhibiting some deposition but functioning primarily as transport reaches. Overall channel complexity is expected to remain degraded.

Fall Creek Dam blocks transportation of substrate and large woody debris currently present in the system. The resultant lack of debris negatively affects the stream channel's ability to rebuild a properly functioning 'C' channel. The outcome is a channel with poor aquatic habitat and channel complexity. Given the current land use patterns and channel condition, this trend is expected to continue.

Tributary areas within the lower part of the watershed have been impacted mainly by logging and road construction. Past management practices have not emphasized protection of riparian areas. Much of the large wood needed for channel stabilization and habitat was probably removed by management activities. The majority of these areas are associated with private land where riparian management will continue to be minimal; however, isolated riparian areas associated with BLM administered lands will be enhanced and maintained.

Roads within the watershed contribute fine sediment to stream channels. The majority in lower Fall Creek and lower Winberry are on clay soils. These types of soils present a particular problem since clay particles stay suspended longer and increase turbidity. The fine particles that settle out can also negatively impact spawning and macroinvertebrate habitat. Chronic road-related problem areas are not known in this lower portion of the watershed. Road densities are high, calculated at 4.66 miles/square mile but assumed to be higher because data for private land is limited.

Upper Winberry (Forest Service Administered Land)

Past forest practices have impacted stream conditions. Removal of riparian trees, instream salvage and road building have minimized channel complexity and contributed to an increased number of landslides *(see Geomorphology/Landslides, page 124)*. Stream channels throughout the upper Winberry drainage have been enhanced to improve channel complexity *(see Map 41 for restoration project locations)*. Prior to project implementation, many channels were scoured to bedrock. Now, woody debris is trapping sediment and collecting debris. Recent stream inventories still indicate a lack of large woody material and pool habitat, implying that the aquatic habitat has improved but is still limited. *Map 43* shows the LWD component and rates structure quality.

Roads can be a source for introduction of fine sediment into the stream channel. Fine soils *(see Map 10)* are of particular concern in earthflow areas. This type of sediment stays suspended within the water column. At high levels of turbidity fish gills can be damaged. Fines can fill in the crevasses between gravel and cobble substrate. Oxygenated water can no longer percolate through these crevasses, thereby negatively affecting pre-emergent fish and destroying spawning and macroinvertebrate habitat. Of concern are the headwaters in Brush Creek, upper and mid-North Fork Winberry Creek, Blanket Creek, Traverse Creek, mid-Cabin Creek and a small area on the mid southside of South Fork Winberry Creek. Specific roads known to present a problem and provide opportunities for restoration are detailed in Chapter 5, Recommendations, page 174 and 176.

Chip seal and drainage reconditioning projects are currently underway along the 1802.150 road and are expected to reduce sedimentation into South Fork Winberry Creek.

The landslide inventory indicated that Cabin Creek sluiced out in the 1964 flood event scouring the channel to bedrock. Then in 1990, Blanket Creek failed. Both of these landslides were initiated at road crossings and were attributed to plugged culverts.

Stream survey data for Cabin Creek was collected in 1990, indicating that much of the channel is scoured to bedrock in the lower fish bearing reaches. Very little large woody debris is present, along with limited pool habitat. Riparian habitat is in good condition with the majority of the riparian reserve consisting of large conifer trees. During a 1996 field review, some recent blowdown was observed, which indicates that this healthy riparian system is starting to produce down woody debris and show improved channel conditions.

Blanket Creek was surveyed in 1995. Bedrock is exposed in much of the channel. Completed instream log and boulder habitat enhancement projects have greatly improved habitat from the mouth to its confluence with Traverse Creek. The inventory indicates that the amount of large woody debris was moderate in the project area and low throughout the rest of the stream. However, smaller wood does exist in the channel providing new pool habitat and structure. A healthy riparian area along the lower fish bearing reaches of Blanket Creek has helped improve habitat.

A recent road-related slide occurred in Brush Creek approximately half mile upstream from its confluence with North Fork Winberry Creek. This slide has impeded the stream and created a low-water fish migration barrier. In the upper reaches of Brush Creek, blowdown has caused small bank slides to occur. This stream appears to have a fine sediment problem, although spawning is still currently taking place at the beginning of the reach.

2. Where is the best quality aquatic habitat located, and can these areas be further enhanced or protected?

Monterica Creek is the least impacted drainage within the watershed. Due to its steep, unstable slopes, very little timber harvest or road construction has occurred here. Riparian habitat is in a LSOG seral condition. However, as a result of the steep gradient and small drainage size, available fish habitat is limited to approximately ½ of a mile. The steep gradient also indicates that migration barriers may be common. Several instream habitat enhancement gabion structures were installed from the mouth to a few hundred feet upstream in 1986. Channel complexity has been enhanced in this area, although gabion structures are not preferred and would not be installed today. A formal stream inventory was not conducted in Monterica Creek so habitat conditions are unknown, but it is assumed to be of good quality based on the riparian condition and lack of management in the drainage.

Traverse Creek appears to provide the most diverse aquatic habitat based on stream inventory data, but riparian seral condition and bank stabilization are a concern. Riparian vegetation condition is fair with several areas adjacent to the stream in an early to young seral condition. Bank erosion is also common in Reach 2 since Traverse Creek flows through earth flow terrain. However, large woody debris has trapped a significant amount of fines and the stream appears to be stable. Approximately two miles of Traverse Creek are fish bearing and a large unnamed tributary entering Traverse Creek provides an additional two miles of fish habitat. This tributary was surveyed for fish use but no habitat condition survey was conducted. Cutthroat trout are the predominant species found in Traverse Creek. Several adult fish were found in Reach 1.

Chapter 5, Recommendations, page 176, indicates enhancement opportunities in these areas.

Other areas on USFS lands providing important spawning and adult holding habitat are indicated on *Map 44, USFS Resident Trout Habitat.*

3. How have management activities affected aquatic species (including anadromous and resident populations)? What are the future trends?

Anadromous runs within the Fall Creek Watershed consist of spring chinook and winter steelhead. As mentioned previously, impacts to these runs have been severe. The dam has fish passage facilities but problems in the downstream passage have affected returns. Initial dam operations brought the reservoir down slowly to streambed, flushing out smolts under low head (height of water in reservoir) which resulted in high survival of

juvenile salmonids passing through the dam. As recreational use increased, reservoir flood control draw-down was delayed so visitors to the project could recreate at full pool. Then a greater volume of water was released over a shorter period of time, decreasing survival of downstream migrant salmon. Recently, a new draw-down regime has been established; three years after this change in draw-down, returning adult numbers began to improve.

Even with the increase in returning adults, the COE is not meeting its goal of 450-600 adults returning to the dam. Future trends in fish returns and survival will depend upon the priorities established. If meeting this mitigation becomes priority, other measures, such as drawing the reservoir down to streambed, may help improve runs. This was last performed in 1987 resulting in high downstream turbidity which negatively impacted downstream conditions. It is anticipated that this high turbidity would not persist if the reservoir was drawn down to streambed each year. Short term impacts during the first year or two must be weighed against long term impacts. In addition, this extreme draw-down would flush out exotic fish such as large mouth bass, which feed on salmon presmolts raised in the reservoir and naturally spawned salmon smolts passing through the reservoir.

If recreation becomes a higher priority than meeting the mitigation measure of providing salmon to the drainage, the run size may continue at current levels or decrease. Other cumulative impacts, such as ocean harvest and habitat degradation, may continue to impact the Fall Creek runs.

Resident trout numbers within the drainage were high. Anecdotal evidence was provided by William Hueka and Nattalie Reid (Hueka, Reid, personal communication), who have lived in the area since the 1930s and remember easily catching the limit of 30 fish in Fall Creek and Winberry Creek. Numbers have decreased since ODFW poisoned the stream just prior to dam construction. In addition, cumulative impacts from upslope logging, instream salvage, road use and construction, and downstream agricultural practices have negatively impacted available habitat. Future trends are expected to vary. Habitat within federal lands is expected to improve over time as long as Aquatic Conservation Strategy objectives are met. However, conditions on private land are not expected to improve and may degrade over time.

Harlequin ducks have also been impacted by past harvesting practices since they favor forested streams providing adequate nesting habitat adjacent to the stream channel. The Winberry system has potential to provide suitable habitat for this waterfowl species above the Forest boundary as the riparian reserves fully recover. Habitat improvement projects in both South Fork Winberry and North Fork Winberry have benefited macroinvertebrate population levels, the duck's main forage. Below the Forest boundary, potential is low due to current forestry practices which retain minimal cover and nesting habitat along the larger order streams.

Amphibian surveys conducted on USFS lands indicate the presence of more pristine cold water dependent species such as the tailed frog and torrent salamander in upper reaches of the drainages, where impacts to streams from sedimentation and increased

temperature are minimal. A more encompassing survey would substantiate this. Future trends for these stream-associated amphibians are better in protected USFS riparian areas than on private and BLM lands, where they could be further impacted due to logging practices adjacent to streams above and below BLM ownership. Although BLM lands will provide adequate riparian protection, this could be to no avail if streams above their checkerboard ownership continue to be highly impacted.

Issue 4: Water Quality and Quantity

Key Questions

1. ***What are the implications of applying current state water quality standards on future management of Federal lands in the watershed?***

Water quality standards of concern in the Winberry/Lower Fall Creek Watershed include temperature, habitat-flow modification and sedimentation. Data indicates that several streams within the watershed have had summer water temperatures in excess of the state standard (64°F). These streams include Lower Fall Creek, the mainstem of Winberry Creek, North and South Forks of Winberry Creek, and Blanket Creek. It is important to note that the data indicate these elevated temperatures occurred in excess of seven days, not just on isolated one-day occurrences. The state standard also provides for a maximum 55°F temperature during October 1 through May 31 when salmonids spawn and egg incubation and fry emergence takes place. Available data indicates that the mainstem of Winberry Creek above the reservoir has experienced elevated temperatures in late May and early October during some years. This data may warrant future listing of these streams as Water Quality Limited Waterbodies on the DEQ 303(d) list which is compiled every two years.

The result of such a listing will be a DEQ requirement that landowners or land management agencies develop a management plan for the streams to facilitate meeting state water quality standards. The effect of establishing substantial riparian reserves on federal land, as required by the Forest Plan, may significantly improve water temperatures over the course of time. It is important to understand that due to the large amount of privately owned and controlled lands in Lower Fall Creek and the mainstem portion of Winberry Creek, improvement of riparian conditions throughout the area, not only on federally managed lands, would be necessary to meet state temperature standards.

The DEQ identified Lower Fall Creek as a Waterbody of Concern because aquatic habitat has been altered due to the modification of natural stream flows as a result of reservoir operations. The data presented in this document illustrates efforts by the COE to promote successful salmonid smolt outmigration from the reservoir during the late summer and early fall by increasing the average daily flow. Clearly, the Fall Creek dam is here to stay, but perhaps additional measures could be initiated to enhance fish habitat downstream from the reservoir.

With regard to sedimentation, the North and South Forks of Winberry, mainstem Winberry and Fall Creek Reservoir are all listed on the current Water Bodies of Concern List published by the DEQ. In most cases, these waterbodies are listed based on visual observation only. Should data become available, indicating that sedimentation is indeed a problem, these streams and the reservoir could potentially be listed as *Water Quality Limited* (303(d)). Current water quality parameters state that the formation of deposits deleterious to fish or other aquatic life, or injurious to public health, recreation, or industry shall not be allowed. Also, the Oregon State Forest Practices Act requires that timber harvesting activities cannot increase turbidity in the water by more than 10% from baseline levels. Water sampling would be necessary to determine if this is occurring but no data is currently available on baseline turbidity levels.

The amount of sediment entering the stream system from both private and federally controlled roads has not been determined, and represents an important data gap in this analysis. The current theory is that areas underlain by clay soils derived from the erosion of pyroclastic bedrock are more prone to contribute fine sediments to the stream system. Unlike landslide failures, which tend to happen relatively quickly and impair water quality on a more localized scale, fine sediment can enter the streams from an extensive road system and become a chronic problem. Stream surveys conducted by USFS have indicated that fine sediments have been deposited in Brush Creek due to road related runoff and landslide occurrence. These fine sediments provide beneficial structure to the riparian area, which can then support new vegetation. Normal low amounts of fine sediment deposition are actually beneficial to the riparian area, but high volumes of material during low stream flow is detrimental to the condition of macroinvertebrate habitat and spawning gravels and can cause fish mortality.

2. How have reservoir operations affected downstream beneficial uses of water?

Downstream from the reservoir, beneficial uses include aesthetics, resident fish and aquatic life, salmonid spawning and rearing, fishing, and water supply. Reservoir operations have not had a noticeable impact on algae levels in Fall Creek, but since more water is released into Fall Creek during typical low-flow summer months (compared to historical conditions) pollution is thought to be less, thereby improving the aesthetic quality of the creek. Resident fish, aquatic life and salmonid spawning and rearing have been significantly impacted by reservoir operations. Since 1966, Fall Creek has lacked extreme flows since reservoir operations are primarily in place for flood control. In addition to the dam, poor agricultural and forestry practices have severely reduced the amount of coarse sediment and large woody debris in Fall Creek below the dam. Consequently, aquatic habitat in Lower Fall Creek has been impaired by its lack of structure (i.e. large wood) resulting in inadequate gravel and cobble deposits as the current moves these materials down the stream system. This lack of debris prevents the channel from rebuilding. Regulating the amount of water in Lower Fall Creek has significantly reduced the extent of meander within its flood plain. This change in the natural flow regime of Fall Creek combined with the lack of large woody debris has accelerated stream downcutting into the channel bedrock.

Data collected below the dam indicate that Fall Creek has temperatures in excess of the state standard (64°F) during the late summer, probably due to warm water drawn from upper portions of the water column by fish horns at the dam. The observed elevated temperatures may also be attributed to the lack of riparian shading vegetation along Lower Fall Creek.

The COE's current practice of gradually lowering the reservoir water during late summer has resulted in higher than normal flows in Fall Creek during that time of year. This new flow regime is designed to reduce mortality of downstream migrating salmon smolts from the reservoir and has been successful. Although historical late summer flows were much less than those currently, salmonid smolts were able to migrate downstream easily with no barrier to passage.

Reservoir operations have regulated the amount of water in Lower Fall Creek in both the winter and summer months. Flood damage to lands downstream from the reservoir has essentially been eliminated since 1966. Prior to that time, flooding was a common occurrence, causing expensive damage to private land. Although impacting these lands, the extreme flow was essential for creating new channels and building and enhancing the floodplain. With regulation a guaranteed amount of water in the channel is available, which is beneficial for those drawing water from the creek as authorized under water right permits.

Issue 5: Timber Harvest

Key Questions

1. *Where could future harvests occur on federal lands? What acres are available for harvest?*

Winberry/Lower Fall Creek has been designated as a matrix land use watershed in the NWFP. Federal ownership in this watershed is available for future timber harvesting unless it has a reserve priority and is classified as a general forest management area (GFMA) or a connectivity block (CON). Planned timber sales will comply with the ecologically based principles of the NWFP. All timber management on matrix acres will also comply with the Willamette Forest Plan (USFS) or the Resource Management Plan (BLM).

See also Chapter 3, Terrestrial, Vegetation, Future Timber Harvest, page 58.

2. *How can silvicultural prescriptions enhance ecosystem process and functions and mitigate impacts to other resources?*

Past timber harvest activity and product-orientated silviculture treatments have reduced the natural forest complexity. Silviculture prescriptions which enhance natural diversity can hasten the recovery process. Ecologically significant areas, such as riparian zones, wildlife travel corridors and ridgelines, could benefit from silvicultural prescriptions adapted to the new forest plan.

Riparian reserves: These areas are to function as old-growth forests and any silvicultural treatment to promote a multi-storied canopy with its diversity of species and sufficient course woody debris should be viewed as advantageous.

Ridgelines: The riparian reserves function well as travel corridors for terrestrial species along the stream zone, but do not extend to the ridgetop to ecologically connect adjoining watersheds for species migration. These upslope stands may be classified as matrix, but alternative logging methods such as higher green tree retention or partial cut harvest would maintain some of the wildlife travel connections to adjoining watersheds.

Fall Creek Reservoir: The forested area surrounding the reservoir is in a young seral condition. These forested lands provide some wildlife habitat but could contribute more if a silvicultural treatment to enhance the diversity of young stands was used. These treatments could also provide beneficial recreational opportunities.

Unstable slopes*:* Areas with slope stability concerns could be considered for alternative harvest methods such as helicopter logging.

3. How is federal timber management (BLM) affected by private land management?

The BLM manages the O & C sections which are interspersed within private lands. NWFP guidance will develop forest lands functioning differently from the adjoining privately managed industrial forests. BLM's management will reserve riparian zones on all streams, retain several large trees and snags on harvest units, and protect special habitats and reserved lands such as LSR 100s and DDRs (District Designated Reserves). Management alternatives will develop two vastly different forest structures between BLM and private industry lands over time. The shorter rotational cycle and narrower riparian buffers of adjoining private holdings may create an edge effect that will affect the integrity of BLM's ecologically oriented goals. BLM will also be hampered in fully implementing the new plan due to a limited and disjointed land base within the respective subdrainages.

Issue 6: Reservoir

Key Questions

1. What are the effects of operation on anadromous fish, wildlife and recreation? What opportunities exist for reducing conflicts while maintaining ecosystem process and function?

Anadromous Fish

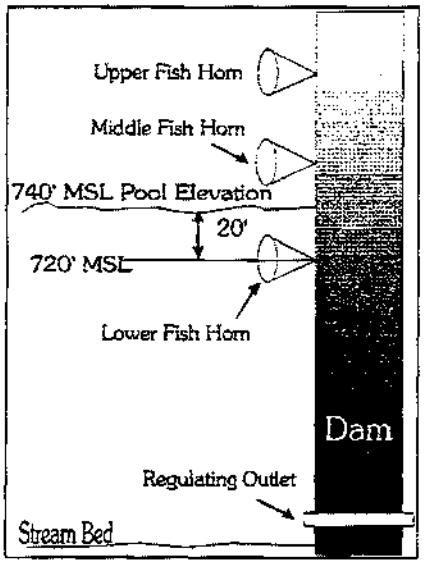
An estimated 450 spring chinook and 75 winter steelhead spawned above the Fall Creek Dam site prior to construction (USDI FWS, 1962). Returning salmon numbers were slightly above 200 fish for the past three years. During the same period, steelhead numbered less than ten, with only one returning this year. In 1991, Oregon Department of Fish and Wildlife (ODFW) research showed that downstream migrating juvenile salmon and winter steelhead are subjected to extreme changes in pressure, high

velocities and other unexplained hazards when passing through the dams' regulating outlets during draw-down operations. The study showed a positive correlation between fish mortality, elevated pool and discharge levels (Downey, 1992). Based on this information a change in the procedure of reservoir draw-down was suggested by ODFW for 1992 and succeeding years. The operation was a compromise between survival of fish passing through the dam's water discharge conduits and water oriented recreational activities on the reservoir. This compromise has not resulted in the high juvenile survival experienced in those early years. The returns of adult spring chinook to Fall Creek Dam in 1994, 1995 and 1996 have shown some improvement, possibly resulting from this modification; however, many factors contribute to numbers of adult salmon returning to their native stream.

Dam discharges, although higher on average than pre-project, are as low as 30 cubic feet per second (cfs) during summer periods. These discharges are marginal at best for upstream migrating adult salmonids. A compromise, used in some years, is to alternate between 30 cfs and 150 cfs discharges, on three to four day cycles. This attracts adult, upstream migrating fish from the Middle Fork of the Willamette, reduces delay and increases the probability of fish getting to the Fall Creek trap safely. Higher discharges, however, reduce the water level of the reservoir compromising an assortment of recreational activities.

As discussed in *Issue 4, Chapter 4, page 152*, Oregon DEQ has proposed that Fall Creek be listed as "water quality limited" below the dam due to elevated summer temperatures. These temperatures could be limiting upstream passage of late-run adult salmonids. Water for the fish ladder is taken from three tiers of juvenile fish bypass "fish horns" located in the forebay at the face of the dam. Essentially, water can be drawn from the reservoir at different depths. This water is then discharged through the ladder used by fish to access the adult fish trap. Warmer water is therefore siphoned from the fish horns near the reservoir's surface in late summer. When the reservoir level approaches within 20 feet of the lower set of fish horns, the adult trap is shut down and water is discharged through the regulating outlets at streambed *(see Figure 21)*. This procedure was suggested by ODFW in an effort to keep juvenile salmon from entering the bypass system where they suffer high passage mortality. Although the bulk of upstream migration occurs in June, cooler water in August would benefit downstream aquatic inhabitants and anadromous species. In 1970 ODFW found that fish delayed by cooler water temperatures during the spring migrated upstream later in the summer (Smith, 1970).

Figure 21. Fish Horn Schematic



Warm water gamefish, especially large mouth bass, are now present in the reservoir and undoubtedly

prey on young chinook salmon. Since the lake is not annually drawn down to stream bed, as prior to 1977, predatory fish are not flushed out. The long-term effect of this situation is certainly not comforting to those trying to increase the numbers of salmonids in this watershed. Annual draw-down of the reservoir to streambed would result in downstream water quality impacts. This option would be controversial due to water quality impacts and most certainly affect the warm water fishery in the reservoir. The ability of the reservoir to continue as an excellent rearing habitat for spring chinook is questionable. The presence of largemouth bass and the native squawfish are currently unquantified variables affecting the lake's ecosystem. The presence of exotic reed canary grass and its relative importance to salmonid rearing and warm water game fish productivity is not clear. Techniques are being investigated in the Santiam system where similar problems with exotic and native pisciverous fish exist. A prototype, floating trap and associated barrier nets, positioned at the upper end of Green Peter Reservoir, may be tested in the near future (COE, 1995) and may be the solution to similar problems encountered at Fall Creek and other COE reservoirs. The lake would continue to function as a rearing area for hatchery produced fry (if the proliferation of exotic predators could be reduced) and the trap would be used to capture downstream migrating progeny of naturally spawning salmonids, released into the watershed above the reservoir.

The number of winter steelhead returning to Fall Creek is much less than that of chinook. Steelhead generally stay in the smaller tributaries, rearing for up to two years before becoming downstream migrants. It is not clear what impacts warm water game fish have on steelhead migrants once they reach the lake. The number of steelhead reaching the reservoir and passing downstream is not known. Those that do undoubtedly suffer high mortality, as do chinook upon passage through the regulating outlets at high pool levels and discharge. One million chinook fry are placed in Fall Creek Reservoir each spring; no similar action is taken with winter steelhead.

Wildlife

The reservoir provides forage for many wildlife species including bats, peregrine falcons, bald eagles, osprey, purple martin, cliff swallows, violet green swallows, numerous waterfowl species, western pond turtles, and various reptiles and amphibians. Although forage for many of these species is directly related to the presence of this water body, the quantity and quality of the food supply is dependent on pool levels manipulated by the COE to meet previously mentioned objectives. The reservoir draw-down, commencing in mid-July, promotes the growth of vegetation below full pool; one species, reed canary grass, *Phalaris arundinacea,* is a non-native. Native emergent plant establishment and growth in the draw-down area is limited by pool fluctuations related to flood control operations. Rapid draw-down in the summer (still during the growing season) could potentially provide opportunities for shoreline revegetation and simultaneously provide an opportunity for *Phalaris* to spread further into the lake bed. Attempts have been made to plant native willow species in the draw-down area although success has been very limited. Plants succumb to very dry conditions if planted too close

to the shoreline, or from inundation when planted too far below full pool level. The ability of canary grass to succeed in this unnatural environment, where native plants cannot, may provide an acceptable alternative to bare, eroded shorelines common to flood control reservoirs.

Bald eagles forage primarily on the reservoir's Fall Creek arm. Observations indicate that the Eagle Rock pair use the reservoir for foraging, especially during the breeding season and before recreational use intensifies in the late spring. Past timber harvests adjacent to the reservoir have minimized chances for eagles to nest near the reservoir although suitable nesting habitat does exist and has been set aside on BLM lands within nesting range of the reservoir in two different areas. It is unknown whether lack of nesting trees, abundance of forage or recreational use are limiting establishment of a nesting pair on the reservoir itself. The relationship between reservoir draw-down, eagle foraging success and the presence of non-native fish species is unclear.

The western pond turtle population in the reservoir suffers from poor juvenile recruitment (K. Beal, 1994). Factors could include predation of young turtles by non-natives species such as bass and bullfrogs and competition for fairly limited food supplies when pool levels recede from the productive emergent vegetation near the upper limits of full pool. Also, since upland nesting and over-wintering locations adjacent to the reservoir are largely unknown, other activities could be preventing successful nesting or impact over-wintering sites. Southern exposures in both Douglas-fir and oak savanna habitat types on the north side of the Fall Creek arm are suspected critical overwintering areas. Lack of adequate basking habitat and structure in certain areas of the reservoir could be an impediment to turtle success. Recreational activities on the reservoir and removal of woody debris (drift materials) to provide safer boating activities may adversely impact the turtle. Rapid draw-down could affect the turtle's survival in general, both in the reservoir and in main Fall Creek below the reservoir.

The presence and apparent successful reproduction of the red-legged frog, *Rana aurora*, an Oregon and USFS designated sensitive species, has been substantiated by COE surveys in the ponds on Corps lands above and below the dam; surveys for larvae are planned to determine reproductive success. It is probable that the non-native bullfrog has a negative impact on larval survival of this species. The COE plans to continue monitoring to determine overall use and reproductive success of this and other pond and slack water breeding amphibians.

Recreation

Early draw-down of the reservoir (6 ft.) by August 15 has substantial negative impacts on lake recreation, boating, swimming, and campground usage. For example, Cascara Campground experiences 20% reduction in usage (see Chapter 4, Issue 7). Winberry Park, operated by Lane County, receives the highest level of use and is also significantly impacted by a loss in revenue of about $13,000. Reservoir draw-down procedures during the past three years resulted in suspension of proposed plans for campground improvements at Winberry County Park.

There is evidence that safety is compromised at lower water levels, particularly for power boating and water skiing. The frequency of accidents could support this observation but other causative factors should not be overlooked.

The draw-down is said to expose more shoreline to Off-Highway Vehicle (OHV) use, impairs revegetation of flats and exposes cultural resources to many more collectors.

Those people favoring recreational uses suggest a lower impact on recreation if operators began to lower the lake on August 1, reduce it five feet by Labor Day and lower it another 10 feet in September. However, this scenario would result in higher discharges at higher lake elevations during part of the downstream migration; certainly not meeting ODFW recommendations to improve anadromous fish runs in this watershed.

2. *What is the extent of shoreline erosion and what opportunities exist for its stabilization?*

Current shoreline erosion impacts 4.3 miles of the total 22.4 shoreline miles, representing 19% of the total shoreline. Recreational use patterns, wind direction and shoreline aspect play an important role in the erosional process of the Fall Creek Reservoir. Shoreline composition determines the rate and amount of erosion in site specific areas. Opportunities for stabilization will be explored in *Chapter 5, Recommendations, page 182.*

Issue 7: Human Uses

> *"People define the values associated with forest settings (where they may live, work or play) and their attitudes, behaviors and knowledge of forest systems affect it directly and indirectly. So programs that alter the biological system processes will alter the human system that interacts with it..."* (Stankey and Clark, 1992)

People usually learn how to act in an outdoor setting from interacting with and observing behaviors of family members, peers or organized groups (such as YMCA, Scouts, etc.). As the population grows, use of recreational facilities is also expected to increase and these behaviors will be reflected in their use of public lands.

Between 1950 and 1989 the Willamette Basin population grew about 1.7% annually to a population of 1,915,000 in 1989. Continued growth of the Eugene/Springfield Metropolitan area, which serves as the Visitor Use Market area for the watershed, is expected well into the future. Social and economic factors have a primary affect on the demand for recreation opportunities (COE, 1987, 1981).

Reservoir operation directly affects the recreational use of Fall Creek Reservoir, Fall Creek and associated river reaches downstream of the dam. The associated increase in recreation, has required a more comprehensive management of resources. Fall Creek Reservoir is heavily used for water-based recreation, while Lower Fall Creek and the Winberry drainage are predominately used for dispersed recreation. Both are important,

but recreation trends indicate that demand for dispersed recreation will surpass developed recreation use in the future.

Increasing pressures on the recreational resources of the watershed pose management challenges to federal agencies, considering that facility and recreation resource development is not likely to keep pace with demand. Visitation estimates for Fall Creek Reservoir project nearly 400,000 visitors by the year 2000 *(see Table F-7, Appendix F).*

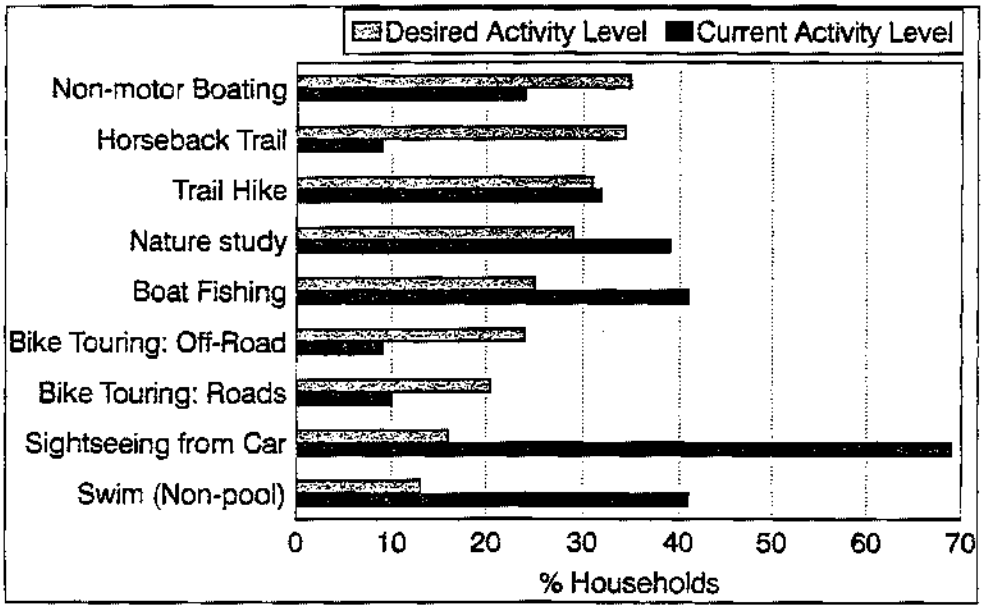
The watershed offers the types of recreational opportunities people appear to desire (SCORP, 1994) (see Figure 22). Interagency cooperation is mandatory to provide future customers with quality recreation.

Key Questions

1. *How will current and future management practices affect human use of the watershed (upstream and downstream of the reservoir)?*

In general, management practices at Fall Creek Reservoir are likely to remain consistent with current master plan guidelines. However, COE regulations and policy currently restricting the level of recreation development may affect the ability to meet future demand for water-related recreation. The Oregon SCORP states that growth in demand for recreation can be projected as a direct correlation to population growth. SCORP recreation demand surveys have indicated desired activities for recreation (see Figure 22). One of the key future needs identified by SCORP, is providing recreation facilities and opportunities close to major population centers. Important planning considerations are: the availability of outdoor recreation opportunities, direct positive impact on local economies, management of resources to include other multiple uses, and examination of future recreation opportunities in relation to regional requirements, as defined in SCORP.

Figure 22. Participation in Dispersed Activities *(from SCORP)*



Recreation Management

The increasing population, with its diverse but stable economy, will foster increasing pressure upon the recreational resources of the region. Visitor attendance is expected to increase at the same rate as population over the next 25 years (20-25%) (US Army Corps of Engineers, 1991). Trends in water-dependent and water-related recreational use, presently influencing watershed management, are inter-related. Maintaining the integrated ecological functions of rivers, streams, and riparian areas is becoming more important as an increased number of people spend more time involved in outdoor recreation activities. Over 80% of recreation activities in Oregon occur in areas associated with water (US Army Corps of Engineers, 1991). Visitors to COE reservoirs have high expectations of water quality and pleasing surroundings showing few management activities.

As the state economy shifts to tourism and recreation, demand for sustained higher water levels in the reservoir during the recreation season will increase. According to the Oregon Marine Board, the number of boats registered in Oregon is growing rapidly (US Army Corps of Engineers, 1991). This growth can be attributed to improved economic conditions, increased employment and continued success by the State Marine Board in provision and development of good boating (COE, 1991).

Visitation

All Willamette Valley reservoirs receive heavy visitation at the beginning of the summer starting with Memorial Day Weekend. Use typically decreases for several weeks until children are out of school, weather generally improves and families begin taking vacations. Use levels peak in July and August and then fall off dramatically after Labor Day weekend, irregardless of water level. However, the average age of users at many of the reservoirs appears to be increasing. Older people, particularly those without school-age children, are less dependent on the typical school vacation schedule and can recreate longer into the fall. For them, delaying draw-down until later in the fall may be more effective in promoting a longer recreation season.

Use of upland trails is slowly increasing, beginning earlier in the season and continuing later into the winter months than in past years. Historically, trails were primarily used during the dry summer and early fall months. In the past five years however, mountain bike use has increased during winter and spring, when soils are saturated and more susceptible to damage.

Dispersed sites also receive increased usage during the wet season, accelerating resource damage. The 1995 Code-A-Site Inventory shows that the area of impact around dispersed sites is expanding.

Other important factors influencing visitation include summer weather patterns and pool levels at other COE reservoirs. The overall demand for water-related recreation at COE reservoirs appears to be independent of water levels, although some direct correlation between pool levels and visitor use exists. If recreationists' preferred reservoir has an unsuitable pool elevation, they will seek opportunities at other alternative reservoirs

within the Basin. This situation is exaggerated at Fall Creek Reservoir, because the draw-down is a planned operation and results in greater fluctuation from full pool than would occur from dry weather conditions.

The Corps Natural Resource Management System (NRMS) includes detailed information on visitation for Fall Creek Reservoir *(see Table 45)*. Data for the remainder of the watershed is limited and is a *"data need"*. Forecasts of regional recreation demand/visitation growth rates are shown in Table F-8, Appendix F. Recreation demand for the Fall Creek area is forecast to nearly triple by the year 2010 (Willamette Basin Review, 1991).

Table 45. COE Fall Creek Reservoir Visitation Summary

Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Average
Visitor Days	195,200	219,000	223,100	265,800	311,600	327,672	284,441	215,369	299,586	253,128	242,900

Other factors relating to visitation include the seasonality of recreational use, an important consideration when analyzing reservoir operation. Recreation usage throughout the Basin is exerting more pressure on maintaining reservoirs at high levels for longer periods during the summer. This trend will increase, although recreation is not a primary purpose of the Willamette Valley Projects (COE). However, recreational use is important on all federal lands and the management challenge facing these agencies will be their ability to provide recreational opportunities to meet the forecasted recreational demand.

Local Economic Development

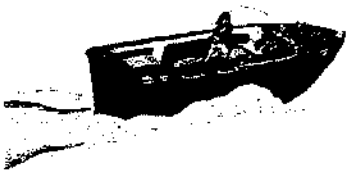
Many socio-economic changes have occurred in the region since the mid 1980s. With the designation of the Northern Spotted Owl as an endangered species, many communities throughout the Willamette Basin experienced a large degree of instability in their local economies, especially in small towns. Tourism and recreation were seen as a partial solution to resolving this impact.

During the 1980s, Oregon's population grew eight percent. This growth was concentrated in urban areas; rural population declined (SCORP, 1994). Rural communities were often dependent on timber revenues. These declined during the mid-1980s and early 1990s. For example, there was a 24% loss of timber and wood products related employment in Lane County from 1972 to 1992 (Lowell Oregon Community Assessment, 1995). This trend is reflected locally in the 74% workforce reduction of the USFS Lowell Ranger District in accordance with the broader societal demand that National Forests reduce their level of timber harvest.

In recent years, recreation and tourism have gained importance as industries in Oregon. This has placed increasing demands and expectations on the area's reservoir and on federal lands. Comments from the citizenry and local public officials at COE public meetings for the Willamette Basin review testified to the importance of nearby reservoirs as recreation and tourism resources.

Winberry/Lower Fall Creek watershed, in conjunction with the Fall Creek Watershed, offers one of the widest range of recreational opportunities in close proximity to the Eugene-Springfield area. Careful planning, including a comprehensive analysis of the area's natural resources, will help determine the resource base's capability to support/sustain multiple uses. This will assure the future availability of a wide range of recreation opportunities, to serve regional recreation demand, and provide the potential for continuing economic benefit to surrounding local communities.

Fall Creek Reservoir



At present use levels, Fall Creek Reservoir has the capacity to support demand for all boating activities. However, during peak use periods, summer weekends and holidays, some congestion occurs, both at boat ramps and on reservoir surface. No serious conflicts between user groups have occurred, but this may be expected if use levels continue to increase. Some boating restrictions may become necessary in the future. Demand for day-use recreation is also expected to increase in the future. The project resource base could support some increases in day-use levels. Recreational use at the reservoir is now relatively static with only slight continued growth, since all existing facilities operate at or near capacity throughout the summer. To help meet future regional demands, more use could be encouraged during the week or non-summer months.

Pool Elevation

Reservoir operation is one of many interrelated factors that influences recreation use at Fall Creek Lake. Two studies analyzed the potential effects of pool elevation on recreation use at Willamette Valley Project Lakes: *the Willamette Basin Reservoirs Recreation Assessment* (1984) and the *Report to Oregon Water Resources Department* (1988). These studies verified that, in general, draw-down has an adverse effect on water-related recreational use. There is some indication that maintaining full pool into the early fall would benefit recreation use. Present operations at Fall Creek Reservoir, where draw-down begins in July, have a significant effect on all recreation uses at the reservoir.

Cascara Campground and Winberry Creek Park are particularly affected economically. Revenue reductions at Cascara are approximately 20% while losses at Winberry Creek Park are approximately 20%-25%. Renovations or design changes to access lower water levels is not likely to restore use. If pool levels remain low during the peak summer recreation season, these areas will suffer long term negative recreation impacts. Lane County planned an addition to Winberry Creek Park, but suspended it based on economic considerations. Reduced visitation could also impact communities economically by reducing customers to local businesses.

Early draw-down also results in an increase in unauthorized OHV use, degradation of cultural resource sites, reduction in fishing/boating opportunities, and diminished scenic qualities. Safety of the boating public is especially of concern during the last portion of the summer, with reduced water levels.

The lack of facility development coupled with increased recreation demand, shifts users to adjacent areas and can result in overcrowding. If current management levels are reduced due to lack of funding and development does not meet demand, recreation use would adversely affect the resources ultimately causing deterioration.

2. *What management practices are available to enhance or protect recreation opportunities in the watershed? How could future recreation trends affect ecological processes?*

Establishment of recreation carrying capacities is critical in recreation management and planning. Updated and reliable visitation data is needed for the watershed as a whole, so realistic recreation carrying capacities may be determined to provide future recreational opportunities. Interagency collaboration would provide integrated resource management and more effective public service.

For a discussion of Recreation Carrying Capacity, see Appendix F, page 209.

See Chapter 5, Recommendations, Issue 7, page 183, for response to available management practices that protect or enhance recreational opportunities in the watershed.

CHAPTER 5
RECOMMENDATIONS

ISSUE 1: TERRESTRIAL HABITAT

Key Questions

1. *How have differences in land ownership and management contributed to changes in the vegetation?*

See Chapter 4, Interpretations, page 135.

2. *How have historic management activities affected known populations and habitats of T&E/C3 species, noxious weeds and big game or other wildlife species of concern?*

General Recommendations

- Continue to survey for threatened, endangered, sensitive and Strategy 1 & 2 Survey and Manage species (USDA, 1994b). Document presence and/or distribution in both GIS and associated databases as opportunities arise.
- Aggregate harvest units where feasible to minimize fragmentation and retain larger blocks of interior habitat for as long as possible while riparian reserve areas recover.
- Prescribe restoration of special habitats during project level planning and the ATM process. This could take the form of prescribed burning, tree girdling or removal, hydrologic restoration (culvert replacement), skid road obliteration, noxious weed removal and native species planting and revegetation.
- Maintain active noxious weed survey and control program. Prescribe and prioritize control methods at project level or in annual work plans giving unique sites/areas highest priority. For scotch broom, recommend manual control by cutting at the base and not pulling the plant since soil disturbance promotes seed generation.
- Maintain natural meadow complexes by prescribed fire, reducing conifer encroachment and non-native species eradication.
- Use native species for all revegetation activities and wherever possible for roadside erosion control projects.
- In proposed regeneration harvest units, maintain option of using clumping or dispersal for the 30% within the context of the NWFP S & Gs 70/30 direction.
- Compliment revegetation efforts with a mix of native fruit-bearing plant species to enhance forage opportunities for neotropical migrants. This activity should be focused primarily in riparian areas. Plant species might include *Sambuccus, Vaccinium, Almelanchier, Symphoricarpos, Prunus,* and *Rhamnus.*

- Target snag creation in older managed stands and mature second growth stands on USFS and BLM lands to provide foraging opportunities. Asses the opportunity to create snags on snag-deficient COE lands adjacent to Fall Creek Reservoir. Recommend a range of treatments in larger trees such as tree topping, blasting, girdling and fungal heartrot inoculation to create more cavity opportunities.
- The NWFP minimum of 40% snag retention prescriptions are required in all future harvest units on USFS and BLM lands. In areas with less than 40% snag levels (such as North Winberry drainage and BLM lands) consider prescriptions higher than minimum levels to achieve the 40% standard at the drainage level.
- Develop management guidelines for the Saddleblanket and Sourgrass Special Wildlife Habitat Areas.
- Propose dropping the "9D" land management plan allocation for the North and South Winberry areas due to their overlap with the current ROD allocation as riparian reserves.
- Maintain species diversity in managed stands using:
  - ◊ diverse tree species and ages in green tree retention units as some epiphytes are species-specific,
  - ◊ both clumped and dispersed green tree retention to allow dispersal of all species (lichens need dispersed trees),
  - ◊ maintain adequate CWD and snag levels in intact green tree retention areas to create and maintain habitat for CWD-dependent species.

Species Specific Recommendations

1. ***Romanzoffia*** and ***Frasera***
   - ◊ Manage Special Habitat Areas consistent with the Forest Plan FW-211 (USFS) to maintain or enhance population viability.
2. ***Epipactis*** and ***Iris***
   - ◊ Monitor COE populations to ensure maintained viability. Inventory Iris hybrid to determine its numbers
3. **Spotted Owl**
   - ◊ Coordinate with USFS/BLM/ODF to establish the best activity center for MSNO 3406 (Berma Pair). Originally this owl pair was detected on private land and later found on adjacent USFS lands. Recommend maintaining the activity center for this owl pair on USFS lands.
   - ◊ Establish 100-Acre LSR around a new activity center found in the Berry Patch Planning Area. This activity center has a historic record of consistent response in the immediate area that justifies 100-acre protection
   - ◊ Avoid "*Take*" where possible based on USFWS recommendations and Section 7 streamlined consultation process results.

- ◊ Maintain integrity of the 100-Acre cores on USFS, BLM and ODF lands by implementing prescriptions on units immediately adjacent to these cores which would prevent or reduce the amount of windthrow or other human-induced effects to these core areas.

4. **Bald Eagle**
   - ◊ Assess potential for stand density management activities on COE lands adjacent to Fall Creek Reservoir. These activities should promote development of nesting habitat and diversify the stands.
   - ◊ Promote stand development within Bald Eagle Habitat Areas on BLM lands by thinning or related silvicultural prescriptions.
   - ◊ Create more perching opportunities around Fall Creek Reservoir by tree topping or partial limbing of selected trees not immediately adjacent to developed recreation sites
   - ◊ Continue monitoring of the reservoir to determine foraging patterns/impacts from recreation and draw-down operations
5. **Townsend's big-eared bat**
   - ◊ Survey Winery Cave to determine bat presence and associated effectiveness of the no-harvest buffer implemented for this site in 1992.
   - ◊ Assess bat use of the old Winberry Mine shaft and the possibility of closing or barricading it to reduce human disturbance or for safety.
6. **Great Gray Owl**
   - ◊ Protect natural meadow complexes in the watershed by implementing ROD S & G buffers for special habitat protection.
   - ◊ Enhance nesting opportunities by nest platform placement adjacent to meadow complexes in the Mount Salem, Joe's Peak, Saddleblanket and Sourgrass Mountain areas.
7. **Red-legged frog**
   - ◊ Create suitable pond habitat for breeding and larval development of this species. Target areas in riparian reserves adjacent to streams. Create slack water areas by channel diversion or other methods. Design future water sources for wildland fire suppression apparatus in areas more conducive to breeding conditions.
8. **Big Game**
   - ◊ Enhance forage opportunities in the high use Cabin Creek area through seeding and fertilization of native species, prescribed burning of natural meadows and underburning of forested stands, browse cutback and forage planting (*Rhamnus*, *Ceanothus* & *Sambuccus*).
   - ◊ For recently installed gates, the recommended seasons of closure are:
     - 1802164- Nov. 1 - May 1
     - 1824146- April 1 - Nov. 30
     - 1802154- Nov. 1 - May 1.

- ◊ Roads recommended for gate installation and season of closure:
  - 1824158- April 1 - Nov. 30
  - 5824 (replace old gate at Winberry Divide)- yearly closure.
- ◊ Identify other opportunities for road decommissioning or barrier closures to reduce open road densities to Forest Plan S & G levels on USFS lands and assess potential for reducing open road densities on BLM lands.
- ◊ Coordinate with silviculture by maintaining roadside vegetation screening to enhance big game security. Recommend no-treatment strips of vegetation (width should be based on site-specific evaluation).
- ◊ Develop alternative harvest prescriptions for increased green tree retention and cover along main ridgeline travel routes. This would include Alpine Ridge, Winberry/Fall Cr. Divide and Winberry/Middle Fork Divide. These areas would also be identified as moderate priority harvest areas *(refer to Map 37)*.

Data Needs

- Inventory noxious weeds to prioritize treatment sites (COE & BLM lands).
- Inventory for C3 species in interior old-growth habitat.
- Survey for better information on current snag/CWD levels in managed and natural stands.
- Survey special habitats for restoration opportunities, for rare plant species and to classify sites by plant association (check and verify aerial photo determination).
- Compile information from literature on benefits/detriments of dispersed vs. clumped green tree retention (ex. Peck, J. E. and B. McCune, 1995).
- Inventory for roost site use and bat species, using mist netting, bridge capture techniques and anabat surveys.

3. *How has fire suppression affected vegetation? How and where does fuel loading contribute to the potential for catastrophic fire?*

- Current fire management practices are recommended for fuels reduction resulting in fire hazard reduction.

  Since this entire area is either in private holdings or considered matrix land, timber harvest will continue to manipulate fuels and ease the threat of large-scale catastrophic fires.

- Do ***NOT*** recommend systematic underburning of late successional old-growth stands for hazard reduction. Large-scale prescribed burning of such stands will increase rather than reduce the threat of catastrophic fires. While fuels in the 9-20" size class exceed the standards of allowable downed woody material in late-succesional old-growth, the 0-3" fuels are of greatest concern when planning for large scale fires. Prescribed burning of these stands will not significantly decrease the amount of these larger fuels. Rather it will kill the smaller shade tolerant species, and as these fuels fall

to the ground, there will be an overall increase in 0-3" fuels. In addition, although prescribed fire will decrease the amount of ladder fuels in these stands, it will degrade the multi-leveled canopy without significantly affecting catastrophic fire occurrence.

4. *How does the Winberry/Lower Fall Creek watershed contribute in providing connectivity between adjacent watersheds and Late successional Reserves?*

   What opportunities might provide or enhance late successional forest habitat for dispersal/movement of terrestrial plant and wildlife species and where are they found?

- Recommend maintenance or enhancement of stands in two specific areas that would potentially address short term dispersal avenues between watersheds and LSRs:
  1. along Alpine Ridge which separates the Winberry and Fall Creek watersheds from the North Fork of the Middle Fork Willamette River and
  2. a specific area in the upper end of South Fork Winberry Creek that uses withdrawn allocations as "stepping stones" in providing a link to Tire Mountain and down the Tire Creek drainage to LSR RO222.

  These areas, in conjunction with the "intra-watershed" dispersal corridors, would provide a network of low priority harvest areas that would aid in watershed health. This proposal is recommended mainly as a short term strategy as the riparian reserve network recovers. This watershed has a high percentage of matrix land and will be harvested consistent with the NWFP, the Willamette LRMP and the BLM RMP. Within this context, however, priorities may be established to defer some areas from harvest for as long as feasible.
- Recommend that regeneration harvest be a low priority in dispersal corridors in the near future *(corridors delineated on Map 37).* Develop alternative retention prescriptions for these ridgetop stands to provide for increased dispersal capability for diverse wildlife species.
- These low priority regeneration harvest areas would also be high priority pre-commercial and commercial thinning harvest areas to enhance tree growth and stand development.
- Recommend effective width of these corridors to be 2,000-2,500 feet (Minsker and Manley, 1992; Mellen, 1996).
- Identified function of the BLM connectivity block: *is it providing connection to something or primarily operating as an island of "refugia" adjacent to private industrial lands?*
- Recommend the maintenance or enhancement of stands identified on *Map 37* to create a dispersal corridor between BLM and USFS lands in the Brush Creek and Boundary Creek (Fall Creek Watershed) drainages. This would address short term dispersal avenues between the BLM connectivity block in T19S R1E Section 3 and USFS lands to the east. Regeneration harvest should be a low priority in these stands

with precommercial and commercial thinning a higher priority, to enhance tree growth and stand development. This in turn facilitates dispersal of wildlife to late successional forests within the Pileated Woodpecker Habitat Area in Brush Creek. The width of these corridors should be approximately 1500 feet to accommodate the dispersal and subsequent survival of interior forest species. Lower harvest priorities and alternative harvest prescriptions should be implemented in these corridors until the riparian reserves develop into suitable dispersal and late successional forest habitat.

5. *How has the introduction of non-native species affected the native plants and animals in the watershed?*

- Identify roads recommended for closure by decommissioning or barrier placement during the project planning or ATM process to reduce noxious weed dispersal avenues.
- Develop alternative seed mixes for erosion control and wildlife forage enhancement projects using native species.
- Avoid using rock sources outside the watershed known to be sources of noxious weed seed (in USFS construction projects). Place appropriate restrictions in project contracts to reduce the threat of importing noxious weeds on equipment (ex. washing equipment prior to transport).

Data Needs

- Investigate impacts to neotropical migrants from brown-headed cowbirds in the lower, more developed portion of the watershed.
- Investigate impacts to neotropical migrants from domestic cats, suspected to be very abundant in the lower portion of the watershed due to increased population and urban development.

Issue 2: Riparian Habitat

Key Questions

1. *How have different land use patterns (ex. agriculture, roads, timber harvest) impacted riparian habitat and function above and below the reservoir? What is its importance to federal land managers?*

See Chapter 4, Interpretations, page 170.

2. *How do the riparian reserves (and other withdrawn allocations) currently function as habitat and dispersal corridors for terrestrial and riparian species? What are future trends?*

As identified in Chapter 4, riparian conditions are less than optimal in providing dispersal conditions for late successional forest related species.

- An interim recommendation is to provide a strategy of late successional forest retention, providing conditions that might aid in enhancing movement/dispersal until riparian reserves fully recover. These areas, as described in *Issue 1* and displayed on *Map 37*, would be targeted for low priority timber regeneration harvest in conjunction with high priority commercial thinning or alternative retention prescriptions. The areas proposed for **low priority** or **moderate priority** harvest are as follows:
    - ◊ A continuation of the Andy Creek corridor proposed in the Fall Creek Watershed Analysis would extend from the saddle down into the headwaters of Minnehaha Creek and proceed to main Winberry Creek. This would be a low priority harvest corridor.
    - ◊ Continue this corridor south, extending up Blanket Creek and into the headwaters of Monterica Creek, utilizing the 100-acre core areas.
    - ◊ Then following Monterica Creek (utilizing this drainage because it is recommended for a low priority harvest due to its intact condition), across South Fork Winberry and south to the headwaters of Armet Creek on the Middle Fork Willamette River side of the ridge.
    - ◊ A major west-east corridor utilizing North Fork Winberry and Traverse Creeks serving to connect the forest boundary with the Saddleblanket Mountain Special Wildlife Habitat Area. Again, the intent is to maintain late successional forest stands in this area as intact as possible while riparian reserves recover. This would be designated as a low priority harvest area.
- During project level planning, consider the relationship of riparian headwall areas and adjacent ridgetops to determine possible retention for maintaining connection of riparian reserves to ridgetops in critical areas.
- Plant diverse species in riparian areas based on known site preference to enhance species diversity and forage for neotropical migrants.

American Marten/Pileated Woodpecker Areas

- An analysis of these areas indicated a need to maintain the pileated area in Brush Creek on a short-term basis due to the condition of 11-40 and the riparian reserves in this drainage. As these riparian reserves mature, this pileated area's deferred harvest allocation should be reassessed.

- The other areas overlapped 100-acre cores or Special Wildlife Habitat Areas and were therefore not providing unique contributions to the watershed. These should be dropped from further Forest Plan consideration.

3. What opportunities exist for riparian enhancement?

The riparian areas on private lands have been heavily impacted. A watershed council for either Fall Creek Watershed or the entire Middle Fork Willamette Basin can be created. The scale of the council could be determined by the issues and goals the involved public would be willing to address. Certainly, a main focus of the council could be education and enhancing riparian areas on private lands.

Riparian reserves can be enhanced by silvicutural methods. The majority of the riparian areas within this watershed are in an earlier seral condition. Large conifers are preferred adjacent to many of these forested streams. Some preliminary sites requiring field verification as possible project areas include parts of:

- SF Winberry: Reach 6
- Brush Creek: Reach 2 & 3
- NF Winberry: Reach 1 & 3

These and other projects should consider planting diverse native species near riparian areas as sources of forage for song birds.

The Northwest Forest Plan indicates that these riparian areas should provide corridors for terrestrial species. Of particular concern are the C3 species, 11-40 habitat, red tree vole habitat thresholds, and interior habitat availability. Regeneration timber harvest should be deferred or established as a low priority within proposed dispersal corridors within the watershed *(refer to Map 37).* The intent is to maintain existing blocks of late successional forest that fall within these corridors and outside riparian reserve boundaries. This will maintain high quality blocks of late successional forest habitat until riparian reserves develop into the same. Areas of particular concern are North Winberry and Traverse Creek, which could provide an east-west corridor to the upper end of the watershed, and Minnehaha and Cabin Creek to provide north/south corridors and extend the travel corridor planned in the Fall Creek Watershed Analysis. On BLM lands, the riparian reserve network will provide "refugia" opportunities in conjunction with designated connectivity blocks. Project level planning for BLM timber sales should use existing riparian reserves in conjunction with possible deferred or carefully scheduled harvest to provide some habitat links from their connectivity block to USFS lands in the Brush Creek and Boundary Creek (Fall Creek Watershed) drainages.

During timber sale planning, the relationship of ridge tops and riparian areas should be considered to insure dispersal capability and connectivity between watersheds. A possible project level recommendation would be to extend riparian reserves to include ridgetop habitat in critical unstable headwall or other areas, thereby establishing an unbroken link from drainage to ridgetop.

Thinning may be a useful tool to meet Aquatic Conservation Strategy objectives. Prior to removing timber from Riparian Reserves, however, the following criteria should be considered:

- adequate down wood/coarse woody debris if available
- adequate large woody debris in the stream
- the stream is stable
- thinning enhances riparian vegetation
- thinning would *not* negatively impact shading (water temperatures) in proposed 303(d) drainages

In addition, a site-specific ***no harvest buffer*** should be prescribed to protect bank stability and reduce sedimentation directly adjacent to the stream channel.

Trees could be cut and left in the riparian reserve if large wood is low or absent from the terrestrial or aquatic habitat.

Issue 3: Aquatic Habitat and Species

Key Questions

1. *How and where have past management activities (ex. timber harvest, road construction, instream salvage) affected channel complexity above and below the reservoir?*

The Aquatic Conservation Strategy (ACS) emphasizes three types of aquatic habitat restoration projects:

Instream Habitat Enhancement

As indicated on *Map 41,* instream habitat enhancement projects have been installed in much of the upper watershed. Focus should therefore be on monitoring these existing tied-down log and boulder structures for effectiveness. Some opportunities do exist for installing instream structures in a different way. In some areas trees can be pulled over keeping rootwads intact, and placed without tie-down. Only a few trees should be placed in the stream at a time and these monitored before adding more. Cabin and Upper Blanket Creek have both been scoured to bedrock from road failures; and would benefit from this type of restoration.

Road Restoration (upgrading to obliteration)

Road densities are high within each of the drainages. Access and Travel Management (ATM) on Forest Service lands and transportation management on BLM administered lands should analyze road densities and seek opportunities to decommission (including culvert removal) especially on soil types 1 and 2. Other opportunities, such as upgrading roads by outsloping to reduce overland flow and installing more cross ditches and vented fords to reduce maintenance concerns, can be identified in these ATM and Transportation Management Plans.

Cabin Creek and Blanket Creek debris flows resulted from plugged culverts. Current and future maintenance of culverts is a concern needing attention.

- Roads with slides to consider for obliteration, decommissioning or upgrade include:
  - ◊ *1911 south end of Upper South Fork Winberry*

    Road has partially failed. Survey and repair before it initiates a debris torrent. Upgrade should stabilize subgrade. Can pull side-cast material back outside the travel way.
  - ◊ *End of Road 5824-120; south side of Lower South Fork Winberry*

    Several new slides and slumps occurred on the section of road extended during the early 1990s.
  - ◊ *5824-137; south side of Lower South Fork Winberry*

    Small spur off Road 5824-120. WIN inventories identified several slides.
  - ◊ *1802-164; headwaters of East Fork Brush Creek*

    Landslide and WIN inventories identified slides on upper part of road. These areas are associated with Soil Category 1.
  - ◊ 1802-159; *Minnehaha Creek*

    At the end of Spur 159 (which branches off 1802-150). Associated with Soil Category 2.
  - ◊ *1802-186; north side of Lower South Fork Winberry*

    At end of Spur 186 off 1802-159.
- The Forest Service should *continue* the road ditch and cutslope *vegetation program.* This program keeps road ditches well vegetated and helps reduce sedimentation concerns. It is recommend that the BLM begin a similar program.
- A slide entering Brush Creek from the 1802-160 road about a half mile upstream should be reviewed to determine if rehabilitation would benefit aquatic conditions.
- Some erosion has been occurring at the Winberry Campground. An opportunity exists for a possible rehabilitation project for erosion control.
- The culvert on the 1802 road crossing North Fork Winberry is currently a migration barrier and should be replaced.

Refer to question #2 below for more road related enhancement opportunities.

Riparian Silviculture

- A pond created adjacent to South Fork Winberry Creek, just upstream from Monterica Creek, could benefit by riparian planting. In addition, the inlet is currently not functional and needs review for enhancement opportunities.
- The culvert at Dallas Pond should be maintained.
- Identify the best way to provide water for horses at proposed Eugene to Pacific Crest Trailhead.

- The riparian area of Winberry Pond, which drains into Traverse Creek, was harvested. This area should be enhanced by planting hardwood, conifers and forage species for songbirds. The south side of the pond needs shading. There are also opportunities to create artificial nesting and roosting habitat adjacent to this unique pond for various waterfowl, neotropical and bat species. Review and possibly amend the Pencil Thin Timber Sale KV Plan before closure to collect for habitat improvement projects adjacent to this site.

See *Issue 2: Riparian Habitat, page 170,* for other recommended riparian silviculture projects

2. ***Where is the best quality aquatic habitat located, and can these areas be further enhanced or protected?***

Monterica Creek was identified as having some of the best aquatic habitat in the watershed. Following are recommended priorities and possible projects which could occur in this drainage:

- Rehabilitate slide in Sour Joe unit.
- Upper reaches are unstable; unit locations and silvicultural prescriptions should take this into account (example: prescribe partial cuts).
- Protect headwaters and all riparian areas.
- *Low priority area for harvest.* This drainage could provide a large block of interior habitat in the center of the watershed during the short term until other reserve lands recover from past harvest activities. If harvest does occur, minimize fragmentation in the drainage by grouping harvest activity or using alternative silvicultural methods.

Traverse Creek may also have some good aquatic habitat. The following projects can further enhance this drainage:

- Correct fish migration barriers at stream crossings: 1802, 1802-158 & 1802-157.
- Close the following roads to vehicular access in order to reduce fines and stormproof: 1824-141, 1824-150 (already gated), 1802-157, 1802-158, 1802-156. These roads are all associated with soil categories 1 and 2.
- Possible riparian silvicultural project in Reach 2.
- Possible rehabilitation project for mass wasting and bank cutting in Reach 2.

Data Needs

- Analyze WIN inventory to determine priorities for soil category.
- Update Cabin Creek Survey.
- Update South Fork Winberry Survey.
- Inventory Beaver Pond in South Fork Winberry Reach 10; Monitor pH (has high algael levels).

- Determine carrying capacity for anadromous fish in the watershed.
- Survey Monterica Creek.
- Survey unnamed large tributary for traverse potential.
- Survey Nelson Creek (BLM).
- Survey Alder Creek (BLM).
- Survey roads on BLM lands for slides and potential to upgrade or obliterate.
- Survey and monitor Winberry Pond for western pond turtles, other amphibians and non-native species.
- Monitor turtles and other aquatic species.
- Survey for existing Red legged frog breeding habitat and assess the potential to develop new sites.
- Continue surveys to determine amphibian populations.

3. *How have management activities affected aquatic species (including anadromous and resident populations)? What are the future trends?*

See Chapter 4, Interpretations, page 209.

Issue 4: Water Quality and Quantity

Key Questions

1. *What are the implications of applying current state water quality standards on future management of Federal lands in the watershed?*

Data collected by the USFS indicates that elevated stream temperatures occurred in the North and South Forks of Winberry Creek, the mainstem of Winberry Creek and Blanket Creek during 1991 and 1995. Recommendations are to maintain riparian reserve widths on federal lands throughout the watershed and to continue water temperature monitoring at established sites on previously mentioned streams. If new data indicates that state temperature standards are met, then these streams would no longer be listed as Water Quality Limited. The information would also be valuable in assessing the effects of riparian reserve management on water quality.

The DEQ has identified the North and South Forks of Winberry Creek, mainstem of Winberry Creek, Fall Creek Reservoir, and Fall Creek as Waterbodies of Concern due to sedimentation. Lacking existing data, it is recommended that the federal agencies obtain more information on the amount of sediment in these streams, and identify and implement mitigation measures for roads or stream crossings currently transporting sediment into the stream system.

Excessive sediment deposition was noted during steam surveys conducted in Brush Creek. Identification of the source(s) of these sediments is recommended and mitigation

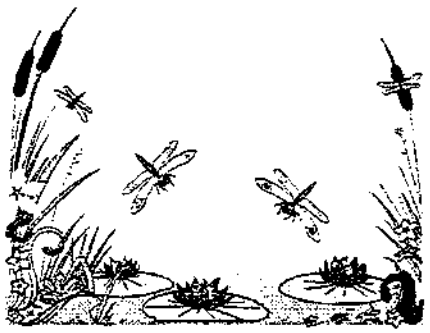
measures to reduce sediment transport in this drainage should be designed and implemented. If this is not accomplished, there is high probability that this creek will be added to the DEQ Waterbodies of Concern List during the next review.

2. How have reservoir operations affected downstream beneficial uses of water?

Data collected by the USGS at its gaging station located downstream from the reservoir indicated that the water in Fall Creek exceeded the state summertime standard (64°F) during 1991-1994. Based on this information, the DEQ has listed Fall Creek (below the reservoir) as a Water Quality Limited stream. To determine if reservoir operations contribute to elevated temperatures in Fall Creek, it is recommended that the Corps of Engineers collect continuous summer/early fall water temperatures at the reservoir outlet. The formation of a Middle Fork Willamette Watershed Council is recommended to address this and other issues in the Winberry and Fall Creek watersheds. This council could involve private land owners as well as federal agencies. For example, riparian vegetation enhancement may be an important aspect of a management plan to lower water temperatures in Fall Creek.

Fall Creek is identified by the DEQ as a Waterbody of Concern due to aquatic habitat modification caused by stream flow regulation resulting from reservoir operations. Recommendations are for the proposed Fall Creek Watershed Council to work with the COE and ODFW in identifying possible enhancement measures for existing aquatic habitat in Fall Creek. This could include annual draw-down of the reservoir to streambed and creating new streambed structures (ex. large wood, increased pool frequency, gravel deposits).

Based on visual observation, sedimentation has been identified as a possible problem in Fall Creek and Fall Creek Reservoir. Since Winberry Creek has been identified as a Waterbody of Concern for sedimentation, material may be entering the reservoir from upstream. Collection of water samples is recommended to evaluate the extent of sedimentation in the reservoir and in water released into Fall Creek. This information would help quantify the extent of current sedimentation in these waterbodies and determine if the reservoir is a significant source of sediment in Fall Creek. If erosion in the draw-down zone is determined to be such a source, new vegetation and/or improvements to minimize wave-related erosion could improve bank stability and thus decrease sedimentation.



Issue 5: Timber Harvest

Key Questions

1. ***Where could future harvests occur on federal lands? What acres are available for harvest?***

Table 46. Suggested Harvest Priorities

High	Cabin Creek to create forage
High	Everything not specified elsewhere in this table. Then run ARPs on USFS land to determine acres available for regeneration.
Medium	Blocks with most interior habitat
Medium	Ridge should be deferred or alternative silvicultural prescriptions
Medium	Removal of suitable habitat that would result in a "take"
Medium	Old-growth fragments
Low	Dispersal corridors except where harvest enhances old-growth characteristics
Low	Moutence drainage (intact drainage, stability concerns)
Low	Defer harvest in Brush Creek pileated woodpecker area

2. ***How can silvicultural prescriptions enhance ecosystem process and functions and mitigate impacts to other resources?***

- Commercial thinning in low priority regeneration harvest areas will enhance growth of trees and overall stand development. This will aid in supporting late successional forest development.
- It is recommended that alternative retention and partial cut prescriptions be considered when planning timber sales along the main ridges surrounding the watershed on USFS lands. This will provide added security for big game travel and dispersal of other late successional dependent species.
- Minimize fragmentation in existing stands where possible. Select the smaller remnant forest stands for priority harvest or outer edges of larger intact stands.
- Avoid harvest of late successional forest in low priority harvest areas while allowing riparian reserves to recover over time and begin to function as intended in the NWFP.

3. ***How is federal timber management (BLM) affected by private land management?***

- The riparian reserve may not as wide as specified in the ACS on one side of a stream on federal land because that stream is near a private property line.

- The stream itself may be on private land, but close enough to BLM land to be considered within the ACS riparian zone. This stream will then have a stream buffer meeting ODF requirements, as well as a harvest gap and reserve buffer on BLM meeting the ACS standards for that side.
- Windthrow of green retention trees and trees from within reserve areas across private property lines will create concerns regarding timber salvage. This issue may become a potential problem for the BLM due to the amount of federal forest land bordering private property.
- Retention trees should be located so they will not cross onto private property in the event that they fall.
- Retention trees should be clumped into small 4-6 tree groups to retain a refugia of vegetation and soil. These small tree groups should be spaced across the harvest unit in a manner which provides some protection from windthrow.
- BLM sections bordered by private forest land will provide greater wildlife refuge habitat for species dependent upon mature forest.

Issue 6: Reservoir

Key Questions

1. *What are the effects of operation on anadromous fish, wildlife and recreation? What opportunities exist for reducing conflicts while maintaining ecosystem process and function?*

Anadromous Fish

An estimated 450 spring chinook and 75 winter steelhead spawned above the Fall Creek Dam site prior to construction. The numbers of adult salmon and steelhead currently returning to the dam do not approach these levels. Causes have been attributed to changes in the way the reservoir is drawn down each year, the presence of exotic predators in the reservoir, deterioration and poor design of the juvenile bypass system, and lack of sufficient flow in Fall Creek below the dam during the summer upstream migration.

A complicated relationship exists between ODFW and COE regarding mitigation for lost anadromous fish resources. Two methods used to replace these fish are artificial propagation (hatcheries) and placement of fish passage structures (such as adult fish traps and ladders) and juvenile bypass systems at the dams. These permit natural spawning and rearing opportunities for anadromous species above the projects. ODFW and the COE entered into a cooperative agreement in 1990 to operate and fund hatcheries replacing Willamette Basin wild fish production (previous contracts with ODFW for individual hatcheries were replaced by the 1990 document). The agreement specifies pounds of hatchery-produced fish rather than specific numbers of adults

returned to COE projects in the Willamette Basin. This technique allows ODFW more flexibility in meeting basin fisheries management goals.

Adult and juvenile fish passage facilities were built into the Fall Creek Dam. Returns of adult salmon to the Fall Creek facility have fallen short of expectations while returns to Dexter have been above the required level. As a result, it is not clear just what the COE responsibilities at Fall Creek are in terms of returning a specific number of adults to the facility. Present and future efforts seem to be directed towards reducing the numbers of hatchery reared fish and increasing natural and wild production. The ODFW, Willamette Basin Implementation Plan for Management of Spring Chinook Salmon, states that *"the middle fork subbasin will be managed primarily for production and harvest of hatchery fish"* (ODFW, 1993). The goals at Fall Creek are less clear.

Recommendations

- Work with ODFW to determine COE mitigation responsibilities in the Willamette Basin and, if not currently met, the recommended course of action to remedy the situation.
- Prepare an environmental assessment to determine the applicability and impacts of annual reservoir draw-down to streambed for purging exotics, chinook and steelhead downstream migrants from reservoir.
- Determine if high, summer water temperature in Fall Creek below the dam, is adversely effecting late-run adult chinook salmon bound for the Fall Creek trap.
- Determine if 30 cfs is adequate to attract all of the salmon and steelhead bound for Fall Creek Dam.
- Cooperate with ODFW and other interested agencies to develop a multiple use management plan for Fall Creek Reservoir. The present operation compromises lake recreation opportunities, anadromous fish production and stability of other native species resulting in less than adequate performance in all areas.
- Integrate information from other watersheds in the basin when developing use priorities for Fall Creek Reservoir. The Willamette Basin Review, currently in the feasibility phase, will also provide guidance in this area.
- Impacts on reservoir operations by the possible listing of Willamette spring chinook under the Endangered Species Act (ESA) should be considered when assessing relative importance of recommendations made in this watershed analysis.

Wildlife

Modification of reservoir draw-down timing and the extent to which it is drawn down has an impact on wildlife species associated with the reservoir. The reduction in shallow water and shoreline habitat resulting from the six foot draw-down by August 15 and the cumulative draw-down of 15 feet by Labor Day could affect the availability of prey for these species. This draw-down scenario would also affect the availability of prey for the western pond turtle. Overall impacts to these species is unknown.

Driftwood in the reservoir can be a safety hazard to recreationists; however, this debris is an important element in shoreline habitat quality. Turtles and other shoreline associated aquatic and terrestrial species use this material during some part of their lifecycle.

Recommendations

- Assure maintenance of a large compliment of drift wood along shorelines and in coves.
- Place log booms across selected coves on the north shore of the reservoir in order to minimize disturbances to resident turtle populations by boaters.
- Continue eradication of bull frogs below dam in areas such as Tufti wildlife management unit and the beaver pond below the spillway.
- Place purple martin nest boxes and bat houses on trees adjacent to the reservoir.
- Use radio telemetry to define turtle nesting and overwintering sites at Fall Creek.
- Temporarily drain pond at upper end of Winberry arm to eliminate overwintering bullfrog tadpoles.
- Create ponds in reservoir draw-down zone to create habitat for native amphibians and turtles.

Recreation

Conflicts between reservoir operation and recreation have been persistent. Early reservoir draw-down and its associated impacts on recreation was raised as an issue 25 years ago. The 1972 Fall Creek Lake Master Plan recommended a basin-wide study to determine the feasibility of concentrating recreational use at several projects and revising their operation schedules to maintain recreation pool levels. Fall Creek Reservoir was one of the selected projects, and the draw-down schedule changed to reflect the priority of maintaining the lake at full pool from May through September. Consequently, the COE assumed financial responsibility for major improvements at Winberry Park (leased to Lane County). The reservoir reached and maintained full pool regularly during the remainder of the 1970s and 1980s. Visitation increased dramatically, and Lane County invested in further improvements, providing universal accessibility to water-related recreation activities in the 1980s. In 1992, a modified version of the initial early draw-down operation was implemented to enhance downstream migrant salmonid fish passage *(see Issue 6, page 155)*.

After 1972, two operational procedures were gradually phased out, both of which seemed to have beneficial effects on anadromous fish runs and minimal impact on recreational use. These were:

1. bringing the reservoir down to streambed, at some point between mid-November and January 1 and
2. surcharging the pool level 2-3 feet above normal full pool level by the first part of May, using that extra water to boost the normal outflow for fish attraction during the early summer.

Many factors influence the success or failure of anadromous fish runs and numerous management prescriptions have attempted to improve the fisheries, although conflicting at times. A long range comprehensive fish management plan would aid in providing consistency in determining the best possible management strategies providing maximum benefit to both recreation and fisheries.

Recommendations

- A conflict exists between maintaining full pool elevation for recreational use and late summer draw-down to enhance anadromous fish management. Consider recreation uses when developing a multiple use management plan *(see Anadromous Fish, page 209).*
- Investigate the possibilities and environmental impacts of surcharging the reservoir 2-3 feet above full pool when conditions allow, prior to May 1. The surplus water would be used to supplement discharges for enhanced upstream migrant fish attraction as well as keeping the pool level higher for recreationists.

2. *What is the extent of shoreline erosion and what opportunities exist for its stabilization?*

In the upper Winberry arm of the reservoir it is recommended to reduce boating speeds and initiate vegetation and energy dissipater projects to prevent further erosion of the shoreline as well as stabilizing and repairing existing erosional areas. Currently the reduced boating speed of five mph extends to within 1800 feet of the Winberry bridge. Expanding it to include the portion west of the Section 8 south shore erosional would prevent further erosion of the shoreline site *(see Map 8).*

In the remainder of the reservoir, implementing vegetation and energy dissipater projects would protect and repair existing erosional areas where boating recreation is the main activity. Projects may include placing log and boulder structures or log booms. These structures would be fairly easy to install and maintain and would reduce the wave/wind action against the shoreline. They would begin repairing the shoreline by collecting sediments along the backside of the structure and native vegetation could be used to keep aggregated sediments in place, thus building a beach.

Data should be collected on erosional rates during early draw-down of the reservoir to determined if erosional rates increase during this period. Specific areas that might be prone to increased erosion during this time are those composed of fine grain soils and have a cut bank of approximately 3 to 5 feet.

Issue 7: Human Uses

Key Questions

1. *How will current and future management practices affect human use of the watershed (upstream and downstream of the reservoir)?*

See Chapter 4, Interpretations, page 160.

2. *What management practices are available to enhance or protect recreation opportunities in the watershed? How could future recreation trends affect ecological processes?*

A major goal of recreation management is to provide and protect areas of natural, scenic and recreational value as recreation resources for the enjoyment and education of present and future generations. The most common activities recreation visitors enjoy are relaxing, viewing scenery, enjoying solitude, wildlife viewing, and picnicking (2010 Plan, 1988). The Winberry/Lower Fall Creek Watershed possesses the recreation resources and opportunities to satisfy these desires. Recreation management objectives for the watershed are to:

- ◊ better define the recreation market,
- ◊ emphasize the value of the watershed as a recreational opportunity,
- ◊ highlight the watershed's contribution to the region's quality of life, and
- ◊ educate, inform and include the public regarding available natural resources and their use.

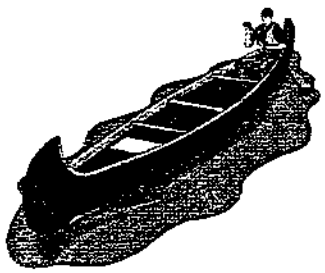
Data needs

- Inventory current and potential recreation resources.
- Conduct a Limits of Acceptable Change (LAC)/Carrying Capacity survey of the watershed recreation areas.
- Reliable visitor use information for federal lands.

Recommendations

- Reduce hazard trees through removal, topping, etc.
- Use trail buffers effectively to benefit recreationists.
- Use management areas compatible with dispersed recreation when considering recreation opportunities (i.e. riparian reserves, wildlife areas, land unsuitable for harvest).
- Consider recreational development opportunities on matrix lands which have been set aside for other purposes (ex. soils, wildlife, aquatic, etc.).

- Maintain and upgrade trails to withstand impacts from:
  - increase in use,
  - horses,
  - mountain bikes.
- Explore the feasibility of constructing a trail around the Peninsula, connecting the Winberry arm, Sky Camp and Fall Creek. Conduct an interagency study into the use of existing BLM roads in the Nelson Creek area (BLM Road 19-1E-16 and associated spurs).
- Explore the feasibility of a snow play area on Saddleblanket Mountain.
- Assess the need for improving kayak access at Road 1802-150, the bridge over Winberry (in Section 16) and Drinkwater.
- Create partnership with other agencies, concessionaires and outfitter guides to teach "No Trace Camping" and other low impact methods of using natural settings.
- Produce a multi-agency recreation opportunity pamphlet for Fall Creek and Winberry. Involve local residents, especially during the initial stages.
- Construct an interagency interpretive site (i.e., kiosk) at Drinkwater (old scaling station below dam). Include a map of the area, recreational opportunities and information about the Winberry and Fall Creek drainages.
- Create an interagency team to provide a comprehensive management plan for recreation resources in the watershed. This watershed analysis serves as a beginning for such an effort.
- Form a Saddleblanket Lookout partnership, to rehabilitate and maintain this unique structure.



Winberry WA

Drainage Overlay

T.18 S., R.1 W.

T.19 S., R.1 E.

T.19 S., R.2 E.

T.20 S., R.2 E.

NORTH RESERVOIR

SOUTH RESERVOIR

BRUSH CREEK

NORTH FORK WINBERRY

LOWER S FORK WINBERRY

UPPER S FORK WINBERRY

N

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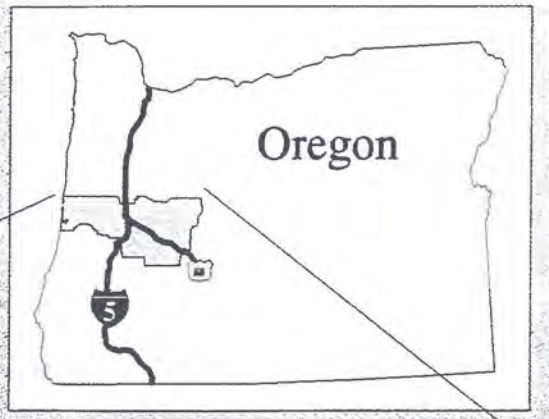
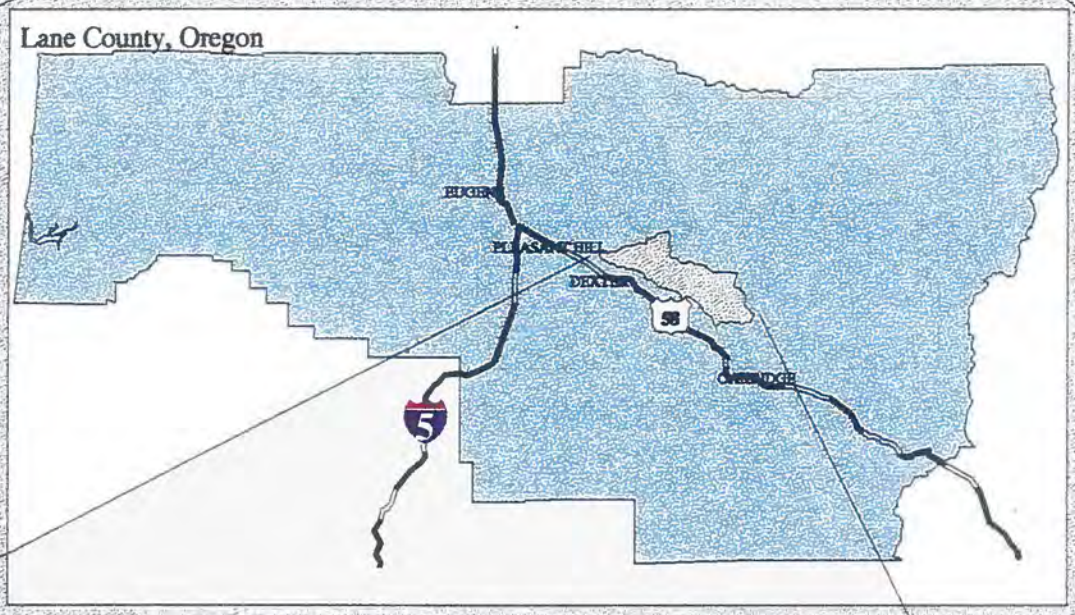
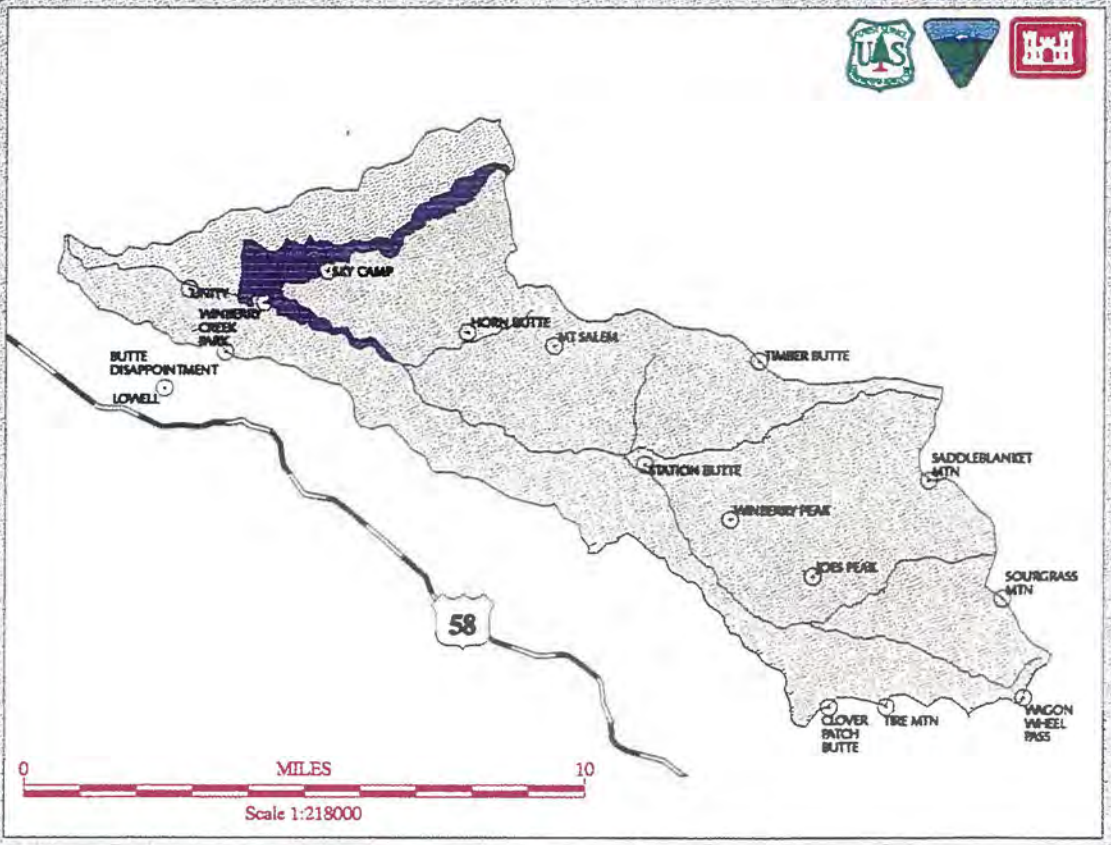
Map 1

Winberry WA

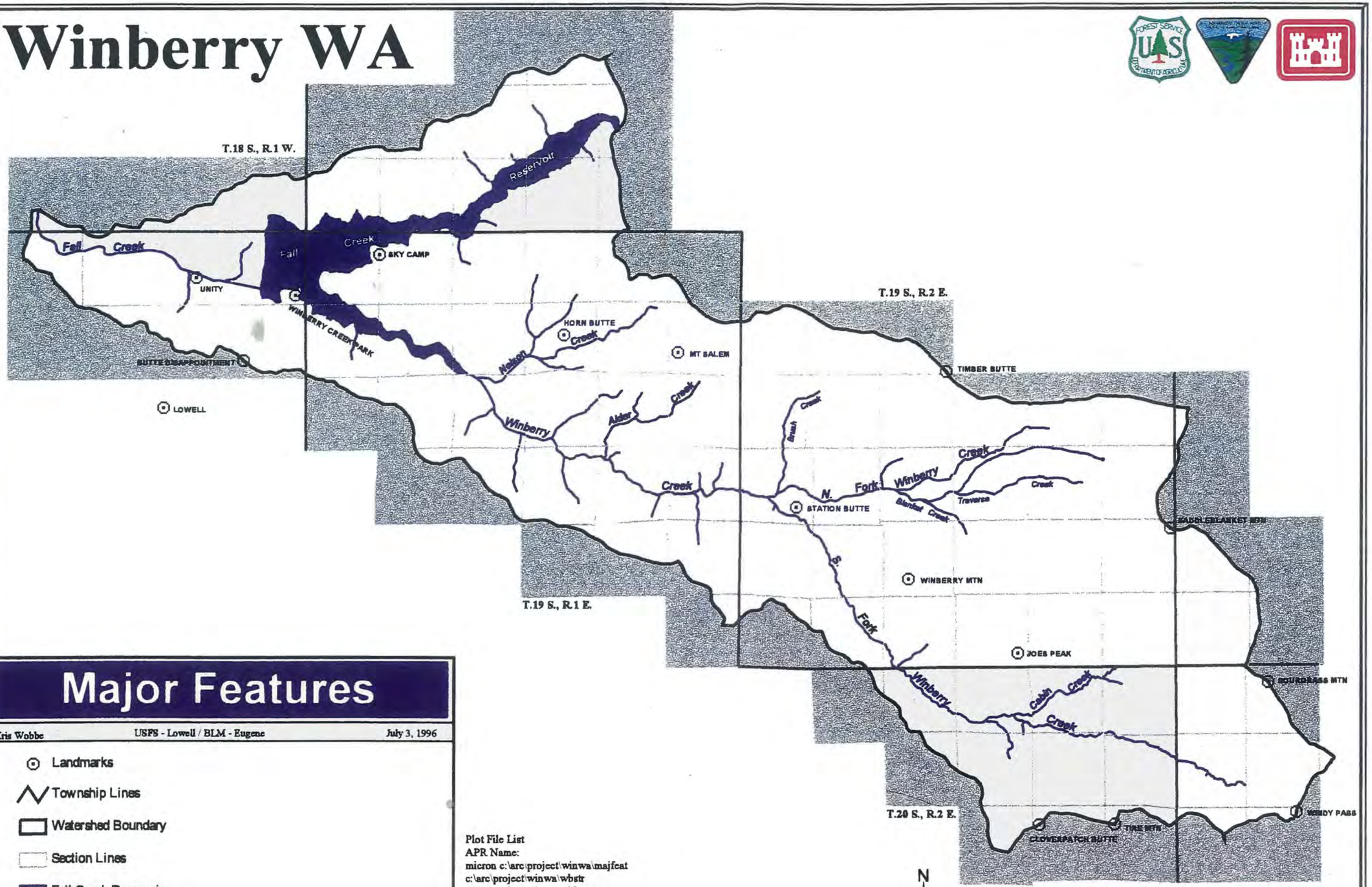
Vicinity Map







Winberry WA



Major Features

Kris Wobbe — USFS - Lowell / BLM - Eugene — July 3, 1996

- Landmarks
- Township Lines
- Watershed Boundary
- Section Lines
- Fall Creek Reservoir
- Streams

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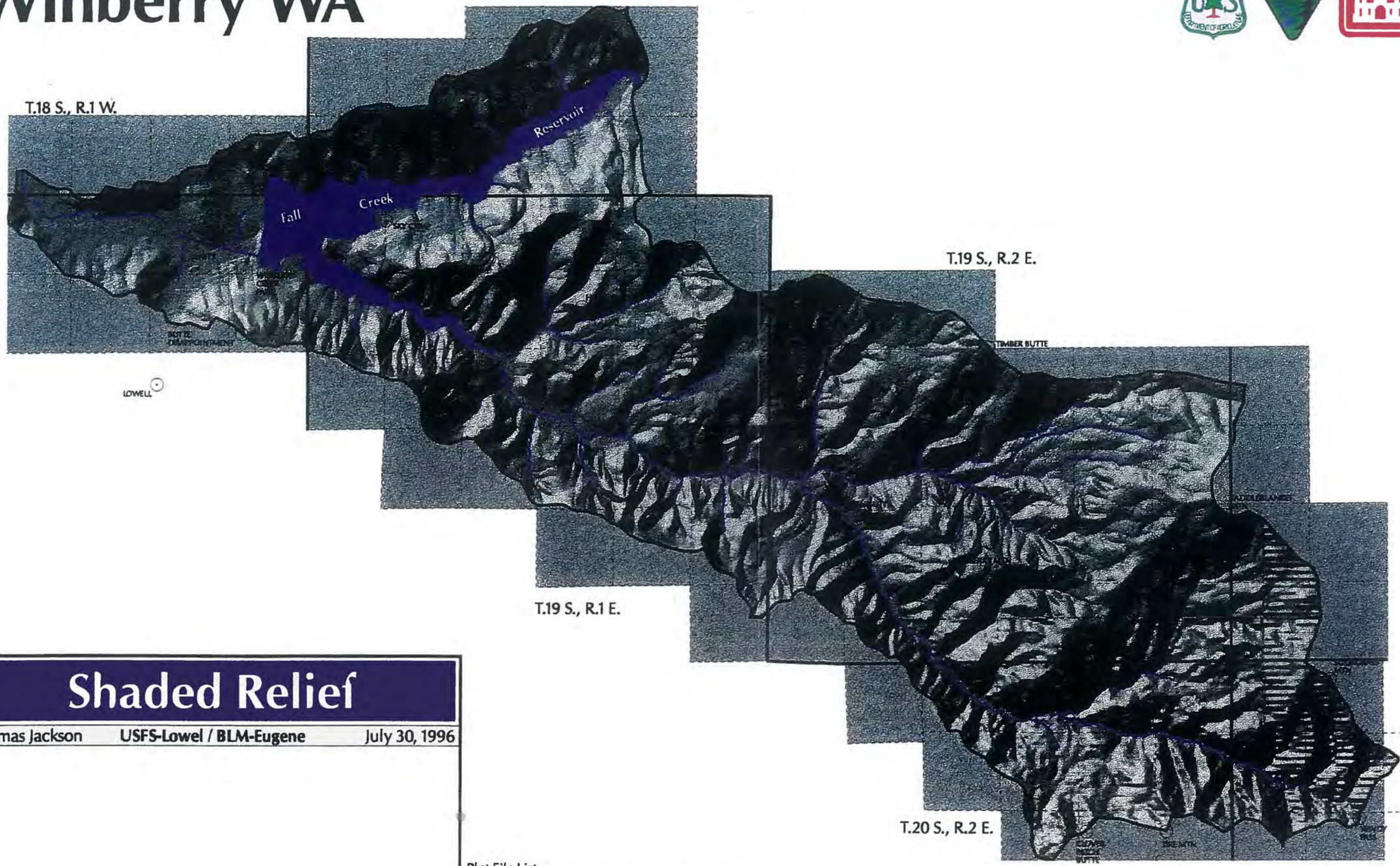
1 0 1 2 3 Miles

Winberry WA



Shaded Relief

Thomas Jackson USFS-Lowel / BLM-Eugene July 30, 1996

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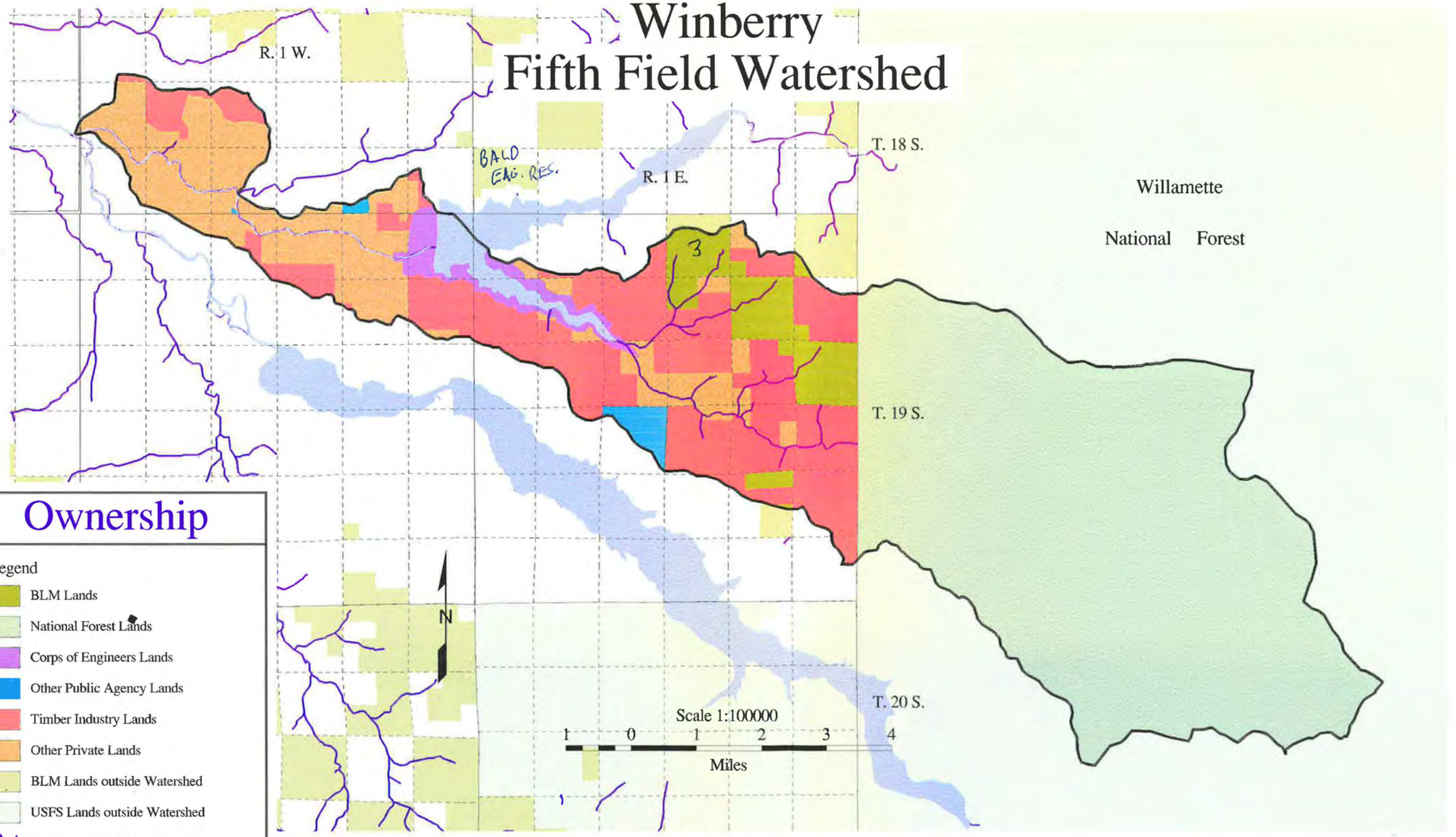
Miles

Winberry
Fifth Field Watershed



Ownership

Legend

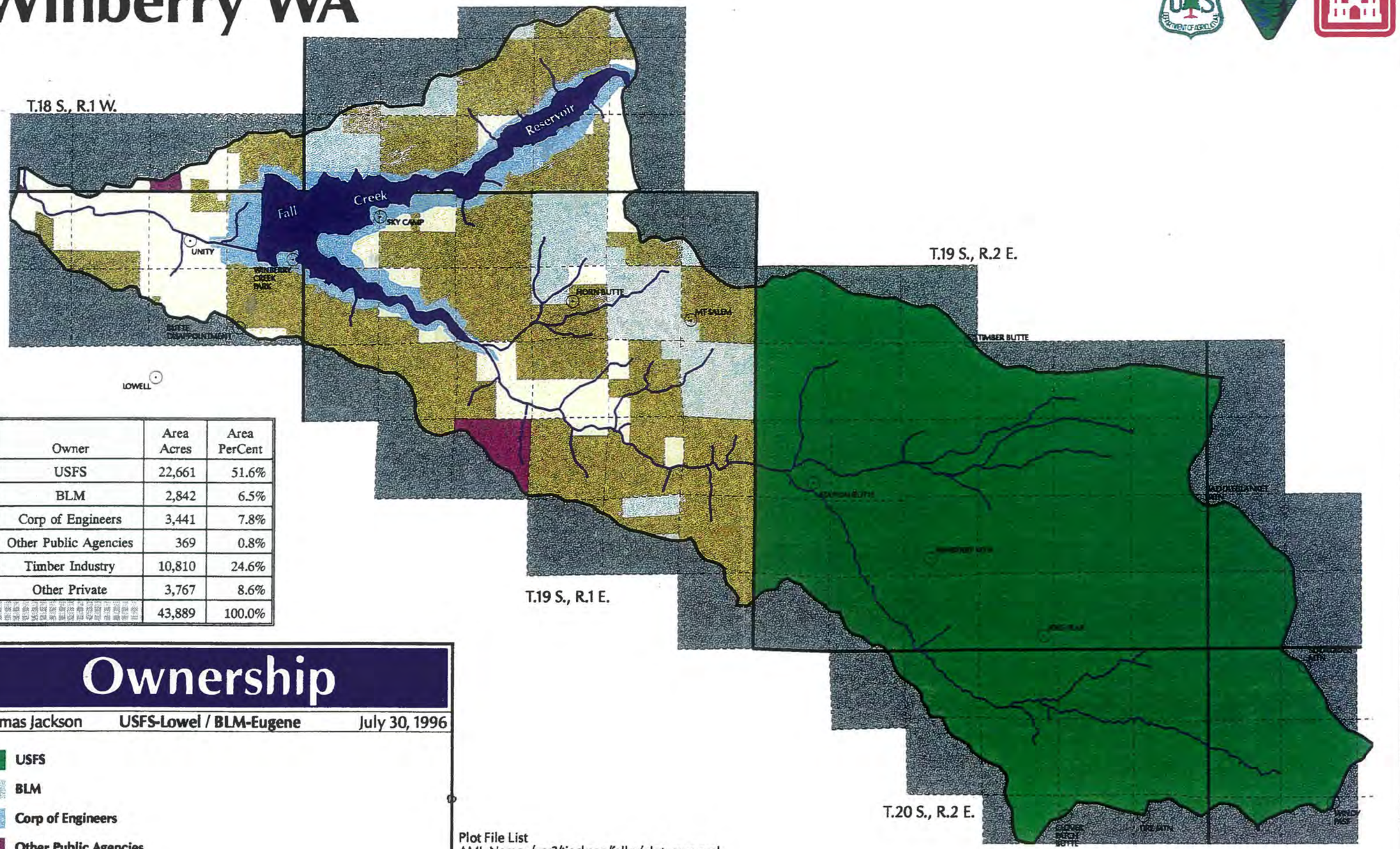
- BLM Lands
- National Forest Lands
- Corps of Engineers Lands
- Other Public Agency Lands
- Timber Industry Lands
- Other Private Lands
- BLM Lands outside Watershed
- USFS Lands outside Watershed
- Streams –3rd order and greater

D. Hanson 09/20/00
aml file –/usr3/winb/winb_1117.aml

Winberry 5th Field Ownerships

Owner	Acres	Percent
BLM	2,090	5.2
US Forest Service	22,661	56.4
Corps of Engineers	1,404	3.5
Other Public Agencies	369	0.9
Timber Industry	8,160	20.3
Other Private Lands	5,528	13.7
Totals	40,211	100.0

Winberry WA



Owner	Area Acres	Area PerCent
USFS	22,661	51.6%
BLM	2,842	6.5%
Corp of Engineers	3,441	7.8%
Other Public Agencies	369	0.8%
Timber Industry	10,810	24.6%
Other Private	3,767	8.6%
	43,889	100.0%

Ownership

Thomas Jackson **USFS-Lowel / BLM-Eugene** July 30, 1996

- **USFS**
- **BLM**
- **Corp of Engineers**
- **Other Public Agencies**
- **Timber Industry**
- **Other Private**

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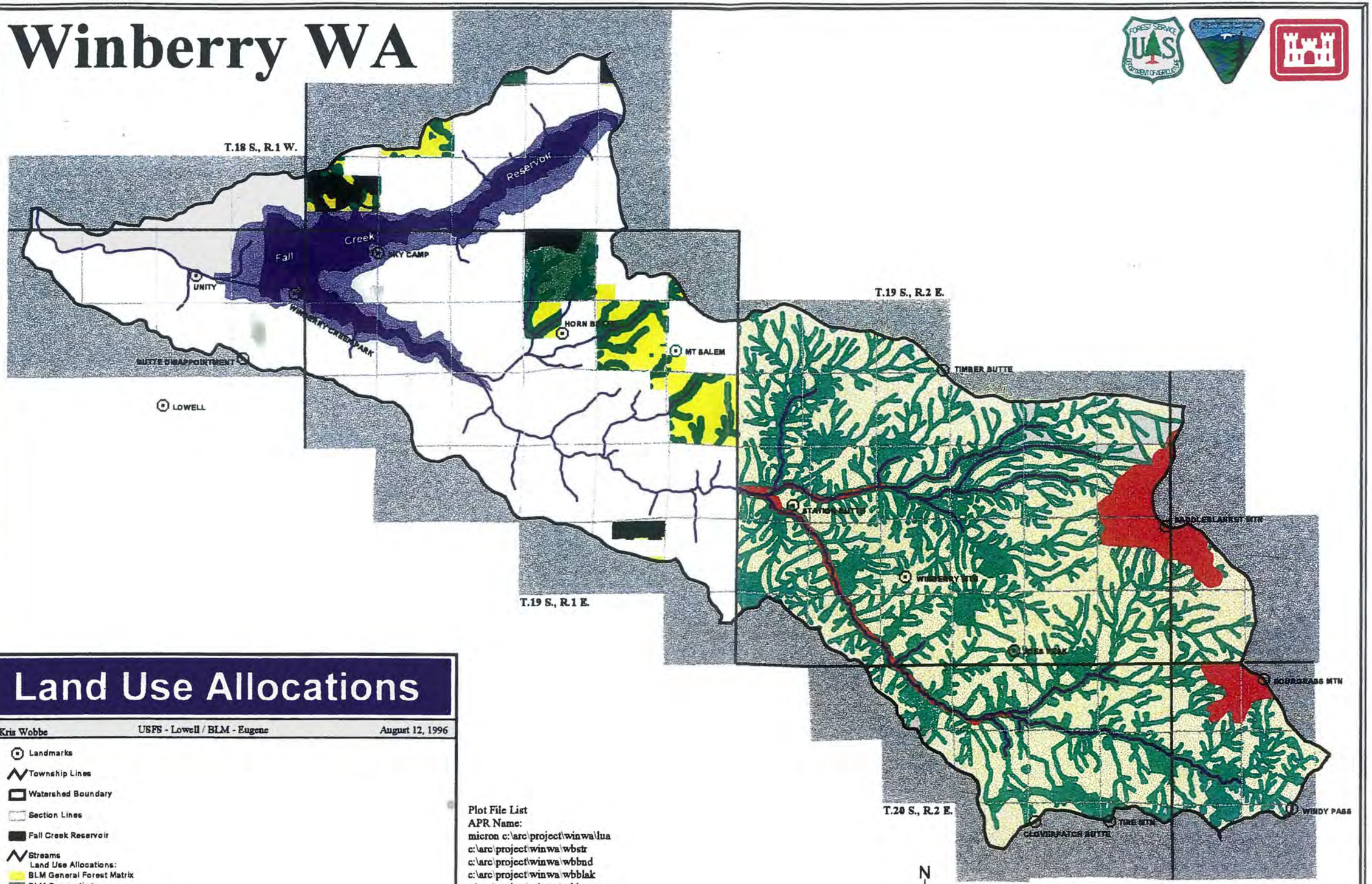
Miles

Winberry WA



Land Use Allocations

Kris Wobbe — USFS - Lowell / BLM - Eugene — August 12, 1996

- Landmarks
- Township Lines
- Watershed Boundary
- Section Lines
- Fall Creek Reservoir
- Streams

Land Use Allocations:
- BLM General Forest Matrix
- BLM Connectivity
- BLM District Designated Reserves
- BLM Other Reserves
- USFS General Forest Matrix
- USFS Special Wildlife Habitat Area
- USFS Other Reserves
- Corps of Engineers Lands

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1 0 1 2 3 Miles

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Winberry WA

T.18 S., R.1 W.

T.19 S., R.2 E.

T.19 S., R.1 E.

T.20 S., R.2 E.

UNITY

LOWELL

SKY CAMP

HORN BUTTE

SKY SALEM

TIMBER BUTTE

STIDDON BUTTE

WINBERRY MTN.

JOES PEAK

Code	Area Hectares	Area Percent	Description
Tub	5,821	32.8%	Basaltic lava flows
Tut	5,117	28.8%	Tuff
Tus	2,542	14.3%	Sedimentary and volcaniclastic rocks
Tu	2,491	14.0%	Undifferentiated tuffaceous sedimentary rocks, tuffs, and basalt (Miocene and Oligocene)
Tsv	532	3.0%	Silicic vent complexes (Pliocene, Miocene, and upper Oligocene)
Qls	449	2.5%	Landslide and debris-flow deposits (Holocene and Pleistocene)
Trb	288	1.6%	Ridge-capping basalt and basaltic andesite (Pliocene and upper Miocene)
Qal	287	1.6%	Alluvial Deposits (Holocene)
Tib	194	1.1%	Basalt and andesite intrusions (Pliocene, Miocene, and Oligocene?)
OW	41	0.2%	Open water
	17,761	100.0%	

Geology

Thomas Jackson — **USFS-Lowel / BLM-Eugene** — July 30, 1996

Tub
Tut
Tus
Tu
Tsv
Qls
Trb
Qal
Tib
OW

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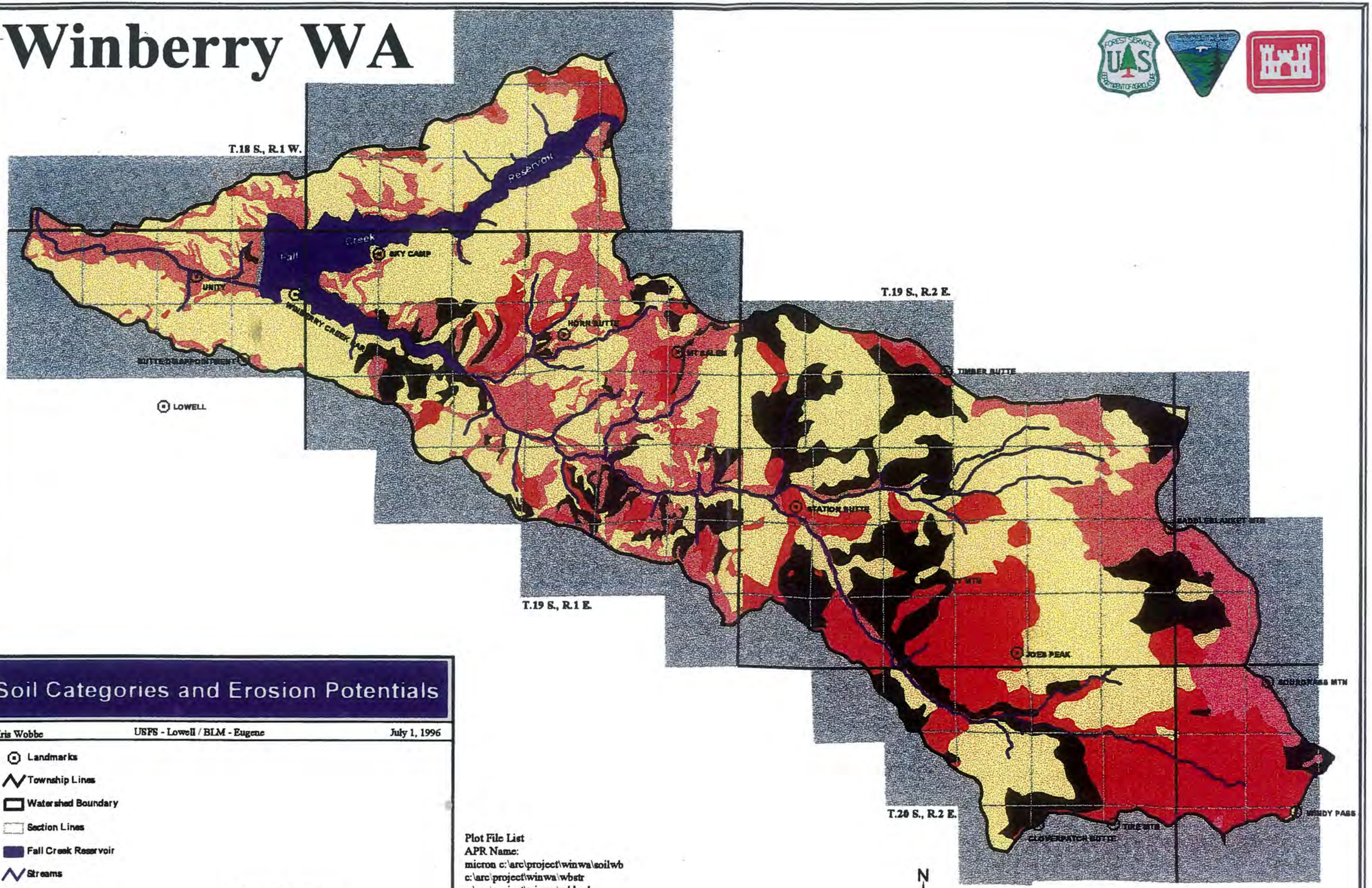
Miles

Winberry WA



Soil Categories and Erosion Potentials

Kris Wobbe — USFS - Lowell / BLM - Eugene — July 1, 1996

- Landmarks
- Township Lines
- Watershed Boundary
- Section Lines
- Fall Creek Reservoir
- Streams

Soil Categories:
- (1) 100% Clay Soils
- (2) >= 50% Clay Soils
- (3) Steep Ground/Shallow Soils
- (4) >= 50% Steep Ground/Shallow Soils
- (5) All Other Soil Types

Erosion Potentials:
- (1) Moderate
- (2) Moderate/Moderately High
- (3) Moderate/High & Very Severe
- (4) Moderate/High & Severe
- (5) Low/Moderate

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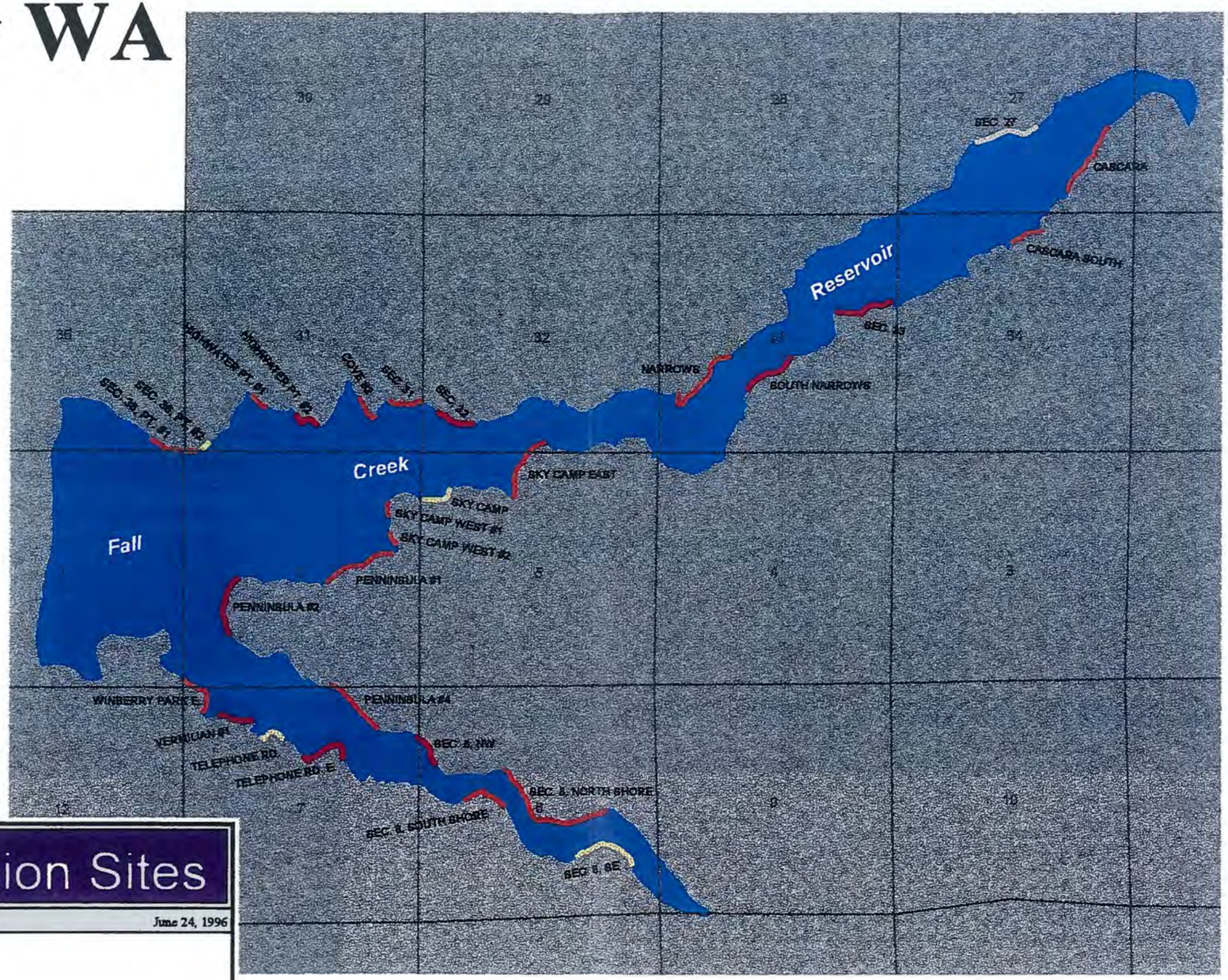
Winberry WA



Reservoir Erosion Sites

Kris Wobbe | USFS - Lowell / BLM - Eugene | June 24, 1996

- Section Lines
- Erosion Level
  - Low
  - Medium
  - High
- Fall Creek Reservoir

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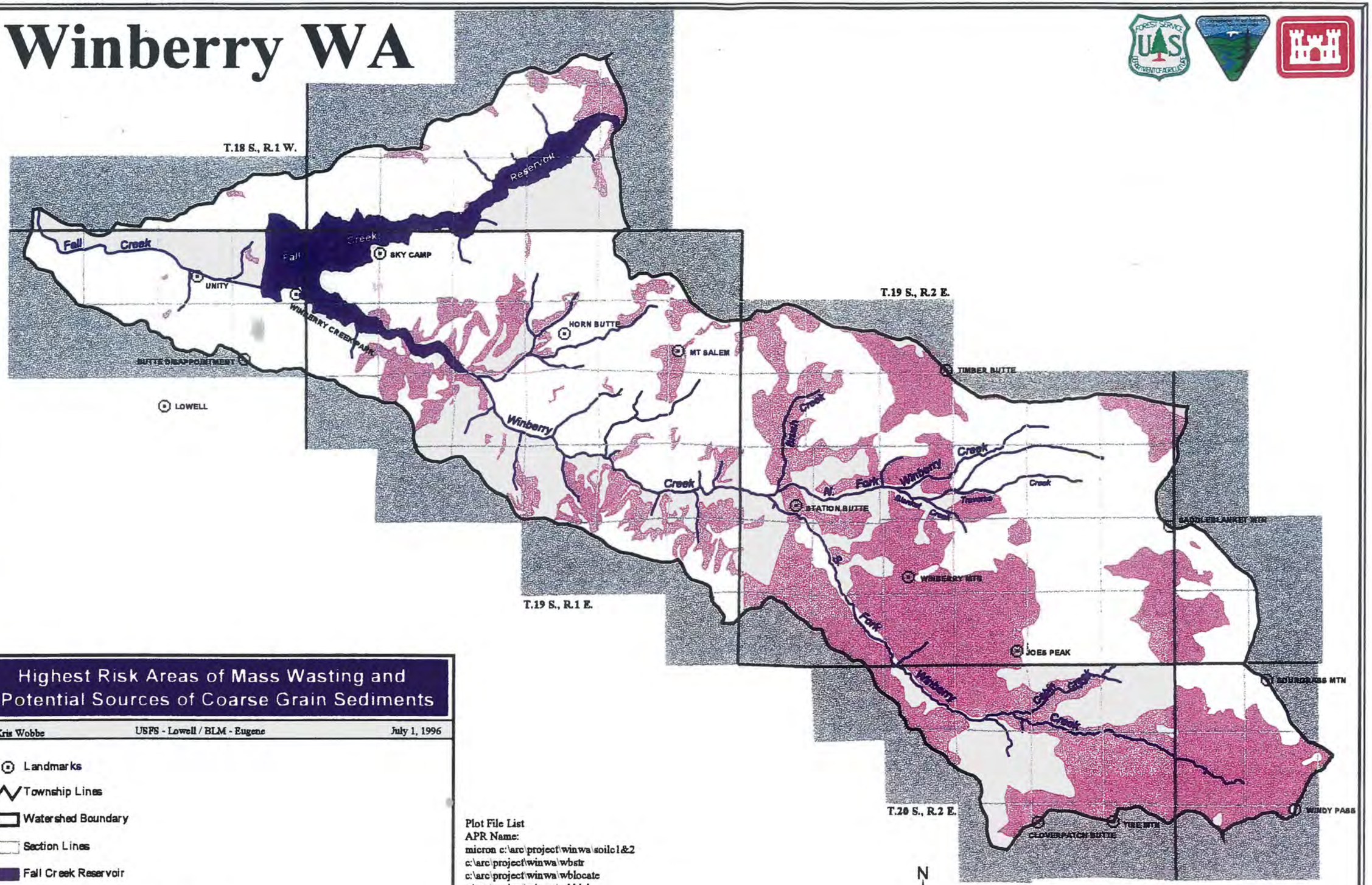
Winberry WA



Highest Risk Areas of Mass Wasting and Potential Sources of Coarse Grain Sediments

Kris Wobbe — USFS - Lowell / BLM - Eugene — July 1, 1996

- Landmarks
- Township Lines
- Watershed Boundary
- Section Lines
- Fall Creek Reservoir
- Streams
- Highest Risk Areas of Mass Wasting and Potential Sources of Coarse Grain Sediments Soil Categories 3 & 4

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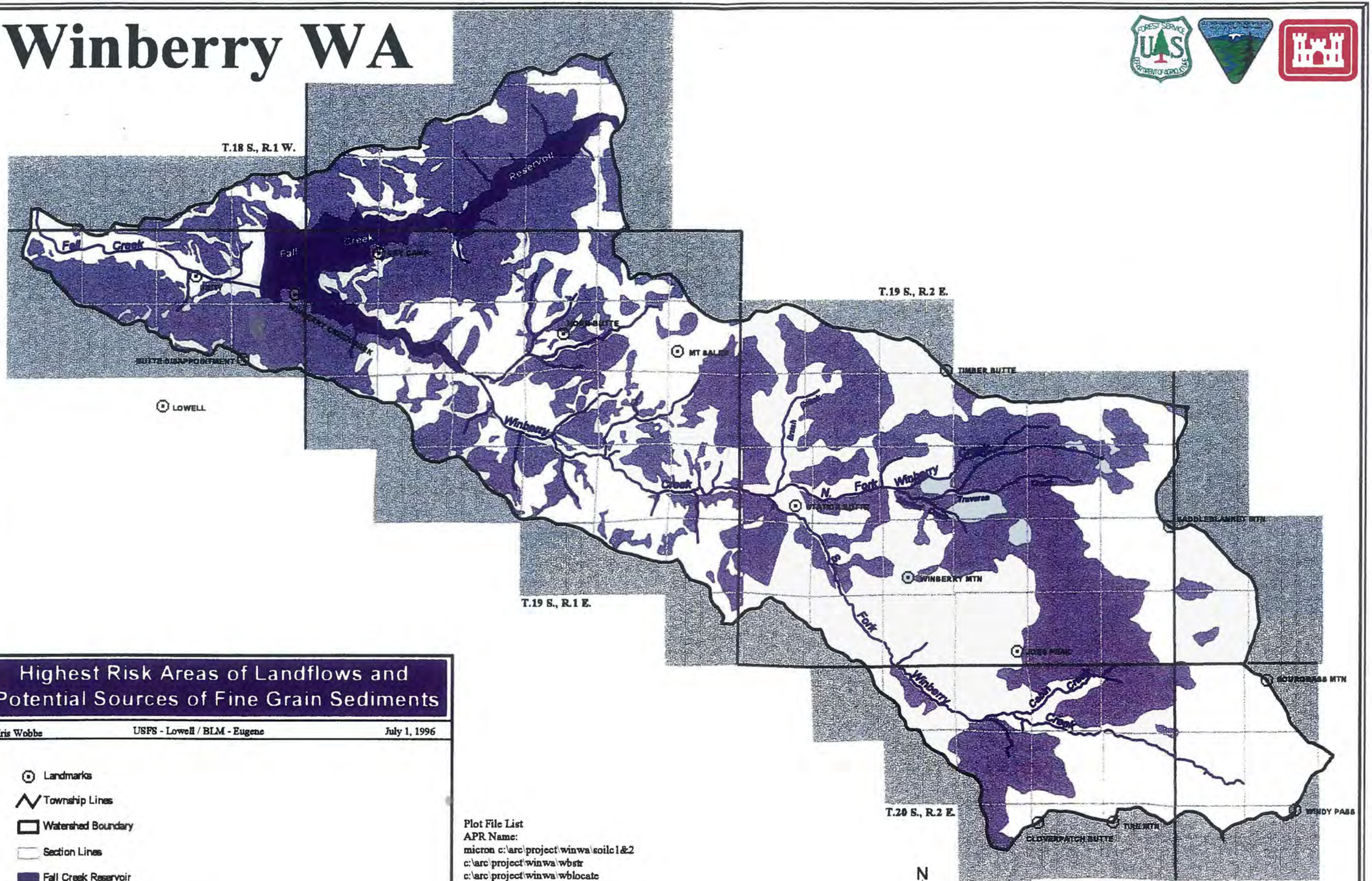
Winberry WA



Highest Risk Areas of Landflows and Potential Sources of Fine Grain Sediments

Kris Wobbe | USFS - Lowell / BLM - Eugene | July 1, 1996

- Landmarks
- Township Lines
- Watershed Boundary
- Section Lines
- Fall Creek Reservoir
- Streams
- Highest Risk Areas of Landflows and Potential Sources of Fine Grain Sediments Soil Categories 1 & 2

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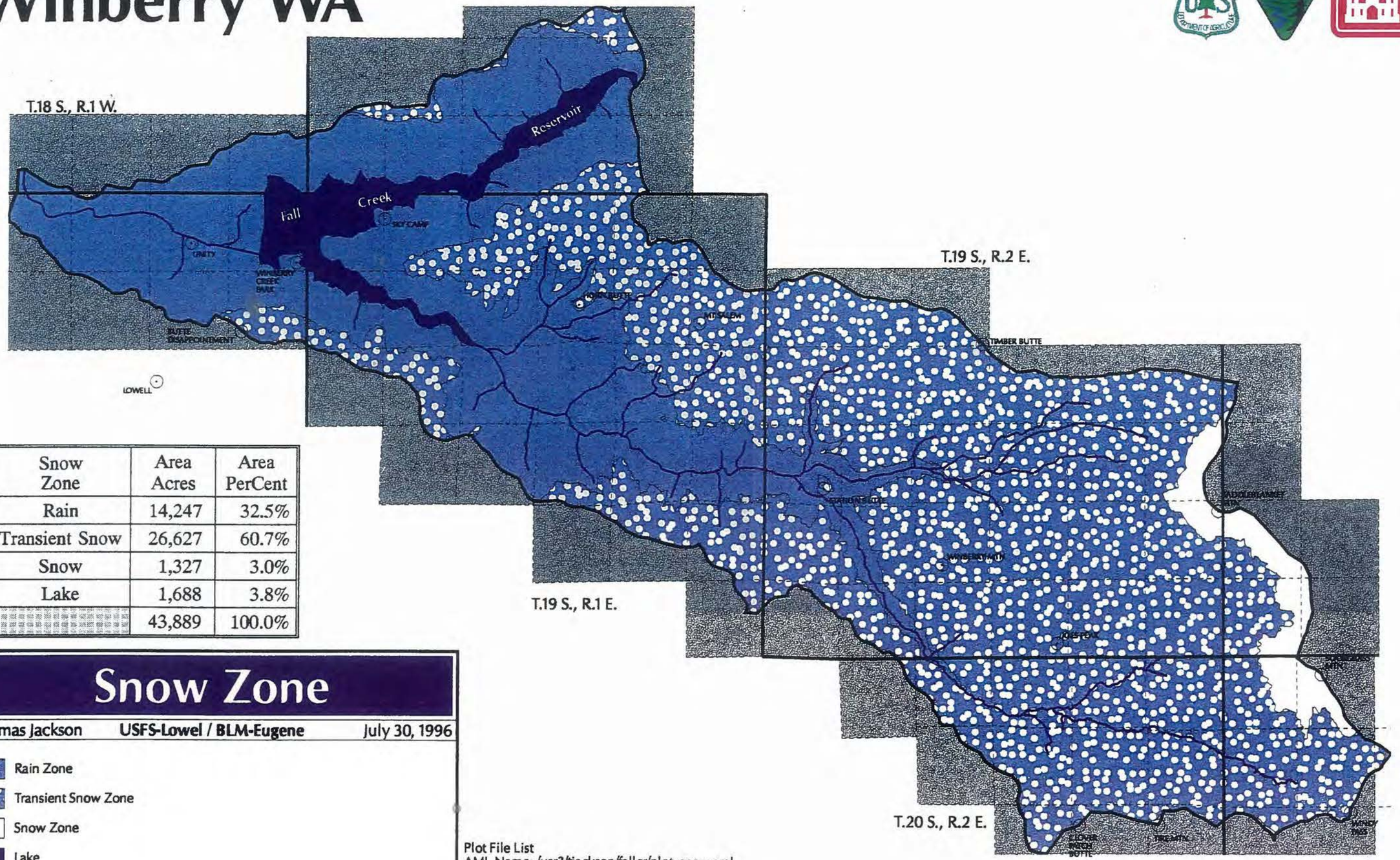
Winberry WA



Snow Zone	Area Acres	Area PerCent
Rain	14,247	32.5%
Transient Snow	26,627	60.7%
Snow	1,327	3.0%
Lake	1,688	3.8%
	43,889	100.0%

Snow Zone

Thomas Jackson **USFS-Lowel / BLM-Eugene** July 30, 1996

- Rain Zone
- Transient Snow Zone
- Snow Zone
- Lake

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/nfs/or0500/usr7/winberry/wb_pls
/nfs/or0500/usr7/winberry/wb_lak
/nfs/or0500/usr7/winberry/wb_hyd_1_2
/nfs/or0500/usr7/winberry/wb_bnd
wb_snow_txt.eps
/nfs/or0500/usr7/winberry/wb_locat2

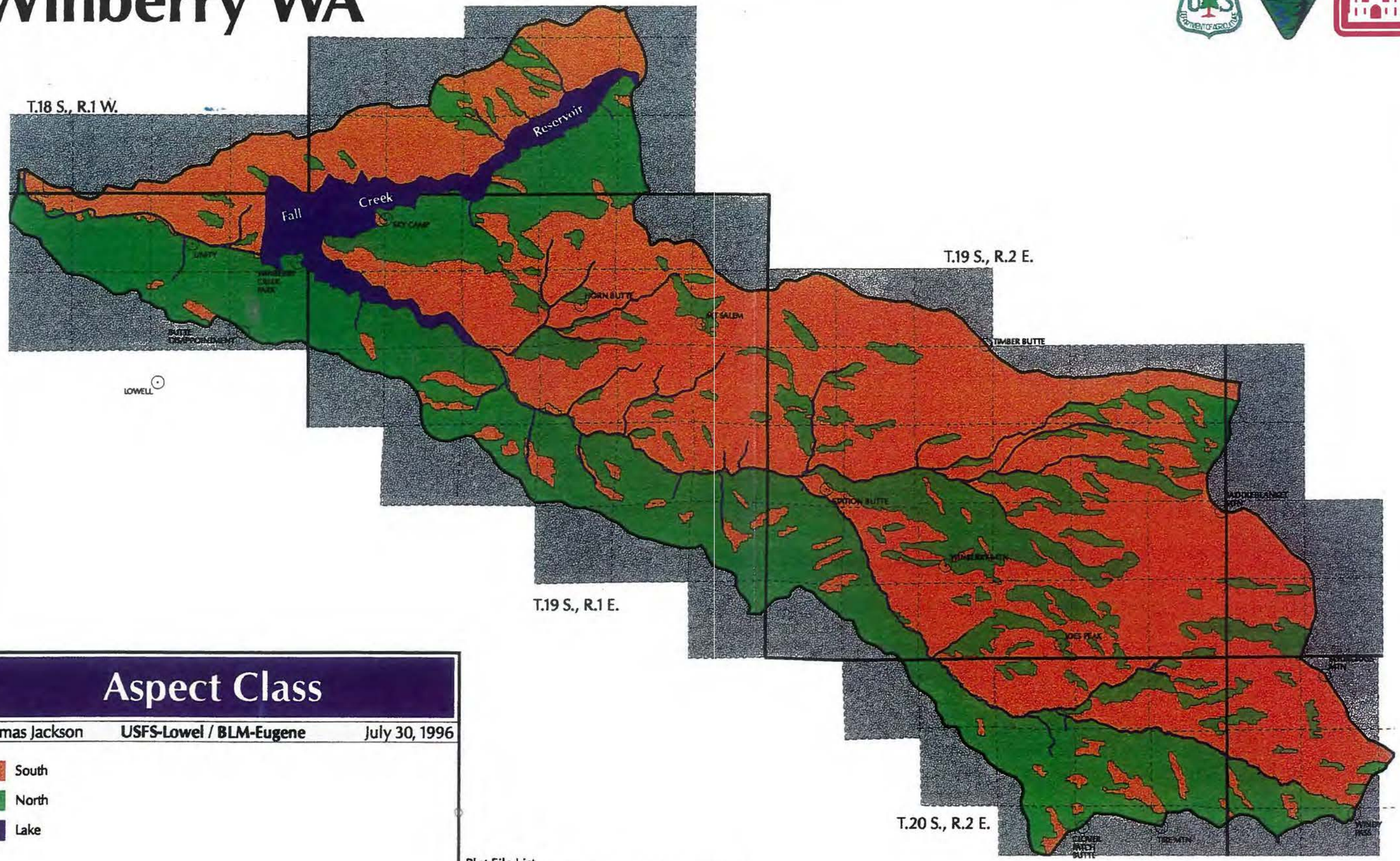
N

Scale 1:80000

1 0 1 2 3

Miles

Winberry WA



Aspect Class

Thomas Jackson | **USFS-Lowel / BLM-Eugene** | July 30, 1996

- South
- North
- Lake

Plot File List
AML Name: /usr3/tjackson/fallcr/plot_aspect.aml
Plot To: wb_aspect.gra
/usr3/tjackson/fallcr/kris/kris_asp
/nfs/or0500/usr7/winberry/wb_greyback
/nfs/or0500/usr7/winberry/wb_pls
/nfs/or0500/usr7/winberry/wb_lak
/nfs/or0500/usr7/winberry/wb_hyd_1_2
/nfs/or0500/usr7/winberry/wb_bnd
/nfs/or0500/usr7/winberry/wb_locat2

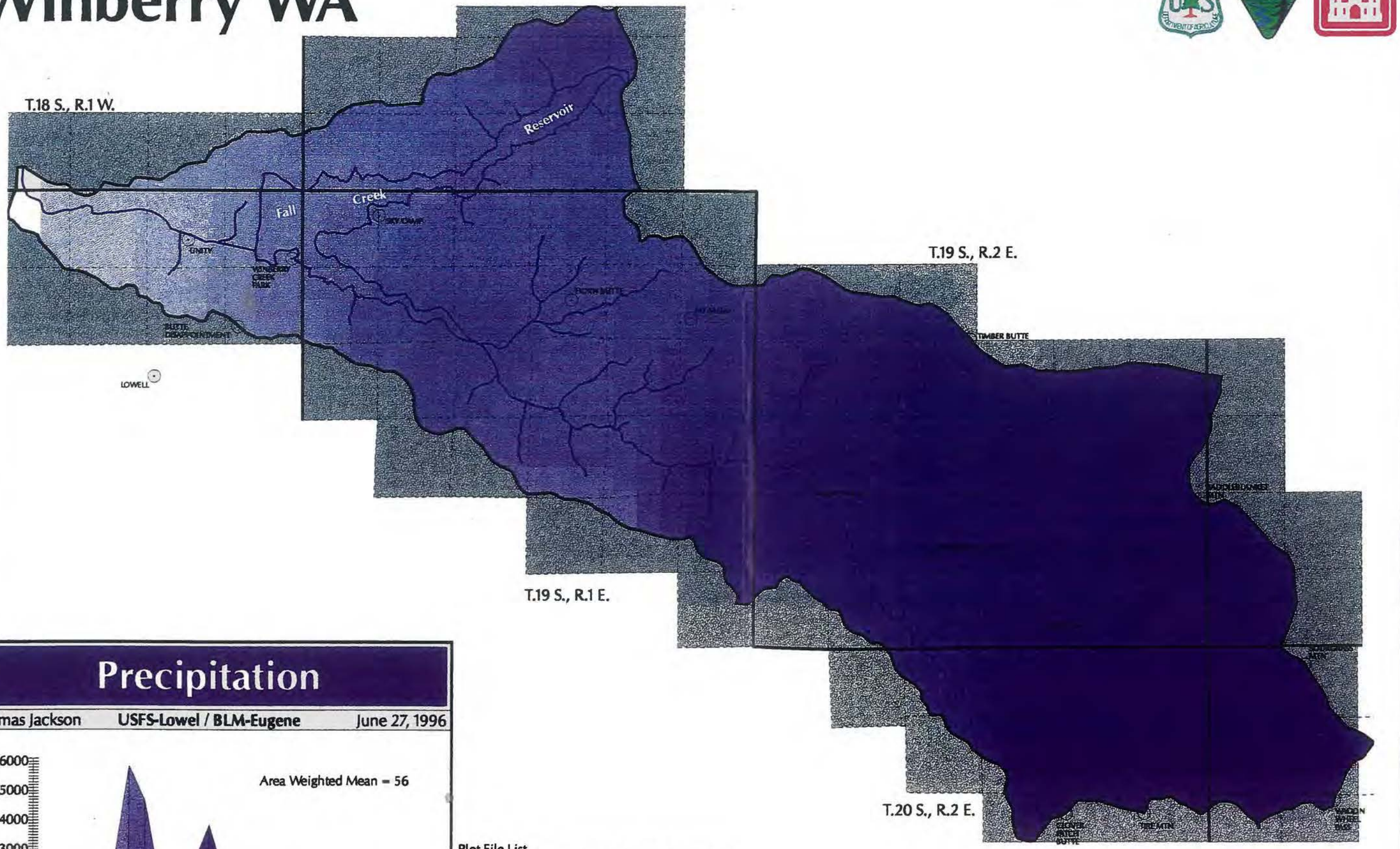
N

Scale 1:80000

1 0 1 2 3

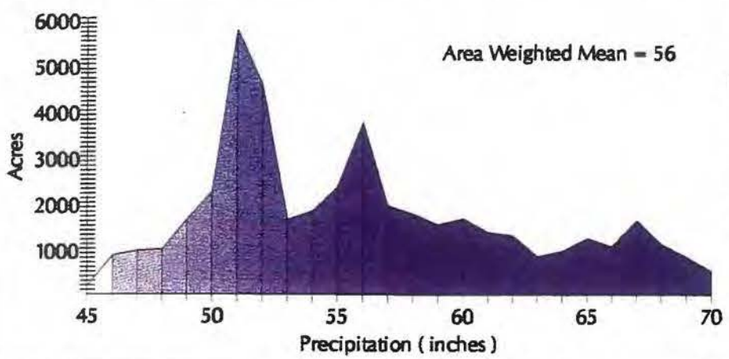
Miles

Winberry WA



Precipitation

Thomas Jackson | USFS-Lowel / BLM-Eugene | June 27, 1996



Plot File List
AML Name: /usr3/tjackson/fallcr/plot_precip.aml
Plot To: wb_precip.gra
/nfs/or0500/usr7/winberry/wb_precip_g
/nfs/or0500/usr7/winberry/wb_greyback
/nfs/or0500/usr7/winberry/wb_pls
/nfs/or0500/usr7/winberry/wb_lak
/nfs/or0500/usr7/winberry/wb_hyd_1_2
/nfs/or0500/usr7/winberry/wb_bnd
/nfs/or0500/usr7/winberry/wb_locat2

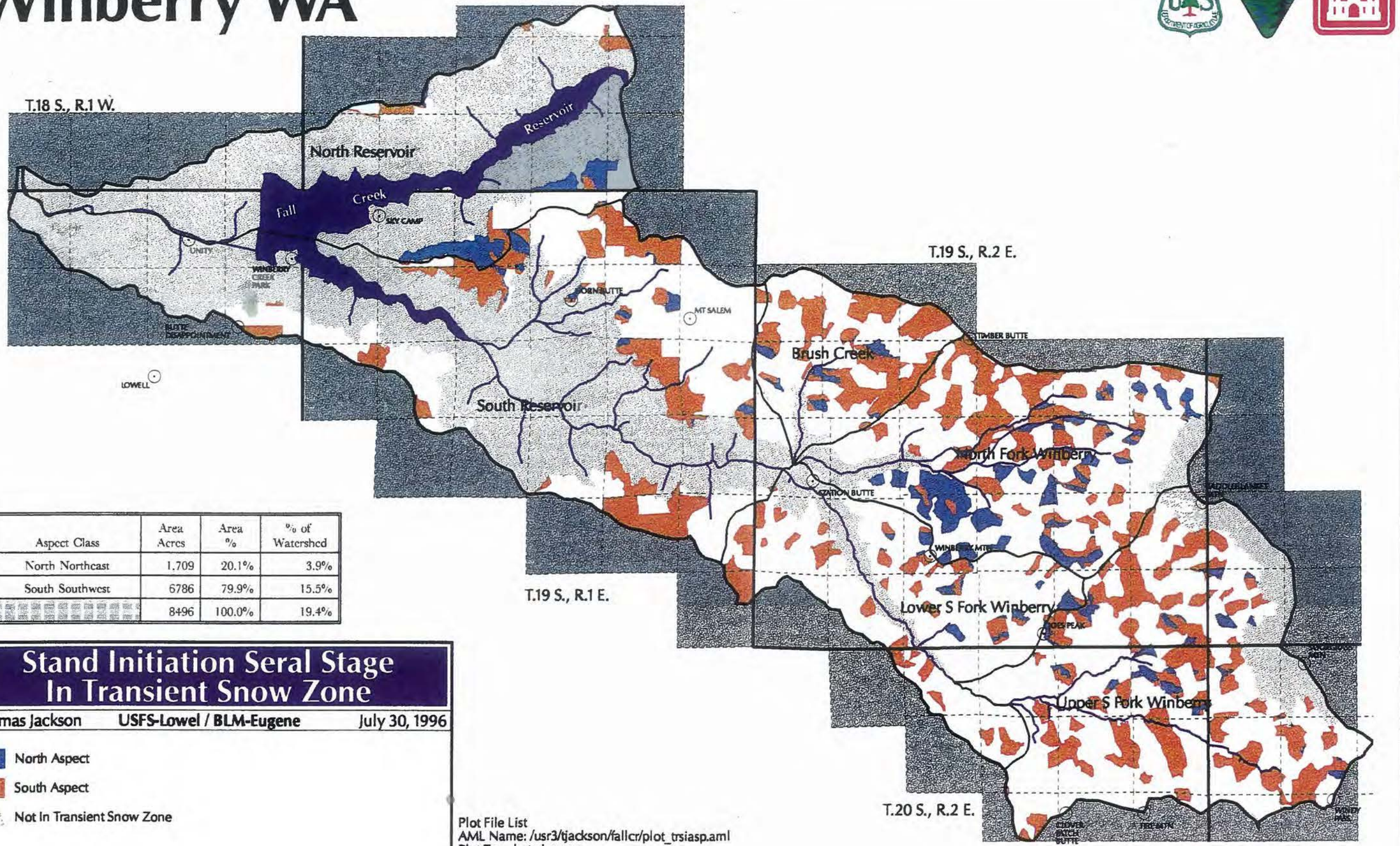
N

Scale 1:80000

1 0 1 2 3

Miles

Winberry WA



Aspect Class	Area Acres	Area %	% of Watershed
North Northeast	1,709	20.1%	3.9%
South Southwest	6786	79.9%	15.5%
	8496	100.0%	19.4%

Stand Initiation Seral Stage In Transient Snow Zone

Thomas Jackson **USFS-Lowel / BLM-Eugene** July 30, 1996

- North Aspect
- South Aspect
- Not In Transient Snow Zone

Plot File List
AML Name: /usr3/tjackson/fallcr/plot_trsiasp.aml
Plot To: wb_trsiasp.gra
/nfs/or0500/usr7/winberry/wb_greyback
/usr3/tjackson/fallcr/kris/tran_si_asp
/nfs/or0500/usr7/winberry/wb_pls
/nfs/or0500/usr7/winberry/wb_lak
/nfs/or0500/usr7/winberry/wb_hyd_1_2
/nfs/or0500/usr7/winberry/wb_subdiv
/nfs/or0500/usr7/winberry/wb_bnd
/usr3/tjackson/fallcr/wb_snow96asptxt.eps
/nfs/or0500/usr7/winberry/wb_locat2

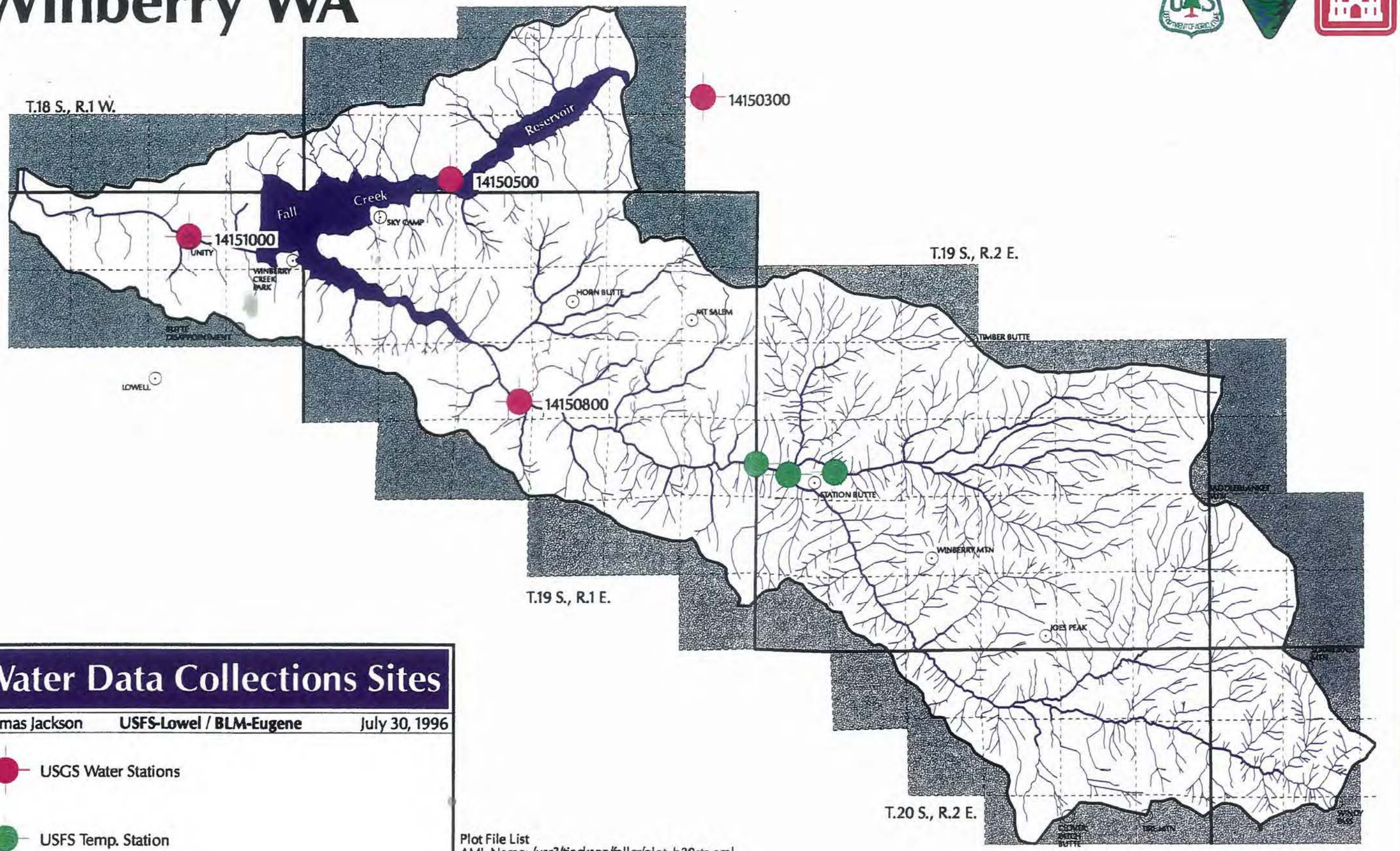
N

Scale 1:80000

1 0 1 2 3

Miles

Winberry WA



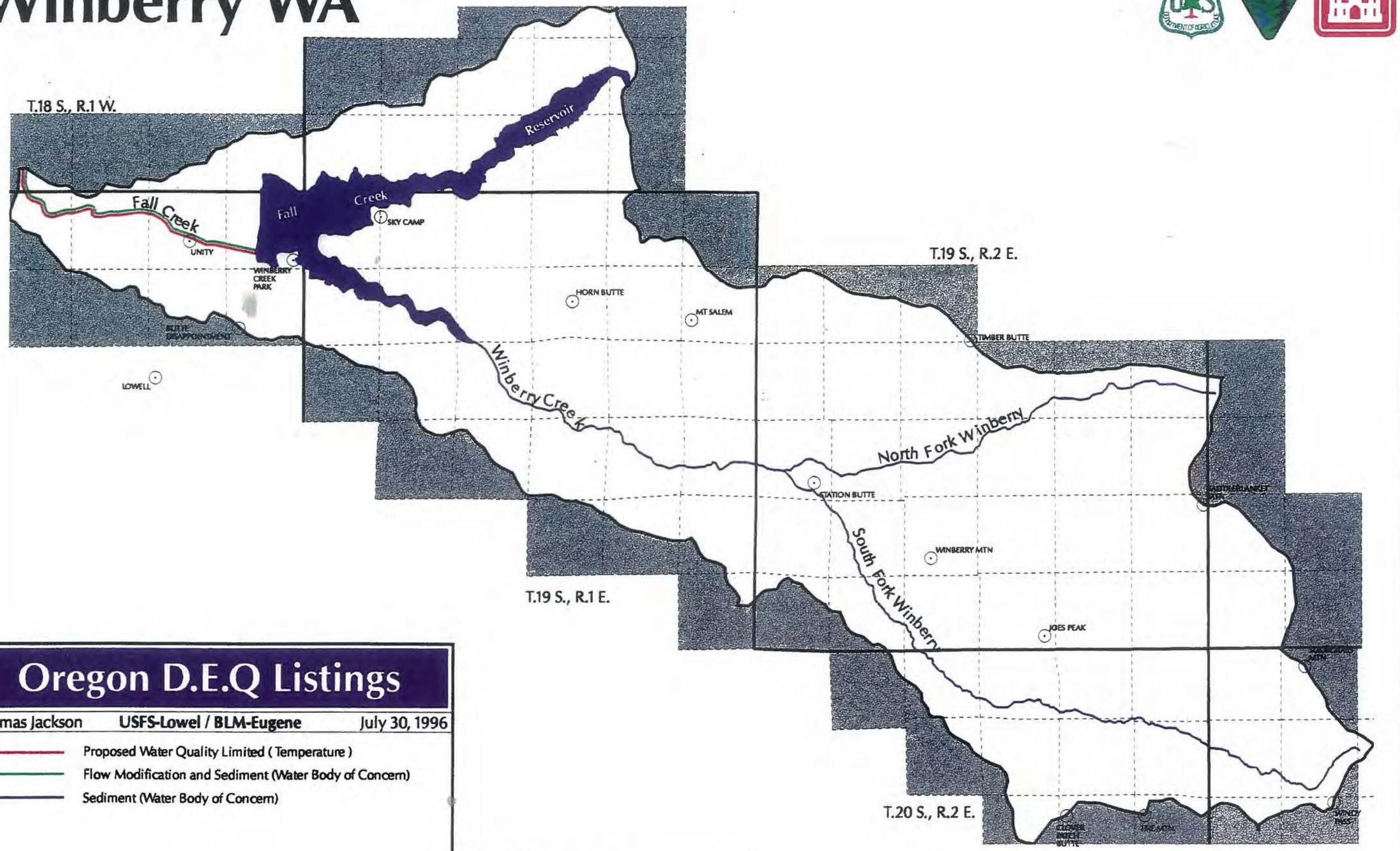
Water Data Collections Sites

Thomas Jackson **USFS-Lowel / BLM-Eugene** July 30, 1996

- USGS Water Stations
- USFS Temp. Station

Plot File List
AML Name: /usr3/tjackson/fallcr/plot_h2osta.aml
Plot To: wb_h2osta.gra
/nfs/or0500/usr7/winberry/wb_greyback
/nfs/or0500/usr7/winberry/wb_pls
/nfs/or0500/usr7/winberry/wb_lak
/nfs/or0500/usr7/winberry/wb_hyd_1_2
/nfs/or0500/usr7/winberry/wb_hyd
/usr3/tjackson/fallcr/water_station
/nfs/or0500/usr7/winberry/wb_bnd
/nfs/or0500/usr7/winberry/wb_locat2

Winberry WA



Oregon D.E.Q Listings

Thomas Jackson **USFS-Lowel / BLM-Eugene** July 30, 1996

- Proposed Water Quality Limited (Temperature)
- Flow Modification and Sediment (Water Body of Concern)
- Sediment (Water Body of Concern)

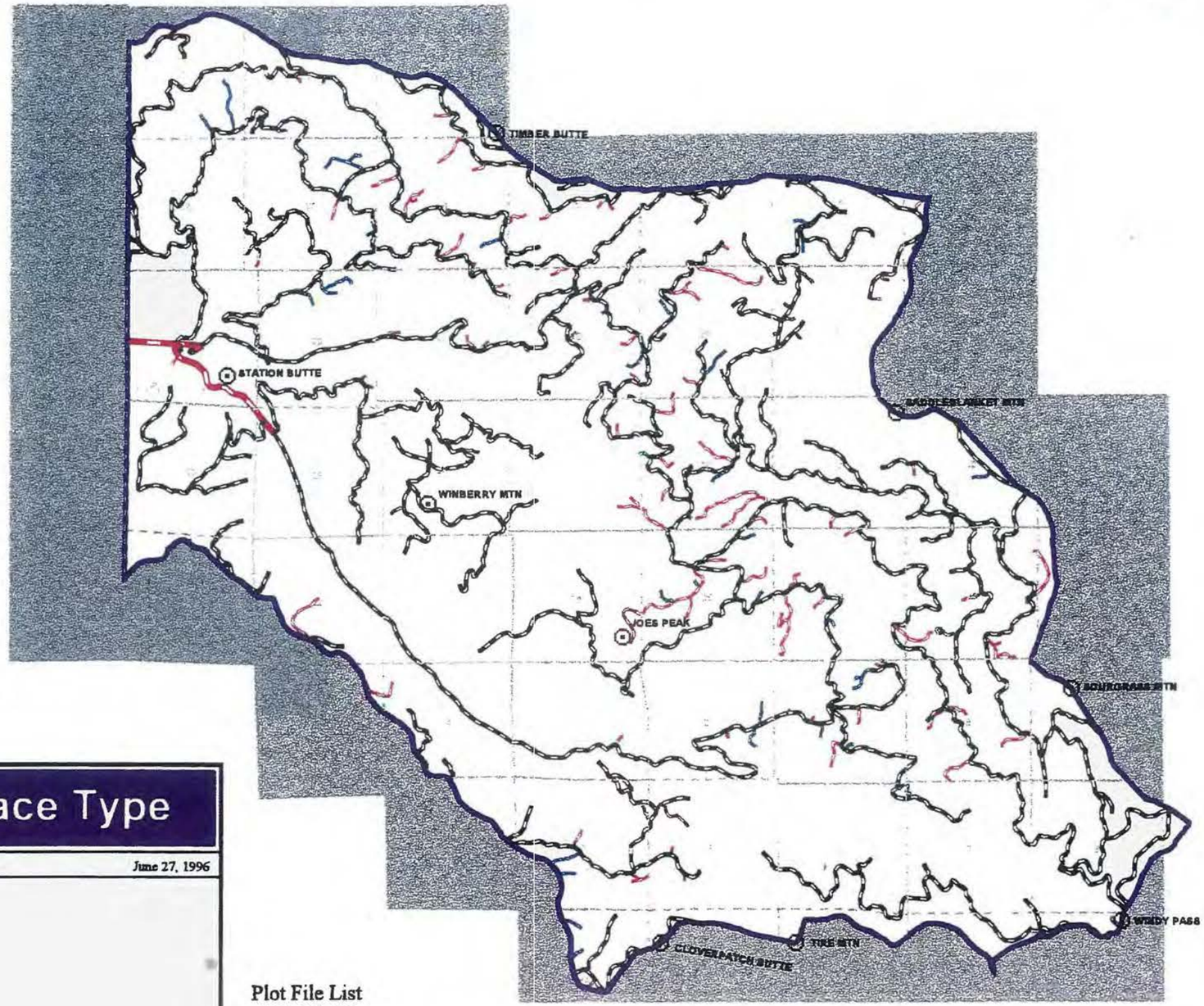
Plot File List
AML Name: /usr3/tjackson/fallcr/plot_hyd_imp.aml
Plot To: wb_deq.gra
/nfs/or0500/usr7/winberry/wb_greyback
/nfs/or0500/usr7/winberry/wb_pls
/nfs/or0500/usr7/winberry/wb_lak
/nfs/or0500/usr7/winberry/wb_hyd
/nfs/or0500/usr7/winberry/wb_bnd
/nfs/or0500/usr7/winberry/wb_locat2

Scale 1:80000

1 0 1 2 3

Miles

Winberry WA



USFS Road Surface Type

Kris Wobbe | USFS - Lowell / BLM - Eugene | June 27, 1996

- Landmarks
- Watershed Boundary
- Section Lines

Surface Type

- ACC - Pavement
- AGG - Aggregate Crushed
- IMP - Improved (Pit Run)
- NAT - Non-surfaced

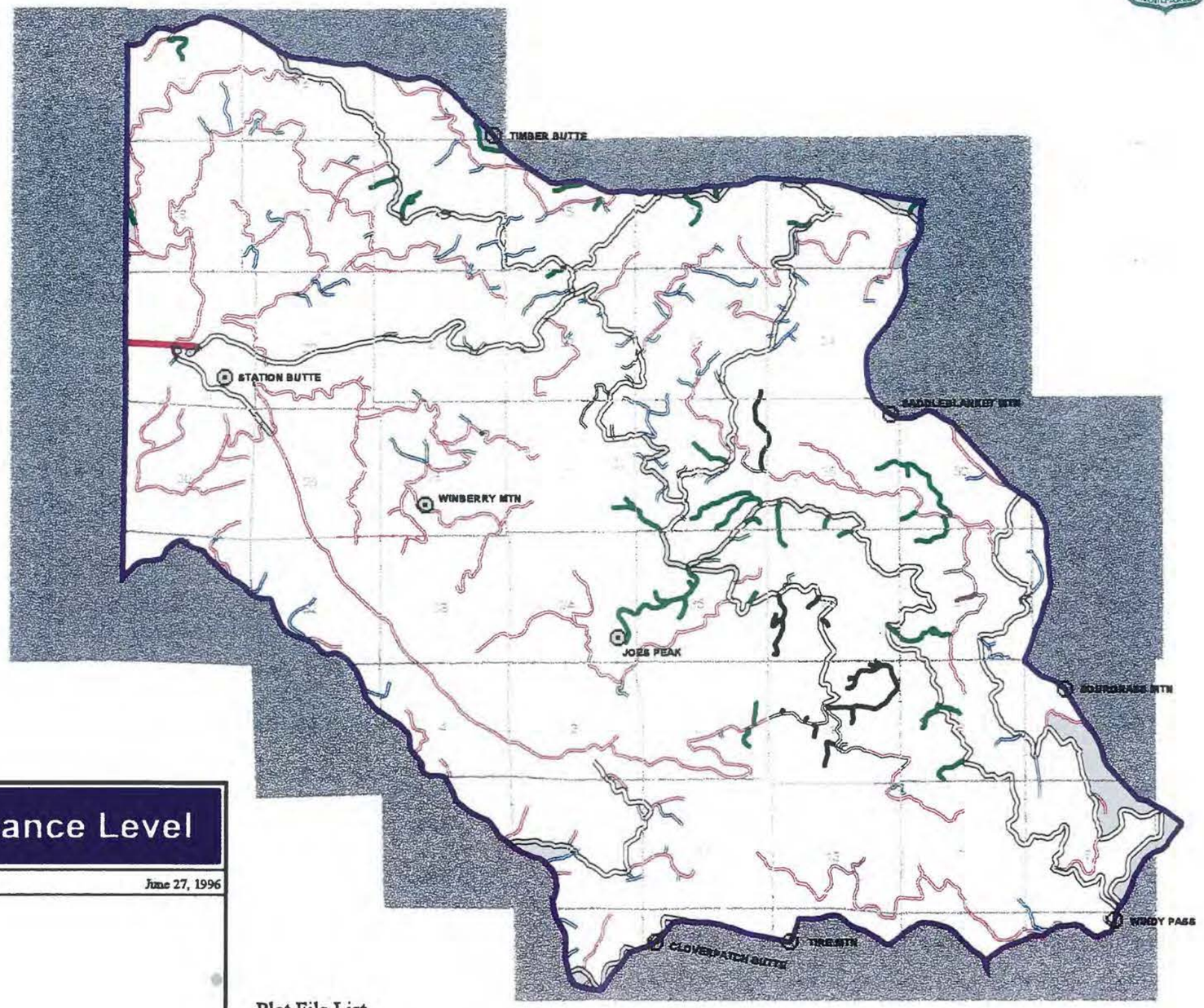
Plot File List
APR File Name:
micron c:\arc\project\winwa\tran
c:\arc\project\winwa\wbfroad
c:\arc\project\winwa\wbfbnd
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wblocate

N

Scale 1:60000

1 0 1 2 Miles

Winberry WA



USFS Road Maintenance Level

Kris Wobbe | USFS - Lowell / BLM - Eugene | June 27, 1996

- Landmarks
- Watershed Boundary
- Section Lines

Maintenance Level
- 0 - Decommissioned
- 1
- 2
- 3
- 4
- 5

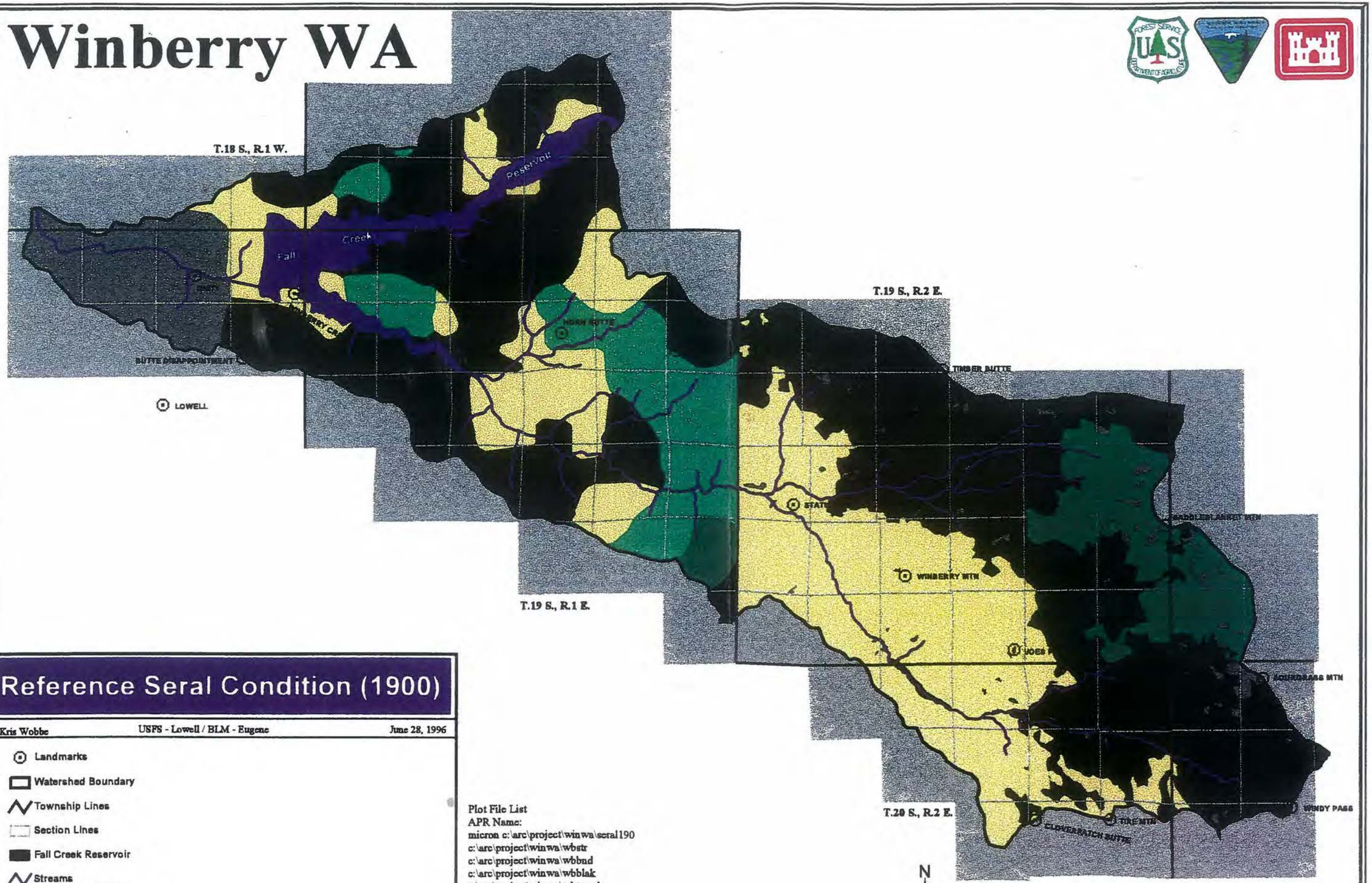
Plot File List
APR File Name:
micron c:\arc\project\winwa\tran2
c:\arc\project\winwa\wbfroad
c:\arc\project\winwa\wbfbnd
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wblocate

N

Scale 1:60000

1 0 1 2 Miles

Winberry WA



Reference Seral Condition (1900)

Kris Wobbe | USFS - Lowell / BLM - Eugene | June 28, 1996

- Landmarks
- Watershed Boundary
- Township Lines
- Section Lines
- Fall Creek Reservoir
- Streams
- Seral Stage (1900)
  - Late Successional Old Growth
  - Non-Forest
  - Stem Exclusion
  - Stem Initiation
  - Understory Reinitiation

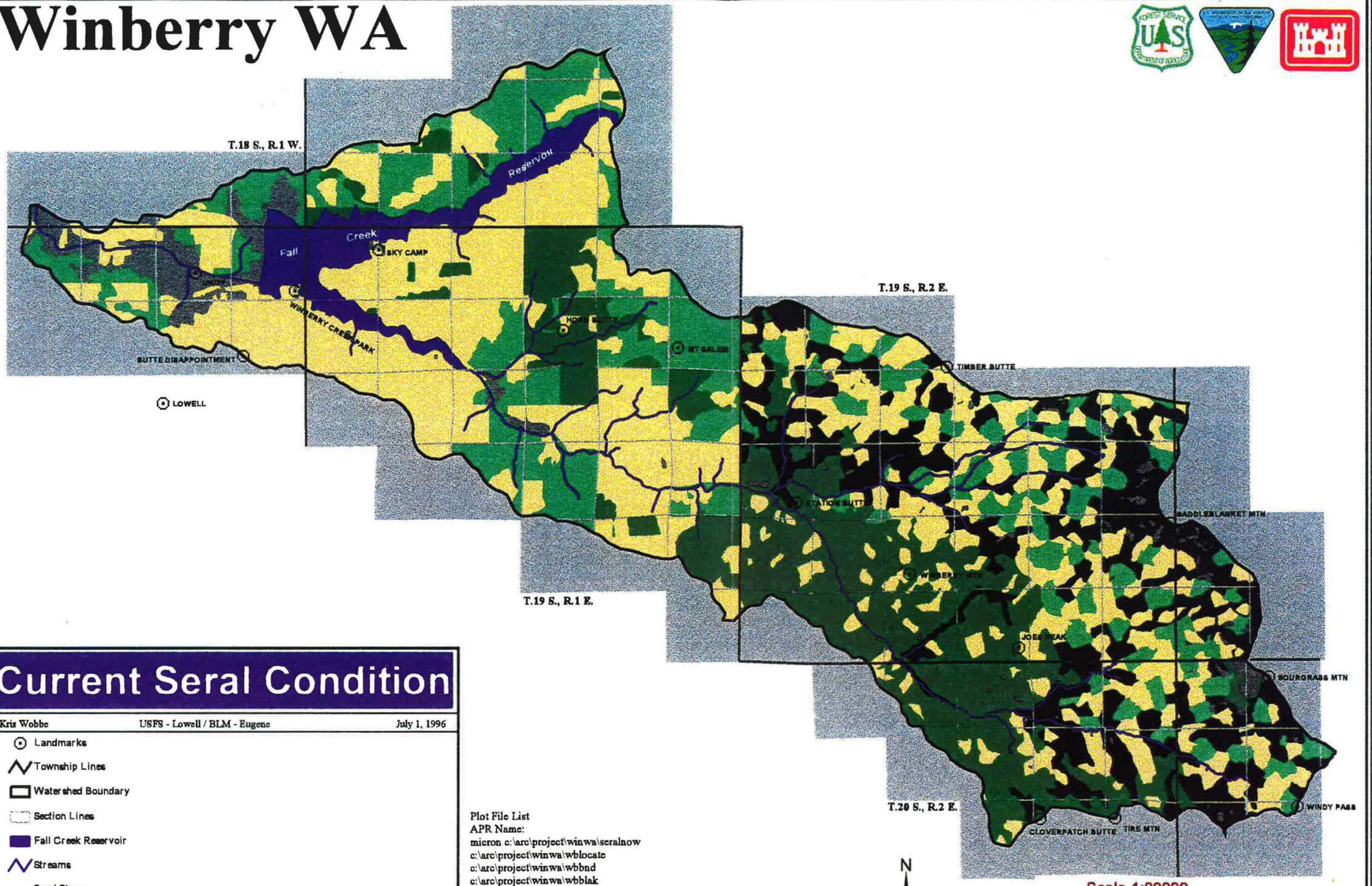
Plot File List
APR Name:
micron c:\arc\project\winwa\seral190
c:\arc\project\winwa\wbstr
c:\arc\project\winwa\wbbnd
c:\arc\project\winwa\wbblak
c:\arc\project\winwa\wbtwnshp
c:\arc\project\winwa\wblocate
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wbvegall

N

Scale 1:80000

1 0 1 2 3 Miles

Winberry WA



Current Seral Condition

Kris Wobbe — USFS - Lowell / BLM - Eugene — July 1, 1996

- Landmarks
- Township Lines
- Watershed Boundary
- Section Lines
- Fall Creek Reservoir
- Streams

Seral Stage
- Late Successional Oldgrowth
- Non-Forest
- Stem Exclusion
- Stem Initiation
- Understory Reinitiation

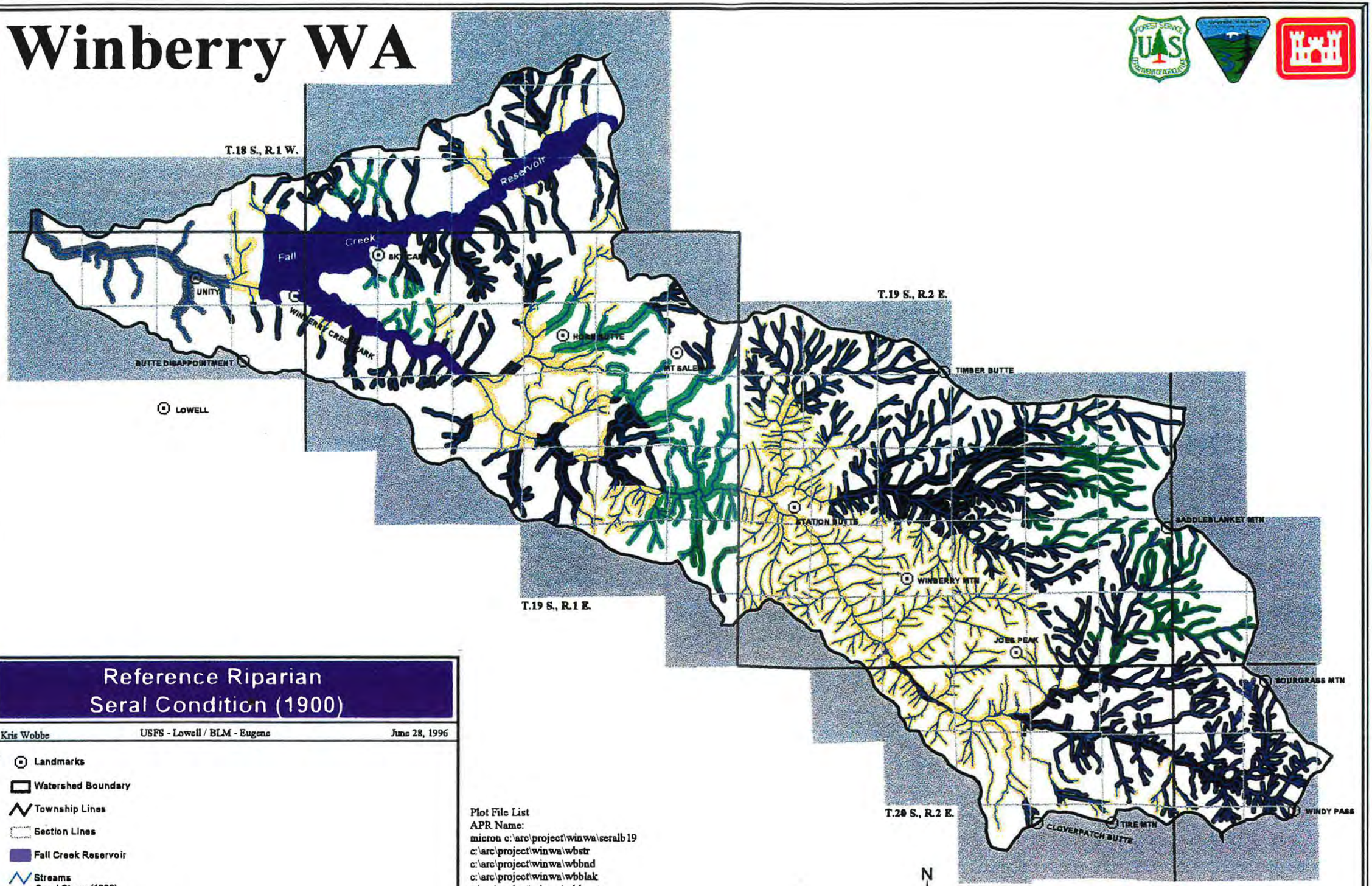
Plot File List
APR Name:
micron c:\arc\project\winwa\seralnow
c:\arc\project\winwa\wblocate
c:\arc\project\winwa\wbbnd
c:\arc\project\winwa\wbblak
c:\arc\project\winwa\wbvegall
c:\arc\project\winwa\wbstr
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wbtwnshp

N

Scale 1:80000

1 0 1 2 3 Miles

Winberry WA



Reference Riparian Seral Condition (1900)

Kris Wobbe — USFS - Lowell / BLM - Eugene — June 28, 1996

- Landmarks
- Watershed Boundary
- Township Lines
- Section Lines
- Fall Creek Reservoir
- Streams

Seral Stage (1900)
- Late Successional Old Growth
- Non-Forest
- Stem Exclusion
- Stem Initiation
- Understory Reinitiation

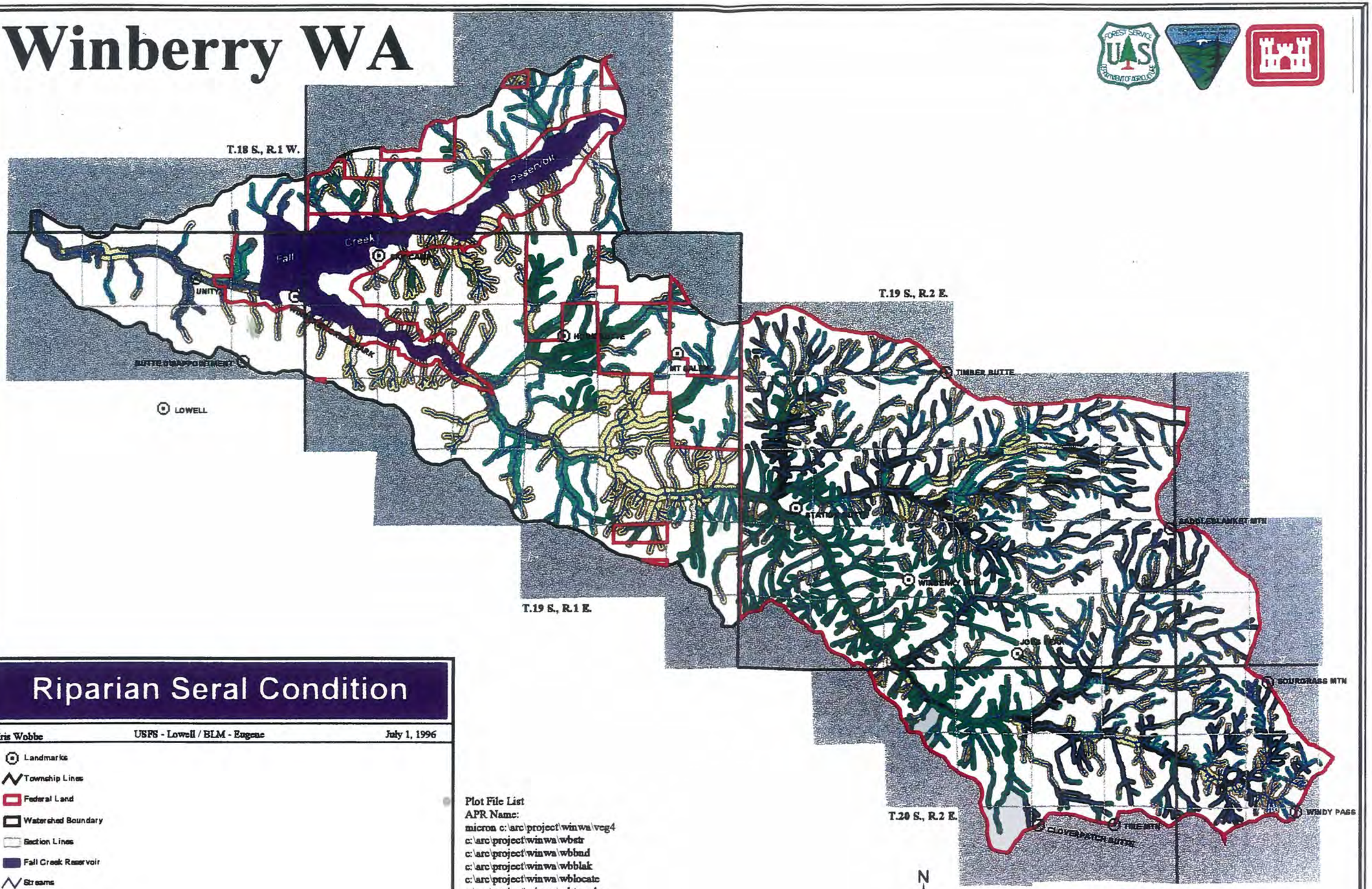
Plot File List
APR Name:
micron c:\arc\project\winwa\seralb19
c:\arc\project\winwa\wbstr
c:\arc\project\winwa\wbbnd
c:\arc\project\winwa\wbblak
c:\arc\project\winwa\wblocate
c:\arc\project\winwa\wbtwnshp
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wbvegall

N

Scale 1:80000

1 0 1 2 3 Miles

Winberry WA



Riparian Seral Condition

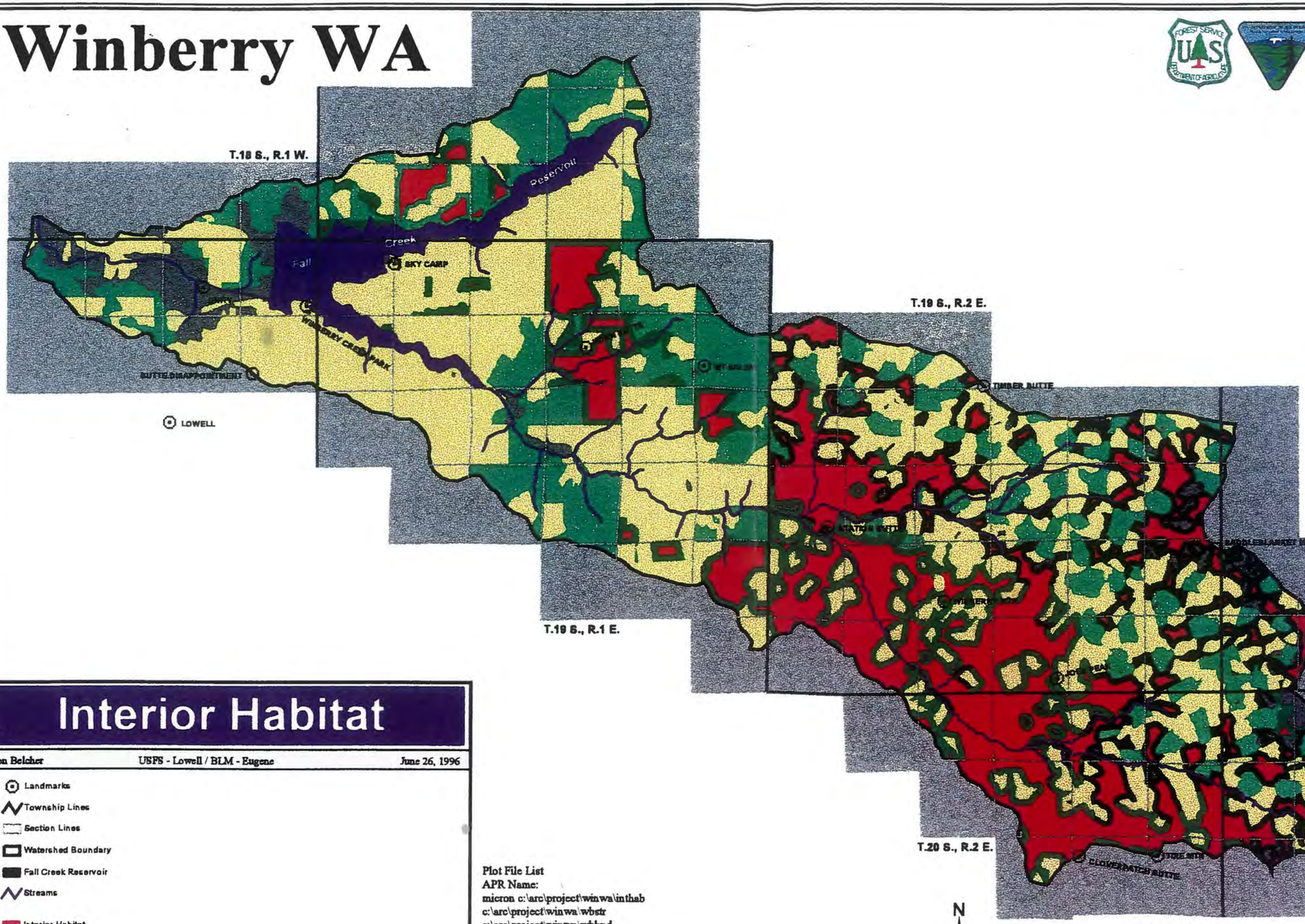
Kris Wobbe | USFS - Lowell / BLM - Eugene | July 1, 1996

- Landmarks
- Township Lines
- Federal Land
- Watershed Boundary
- Section Lines
- Fall Creek Reservoir
- Streams

Seral Stage
- Late Successional Old Growth
- Non-Forest
- Stem Exclusion
- Stem Initiation
- Understory Reinitiation

Plot File List
APR Name:
micron c:\arc\project\winwa\veg4
c:\arc\project\winwa\wbstr
c:\arc\project\winwa\wbbnd
c:\arc\project\winwa\wbblak
c:\arc\project\winwa\wblocate
c:\arc\project\winwa\wbtwnshp
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wbvgsbsd
c:\arc\project\winwa\wbown

Winberry WA



Interior Habitat

Jon Belcher | USFS - Lowell / BLM - Eugene | June 26, 1996

- Landmarks
- Township Lines
- Section Lines
- Watershed Boundary
- Fall Creek Reservoir
- Streams
- Interior Habitat

Seral Stage
- LSOG - Late Successional Oldgrowth
- NOT - Non Forest
- SE - Stem Exclusion
- SI - Stand Initiation
- UR - Understory Reinitiation

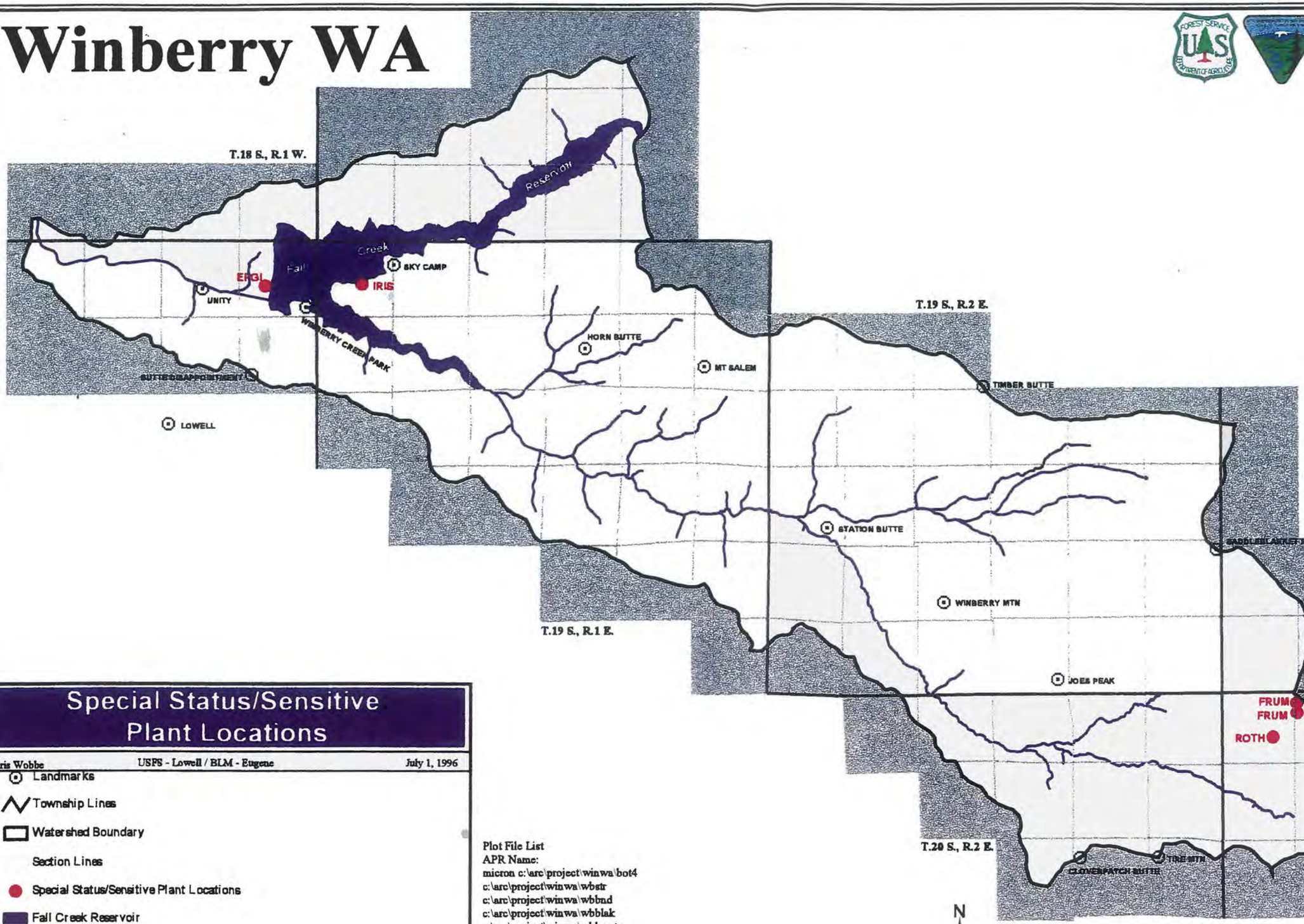
Plot File List
APR Name:
micron c:\arc\project\winwa\inthab
c:\arc\project\winwa\wbstr
c:\arc\project\winwa\wbbnd
c:\arc\project\winwa\wbblak
c:\arc\project\winwa\wblocate
c:\arc\project\winwa\wbvegall
c:\arc\project\winwa\wbinthab

N

Scale 1:80000

1 0 1 2 3 Miles

Winberry WA



Special Status/Sensitive Plant Locations

Kris Wobbe | USFS - Lowell / BLM - Eugene | July 1, 1996

- Landmarks
- Township Lines
- Watershed Boundary
- Section Lines
- Special Status/Sensitive Plant Locations
- Fall Creek Reservoir
- Streams

Plot File List
APR Name:
micron c:\arc\project\winwa\bot4
c:\arc\project\winwa\wbstr
c:\arc\project\winwa\wbbnd
c:\arc\project\winwa\wbblak
c:\arc\project\winwa\wblocate
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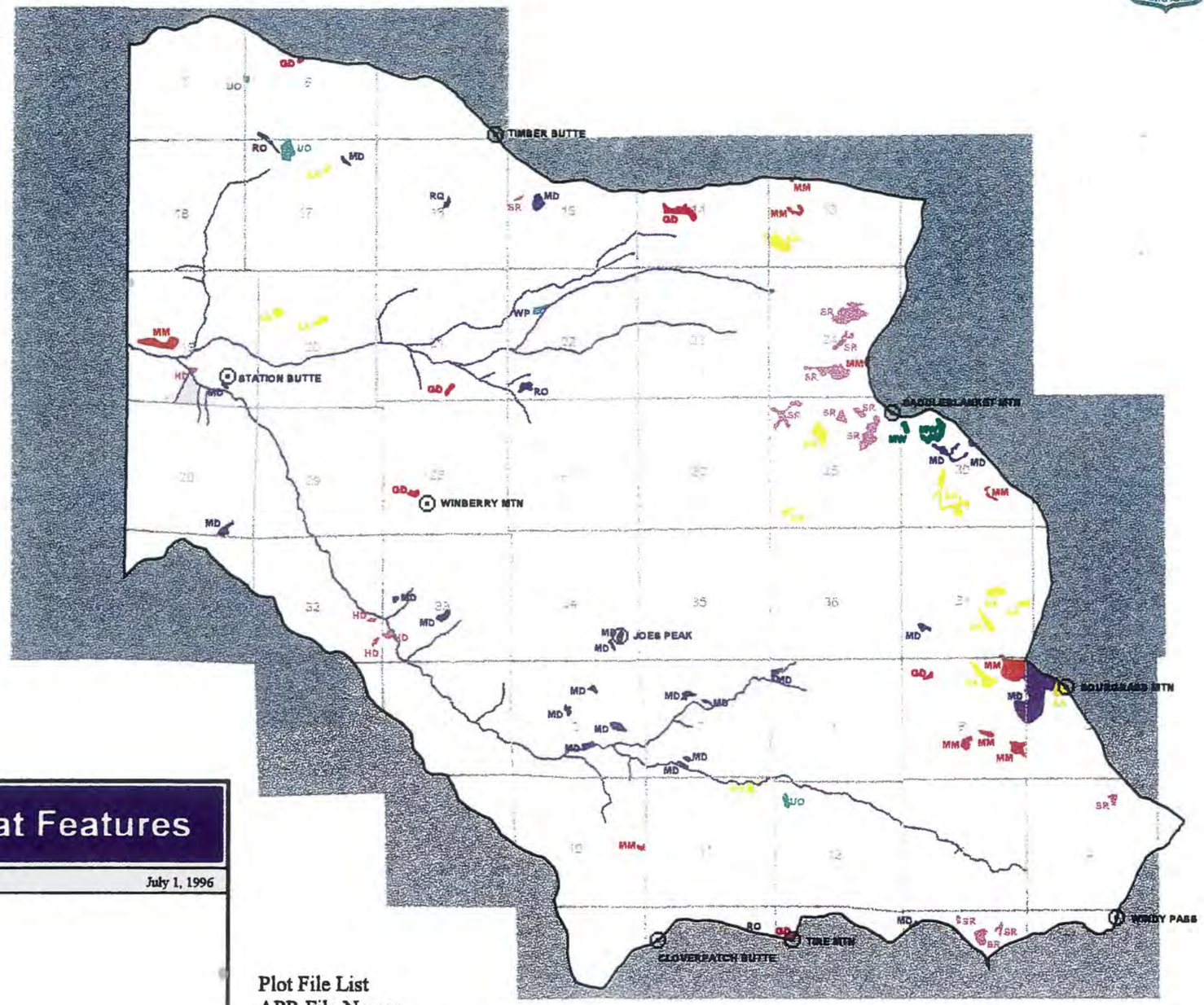
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wbtes

Winberry WA



USFS Special Habitat Features

Kris Wobbe | USFS - Lowell / BLM - Eugene | July 1, 1996

- Landmarks
- FS Watershed Boundary
- Section Lines
- Streams

Habitat Features

- GD - Dry Rock Garden
- HD - Hardwood Inclusion
- MD - Dry Meadow
- MM - Mesic Meadow
- MW - Wet Meadow
- RO - Rock Outcrop
- RQ - Rock Quarry
- SA - Sitka Alder
- SR - Vine Maple
- UO - Small Openings
- WP - Pond

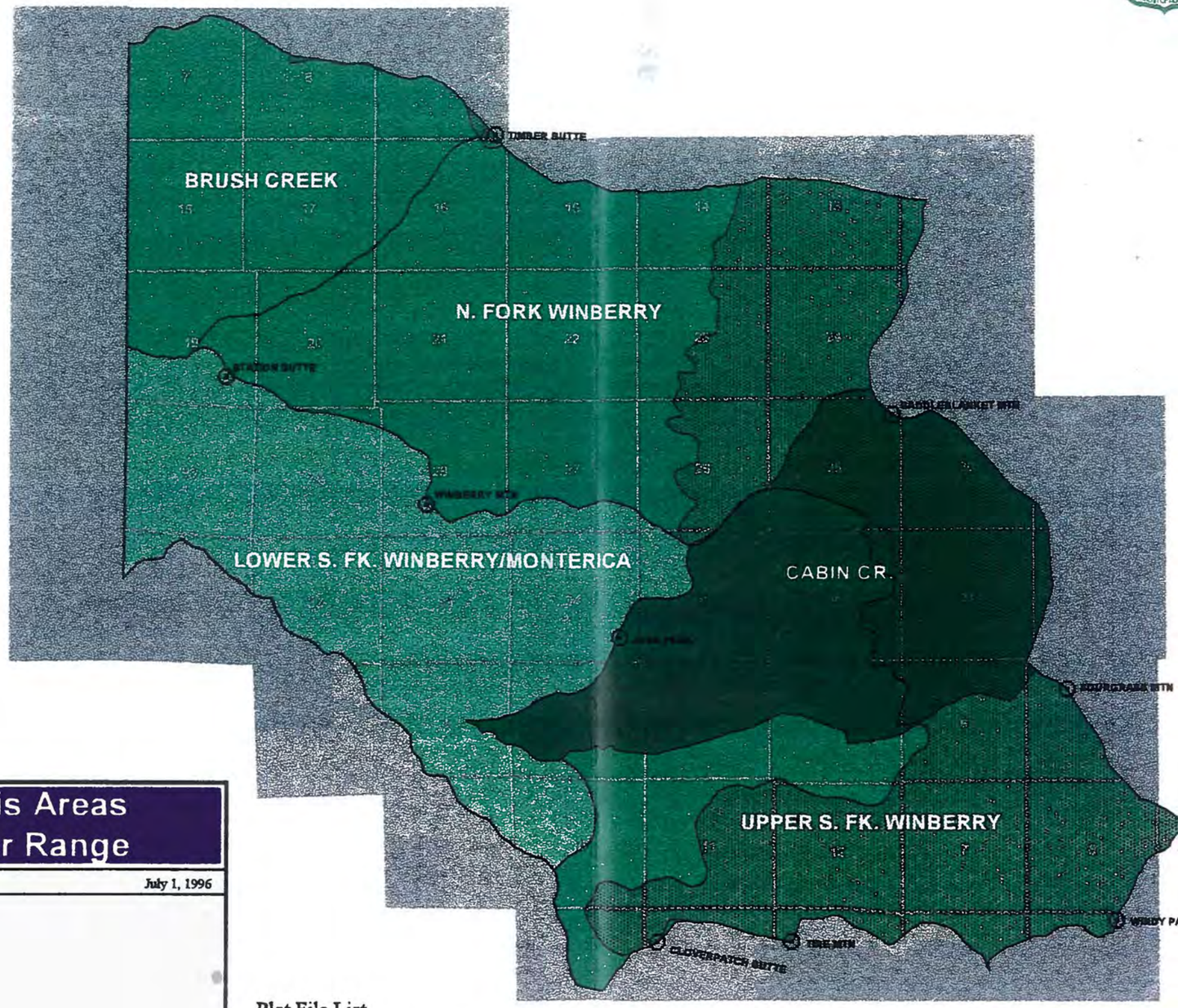
Plot File List
APR File Name:
micron c:\arc\project\winwa\botany2
c:\arc\project\winwa\wbshab
c:\arc\project\winwa\wbfbnd
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wblocate
c:\arc\project\winwa\wbfstr

N

Scale 1:60000

1 0 1 2 Miles

Winberry WA



Big Game Emphasis Areas and Winter/Summer Range

Kris Wobbe — USFS - Lowell / BLM - Eugene — July 1, 1996

- Landmarks
- Winter/Summer Range
  - Summer
  - Winter
- Section Lines
- Big Game Emphasis Level
  - High
  - Low
  - Moderate

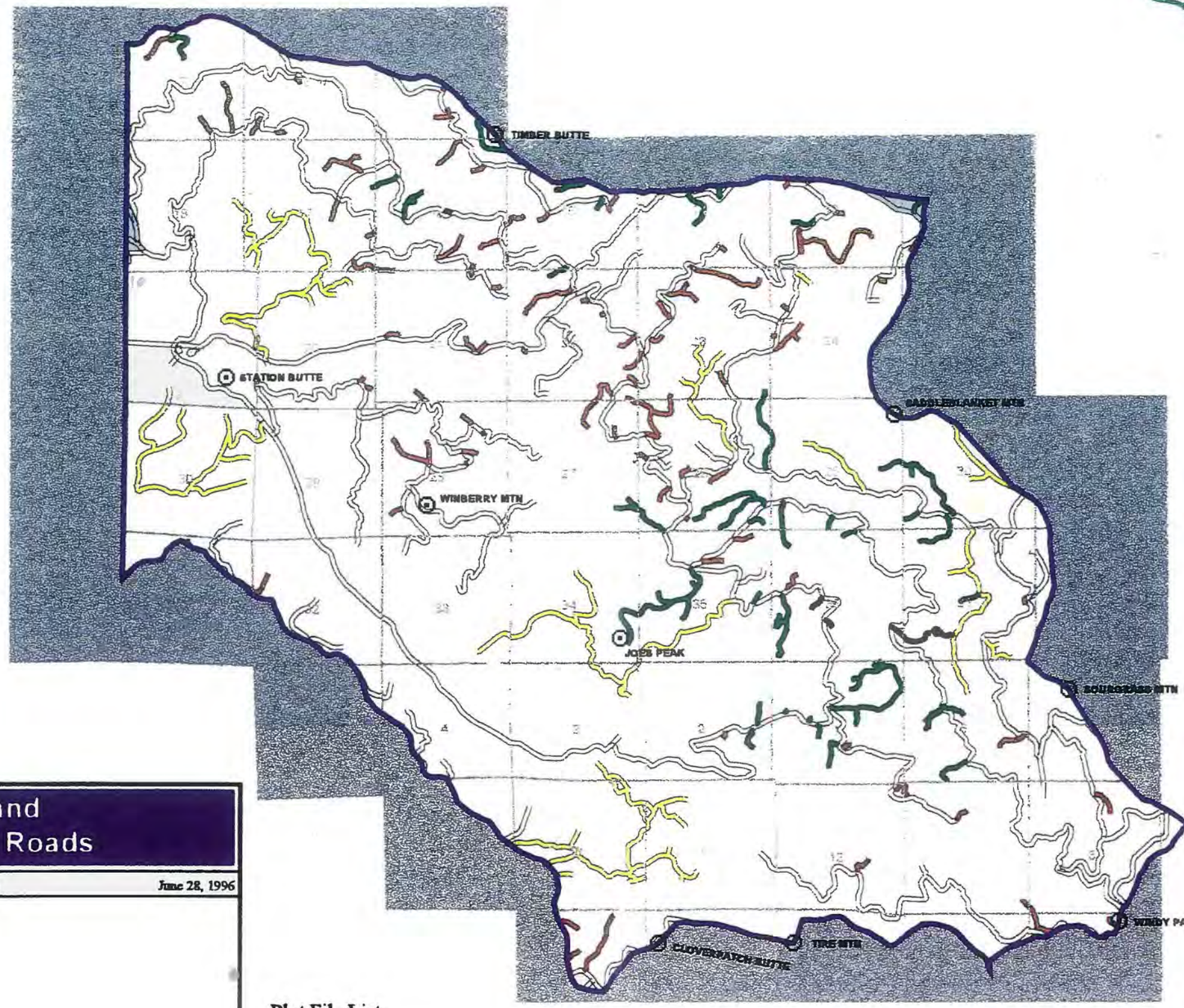
Plot File List
APR File Name:
micron c:\arc\project\winwa\wild11
c:\arc\project\winwa\wblocate
c:\arc\project\winwa\wbfelk
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wbfbgwsr

N

Scale 1:60000

1 0 1 2 Miles

Winberry WA



USFS Closed and Decommissioned Roads

Kris Wobbe | USFS - Lowell / BLM - Eugene | June 28, 1996

- Landmarks
- FS Watershed Boundary
- Section Lines

Closure Type
- Decommissioned Roads
- Closed By Gate
- Closed By Berm
- FS Roads

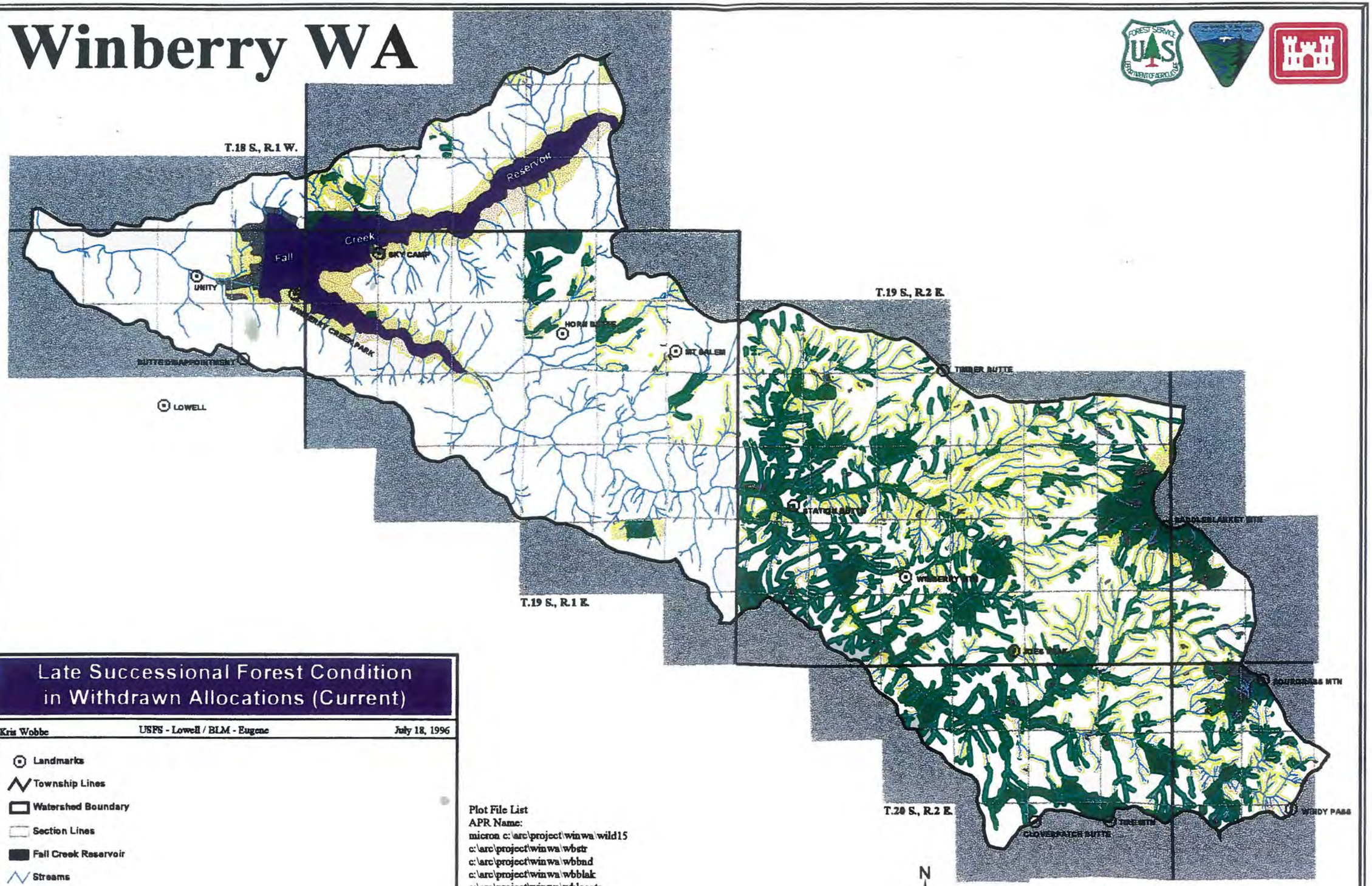
Plot File List
APR File Name:
micron c:\arc\project\winwa\wild14f
c:\arc\project\winwa\wbfroad
c:\arc\project\winwa\wbfbnd
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wblocate

N

Scale 1:60000

1 0 1 2 Miles

Winberry WA



Late Successional Forest Condition in Withdrawn Allocations (Current)

Kris Wobbe | USFS - Lowell / BLM - Eugene | July 18, 1996

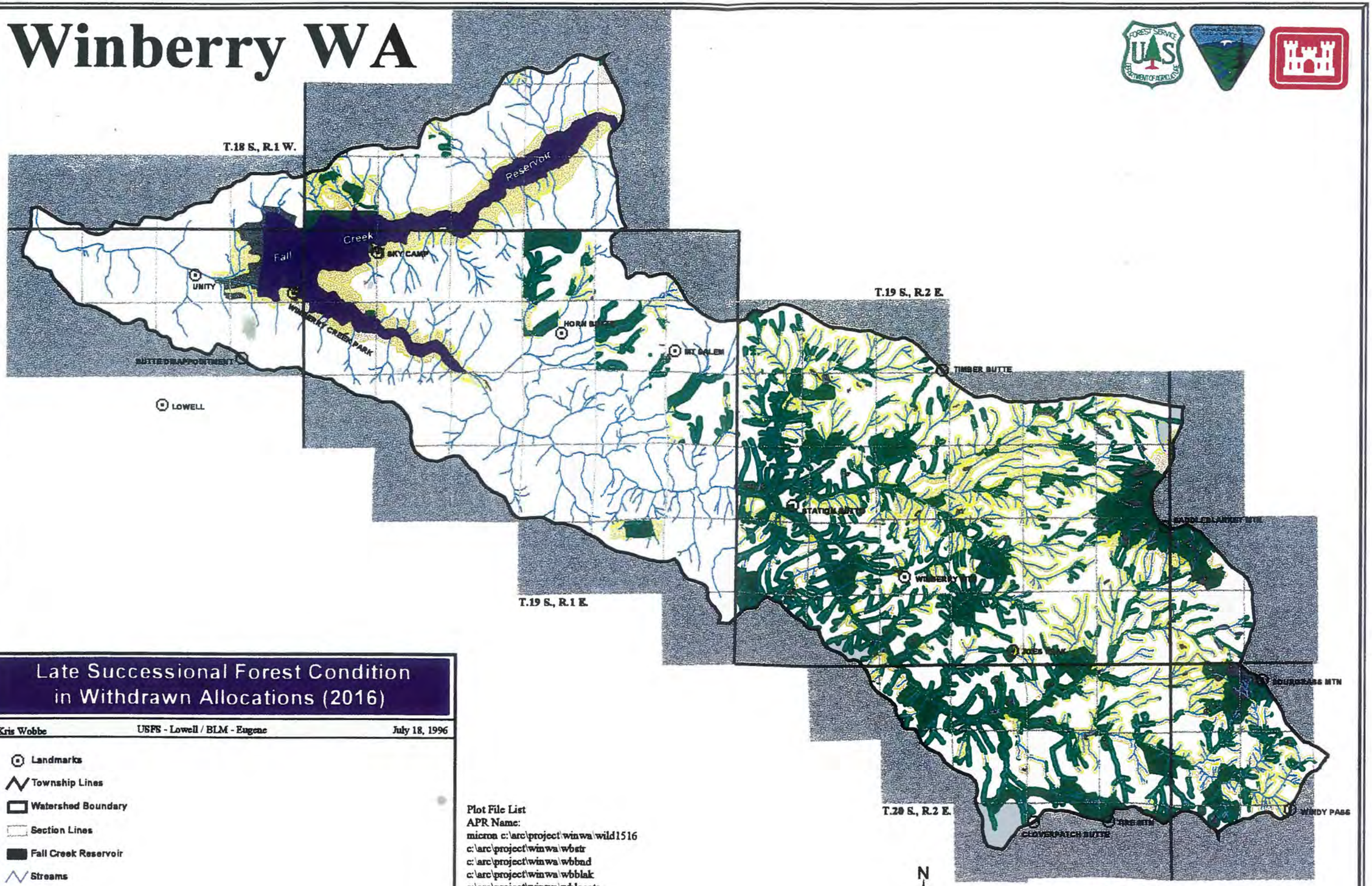
- Landmarks
- Township Lines
- Watershed Boundary
- Section Lines
- Fall Creek Reservoir
- Streams
- Non-Forest

Successional Forest Condition
- Early (<81 Years)
- Late (>80 Years)

Plot File List
APR Name:
micron c:\arc\project\winwa\wild15
c:\arc\project\winwa\wbstr
c:\arc\project\winwa\wbbnd
c:\arc\project\winwa\wblak
c:\arc\project\winwa\wblocate
c:\arc\project\winwa\wbtwnshp
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wbvegrsv
c:\arc\project\winwa\wbohbsdc

No warranty is made by the Federal Agencies for use of the data for purposes not intended by them

Winberry WA



Late Successional Forest Condition in Withdrawn Allocations (2016)

Kris Wobbe — USFS - Lowell / BLM - Eugene — July 18, 1996

- Landmarks
- Township Lines
- Watershed Boundary
- Section Lines
- Fall Creek Reservoir
- Streams
- Non-Forest

Successional Forest Condition
- Early (<81 Years)
- Late (>80 Years)

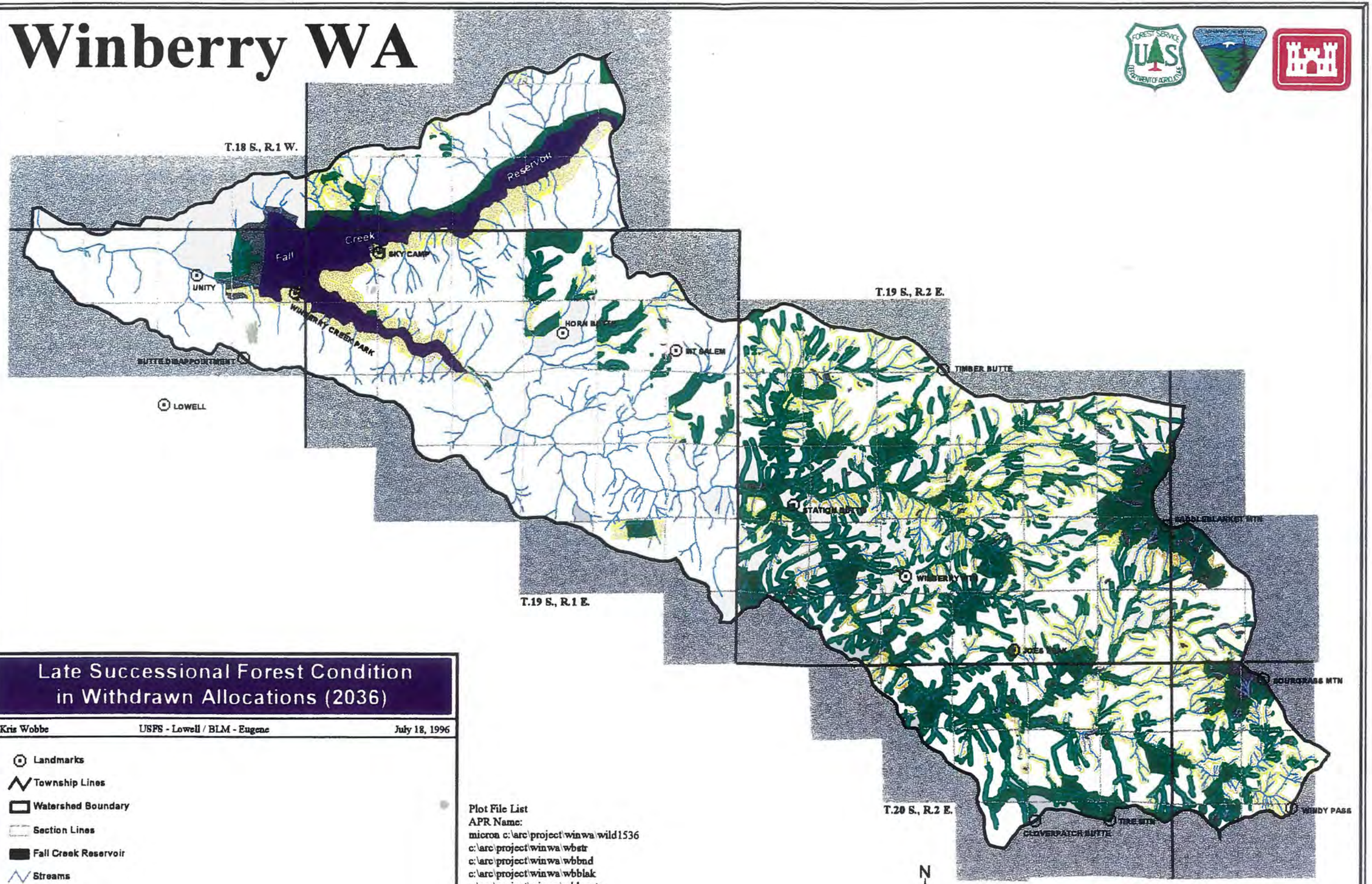
Plot File List
APR Name:
micron c:\arc\project\winwa\wild1516
c:\arc\project\winwa\wbstr
c:\arc\project\winwa\wbbnd
c:\arc\project\winwa\wbblak
c:\arc\project\winwa\wblocate
c:\arc\project\winwa\wbtwnshp
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wbvegrsv
c:\arc\project\winwa\wbohbsdc

N

Scale 1:80000

1 0 1 2 3 Miles

Winberry WA



Late Successional Forest Condition in Withdrawn Allocations (2036)

Kris Wobbe | USFS - Lowell / BLM - Eugene | July 18, 1996

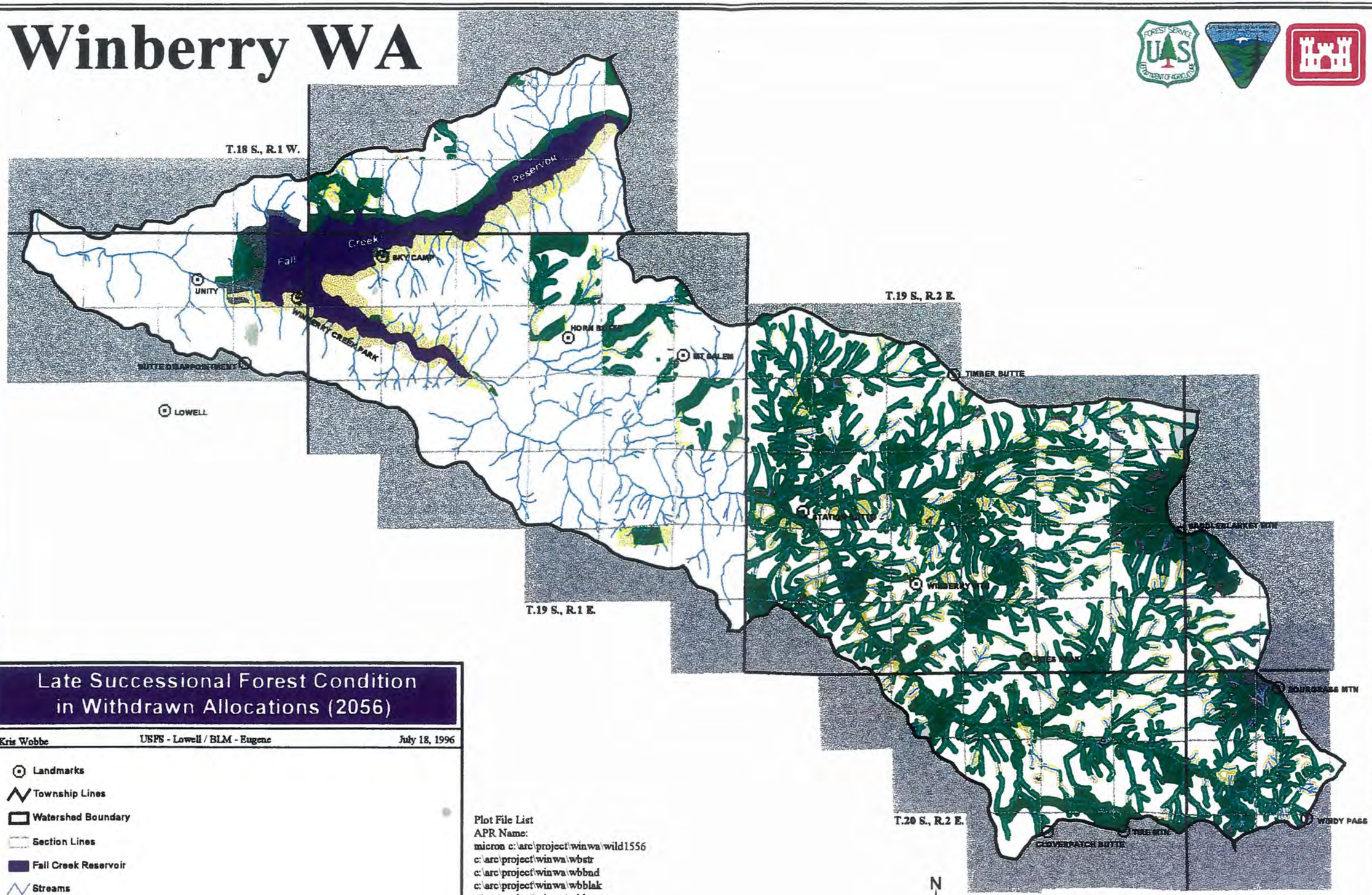
- Landmarks
- Township Lines
- Watershed Boundary
- Section Lines
- Fall Creek Reservoir
- Streams
- Non-Forest

Successional Forest Condition
- Early (<81 Years)
- Late (>80 Years)

Plot File List
APR Name:
micron c:\arc\project\winwa\wild1536
c:\arc\project\winwa\wbstr
c:\arc\project\winwa\wbbnd
c:\arc\project\winwa\wbblak
c:\arc\project\winwa\wblocate
c:\arc\project\winwa\wbtwnshp
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wbvegrsv
c:\arc\project\winwa\wbohbsdc

No warranty is made by the Federal Agencies for use of the data for purposes not intended by them

Winberry WA



Late Successional Forest Condition in Withdrawn Allocations (2056)

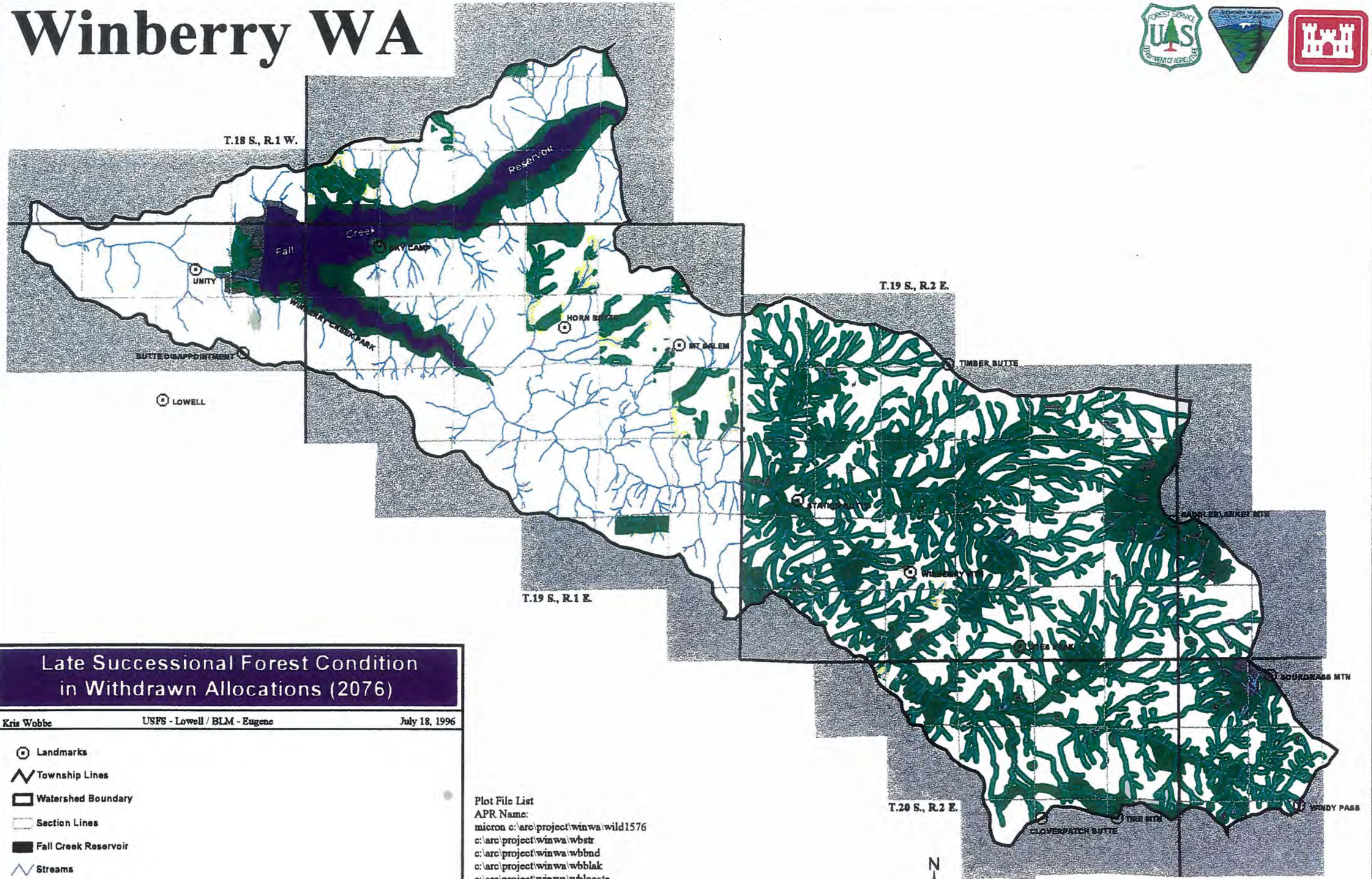
Kris Wobbe | USFS - Lowell / BLM - Eugene | July 18, 1996

- Landmarks
- Township Lines
- Watershed Boundary
- Section Lines
- Fall Creek Reservoir
- Streams
- Non-Forest

Successional Forest Condition
- Early (<81 Years)
- Late (>80 Years)

Plot File List
APR Name:
micron c:\arc\project\winwa\wild1556
c:\arc\project\winwa\wbstr
c:\arc\project\winwa\wbbnd
c:\arc\project\winwa\wbblak
c:\arc\project\winwa\wblocate
c:\arc\project\winwa\wbtwnshp
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wbvegrsv
c:\arc\project\winwa\wbohbsdc

Winberry WA



Late Successional Forest Condition in Withdrawn Allocations (2076)

Kris Wobbe | USFS - Lowell / BLM - Eugene | July 18, 1996

- Landmarks
- Township Lines
- Watershed Boundary
- Section Lines
- Fall Creek Reservoir
- Streams
- Non-Forest

Successional Forest Condition
- Early (<81 Years)
- Late (>80 Years)

Plot File List
APR Name:
micron c:\arc\project\winwa\wild1576
c:\arc\project\winwa\wbstr
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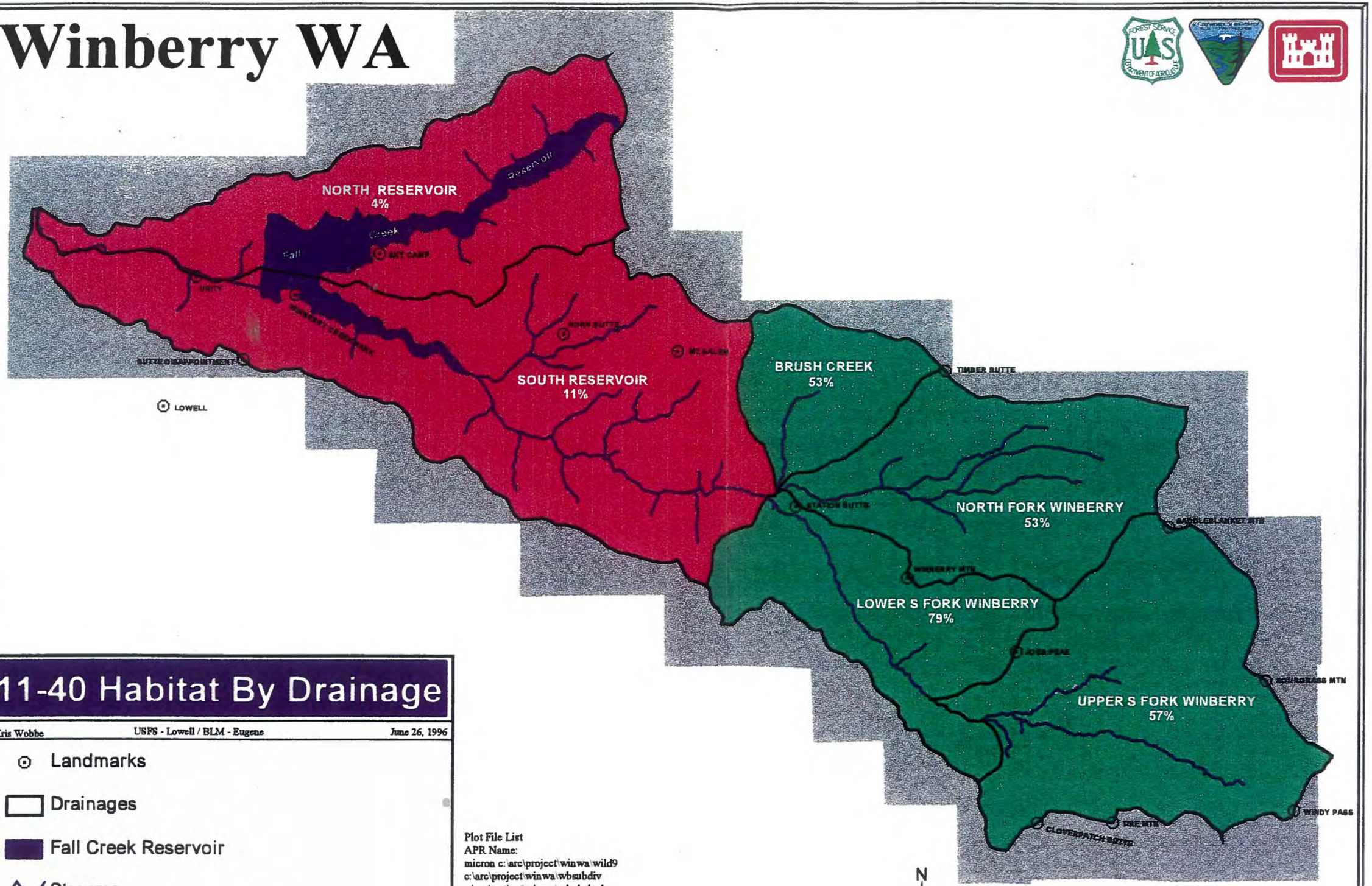
c:\arc\project\winwa\wbblak
c:\arc\project\winwa\wblocate
c:\arc\project\winwa\wbtwnshp
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wbvegrsv
c:\arc\project\winwa\wbohbsdc

Winberry WA



11-40 Habitat By Drainage

Kris Wobbe | USFS - Lowell / BLM - Eugene | June 26, 1996

- Landmarks
- Drainages
- Fall Creek Reservoir
- Streams
- < 50%
- > 50%

Plot File List
APR Name:
micron c:\arc\project\winwa\wild9
c:\arc\project\winwa\wbsubdiv
c:\arc\project\winwa\wbohabsd
c:\arc\project\winwa\wblocate
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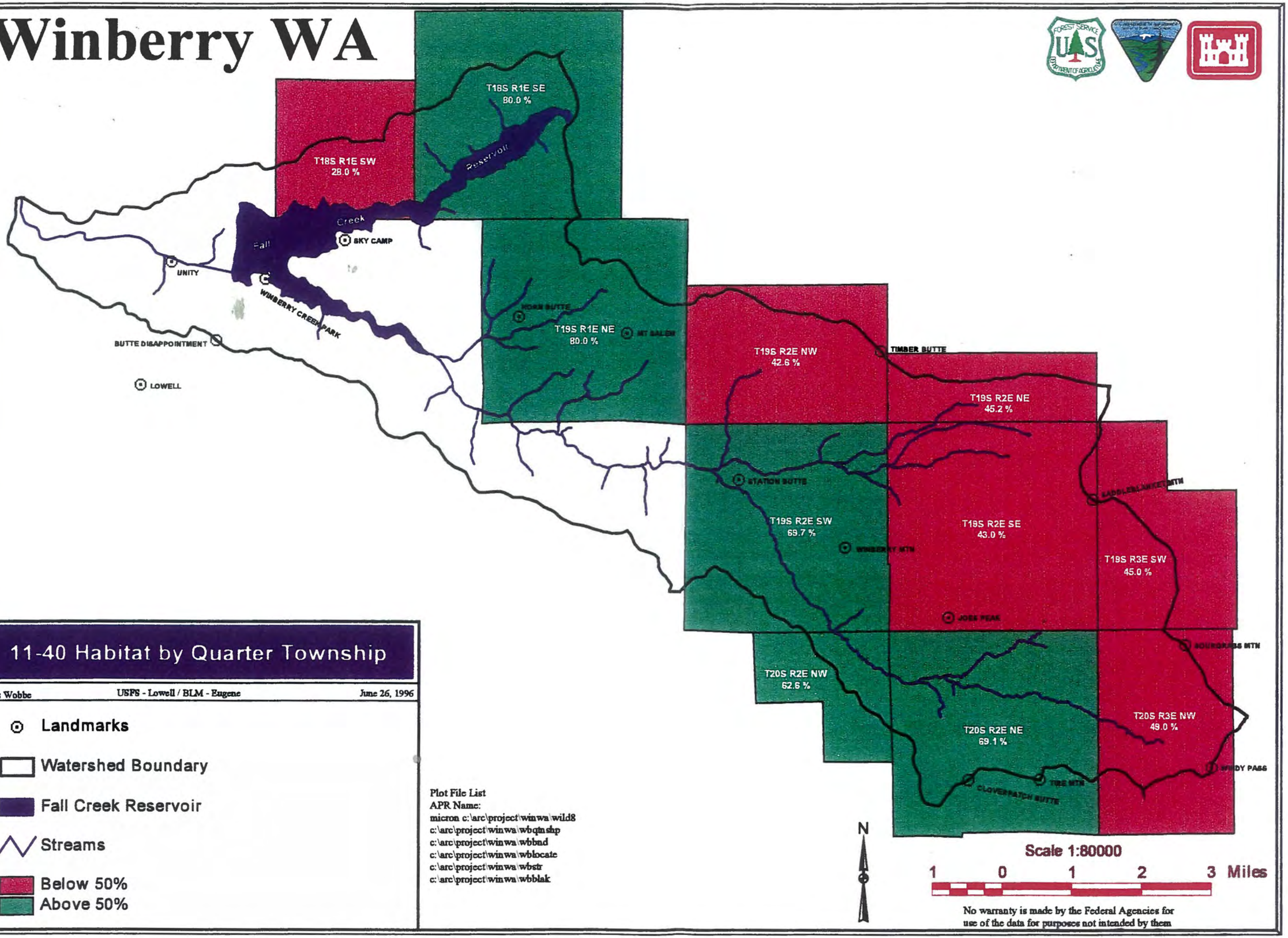
N

Scale 1:80000

1 0 1 2 3 Miles

Winberry WA



11-40 Habitat by Quarter Township

Kris Wobbe — USFS - Lowell / BLM - Eugene — June 26, 1996

- Landmarks
- Watershed Boundary
- Fall Creek Reservoir
- Streams
- Below 50%
- Above 50%

Plot File List
APR Name:
micron c:\arc\project\winwa\wild8
c:\arc\project\winwa\wbqtnshp
c:\arc\project\winwa\wbbnd
c:\arc\project\winwa\wblocate
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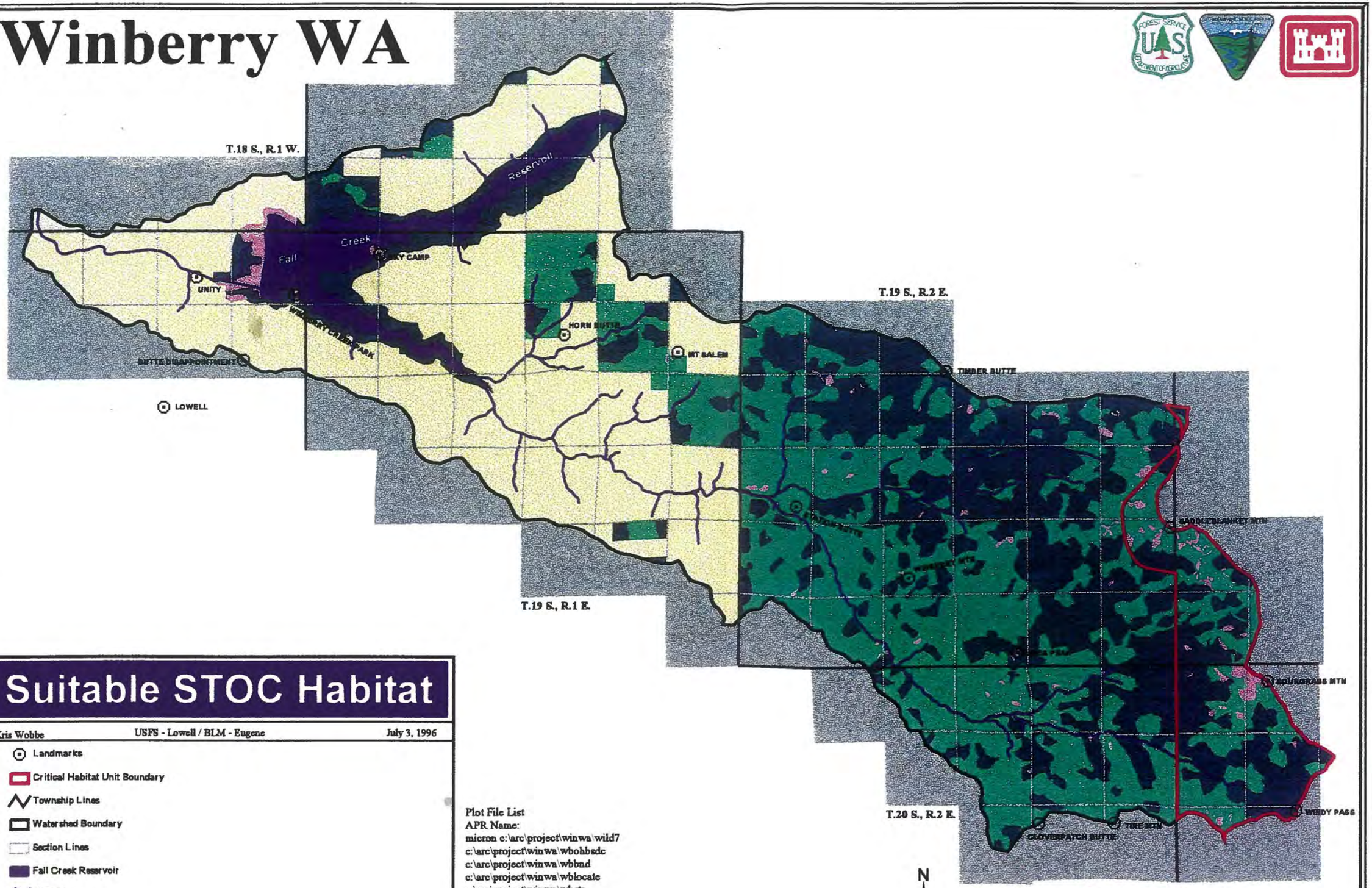
c:\arc\project\winwa\wbblak

Winberry WA



Suitable STOC Habitat

Kris Wobbe — USFS - Lowell / BLM - Eugene — July 3, 1996

- Landmarks
- Critical Habitat Unit Boundary
- Township Lines
- Watershed Boundary
- Section Lines
- Fall Creek Reservoir
- Streams
- STOC Habitat
- Suitable
- Non-Suitable/Non-Capable Federal Land
- Capable
- Private Land

Plot File List
APR Name:
micron c:\arc\project\winwa\wild7
c:\arc\project\winwa\wbohbsdc
c:\arc\project\winwa\wbbnd
c:\arc\project\winwa\wblocate
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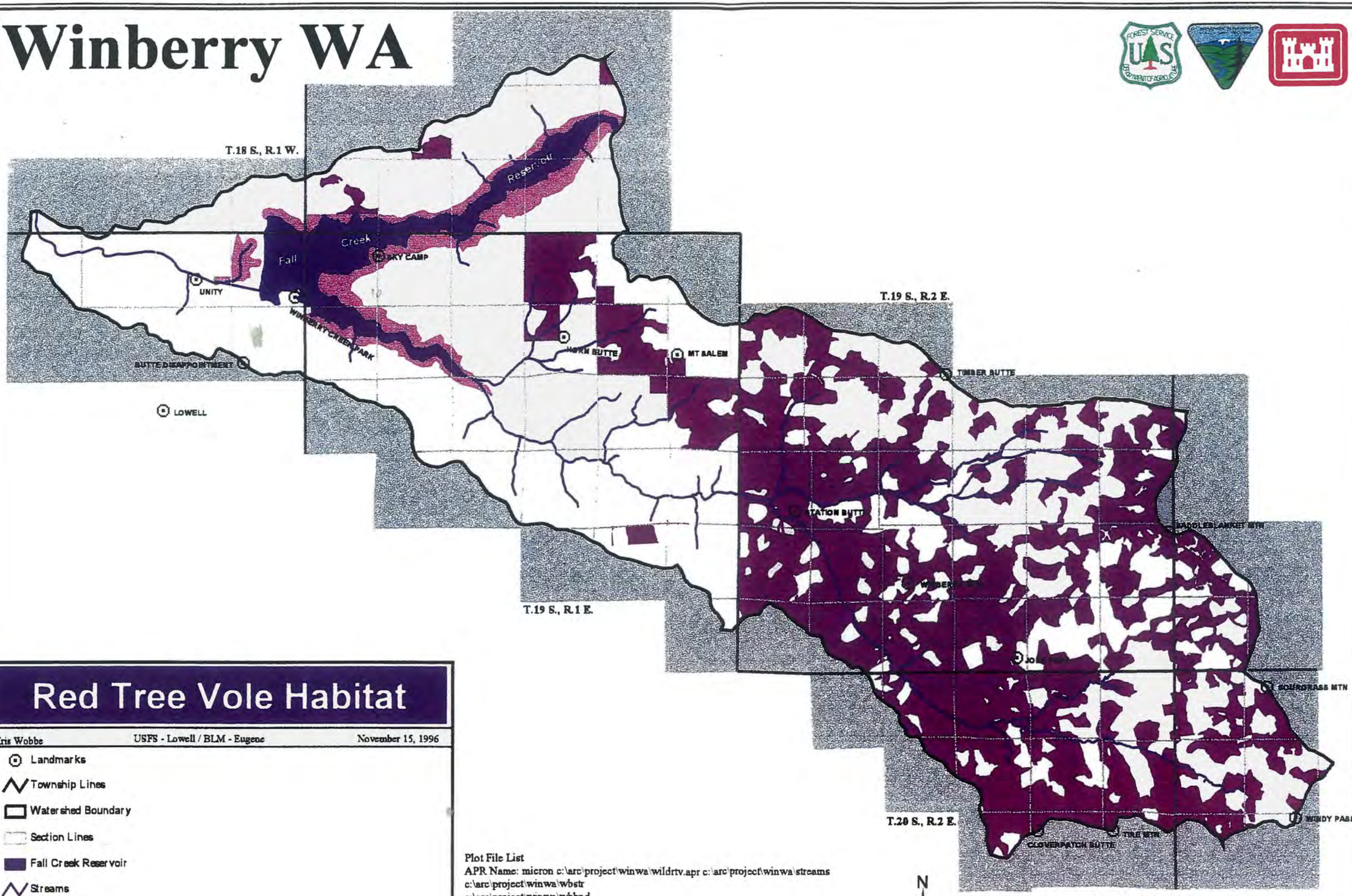
c:\arc\project\winwa\wbchu
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wbtwnshp

Winberry WA



Red Tree Vole Habitat

Kris Wobbe | USFS - Lowell / BLM - Eugene | November 15, 1996

- Landmarks
- Township Lines
- Watershed Boundary
- Section Lines
- Fall Creek Reservoir
- Streams
- Potential Habitat
- Potential Habitat on COE Lands

Plot File List
APR Name: micron c:\arc\project\winwa\wildrtv.apr c:\arc\project\winwa\streams
c:\arc\project\winwa\wbstr
c:\arc\project\winwa\wbbnd
c:\arc\project\winwa\wbblak
c:\arc\project\winwa\wbvegall
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wbtwnshp

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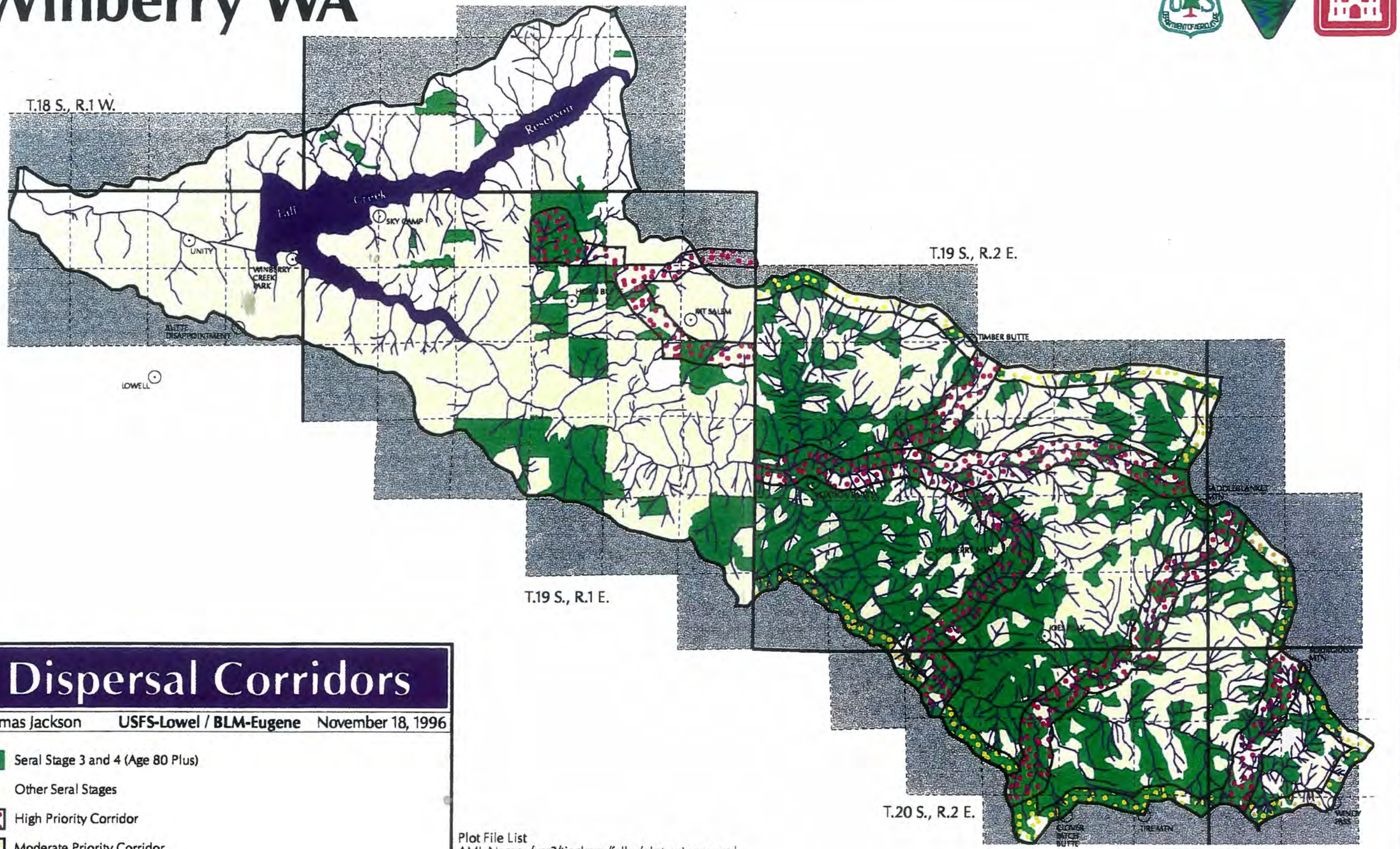
Scale 1:80000

1 0 1 2 3 Miles

Winberry WA



Dispersal Corridors

Thomas Jackson **USFS-Lowel / BLM-Eugene** November 18, 1996

- Seral Stage 3 and 4 (Age 80 Plus)
- Other Seral Stages
- High Priority Corridor
- Moderate Priority Corridor

Plot File List
AML Name: /usr3/tjackson/fallcr/plot_wincorr.aml
Plot To: wb_dispcorr.gra
/nfs/or0500/usr7/winberry/wb_greyback
/nfs/or0500/usr7/winberry/wb_seral96
/nfs/or0500/home/gmiller/arc/wincorridor
/nfs/or0500/usr7/winberry/wb_pls
/nfs/or0500/usr7/winberry/wb_lak
/nfs/or0500/usr7/winberry/wb_hyd
/nfs/or0500/usr7/winberry/wb_bnd
/nfs/or0500/usr7/winberry/wb_locat2

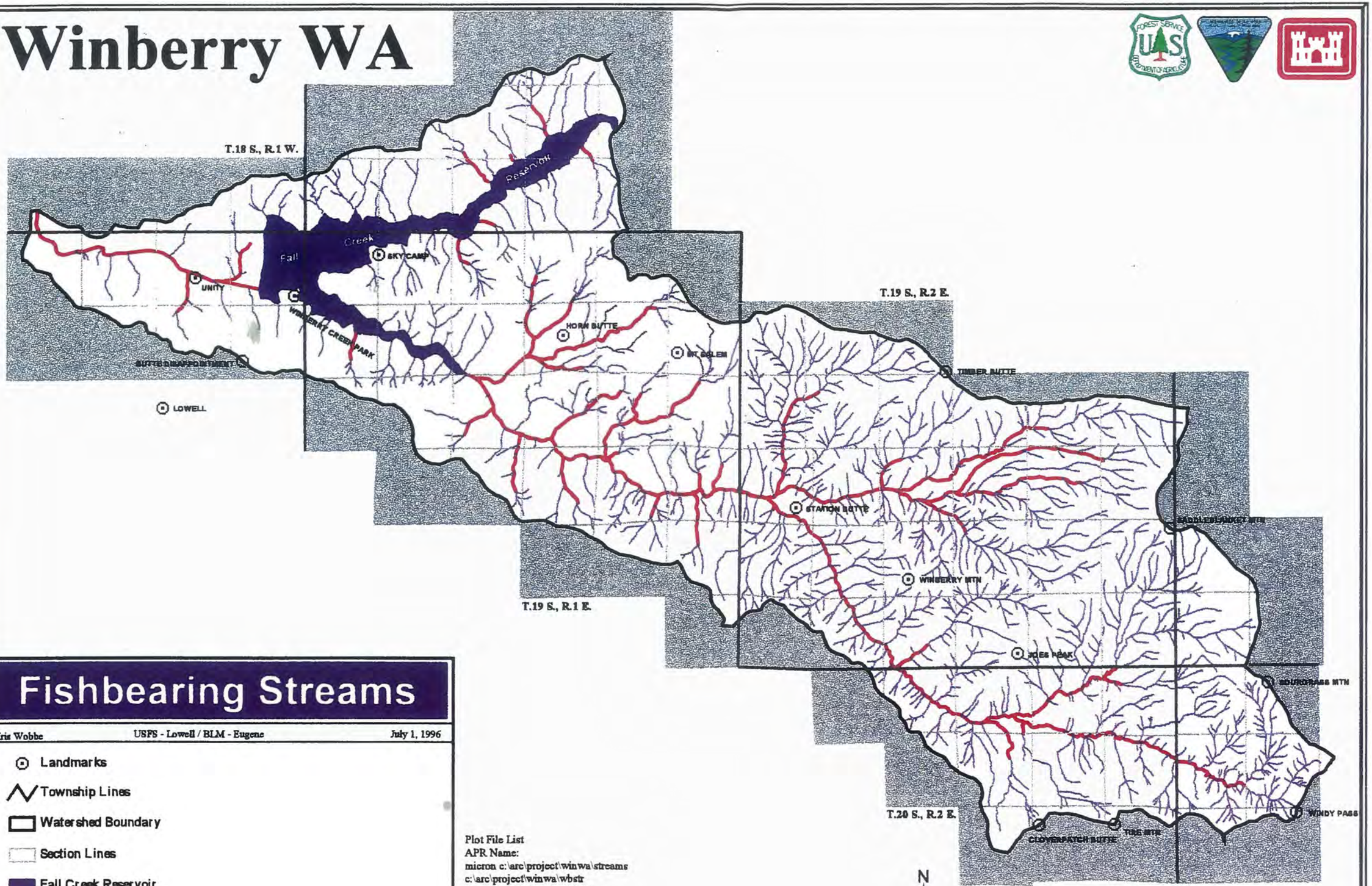
N

Scale 1:80000

1 0 1 2 3

Miles

Winberry WA



Fishbearing Streams

Kris Wobbe — USFS - Lowell / BLM - Eugene — July 1, 1996

- Landmarks
- Township Lines
- Watershed Boundary
- Section Lines
- Fall Creek Reservoir
- Streams
- Non-Fishbearing
- Fishbearing

Plot File List
APR Name:
micron c:\arc\project\winwa\streams
c:\arc\project\winwa\wbstr
c:\arc\project\winwa\wbbnd
c:\arc\project\winwa\wbblak
c:\arc\project\winwa\wblocate
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wbtwnshp

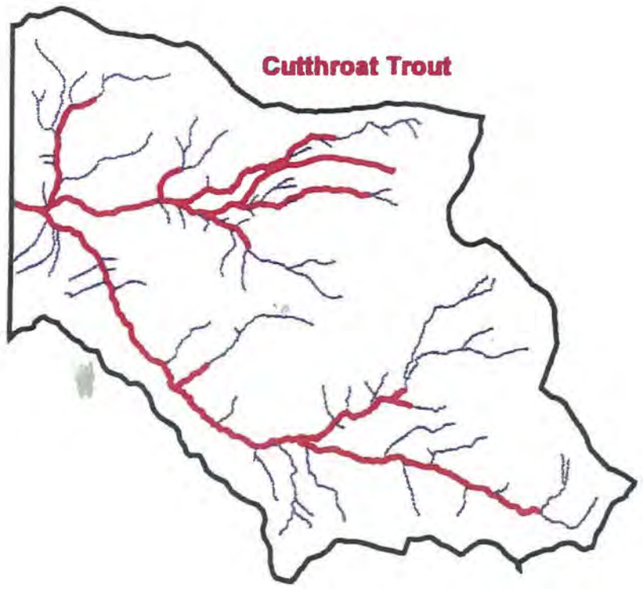
N

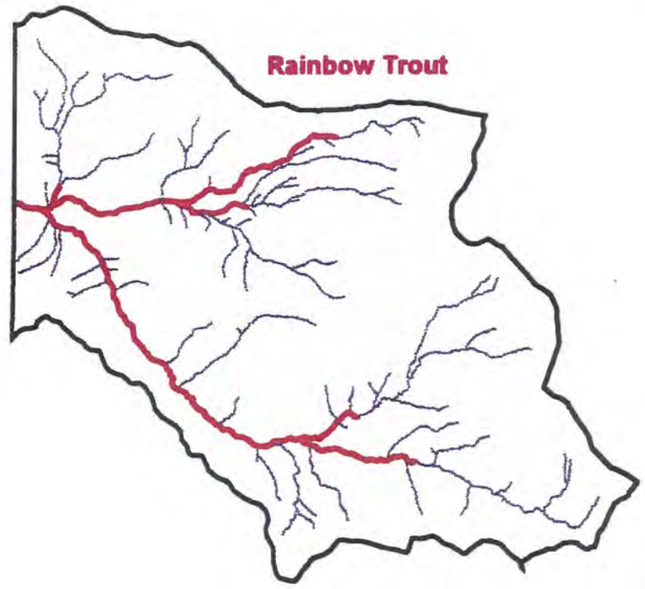
Scale 1:80000

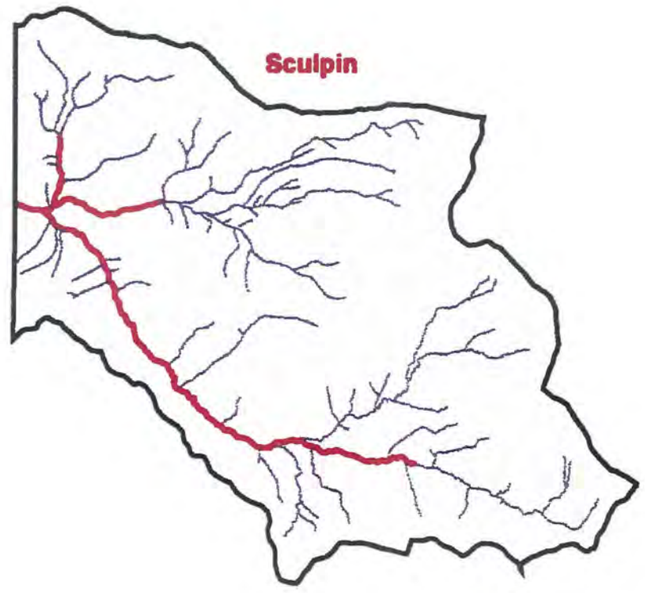
1 0 1 2 3 Miles

No warranty is made by the Federal Agencies for use of the data for purposes not intended by them

Winberry WA







USFS Fish Distribution

Kris Wobbe | USFS - Lowell / BLM - Eugene | June 26, 1996

FS Watershed Boundary

Streams
Fish Distribution

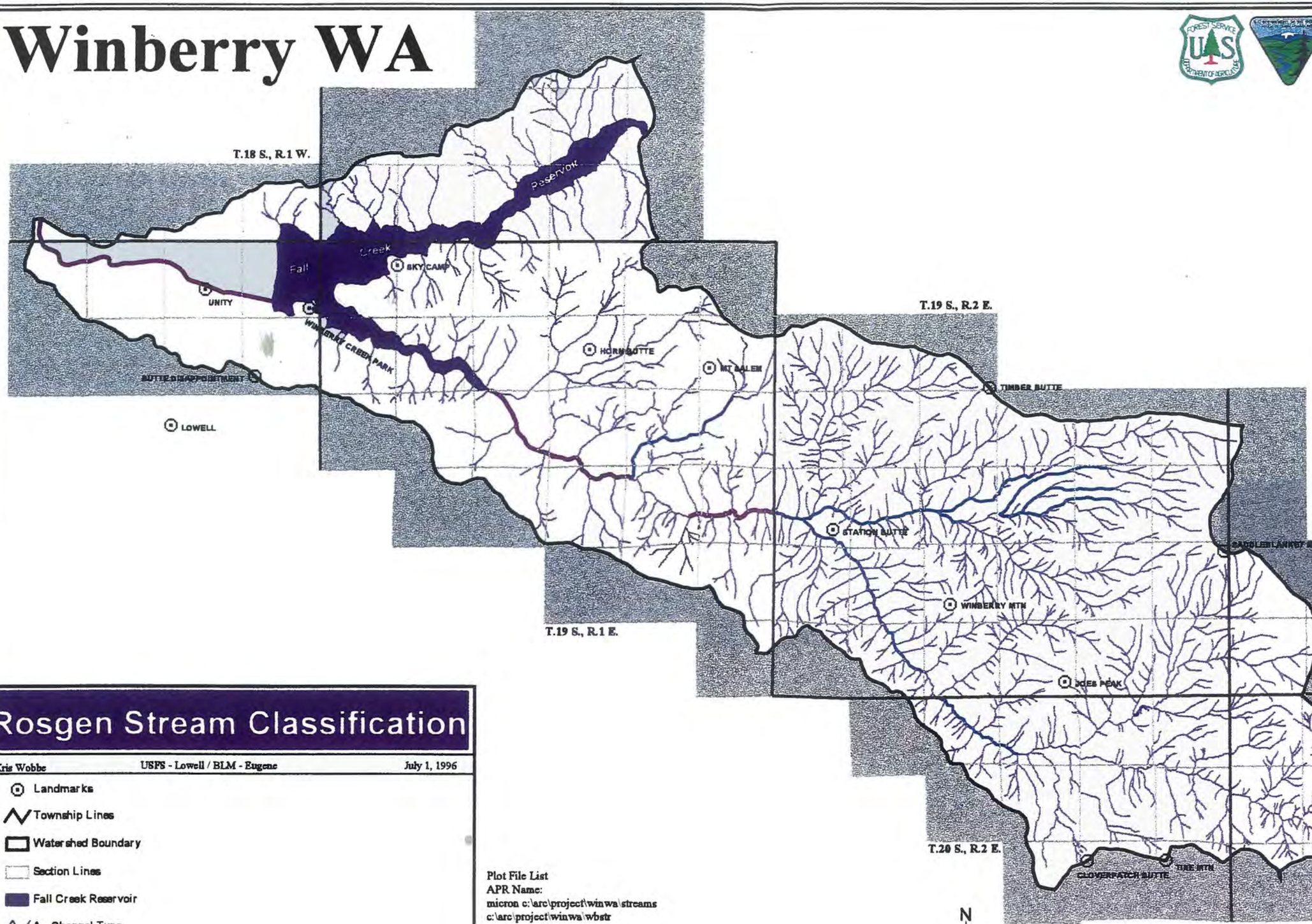
Plot File List
APR Name:
micron c:\arc\project\winwa\fishdist
c:\arc\project\winwa\wbfstr
c:\arc\project\winwa\wbflbnd

N

Scale 1:125000

1 0 1 2 3 4 5 Miles

Winberry WA



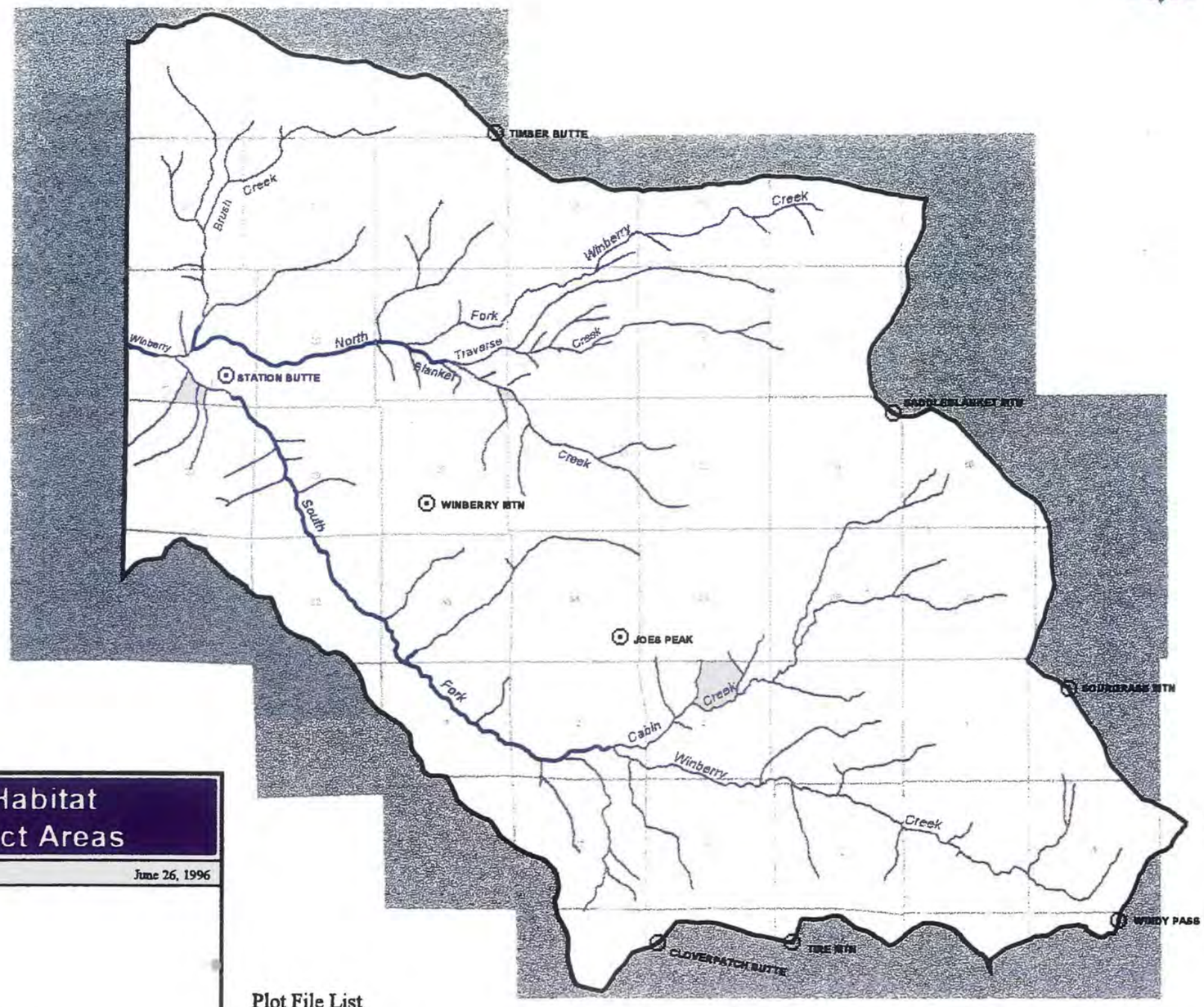
Rosgen Stream Classification

Kris Wobbe — USFS - Lowell / BLM - Eugene — July 1, 1996

- Landmarks
- Township Lines
- Watershed Boundary
- Section Lines
- Fall Creek Reservoir
- A - Channel Type
- B - Channel Type
- F - Channel Type

Plot File List
APR Name:
micron c:\arc\project\winwa\streams
c:\arc\project\winwa\wbstr
c:\arc\project\winwa\wbbnd
c:\arc\project\winwa\wbblak
c:\arc\project\winwa\wblocate
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wbtwnshp

Winberry WA



USFS Completed Habitat Enhancement Project Areas

Kris Wobbe | USFS - Lowell / BLM - Eugene | June 26, 1996

- Landmarks
- FS Watershed Boundary
- Other Streams
  Completed Habitat Enhancement Project Areas
- Section Lines

Plot File List
APR File Name:
micron c:\arc\project\winwa\strstruc
c:\arc\project\winwa\wbfstr
c:\arc\project\winwa\wbfbnd
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wblocate

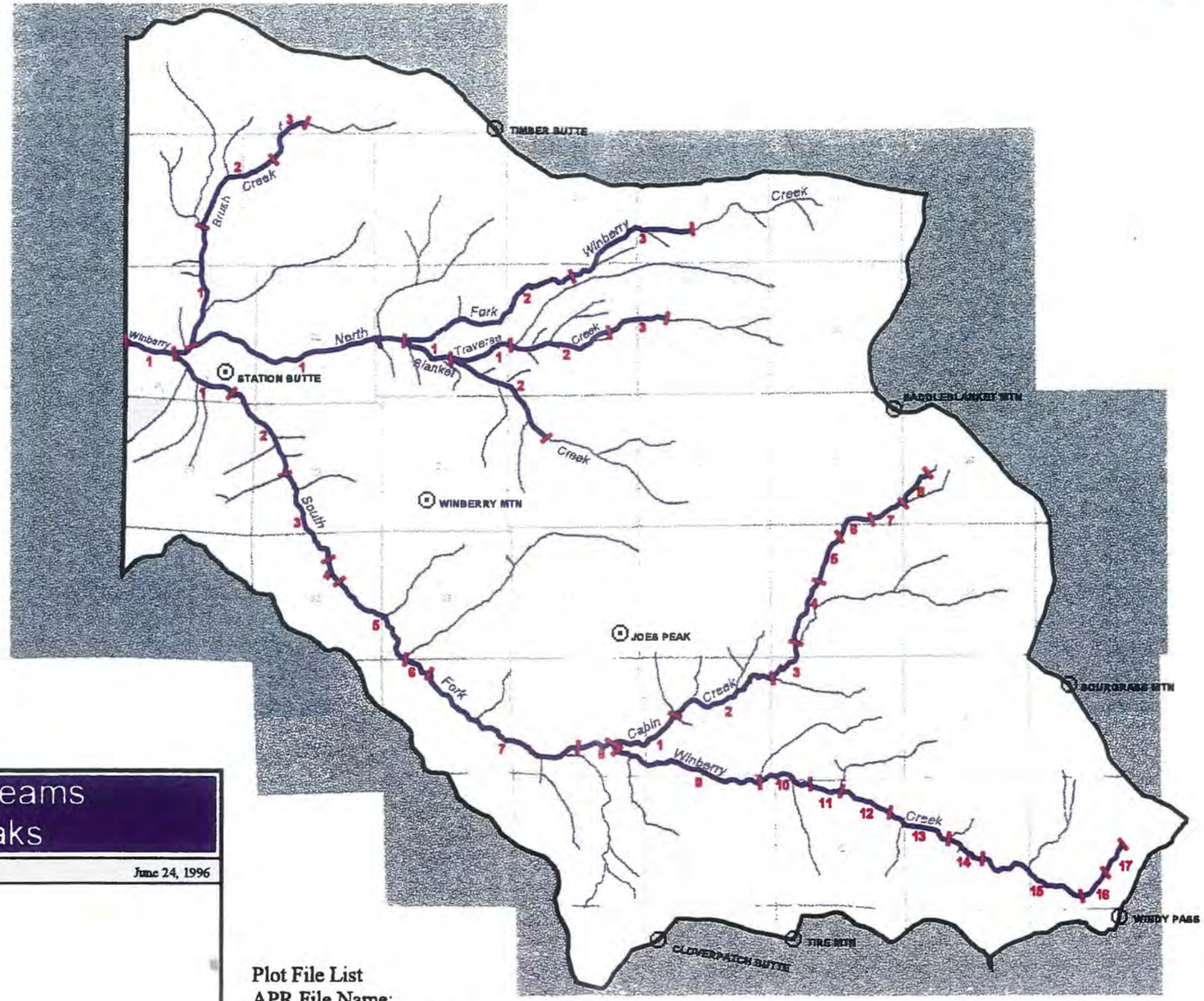
N

Scale 1:60000

1 0 1 2 Miles

No warranty is made by the Federal Agencies for use of the data for purposes not intended by them

Winberry WA



USFS Surveyed Streams With Reach Breaks

Kris Wobbe | USFS - Lowell / BLM - Eugene | June 24, 1996

- Landmarks
- Reach Break
- FS Watershed Boundary
- Other Streams
- Surveyed Streams
- Section Lines

Plot File List
APR File Name:
micron c:\arc\project\winwa\stream2
c:\arc\project\winwa\wbreach
c:\arc\project\winwa\wbfstr
c:\arc\project\winwa\wbfbnd
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wblocate

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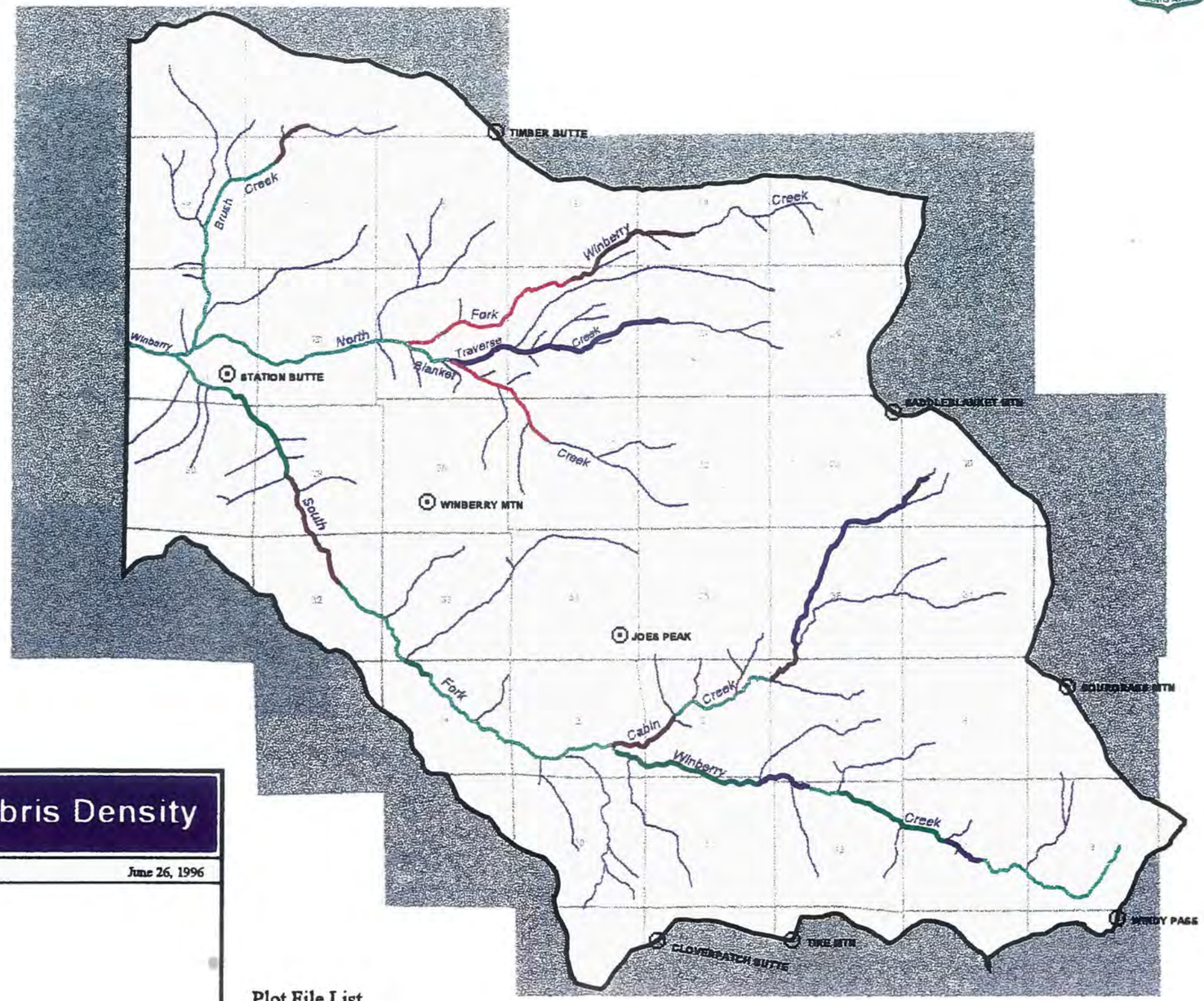
Scale 1:60000

1 0 1 2 Miles

Winberry WA



USFS Large Woody Debris Density

Kris Wobbe | USFS - Lowell / BLM - Eugene | June 26, 1996

- Landmarks
- FS Watershed Boundary
- Level of LWD
  - Low
  - Moderate/Low
  - Moderate
  - Moderate/High
  - High
- Other Streams
- Section Lines

Plot File List
APR File Name:
micron c:\arc\project\winwa\strlwd
c:\arc\project\winwa\wbfstr
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c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wblocate

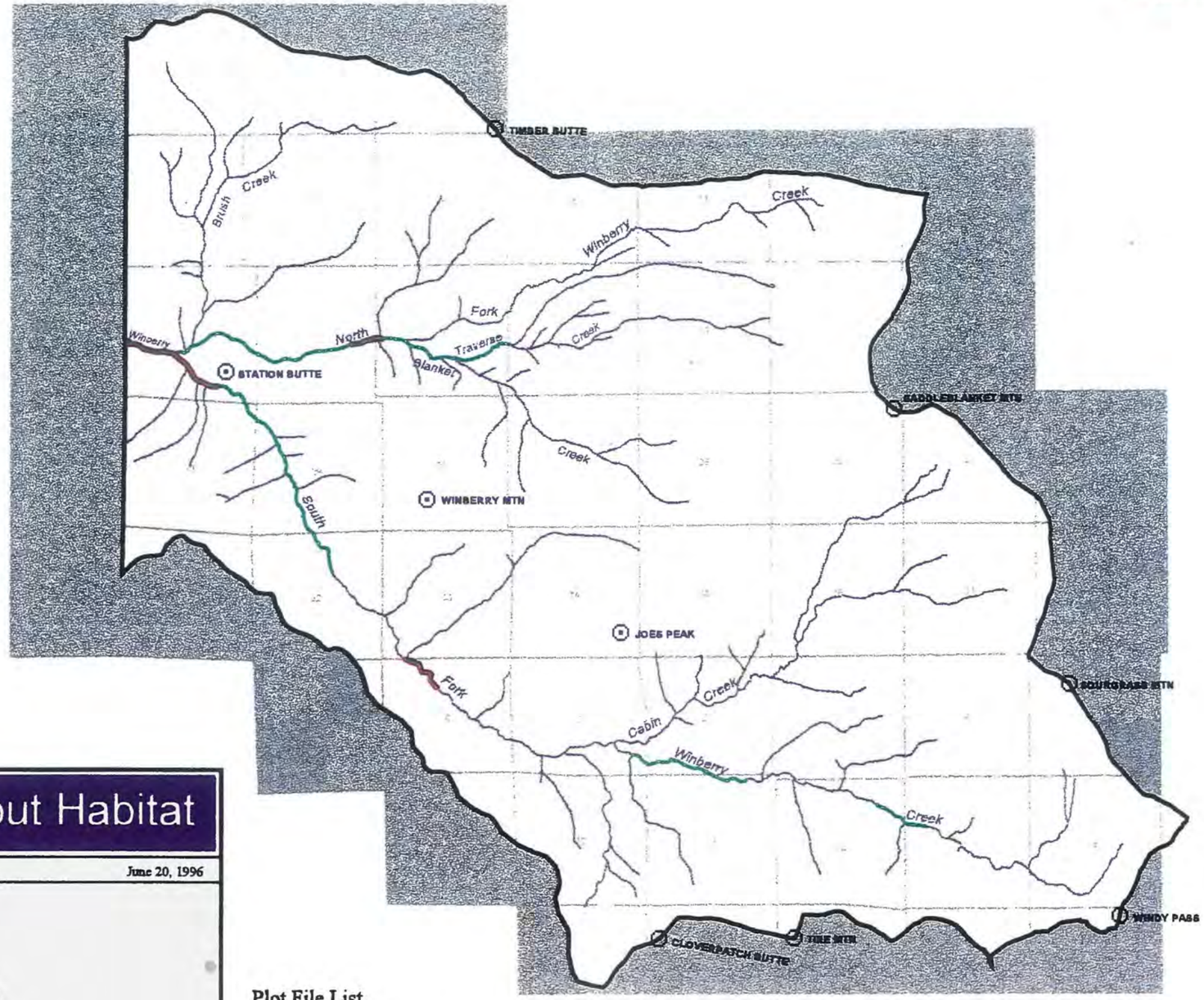
N

Scale 1:60000

1 0 1 2 Miles

No warranty is made by the Federal Agencies for use of the data for purposes not intended by them

Winberry WA



USFS Resident Trout Habitat

Kris Wobbe | USFS - Lowell / BLM - Eugene | June 20, 1996

- Landmarks
- FS Watershed Boundary
- Probable Primary Spawning Areas
- Known Areas of Adult Holding Habitat
- Other Streams
- Section Lines

Plot File List
APR File Name:
micron c:\arc\project\winwa\strtrhab
c:\arc\project\winwa\wbfstr
c:\arc\project\winwa\wbfbnd
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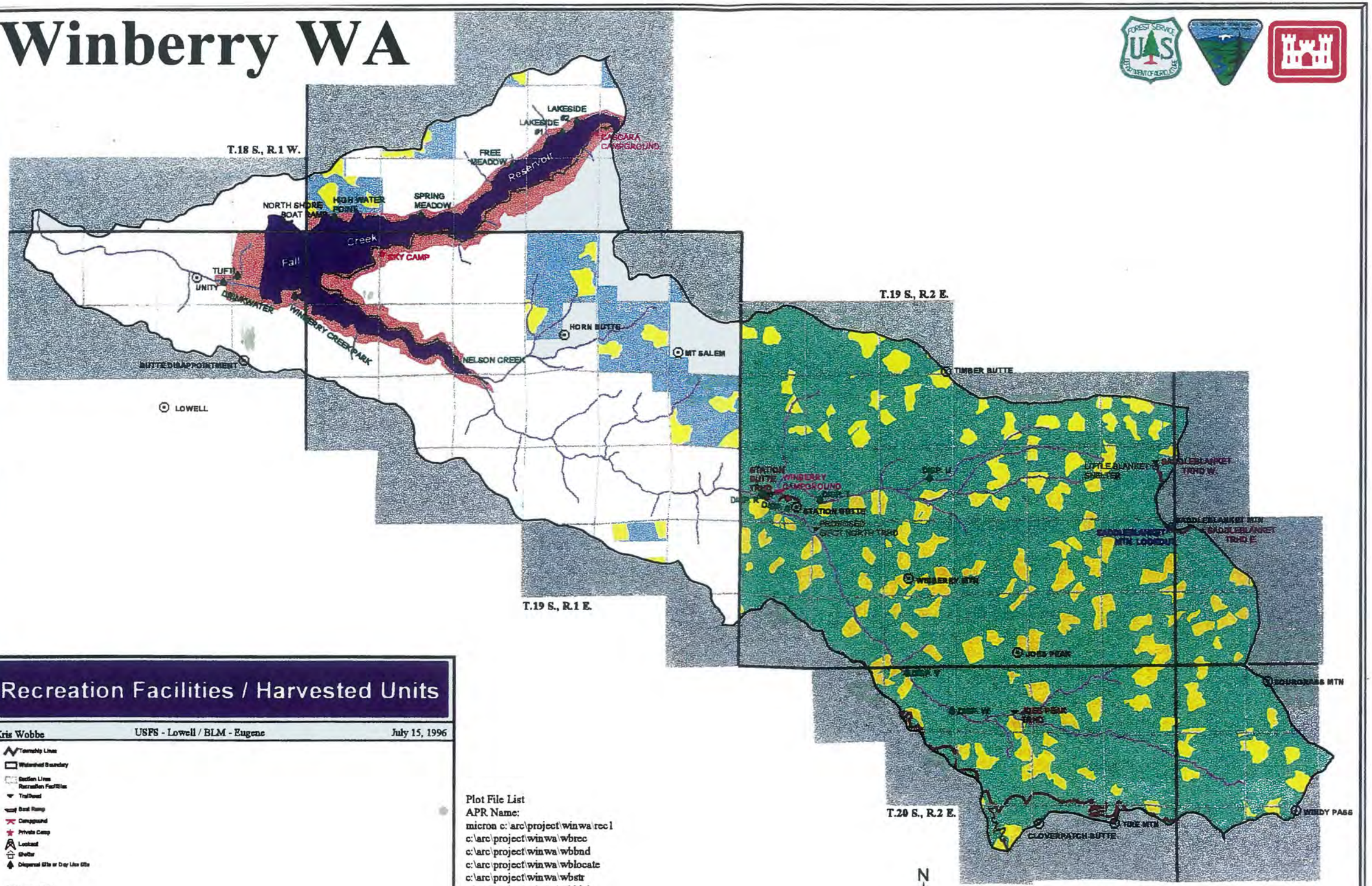
N

Scale 1:60000

1 0 1 2 Miles

Winberry WA



Recreation Facilities / Harvested Units

Kris Wobbe — USFS - Lowell / BLM - Eugene — July 15, 1996

- Township Lines
- Watershed Boundary
- Section Lines
- Recreation Facilities
- Trailhead
- Boat Ramp
- Campground
- Private Camp
- Lookout
- Shelter
- Dispersal Site or Day Use Site
- Proposed Trail
- Trails
- Streams
- Fall Creek Reservoir
- Harvested Units
- Stands < 20 Years Old
- Federal Ownership
- BLM
- COE
- USFS

Plot File List
APR Name:
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c:\arc\project\winwa\wbrec
c:\arc\project\winwa\wbbnd
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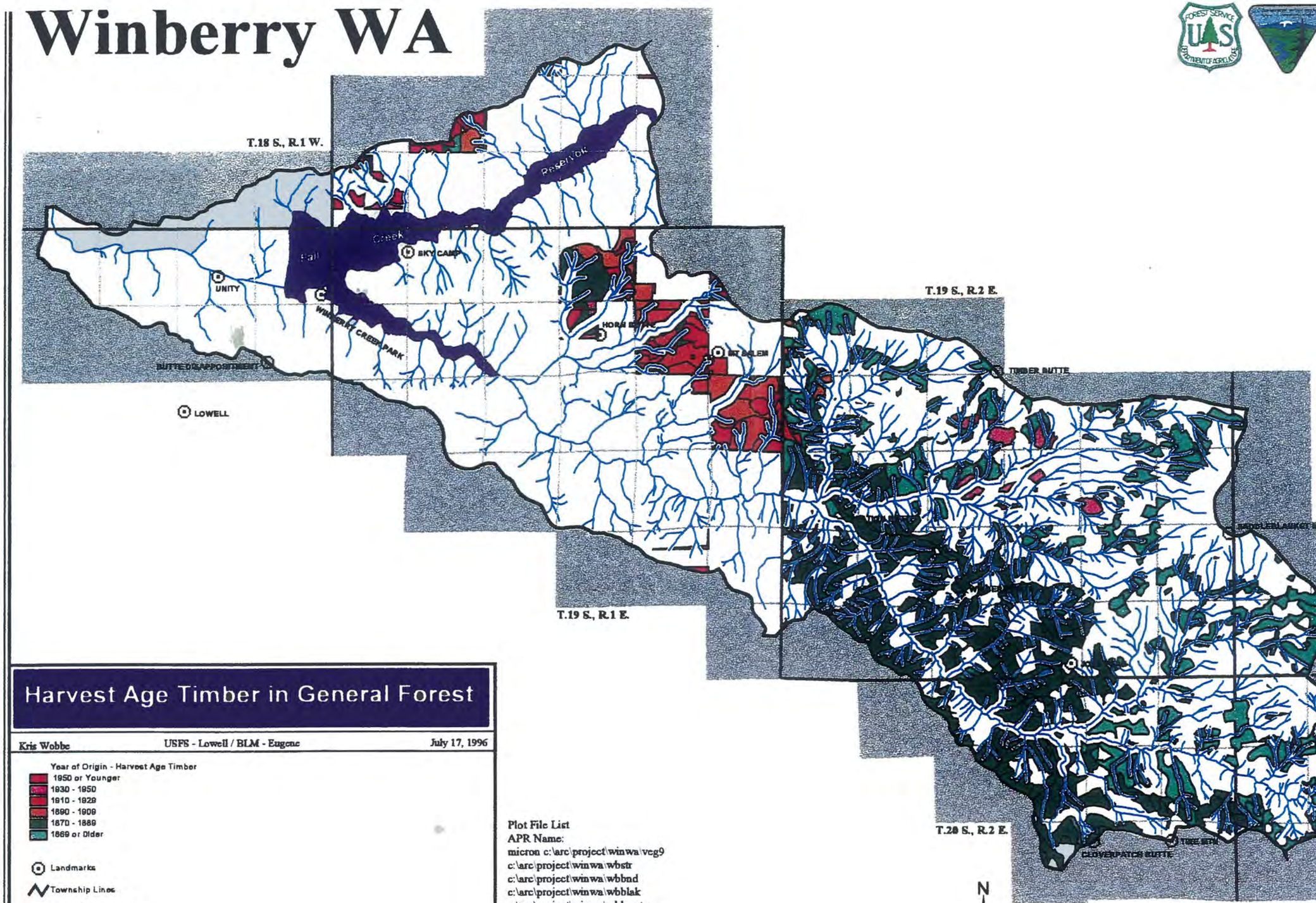
c:\arc\project\winwa\wbblak
c:\arc\project\winwa\wbtrail
c:\arc\project\winwa\wbvegall
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wbtwnshp

N

Scale 1:80000

1 0 1 2 3 Miles

Winberry WA



Harvest Age Timber in General Forest

Kris Wobbe — USFS - Lowell / BLM - Eugene — July 17, 1996

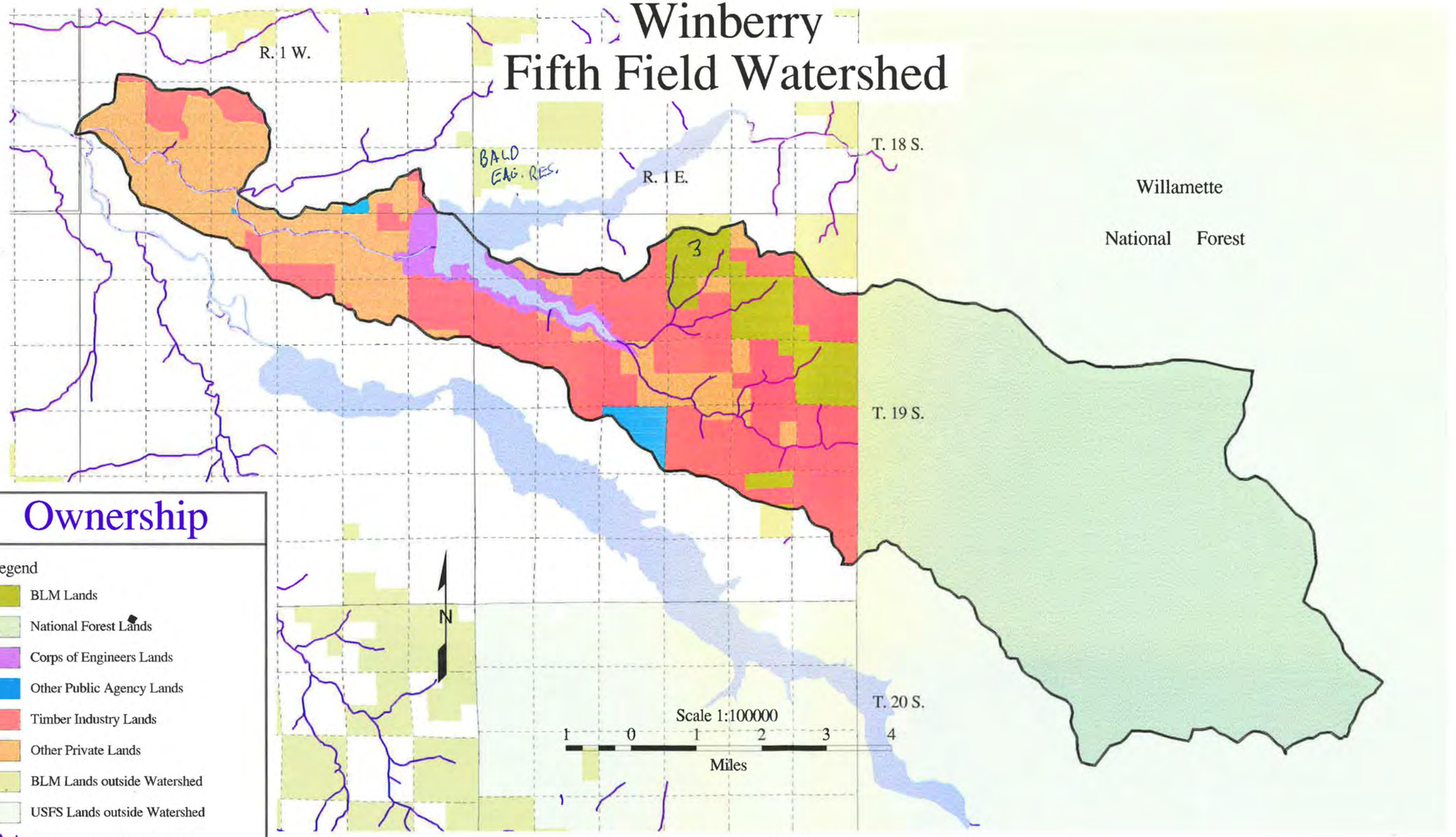
Year of Origin - Harvest Age Timber
- 1950 or Younger
- 1930 - 1950
- 1910 - 1929
- 1890 - 1909
- 1870 - 1889
- 1869 or Older

- Landmarks
- Township Lines
- Watershed Boundary
- Section Lines
- Fall Creek Reservoir
- Streams

Plot File List
APR Name:
micron c:\arc\project\winwa\veg9
c:\arc\project\winwa\wbstr
c:\arc\project\winwa\wbbnd
c:\arc\project\winwa\wbblak
c:\arc\project\winwa\wblocate
c:\arc\project\winwa\wbtwnshp
c:\arc\project\winwa\wbplss
c:\arc\project\winwa\wbvegrsv

No warranty is made by the Federal Agencies for use of the data for purposes not intended by them

Winberry
Fifth Field Watershed



Ownership

Legend

- BLM Lands
- National Forest Lands
- Corps of Engineers Lands
- Other Public Agency Lands
- Timber Industry Lands
- Other Private Lands
- BLM Lands outside Watershed
- USFS Lands outside Watershed
- Streams –3rd order and greater

D. Hanson 09/20/00
aml file –/usr3/winb/winb_1117.aml

Winberry 5th Field Ownerships

Owner	Acres	Percent
BLM	2,090	5.2
US Forest Service	22,661	56.4
Corps of Engineers	1,404	3.5
Other Public Agencies	369	0.9
Timber Industry	8,160	20.3
Other Private Lands	5,528	13.7
Totals	40,211	100.0

Appendix A: Acronyms

Acronym	What it means	Agency
100 Ac LSR	100 Acre Late Successional Reserve *(from ROD of NWFP)*	USFS & BLM
ACS	Aquatic Conservation Strategy	
APHIS	Animal Health and Plant Inspection Service	USDA
ARP	Aggregate Recovery Percentage	USFS
ATM	Access and Travel Management Plan	USFS
BEHA	Bald Eagle Habitat Area	BLM
BGEA	Big Game Emphasis Area	USFS
BLM	USDI Bureau of Land Management	
CCC	Civilian Conservation Corps	
CCS	Cryptocrystalline Silicate (Archaeology)	
cfs	cubic feet per second	
CMP	Corrugated Metal Pipes (Engineering)	
COE	United States Army Corps of Engineers	COE
CON	Connectivity Block	BLM
CTI	Central Tire Inflation (Engineering)	
CWD	Coarse Woody Debris	
DBH	Diameter Breast Height	
DDR	District Designated Reserves	BLM
DEIS	Draft Environmental Impact Statement	USFS
DEQ	Department of Environmental Quality	
DFC	Desired Future Condition *(Fisheries)*	USFS
EIS	Environmental Impact Statement	
ESA	Endangered Species Act	
FSEIS	Final Supplemental Environmental Impact Statement	
GFMA	General Forest Management Area	
GIS	Graphic Information Systems	
GLO	Government Land Office	

Acronym	What it means	Agency
GTR	Green Tree Retention	USFS & BLM
KV	Knudsen-Vandenburg Act	USFS
LAC	Limits of Acceptable Change	USFS
LRFD	Lowell Rural Fire District	
LRMP	Land and Resource Management Plan	USFS
LSOG	Late successional Old-Growth Seral Stage	
LUA	Land Use Allocation	
LWD	Large Woody Debris	
LWM	Large Woody Material	
MLSA	Managed Late successional Areas	USFS & BLM
MSL	Mean Sea Level	
NRMS	Natural Resource Management System	COE
NWFP	Northwest Forest Plan	USFS & BLM
O & C	Oregon and California Revested Lands	
ODF	Oregon Department of Forestry	
ODFW	Oregon Department of Fish and Wildlife	
OHV	Off Highway Vehicle	
OMP	Operational Management Plan	COE
OSP	Oregon State Police	
PACFISH	*Refers to an inter-regional, inter-agency strategy to provide habitat conditions that contribute to the conservation and restoration of naturally-reproducing stocks of pacific salmon and anadromous trout.*	
PD	Public Domain	
PNW	Pacific Northwest (Research Station)	USFS
PSUB	Planning Subdrainage	USFS
RI	Recurrence Interval (Hydrology)	
RMP	Resource Management Plan	BLM
ROD	Record of Decision	USFS
RR	Riparian Reserves	
RRA	Riparian Reserve Area	

Acronym	What it means	Agency
RUO	Resource Use Objectives	COE
RVD	Recreation Visitor Days	
S & G	Standards and Guidelines	
SCORP	State Comprehensive Outdoor Recreation Plan	
SCS	Soil Conservation Service	
SE	Stem Exclusion Seral Stage	
SEIS	Supplemental Environmental Impact Statement	USFS & BLM
SI	Stand Initiation Seral Stage	
SRI	Soil Resources Inventory *(Soils)*	USFS
TMDL	Total Maximum Daily Loads *(Hydrology)*	
UDV	Unit Day Value	COE
UR	Understory Reinitiation Seral Stage	
USDA	United States Department of Agriculture	
USDI	United States Department of Interior	
USFS	United States Forest Service (USDA)	
USFWS	United States Fish and Wildlife Service (USDI)	
USGS	United States Geological Survey	
WIN	Watershed Improvement Needs	USFS

Appendix B: Fire and Fuels

ODF and LRFD protected lands

Figure B- 1. Number of Fires 1932-1995

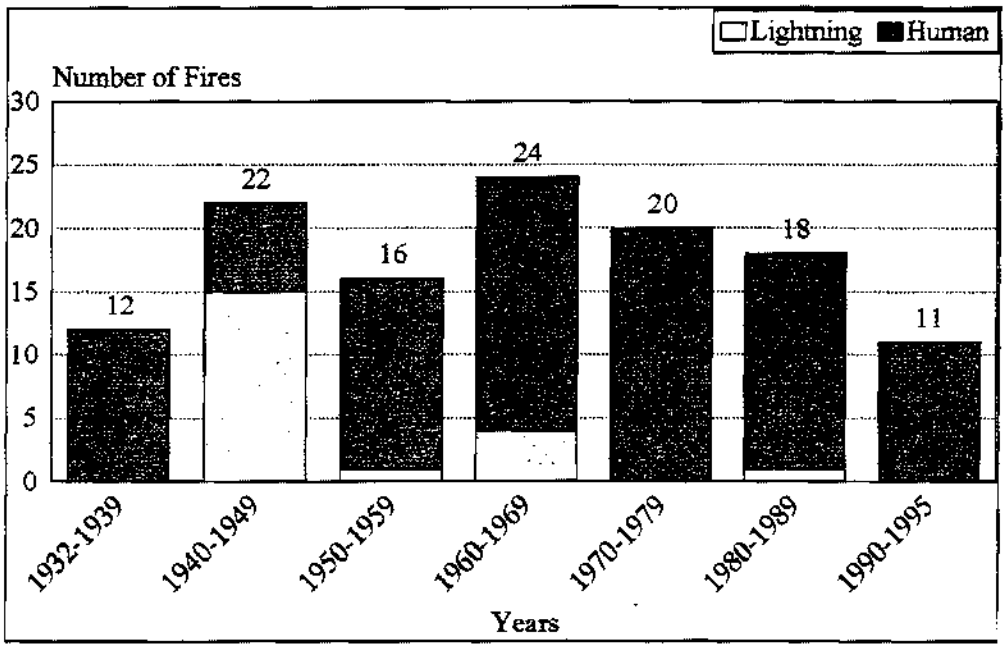
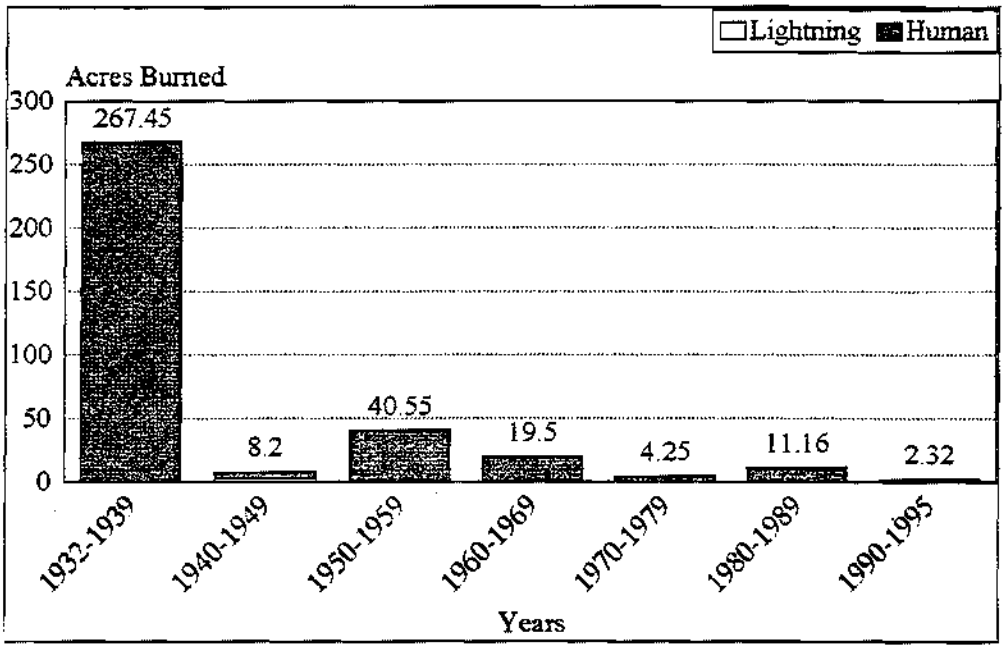


Figure B- 2. Acreage Burned by Fires 1932-1995



USFS lands

Figure B- 3. Number of Fires 1949-1995

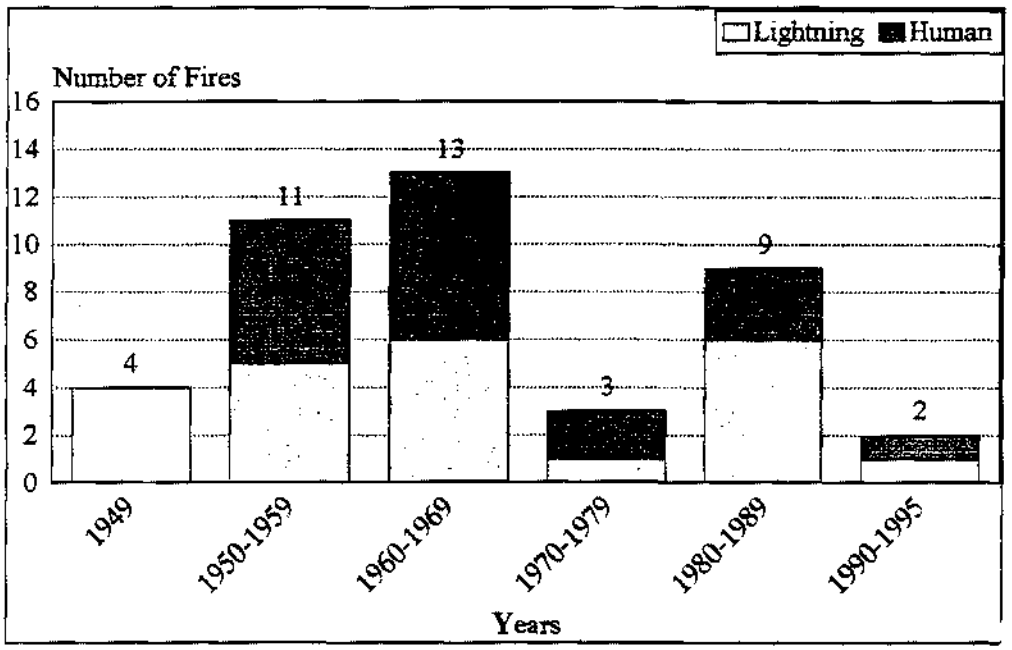


Figure B- 4. Acreage Burned by Fire 1949-1995

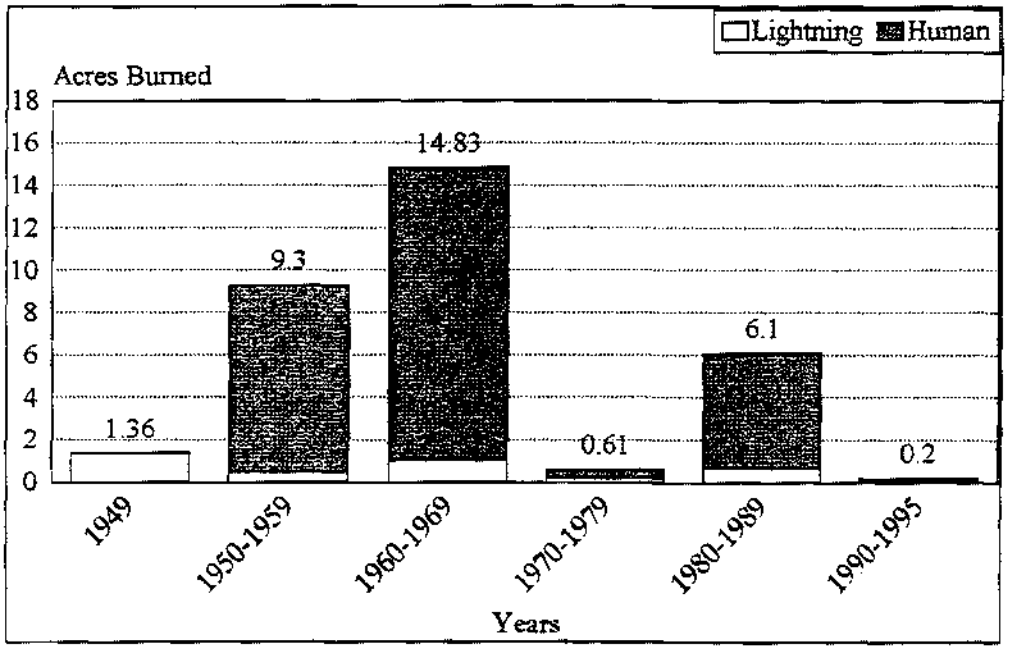


Table B- 1. Comparison of Amount of Seral Stages in Reference and Current Conditions

Seral Stage	Stand Initiation				Stem Exclusion				Understory Reinitiation				Late successional Old-Growth			
	Reference		Current		Reference		Current		Reference		Current		Reference		Current	
Drainage	Ac	%	Ac	%	Ac	%	Ac	%	Ac	%	Ac	%	Ac	%	Ac	%
Brush Creek	691	26.4	985	37.6	9	3	947	11.2	0	0	198	7.5	1904	72.7	947	36.2
Lower South Fork Winberry Cr	4503	91.7	909	18.5	15	<0.0	42	0.9	148	3	3701	75.3	242	4.9	247	4.9
North Reservoir	1665	21.2	3298	41.9	376	4.8	936	11.9	0	0	1777	22.6	5010	63.7	0	0
South Reservoir	3323	24.7	6768	50.4	3320	24.7	3444	25.6	209	1.6	1935	14.4	5079	37.8	72	0.5
North Fork Winberry Cr	840	13	2237	34.7	0	0	1438	22.3	1180	18.3	527	8.2	4321	67.1	2140	33.2
Upper South Fork Winberry Cr	1742	20.2	2412	28.0	0	0	1374	16	1384	16.1	1450	16.8	5259	61.1	3150	36.6

Table B- 2. Non-forested Lands: Reference compared to Current Conditions

Seral Stage	Other *(Non-Forested Lands)*			
	Reference		Current	
	Ac	%	Ac	%
Brush Creek	16	0.6	16	0.6
Lower South Fork Winberry Creek	18	0.4	18	0.4
North Reservoir	812	10.3	1851	23.6
South Reservoir	1508	11.2	1219	9.1
North Fork Winberry Creek	102	1.6	101	1.6
Upper South Fork Winberry Creek	225	2.6	225	2.6

Table B- 3. Fires on ODF and LRFD Protected Lands by Decade

Decade	Lightning Caused		Human Caused		Total Fires	
	Number	Acres	Number	Acres	Number	Acres
1932-1939	0	0	12	267.45	12	267.45
1940-1949	15	2.85	7	5.35	22	8.2
1950-1959	1	0.25	15	40.3	16	40.55
1960-1969	4	0.4	20	19.1	24	19.5
1970-1979	0	0	20	4.25	20	4.25
1980-1989	1	0.1	17	11.06	18	11.16
1990-1995	0	0	11	2.32	11	2.32
Total	21	3.6	102	349.83	123	353.43
Percent	17%	1.02%	83%	98.98%		

Table B- 4 Fires on USFS Protected Lands by Decade

Decade	Lightning Caused		Human Caused		Total Fires	
	Number	Acres	Number	Acres	Number	Acres
1932-1939	*No Data*					
1949 only	4	1.36	0	0	4	1.36
1950-1959	5	0.5	6	8.8	11	9.3
1960-1969	6	1.03	7	13.8	13	14.83
1970-1979	1	0.2	2	0.41	3	0.61
1980-1989	6	0.7	3	5.4	9	6.1
1990-1995	1	0.1	1	0.1	2	0.2
Total	23	3.89	19	28.51	42	32.4
Percent	55%	12.01%	45%	87.99%		

APPENDIX C: VEGETATION

Forest Successional Development

Succession describes the progression of vegetative communities following events that change or alter the original community. Eventually the original community is restored and remains reasonably stable and constant until the next disturbance event. In the Pacific Northwest, the dominant species are so long-lived that the probability of succession restoring the original community before another disturbance event takes place is low.

The following is a general description of various successional stages. Ages may differ with different specific site conditions and species, but the overall stand level dynamics and interactions are well documented.

Stand Initiation Seral Stage (SI)

This seral stage occurs from the time of disturbance exposing bare ground to with conifer or hardwood saplings. Domination of the site by hardwood and/or conifer saplings typically occurs about 15 years after disturbance. The first two to five years are usually dominated by grasses, forbs, and herbaceous vegetation followed by shrubs and/or hardwoods. Species diversity is highest in this seral stage and biomass is relatively low, but increases rapidly throughout the stage. Conifers develop slowly at first but gradually become dominant. Once conifer dominance occurs and crowns close to fully occupy the site, then this early seral stage is concluded. Stands currently in this seral stage have developed as a result of human-caused disturbance (forest management) not from natural disturbances.

Stem Exclusion Seral Stage (SE)

This stage is distinguished by dominance of conifers. Sites are characterized by a dense conifer stand, a closed canopy with crown cover ranging from 60-100%, and a relatively low level of understory vegetation.

The overstory trees grow very rapidly and begin to lose their lower, deeply shaded foliage and branches. Stem growth slows and its form becomes more tapered. As individual trees within the stand differ in growth rates and occupy different amounts of growing space, some trees gain a competitive advantage. Since the overstory grows very rapidly, the larger more dominant trees begin to encroach upon the growing space of smaller less competitive individuals. This process, called stand differentiation, is generally manifested first in diameter differences and later in height differences. Stand differentiation creates a stand with individual trees of different crown sizes and positions, as well as different heights and diameters. This allows for a classification of individual trees by canopy position or crown class: dominants, codominants, intermediates, and overtopped or suppressed.

In most cases, species diversity decreases. Size and number of snags and coarse woody debris is dependent upon the stand origin. Managed stands created by forest management during the past decades tend to be devoid of large snags and downed logs. However a large number of small snags are present. These snags are created by stand differentiation and competition mortality and tend to be the smaller sized trees in intermediate and overtopped crown classes. Natural stands may have a greater number of snags and large downed logs, legacies from the original forest, as well as high amounts of small snags and downed logs created by competition mortality. These existing natural stands tend to have limited numbers of large snags as a result of past fire management policies, but still have some levels of downed logs.

Understory Reinitiation Seral Stage (UR)

This stage is typically characterized by openings in the dominate canopy and a secondary pole size understory with a corresponding increase in forbs and shrubs. Stand diversity is gradually increasing in response to openings in the canopy created by windthrow, disease, insects, and stand mortality. Biomass is increasing but at a relatively slow rate. Stands provide different wildlife habitat than smaller sized stands.

These stands typically have large numbers of small diameter snags and downed logs resulting from stand density and competition related mortality. Large diameter snags and downed logs, legacies from the previous forest, tend to be few in number, limited in distribution, and those present are typically in more advanced decay classes. The number of legacy and small diameter snags and downed logs tends to be greater in naturally regenerated stands. Past management activities and silvicultural treatments, such as precommercial and commercial thinning, tend to decrease the number of small snags and downed logs present in these stands.

Late Successional Old-Growth Seral Stage (LSOG)

This stage typically occurs after 195 years and represents climax and subclimax plant communities. The subclimax condition may persist for centuries depending on the frequency of natural disturbances. Both in climax and subclimax condition, old-growth is characterized by two or more tree species with a wide range of size and age including long-lived seral dominants, decadence of the long lived dominants, a deep, multi-layered canopy, significant amounts of snags and downed logs, and openings or gaps in the canopy. More tolerant conifers (western hemlock and western red cedar) and/or shrub species are found in the understory or in gaps and openings caused by windthrow or other disturbance. Old-growth stands provide optimal habitat for saprophytic plants, lichens, mosses, and liverworts. Biomass reaches a maximum and species diversity approaches the level found in early seral stages.

Table C- 1 Current Seral Stages of all lands in Winberry/Lower Fall Creek Watershed

Seral Stage	Age (years)	Area (acres)	Area (%)
Stand Initiation	0 - 30	13,982	31.9
Stem Exclusion	31 - 80	11,136	25.4
Understory Reinitiation	81 - 200	8,851	20.2
Late Successional Old-Growth	200+	6,553	14.9
Non-Forest		1,680	3.8
Fall Creek Reservoir		1,688	3.8
	TOTAL	43,890	100 %

Table C- 2. Federal Ownership by Drainage

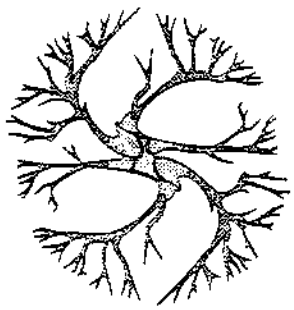
Drainage	USFS	% in Drainage	BLM	% in Drainage	COE	% in Drainage	Total
Brush Creek	2,604	99%	14	1%	0	0%	2,618
Lower South Fork	4,622	100%	0	0%	0	0%	4,622
North Reservoir	0	0%	756	41%	1,068	59%	1,824
North Fork Winberry	6,443	100%	0	0%	0	0%	6,443
South Reservoir	316	11%	2,072	69%	607	20%	2,995
Upper South Fork Winberry	8,611	100%	0	0%	0	0%	8,611
Fall Creek Reservoir	—	—	—	—	1,641	—	1,641
Total	22,596	78%	2,842	10%	3,316	12%	28,754

Table C- 3. Current Seral Condition, Federal Lands

Seral Stage	USFS	BLM	COE	Total	Percent
SI	6,422	702	1,119	8,243	30.4%
SE	3,340	1,012	112	4,464	16.5%
UR	5,926	1,113	276	7,315	27.0%
LSOG	6,537	7	0	6,544	24.1%
Reservoir	0	0	1,641	1,641	N/A
Non Forest	371	8	168	547	2.0%
Total	22,596	2,842	3,316	28,754	100%
Percent	78.6%	9.9%	11.5%	100%	

Table C- 4. Reserved Forested Acres (80+ Years) on Federal Lands

Drainage	Total Acres	80+ Reserved	% of Drainage	USFS	% of Drainage	BLM	% of Drainage
Brush Creek	2,618.9	692.7	26.5%	692.7	26.4%	0	0%
Lower South Fork	4,636.9	2,140.8	46.2%	2,140.8	46.2%	0	0%
North Reservoir	748.7	205.7	27.5%	0	0	205.7	27.5%
North Fork Winberry	6,443.4	1,506.9	23.4%	1506.9	23.3%	0	0%
South Reservoir	2,714.8	556.4	20.5%	154.4	5.6%	402.0	14.8%
Upper South Fork Winberry	8,611.0	2,512.1	29.2%	2,512.1	29.2%	0	0%
Total	25,773.7	7,614.6	29.5%	7,006.9	27.1%	607.7	2.4%



APPENDIX D: WILDLIFE

Table D- 1. Northern Spotted Owl Reproductive History and Home Range Acres

REPRODUCTIVE HISTORY YEARS	MSNO	1039 (CHU)	0054 (Matrix)	0065 (Matrix)	1023 (Matrix)	1037 (Matrix)	2855 (Matrix)	2856 (Matrix)	2871 (Matrix)	2886 (Matrix)
	Geographic Name	Lower South Winberry Creek	Cabin Creek	Blanket-Montenica Cr.	Lower Brush Creek	South Fork Winberry Creek	Cabin Creek North	Blanket Creek	Station Butte	Brush Creek
	1970									
	1971									
	1972						PN2			
	1973						PX	S		
	1974						S			
	1975									
	1976									
	1977									
	1978									
	1979									
	1980					PU	PU	S		2
	1981		PN1			PU				PU
	1982		PU			S				
	1983									
	1984									
	1985									
	1986									
	1987									
	1988									
	1989	S		2				S	PN2	PU
	1990		PN1	PN1		PU	PN2	PN1	PU	PN1
	1991	PU	PU	S (night resp.)	S	S	PU	PU	PN1	
	1992	PNU	PN2	PNU	PN1	PN1	S (night resp.)	PN1	PN2	PN2
	1993		PNU	PX	PU			PX	S (night resp.)	PN1
	1994		PU		PX				PU	PU
	1995		S	PU			S (night resp.)	S (night resp.)	S	S
	1996	PN*	PU*	PU*		PN*	S (night resp.)			
TAKE STATUS 7 Mile Radius	<30%									
	30 - 40	394.73								
	40 - 50									435.02
	>50%		525.50**	759.31**	720.80	505.94	522.22	554.71	778.82	
TAKE STATUS 1.5 Mile Radius	<30%									
	30 - 40									
	40 - 50	1227.72				1441.46	1313.26	1339.67		1294.54
	>50%		1460.76**	2068.93**	1817.50				2152.40	

Table D-2 *(continued).* Northern Spotted Owl Reproductive History and Home Range Acres

		MSNO	2896 (Matrix)	2898 (Matrix)	3406 (Matrix)	L602	0120 BLM)	1943 (Private)	2135 (Private)
		Geographic Name	Winberry-Armet Cr	Spring Creek	Burma	Cabin Winberry		φ-1	φ-2
REPRODUCTIVE HISTORY	YEARS	1970							
		1971							
		1972							
		1973							
		1974							
		1975							
		1976							
		1977							
		1978							
		1979							
		1980							
		1981							
		1982							
		1983							
		1984							
		1985							
		1986							
		1987							
		1988							
		1989							
		1990	PX	S					
		1991		PN1					
		1992		PN1	PU				
		1993		PU	PX				
		1994		PN1					
		1995	S (night resp.)						
		1996				PN*			
TAKE STATUS	.7 Mile Radius	<30%						142	
		30 - 40							
		40 - 50		489.51			400		
		>50%	826.92		532.85	563.5			
	1.2 Mile Radius	<30%					593	702	
		30 - 40		1143.87					
		40 - 50			1312.67				
		>50%	2219.91			1660.6			

DEFINITIONS FOR REPRODUCTIVE HISTORY AND TAKE STATUS:

Reproductive History

Site Status P = Pair,
S = Single,
"blank" = unknown or not surveyed,
= number of birds, status unknown

Nesting Status N = Nesting,
X = Non nesting,
U = Unknown nesting (either surveyed with unknown results or not surveyed),
Z =Failed

Reproductive Status # = Number of young produced,
U =Unknown
* - Still under survey at this time

Take Status

Take is defined by USFWS as either
1) Less than 50% (500 ac.) suitable spotted owl habitat remaining within >.7 mile home range radius of the activity center or
2) Less than 40% (1182 ac.) suitable spotted owl habitat remaining within 1.2 mile home range radius of the activity center

CHU = Critical Habitat Unit

φ-1 -- 70 acre core shared by BLM *and* private ownership

φ-2 -- 70 acre core established on private lands. 1.2 and .7 mile home range acres not managed for.

Table D- 2. USFWS Threatened, Endangered, Sensitive, and Category 1 & 2 Species; ROD Survey and Manage (C-3) Species; Appendix J2 Species and Other Species of Concern

Species (*scientific name*)	Regional Forester's Sensitive Species List	Federal Register Notice of Review	ROD Table C-3 Survey and Manage Species (√)	Appendix J2 Species of Concern (√√)
Amphibians and Reptiles				
Northern red legged frog (*Rana aurora aurora*)	S	C2		
Northwestern pond turtle (*Clemmys marmorata marmorata*)	S	C2		
Spotted frog (Western pop.) (*Rana pretiosa*)		C1		
Tailed frog (*Ascaphus truei*)		C2		√√
Foothill yellow-legged frog (*Rana boylii*)		C2		
Cascades frog (*Rana cascadae*)		C2		
Southern torrent (seep) salamander (*Rhycotriton variegatus*)		C2		√√
Cascade torrent (seep) salamander (*Rhycotriton cascadae*)				√√
Clouded salamander (*Aneides ferreus*)				√√
Oregon slender salamander (*Batrachoseps wrighti*)				√√
Birds				
American peregrine falcon (*Falco peregrinus anatum*)	S	E		
Northern bald eagle (*Haliaeetus leucocephalus*)	S	T		
Northern spotted owl (*Strix occidentalis caurina*)	S	T		
Ferruginous hawk (*Buteo regalis*)	S	C2		
Harlequin duck (*Histrionicus histrionicus*)	S	C2		
Northern goshawk (*Accipiter gentilis*)		C2		
Greater sandhill crane (*Grus canadensis*)	S			
Common merganser (*Mergus merganser*)				√√
Great gray owl (*Strix nebulosa nebulosa*) **ROD species of concern w/ protect. buffer**				

(S) = Species identified on Regional Forester Sensitive Species List

(√) = Survey and manage species identified in the ROD under Table C-3

= Sp Concern recognized in Appendix J2 of ROD

Federal Register Notice of Review classifications:

(E) = Endangered (T) = Threatened

(C1) = Category 1: Taxa for which the USFWS has sufficient biological information to support a proposal to list as endangered or threatened.

(C2) = Category 2: Taxa for which existing information ir "may wa ling," but for which substantial biological information to support a ed rule is .

Table D-2. *(continued)*

Species (*scientific name*)	Regional Forester's Sensitive Species List	Federal Register Notice of Review	ROD Table C-3 Survey and Manage Species (√)	Appendix J2 Species of Concern (√√)
Mammals				
California wolverine (*Gulo gulo luteus*)	S	C2		
White footed vole (*Arborimus alpies*)	S	C2		
American marten (*Martes americana*)				√√
Pacific fisher (*Martes pennanti pacifica*)		C2		√√
Oregon red tree vole (*Phenacomys longicaudus*)			√	√√
Pacific western big-eared bat (*Plecotus townsendii townsendii*)	S	C2		
Long eared myotis (*Myotis evotis*)		C2		√√
Yuma bat (*Myotis yumanensis*)		C2		
Fringed myotis (*Myotis thysanodes*)		C2		√√
Long legged myotis (*Myotis volans*)		C2		√√
Hoary bat (*Lasiurus cinerus*)				√√
Silver haired bat (*Lasionycteris noctivagens*)				√√
Arthropods				
Beer's false water penny beetle (*Acneus beeri*)	S	C2		
Mt. Hood primitive brachycentrid caddisfly (*Eobrachycentrus gelidae*)	S	C2		
Tombstone prairie faralan caddisfly (*Farula reaperi*)	S	C2		
Fort Dick limnephilus caddisfly (*Limnephilus atercus*)	S	C2		
Tombstone Prairie oligophlebodes caddisfly (*Oligophlebodes mostbento*)	S	C2		
One-spot rhyacophilan caddisfly (*Rhyacophila unipunctata*)	S	C2		
Molluscs				
Prophysaon coeruleum			√	√√
Prophysaon dubium			√	√√

APPENDIX E: AQUATIC HABITAT

WINBERRY CREEK

(Forest Service Boundary to the confluence of North and South Fork Winberry)

Reach 1:

This reach is a 'B3' (cobble) and 'B4' (gravel) Rosgen stream typing. The 1802 road constricts the channel along its right bank (looking downstream). Much of the LWD was removed by past salvage activities. The channel has downcut resulting in a much wider and shallower stream without much meander. Subsequently, instream log and boulder structures were installed to help restore the aquatic habitat. These human-made structures have increased the channel complexity. A channel previously scoured to bedrock is now starting to collect debris. More pools are forming and hiding cover has increased. LWD per mile is still determined to be low, although this is because much of the wood installed did not meet the criteria as LWD in the stream survey protocol.

Although pools per mile have increased they are still considered low. Some areas are still scoured to bedrock. A five-foot bedrock slide in this section was noted to be at least 15 feet high in the 193? stream inventory, and the end of anadromous fish use. Since this is the only reference, it is an unconfirmed possibility that salmon were not able to migrate past this area. Riparian condition consists of large trees, but the road within the riparian reserve opens the canopy and has negative effects on the stream channel. Channel stability is fair, with some mass wasting and bank cutting found along the left bank. Observed fish were primarily cutthroat with a few rainbow. The larger pools are good adult holding habitat. A couple of 10-12 inch trout were observed. Spawning is also thought to occur here, with cobble and gravel the dominant and subdominant substrate. Sculpin and dace are found through out this reach.

NORTH FORK WINBERY CREEK

Reach 1

This reach is a 'B3' (cobble) and 'B4' (gravel) Rosgen stream typing. Similar impacts have resulted in the North Fork Winberry Creek as those observed downstream in Winberry Creek. However, here the stream is much smaller and has a steeper gradient. Log and boulder structures were installed throughout the reach which now has increased pool habitat, channel complexity and provides more cover. Pools per mile are considered adequate according to the criteria; however the pool:riffle ratio is high at 47:50. This indicates pool habitat is in good condition. The amount of large wood per mile is determined to be low since many of the installed logs do not meet the protocol criteria. Despite the smaller size, they are still very effective for this stream. Substrate is predominantly cobble and gravel; fines do not appear to be a problem. Some areas are

still scoured to bedrock but the installed log structures have improved these conditions. Riparian conditions are good consisting primarily of large trees. The road within the riparian reserve does have negative impacts and this area has a larger small tree component to the seral condition than found downstream. Cedar is found to be more dominant here. Temperatures were taken throughout the survey ranging from 54-63°F. The highest was recorded to be 63°F at 1500 hours on 7/17/95. Rainbow trout, cutthroat trout, banded sculpin, and crawfish were present throughout the reach. Several 8-10 inch trout were observed along with many fry upstream and downstream from the confluence of Minnehaha Creek. This may be an important spawning area.

Reach 2:

This reach begins at the confluence of Blanket Creek. It is a type 'B' channel beginning to grade into a type 'A'. Cobble and gravel were the dominant and subdominant substrate types at the wolman pebble count area but small boulder and cobble were determined to be the dominant and subdominant substrate type throughout the reach. Instream structures have not been installed in this reach. Pieces of LWD per mile and pools per mile are moderate. Road 1802 is within the riparian reserve for the first 0.5 miles of this reach. The road then crosses the channel creating a migration barrier with a 7.5 ft. falls. Fish are found approximately two miles above this barrier. Parts of this reach have small floodplain areas and side channels that appear to be functioning well. The inner riparian habitat of hardwoods is fairly wide at 40 feet. The outer riparian conifers consist of 47% large trees and 43% small trees. A clearcut located along the upper part of the reach is responsible for the small tree component. Braided riffles are commonly found and it appears that the coarse debris is more often transported down the channel. Mass wasting is fairly common along the banks although most of the area is well armored. Rainbow and cutthroat trout are the only fish species found in this reach. The reach ends at another stream crossing posing a possible migration barrier to smaller fish.

Reach 3

This is a type 'A' channel with cobble and gravel as the dominant and subdominant substrate. Cobble embeddedness appears to be a higher concern in this reach than previously. The large wood and pools per mile components are low. Road 1821 affects the first part of this reach, contributing some areas of mass wasting. Riparian condition is primarily in a sapling pole condition and considered poor. Large trees are found adjacent to the channel in the reach's lower section. A very large and dense patch of devils club was found at the top of the reach. It was so thick the stream surveyors had to skip this portion (approximately 800 feet). The reach ended at a 30 foot waterfall which also confirmed the end of fish use. Downstream of this falls, rainbow and cutthroat trout were observed through out the reach.

BRUSH CREEK

Reach 1

Overall, this stream is a channel type 'A' although it becomes a type 'B' at times. Dominant and subdominant substrates are cobble and gravel. Fines appear to be a problem since cobble embeddedness tended to rate as high, especially compared to the other streams surveyed by the same crew. Stream enhancement structures were installed for the first 0.2 miles. The existing pools per mile and pieces of LWD per mile are low through out most of the reach. Existing pool habitat tends to be of good quality and they are particularly deep considering the stream size. Road 1802.160 is just above the stream channel, causing some mass wasting. At river mile 0.5 a large slide dammed the channel creating a pond and a possible migration barrier. Fine sediment and algae is present in relatively large amounts and the channel is shallow and braided, at times disappearing beneath the surface. Riparian seral conditions are large trees. At the beginning of the reach, a campground appears to be causing some erosion. In the past ODFW has supplied winter steelhead fry which the USFS raised in hatch boxes on Brush Creek. This has not occurred since 1992. Primarily cutthroat trout were found in Brush Creek along with banded sculpin, crayfish and Pacific giant salamanders. Many fry were concentrated at the beginning of the reach. This could be an important spawning area for resident trout within Winberry or North Fork Winberry Creeks.

Reach 2:

The stream continues to be classified as a type 'A' channel with a cobble/gravel substrate. Fines tended to embed the cobbles. More large woody debris is present in reach 2. Many pieces were too small to count but still provided good habitat. A couple of LWD jams are creating an 8 foot and a 4 foot falls. Pools per mile are still low, although those present were of quality habitat similar to reach 1. Riparian seral condition was good with 80% as large trees. However, a clearcut with no buffer is located adjacent to the right bank (looking downstream) at the top of the reach. This clearcut unit has created a significant amount of erosion. Mass wasting and bank cutting is evident adjacent to the channel in this area. Blowdown, which has caused slides, has also been found adjacent to the stream. Riffle braids are common in this area. Stability concerns are high in upper Brush Creek. Most of the trout observed were less than six inches. Fry were seen in great numbers around NSO 113-114 (see stream inventory folder); this may be a spawning area. The reach ended at a large log jam, which also ended fish use.

Reach 3:

Since fish use ended in reach 2, this reach was formally surveyed only for the first 580 feet. The rest was walked through so data tends to be more generalized. The channel type is an 'Aa+ 3' (cobble). Deposition and braided channels were common. Pools were more common and quality was good. Wood was all very small, not meeting the regional protocol criteria to be counted. Riparian condition was poor due to clearcuts on

both sides of the stream. Stability was still a concern with mass wasting and bank cutting commonly observed.

BLANKET CREEK

Reach 1:

The channel type is a 'B' with cobble and small boulder as the dominant and subdominant substrate. Stream enhancement structures were installed for the first 3/4 of the reach. They are of good quality adding complexity to the system. The logs used tend to be small diameter, collecting gravels and cobbles on previously scoured bedrock. Pools per mile are high. Large woody material is low in pieces per mile, however much of the wood is smaller than protocol criteria so it is not counted even though it is very effective at providing habitat. Side channel habitat was found throughout the reach. Riparian seral condition in the lower part of the reach was good. The inner hardwood riparian is 45 feet wide and the outer riparian consisted of large and mature trees. Seral conditions changed to smaller trees upstream. Water temperature reached 64°F at 1535 hours in September. Some bank cutting is evident, but does not appear to present a problem. Clay was observed in some of the banks. Rainbow and cutthroat trout were found in reach 1; cutthroat were most common. Lengths range from fry up to 8 inches. Most of the fish were found in pools created by the log and boulder structures.

Reach 2:

Channel type is an 'A' with bedrock and cobble as the dominant and subdominant substrate. Pools per mile are high even though long bedrock riffles were common. Pieces of large woody debris per mile areas low, although much of the wood was not within the bankfull criteria needed to count as a piece of LWD. This was especially noted in two log jams, one of which was very large but only a few pieces could actually be counted. Many side channels were found within the reach. Two waterfalls are migration barriers; one is 13 feet and the other is 70 feet and marks the end of fish use. Cutthroat were the only species seen and very few were observed. Most were 0-3 inches; only one was between 3-6 inches.

TRAVERSE CREEK

Reach 1:

This stream is a type 'B' channel with cobble and gravel as the dominant and subdominant substrate where measurements to determine channel type were taken. However, small boulders tended to dominate throughout the reach. Pool habitat was very good, with plenty of deep pools. Pocket pools within riffles were also common. Large woody debris was common and helped create much of this good pool habitat. Side channel habitat was also available. The riparian area is predominately large trees; however, a clearcut runs along the right bank for part of the reach. A narrow buffer was

left adjacent to the stream channel. Temperature was highest at 64°F at 1520 hours on 6/18/95. Cutthroat and rainbow trout were the only fish species observed. Several adults (6-8 inches) were found in some of the high quality pools. These are particularly large fish for this size stream when compared to other area streams surveyed.

Reach 2:

Channel type 'B' continues as the channel gradient decreases. Pool habitat is common and of good quality. Small boulders and cobble are the dominant and subdominant channel substrates. Bank cutting and mass wasting are common with clay soils in the upper banks. Fortunately the large amount of large woody debris is maintaining channel stability in this earthflow-prone terrain. There is one huge log jam within the reach. Heavy deposits of fines are being trapped by the log jams. Riparian condition is fair to poor; much of the riparian area is in a small tree seral stage. Very few cutthroat or rainbow trout were observed. Pacific giant salamanders and crayfish were present. The culvert on the 1802.158 road is a barrier.

Reach 3:

This reach is a 'B' channel with a cobble and gravel substrate. There is a high amount of large wood present. Pools are frequent and there is some side channel habitat. Riparian condition is poor with a clearcut on both sides of the channel for the upper half of the reach. Little to no buffer exists, limiting future recruitment of large woody debris. A 15 foot fall and possibly two culverts are migration barriers. However, cutthroat trout are found half a mile upstream from the second culvert.

SOUTH FORK WINBERRY CREEK

This stream was surveyed in 1992 when survey protocol was somewhat different than the surveys discussed above. Large woody debris was counted more often, riparian did not have a hardwood inner zone and other parameters, such as bank instability were not collected. Reaches were also identified much more frequently. For example, this survey covers 17 reaches. For purposes of distilling information the following report will combine several reaches.

Reach 1 to 2

These reaches are within a type 'B' channel. Substrate tends to be cobble and small boulder. Pools per mile are moderate and LWD per mile is high. This is primarily due to restoration enhancement projects of log and boulder structures. Riparian seral condition consists of large trees although hardwoods are dominant in part of reach 2. Cutthroat and rainbow trout were observed. Many fry were seen near the mouth of South Fork Winberry Creek, possibly indicating a popular spawning area. Temperature in Reach 1 was 61°F at 1430 hours on 7/22/92.

Reach 3 through 5:

This channel is predominantly a 'B' channel type, with a small confined area in Reach 5 grading to 'A'. The type 'A' channel begins at a 15 foot waterfall and continues upstream for less than half a mile. Habitat enhancement projects were completed throughout this area, with several log and boulder structures placed after the survey was conducted. Survey shows high quality pool habitat in reaches 3 and 5, with poor quality pool habitat in Reach 4. However, instream structures were installed after the survey was conducted so pool quality may be improved. Bedrock was common, particularly along the banks. Many fish were observed; some were 9-10 inches long. Temperature of 65°F was recorded on 7/28/92 at 1238.

Reaches 6 to 8

Reaches 6 and 7 are type 'B' channels and the stream becomes more entrenched in Reach 8 to an 'A' channel. Beaver dams and side channels are common in the moderately entrenched reaches. The channel has been scoured to bedrock in several places. Installed log and boulder structures have helped trap some debris and form plunge pools but quality pools are limited. Sinuosity is high in Reaches 6 and 7, and a larger floodplain is found in Reach 6. Riparian condition is hardwood dominant with two harvest units adjacent to Reach 6. One has a 100 foot buffer but is fairly open and the channel is not well shaded. Temperature recorded on 7/28/92 at 1610 was 66°F. Many trout up to 9 inches were observed in the lower gradient, moderately entrenched reaches.

Reaches 9 to 11

These are 'A' channel types. Wood is mostly accumulated in large log jams. Reach 10 has 2 very large jams which divert water into the bank and cause erosion and subsurface flows. This creates a low flow migration barrier. There is also a beaver pond at the end of Reach 10 containing copious amounts of algae. Clearcuts are commonly found adjacent to the channel. Water temperature was 65°F on 8/10/92 at 1330. Reach 11 ends at an 8 foot waterfall.

Reaches 12 to 17

These are 'A' channel types. Habitat tended to stairstep with log jams in the nick points. Reach 13 had many log jams. Beavers were found in Reach 14. Many fish up to 8 inches were seen in reach 13 but fish use ended in Reach 15 Clearcuts are adjacent to the channel in reaches 12, 13, 14, and 17 and second growth is adjacent to reaches 15 and 16. Reach 16 has stability problems and Reach 17 is marshy with sedges and cattails. No beaver activity was observed on this wet area.

CABIN CREEK

This stream was surveyed in 1990 using the Gifford Pinchot National Forest Stream Methodology. Much of the channel is scoured to bedrock since it failed after the 1964 storm event. Pool habitat is limited; however, large woody debris appears to be plentiful. Protocol for collecting pieces of large wood is different for this methodology, so numbers cannot be compared to other surveys. Riparian condition is fair. Most of the area consists of mature trees but small trees and clearcuts can also be found.

APPENDIX F: RECREATION

Fall Creek Reservoir Use

Unit Day Value (UDV) is a method for determining the economic benefits of recreational activities developed by the COE. Five categories of evaluation criteria are considered in determining the UDV, and each can be affected by changes in reservoir operation. The evaluation analysis for Fall Creek Reservoir is shown in Table F-9. This reservoir scored on the higher end of the scale for the twelve analyzed. If it were not for the operational drawdown and, to a lesser extent, additional developed facilities, Fall Creek Lake would have ranked the highest. The total average annual recreation value for Fall Creek Reservoir during 1985-89 was $966,849.00/ year. Forecast value for the years 2000 and 2010 are $1,581,362.00 and $2,669,510.00 respectively. Consequently, though the Corps receives only a fraction of these values in return, the economic benefit is substantial. These calculations were done in conjunction with the 1991 Willamette Basin Review.

Recreation Carrying Capacity

The capacity of a recreation resource to provide opportunities over the long term, without significant degradation of the resource is called the *carrying capacity (see Figure F-1)*. Two components of carrying capacity are the social and resource capacity. *Social capacity* defines the amount of use an area can receive while still providing a quality recreational experience. *Resource capacity* refers to the level of use beyond which environmental deterioration is irreversible or resource degradation renders it unsuitable and unattractive. When the social capacity is exceeded the result is overcrowding. Exceeding the resource capacity constitutes overuse. Establishment of recreation carrying capacities is critical in recreation management and planning. Visitation projections are a reflection of estimated recreation demand and assume that continued development will occur commensurate with demand. However, there are many constraints to the watershed's capacity to sustain continued development, including resource capacity, financial and policy considerations, and management objectives not compatible with recreation use. The COE has completed determinations of carrying capacities for Fall Creek Reservoir in conjunction with the Master Planning process (1994).

Limiting the watershed's sustained visitor use is the *maximum practical use level*. This is dependent on the nature and extent of recreational opportunities available at present and in the future *(see Table F-10)*. As the maximum practical use level is exceeded, the watershed's resources and visitors' enjoyment will deteriorate. Demand at Fall Creek Reservoir has regularly exceeded carrying capacity in recent years, particularly in 1989, 1990, 1991, and 1993. Recent improvements at many of the recreation sites have allowed a higher density use, without resource deterioration. Consequently the maximum practical use may need revision. If all proposed facilities are constructed at Fall Creek Reservoir, estimates indicate demand will exceed ultimate carrying capacity by the year 2010. However, it is unlikely that any of the proposed facilities will be

constructed, until changes in reservoir operation and fiscal and policy constraint occurs. Consequently, Fall Creek Reservoir will not meet the estimated future demand for water-related recreation in the area. Inadequate recreational use data exists for the remainder of the watershed, and is necessary to effectively manage for future needs.

Identified regional resource needs have been translated into project wide resource objectives for Fall Creek Reservoir and analyzed for suitability *(see Table F-11).* The Resource Use Objectives (RUO), presented in the Corps of Engineers Master Plans, are intended to promote sound stewardship of natural resources and ensure future opportunities for their public use, while emphasizing each reservoir's unique and particular qualities.

Updated and reliable visitation data is needed for the watershed as a whole, so realistic carrying capacities may be determined, and plan to provide future recreational opportunities. Collaboration in this endeavor could benefit the public as well as the federal agencies involved.

Table F- 1. Visitation to Willamette National Forest

	Visitor Days		
Year	Developed Sites	Dispersed Areas	Total
1982	1,424,000	1,463,400	1,887,400
1981	1,414,000	1,473,700	1,887,700
1980	1,393,400	1,399,500	2,792,900
1979	1,374,700	1,342,800	2,717,500
1978*	1,176,600	1,150,500	2,327,100
1977	1,108,900	1,153,100	2,262,000
1976	920,300	1,153,100	1,949,900
1975	1,038,100	1,030,400	1,068,500
1974	1,121,700	1,300,400	2,422,100
1973	948,500	1,073,400	2,021,900
1972	964,800	904,700	1,869,500
1971	936,200	903,600	1,839,800
1970	1,026,100	1,140,100	2,166,200
1969	946,500	1,033,700	1,980,200
1968	1,000,000	819,700	1,819,700
1967	984,700	736,700	1,721,400
1966	956,900	693,300	1,650,200

* Starting in 1978, data is for the fiscal year. Prior to 1977, data was compiled on a calendar year basis.

Source: U.S. Forest Service, Recreation Information Management System.

Table F- 2. Population by Decade and Average Annual Population Change

Population by Decade

Decade	1950	1960	1970	1980	1989
Oregon	1,521,341	1,768,687	2,091,533	2,633,149	2,791,000
Will. Basin	992,387	1,168,899	1,446,594	1,793,860	1,915,000
WRB % of State	65.2%	66.1%	69.2%	68.1%	68.6%
Counties					
Benton	31,570	39,165	53,776	68,700	71,000
Clackamas	86,716	113,038	166,088	243,000	265,500
Lane	125,776	162,890	213,358	275,200	281,000
Linn	54,317	58,867	71,914	89,750	90,000
Marion	101,401	120,888	151,309	204,692	224,000
Multnomah	471,537	522,813	554,668	562,640	581,000
Polk	26,317	26,523	35,349	45,560	47,800
Washington	61,269	92,237	157,920	247,800	295,000
Yamhill	33,484	32,478	40,213	55,600	60,700

Source: *Population Estimates for Oregon,* 1980-89. Center for Population and Research, Portland State University, 1990.

The following table illustrates the annual rate of population change over comparative time periods for the state, basin and individual counties within the basin.

Average Annual Population Change

Area	1950-1989	1980-1989
Oregon	1.57%	.65%
Willamette Basin	1.7%	.73%
Benton	2.1%	.37%
Clackamas	2.91%	.99%
Lane	2.07%	.19%
Linn	1.3%	.03%
Marion	2.05%	.94%
Multnomah	.54%	.36%
Polk	1.54%	.53%
Washington	4.11%	1.96%
Yamhill	1.54%	.98%

Source: US Census of Population, US Dept. of Commerce, Bureau of Census 1950, 1960, 1970, 1980. 1989 figures for Oregon from Portland State University, Center for Population Research and Census.

Table F-3. Fall Creek Lake Existing Public Use Facilities

Table F-3
Fall Creek Lake
Existing Public Use Facilities

Site	Acres	Agency	Fees	Type Of Area	Facilities						
					Picnic Tables	Camping Spaces	Boat Ramp Lanes	Boat Docks	Parking Cars	Parking Trailers	Swimming Beach
Winberry Cr. Park	62.1/land 19.4/water	Lane County	No	Day use	57	0	2	1	108	120	Yes
North Shore Access	13.6/land 2.8/water	Lane County	No	Day use; minimal development	4	0	2	0	0	30	No
Sky Camp	103/land 30/water	Lane Co SD #52	Yes	Day use/overnight (education camp)	10	*6	1	0	75	20	Yes
Cascara Campground	80	Corps	Yes	Overnight use	10	45	1	1			Yes
Fishermans' Pt. Prim. Campgrd.	5	Corps	No	Overnight use; minimal development	10	10	1	0	30	10	No
Fall Cr Arm Day Use	4**	Corps	No	Day use; minimal development	13	0	2	0	23	12	No
Tufti W.L. Area	280	Corps	No	Day use/Wildlife	0	0	0	0	10	0	No
Total Visitor					104	61	9	3	246	192	

* 6 Cabins with 30+- spaces plus lodge
** 40 Acres represent developed area only

Table F- 4. Analysis of Project Historic Visitation

Project: Fall Creek Lake

Activity	1985	1986	1987	1988	1989	Average
Camping	32,536	35,026	39,381	49,516	69,003	45,092
Picnicking	28,850	28,725	42,156	49,621	56,374	41,145
Boating	55,094	45,173	65,368	88,483	87,333	68,290
Fishing	24,419	30,992	46,527	60,568	62,261	44,953
Hunting	4,290	3,710	3,114	3,343	3,373	3,566
Sightseeing	9,667	12,825	22,801	32,914	37,757	23,193
Waterskiing	51,185	51,179	36,248	44,592	46,018	45,844
Swimming	41,063	38,705	62,905	71,348	83,017	59,408
Other	88,039	91,509	83,152	81,649	97,797	88,429
Total Activity Occasions	335,143	337,844	401,652	482,034	542,933	419,921
Total Visitors	195,162	219,050	223,068	265,835	311,519	242,927
Ratio of Duplication (%)	1.72	1.54	1.80	1.81	1.74	1.72

Average % of Hunting and Fishing: 0.20

Average % of General Recreation: 0.80

Table F-5
Visitor Attendance at Fall Creek Lake, 1985

MONTH	Camping	Picnicking	Boating	Fishing	Hunting	Sight Seeing	Water Skiing	Swimming	Other	TOTAL
Jan	103	372	450	1,404	959	718	0	0	4,612	6,589
Feb	65	202	393	1,367	0	552	0	0	6,579	8,176
Mar	306	0	546	1,368	0	392	0	0	5,536	7,376
Apr	1,374	683	2,208	2,801	0	805	0	0	10,247	14,923
May	3,364	2,646	7,297	3,380	0	689	609	1,245	5,261	17,225
Jun	5,822	5,740	12,685	3,217	0	1,147	14,345	9,095	7,306	30,165
Jul	9,479	12,395	16,582	3,955	0	1,652	20,116	19,460	18,805	44,295
Aug	9,277	5,128	11,910	3,026	0	1,465	13,660	8,820	8,381	31,410
Sep	1,248	1,091	1,678	925	0	389	2,318	2,306	2,280	7,136
Oct	1,222	226	452	616	827	516	137	137	5,317	7,607
Nov	0	256	304	650	1,399	629	0	0	9,000	11,816
Dec	276	111	589	1,710	1,105	713	0	0	4,715	8,444
TOTAL	32,536	28,850	55,094	24,419	4,290	9,667	51,185	41,063	88,039	195,162
% of Total	16.7%	14.8%	28.2%	12.5%	2.2%	4.9%	26.2%	21.0%	45.1%	

Source: U.S. Army Corps of Engineers, Portland District.

Table F-5. Visitor Attendance at Fall Creek Lake, 1985

Table F- 6. Projected Fall Creek Lake Visitation

Year	Trend Extrapolation Method	Visitation Analysis Method
1992	326,000	342,000
1995	353,000	380,013
2000	360,000	411,164
2005	380,000	440,849
2010	403,000	471,937
2015	420,000	505,361
2020	438,000	541,026
2025	456,000	579,374

Table F- 7. Forecast Future Visitation at Fall Creek Lake

Project: Fall Creek Lake

Activity	Average Annual Activity Occ. (1985-1989)	Forecast Regional Growth Rates (%)		Estimated Future Use in Act. Occ.	
		2000	2010	2000	2010
Camping	45,092	70	191	76,657	131,219
Picknicking	41,145	40	109	57,603	85,993
Boating	68,290	49	140	101,752	163,896
Fishing	44,953	50	123	67,430	100,246
Hunting	3,566	2	4	3,637	3,709
Sightseeing	23,193	59	165	36,877	61,461
Waterskiing	45,844	55	139	71,059	109,568
Swimming	59,408	63	160	96,834	154,460
Other	88,429	94	288	171,553	343,105
Total Activity Occ. Averages	419,921	54	147	683,403	1,153,658
Total Visitors	242,927			397,327	670,731
Ratio of Duplication (%)	1.72				

Table F- 8. Projected Land County Recreation Demands and Needs

Projected Outdoor Recreation Demand, Lane County 1975-90

Activity	1975	1980	1985	1990
Camping	1,834,771	2,014,367	2,171,894	2,280,717
Picnicking	2,186,777	2,400,829	2,488,578	2,718,279
Non-Pool Swimming	894,481	982,037	1,058,834	1,111,887
Sightseeing	3,746,694	4,113,438	4,435,116	4,657,338
Fishing	1,685,289	1,850,253	1,994,946	2,094,908
Power Boating	773,931	849,687	916,134	962,037
Float Boating	253,155	277,935	299,670	314,685
Waterskiing	279,676	307,052	331,064	347,652
Pleasure Walking	10,442,041	11,464,157	12,360,740	12,980,007
Hiking	1,673,234	1,837,018	1,980,676	2,079,918
Hunting	691,957	759,689	819,098	860,139
Outdoor Games	3,828,846	4,198,142	4,526,444	4,255,242
Bicycling	12,693,915	13,936,455	15,026,310	15,779,205
Off-Road Vehicling	935,468	1,027,036	1,107,352	1,162,836
Other	453,268	497,636	536,552	563,436

Source: Oregon Outdoor Recreation Demand Bulletin, Technical Document I of the Statewide Comprehensive Outdoor Recreation Plan. 1975.

Lane County Recreation Needs

Facility	Unit	Supply	Gross Need	1982	Net Need 1990	20000
Campsites	Site	3,917	1,696	(2,221)	(2,037)	(1,694)
Picnic Tables	Table	3,559	1,638	(1,921)	(1,679)	(1,525)
Boat Launch Lanes	Lane	183	80	(103)	(91)	(84)
Walking & Hiking Trails	Mile	56	507	451	520	560
Biking Trails	Mile	38	19	(19)	(16)	(15)
Bridle Trails	Mile	0	95	95	109	188
Ball Fields	Field	39	226	187	228	257
Neighborhood Parks	Acres	248	1,355	1,107	1,352	1,527
Community Parks	Acres	1,205	2,710	1,505	1,995	2,345
District Parks	Acres	8,293	4,065	(4,228)	(3,493)	()

() indicates surplus

Source: Oregon Outdoor Recreation, Statewide Comprehensive Outdoor Recreation Plan, 1983.

Table F- 9. Analysis of Estimated Unit Day Values for Water-Related Recreation

Project: Fall Creek Lake

Evaluation Criteria	Judgment Factors		
	Baseline Condition	Scenario I	Scenario II
Recreation Experience (Max. Point Value: 30)	Many activities; moderate to high quality 20	No significant change over B.C. 20	No significant change over B.C. 20
Availability of Opportunity (Max. Point Value: 18)	Several lakes within 1 hour; 2 within 30 minutes 4	No significant change over B.C. 4	No significant change over B.C. 4
Carrying Capacity (Max. Point Value: 14)	Adequate facilities; some expansion possible to optimize site potential 7	No significant change over B.C. 7	No significant change over B.C. 7
Accessibility (Max. Point Value: 18)	Fair access; fair roads at site; moderate impacts at drawdown 8	No significant change over B.C. 8	No significant change over B.C. 8
Environmental Conditions (Max. Point Value: 20)	Above average aesthetic quality 10	No significant change over B.C. 10	No significant change over B.C. 10
Total Assigned Points	49	49	49

Figure F- 1. Estimated Annual Visitation (Demand) and Maximum Practical Use Levels for Fall Creek Lake

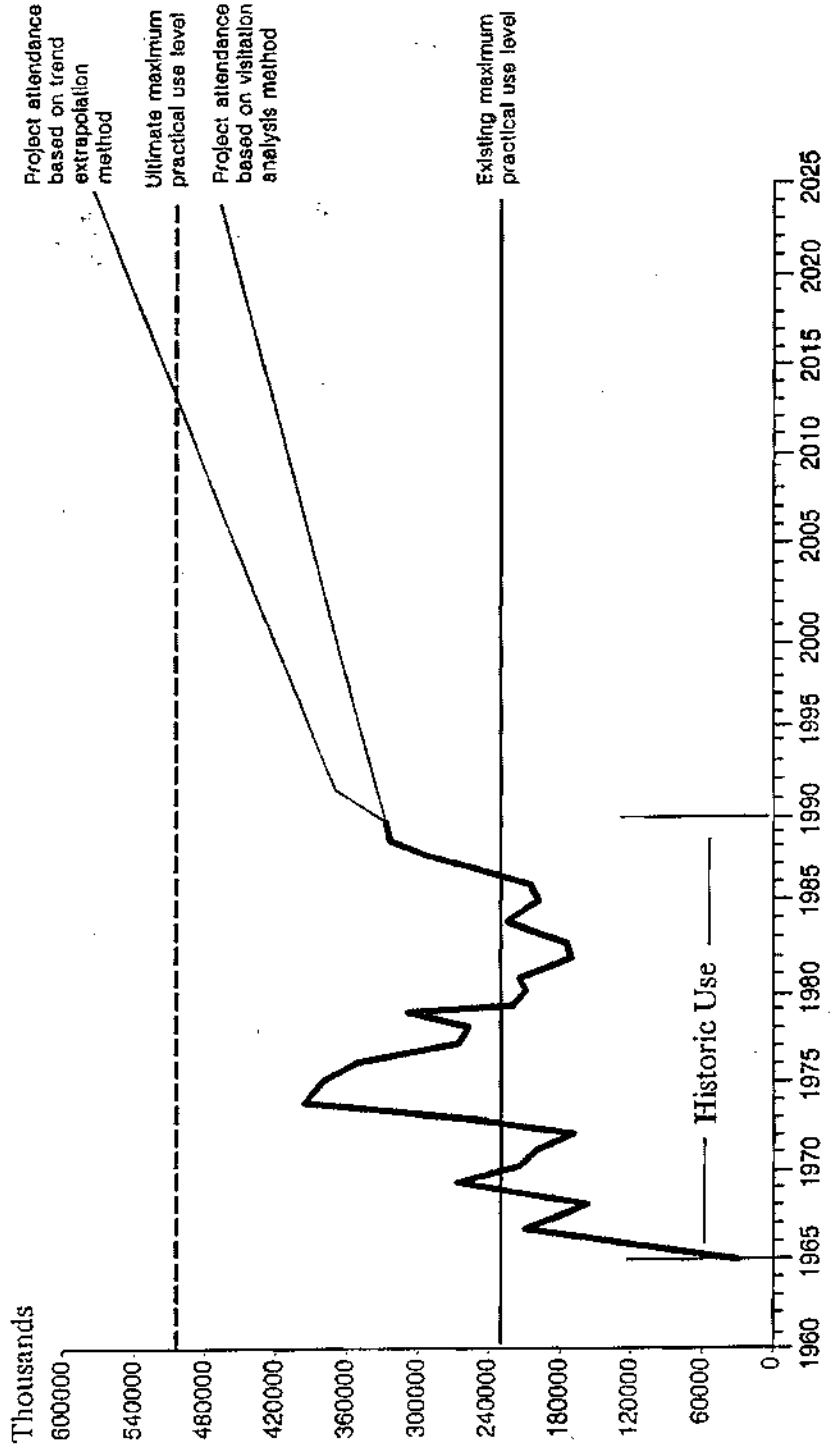


Table F-10. Estimated Maximum Practical Use of Fall Creek Lake

Table F-10
Estimated Maximum Practical Use
Fall Creek Lake

Activity	Unit	Density or Space Standard (Social Carrying Capacity)	Turnover Rate	Facilities or Resources		Activity Occasions/Day	
				Existing	Future	Existing	Future
Boating	Surface Acres						
Waterskiing		7.5 acres/boat (3 persons)	3	1200	1200	1400	1400
Motorized		8.8 acres/boat (4 persons)	3	350	350	480	480
Other motorized		11.5 acres/boat (2 persons)	3	72	72	38	38
Boat fishing		9.0 acres/boat (2 persons)	2	1600	1600	711	711
Picnicking	Tables	6 persons/site	3	97	200	1746	3600
Camping	Sites	5 persons/site	1	50	150	250	750
Swimming	Surface Acres	113 swimmers/acre	3	3	4	1017	1356
Shoreline Fishing	Linear Feet	60 feet/angler	2	12,000	12,000	600	600
Open Play	Acres	50 persons/acre	3	10	15	1500	2250
Sightseeing	Parking Spaces	4 persons/space	3	50	100	600	1200
Walking/Bicycling	Trial Miles	10 persons/mile	2	5	10	100	200
Hunting	Acres	30 acres/hunter	3	60	60	6	6
						8,488	**13,631**

Table F- 11. Relative Suitability of Fall Creek Lake

Relative Suitability of Fall Creek Lake Meeting Project-wide Objectives

Regional Needs*	Project-wide Objectives*	Fall Creek
WILLAMETTE BASIN PROJECT – Develop a comprehensive water control plan [Flood Control Act OF 1938 (PL–761) and Flood Control Act of 1950 (PL–516)]	To develop and maintain Project to meet authorized purposes.	●
CAMPING – An estimated 754,000 annual camping occasions occur within the study area. Project camping use accounts for approximately 17 percent of this demand.	To maintain lands and facilities to help support identified existing and future regional camping needs.	●
DAY USE RECREATION – An estimated demand of 7,443,320 day use activity occasions occurs within the study area. Project lands and facilities help support approximately 25 percent of this demand.	To maintain lands and facilities to help support identified regional day use recreation needs which presently occur or could be accommodated on Project lands in the future.	●
LAND USE/OPEN SPACE – LCDC Goals and Guidelines 3, 4, 5, 6 and 15 seek to preserve agricultural, and forest lands, and maintain rural setting and open space values.	To maintain Project lands in support of State and Counties requirements to preserve both visual and open space values.	●
WATER QUALITY – Oregon Administrative Rules Chapter 340 and LCDC Goals and Guidelines Number 6 define requirements to preserve and maintain the State's water resources.	To maintain and preserve high quality water resources for public, wildlife, and fisheries benefits.	●
UNIQUE AND ENDANGERED FLORA – The Endangered Species Act of 1873 and the Oregon Revised Statute 564.020 seek to protect threatened, endangered and rare vascular plants. Currently thirty such species are located with the study area.	To maintain and manage Project lands to support Federal and/or State efforts to protect and increase populations of threatened, endangered or rare vascular plants.	○
UNIQUE THREATENED AND ENDANGERED ANIMAL SPECIES – The Endangered Species Act of 1973 seeks to protect threatened, endangered and unique wildlife species. Currently 19 such species are located within the study area.	To maintain and preserve habitat for the benefit of unique and endangered wildlife species, and to support of Federal and/or State efforts on adjacent lands which seek to benefit these species.	●
WATERFOWL – The USFWS and ODFW have developed regional waterfowl management objectives including a 3-year wintering average of 75,000 Canada geese, 5,000 Tundra swans, a 250,000 average for puddle ducks (Willamette Basin) to maintain traditional production, migration, and wintering habitats, to uniformly distribute waterfowl and to provide for public use of waterfowl.	To maintain and manage wildlife habitat on Project lands to support regional management guidelines for waterfowl management.	○
BIG GAME – The ODFW management objectives for big game include habitat to support 3,500 Roosevelt elk and 37,000 black-tailed deer (McKenzie unit), 1,300 Roosevelt elk and 18,650 black-tailed deer (Indigo unit) and reduction of deer population in the Willamette unit.	To manage and manage Project habitat in support of regional big game management program.	◒
NON-GAME – The ODFW and USFWS management objectives for species in this category include managing and maintaining present production, migration, foraging, roosting and wintering habitat to increase populations of threatened, endangered, sensitive bird and national species groups of special emphasis.	To manage wildlife habitat on Project lands to maintain or increase non-game wildlife populations.	◒
UPLAND GAMEBIRDS – The ODFW management objectives are to maintain and manage the present production, foraging roosting and wintering habitat to increase upland gamebird populations.	To manage upland gamebird habitat to support regional upland gamebird management programs.	◒
FISHERY – ODFW's fishery management objectives include an 45,000 Spring Chinook over the Willamette Falls with a 10,000 adult harvest, maintain a 5,000 minimum early and a 14,000 native late steelhead run, and maintain optimum populations of fish resources for public and commercial benefits.	To maintain and manage fisheries habitat on Project lands to support identified regional needs.	◒
CULTURAL RESOURCES – Protect cultural resources in compliance with Executive Order 11593, National Historic Preservation Act Of 1966 (PL 89–665) and amendments, National Environmental Policy Act of 1969 (PL 91–190), Archaeological Resources Protection Act of 1979 (PL 96–95, and ORS 97–740–97–750.)	To protect known cultural resource sites and investigate those sites having high probability of containing significant information.	◒
INTERPRETIVE FACILITIES – Develop a coordinated regional program to meet public needs within the study area for information and access to public lands.	To develop an interpretive program that will provide public understanding of the Corps role in developing the basins water resources.	◒

* A more detailed explanation of these needs and objectives are discussed on page 3-13 (Regional Needs), and page 4-49 (Project-Wide Objectives) of the UWVP MPRU, Volume 1.

● High Suitability ◒ Moderate Suitability ○ Low Suitability

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MAPS

Mylar Overlay

Map 1. Vicinity Map

Map 2. Major Features

Map 3. Shaded Relief

Map 4. Ownership

Map 5. Land Use Allocations

Map 6. Geology

Map 7. Soil Categories and Erosion Potentials

Map 8. Reservoir Erosion Sites

Map 9. Highest Risk Areas of Mass Wasting and Potential Sources of Coarse Grain Sediments

Map 10. Highest Risk Areas of Landflows and Potential Sources of Fine Grain Sediments.

Map 11. Snow Zone

Map 12. Aspect Class

Map 13. Precipitation

Map 14. Stand Initiation Seral Stage In Transient Snow Zone

Map 15. Water Data Collections Sites

Map 16. Oregon DEQ Listings

Map 17. USFS Road Surface Type

Map 18. USFS Road Maintenance Level

Map 19. Reference Seral Condition (1900)

Map 20. Current Seral Condition

Map 21. Reference Riparian Seral Condition (1900)

Map 22. Riparian Seral Condition

Map 23. Interior Habitat

Map 24. Special Status/Sensitive Plant Locations

Map 25. USFS Special Habitat Features

Map 26. Big Game Emphasis Areas & Winter/Summer Range

Map 27. USFS Closed and Decommissioned Roads