Lookout Point Watershed Analysis Area

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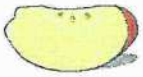

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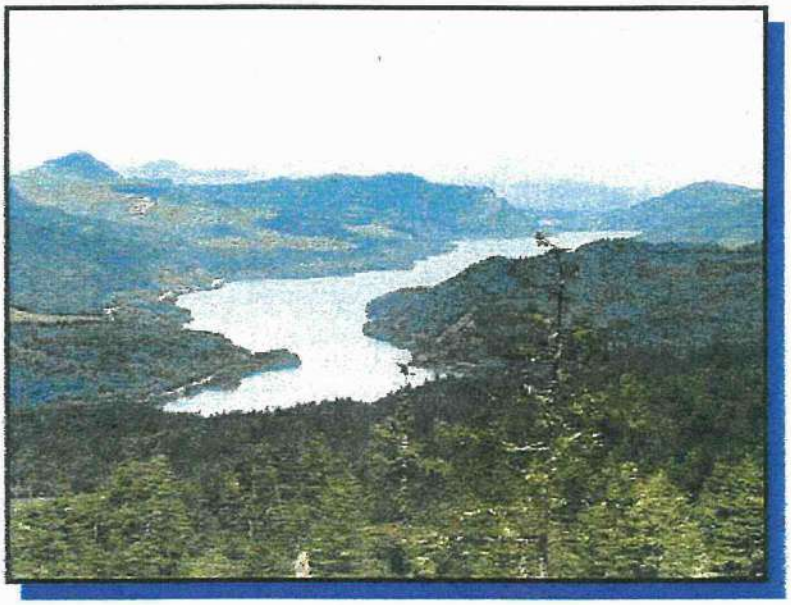
Buckhead Pond

Goodman Creek Inlet



West from Cloverpatch Butte Trail
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Lookout Point Dam

Shady Dell Campground

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INTRODUCTION

The Lookout Point Watershed Analysis Area examines conditions within a portion of the Middle Fork Willamette River and its associated tributaries. This analysis area lies within the boundaries of Lowell Ranger District on the Willamette National Forest. It is located in Lane County about 15 miles southeast of Eugene near the communities of Lowell and Oakridge *(see Map 1)*. The analysis area is 49,126 acres in size; its major features are delineated in Map 2 with a shaded relief shown on Map 3.

From a regional perspective, the Lookout Point Watershed 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 sub-watershed and drainage scale.

Table 1. Land Allocations in Lookout Point Watershed Analysis Area

Land Allocations	**Acres**	**% of Watershed**
USFS	46,444	94.5%
• LSR 100 (owl core reserves)	667	1%
• LSR RO222	32,477	66.1%
• Riparian Reserves	4,383	8.9%
• Other Forest Plan Withdrawn	1,198	2.4%
• Matrix	7,719	15.7%
◊ Visuals	5,571	
◊ Non-visuals	2,148	
BLM	75	0.1%
COE	2,098	4.2%
• Reservoir	1,683	3.4%
• Other Lands	415	0.8%
Private	508	1%
Total	**49,126**	

The project area is a mixture of private and governmental ownerships, with 94.5% of the land managed by the United States Forest Service (USFS). Other land administrators and owners include the US Army Corps of Engineers (COE) with

holdings adjacent to Lookout Point Reservoir, the Bureau of Land Management (BLM), and private owners. Specific land allocations can be found in Table 1 and Map 5. Since the USFS is by far the major land holder within the Watershed Analysis Area (WAA), this analysis will be focused on USFS lands.

The Lookout Point Watershed Analysis Area 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, and contributing towards flood control and power generation. Both natural processes and land use activities have shaped the landscape into its present form.

This WAA is unique as it is not a true watershed. It is composed of a number of small drainages and sub-watersheds. As explained in the federal guide, this WAA can be referred to as a composite watershed, formed as a residual or byproduct of delineating adjacent true watersheds where all water flows to a common point. This area is also the furthest downstream watershed on federal lands before the Middle Fork Willamette River continues onto non-Forest Service administered lands.

Another unique aspect of the watershed is that it serves as a travel corridor for fairly extensive commercial transport between population centers in the Willamette Valley and destinations east. Avenues of commercial use include the Southern Pacific Railroad, Highway 58 (a major east/west commercial trucking route) and Bonneville Power Administration (providing power to the Willamette Valley via transmission lines that bisect the watershed). These uses are all focused along the river/lake corridor within riparian reserve boundaries designated in the Northwest Forest Plan.

Direction for management of USFS lands in the WAA is provided by:

1) 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), referred to in this document as the Northwest Forest Plan (NWFP) and
2) the Willamette National Forest Land and Resource Management Plan (WNF-LRMP) (USDA, 1990).

While the NWFP has amended the WNF-LRMP, specific guidelines will be referenced by the applicable plan.

This WAA 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.

This analysis provides responsible officials with more comprehensive information upon which to base land management decisions. It is based on existing data; additional information was not collected but rather identified as "data needs."

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)*

  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).

- **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-C* 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 Lookout Point Watershed Analysis Area in context within the river basin and province, and to briefly analyze and describe its dominant physical, biological, and social features.

GEOLOGY

The analysis area lies entirely in the Western Cascade Province, located at the northwest boundary of the Basin and Range Province. It consists of rocks ranging in age from the Oligocene to Pliocene. These rock formations, called the Little Butte volcanic series, consist of tuffs, tuffaceous sedimentary rock, lava and intrusions (Peck, *et. al.*, 1964; Sharrod, 1991). The majority of the area consists of tuffs and tuffaceous sedimentary rocks found from low to middle elevations. Younger basaltic and andesite flow rocks are found at higher elevation such as Alpine Ridge and Patterson Mountain. The Little Butte formation has been altered by dioritic intrusions. These intrusions have modified the older Little Butte Series through thermal and hydrothermal processes that resulted in production of clay minerals from the parent material. An example of intra-canyon lava flows deposited on older glacial gravels is found across from Black Canyon Campground.

Large scale faulting in the area tends to follow a northwest trend and predates the eruption of intra-canyon Black Canyon lavas. The Eugene-Denio fault zone is commonly shown following the Middle Fork Willamette River valley in the vicinity of Lookout Point Reservoir (Lowell Watershed Assessment, 1994).

The analysis area lies in the lower reaches of the Middle Fork Subbasin; hence it is not a true watershed. The largest portion of the Middle Fork Basin is found to the east. Approximately 900 square miles drain into the Lookout Point WAA. The analysis area is constrained on both sides by high ridges forming a broad valley bisected by the Middle Fork Willamette River and has a dendritic drainage pattern typical of streams developed on these types of volcanic rocks. Streams are generally steep and narrow, separated by acute ridges.

EROSION PROCESSES

Mass wasting , hillslope and road-related land movements are the dominant forms of erosion in this watershed. They occur in steep areas prone to debris torrents associated with roads, concave slopes, headwalls, and bedrock hollows. Large storm events increase soil moisture content on these steep slopes triggering slope failures. These types of failures add coarse grain sediments, rocks and wood to stream channels.

Surface erosion is a result of hill-slope processes on large, deep-seated landslide areas. Such areas are found at lower to middle elevations and are a result of large land blocks

slowly creeping downward or rapid movement of these blocks from seismic events. These areas are stable in their current slope geometry, but prone to surface erosion at the toe of slopes in stream channels or adjacent to road cuts. These deep seated landslides produce fine-grain sediments which move a greater distance from their source and have the potential to degrade water quality and aquatic habitat.

Potential for mass wasting and subsequent coarse-grain sediment delivery to streams in the Lookout Point WAA was developed by classifying the landscape into areas with a High, Moderate, or Low rating. Fifty-eight percent of the area was identified as having high potential for mast wasting, most located on steep sideslopes near ridgetops *(see Map 11)*. Surface erosion potential for fine grain sediment was developed in a similar manner *(see Map 12)*. Thirty-eight percent of the area was identified as having a high rating for surface erosion.

Hydrology

The Middle Fork Willamette Subbasin has a maritime climate. Winters are mild and wet with most of the precipitation falling between October and April. Annual precipitation ranges from 45 inches at lower elevations to 70 inches at higher elevations. The Calapooya mountain range to the south may cause precipitation within the analysis area to be less than average. At lower elevations (900 feet to 1500 feet) precipitation is usually rain; between 1500 feet and 4200 feet it can be either rain or snow. Snow accumulations of 5 feet or more generally occur above 4200 feet. Summers are usually dry with average temperatures between seventy-five and the low eighties.

Runoff is rapid due to shallow, high permeable soils and high ridges lining the project area. The Middle Fork Willamette River is regulated above by the Hills Creek dam and below by Lookout Point dam. A portion of the reservoir created by the Lookout Point dam is in the analysis area. Streams in this area drain into the reservoir whereas streams above the reservoir drain directly into the Middle Fork Willamette River.

The most dominant hydrologic feature in the project area is Lookout Point Reservoir. It is located on the Willamette River at river mile 206. Lookout Point Dam has a drainage area of 991 square miles. At full pool its elevation is 929 feet and storage capacity is 453,000 ac-ft. It covers a total area of 4,360 acres of which 1,683 acres is in the analysis area. Discharge at normal operation is 12,000 cubic feet per second (cfs). Discharge at maximum operation is 15,000 cfs. This may be exceeded when required by the special flood regulation schedule.

Stream Channels

The Lookout Point WAA consists of many face tributaries. These are predominantly high gradient streams with a stairstep type of habitat. The Rosgen methodology was used to classify stream channels *(see Map 29)*. Most of these face tributaries are considered 'A' channels which are deeply entrenched and have a low meander pattern. These are the sediment source and transport reaches. Lower gradient channels are

moderately entrenched and slightly more sinuous. These are classified as 'A/B' channels which have characteristics of both Rosgen 'A' and 'B' channels. They function as sediment transport reaches.

The Middle Fork Willamette River above Lookout Point Reservoir is an 'F' channel type. It is a low gradient, moderately entrenched, shallow and wide channel with a moderate sinuosity. It has been altered due to the reservoir, highway and upstream reservoir on Hills Creek which regulates much of the flow thereby eliminating extreme high and low flows. This channel is still functioning as depositional. However, due to these alterations, sediment and debris are more readily transported through this reach and eventually deposited within Lookout Point Reservoir.

The low gradient section of Buckhead Creek is unique to this watershed analysis area. It encompasses multiple side channels and wetland habitat. The Rosgen channel classification is 'C', with a meandering pattern of scoured out pools and gravel bar deposition. A low channel entrenchment allows the creek to interact with its floodplain. This part of Buckhead Creek is highly depositional.

Water Quality

Primary beneficial uses within the watershed analysis area are aquatic life (including the Oregon chub, a federally endangered species), aesthetics, water-contact recreation, and domestic water sources. The unique aspect of this analysis area is its high commercial use. Trucks and railroads transport many unknown chemicals which have the potential to impact water quality should an accident occur. Developments within the project area that might affect water quality in the event of an accident, include a gas station and a trailer park.

Other water quality concerns are possible alterations to water temperature from timber harvest. Oregon Department of Environmental Quality (DEQ) has designated several streams within adjacent watersheds as water quality limited based on water temperatures exceeding the standard. The beneficial use standard for salmonid habitat requires that a moving seven-day average of daily maximum stream temperatures should not exceed 64°F during June 1 through September 30. Streams within this watershed analysis area have not been listed, possibly due to a lack of available data.

Vegetation

The Lookout Point WAA is a part of the Oregon Western Cascades province. Its vegetation is a diverse mosaic. Earliest known harvest activity occurred between 1900 and 1920 in Hazel Creek drainage on the west edge of the analysis area. Access was from Highway 58 through private land. Other areas harvested at the turn of the century include the ridge west of Wesfir and Goodman Creek, both logged around 1901. The main road systems were not developed until the 1940s, so access was restricted except along the north shore of Middle Fork Willamette River and the Highway 58 corridor.

The area has a wet and mild maritime climate but the moisture and temperature variation is wide due to its distance from the ocean. Mild winters result in an extended growth period.

Vegetation changes are caused by a combination of physical factors and disturbance elements. Physical factors include environmental conditions of slope, aspect, elevation, soil types, and precipitation. Topographic features modify precipitation patterns; a rise in elevation corresponds to an increase in rainfall. Disturbances, such as stand replacement or low intensity fires, affect large expanses of vegetation. Flood, wind, disease, insect, and animal damage affect vegetation in more localized areas.

Vegetation series found in the analysis area are:

1) western hemlock *(Tsuga heterophylla)* series
2) Douglas-fir *(Pseudotsuga menziesii)* series and
3) Pacific silver fir *(Abies amabilis)* series.

A large portion of the watershed falls into the western hemlock series, which is lower in elevation than the Pacific Silver fir series. Important species include Douglas-fir and western hemlock with western redcedar *(Thuja plicata)* in the wetter areas. Bigleaf maple *(Acer macrophyllum)* and Pacific dogwood *(Cornus nuttallii)* are common especially at lower elevations. On warmer sites in Deception and Shady Dell drainages, white pine and sugar pine are found with low relative covers. Non-stand replacing fires tend to create and maintain canopy gaps that promote and maintain sugar pine regeneration. Effective fire control has reduced the area affected by low intensity burns. Two of the sugar pines in this area have seed that has been tested and exhibits a 95% resistance to white pine blister rust fungus *(Cronartium ribicola).* Seed will be collected and utilized for reforestation.

The Douglas-fir series occurs on warm, relatively dry sites at lower elevations and on south and west aspects. Annual winter precipitation amounts to about 40-50 inches of rain or transient snow. Douglas-fir dominates the canopy and the regeneration layer with incense cedar *(Libocedrus decurrens)* and grand fir *(Abies grandis)* also present as climax species. The Douglas-fir series tends to be transitional to the wetter western hemlock series as evidenced by a mixture of western hemlock and Douglas-fir in the understory. This is the driest environment that will support a closed forest canopy on the Willamette National Forest. The driest sites contain Oregon White Oak *(Quercus garryana)* in small openings. Dry site associates include chinkapin *(Castanopsis chrysophylla),* madrone *(Arbutus menziesii),* oceanspray *(Holodiscus discolor),* and poison oak *(Rhus diversiloba).* Grand fir is present on well-drained river terraces at Black Canyon. Grand fir is a minor component.

The Pacific silver fir series occupies small areas of the highest ridgetops such as Patterson mountain, Alpine Ridge and Deception Butte. Precipitation is about 10 inches greater on these higher elevation areas.

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 in reducing post-harvest, logging debris. Natural fires and unplanned human-caused 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.

Species and Habitats

Aquatic

A minnow endemic to the Willamette Valley, the Oregon chub, was listed on the Federal Endangered Species List in 1993. At one time found throughout the Willamette Valley, this species has declined drastically. The majority of Oregon chub populations are now found along the Middle Fork Willamette Valley. The project area includes several of these populations. The NWFP has delineated Key 1 Watersheds to protect and enhance Oregon chub habitat *(see Map 6)*.

Oregon chub prefer a pond-like habitat with minimum flow, depositional substrate and abundant aquatic vegetation. The largest populations are found in isolated ponds containing only native fish species. In such areas road or beaver dams have blocked competition or predation from exotic species found in the Middle Fork Willamette River mainstem or Lookout Point Reservoir.

Spring chinook are native to the Middle Fork Willamette Valley; summer and winter steelhead were introduced. Construction of Dexter and Lookout Point Dams blocked all migration of these species, now trapped below Dexter and spawned at the hatchery. Spring chinook are stocked in Lookout Point Reservoir, but only for the purpose of creating a catchable fishery. The US Army Corps of Engineers (COE), Oregon Department of Fish and Wildlife and other agencies are currently exploring the possibility of reintroducing salmon and steelhead to the upper Middle Fork Willamette River. Some potential spawning habitat exists in the watershed analysis area. However, spawning was more common further upstream in the North Fork Middle Fork Willamette River, Salmon Creek and Salt Creek before the dams were built (COE, 1997).

Fish migration barriers are common in high-gradient stairstep tributaries draining into the Middle Fork Willamette River. These tributaries are dependent on mature riparian trees to provide a variety of functions such as shade and stability. Over time these large trees are the source for much needed large woody debris that helps stabilize and create quality aquatic habitat. Cutthroat trout are primarily found in this type of habitat *(see Map 28)*.

Native fish species found within Lookout Point Reservoir are rainbow trout, large scale suckers, northern squawfish, redside shiners, Oregon chub and spring. Illegally introduced fish include brown bullhead, white crappie, largemouth bass, bluegill, smallmouth bass, and channel catfish. The reservoir provides a cool water fishery supporting populations of both warm and cold water species.

The mainstem Middle Fork Willamette River provides habitat for large adult trout and several other native fish such as large scale suckers, northern squawfish, mountain whitefish, redside shiners, longnose dace, speckled dace, and several species of sculpin. Various exotic species may migrate up from the reservoir.

The Northwestern pond turtle is documented in the watershed utilizing inlets and coves of Lookout Point Reservoir and also found in the ponds and slackwater areas of Buckhead Special Wildlife Habitat Area. Historically, the species was more abundant along the Middle Fork than it is today due to previously existing slackwater/pond habitat along its floodplains. With the construction of Hills Creek and Lookout Point Reservoirs, subsequent moderation of peak flows in the river may affect turtle abundance due to habitat loss. Turtles are terrestrial nesters where they travel as much as 200-300 meters to excavate a cavity in the soil and deposit eggs. Potential loss of suitable nesting habitat due to development along the river corridor may also contribute to declining numbers. A third contributor to potential decline is the introduction of non-native species into the watershed. Bullfrogs and warm water fish species such as bass prey on young turtles, thus affecting successful juvenile recruitment into local populations.

Limited surveys for a few aquatic amphibian species have been conducted within the analysis area. Results have verified presence of red-legged frogs, tailed frogs and torrent salamanders. The red-legged frog is listed as sensitive by Region 6 of the USFS. Breeding sites for this species include permanent or temporary waters with little or no flow. Stream surveys have identified a relatively high abundance of red-legged frogs in the lower reaches of Deception Creek drainage. Numerous sites within the watershed potentially support breeding of this species. The tailed frog and torrent salamander, both aquatic dependent species, are Appendix J2 species of concern as listed in the NWFP. Although their presence has been documented, overall watershed distribution and abundance of these species is unknown.

TERRESTRIAL

Wildlife habitats found within the project area are fairly diverse, supporting a number of terrestrial wildlife species. Oak savanna meadows along the north shore of Lookout Point Reservoir, Cloverpatch Bluffs in Cloverpatch Special Wildlife Habitat Area (SWHA), the unique lowland/floodplain habitats of Buckhead SWHA, and high elevation meadow complexes in the Patterson Mountain SWHA all contribute to habitat diversity *(see Map 6)*. Lookout Point Reservoir, although constructed by humans, provides seasonal as well as yearly habitat for a number of local and migrating waterfowl species as well as prey species utilized by osprey and bald eagles.

A number of *species of interest* have been documented or suspected to occur in this watershed. Potential nesting habitat for the peregrine falcon exists at Cloverpatch Bluffs, Deception Rock and Buckhead Mountain. Ongoing surveys at these sites are being conducted to verify activity. Currently 22 spotted owl activity centers are known to exist within the analysis area. Seven of these are sites in the matrix portion; the remainder occur within the Late Successional Reserve (LSR) part of the watershed.

Three pairs of bald eagles forage and/or nest within the analysis area. Presence of the Townsend's big-eared bat is documented along the north side of the reservoir. Ongoing monitoring of a recently closed mineshaft in the watershed is being conducted to determine its suitability as a winter hibernacula site. Roosevelt elk and black-tailed deer are present in healthy numbers. The entire portion of the analysis area north of Lookout Point Reservoir is high use elk winter range due to aspect and low elevation. Portions of Whitehead and Bridge Creeks and Patterson Mountain (summer range) are also high use elk areas.

Special habitats are important for wildlife and plant diversity and Lookout Point WAA has some areas of high botanical diversity. Large blocks of rock garden habitat ring the northern edge of the watershed, above Lookout Point Reservoir. These meadows have decreased in size dramatically due to fire suppression. They provide habitat for the sensitive plant, Thompson's mistmaiden, in the early spring. A series of alpine meadows at the southern headwaters of the watershed range from dry to mesic (Hardesty-Mt. June and Patterson Mountain areas). Some massive rock outcrops exist between the meadows in near Sawtooth Rock, Krueger Rock and Deception Rock/Butte.

Unique plants found in this watershed include Cusick's checkermallow, Thompson's mistmaiden, Spring phacelia, Howell's montia, and branching montia. The most common noxious weeds are Scotch broom and tansy, although Canada thistle, bull thistle and St. John's-wort are also prevalent. One especially nasty invader is spotted knapweed, located along the Highway 58 corridor. Spotted and meadow knapweeds are also found in small isolated pockets away from the main highway corridor. Exotic species are found in Lookout Point Reservoir itself as well as its drawdown zone. Giant knotweed has been spotted on islands in the middle of the river just upstream from Buckhead. Populations of Survey and Manage Species identified by the NWFP exist in the analysis area; habitat for these species is very scattered and distributed in small patches of unmanaged timber stands.

Human Uses

The Middle Fork of the Willamette River has served as an important travel corridor for perhaps 8,000 years. Archaeological evidence suggests that native people inhabited the area prior to the eruption of Mt. Mazama. The Kalapuya, Molala and Klamath visited the area for hunting, food and toolstone collecting. In later times, fire was used as a tool to maintain an oak woodland/savanna vegetation type at lower elevations and to maintain high elevation meadows.

Early EuroAmerican settlement of the lower Middle Fork of the Willamette was primarily focused on subsistence farming, logging, and small scale lumber and shake manufacturing.

The pioneering of an "immigrant" road from the Oregon Trail across eastern Oregon and down the Middle Fork led to settlement of the Lowell-Pleasant Hill area and spurred the development of the Oregon Central Military Wagon Road in 1864. One hundred years later, Lookout Point Dam flooded the settlements along the Middle Fork, known as "Rush Island", displacing about 300 people.

Although well used as a travel corridor for thousands of years, few people actually lived in the watershed throughout the year. There are no towns within the watershed currently. Ownership is primarily Federal, with State and private lands clustered around State Highway 58 and Forest Road 5821. The reservoir flooded the few, small towns present through the 1950s, leaving scattered private holdings of harvested timberlands, residential property and two businesses.

Today, the ridges and areas near water are popular destinations for recreation users, primarily due to year-round accessibility from Highway 58 and proximity to the Eugene/Springfield metropolitan area. All three campgrounds in the watershed are found within riparian reserves along the highway. Human use patterns include recreation activities on trails and in campgrounds, timber management, rural residences (including a small trailer park), and a gas station/"mini-mart" business. Recreation and tourism are being pursued by adjacent small communities as a source of economic gain, although these have much less wage earning power than timber harvesting,.

Most recreation use occurs from Memorial Day through Labor Day, although use is increasing throughout the year. Eugene area residents are attracted because they have quick access to a forested setting after work or on weekends. Very little water recreation occurs on Lookout Point reservoir, which may be due to the abundance of other lakes and reservoirs available less than 50 miles from Eugene.

The watershed contains 42 miles of trail. Many trails that historically provided access to the forest now lie beneath roads. Most trail routes connect the river corridor to upland areas. As such, they tend to be steep and deterioration of the tread is escalating as their popularity increases. Several trails and roads are advertised in bike guides and bike magazines.

Patterson, Tire and Hardesty Mountains are the highest points in the analysis area and all have biological, recreational and historic significance. Fire lookouts were once stationed on top of Hardesty and Tire Mountains; both are still accessible only by trails. Lone Wolf Shelter stands near meadows on the broad shoulders of Patterson Mountain. Ash Swale Shelter lies farther west along the same ridge system. Both were constructed in the 1930s by the Civilian Conservation Corps (CCC), as a shelter for forest workers.

CHAPTER 2
ISSUES AND KEY QUESTIONS

ISSUE 1: WATER QUANTITY AND QUALITY

The Middle Fork Willamette River mainstem is partially regulated by the US Army Corps of Engineers' operations at Hills Creek Reservoir, limiting floodplain use and eliminating extreme high and low flows. Water quantity may also be altered upslope on forested lands where roads intercept flows and drain into stream channels. Timber harvest and roads within the watershed analysis area may have affected water temperature.

Key Questions

1. *How have upstream management activities affected water quality and quantity?*

ISSUE 2: VEGETATION

Vegetation in the Lookout Point WAA has been altered by a variety of disturbances. Timber harvest and associated road building activities have been prevalent during the past 40-50 years.

Large fire occurrences, of importance in shaping vegetation patterns within this and adjacent watersheds, have been altered during the past 100 years. Native vegetation communities have been affected by suppression efforts.

A number of special habitats, both forested and non-forested, are found in this watershed. Past human and natural disturbances may have affected these habitats and the overall biodiversity.

Matrix lands, located north of the Middle Fork Willamette River, are managed under various constraints, which reduce harvest activities along trails and the Highway 58 corridor.

Managed stands within LSR RO222 will be slow in developing late-successional forest characteristics due to competition and densities of conifers in these stands.

Key Questions

1. *Where and how much matrix land is available for timber harvest within the next decade?*

2. *What was the historic fire occurrence within the Middle Fork Willamette and Tributaries analysis area? How did historic fire occurrence affect vegetation? Should we reinitiate this significant disturbance in the WAA?*

3. *What and where is the potential for large fire occurrence in the watershed? What are the causal factors for this potential?*

4. *Where and to what extent have natural and human caused disturbances affected special habitats and their contribution to biodiversity? What are future trends?*

5. *Are there opportunities for stand density management within LSR RO222 that will maintain consistency with LSR objectives and improve stand development? Where?*

Issue 3: Aquatic Habitat and Species

The Lookout Point WAA provides diverse aquatic habitat. Some of these diverse habitats include: high gradient face tributaries, the mainstem Middle Fork Willamette River, slow moving streams with side channels, and wetlands such as those found in the Buckhead area and Lookout Point Reservoir. Land management activities such as logging, roads and dam construction have affected native trout, salmon and other aquatic species.

Oregon chub, an endangered species, is found in several locations along the Middle Fork Willamette River. Four small Tier 1 key watersheds have been established within the project area to help maintain and restore populations.

Key Questions

1. *What is the current status and available habitat for the Oregon chub? What are the trends? What are the recommendations to assist the recovery of this species?*

2. *What is the current status and potential reintroduction for anadromous fish?*

3. *How diverse is the aquatic habitat and how have management activities affected these habitats? What are the trends?*

Issue 4: Terrestrial Habitat and Species

The amount and distribution of past vegetation manipulation activities may have affected the amount and location of late-successional interior forest habitat. This may hinder or alter movement and dispersal capabilities of late-successional forest related species.

Invasion of non-native terrestrial plant and animal species may affect local populations of native species.

Key Questions

1. *How have species distribution and their habitats changed over time due to past management activities? What are the future trends?*
2. *Are there any priorities for maintaining or enhancing late successional forest conditions to provide for dispersal and movement of plant and animal species? If so, where?*
3. *Can the Buckhead Special Wildlife Habitat Area be managed as late-successional habitat? Are there any proposed management activities not consistent with LSR objectives?*

Issue 5: Human Uses

Numerous non-Forest Service related activities have been established within the watershed. These activities include Highway 58, Southern Pacific Railroad and Bonneville Power Administration powerlines. These special uses have impacted or have the potential to impact plant and animal species and their habitats.

With population growth in adjacent metropolitan areas, existing and future potential recreation activities may affect the forest environment.

Key Questions

1. *What current or potential future effects do non-Forest Service special uses and right-of-ways (such as the railroad, Highway 58 and Bonneville Power Administration) have on species and habitats?*
2. *What are the trends of recreational and human use in the watershed?*
3. *What effect will these trends have on forest management guidelines and on wildlife species and their habitats?*

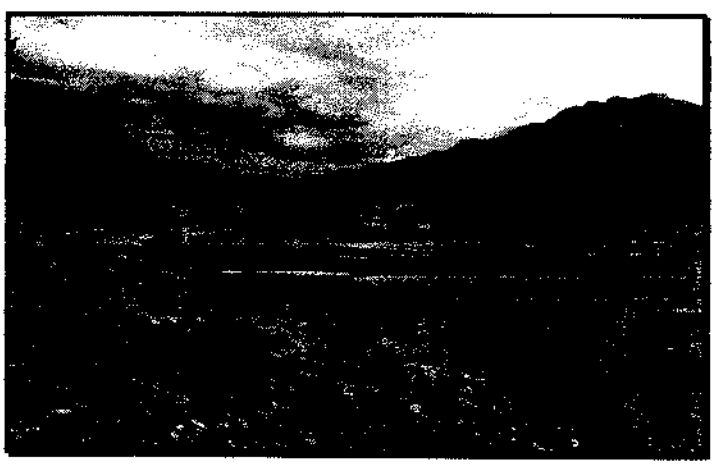


Figure 2. East end of Lookout Point Reservoir during Low Pool

CHAPTER 3
REFERENCE AND CURRENT CONDITIONS

GEOLOGY

The Lookout Point WAA lies in the lower Middle Fork Willamette subbasin; hence it is not a true watershed. Approximately 900 square miles of the Middle Fork Willamette subbasin lies to the east of the project area. The analysis area is 49,049 acres in size and has been subdivided into fifteen drainages. The largest is Goodman (9,099 acres); Lookout Point Reservoir is the smallest with 127 acres.

An east-west trending ridge divides the analysis area from South Fork Winberry drainage to the north. The Calapooya mountains lie between the analysis area and Layng watershed to the south. Numerous face tributaries drain directly into the Middle Fork Willamette River from the project area. The largest of these are Tire, Goodman and Deception Creeks.

Igneous extrusive 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 the Calapooya mountain range.

Emplacement of numerous dioritic-dacitic intrusions between ten and three million years ago resulted in thermal and hydrothermal alterations of the rocks already present. 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 these are used as crushed aggregate. Some 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 WAA 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 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 western portion of the WAA 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.

Large scale faulting in the area tends to follow a northwest trend and predates the eruption of intra-canyon Black Canyon lavas. The Eugene-Denio fault zone is commonly shown following the Middle Fork Willamette River valley in the vicinity of Lookout Point Reservoir (Lowell Watershed Assessment, 1994).

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). The SRI was written in 1973 and its maps revised in 1990.

To simplify soil analysis, the 1990 SRI soil mapping units within the WAA have been grouped into five categories. These categories are based on similar soil properties and expected behavioral response to management activities *(see Map 10)*

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.

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. 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 Mapping Units by Soil Category

Soil Category	Definition of SRI Soil Categories	SRI Mapping Units
Category 1	nearly 100% clayey soils	22,25,35,255
Category 2	at least 50% clayey soils	23,33,235,251,252,253,254,256, 335,353,356
Category 3	nearly 100% steep ground and shallow soils	1,2,3,8,16,21,31,61,201,202, 203,204,210,301,302,310,315, 316,444,601,602,603,610
Category 4	at least 50% steep ground and shallow soils	161,168,212,213,214,215,216, 304,305,313,332,441,517,604, 605,606,607,608,614,615,616, 617
Category 5	all others	all others

Erosion Processes

In order to evaluate the assumptions behind soil behavior categories and evaluate trends, adjacent watershed analysis were used. Since the geology and topography is similar or basically the same it is thought that the percentage of failures from management activities will remain the same. Watershed analysis cited are: *Layng Creek* (Umpqua National Forest, Cottage Grove Ranger District), *Winberry and Lower Fall Creek* and *Fall Creek* (both on Willamette National Forest, Lowell Ranger District).

Layng Creek Watershed lies just to the south of Lookout Point WAA. The Layng Creek Watershed Analysis identified a complete reversal of landscape disturbances from the 1946 to 1966 aerial photo series. The 1946 photos series suggests that 69% of the landslide features were associated with natural disturbances. In the 1966 photo series, 54% of the landslide features appear to be associated with timber harvest and road construction. The 1988 photo series identified a large number of additional landslide features not identified on previous photo series. Of these, 88% were related to timber harvest and associated road construction (Layng Watershed Analysis, 1995).

Winberry and Lower Fall Creek Watershed Analysis discusses the area to the north. This analysis suggests that failure frequency on unmanaged ground has remained constant during the past 50 years. On managed acres, failures from roads represent 63% percent of the total; of these, 36% are related to harvest units. They occur in Category 3 and 4 soils (Winberry and Lower Fall Creek Watershed Analysis, 1996).

Fall Creek Watershed lies to the north of Winberry Creek Watershed. The geology is similar to that of Lookout Point WAA. Aerial photo analysis recognized that 64% of the failures were road-related; of these, 78% were in Category 3 and 4 soils. Ninety percent of all failures occurred on managed land (Winberry and Lower Fall Creek Watershed Analysis, 1996).

All three watershed analyses indicate that 88 to 90 percent of all recent failures (from 1955 to present) occurred on managed lands. They all found that most failures occurred on steep shallow soils and a high percentage was associated with road construction.

District engineers and others think that the analysis area does not have the same frequency of failures associated with management activities as do surrounding watersheds. This may result from less precipitation, since the east-west trending valley of the WAA allows weather systems to move through without releasing precipitation, and later timber harvest which resulted in better road construction practices.

Prior to logging and road construction, 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. Currently, these large scale landslide areas have a stable slope geometry. The Oregon State Geology Map shows six areas of landslide deposits found in Rolling Riffle (1), Goodman (2), Carpet Hill/Hospital (one large landslide), Rock (1), and Tire (1) drainages. Streams cut across the toes of these landslides producing fine-grained sediments, which stay in suspension for long periods of time *(see Map 9).* This may contribute to the turbidity of the reservoir.

On Forest Service lands, the 1973 SRI map identifies numerous landflows or slumps in areas associated with Category 1 soils. These areas produce fine-grain sediments. Failures in these landflows or slump areas are usually associated with road cuts or stream channel sideslopes. Failures are small, rotational slumps producing fine-grained sediments that can be suspended in water for long periods of time. This can prove detrimental to fish spawning areas.

The SRI also identifies unstable areas associated with steep, shallow soils characterized by Categories 3 and 4. Debris slides are found along steeper streamsides and on higher, steeper mountainsides. Still, it is valid to say that the number of failures on unmanaged land is basically constant, or has only slightly increased, during the past 50 years.

Table 3. Miles of Road on Sideslopes (by Drainage)

Drainage	Road on Sideslopes				
	Miles < 51%	% < 51%	Miles ≥ 51%	% ≥ 51%	Total Miles
Rhodes	6.6	97%	.19	3%	**6.79**
School	9.48	84%	1.8	16%	**11.28**
Cain/Armet	15.48	98%	.62	3%	**16.1**
Carpet Hill/Hospital	10.4	96%	.44	4%	**10.84**
Tire	18.81	94%	1.26	6%	**20.07**
Buckhead	14.82	85%	2.6	15%	**17.42**
Rolling/Hazel-Fern	11.46	95%	.62	5%	**12.08**
Goodman	32.49	85%	5.49	15%	**37.98**
Crale	12.65	96%	.49	4%	**13.14**
North/South/ Schweitzer	13.43	94%	.93	6%	**14.36**
Duval	14.64	88%	2.02	12%	**16.66**
Rock	17.68	99%	.52	1%	**18.2**
White-Bridge/Dell	22.94	95%	1.09	5%	**24.03**
Deception	24.85	79%	6.82	21%	**31.87**
TOTAL	**225.73**	**90%**	**25.09**	**10%**	**250.82**

Table 4. Miles of Road on Sideslopes (by Soil Category)

SRI Soil Category	Road on Sideslopes				
	Miles < 51%	% < 51%	Miles ≥ 51%	% ≥ 51%	Total Miles
1	26.7	98%	0.71	2%	**27.41**
2	96.47	98%	1.76	2%	**98.23**
3	35.98	72%	14.5	28%	**50.48**
4	57.26	91%	5.62	9%	**62.88**
5	12.35	99.5%	.07	0.5%	**12.42**
TOTAL	**228.76**		**22.66**		**251.42**

As indicated above, most failures were associated with roads on steep slopes. In order to evaluate potential failures, the number of road miles in each Soil Category on sideslopes greater than 50% was calculated for each drainage *(see Table 3).*

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 analysis, it is thought that the 5% difference does not have a significant effect on slope failure distribution.

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 in order by Categories 4, 1, 2, and 5 *(see Table 5 and Map 10).* 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 5. Erosion Rating of SRI Soil Categories

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

The watershed has approximately 251.42 miles of road. Goodman has the most with 37.84 miles of roads followed by Deception drainage with 32.74 miles of road. The rest of the drainages range between 5.62 miles of road to 23 .76 miles. Table 7 shows the Soil Category distribution by drainages in acres. Table 8 shows the percentage of drainages in each Soil Category.

As mentioned earlier, 88-90% of slope failures occur as a result of management activities with a high percentage related to roads. Most occur in Categories 3 and 4, which feature steep sideslopes and shallow, coarse-grained soils. These soils represent 55% of the WAA and contain 45% of the roads. Of these roads, 89% are constructed on sideslopes greater than 50%. *(see Table 8).*

Table 6. Road Distribution by Drainage

Drainage	% of total roads in drainage	% on sideslopes > 50%
Rhodes	2%	3%
School	4%	16%
Cain/Armet	6%	3%
Carpet Hill/Hospital	4%	4%
Tire	8%	6%
Buckhead	7%	15%
Rolling Riffle/Hazel/Fern	5%	5%
Goodman	15%	15%
Crale	5%	4%
North/South/Schweitzer	7%	6%
Duval	7%	12%
Rock	7%	1%
White/Bridge/Dell	10%	5%
Deception	13%	21%
TOTAL	**100%**	

Table 7. Soil Category Distribution by Drainage (in acres)

	Soil Category				
Drainage	**1**	**2**	**3**	**4**	**5**
Rhodes	19.65	357.2	164.54	483.7	0
School	302.2	67.7	747.6	371.2	1.5
Cain/Armet	254.4	428.6	430.3	1012.4	0
Carpet Hill/Hospital	0	1561.6	32.3	193.2	0
Tire	1128.5	644.4	1474.9	627.6	20.1
Buckhead	89.7	845.1	1635.76	480.9	263.2
Rolling Riffle/Hazel/Fern	454.2	1203.3	14.5	646.3	0
Goodman	314.1	2106.9	4190.76	1423.4	0
Lookout Pt	1.5	46.8	8.3	70.8	0
Crale	133.4	878.4	100.5	722.9	0
North/South/Schweitzer	139	922.9	2024.9	708.8	0
Duval	357.6	840.7	584.2	1556.6	163.79
Rock	160.8	1501.1	490.8	709	180.1
Whitehead/Bridge/Dell	336.4	1653.6	293.1	955.2	299.1
Deception	537.6	1138.9	4686.5	463.4	568.9

Table 8. Percentage of Drainage in Each Soil Category

	Soil Category				
Drainage	**1**	**2**	**3**	**4**	**5**
Rhodes	2%	35%	16%	47%	0
School	20%	5%	50%	25%	0
Cain/Arnet	12%	20%	20%	48%	0
Carpet Hill/Hospital	0	87%	2%	11%	0
Tire	28.9%	16.5%	37.8%	16.1%	.1%
Buckhead	2.7%	25.5%	49.3%	14.5%	7.9%
Rolling Riffle/Hazel/Fern	18.5%	49.1%	6.1%	26.3%	0
Goodman	4%%	26%	52%	18%	0
Lookout Point	0	37%	7%	56%	0
Crale	7%	48%	6%	39%	0
North/South/Schweitzer	4%	31%	46%	19%	0
Duval	10%	24%	17%	44%	5%
Rock	6%	49%	16%	23%	6%
Whitehead/Bridge/ Dell	10%	47%	8%	27%	8%
Deception	7%	15%	63%	6%	8%

HYDROLOGY

Reservoir

Lookout Point Dam was constructed in 1954. It is an earth and gravel filled dam with a concrete spillway 276 feet high. Full pool 929 feet in elevation and encompasses 4,255 acres. Minimum pool drops to 819 feet in elevation and 2,090 acres. This reservoir is one of the earliest Upper Willamette Army Corps of Engineers projects to be drawn down to meet specific instream flow requirements in Salem. The rapid draw-down occurs during the summer months and the reservoir is refilled by mid-May. Shoreline wave action is common along the reservoir creating erosion and increasing turbidity. This also results in areas of sparse aquatic vegetation.

Stream Flow

Reference Condition (Pre-Reservoir)

Stream flow fluctuations responded to both rainfall and snow melt which extended relatively high flows into late spring. Annual precipitation in the Western Cascades ranges from 45 inches per year in lower elevations to 70 inches at higher elevations. The actual precipitation in the WAA may be lower. The analysis area is a broad valley trending from east to west through which weather systems move without releasing

precipitation. In conjunction with this the Calapooya mountain range may act as a barrier and intercept marine air entering from the southwest (Weyerhaeuser, 1996). Therefore the actual precipitation in the project area may be less than in surrounding areas. Most of the precipitation falls between November and February.

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 the Middle Fork Willamette River during the turn of the century. The largest historical flood occurred in 1861 with an estimated peak discharge of 87,000 cubic feet per second (cfs) at Lookout Point Dam. Considering bankfull conditions (the equivalent of a 1½-year event storm) are approximately 16,000 cfs, these historical storms undoubtedly damaged crops and settlements located adjacent to the Middle Fork Willamette River. These flood volumes exceeded any subsequent flood events.

Current Condition (Post-Reservoir)

As mentioned earlier, approximately 900 hundred square miles of the Middle Fork Willamette River basin lies to the east of the analysis area. Approximately 40% of this drainage area is regulated by Hills Creek Dam, located southeast of Oakridge on the Middle Fork Willamette River. Hills Creek Dam regulates 31.0% of the annual runoff entering the project area. The other main unregulated tributaries entering the Middle Fork Willamette River above the WAA are: Salt Creek (contributing 6.6 percent of the annual runoff), Salmon Creek (9.6 percent of the annual runoff), and the North Fork Willamette River (17.7 percent runoff).

Natural flow of the Middle Fork Willamette River has changed significantly from historic conditions due to the installation of Hills Creek and Lookout Point Reservoirs. Regulation of flow from Hills Creek Reservoir began in 1961. The average annual volume of water passing through Lookout Point WAA has not been changed by the Hills Creek project. What has changed is the average mean monthly flow. Data shows a change in flow regimes due to regulated flow from Hills Creek Dam. Less water is released during the winter months (January-June) and more water is released in late summer to early winter (July-December). The regulation of flow regimes provides flood protection in the winter and water supply in the spring. Conversely, more water is released during the fall and early winter to prepare for the next flood season (COE, 1997).

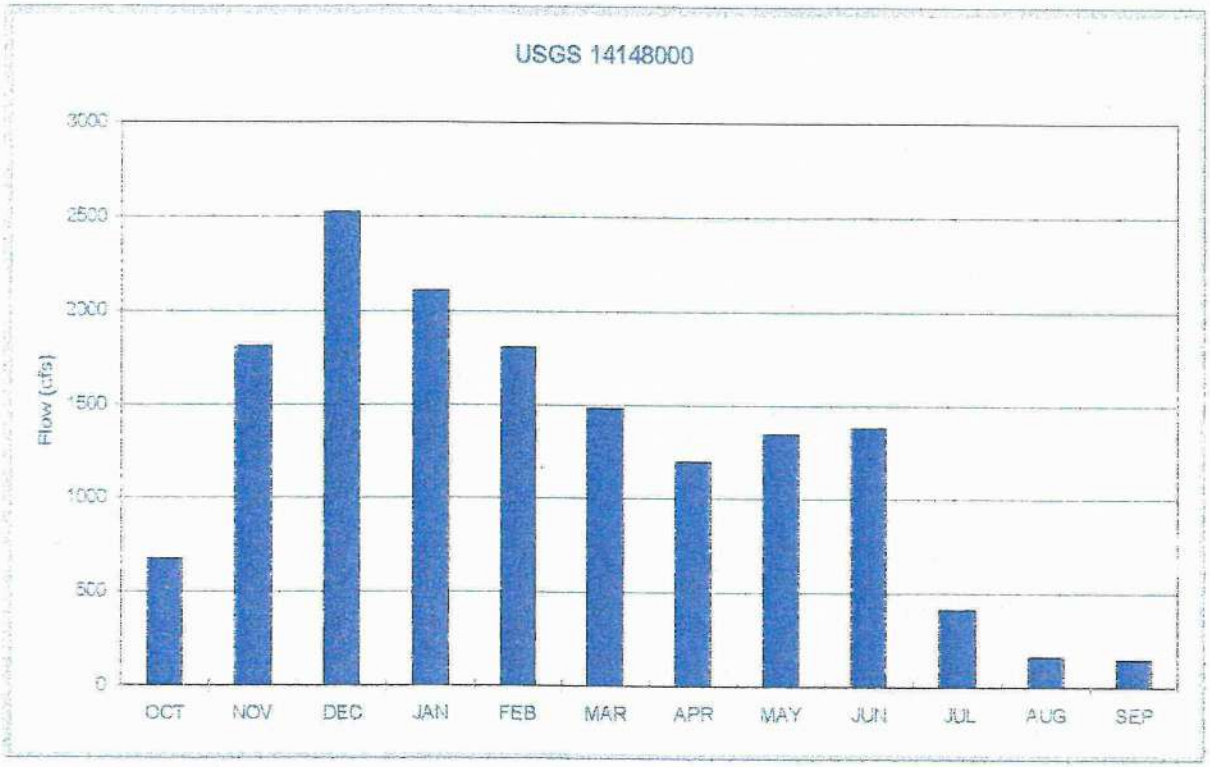
Average Runoff

Average annual runoff for the Middle Fork Willamette River in the analysis area was calculated using USGS gauging stations 14148000 (located upstream from Lookout Point Reservoir) and 14150000 (located below Dexter Reservoir) *(see Map 8 and Table 9)*. The data shows that approximately 4% or 143,000 acre-feet of the annual runoff for the Middle Fork Willamette River originates from the analysis area. Average monthly discharge is illustrated in Figure 3.

Table 9. Middle Fork Willamette River Watershed Total Yield and Peak Flows

	Middle Fork Willamette River	
	Middle Fork Willamette River below the North Fork Willamette River USGS Station 14148000	**Middle Fork Willamette River, near Dexter, OR** USGS Station 14150000
Total Yield	2,148,000 acre-ft/yr	2,292,000 acre-ft/yr
Maximum Recorded Flow	81,800 cfs (1945)	62,000 cfs (1953)
Minimum Recorded Flow	322 cfs (1961 Reg)	100 cfs (1960 Reg)
Average Recorded Flow	2,785 cfs (1923-1987) (adjusted since 1961)	3.163 cfs (1946-1987) (adjusted since Jan., 1953)

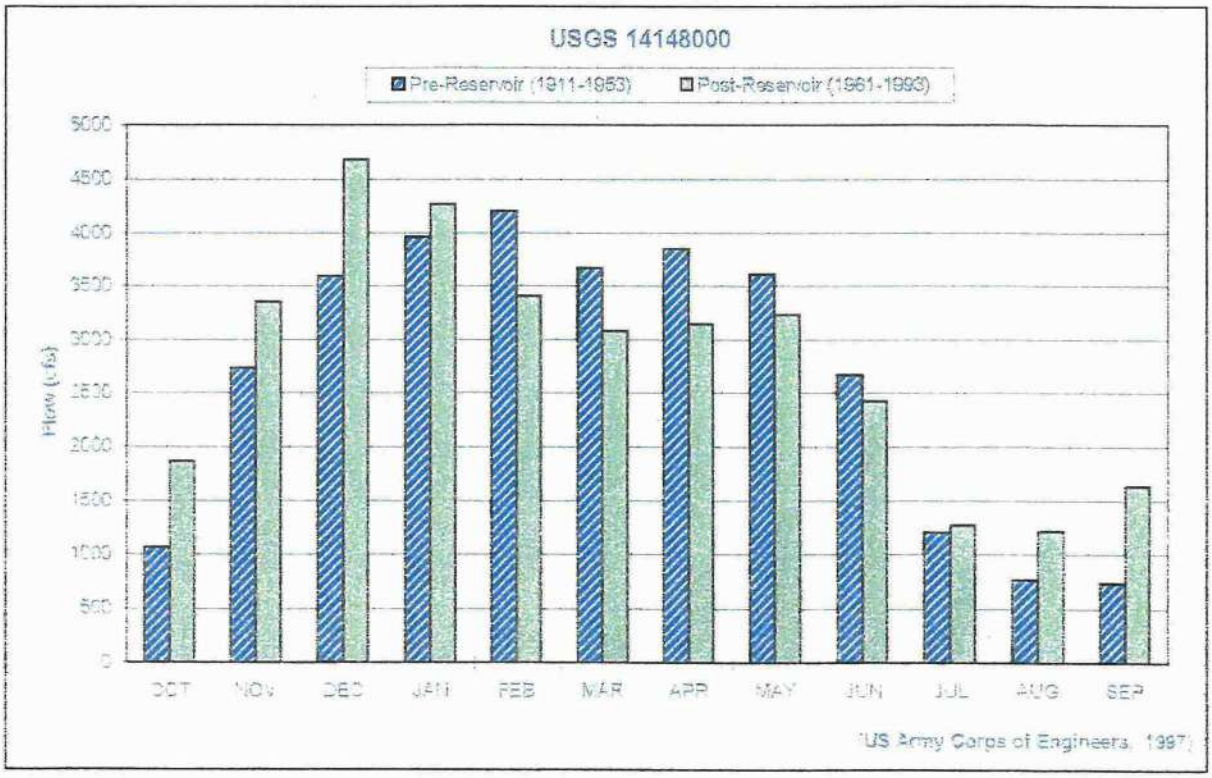
Figure 3. Average Monthly Discharge - Middle Fork Willamette River



The natural flow of the Middle Fork Willamette River in the analysis area has changed significantly from historic conditions due to the installation of Hills Creek Reservoir and the Lookout Point Reservoir. Regulation of flow from Hills Creek Reservoir begun in 1961. The average annual volume of water passing through Lookout Point analysis area has not changed overtime by the Hills Creek project. What has changed is the average mean monthly flow. The data shows a change in flow regimes due to

regulated flow from Hills Creek Dam. Less water is released during the winter months (January-June) and more water is released in late summer to early winter (July-December). Regulation of flow is to provide flood protection in the winter and water supply in the spring. Conversely, more water is released during the fall and early winter to prepare for the next flood season. Figure 4 compares average monthly discharge of the Middle Fork Willamette River at the USGS gaging station 14148000 before and after Hills Creek was constructed. Lookout Point Dam was completed in 1953. It is located 22 miles southeast of Eugene on the Middle Fork Willamette River. Approximately 20% of the Lookout Point Reservoir is within the analysis area. (COE, 1997).

Figure 4. Average Monthly Discharge (Pre- and Post-Hills Creek Dam)



Instantaneous Peak Flow

Reference Condition (Pre-Reservoir)

Instantaneous peak flow is defined as the highest water level measured at a gaging station on a single day. A *recurrence interval* is the probability that a certain magnitude flood event will occur over a given period of time. Significant flood events in the analysis area for the period of record occurred in water years 1943, 1946, two in 1953, and one in 1955. The instantaneous peak flow for a five-year flood event on the Middle Fork Willamette River in the analysis area is estimated at 37,400 cfs. On December 28, 1945 (water year 1946) there was a instantaneous peak flow of 81,800 cfs; therefore this flood was slightly higher than a one hundred-year event at this

location. On November 22, 1953 there was a instantaneous peak flow of 72,900 cfs. This storm produced flows slightly higher than a 50-year flood event for that channel *(see Figure 5).*

Figure 5. Instantaneous Peak Flow Middle Fork Willamette River (USGS 14148000)

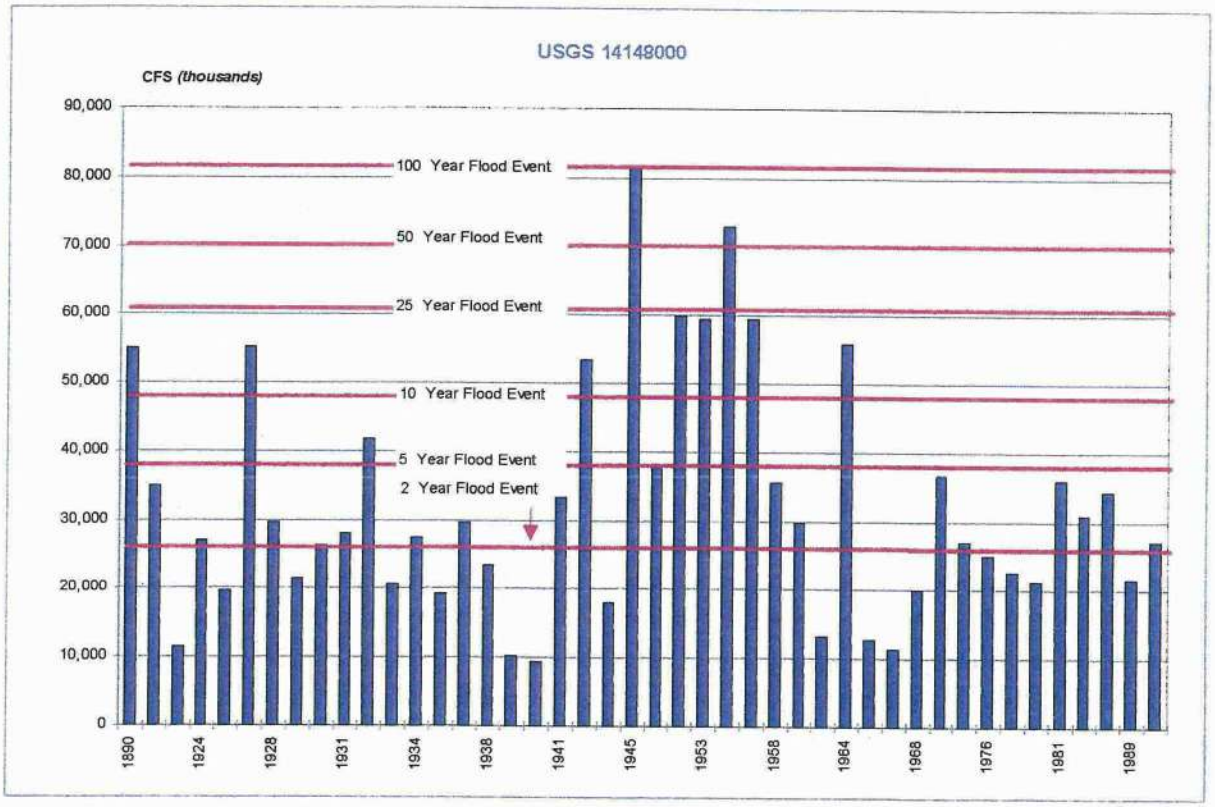


Table 10. Instantaneous Peak Flows from USGS Equations

Recurrence Interval (Years)	Exceedance Probability	Middle Fork Willamette River (USGS station 14148000)
1.25	80%	15,300 cfs
2	50%	24,000 cfs
5	20%	37,400 cfs
10	10%	47,000 cfs
25	4%	59,900 cfs
50	2%	69,900 cfs
100	1%	80,400

Current Condition

USGS created statistical estimates for 2, 5, 10, 25, 50, and 100 year flood events at gaging station locations shown in Table 10. The volume of water typical for a historical five-year event (37,400 cfs) on the Middle Fork Willamette River has not occurred since operation of Hills Creek Reservoir began in 1961, with one exception (1964) *(see Table 10 and Figure 5).*

Minimum Flow

Historically, average minimum flows on the Middle Fork Willamette River ranged from 50 to 100 cfs during July through September. Following completion of Hills Creek Dam, average minimum flows between July and September ranged from 250 to 600 cfs (USGS, 1997).

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 under study 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 containing transient, shallow snowpacks, higher peak flows were up to five times more prevalent from rain-on-snow storm events than only from rain. Not surprisingly, a higher number of landslides occurred during rain-on-snow storms than during rainstorms alone. Not only are the uplands altered by landslides during these events, but streams also carry large amounts of sediment and deposit woody debris in the channels. Channel morphology can be altered by bank undercutting, downcutting of the stream bed and redistribution of sediment in the channel.

Nearly 74% of the Lookout Point WAA is within the transient snow zone, situated between 1500 feet and 4200 feet in elevation *(see Map 13).* The transient snow zone exhibits a high potential for runoff when warm wind and rain follow 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 18% of the analysis area has a south or southwest aspect *(see Map 14)* with a precipitation range from 45 inches per year at lower elevations to a maximum of 70 inches per year at higher elevations.

Groundwater storage capacity is directly related to the type and depth of soil and bedrock. Relatively shallow soils store less water, thus having the greatest potential of contributing 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 Lookout Point WAA, soil Category 1 is considered to have a low runoff rate, high water retention capacity (due to greater thickness and higher clay content) and is important in sustaining base flow. Soil Category 2 tends to occur on steeper terrain 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, 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 evapotranspiration rates. Closed or dense canopies can intercept some precipitation before it reaches the ground. Dense stands of timber also protect an accumulated snowpack from rapid melting by reducing the amount of light and wind in the understory.

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 13, page 40, shows stream miles for each drainage in the WAA. Stream 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 analysis area.

Water Quality

Reference Condition

During the early 1900s, heavy logging took place in the area surrounding the community of Oakridge. In these early days timber was harvested within 200-300 feet of the stream along main tributaries of the Middle Fork Willamette River. Logs were sluiced down the Middle Fork to mills in Springfield when stream flows were high enough to move them. At this time, a very rough road provided access to the city of Oakridge. 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 the river. Slope failures also introduced sediment into the waterways, but data quantifying the extent of such an impact to water quality is unavailable.

In 1912 the Southern Pacific Railroad was built along the Middle Fork Willamette River. It runs along the south side of Lookout Point Reservoir, crosses the Middle Fork Willamette River at Hampton Campground, then continues along the north side of the river. It undoubtedly introduced large amounts of sediment to the river system during construction.

Current Condition

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.

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.

There is little data water quality perimeters other than temperature during recent times. In a personal communication with Gary Arnold of Oregon Department Environmental Quality (DEQ), he stated: *"it is thought that the waters from the upper Middle Fork Willamette River are within Oregon standards,"* but added that *"more monitoring and analysis should be conducted"* (1997).

Water quality may be affected by the abandoned Hines Mill at Westfir. This mill site is located adjacent to the North Fork of the Middle Fork Willamette River just above its confluence with the Middle Fork. Hazardous chemicals may be leaching into the North Fork from this site.

Temperature

In the late 1950s and early 1960s, water temperatures at the Middle Fork Willamette River gaging station (USGS 1414800) were in excess of 70°F for at least a week during the summer (June and September). This is probably due to clear cutting of the area now covered by Hills Creek Reservoir.

Since 1961, when Hills Creek Dam became operational, maximum stream temperatures on the Middle Fork Willamette dropped from 70°F to below 65°F. This is a result of colder water released from the bottom of Hills Creek Dam. The period of record for this temperature data is 1952 to 1987. The data suggests that temperatures are generally lower in the Middle Fork Willamette River after construction of Hills Creek Reservoir than they were from 1952-1956 *(see Figure 6)*.

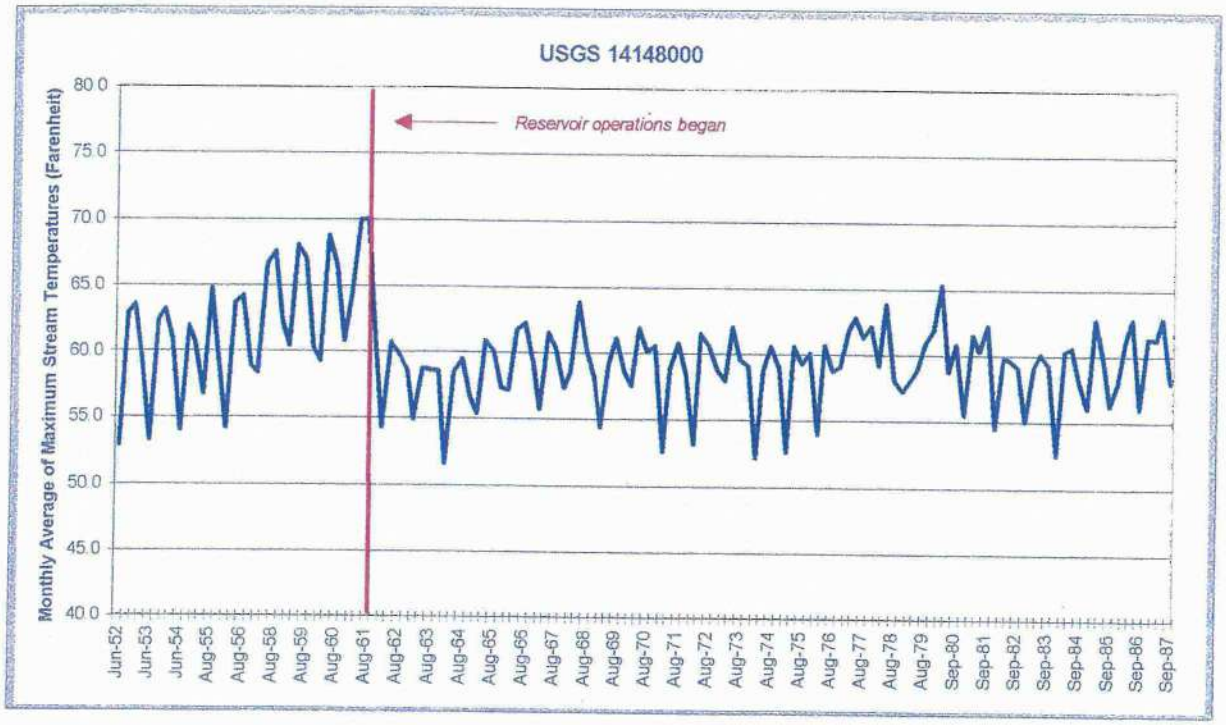
During surveys of fish habitat in Deception Creek, a steam sample was taken on August 8, 1996, indicating stream temperature to be 64°F. Data to suggest that this temperature exceeds the state standards is insufficient.

Water Supply

A few surface water right permits are on record with the County for lands within the WAA. 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.

Figure 6. Monthly Average of Maximum Temperatures of Middle Fork Willamette River



Transportation

Lookout Point WAA has a total of 250.8 miles of road *(see Map 33).* Roads are managed by the USDA Forest Service, Lane County, and Oregon Department of Transportation (ODOT). Road density for drainage groups in the analysis area ranges from 2.4 to 4.8 miles per square mile. Roads provide a source of fine sediment to streams, particularly in earthflow terrain. School, Tire and Rolling Riffle/Hazel Drainages have the highest percentage of earthflow terrain within the WAA.

A study by Sam Dimas (USDA, 1996) on the Lowell Ranger District, suggested that higher quality road surface decreases sediment runoff concerns. Table 11 indicates the miles and percentage of roads for each drainage separated by type of road surface *(also see Map 34).* Paved and aggregate are the highest quality surface and produce the least amount of fines. These two surface types comprise 86% of the total roads within the WAA. Native roads are of highest concern as they have no surfacing. However, since these comprise only five percent of the WAA, fine sediment produced by roads does not appear to be a significant concern.

Table 11. Road Miles and Percentage by Surface Type and Drainage

Drainage Group	Paved		Aggregate		Improved		Native	
	Miles	%	Miles	%	Miles	%	Miles	%
Rolling Riffle/Hazel	1.2	11%	10.0	86%	0.4	3%	0.0	0%
Goodman	2.3	6%	31.3	84%	1.9	5%	1.6	4%
Crale	2.9	22%	7.0	53%	2.3	17%	1.0	8%
North/South/Schweitzer	0.3	2%	11.3	79%	2.0	14%	0.6	5%
Duval		0%	15.3	92%	0.9	5%	0.6	3%
Whitehead/Bridge/Dell	3.4	14%	19.1	80%	0.1	0%	1.3	5%
Deception	0.0	0%	26.8	85%	2.4	8%	2.2	7%
Rock	4.4	25%	12.3	69%	1.1	6%	0.0	0%
Rhodes		0%	5.8	85%	1.0	15%		0%
School		0%	10.1	91%	0.4	4%	0.6	5%
Cain/Armet		0%	12.6	81%	1.8	11%	1.3	8%
Carpet Hill/Hospital		0%	8.2	75%	0.9	8%	1.8	16%
Tire		0%	15.5	77%	4.1	20%	0.6	3%
Buckhead	1.2	7%	12.8	73%	2.1	12%	1.4	8%
Totals	**15.7**	**7%**	**197.9**	**79%**	**21.3**	**9%**	**12.9**	**5%**

Maintenance levels for roads within each drainage group are shown in Table 12 and on Map 35. Level I roads are closed to all motor vehicles exceeding a 42 inch wheel base. Level II are opened to high clearance vehicles. Level III are gravel roads open to all vehicles. Both Level IV and V roads are paved and open to all vehicles. Level IV are typically single lane roads and Level V usually have double lanes.

Sixty percent of the roads within the WAA are at Maintenance Level II. This is of concern since these roads may not receive adequate surface maintenance causing ruts to develop. Increased fine sediment may be deposited into stream channels and possible catastrophic failure of sidecast material may result, as seen during recent flooding events.

Aquatic and wildlife concerns have led to decommissioning and closure of roads *(see Map 36).* This has reduced fine sediment deposition into streams and decreased the open road density to benefit big game *(see page 76).*

Table 12. Road Miles and Percentage by Operational Maintenance Level by Drainage

Drainage Group	Level I		Level II		Level III		Level IV		Level V	
	Miles	%	Miles	%	Miles	%	Miles	%	Miles	%
Rolling Riffle/Hazel	0.6	5%	9.8	84%	-	0%	0.3	3%	0.9	8%
Goodman	2.6	7%	26.7	72%	5.4	15%	2.1	6%	0.2	0%
Crale	2.9	22%	7.4	56%	-	0%	-	0%	2.9	22%
North/South/Schweitzer	2.3	16%	8.6	61%	0.1	1%	2.9	21%	0.3	2%
Duval	1.3	8%	13.4	80%	-	0%	1.9	12%	-	0%
Whitehead/Bridge/Dell	1.4	6%	13.3	55%	6.1	26%	0.4	2%	2.7	11%
Deception	3.0	10%	15.7	52%	11.2	37%	-	0%	0.0	0%
Rock	1.1	6%	9.0	50%	1.3	7%	4.0	23%	2.5	14%
Rhodes	1.0	15%	2.6	38%	0.2	3%	-	0%	3.0	44%
School	2.3	20%	5.6	50%	3.2	29%	-	0%	0.1	0%
Cain/Armet	2.8	18%	6.8	43%	2.7	17%	-	0%	3.4	21%
Carpet Hill/Hospital	2.5	23%	5.1	47%	3.2	29%	-	0%	0.1	1%
Tire	3.3	16%	13.2	66%	3.6	18%	-	0%	-	0%
Buckhead	2.4	14%	12.0	69%	1.9	11%	-	0%	1.1	6%
Totals	30.4	12%	149.7	60%	39.2	16%	11.9	5%	19.7	8%

Stream Channels

Reference Condition

The WAA contains 402 miles of streams; 46 miles are fishbearing. These channels range from low-gradient depositional reaches to steep, high-gradient source channels. Drainages were grouped for the purpose of analysis *(see Map 7).* Stream classes are displayed on Map 30. Tributaries in earthflow terrain (soil Category 1) contribute fine sediments to the system, while streams found in debris slide basins (Category 3) are source areas for coarse sediments such as gravels and cobbles *(see Table 13)* Soil Category 2 has some of the characteristics of Category 1, while Category 4 is similar to Category 3.

Tributaries entering the Middle Fork Willamette tend to have a fairly high gradient. The deeply entrenched channels are usually bedrock controlled and classified as Rosgen 'A' channels. Some are relatively less steep and moderately entrenched. These are classified as Rosgen 'B' channels although many of these also tend to have some 'A' characteristics *(see Map 29).*

Table 13. Miles of Stream by Soil Category

Drainage	Soil Category 1	Soil Category 2	Soil Category 3	Soil Category 4
Rhodes	0.4	1.9	0.6	3.7
School	4.8	0.5	7.4	3.4
Cain/Armet	3.9	3.8	4.9	7.3
Carpet Hill/ Hospital		8.3		1.6
Tire	13.5	4.0	9.1	5.9
Buckhead	0.9	6.1	14.8	3.3
Rolling Riffle/ Hazel	5.0	8.0	0.5	4.6
Goodman	4.4	16.1	38.0	11.2
Crale	2.3	6.1	1.4	5.4
North/South/ Schweitzer	1.5	5.5	17.4	8.5
Duval	5.6	4.7	5.9	15.0
Whitehead/ Bridge/Dell	5.5	12.4	1.3	7.4
Deception	7.9	12.0	45.1	3.1
Rock	1.6	11.9	3.9	5.4

The Middle Fork Willamette was a free flowing river prior to Lookout Point Dam construction. Aerial photos from 1944 indicate a braided channel meandering across the valley bottom. Many side channels provided backwater habitat, and floodplains were commonly inundated during high winter flows. Part of the river was highly sinuous, non-entrenched with a low channel gradient and classified as a 'C' Rosgen channel. These areas were the depositional/response reaches of the WAA. Interspersed with these wide alluvial reaches, there are two other confined, low gradient canyons, in the Hospital/Carpet Hill Creeks and Black Canyon areas. These sections are bedrock controlled and classified as Rosgen 'F' channels. They function primarily as transport reaches and have not changed significantly from historic conditions.

Current Condition

During the early 1900s, splash damming was a common method for transporting logs downstream. Streams were dammed until a significant number of logs collected upstream, upon which dams were breached and logs released. This caused one of the

first impacts to the stream channel, reducing habitat complexity. Records exist of splash dams at Black Canyon in the Middle Fork Willamette River and Rolling Riffle Creek.

Many of the tributary stream channels have been affected by road construction and harvest of riparian trees. Table 14 displays the road density, soil type and riparian condition for each drainage within the WAA. Roads not only confine the channel but also provided easy access for past management practices such as harvesting riparian trees or instream large woody debris. Large woody debris helps create stream channel morphology, especially evident in a stairstep type of habitat, and provides channel stability.

Downed large wood is particularly important for providing stability in earthflow terrain where soils are deep (Category 1). Such areas are also sources for fine sediment. Roads within these areas easily transport fines into stream channels. High road densities with midslope roads and stream crossings can be a concern for potential increase in fine sediments to the stream.

Aerial photos from 1944 were consulted and compared with current photos to determine changes in the Middle Fork Willamette River from the head of the reservoir to the North Fork Middle Fork confluence. Large changes occurred in the Buckhead area, where the river is controlled by alluvial processes. The channel fluctuated back and forth across the floodplain. At the time of the photos, the majority of channel flow was on the north side of the valley with several side channels. Now one confined channel exists on the south side of the valley adjacent to Highway 58. Hills Creek Reservoir regulates 31% of the flow for the Middle Fork Willamette River reducing its extreme high and low flows. In conjunction with downcutting of the streambed, this has resulted in a very limited use of overflow channels and subsequent floodplain inundation.

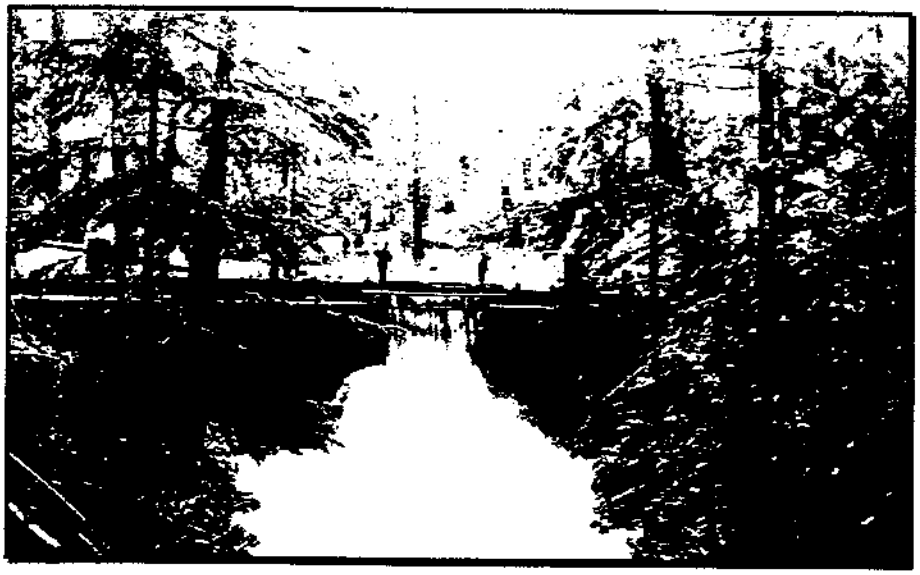


Figure 7. Log drive splash dam at Rolling Riffle Creek.
Photo courtesy of Lane County Historical Museum.

Table 14. Drainage Densities

Drainage Group	Acres	Square Miles	Miles of Fishbearing Streams	Miles of Class III Streams	Miles of Class IV Streams	Total Stream Miles	Stream Density mi/mi^2	Miles of Road	Road Density mi/mi^2	Riparian Seral Condition	
										0-80 years	80+ years
Rolling Riffle/Hazel	2356.3	3.7	1.1	1.2	15.3	17.7	4.8	12.3	3.3	31%	69%
Goodman	8100.4	12.7	8.0	8.7	52.0	68.8	5.4	41.9	3.3	27%	73%
Crale	1841.1	2.9	0.9	2.7	9.6	13.3	4.6	19.2	6.7	48%	51%
North/South/Schweitzer	3796.7	5.9	4.5	6.1	21.8	32.4	5.5	19.2	3.2	21%	79%
Duval	3503.2	5.5	1.9	7.8	22.7	32.4	5.9	17.1	3.1	44%	53%
Whitehead/Bridge/Dell	3537.5	5.5	6.4	4.9	19.2	30.5	5.5	24.1	4.4	37%	63%
Deception	7395.7	11.6	8.2	6.5	57.4	135.9	11.8	36.2	3.1	33%	65%
Rock	3091.2	4.8	3.3	3.6	17.5	24.4	5.1	21.4	4.4	25%	67%
Rhodes	1050.4	1.6	0.2	1.2	4.4	5.8	3.5	6.8	4.2	43%	57%
School	1495.3	2.3	2.0	3.1	11.0	16.1	6.9	11.1	4.8	50%	47%
Cain/Armet	2139.3	3.3	1.6	1.8	14.6	17.9	5.4	15.7	4.7	35%	65%
Carpet Hill/Hospital	1732.5	2.7	0.7	1.1	8.2	9.9	3.7	11.6	4.3	28%	72%
Tire	3895.6	6.1	1.3	7.7	23.9	33.0	5.4	23.2	3.8	24%	74%
Buckhead	3314.8	5.2	5.7	4.6	17.1	27.4	5.3	22.2	4.3	44%	53%
Lookout Point Reservoir	1777.8	2.8	0.1	0.1	0.2	0.4	0.2	9.4	3.4	82%	0%
Totals	**49,027.8**	**76.6**	**46.0**	**61.0**	**295.1**	**402.1**	**5.2**	**291.5**	**3.8**	**33%**	**65%**

VEGETATION

The Lookout Point WAA is fragmented into small stands due to human activity. The largest stand is in the Hardesty area where fires occurred more than a hundred years ago. In the early 1900s forest management activities began and have reduced the average age, complexity and stand size of the forest. Many acres are now in earlier seral stages and smaller blocks, which do not provide historic levels of forest diversity, wildlife habitat or stand structure.

The predominant forest climax series found within the analysis area is western hemlock. This series is found in warm, moist conditions and lies between the lower, drier Douglas-fir series and the higher Pacific silver fir series. In the western hemlock series, Douglas-fir is the dominant species, growing with western hemlock and western red cedar. 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.

The Douglas-fir series is found in droughty areas of the WAA where soils may be heavy and clayey. Tree species associated with this series are Douglas-fir, madrone and incense cedar. Pockets of sugar pine and western white pine are found in the Deception Creek and Shady Dell areas. Shrubs include dwarf Oregon grape, whipple vine salal, baldhip rose, and trailing snowberry. Herbs common to this series are swordfern, snowgreen, wild strawberry, and pathfinder.

Reference Condition

The chosen reference year for the analysis area is 1900. Landscape information was developed from estimated year of origin, ecoplot/stand data and other USDA Forest Service data.

Fires and windstorms are the most frequent mechanisms in stand replacement events. Fire patterns created a mosaic of stands. Floods and insect damage caused small and more localized stand changes. Early records (circa 1860) tell of grass savannas with scattered Douglas-fir and oak at the interface of the Willamette Valley watershed. Native Americans created savannas by repeatedly burning grasslands in the valley and foothills to improve big game habitat.

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 late-successional old-growth (LSOG) *(see Table 15 for stand ages).* These seral conditions are used as general descriptive guides. Description of developmental stages for this assessment were based on GIS stand ages. Stand ages north of the reservoir were developed from stand exams while ages on the south side of the reservoir were developed from a few ecoplots and aerial photo interpretation.

In 1900, mature and old-growth forest covered more than 56% of the watershed in large undisturbed tracts. Intermixed were younger forests and early regenerating stands resulting from human or lightning fires.

Table 15. Reference Seral Condition, 1900.

Seral Classes	Estimated Stand Conditions	Area Acres	Area %
Stand Initiation 0-30 years	**Fires**	7,584	15
Stem Exclusion 31-80 years	young stands	12,934	26
Understory Reinitiation 81-200 years	mature stands	23,815	49
Late Successional Old-growth >200 years	old-growth stands	3,290	7
Non -Forest	Non-Forest	1,502	3
	Total	**49,125**	

Current Condition

The present vegetation is the result of fires and management activities in this area *(see Table 16).* Currently, 63% of forested area in the WAA is in understory reinitiation and late-successional old-growth seral stage. Twenty two percent of the area is in stand initiation seral condition, and 9% in stem exclusion. These younger stands are forest plantations well stocked by silvicultural management activities, but lacking snags or downed logs.

Table 16. Current Seral Condition, 1997.

Seral Classes	Estimated Stand Conditions	Area Acres	Area %
Stand Initiation 0-30 years	Management Activities	10,580	22
Stem Exclusion 31-80 years	young stands	4,427	9
Understory Reinitiation 81-200 years	mature stands	16,225	33
Late Successional Old-growth >200 years	old-growth stands	14,811	30
Non-Forest	Non-Forest	3,074	6
	Total	**49,125**	

Stand initiation has increased with harvest activities. The oldest stem exclusion stands have grown into the next seral class. Understory reinitiation stands have been harvested or grown into late-successional stands.

Non-forested acres have increased and include areas such as the reservoir which are removed from harvest status. For a comparison between current and reference seral conditions, refer to Table 17.

Table 17. Comparison of Reference and Current Seral Classes for Forested Lands.

Seral classes	Reference acres	Current acres	Acre Change
Stand Initiation O-30 years	7,584	10,580	+2,996
Stem Exclusion 31-80 years	12,934	4,427	-8,507
Understory Reinitiation 81-200 years	23,815	16,225	-7,590
Late Successional Old-growth >200 years	3,290	14,811	+11,521

FIRE REGIMES

Reference Condition

The historical fire regime for Lookout Point WAA is characterized as 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-caused, fire cycles are usually less than 25 years apart (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 the indigenous people *(see Chapter 3, Reference Conditions, page 90).*

> *"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 current seral stages indicates that the majority of trees are 80-200 years old or in the understory reinitiation stage. Notable exceptions are Patterson Mountain, upper Duval and Whitehead Creeks, the lower two thirds of Deception Creek, and lower Bridge and Rock Creeks. On the north side of the Middle Fork Willamette River only Buckhead Creek, the lower third of Burnt Bridge Creek, and the very top of Tire Mountain show significant stands of late successional old-growth. This is consistent with surveys completed in 1854-55, only ten years after settlement began and about the

same time as cessation of aboriginal burning in the Willamette Valley basin (Morris, 1934; Cole, 1977; Burke, 1979).

Current Condition

The Lookout Point WAA is currently classified as 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 events 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).

Historical fire records show that Lookout Point WAA had 273 fires totaling 396.15 acres during 1949-1995. Average fire occurrence was 5.9 fires per year and average fire size was 1.45 acres.

Although a high percentage of the fires were caused by railroad activity ignitions (59.3%), most of these fires were small and only amounted to 11.2% of the total acreage consumed by fire during this record period. The number of railroad-related fires has decreased significantly during the past two decades, from 147 fires in the 1960s and 1970s, to 10 fires from 1980 to the present. This decrease in railroad-related fires is a direct result of improved train brake systems and an increased effort to control vegetation along railroad tracks.

Lightning fires in Lookout Point WAA account for 11.4% of total fires and only 0.98% of the total acreage consumed by fire during this record period *(see Table 18).*

Table 18. Human Caused Fire History 1949-1995

Fire Causes	Number of Fires	Percent of Total Fires	Number of Acres	Percent of Total Acreage
Railroad	162	59.3%	44.27	11.2%
Lightning	31	11.4%	3.61	0.9%
Other Human	80	29.3%	348.27	87.9%
Total Human Caused Fires	273	100.00%	396.15	100.00%

FUELS

Average fuel loading for seral stages was calculated using PNW photo series (PNW-51 (Maxwell and Ward, 1976), PNW-105 (Maxwell and Ward, 1980) and PNW-GTR-258 (Ottmar, 1990)) *(see Table 19).* Maximum acceptable fuel loading set by the WNF-LRMP are shown in Table 20.

Table 19. 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 20. Maximum Acceptable Fuel Loading from WNF-LRMP

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 stand initiation and late successional old-growth. As shown in Table 19, 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 WNF-LRMP *(see Table 20)*. 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 this higher fuel loading results from silvicultural prescriptions, and will be relatively short-lived (3-6 years).

In 9-20" fuel category, the late successional old-growth seral stage exceeds fuel loading limitations delineated by the WNF-LRMP *(see Table 19 and Table 20)*. 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 Condition

Stand initiation accounted for 7,583 acres (15.4%) of the total analysis area in the reference condition. 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 fuel loading determination. Late successional old-growth accounted for 3,290 acres or 6.7% 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 Standards. These seral stages accounted for 36,749 acres (74.8% of the analysis area); of these 12,934 acres (26.3%) were in stem exclusion and 23,815 acres (48.5%) were in understory reinitiation seral stages.

Current Condition

The area in stand initiation seral stage has increased from a reference condition of 7,583 ac (15.4%) to 10,588 acres (21%). Late successional old-growth has increased from a reference condition of 3,290 acres (6.7%) to the current 14,811 acres (30.1%). From a fuels point of view, the area of concern (stand initiation and late successional old-growth) has increased in the analysis area from 22.1% to 51.7% of the total area.

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.

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, as most units required 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" in diameter 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.

Species and Habitats

Aquatic

Oregon Chub *(Oregonichthys crameri)*

Reference Condition

Oregon chub are indigenous to the Willamette Valley, originally found throughout the valley from Portland to the Coast Fork and Middle Fork Willamette Rivers and tributaries. The species lived in off-channel habitat such as beaver ponds, oxbows, stable backwater sloughs, and flooded marshes. These pond-like habitats have minimal or no water flow with depositional substrate and abundant aquatic vegetation.

Prior to construction of dams, the Willamette Valley was often flooded, creating new sidechannels and backwater areas. This species was one of the first native fish to inhabit these areas. Sedell and Froggatt (1984) demonstrated the huge reduction of off-channel habitat along the Willamette River, already seen in 1967. With the loss of habitat, this species began to diminish.

Other influences leading to the decline of the Oregon chub were the channelization of rivers, draining and filling of wetlands, and introduction of non-native fish such as bass and mosquitofish, which prey or compete with Oregon chub. In November, 1993 the fish was federally listed as an endangered species. Prior to this listing an Oregon Chub Working Group was formed. This working group consisted of biologists from several agencies who have been trying to restore habitat, create new habitat, reintroduce the Oregon chub into areas, monitor populations, and educate the public on the importance of this native species to the Willamette Valley.

Current Condition

Populations of Oregon chub are currently found along the Middle Fork Willamette River where pond-like habitat is isolated from Lookout Point and Dexter Reservoirs. Roads or beaver ponds have isolated most of these areas creating barriers for non-native predator species. Other small populations have been found scattered along the Willamette Valley.

The Oregon Department of Fish and Wildlife's research branch has been intensely monitoring known populations and looking for new populations and habitat. The US Forest Service, Oregon Department of Fish and Wildlife and Army Corps of Engineers have been actively involved in developing and enhancing suitable habitat. The US Fish and Wildlife Service has been pursuing the introduction of Oregon chub onto private land where suitable habitat is available. Federal agencies involved with the working group have developed a Programmatic Environmental Assessment for its reintroduction into suitable habitat throughout the Willamette Valley. Education has primarily focused on the development of a brochure to inform people about this endangered species.

Several Oregon chub enhancement projects have been and will be implemented in the project area. Not all projects have been highly successful with regards to increasing Oregon chub habitat, but they have tended to improve aquatic habitat with a resulting benefit to western pond turtles. In the process it was learned that the ponds need to be isolated from non-native fish species.

Within the WAA, the main populations of Oregon chub are found in the Buckhead area, Shady Dell pond and at an old beaver dam pond just west of Hospital Creek. Other populations located just outside the WAA are in Minnow Creek Pond, an alcove to Dexter Reservoir known as The Pit, Elijah Bristow State Park, and East Ferrin Pond.

Anadromous Fish

Reference Condition

Spring chinook *(Onchorhynchus tshawytscha)* are native to the Middle Fork Willamette River. Run size was estimated to be about 2,550 adults returning, representing about 21% of the run above Willamette Falls (COE, 1997). This may have been the largest spring chinook run in any of the subbasins above Willamette Falls. Adults entered in early May to late August, peaking during the end of June. Spawning occurred early September to mid-October. Fish moved up above Dexter to spawn; most spawning occurred east of the WAA in the North Fork of the Middle Fork River, Salt Creek and Salmon Creek. The mainstem Middle Fork of the Willamette River would have been important for large (>3 feet) adult holding pools prior to spawning. Surveys conducted in 1938, prior to dam construction, indicated 13.4 pools per mile.

Very few if any winter steelhead *(Onchorhynchus mykyss)* were native to the Middle Fork Willamette River. ODFW records indicate that winter steelhead runs did not occur until 1956 (Connolly, *et. al.*, 1992). The first hatchery introductions were made after Dexter and Lookout Point dams were completed in 1953. A Skamania stock of summer steelhead was first released into the Middle Fork Willamette subbasin in 1981.

Current Condition

Spring chinook and both summer and winter steelhead adults are now collected at the Dexter facility and spawned at the Oakridge fish hatchery. A small amount of returning fish may be spawning below Dexter Dam. However, due to the change in water temperature of water released from the reservoir (colder during the summer and warmer in the winter compared to pre-dam temperatures), the chinook tend to spawn later in the year (early October to mid-November).

The Oregon Department of Fish and Wildlife's Wild Fish Policy states that it is a priority to reestablish or maintain wild spring chinook in the upper Middle Fork Willamette Subbasin. A reconnaissance report was written by the US Army Corps of Engineers in 1997 analyzing alternatives which allow spring chinook salmon to migrate from their natural spawning habitat in the upper Middle Fork Willamette Subbasin to the ocean and back. More studies are needed and presently awaiting funding. Chinook are currently stocked into Lookout Point Reservoir to help increase the sport fishery.

A stream survey of the Middle Fork Willamette River between Lookout Point and Hills Creek Reservoirs was conducted by ODFW in 1996. Overall pool habitat declined from 13.4 pools/mile in 1938, prior to dam construction, to 6.87 pools/mile. The one exception to this decrease in pool habitat was in Black Canyon, a more confined valley where the majority of habitat consisted of scour pools. Above Black Canyon riffles predominated as the habitat became an alluvial valley. Pool habitat is important in these areas. The data suggests that Black Canyon has adequate adult holding pools for anadromous fish as they move upstream to spawn but the alluvial sections have limited pool habitat.

Resident Trout and Other Native Fish Species

Reference Condition

Rainbow and coastal cutthroat trout *(Oncorhychus clarki clarki)* were found throughout much of the WAA. The majority of trout in the lower reaches and larger streams or rivers were rainbows, while the upper higher-gradient streams had primarily cutthroat. Both residential and fluvial (adults live in river mainstem and migrate into its tributaries to spawn) populations were found in the project area.

Other native fish found in the Middle Fork Willamette River mainstem include Mountain whitefish *(Prosopium williamsoni)*, large scale suckers *(Catostomus macrocheilus)*, northern squawfish *(Ptychoceilus oregonensis)*, longnose dace *(Rhinichthys cataracta)*, speckeled dace *(Rhinichthys osculus)*, redside shiner *(Richardsonius balteatus)*, chiselmouth *(Acrochelius alutaceus)*, peamouth *(Mylocheilus caurinus)*, pauite sculpin *(Cottus beldingi)*, shorthead sculpin *(Cottus confusus)*, reticulate sculpin *(Cottus perplexus)*, torrent sculpin *(Cottus bairdi)*, and lamprey species *(Lampetra* spp.*)*.

Fish found in the higher gradient tributaries were primarily cutthroat trout, rainbow trout, sculpin, and dace. No known records indicate that bull trout *(Salvelinus confluentus)* were found within the WAA. They were found in the upper Middle Fork above Hills Creek Reservoir and possibly in the North Fork Middle Fork Willamette River, which is just above the WAA. Since there are no natural migration barriers, the Middle Fork Willamette may have contained bull trout at one time as a dispersal or migratory species if not a resident. However, temperatures may have been warmer than bull trout require.

Lookout Point Reservoir now covers the area where the Middle Fork Willamette River once flowed. The river provided off-channel habitat for many of these cooler water fish species and large, deep pools for cold water trout. High winter flows flooded lower gradient areas. The main river and its higher gradient tributaries were thought to have a high amount of large woody debris creating log jams, pools, cover habitat, and contributing to the formation of stairstep habitat in higher gradient tributaries. This large woody debris was essential not only providing quality habitat but also contributing towards channel stability. Riparian vegetation consisted primarily of large conifers with hardwood patches in areas with frequent floodplain interaction. These large conifers were the source for the large woody debris.

Current Condition

Map 28 shows the fish-bearing portion of the project area. Resident, fluvial and adfluvial (adults living in the reservoir and migrating up tributaries to spawn) trout populations are found within the WAA.

Several non-native species of fish have been introduced into Lookout Point Reservoir. These include channel catfish *(Ictalurus punctatus),* brown bullhead *(Ictalurus nebulosus),* yellow bullhead *(Ictalurus natalis),* bluegill *(Lepomis macrochirus),* pumpkin seed *(Lepomis gibbosus),* largemouth bass *(Macropterus salmoides),* smallmouth bass *(Macropterus dolomieui),* white crappie *(Promoxis annularis),* and black crappie *(Promoxis nigromaculatus).* Kokanee *(Oncorhychus nerka),* a landlocked sockeye salmon, was also introduced into Lookout point Reservoir; however these fish do not appear to have naturalized. Current game species within Lookout Point Reservoir are rainbow trout, largemouth bass, smallmouth bass, brown bullhead, and crappie. Rainbow trout are commonly caught from the Middle Fork Willamette River above Lookout Point Reservoir.

Erosion resulting from drawdown and wave action along the shoreline of Lookout Point Reservoir affects aquatic species and habitat. The lack of vegetation increases turbidity and decreases food production and available nutrients. Both native fish and non-native fish, such as squawfish and catfish, have adapted well to this cool lake environment and outcompete or prey on native salmonids.

Many of the tributaries flowing into Lookout Point Reservoir or the mainstem Middle Fork Willamette River are now isolated for part of the year by migration barriers created by humans such as road and railroad culverts. These barriers tend to be passable at full pool. However, the pools are low during the winter and spring months when adfluvial trout migrate upstream to spawn.

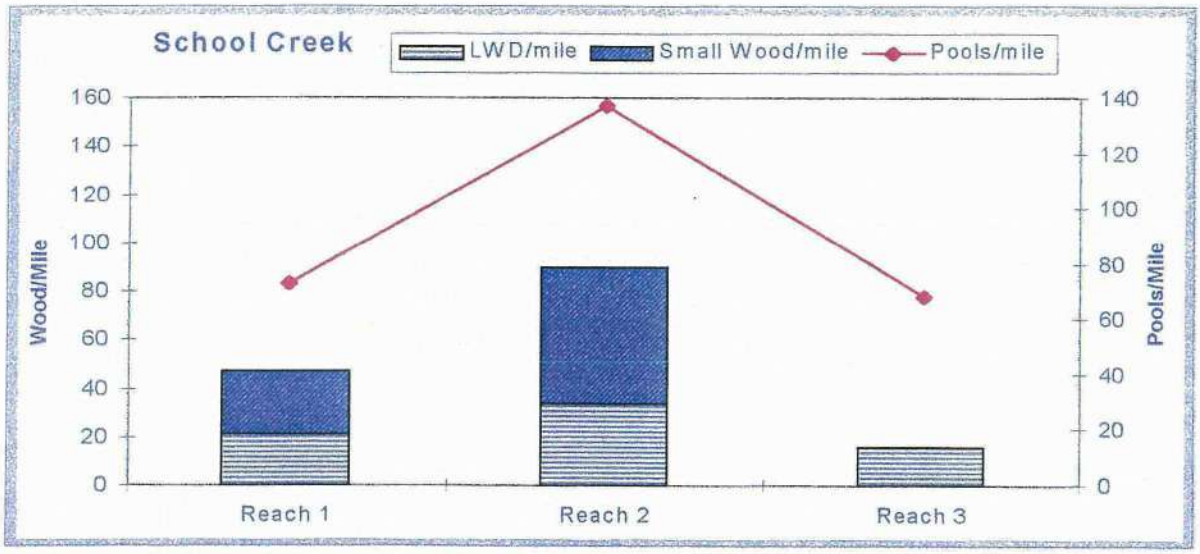
Recent (1996) stream surveys were conducted on Tire, School, Goodman, Deception, and part of Buckhead Creeks *(see Map 31).* Below is a brief discussion of current habitat conditions.

School Creek

School Creek is fish bearing for approximately 1.2 miles. Cutthroat trout were the only species of fish observed. The stream runs through an earthflow terrain where fine sedimentation and channel stability are a concern. Since soils are very deep, large woody debris and a mature riparian seral condition play a major role in providing the channel stability needed in this type of terrain.

Reach 1 begins upstream from the full pool area of Lookout Point Reservoir (above Road 5821) and continues for 0.7 miles to a tributary entering on the right bank (bank directions are always given looking downstream). Fish were observed throughout the reach. Large woody debris was minimal and pool habitat was fair *(see Figure 8).* The high cobble embeddedness level and bank cutting may have resulted from the lack of large wood necessary for stability in this earthflow terrain.

Figure 8. Pools and Wood - School Creek



Riparian condition was poor with an average inner hardwood riparian zone of 37.5 feet (alders). This is a relatively wide inner riparian perhaps suggesting signs of past channel disturbance. Other signs of instability were shown by many small areas of braided channels (16-52 feet long). This is not characteristic of a 'B' Rosgen channel type (this reach was calculated as such) and suggests that the sediment load is not in equilibrium with the channel. The outer riparian varies, primarily consisting of large conifer trees on the left bank and small conifer trees from a past harvest unit along the right bank. Riparian seral condition is below the desired mature seral condition. There are no migration barriers found within this reach.

Reach 2 is also approximately 0.7 miles long and ends at the first crossing of Road 5823. Woody debris and pool habitat increases in this reach. Smaller wood (12-24" DBH and >25' long) appears to be functioning as large woody debris for this small stream *(see Figure 8)*. Sand substrate and cobble embeddedness is still commonly found within the stream channel but to a lesser extent than in Reach 1. Perhaps this woody material is helping to stabilize the stream a little more than in the downstream reach.

The inner hardwood riparian is still quite wide in this reach (about 47 feet), consisting primarily of big leaf maple trees. Again the wide inner riparian suggests possible past channel disturbance. The outer riparian consists of mature trees on the left bank and saplings/poles from a clearcut unit along most of the right bank. This does not meet the desired condition of a predominantly mature seral condition. The highest temperature recorded during the survey was 61°F, but since the survey was conducted in mid-July, temperature may be a concern in August and early September.

This reach was calculated to be an 'A' Rosgen channel type, but areas more characteristic of a 'B' channel may be present. Channel braiding was still evident, although to a lesser extent (ranging from 12-30 feet). This is a sign of channel

instability for an 'A' channel type, suggesting the channel is still out of equilibrium with its sediment load.

An 8 foot falls was found towards the end of the reach. It serves as a migration barrier and is thought to end fish use of the stream. *Rana* species of frogs and tailed frogs were observed in this reach.

Reach 3 is a short reach of only 0.2 miles between the two crossings of Road 5823. Since it is not fish-bearing a Willamette National Forest Modified Level II survey was conducted. Large woody debris was low in numbers and pools were fair. Riparian condition seemed to be the greatest concern since all the trees were recently harvested. Sand was still a significant component of the stream substrate.

Tire Creek

Lower Tire Creek is deeply entrenched, while upper Tire Creek flows through earthflow terrain. The earthflow terrain provides a fine-sediment source since the deep soils are prone to erosion and channel instability. Large woody debris plays an important role in providing stability to the channel in these earthflow areas.

Reach 1 is 1.7 miles long, extending from the confluence of Tire Creek with the Middle Fork Willamette River to just above the second stream crossing of Road 5826, where the stream flow splits into two forks. Fish were only observed for the first 0.25 miles, at which point a 20 foot waterfall provides a year-round migration barrier. Road 5821 crosses Tire Creek at its mouth with a concrete culvert presenting a 13 foot jump during low flow. It may also be a high flow barrier. Many red-legged frogs, Pacific giant salamanders, rough skinned newts, and crayfish are found in the non-fishbearing portion of the stream.

The majority of the reach is steep and deeply entrenched with a stairstep morphology. Stream gradient decreases towards the upper part of the reach where earthflow terrain is found. Plunge pools tend to be very deep for this size stream with 16.7 pools per mile greater than 3 feet deep and an average residual depth of 2.7 feet. Large woody debris is somewhat limited, although this is expected in the steep bedrock canyon portion of this reach.

Riparian vegetation consists predominantly of large conifers. However, a few recent harvest units in the upper part of the reach have left buffer strips adjacent to the stream channel.

Reach 2 begins just above the second stream crossing of Road 5826 and follows the west fork for 0.6 miles to a tributary entering the left bank. No fish were present in this reach, but red-legged frogs and Pacific giant salamanders were abundant. No rough-skinned newts were sighted. The stairstep environment continued, with pools as the primary habitat type.

This reach is within earthflow terrain as indicated by the lack of bedrock, a high cobble embeddedness and copious areas of mass wasting and bank cutting. Large woody debris increases in this reach and is probably aiding the channel stability, although

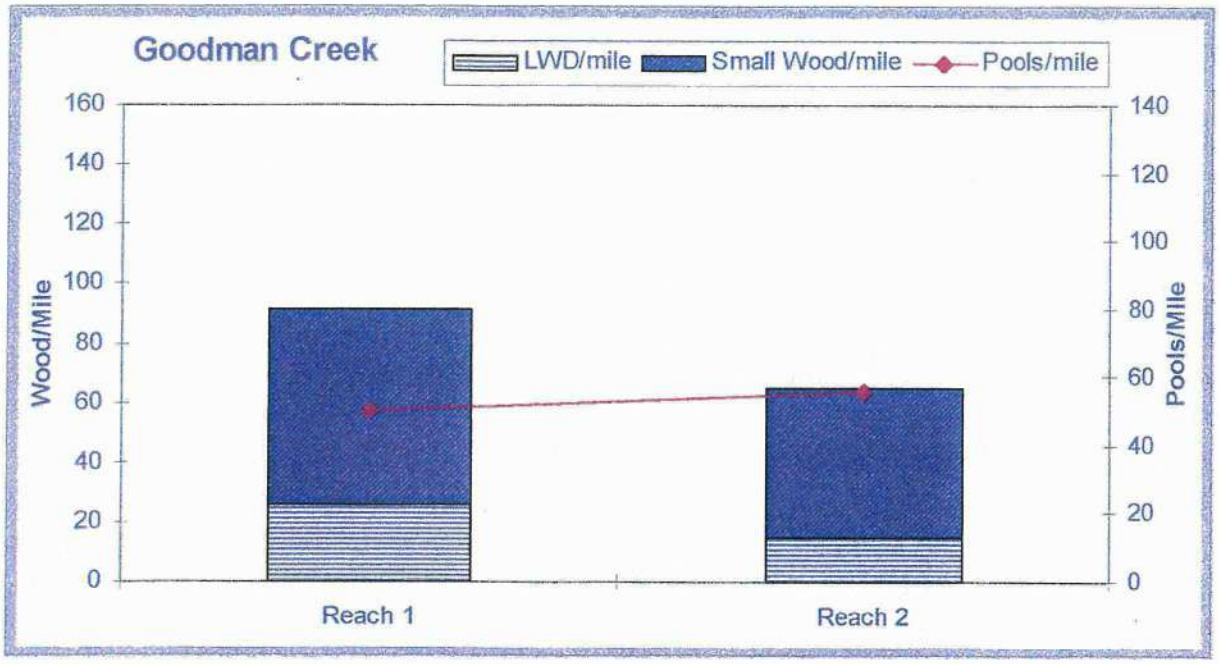
stability is generally poor. Riparian vegetation is primarily large conifer trees but more harvest units are visible from the stream channel than in Reach 1.

Goodman Creek

Goodman Creek is a large drainage (7,226 acres) consisting of three main tributaries. The tributary labeled "Goodman Creek" on the forest/district map is the middle tributary. However, the western tributary had the highest flow and was therefore surveyed. The west fork is moderately steep with deep soils. The middle and east fork tributaries are very steep and highly entrenched.

Reach 1 is two miles long. It begins at full pool for Lookout Point Reservoir and ends at Tributary 4, which had significant stream flow. Pool habitat is fair with shallow pools (residual depth of 0.8 feet) and 50 pools/mile. Large woody debris levels are moderate with 26 pieces/mile *(see Figure 9)*. Small woody debris within this reach brings the total wood/mile up to exceed the desired condition of 80 pieces/mile. However, 11% of the reach was affected by bank cutting, possibly indicating that this smaller wood is not providing channel stability or scouring out channel-width pools as larger pieces would.

Figure 9. Pools and Wood - Goodman Creek



Riparian habitat is of poor quality due to its early seral condition and abundance of hardwoods. This may also affect channel stability and limit the future source of large woody debris. Hardwoods, rather than conifers, dominate the riparian area providing adequate shading to the stream.

In some places only a narrow buffer strip remains adjacent to the stream. There is evidence of salvage logging near the stream and clearcuts have reduced the amount of

large woody debris available. Furthermore, Road 5583 runs parallel to the reach also affecting its riparian area.

Reach 1 was estimated to be a 'B' Rosgen channel type with gravel/cobble substrate. Bedrock is also common in places. The width-to-depth ratio is very high at 30.5, indicating poor channel stability. Cutthroat trout and sculpins were found throughout the reach. Large scale suckers were present in the lower part of the reach. Other aquatic species observed include crayfish and rough skinned newts. Signs of beaver were also seen within the reach.

Reach 2 is 1.7 miles long and ends at Tributary 5. Pool habitat is slightly better in this reach than in Reach 1, having an average residual pool depth of 1.4 feet and 55.4 pools/mile. The amount of large woody debris is lower with 15 pieces/mile in the large category and 50 pieces/mile in the small category. However, the smaller pieces appear to be functioning better in this smaller channel.

The riparian is in good condition with a narrow inner zone of hardwoods and an outer zone consisting primarily of large conifers. This, in conjunction with no road presence adjacent to the channel, has improved channel stability in Reach 2. This reach is also steeper confirming its categorization as an 'A' Rosgen channel. Gravel, along with cobble and boulders, was the primary substrate. Cutthroat trout were the only species found within this reach. Fish use ended at the end of the reach where a large waterfall (greater than 30 feet) was found just above the reach break.

Deception Creek

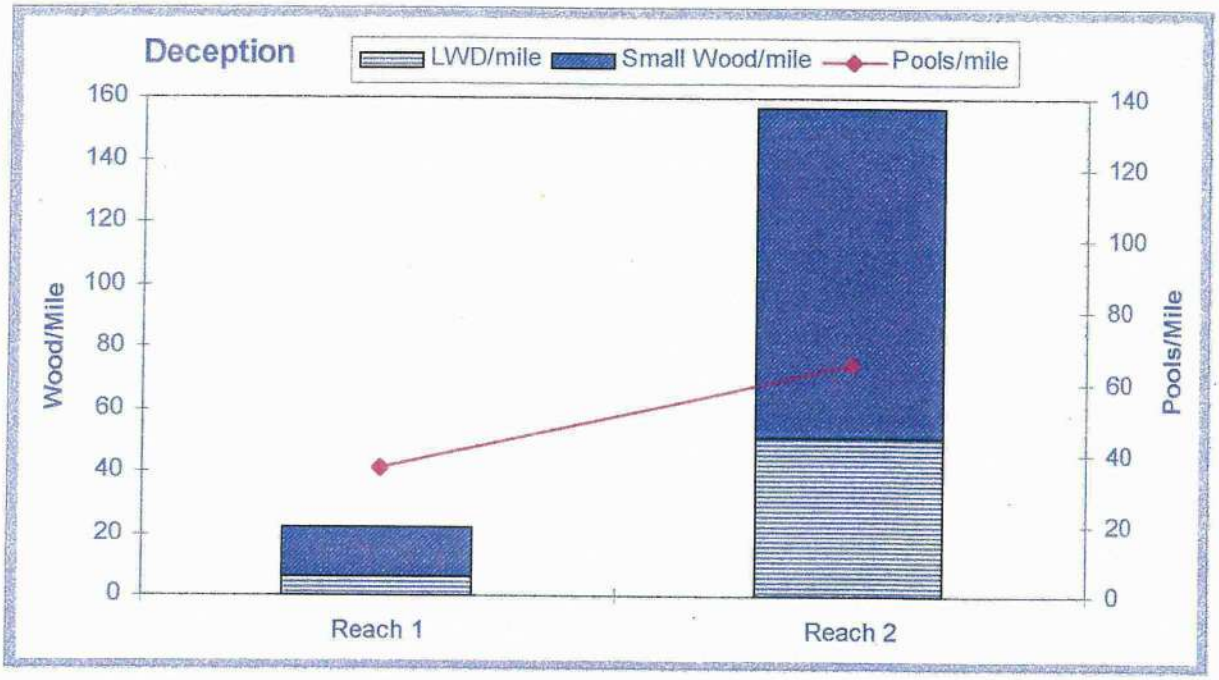
Deception is a large drainage (7,443 acres), with three large tributaries entering its mainstem. The stream channel labeled "Deception Creek" on maps was considered the mainstem. This steep, highly dissected drainage is bedrock constrained and tends to be prone to debris flows, providing a source of coarse substrate such as boulders and cobbles. Much of the drainage is fairly inaccessible as roads are located near the ridgetops or midslope in the upper part of the drainage. Very few roads cross perennial streams and no roads cross fish bearing sections. A total of 8.2 miles within the drainage are fish bearing *(see Map 28).* Two reaches were surveyed.

Reach 1 is 1.6 miles long. A privately owned trailer park is located near the mouth of Deception Creek and borders the stream channel for approximately 800 feet. This trailer park is built on an apparent alluvial fan from a past debris flow. The stream is heavily used by people in this area resulting in an abundance of litter. This reach has poor pool habitat and low amounts of large woody debris. Figure 10 shows that the wood present is largely in the small category (12-24" and >25'). Available pool habitat tends to have good depth, with an average residual pool depth of 1.9 feet and 5 pools per mile deeper than 3 feet. Large cobbles and boulder substrate are common and provide some cover.

Red alder trees dominating the inner riparian provide good shading. However, the riparian area is in poor condition with an average inner zone width of 67 feet. The outer zone is primarily Douglas fir and small red alder trees. The lack of large conifers

near the stream indicates that future recruitment of large woody debris is severely lacking. The riparian zone was often harvested right up to the stream channel. Cable and bucked logs were commonly observed. Bank erosion was seen throughout the reach, possibly resulting from limited large woody debris and past removal of riparian vegetation.

Figure 10. Pools and Wood - Deception Creek



The reach was calculated to be a Rosgen 'B' channel type. Width-to-depth ratio was high at 24.7. This may be an indicator of channel instability and may also result from the high amount of bedload entering the system.

Cutthroat trout were found throughout the reach, with small numbers of dace and sculpin found near the mouth. Red-legged frogs were abundant and often seen sitting on large cobbles and boulders. Rough skinned newts were seen in isolated pools within the bankfull channel. Crayfish were occasionally observed and old beaver signs were found. On the 8th of August at 1410 hours, temperatures were measured at 64°F. These warm temperatures were found in an area considered to have good shade from hardwoods and may be the result of an over widened channel and ground water from adjacent clearcuts.

Reach 2 begins at the second tributary confluence, is 1.1 miles long and ends at the confluence of the fourth tributary. The second and fourth tributaries both contribute about 40% flow to the mainstem. Pool habitat and large woody debris are much more common in this reach *(see Figure 10)*. Most of the wood falls within the small category but a moderate to high amount is also found within larger categories. The increase in number of pools may result from a higher amount of large woody debris.

Riparian condition is fair in this reach, although much better than in the previous reach. The average inner hardwood riparian is 19 feet wide, typical for this type of channel. The outer riparian is dominated by Douglas fir trees and consists of 47% small trees and 53% large, mature trees. Occasional past harvest of riparian trees reached the stream channel.

Gravel and cobble are the most common substrate with a large boulder component. The high amount of bedload is often captured behind large woody debris. Little bank cutting was observed. Large wood and a more intact riparian zone may be aiding in channel stability. This reach was also classified as a Rosgen 'B' channel. The high width-to-depth ratio of 24.8 is uncharacteristic and suggests some possible channel instability. This may be caused by a high bedload resulting from slides and widening the channel. Much higher flows were experienced in this drainage the winter after completion of the survey.

Temperatures were much cooler in this reach, with a high of 59°F at 1445 hours. The intact riparian and smaller stream channel probably influenced these cooler temperatures. Cutthroat trout were the only fish species present in this reach and they extended beyond its end. No red-legged frogs were observed. This is somewhat surprising since so many were present in Reach 1. Perhaps the higher gradient, elevation and increase in cover, such as large woody debris, has discouraged this species.

Buckhead Creek

Buckhead Creek is fish bearing for 5.5 miles. The lower section of Buckhead is unique to the watershed, as a depositional low-gradient stream with a wide floodplain. The area surveyed in 1996 was limited to the first 1.3 miles. An older survey conducted in 1992 inventoried the area further upstream. The low-gradient portion of the Buckhead Creek drainage is a designated Wildlife Area and within a Late Successional Reserve (LSR).

Oregon chub, a federally listed, endangered minnow, is found in low numbers within the low-gradient section of Buckhead Creek. Due to the presence of this species, the NWFP has designated Buckhead Creek as a Key Watershed *(see Map 6).*

Other fish species observed during the survey include speckled and/or longnose dace, redside shiners, and rainbow and/or cutthroat trout. Sampling by Oregon Department of Fish and Wildlife has also documented a few sculpin, northern squawfish and large scale suckers. These species are all found within the low-gradient portion of the stream. Trout are the only fish expected to reside in the steeper upstream reaches. Dace were extremely abundant during the survey. Redside shiners were common and trout were seen throughout the reach. No Oregon chub were observed during the biological portion of the stream inventory. Other aquatic species include Western pond turtle, many beaver, many red-legged frogs, rough skinned newts, and crayfish. These native aquatic species indicate the biological richness and diversity of the low-gradient reach of Buckhead Creek.

District archaeology records indicate that ponds used for steam engines were created at Buckhead when the railroad was built in 1911. It is quite possible that Buckhead Creek may have been channelized and redirected at that time to flow onto the flat area northwest of its original confluence with the Middle Fork Willamette River.

Stream surveys taken in 1937 and 1938 indicate that Buckhead Creek was a small and steep tributary, suggesting that it flowed directly into the Middle Fork Willamette without turning. However, aerial photos from 1944 show that lower Buckhead Creek turned sharply to the north immediately below the railroad culvert forming a very straight channel. Fifty years later, Buckhead Creek is still in this same channel. Natural processes would create sinuosity in low gradient streams. The lack of such meander patterns in Buckhead Creek suggests that it was channelized.

The lack of sinuosity results primarily from human-built berms confining Buckhead Creek. These berms limit floodplain use and create a stationary channel, where normally the stream would meander and have high floodplain interactions in this low-gradient section.

Hardwoods are the dominant tree species found within riparian areas. However, the 1944 aerial photos show a dense stand of conifers in this area. Aerial photos from 1959 clearly indicate harvest of these trees during the BPA powerline right-of-way construction, resulting in its current hardwood riparian condition.

The reach surveyed was classified as a Rosgen 'C' channel type. As indicated, however, sinuosity is low for this type of channel and is thought to result from human-built berms confining the channel. Bermed channels often result in downcut channels that become a Rosgen 'G' type. However, this reach is aggrading rather than degrading.

Riparian vegetation is poor with grass/forbs and hardwood shrub/sapling as the dominant seral types. Himalayan blackberries covering the berms, scotch broom and other non-native vegetation are common within the riparian reserve, primarily due to vegetation maintenance under the powerline right-of-way. Solar exposure is high resulting in elevated temperatures which favor warmer water species such as dace, redside shiners and Oregon chub. However, some areas are almost stagnant pools where temperatures may be too high and eutrophication appears evident; oxygen may be a limiting factor.

Pools are not very deep for this stream (residual pool depth averaged 1.6 feet), especially considering the abundant beaver activity. Since this is a depositional area, the streambed has filled in with sediment, but does not appear to be scouring. Instream large woody debris is minimal or absent in the medium and large size (>24" and >50') and fair for the small category (12-24" and >25'). The small category is expected to be more common for this hardwood dominant riparian zone but quantity should be higher. Future recruitment of large woody debris is extremely limited throughout most of the reach.

Other Aquatic Species

Harlequin Duck (Histrionicus histrionicus)

Current Status

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 the district with an emphasis on the Fall Creek and Winberry Creek watersheds. The only suitable habitat existing in the project area is the Middle Fork Willamette River above Lookout Point Reservoir and possibly the lower reach of Deception Creek. No known sightings of the duck exist within the WAA.

Future Trends

Approximately five miles of potential nesting and rearing habitat exists for the Harlequin duck within the analysis area. The potential for the duck to actually use this area for nesting is low due to human disturbance and high use within the river corridor. Highway 58, Southern Pacific railroad and motorized (as well as non-motorized) use on the river itself lends to this low potential as the duck is extremely sensitive to human disturbance. 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.

Northwestern Pond Turtle (Clemmys marmorata marmorata)

Current Status

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 in Lookout Point Reservoir has been conducted by the US Army Corps of Engineers (Beale, 1996). Turtles have been seen in almost every cove or inlet along the north shore of the reservoir. They are not nearly as common along the south side of the reservoir. This is probably attributed to better exposure and basking sites along the north shore in conjunction with more of these protected inlets

A two year Challenge Cost Share telemetry study in cooperation with the COE is currently being conducted along the upper reaches of the reservoir and within the Buckhead Special Wildlife Habitat Area. The work consists of radio attachment to gravid female turtles and tracking these females to determine nesting chronology and nest locations. Initial trapping results indicate a significant population in the Buckhead ponds although it is unclear whether successful nesting and juvenile recruitment is occurring. A significant bullfrog population in the wildlife area has been observed.

Future Trends

Although habitat for the turtle does exist within the WAA, human impacts on nest sites and juvenile recruitment could be impacting its abundance. This is due to loss of habitat from regulated river flows from Hills Creek Reservoir and introduction of non-native species (warm water fish species in the reservoir and the bullfrog) that prey on juvenile turtles and compete for forage. The telemetry work being conducted could provide clues to nest locations and the timing of nesting.

Tailed Frog (Ascaphus truei)

Current Status

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.

Spot amphibian surveys were conducted in the watershed on USFS lands in 1995. Stream surveys were conducted by the fisheries crew in 1996 on a few drainages. These survey efforts resulted in documentation of tailed frogs existing in numerous locations within the WAA, including the Duval Creek, Deception Creek and School Creek drainages.

Future 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. The major concern for the tailed frog is a degrading road system and the increasing potential for road failures with accompanying degradation of associated aquatic habitat.

Cascade torrent salamander (Rhyacotriton cascade)

See Southern torrent salamander

Southern torrent salamander (Rhyacotriton variegatus)

Current Status

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.

Amphibian surveys conducted in 1995 have verified presence of *Rhyacotriton* salamanders in the WAA. Documented sightings are in the Duval Creek and Goodman Creek drainages, specifically the upper reaches. It has yet to be determined whether these salamanders are cascade or southern torrent. 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 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).

Riparian and Aquatic Habitats

Reference Condition

The riparian seral condition was thought to be similar to the reference seral condition mentioned in the vegetation section. Table 21 represents a "snapshot in time" of the vegetation in 1900.

Table 21. Reference Riparian Seral Condition (1900)

Seral Stage	Age	Riparian
Stand Initiation	0-30 years old	16%
Stem Exclusion	30-80 years old	27%
Understory Reinitiation & Late-Successional Old Growth	80+ years old	57%

As discussed elsewhere (see Vegetation, Fire Regimes, page 45, and Human Uses, Reference Condition, page 90), fire played an important role in this WAA. Native American burning practices kept a portion of the project area in an earlier seral condition compared to adjacent watersheds on the forest.

Wildlife species associated with riparian and aquatic habitats were probably much more abundant and widespread historically than they are today. Intact riparian areas with cooler water temperatures, low sediment and embeddedness 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 in the northwest and specifically 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, due to healthy riparian and aquatic systems.

The Middle Fork Willamette River corridor served as a major riparian connection between the upper Willamette Valley lowlands and the higher cascade drainages such as the North Fork of the Middle Fork, Salt Creek, Salmon Creek, and the upper Middle Fork. This connection was important in providing species movement and genetic interchange throughout the area and between watersheds east and west of the cascade crest.

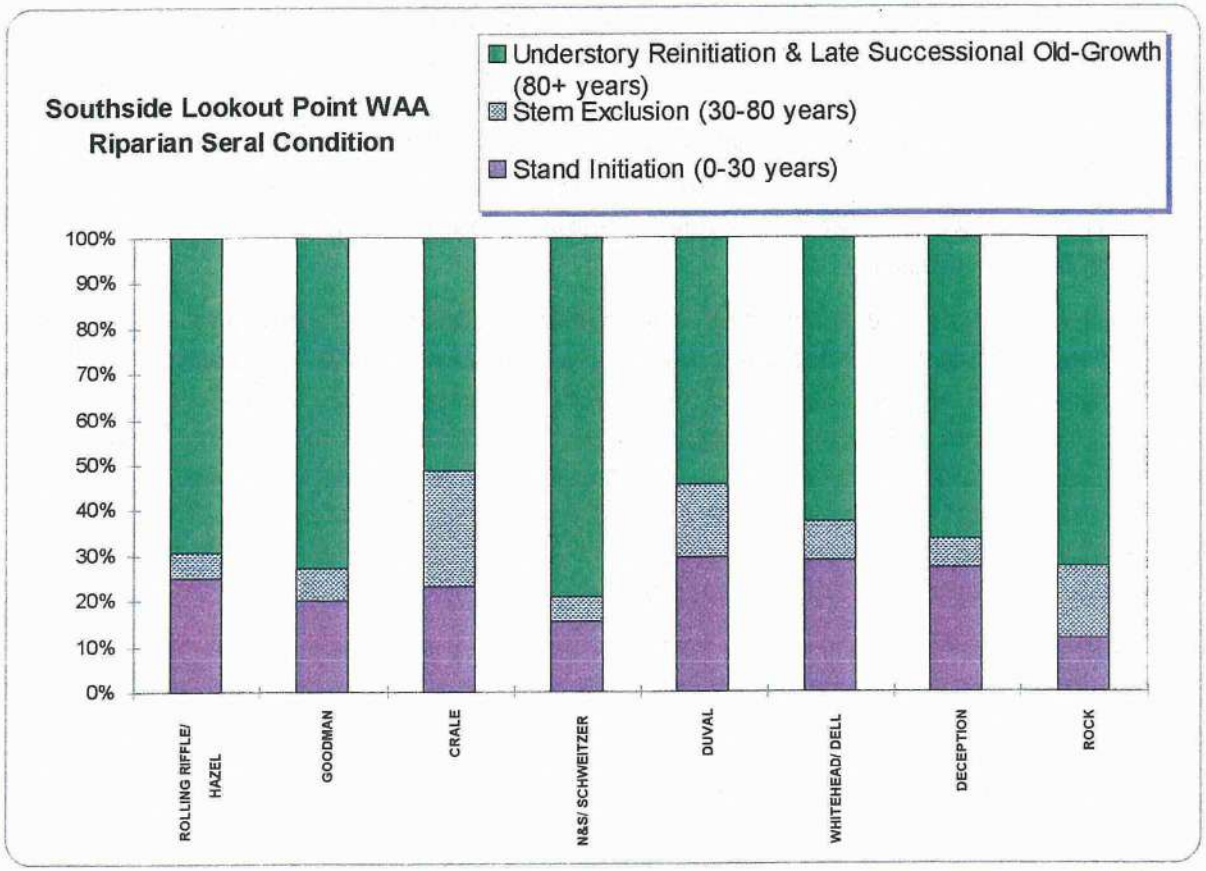
Current Condition

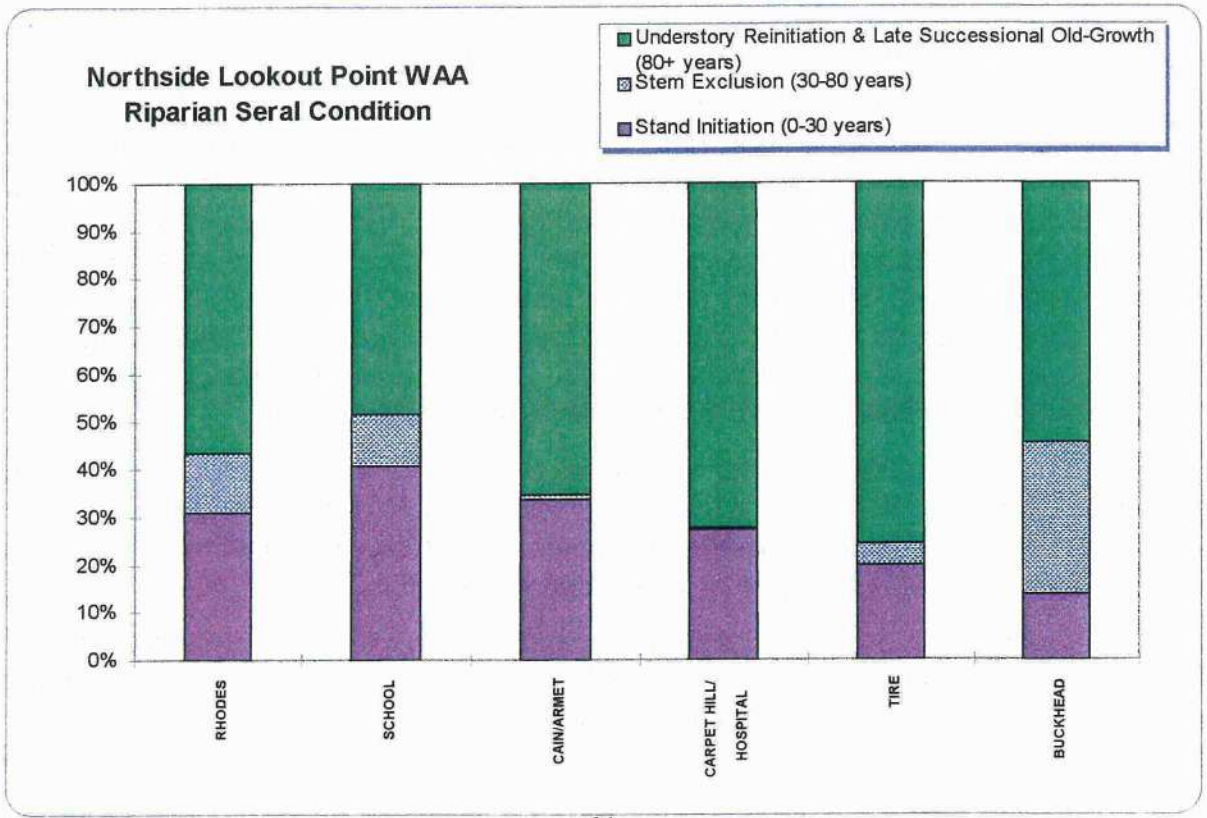
The current seral condition of riparian reserves was determined from GIS data (using acres). Riparian reserves of fish-bearing streams are defined by the height of two site-potential trees (340 feet along both sides of the stream). Riparian reserves along non-fish-bearing streams are one site-potential tree wide (170 feet). Percentages in different seral stages for each drainage are displayed in Figure 11. The data indicates a higher percentage of stand initiation than stem exclusion seral stage. This is reversed from the reference condition of these early and mid seral stages. However, the late seral condition (understory reinitiation and late-successional old-growth) is often equivalent to or exceeds the reference condition of 57%. Crale, Duval, Buckhead, and School Creek drainages have less than the desired older seral condition.

The riparian reserve strategy within the range of the northern spotted owl was developed to provide late successional forest conditions over time to protect aquatic habitat and provide habitat for dispersal of several terrestrial vertebrate species. These include the spotted owl, red tree vole and American marten.

Figure 11 depicts current conditions of the riparian reserve network in the watershed, 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.

Figure 11. Riparian Seral Condition by Drainage Groups





Map 19 spatially displays impacts to the reserve network by past management activities. The reserve network displayed on this map includes other withdrawn allocations also providing current and potential late successional forest conditions for dispersal.

Lookout Point Reservoir

Lookout Point Reservoir, constructed in 1953, inundated 4,360 acres of agricultural, forest and riparian habitats along with a number of vacated small communities along the river. The annual fluctuations in reservoir water level to support flood control and recreational use have created a fairly "sterile" condition for aquatic dependent wildlife. This reservoir does not have the high recreational use seen in Fall Creek and Hills Creek Reservoirs although a low-water boat ramp has been installed at Signal Point to provide boating access during drawdown periods.

A number of wildlife species are known or suspected to use the reservoir and US Army Corps of Engineer (COE) lands immediately adjacent to the reservoir. These include the Northern bald eagle, Northwestern 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.

TERRESTRIAL

Habitat Components and Structure

Reference Condition

Historic vegetation conditions indicate substantial fire history within the WAA *(see Map 15)*. A portion of this fire history is suspected to be a result of natural occurrences although a significant portion of the watershed's fire history was attributed to Native American burning. This burning was used to develop and maintain a more open forested condition, beneficial to increased game hunting success and maintenance of fruit and root-bearing plants. Based on age of stands within the WAA, there is evidence that a significant amount of stand replacement acreage was burned in the late 1800s and early 1900s. This fire history could be attributed to Native American burning where burning conditions led to stand replacement events. The historic occurrence of maintenance fires contributed to somewhat lower levels of coarse woody debris (CWD) and snags than currently exist in the same stands. These cool underburns probably aided in keeping fuel buildups to a minimum within these younger forested stands.

Many of the natural stands in existence today are suspected to be low in snags and CWD compared to levels recommended in current plans. This could be due to a combination of fire history and salvage operations in these stands during the last 50 years. Generally speaking, snag and CWD levels in the watershed contributed to healthy terrestrial and riparian systems. Natural recruitment from 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 terrestrial into aquatic systems was a 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 or removal of snags and other non-merchantable material, road construction with minimal or no restrictions through riparian areas, and stream cleanout substantially reduced those components which provided optimal microhabitat for many organisms.

Current Condition

Snag and coarse woody debris levels vary substantially within the watershed. Current seral conditions indicate that some areas are potentially low in snag and CWD levels. These include portions of Goodman, Whitehead, Tire, Hardesty, Hospital, Carpet Hill, and Armet Creeks. Refined snag modeling will be needed during planning to determine snag levels with more accuracy.

Connectivity, Dispersal and Interior Habitat Conditions

Reference Condition

Reference vegetative conditions, reconstructed in GIS using stand year of origin information *(see Map 15)*, depicts a watershed comprised substantially of early and mid-seral habitat conditions. As previously mentioned, the vegetation conditions at this point in time could be attributed to natural occurring fire and Native American burning to maintain optimal foraging conditions.

The condition of these stands 500 years ago is unknown, but it can be theorized that more late successional habitat existed on the south side of the Middle Fork prior to the 1900 reference year. These stands were 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 early and late successional forest dependent species in the watershed.

With the onset of European-American influence and settlement, suitable habitats for late-successional forest related species started to decline. This was largely due to increased forest fragmentation resulting from logging and road construction, degradation of aquatic and riparian conditions, and increased forest fire suppression. Although a relatively high level of early seral conditions existed in 1900, the habitat was more contiguous, thereby providing more interior habitat conditions (early as well as late successional seral stages).

Since 15% of the watershed was estimated to be in an early seral stage condition (stand initiation), early seral stage dependent or contrast species could be as abundant today as they were in 1900. Species abundance in the WAA 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.

Current Condition

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 as well as terrestrial-associated species. In addition to riparian reserves, other lands set aside within the matrix portion of the watershed 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 (short or long term) to provide specific 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 recommended when habitat removal or degradation is planned in ¼ townships below the 50-11-40 threshold in identified areas of concern. *(Refer to Northern spotted owl, page 82, for a discussion on dispersal conditions.)*

Further areas of concern are the major ridgetops bordering the watershed. They can be main travel and dispersal corridors for many wildlife and plant species. Winberry Divide, the main ridge between Winberry drainage and the Middle Fork Willamette River, is a main big game travel route and use area. It is also a connector with the Alpine ridge system, eventually extending into the Fall Creek LSR RO219. The ridge defining the southwestern boundary of the WAA is the main divide between the Middle Fork Willamette River drainage and the Coast Fork Willamette River drainage to the south. It provides important habitat for movement and dispersal of plant and animal species from the lowland habitats in the Lost Creek watershed to the Calapooya Divide at the upper end of the Middle Fork drainage above Hills Creek Reservoir. As a result of the riparian reserve strategy in the NWFP, ridgetops may be impacted from concentrated harvest activities in the future, thereby reducing effectiveness of these routes as main travel and dispersal corridors.

Map 20 displays current late-successional forest interior habitat conditions. Interior habitat is defined as stands >80 years in age and having a 100 meter buffer from any edge.

Providing for dispersal and movement of late successional forest wildlife and plant species between Late Successional Reserves is important in maintaining genetic diversity and species health across the landscape. The Lookout Point WAA is located between LSRs RO219 (Fall Creek) and RO222 (south of Highway 58). Currently, a significant combination of human-created features could inhibit successful dispersal between adjacent LSRs. The combined effects of Lookout Point Reservoir, Westfir and Oakridge city limits, Hills Creek Reservoir, Highway 58, and Southern Pacific Railroad could prove to be a significant hindrance to successful long term dispersal between these LSRs. The listed areas are either large tracts of land devoid of late successional forests or narrow strips with high human travel that could deter late successional forest species movement.

Sensitive and Rare Plants

Reference Condition

Human use in the analysis area was concentrated in the lowland riparian zones where Lookout Point Reservoir currently sits and along ridgeline trail systems used by seasonally nomadic tribes (Alpine-Tire Mountain, Mt. June-Hardesty Mountain, and Patterson Mountain Trails). All the USFS sensitive plants may have been encountered by Native Americans or early settlers, but there are no accounts of their use as either medicinal/food plants or as grazing forage.

Current Condition

No plant species listed as Threatened or Endangered by the USFWS occur on the Willamette National Forest. The Forest has a list of sensitive plant species designated by the Regional Forester. 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. Table 22 lists sensitive and rare plants found in the analysis area.

Table 22. Sensitive and Rare Plants of the Lookout Point Watershed Analysis Area

Species	Populations	Impacts
Romanzoffia thompsonii	10	Adjacent Trails and Timber Sale Units
Montia howellii	1	Adjacent parking lot and trail
Sidalcea cusickii	1	Adjacent Trail
Phacelia verna	2	Adjacent Trail
Montia diffusa	1	Adjacent Trail

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

All populations of *Romanzoffia* are within the Matrix Northwest Forest Plan Allocation. Six populations are in General Forest, three in Scenic and one in a Special Wildlife Habitat (9D) Willamette Forest Plan allocation. All populations are found in special habitats, treated in the Willamette NF land management plan 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 these habitats were to undergo a loss of or change in the water flow pattern. Two of the populations are adjacent to Cloverpatch Trail and three are adjacent to Tire Mountain Trail.

Howell's montia *(Montia howellii)* is a very small resident of ephemeral ponds and puddles. This species tolerates some disturbance (ponding is probably due to compaction) but will not withstand physical destruction of its habitat such as grading or ripping of the roadbed.

The population of montia is located in a Late Successional Reserve Northwest Forest Plan Allocation and a Scenic-Retention foreground Willamette NF Plan Allocation. The habitat is a parking lot for a major trailhead.

Rare and Unique Plants

The Willamette NF also tracks rare and unique plant species with the potential of being listed as Sensitive. These species may be associated with disappearing habitats or they 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).

A few of these species are found in the Lookout Point WAA. *Phacelia* is found in rocky areas, characteristic of the high boundaries in the project area's southern portion. Diffuse montia grows in forested habitats which have recently experienced some type of disturbance. Seeds need some type of scarification to germinate (ex. the seed coat may be cracked open by fire or scraped by a machine). Cusick's checkermallow prefers mesic meadow habitats (Hitchcock and Cronquist, 1973).

Survey and Manage Species

Reference Condition

Most of the species designated as survey and manage are associated with old-growth and riparian habitat. It may be that habitat for old-growth associated species has increased during the past 100 years due to fire suppression by early European settlers in the Willamette River valley and Oakridge areas. Prior to this time, it is thought that fires started by Native Americans traveled up to the ridgeline of south-facing slopes and remained in the lower areas of north-facing slopes. We infer from studies in the Santiam drainage (Towle, 1974) that south-facing slopes were composed of oak-savannah habitat with conifers confined primarily to riparian areas and ridgetops. Recent fragmentation of riparian habitat by timber management and related activities, such as road construction, has probably decreased habitat for riparian-dependent species.

Current Condition

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, 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 in the NWFP). A survey and manage standard and guideline for all management areas created four categories of survey strategy:

1. *Manage known sites*: in most cases this involves protection of small sites.
2. *Survey prior to ground-disturbing activity*: for botanical elements this refers to projects with decisions made in fiscal year 1999.
3. *Extensive surveys*: conduct surveys to find high-priority sites for management.
4. *General regional surveys*: survey for species to find additional information on habitat and ecology and determine necessary levels of protection.

Botanical survey and manage elements include lichens, bryophytes (mosses and liverworts), fungi, and vascular plants. Information on species distribution is incomplete. 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 in the winter when grass and shrubs are unpalatable or buried by snow (USDA, 1993). 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 of 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 (USDA, 1993). 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, they have been recorded in six locations within the analysis area. Examples are: *Lobaria oregana, Lobaria pulmonaria, Fuscopannaria leucostictoides, Nephroma laevigatum, Pseudocyphellaria anomala,* and *Pseudocyphellaria anthraspis.* These species are epiphytes, so they require retention of standing trees aggregates 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.

One rare nitrogen-fixing lichen *(Lobaria hallii)* is found in the watershed. This species is found on bark and wood of both conifers and hardwoods, usually in riparian areas. The species is one for which the Willamette NF is required to manage known sites (Survey Strategy 1 and 3).

No known survey and manage fungi or vascular plants occur in the watershed. *Allotropa virgata,* the candystick, has potential to occur in the watershed (Survey Strategy 1 and 2). This is a mycotrophic species, a plant with no chlorophyll, which requires an association with another plant for food. The plant grows in the Douglas-fir series and may be associated with western hemlock, Pacific silver 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).

Current conditions for riparian species in this WAA are poor compared to historic patterns. The average amount of early seral riparian habitat in the watershed is 33%. Some areas, however, exhibit much higher numbers: School (52%), Crale (49%), Buckhead (45%), Duval (45%), Rhodes (43%), and Whitehead Bride/Dell (38%). This loss of habitat results in very few, if any, remaining trees adjacent to streams and epiphytic species do not have an interior microclimate or habitat. Riparian habitat is highly fragmented so potential dispersal and movement corridors are dissected.

Habitat for late-successional survey and manage species has also changed, with late-successional old-growth (200+ years) increasing from a reference condition of seven percent to its current 30%. However, most of the WAA north of Lookout Point Reservoir (16% of the analysis area) is considered matrix land, so a dramatic reduction in this type of habitat will occur over the course of the next 80 years.

Special Habitats

Reference Condition

Although we have no direct documentation for the previous distribution of special habitats, it is fair to assume that the most common habitat, dry meadows, existed in much greater numbers than they do today. The majority of unique habitats seem to ring the northern and southern reaches of the WAA *(see Map 21).* To the north, the Tire Mountain/Cloverpatch Butte complex of meadows dominates (Willamette Forest

Plan Management Area 9D, Special Wildlife Habitat). In the south an abundance of meadows and rock outcrops are found in the Hardesty/Sawtooth/Mt. June area (Management Area 5b). Recurring fires (set by Native Americans) maintained dry open meadows and prevented conifer encroachment.

The hydrologic regime was probably such that ponds, sumps, wet, and mesic meadows developed over time and remained as sources of unique native vegetation and habitats for some special habitat species obligates. The Winberry Divide and Calapooya Divide probably functioned as a north/south ridgeline corridor for movement of both plant and animal species.

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, the Native Americans in the western Cascades manipulated special habitats. As these areas burned along with forested areas, drier habitats burned more intensely then wetter ones. Fires were started in meadows to lure deer and elk in to forage.

Current Condition

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 including meadows, rock outcrops, ponds, and talus slopes. Some special habitats, such as swamps and mineral deposits, are forested.

The Willamette National Forest has recognized the significance of these sites (comprising approximately 1.5% of the Lookout Point WAA) in its standard and guideline FW-211 (USDA, 1990). This S&G states that these sites will be maintained or enhanced (repaired) and their ecotones buffered from management activities.

Special habitats were mapped and given general habitat types using aerial photo interpretation. Dry meadow complexes are the predominate special habitat in the Lookout Point WAA, accounting for close to 420 acres. Others such as dry rock gardens, hardwood complexes, mesic meadows, rock outcrops, and shrubby areas appear in lesser amounts.

Table 23 depicts location and acreage of special habitats. Maintaining or "reclaiming" special habitats is crucial to retaining biodiversity across the landscape in the Pacific Northwest. Various wildlife species have evolved to be either partially or totally dependent on these habitat types for a portion or all of their life histories. It is suspected that some land slugs are 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. 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 are important for a long list of wildlife species. They serve as homes for many primary and secondary cavity-nesting birds. Insects and fungi are

decomposers of dead wood which eventually contributes to long-term site productivity. Marten use dead and downed wood for foraging, denning and resting.

Table 23. Special Habitats of Lookout Point Watershed Analysis Area

Habitat Type	Acreage	Number in Watershed
Dry Meadow	419	77
Dry Rock Garden	69	20
Rock Outcrop	65	14
Shrub Alder and Maple	66	9
Mesic Meadow	37	10
Hardwoods	36	6
Talus	19	5
Opening in Canopy	48	15

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

Functions of each type of special habitat delineated previously, and the wildlife species which use them, are outlined in the Special Habitat Management Guide (Dimling and McCain, 1992).

Figure 12. Cloverpatch Bluffs from Hampton Boat Launch

To determine the effects of management on special habitats, an analysis was completed using GIS to see if habitat features intersect roads and/or managed stands. The results are found in Table 24. Roads and trails bisect rock gardens, hardwoods, mesic and dry meadows, rock outcrops, and shrub talus. Timber harvest units surround hardwoods, dry meadows, mesic meadows, rock outcrops, and shrub alder.

Table 24. Percent of Special Habitats Intersecting with Roads and Managed Stands

	Acreage Affected	
Habitat Type	Roads	Managed Stands
Dry Meadow	53%	5%
Dry Rock Garden	37%	0%
Rock Outcrop	32%	2%
Shrub Alder and Maple	0%	41%
Mesic Meadow	84%	5%
Hardwoods	14%	64%
Talus	53%	0%
Canopy Opening	6%	44%

Non-Native Species

Reference Condition

At the turn of the century, no non-native species were known to have occurred within the WAA. Any non-native species currently existing in the analysis area was introduced as European people started to enter the area commercially.

Current Condition

Non-native animal species are found in the watershed and potentially affect wildlife species populations. Warm-water fish, such as bass introduced into Lookout Point Reservoir, potentially impact successful recruitment of young pond turtles into the reservoir population due to predation or competition for a very limited food supply resulting from annual water fluctuations. On the positive side, non-native warmwater fish in the reservoir provide a foraging source for bald eagles, herons, mergansers, and kingfishers. Bullfrogs, seemingly very abundant in areas of the project area (especially in the Buckhead Special Wildlife Habitat Area), also affect both turtle and amphibian survival and recruitment into adult populations due to 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 foraging areas. Although suitable purple martin nesting habitat has been reduced in the watershed with 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 the Middle Fork/Buckhead area above the reservoir. Ideally, this would occur synonymous with holding starling levels in check.

Non-native botanical species of concern include two species of blackberry: Himalayan and evergreen. These species have encroached upon some former riparian areas, namely the Buckhead Wildlife area along North Shore road, as well as many places along the reservoir. They have the potential to outcompete native vegetation and may have an adverse impact on wildlife species. Control of these species has been confined to the eradication of outlying plants.

Noxious Weeds

Reference Condition

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 has been a medicinal herb for many years; it was probably a garden escapee. Thistles traveled west as contaminants in alfalfa and other crop seedbags and came into 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 Condition

The Willamette National Forest 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).

The highest priority species for treatment are new invaders: those weeds in early stages of invasion which have not naturalized to the point of resource damage. Spotted knapweed *(Centaurea maculosa)* is located in two areas within this WAA (along the Highway 58 corridor and on Road 5847/547) and meadow knapweed *(Centaurea pratensis)* is found on Road 5824/120. A third new invader, giant knotweed, is known upstream within the WAA and will most likely move into the analysis area. This species is located in the town of Westfir, growing in gravel bar islands, and along the shore of Middle Fork Willamette River.

Control methods for new invaders are site dependent. Some spotted knapweed populations occur near known bull trout habitat, adjacent to Lookout Point Reservoir. These populations will be controlled manually. Other populations along the highway corridor may be sprayed with herbicides.

Other species found within this analysis area 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 in any disturbed site but is most commonly associated with clearcut logging units, landings and roads. Scotch broom competes with young conifers in plantations. This species is found throughout; no area has escaped. Other weed species associated with plantations include Canada thistle, bull thistle and tansy. All are generally outcompeted due to lack of sunlight 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 the biological diversity of a site, especially in the rock garden habitats found in this analysis area.

Due to the sheer amount of acreage these infestations cover, treatment methods are limited primarily to biological control. 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. Records of biological control releases indicate that insects have been released in the Lookout Point WAA since 1988. Seed weevils and flea beetles have been released for control of Scotch broom and tansy respectively.

Alternative methods have been used to locally control established infestations. These include manual cutting of large Scotch broom in the meadows above North Shore Road and hand-pulling of tansy. Experimental prescribed burning of St. Johns-wort and Scotch broom will also be used as a control method to determine whether St. Johns-wort is susceptible to fire and if the Scotch broom seed bank may be flushed out. These methods are more costly and will be used primarily in areas of biological interest or concern such as meadows, riparian areas and sensitive or rare plant and animal habitats.

Big Game

Reference Condition

The Columbia white-tailed deer *(Odocoileus virginianus leucurus)* is currently listed as threatened by the US Fish and Wildlife Service. The two main populations occurring in the Northwest are along the lower Columbia River in Washington and in Douglas County near Roseburg. This 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 lying areas of this analysis area, historically composed of oak savanna lowlands and brushy river bottomlands, was probably prime habitat for this species. Reservoir construction and fire suppression has reduced potential habitat for this species in the WAA.

A historical perspective of 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 their 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 (USDA, 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. Lookout Point WAA differs somewhat from Fall Creek, having more acres in early seral conditions due to historic fire occurrence. Modeling was not conducted for big game reference conditions in this WAA, but is suspected that it would show higher habitat values than current indices. 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 actions. The fact that historical vegetation was composed of large contiguous tracts of forage, hiding and thermal habitat coupled with very low open road densities created high habitat values in the modeling process.

Current Condition

Lookout Point WAA is relatively low in elevation, lying mostly within big game winter range. Currently, 22% lies within summer range (10,805 acres) and 78% lies within winter range (38,156 acres). 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 22)*. Main areas of documented activity for Roosevelt elk are:

1. The entire portion of the watershed north of Lookout Point Reservoir and the Middle Fork Willamette River is high use winter as well as summer range. This is primarily due to high percentage of south slopes based on drainage topography and low elevation of most of the north shore area.
2. The Patterson Mountain area is high use summer range and provides a mix of conifer stands and special meadow habitats in a small unroaded area.
3. Portions of Whitehead and Dell Creeks are also high use areas due to favorable topography and forage/cover ratios.

The Willamette NF Land and Resource Management Plan guides 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 eight 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 the two emphasis areas north of the reservoir and river. These are both high BGEAs. Analysis was not completed for the emphasis areas south of the reservoir and Highway 58 with the exception of identifying open road densities. This area is all within LSR RO 222 where habitat objectives are focused on development of late-successional forest habitat and not on management of habitat for big game.

Table 25 displays current conditions of the two high BGEAs located north of the river and also lists current open road densities on those BGEAs south of the reservoir and river *(see Map 36).*

Table 25. 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 HEI	Comments
School/Armet/Hospital High Total Ac. 7,240	.39	.60	.34	.87	.51	.6	Road density and forage quality below S & G of .5
Tire/Buckhead High Total Ac: 8,524	.43	.67	.51	.78	.58	.6	Low forage quality
West Goodman Moderate Total Ac: 5,828	LSR	LSR		LSR	LSR	LSR	S & G of .4 = 2.8 miles/mile^2 of open road
East Goodman/Crale Moderate Total Ac. 6,990	LSR	LSR		LSR	LSR	LSR	S & G of .4 = 2.8 miles/mile^2 of open road
Hardesty Low Total Ac. 4,164	LSR	LSR		LSR	LSR	LSR	S & G of .2 = 4.6 miles/mile^2 of open road
Duval Creek Moderate Total Ac 3,565	LSR	LSR		LSR	LSR	LSR	S & G of .4 = 2.8 miles/mile^2 of open road
Rock/Whitehead/West Deception Creeks High Total Ac: 8,092	LSR	LSR		LSR	LSR	LSR	S & G of .5 = 1.9 miles/mile^2 of open road
East Deception Low Total Ac: 4,557	LSR	LSR		LSR	LSR	LSR	S & G of .2 = 4.6 miles/mile^2 of open road

Legend	High	Moderate	Low

Other Terrestrial Species

The following are threatened, endangered and sensitive species known or suspected to occur within the analysis area. Included in the discussions of each is current information on status and survey history and the potential for future occurrence of listed species based on vegetation trends and land allocations in the NWFP. Also included are species of interest or concern, documented or suspected to occur in this WAA. Refer to Table 38, in Appendix D for species currently listed under the Endangered Species Act. Also listed are those recently included as Category 2 species (USFWS, 1995).

American Peregrine Falcon (Falcon peregrinus anatum)

Current Status

No active peregrine nest sites are known to exist within the project area. In the Pacific states, preferred peregrine falcon nesting sites are sheer cliffs 150 feet or greater in height (USDA, 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, field reconnaissance was conducted on the ground to assess potential sites for peregrines. The district has expanded the list of potential sites to eight, and monitoring these sites will continue in subsequent years. Four sites have been identified as having some potential within the WAA. Monitoring is ongoing to determine if these sites exhibit any signs of use by peregrines.

Future Trends

The potential exists for peregrines to forage above and adjacent to the reservoir. With potential nest sites identified in the WAA, the reservoir could prove to be a preferred foraging area for birds nesting in surrounding areas.

Northern Bald Eagle (Haliaeetus leucocephalus)

Current Status

Three active eagle pairs are suspected to use portions of the WAA for nesting and/or foraging. The Eagle Rock pair, nesting adjacent to Dexter Reservoir, uses the lower end of Lookout Point for foraging. This could include areas as far up the reservoir as the Goodman Creek inlet. The Hampton pair has nested in the area of Hampton/Duval Creek since 1990 with successful reproduction documented in the majority of these

years. The Ferrin pair, located on the Oakridge RD, are suspected to forage along the Middle Fork as far downriver as the upper end of the reservoir.

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 (USDA, 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 (USDI, 1986). The majority of nests in Oregon are located within a half 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

The Pacific Bald Eagle Recovery Plan (1986) lists one target recovery territories for Lookout Point Reservoir. With the adjacent foraging territories of the three active eagle sites, it is unlikely that enough habitat exists within the WAA to support an additional pair of nesting eagles. Current foraging patterns and examination of prey remains collected at the Hampton nest site indicate a significant reliance on warmwater fish species (coarsescale suckers and northern squawfish). Trends would suggest that continued occupation and successful breeding of the Hampton site and foraging by the two adjacent eagle pairs hinge on an adequate food supply in the reservoir. The Hampton eagles seem adapted to the constant highway and railroad noise based on their successful reproductive history. Concerns are surfacing over the increased off-highway (OHV) motorcycle and vehicle use occurring immediately adjacent to the nest site within the reservoir draw-down zone. This should be addressed in cooperation with the US Army Corps of Engineers to develop a plan of recreational use within the draw-down zone of the reservoir.

Northern Spotted Owl (Strix occidentalis caurina)

Current Status

There are 22 known spotted owl activity centers within the watershed. All are located on USFS lands. No known activity centers occur on COE lands. The USFWS addresses habitat removal adjacent to activity centers using *"Incidental Take"* thresholds, commonly known as *"Take."* Removal of suitable habitat where remaining habitat is below 40% within a 1.2 mile radius of the activity center constitutes *"take"*. Table 26 displays activity centers by land allocation and amount below *"Take"* thresholds.

Table 26. Number of Spotted Owl Activity Centers Above or Below "Take" Thresholds

Owl Habitat Remaining	Matrix	LSR	Total
30% to 40%		1	1
41% to 50%	3	7	10
> 50%	5	6	11
TOTAL	8	14	22

All USFS matrix activity centers are protected by designated 100-acre cores, with the exception of two: one discovered in 1996 in near Cloverpatch and the other discovered in 1995 in the Buckhead area. These two sites are protected with interim 70-acre cores but do 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. Such stands would meet nesting, roosting, foraging, and dispersal requirements of the spotted owl. Federal lands currently support 26,333 acres (55.7%) of suitable spotted owl habitat within the watershed. This figure differs from the amount of late successional forest (63.0%) 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. Designation of spotted owl habitat in GIS should be reevaluated based on field reconnaissance to more accurately represent owl habitat, especially in the Hardesty Mountain area.

Critical Habitat

Map 25 displays current spotted owl habitat conditions within the WAA. Overall, 55.7% of the watershed is considered suitable habitat.

Portions of Critical Habitat Units OR-18 and OR-20 are found within the WAA *(see Map 26)*. Approximately 30,431 acres (61.9%) of the watershed lies within these two critical habitat units.

Protocol survey status in the watershed

Over the years, spotted owl survey history has been somewhat fragmented on USFS lands in the analysis area. Survey efforts have been concentrated within the matrix portion of the WAA since 1990, due to the cessation of timber sale planning south of Highway 58 with the adoption of the ISC strategy and subsequent LSR designation from the NWFP. Protocol work is currently outdated in most portions of the LSR and in selected areas of the matrix such as Buckhead, School and Rhodes Creeks.

Dispersal Habitat (11-40) Condition in the Watershed

Table 27 displays percent of acres meeting the 11-40 condition within WAA boundaries. Map 23 depicts values of 11-40 in those drainages. The basic assumption underlying the analysis was that all stands of at least 40 years old meet 11-40 conditions. Table 28 displays 11-40 conditions on federal lands by ¼ townships overlapping the watershed *(see Map 24).*

Table 27. Current Spotted Owl Dispersal (11-40) Conditions within the Watershed

Drainage	% Dispersal
Rhodes	61.9
School	54.7
Cain/Armet	68.8
Carpet Hill/Hospital	61.4
Tire	74.2
Buckhead	60.5
Rolling Riffle/Hazel	70.2
Goodman	74.0
Crale	61.0
North/South/Schweitzer	84.8
Duval	62.8
Whitehead/Bridge/Dell	61.5
Deception	67.6
Rock	64.8

Table 28. Current Spotted Owl Dispersal (11-40) Conditions on Federal Lands by ¼ Township.

Legal Location	%	Geographic Area
T20S R1E NE	61.6%	Rhodes Creek
T20S R2E NW	62.6%	School/Carpet Hill Creeks
T20S R2E NE	69.1%	Cloverpatch/Tire Mountains
T20S R2E SW	56.3%	Cloverpatch Bluffs
T20S R2E SE	61.0%	Tire/Burnt Bridge Creeks
T20S R3E SW	62.3%	Upper Buckhead Creek
T21S R2E NE	53.0%	Lower Buckhead Cr.

Great gray owl (Strix nebulosa nebulosa)

Current Status

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. Three areas with documented activity are Tire Creek, Patterson Mountain and lower Duval/Schweitzer Creek. Numerous responses over multiple years have been elicited in the Tire Creek area, although follow-up visits to determine location and nesting status have been unsuccessful. Survey protocol work has been completed in Carpet Hill Creek in conjunction with this planning area. A Jobs-in-the-Woods project was funded in 1996 to place great gray owl nesting platforms in optimal habitat areas on the district. A number of platforms were placed in the Tire Creek and Patterson Mountain areas to enhance nesting habitat.

Future Trends

Great gray owls west of the Cascades are thought to inhabit stands similar to the Northern spotted owl. Potential great gray owl habitat exists in the watershed, associated with natural meadows in the Tire Mountain, Patterson Mountain and Cloverpatch Butte areas. 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. Nesting conditions may be improved 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)

Current Status

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 primarily foraging within the canopy for small mammals and birds. There is a growing concern that timber harvest and related activities are causing the decline of goshawk populations, although research and monitoring information does not adequately address 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.

Goshawk 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 in Schweitzer Creek, Duval Creek and Patterson Mountain areas. Responses were elicited from adults and young in Duval Creek adjacent to the Lawler Trail, although the nest location was not found.

Future Trends

Goshawks have been documented in the WAA. There is a moderate to high potential for goshawks to exist within the watershed in the future. With approximately two thirds of the watershed exempt from timber harvest, goshawk habitat, in the form of larger contiguous stands of late successional and old-growth forests, will become available.

Pacific Western Big-eared Bat (Corynorhinus townsendii townsendii)

(also known as Townsend's Big-Eared Bat)

Current Status

Although Pacific Western Big-eared bats are the most characteristic bat in caves of the western US, the small amount of historical population data available 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 National Forest (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). Four recent Pacific Western Big-eared bat sites have been recorded on the Lowell Ranger District, one of these within the watershed. This site is an old crystal mine shaft where a bat was detected in 1989. This old shaft continued to receive sporadic human use during the 1990s and it was thought that closure of the shaft was needed to enhance shaft habitat for bat use. A gate was designed and installed in 1995 to prevent human entrance yet provide bats with access to the cave. Vandalism has occurred at the site since the gate was installed, so the effectiveness of this closure is uncertain. Monitoring will continue to determine effectiveness of this project.

Future Trends

The previously mentioned mine and other potential areas should be protected in the future. Any subsequent sites discovered in the WAA should be protected from site alteration by timber harvest, recreation, etc. Substantial foraging habitat for this and other species of bats exists in the project area; therefore habitat components to enhance roosting opportunities should be developed. This could take the form of providing large snag and bridge habitat.

California Wolverine (Gulo gulo luteus)

Current Status

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 on a regional rather than local basis.

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 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 not impacted 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 Trends

With the largest contiguous LSR network designated by the NWFP located in this watershed (LSR RO-222), potential exists for wolverines to inhabit or use this area in the future. Although the habitat might develop and be conducive to wolverine use, the concern remains that high road and trail density and use could prove to be a disturbance barrier, reducing the potential for this species to inhabit this portion of the watershed.

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

Current Status

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 that if such studies were undertaken this vole might be more prevalent than is currently believed (Verts, 1990).

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 Lowell District or within the analysis area. Voles are known to favor riparian associated habitat, although they have also been found in a variety of other forest conditions including logged areas. It is likely that trends for this species in the WAA will be positive, due to the extensive areas of suitable habitat existing or developing in the future as a result of no-harvest allocations.

Pacific fisher (*Martes pennanti pacifica*)

Current Status

The fisher has the potential to occur within the WAA 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 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 to mid-elevation hemlock forests than the American marten. Habitat for this species should increase over time in the no-harvest LSR and riparian reserve allocations, thus providing for an increased potential for the species to inhabit the LSR portion of the watershed.

American marten (Martes americana)

Current Status

The marten is another carnivore potentially occurring within the watershed. This 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 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 (>83% of USFS 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 where marten are more likely to be found.

Oregon red tree vole (Phenacomys longicaudus)

Current Status

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 are not required.

A Forest-wide red tree vole habitat analysis was conducted in November, 1996 at the fifth field watershed scale. The analysis revealed that 71% of the watershed exists in stands that meet the minimum criteria mentioned above. This is well above the 40% minimum threshold that would trigger red tree vole surveys. *Thus, red tree vole surveys are not required in this watershed prior to ground disturbing activities.*

Future 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 approximately 83% of the watershed is in a no-harvest allocation, this species should maintain or increase its abundance within the WAA

Other Mammals

Current Status

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 38, page 143, in Appendix C. Habitat requirements vary among species. The hoary and silver-haired bats are migratory species which 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. Two large nursery colony size bat houses were constructed and placed in the Buckhead Special Wildlife Habitat Area in 1995. Monitoring of these houses indicated use in 1996 although the species was not identified.

Future Trends

Adequate amounts of foraging habitat exist in the watershed with the presence of Lookout Point Reservoir, the Middle Fork Willamette River and unique pond habitat in the Buckhead area. The no-harvest allocations along with mitigation measures established as Standards & Guides in the NWFP will help provide suitable roosting and wintering sites 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.

Clouded Salamander (*Aneides ferreus*)

Current Status

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. The species has been documented in the watershed adjacent to Patterson Mountain Special Wildlife Habitat Area (SWHA) in the upper reaches of the Duval Creek drainage. It is suspected that with more adequate survey efforts for terrestrial amphibians, the clouded salamander would be found in other areas of the WAA, especially those in late-successional old growth conditions.

Future Trends

Existing and developing late-successional forests within riparian reserves and other withdrawn allocations should provide some habitat for this species in the future. 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 such stands develop into a closed canopy situation. As the matrix becomes more fragmented, populations of these terrestrial amphibians could become restricted mainly to undisturbed no-harvest allocations.

Oregon Slender Salamander (Batrachoseps wrighti)

Current Status

Oregon slender salamanders are most commonly found in mature Douglas-fir forests on western slopes of the Oregon Cascades (Nussbaum, *et. al.*, 1983). A species endemic 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 analysis area falls 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 WAA.

Future Trends

Although this species is not documented in the project area, 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. With the provisions for late-successional and riparian reserves, suitable habitat should increase

for this species over time, although it is unclear whether distribution and abundance of the species will be maintained in the northern third of the project area on matrix lands.

Arthropods

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

Mollusks

Current Status

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 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.

Human Uses

Reference Condition

Native Americans

At the time of European exploration, the Middle Fork Willamette drainage, as far upriver as the present town of Lowell, was occupied by the Winefelly band of the Kalapuya. East of this area, the Molala were thought to have been the primary inhabitants, with winter villages in the Oakridge area. The tribes using the Middle Fork watershed were trading partners and often intermarried. The Middle Fork appears to have served as an important corridor for travel between the Willamette Valley and the east side of the Cascades. Unlike the drainages to the north (McKenzie and Santiam), where most of the obsidian used for toolstone came from Obsidian Cliffs near the Middle Sister, obsidian obtained from archeological sites in the Middle Fork drainage comes equally from local sources (Salt Creek), Obsidian Cliffs, and from a variety of sources on the east side, especially the Klamath Lakes area. In pioneer times, settlers

reported groups of Klamath on horseback using the Middle Fork area for trading expeditions. To date, over 50 archaeological sites, representing base camps and seasonally occupied task specific camps have been recorded in the analysis area. While obsidian was preferred for tool making, local jasper and chalcedony was also commonly used.

Vegetation types and fire history of south-facing slopes north of the Middle Fork suggest that this area was maintained as oak woodland and prairie. Fire use by the Kalapuya to maintain this landscape in the Willamette Valley is well documented in the literature (Johannessen, *et. al.,* 1971; Towle, 1974, 1979). It appears likely that fire was consciously used by the native people throughout the Middle Fork corridor. According to John Minto,

> *"Fire was the agency used by the Calapooia tribes to hold their camas grounds and renew their berry patches and grasslands for game and millions of geese, brants, cranes , and swans which wintered in the Western Oregon...On the west face of the Cascades the Molallas claimed dominion, and fire was their agency in improving the game range and berry crops."* (1908:152-153)

Epidemic diseases reduced native populations by at least 80% between 1790 and 1840. Despite the forced relocation of most survivors to reservations, a few remained behind with the new immigrants. Some returned in the 1890s and 1900s to work in the Lowell area hopyards. According to former West Boundary District Ranger C.B. McFarland,

> *"The Indians would come in large numbers to pick hops in the hop yards owned by A.D. Hyland. They would return across the summit with salmon, dried fruits, some green fruits and clothing, and pick huckleberries and hunt...and cross the Willamette Pass just prior to the snowstorms in the early fall."* (McFarland, 1956:4)

Many descendants of local tribes are currently part of the Grand Ronde, Klamath, Siletz, and Warm Springs reservations.

The Homestead Era

The first EuroAmericans to enter the area were probably fur traders working for the Northwest Company of Montreal, Canada. However, no records survive to document their activities. Elijah Bristow was the first settler to stake a claim in Lane County at Pleasant Hill in 1846, arriving via the Oregon Trail. During the next decade, several families moved into open meadows along the Middle Fork, enticed by the Oregon Donation Land Act. The first attempt to pioneer a route across the Cascades down the Middle Fork was that of Stephen H. L. Meek in 1845. Attempting to lead pioneers on a more direct route to the Willamette Valley by heading west from the Snake River, Meek's group became lost and several died before the survivors headed north to join the Oregon Trail at The Dalles.

In 1852, Lane County residents began explorations for a wagon road up the Middle Fork drainage. By 1853, about 1,500 people, mainly members of the Elijah Elliot wagon train, used the Free Emigrant Route. In response to the influx of settlers seeking

title to their lands, Cadastral Surveys were conducted in the vicinity of the Middle Fork as far east as Oakridge between 1854 and 1857. In 1864, Congress began a program of land grant subsidies for road development. During the same year, the Oregon Central Military Wagon Road Company formed in Eugene, beginning survey and construction. Benjamin Simpson, Indian Agent at the Siletz Reservation, was granted the contract for construction of the Oregon Central Military Wagon Road from Butte Disappointment (Lowell) to the Big Pine Openings (near Rigdon Meadows). In 1865, he brought 75 Indian laborers from the reservation to pioneer the road through what is now Dexter and Lookout Point reservoir. By 1867, construction was completed to Emigrant Pass and facilitated the migration of settlers from Western Oregon into the Klamath, Summer and other lake basins of Eastern Oregon. From 1871-1896, Stephen Rigdon and his family operated a seasonal way-station at Rigdon Meadows and kept extensive records of travelers on the road (Beckham, 1981).

Among the homesteaders in the Middle Fork area was Amos Hyland who named the townsite Lowell in honor of his former residence in Lowell, Maine. After the Homestead Act of 1862, pioneers began to occupy the more marginal lands of the Middle Fork within eight miles east of Lowell. By 1900, about a dozen families lived in the area now under Lookout Point Reservoir. Locals called the area "Rush Island", a brushy strip of land between the wagon road and the Middle Fork about 800 yards wide, subject to annual flooding (Williams, 1992). The settlers lived a subsistence lifestyle, depending on wild game for their meat. Briefly, hops were cultivated as a cash crop, but the market soon crashed due to crop disease and market failure.

By the time the Cascade National Forest emerged, it was apparent that attempts at human settlement of the foothill valleys were marginal, and not conducive to farming. Rather, the area was better suited for timber production, grazing or hunting. During and after the Great Depression, locals worked in the woods *"...to give themselves an additional income, because farming wasn't too profitable in those days"* (Hucka, 1996).

During the latter part of the 19th century, a large part of the leadership for creating forest reserves came from urban areas in the Willamette Valley: Portland, Salem, Eugene, and Roseburg.

> *"In 1889...urban dwellers who relied on the mountains for their recreation (outings, mountaineering, hunting and fishing), read scientific reports dealing with the forests and became caught up in the demand for reform of the land laws."* (Rakestraw, 1989)

With people's concern and rage about petty and corrupt management decisions in forests it was no surprise there was little public protest in 1892, when the entire Cascade Range was proposed for a Forest Reserve (Rakestraw, 1989).

Life changed with the beginning of commercial logging and the arrival of the Southern Pacific Railroad. In 1905, inspired by the rise of the Booth-Kelly Lumber Company mills in Springfield, logging camps were established east of Lowell to meet the demand. Many residents became contract loggers and river drivers or "river rats" and drove logs down to the mills on high water. In 1906, J.B. Hills began a harrowing 100-day drive

from Holland Ranch (just below Oakridge) to the Springfield mill pond, enduring drowning and typhoid fever (Huntington, 1984).

In 1909, work began on the Natron Cutoff, a rail link between the Willamette Valley and California. Following the Oregon Central Military Wagon Road route, the rail line was completed to Oakridge in 1912, and began regularly carrying freight and passengers in 1927. Some of the earlier farms broke up and others became sidings, including Carter, Landax, Signal, and Eula (formerly known as Blakelyville), later known as Armet (Lane County Historian, 1988).

Administrative History

In 1907, President Theodore Roosevelt created the Cascade Forest Reserve, ending possibilities of greater settlement along the Middle Fork and opening the era of federal land management. West Boundary Ranger Station was built two and a half miles west of Eula on the north bank of the Middle Fork in T20S, R1E, Section 2.

Early Forest Service rangers on horseback embarked on a ground patrol for fire detection covering a system of trails and vantage points connected to ranger stations by telephone lines. Lookout sites or buildings were established on Eagle's Rest, Hardesty Mountain and Tire Mountain, connected by a system of trails and shelters developed mainly by the Civilian Conservation Corps (CCC) based at Fall Creek between 1933 and 1937. Campgrounds were developed along the Middle Fork at Mossy Maple, River's Edge (both now inundated) and Shady Dell. West Boundary Station was abandoned in 1951 when the facility was moved to its present location in Lowell (Kintzley, 1997).

During and after the CCC era, Forest Service employees were an integral part of the local community. Local people provided books for CCC enrollees and held community events such as dances that were well attended by the young men.

Figure 13. Poling a log through Hellgate, Black Canyon (1905)
Photo courtesy of Lane County Historical Museum.

> *"...the Forest Service as an agency has been, especially until later years, close to the people involved in their areas. For example, they were close to ranchers, they were close to the townspeople in the small communities. Rangers walked pretty tall in these small communities."* (Sorseth, 1982)

Few Forest Service "Rangers" enforcing regulations on the new National Forests left locals free to do as they pleased in the woods. When Federal employees were considered overbearing with people, they were referred to as "bug hatch" (someone "buzzing around" in your face, always telling you what to do) (Reid, 1996).

Chain saws revolutionized the timber industry after World War II.

> *"One man with a chain saw could cut as much as 6-10 men."* (Coltrane, 1996)

> *"It was a good example of technology really changing a whole lot of things. We* (Forest Service) *had a hard time* accepting *the power saw, because surely you couldn't fell a tree with a power saw and save it as well as you could with the hand briar..."* (Sorseth, 1982)

This would not be the last time the Forest Service culture supported a slow-paced acceptance of "new ideas" dealing with forest management.

As soldiers returned from World War II, the housing market boomed, increasing timber demand. Roads were constructed into forested lands to access previously unavailable timber, such as up Patterson Mountain (Worstell, 1996). The size of some sales was directly attributable to this emphasis on accessibility (Sorseth, 1982).

Soon after, during the mid-fifties, local Sierra Club members began vocalizing their interests in keeping forest stands intact, as recreation use increased (Worstell, 1996). However, they were not yet organized to the degree that would make a difference in Forest Service planning (Sorseth, 1982).

By the 1960s, the Forest Service underwent a major expansion in its timber program (Worstell, 1996). By this time community relations with the Forest Service had changed. *"It was not good,"* states Kelly Lunceford. *"If you went into a bar after work, you were ignored (by loggers and mill workers), that's all. They seemed to think the person in the Forest Service wasn't doing anything."* (Lunceford, 1996) Staff, on the other hand, had a different view. They saw their relationship as *"pretty formal. We didn't do too much social activity, but our relation as far as the timber sale contract was good."* (Worstell, 1996).

> *"Oregonians who had lived in rural surroundings were familiar with nature's rapid self-renewal...urbanites, seasonal residents and visitors did not recognize this fact and tended to equate clear cuts with strip mining....Their general way of life and outlook toward the forest was often at odds with those of the established residents. They looked upon the forest as something to be managed primarily for social considerations rather than economic ones—that is, for recreation and aesthetic values rather than for timber production."* (Rakestraw, 1989)

Relations with environmental groups such as the Oregon Natural Resources Council (ONRC), Cathedral Forest Action Group and Oregon Wilderness Coalition hit a low when the area around Hardesty Mountain was not given Wilderness status in the RARE II (Roadless Area Review and Evaluation) process (Rakestraw, 1989). Earth First! members disrupted harvest of Douglas-fir trees blown down during the 1982/83 winter storms **outside** the RARE II area. The flanks of Hardesty Mountain saw the first tree spiking in Oregon (Humphreys, 1997). The struggle for management of National Forests began here in earnest, and its momentum expanded it to a level of national significance by the end of the decade.

In November, 1984, then district ranger Ron Humphrey formed the Hardesty Mountain Consensus Group, bringing the timber industry, environmental groups and public officials together. They produced a compromise management plan over the course of 18 months for incorporation into the 1990 Willamette National Forest Plan. This renewed a meaningful dialogue between the Forest Service and the public on National Forest management.

Current Condition

Recreation

Natural resources and travel corridors within the WAA shaped and continue to affect the availability and type of outdoor recreation opportunities. Many factors influence the way humans use the area, including weather, land management practices, changing recreation trends, water levels, and proximity/accessibility to local populations. Visitation recording has been sporadic and limited in scope, particularly in recent years. It is essential to consider the visitor use market area (Eugene/Springfield) when determining recreation use patterns.

The desire for outdoor recreation resources, facilities, opportunities, and ability as well as intention to use, are known as *recreation demand.*

> *"There is a tendency for recreationists to prefer more natural or primitive settings...with the growing demand for such settings...close to urban areas."* (SCORP, 1994)

Trends indicate that the desire for dispersed recreation opportunities will continue to grow at a steady rate. The 1994 Oregon SCORP (State Comprehensive Outdoor Recreation Plan) identifies activities people participate in, and wish to participate in *(see Table 29).* By 1994, 35% or more households actually participated in bank/dock fishing, nature study, tent camping, boat fishing, swimming (not in a pool), and sightseeing (from a vehicle). In contrast, these same households *desired* to participate in trail hiking, horseback riding on trails and non-motor boating. The difference between current activities and what they desire to be doing can be seen as a future demand for the desired activities. For example, nine percent say they engage in off-road (mountain) biking, but 24% say they desire to take up off-road biking.

Table 29. Statewide Setting Preferences for Dispersed Activities

Activity	Primitive		Semi-Primitive		Roaded Natural		Roaded Modified		Rural/Urban	
	Used	Preferred	Used	Preferred	Used	Preferred	Used	Preferred	Used	Preferred
Swimming, wading at ocean, lake or river	6.3	8.3	10.7	21.5	47.3	44.0	17.4	11.0	18.3	8.9
Motorized boating (including water skiing)	4.6	6.7	4.9	14.6	34.0	41.6	37.2	20.2	29.1	16.9
Non-motorized boating (canoeing, rafting)	9.2	21.7	21.8	31.3	37.9	36.1	23.0	6.0	8.0	4.8
Recreational vehicle camping	4.4	5.2	16.2	19.0	44.1	56.9	22.1	12.1	13.2	6.9
Hiking, backpacking trails	23.3	37.1	34.2	36.2	30.0	22.9	10.0	3.8	2.5	-
Off-road vehicle driving (4-wheel, ATV, etc.)	15.4	20.6	17.9	17.6	35.9	35.3	28.2	23.5	2.6	2.9
Off-road bicycling	-	-	21.2	38.7	15.2	29.0	39.4	19.4	24.2	12.9
Horseback riding on trails	20.0	33.3	22.9	33.3	25.7	15.2	28.6	18.2	2.9	-

The population of the Willamette Basin more than doubled since 1941, increasing pressure on recreational resources. Long-term growth in population, tourism and recreation is expected to increase the demand on forested recreation opportunities.

During the four years since the Oregon SCORP was completed, the WAA has experienced a moderate increase in non-motorized boating, OHV driving, and hiking. Off-road bicycle use has increased greatly.

Lookout Point Dam directly influences recreation patterns. Most non-National Forest lands are located adjacent to the reservoir. Private parcels tend to be harvested timber lands or small private residences, typical of the rural character of the Cascade foothills. Three developed campgrounds, two shelters and one identified dispersed site are found in the WAA, all located within riparian reserves *(see Map 37)*. Two of the three campgrounds are sandwiched between Highway 58 and the Middle Fork of the Willamette. All have been maintained by concessionaires since the spring of 1994. High points along Highway 58 support cellular phone, radio and microwave repeaters.

Recreation Sites

Hampton is small, containing only five sites, and is primarily used as a boat launch during high pool, with some picnicking and swimming. A gate was erected in 1993 and closed during the off-season, to reduce dumping of household trash.

Black Canyon Campground was constructed to replace Mossy Maple and River's Edge campgrounds when Lookout Point Reservoir was built. It has a capacity of 425 PAOTs (people at one time), and receives use in the form of camping, picnicking, bank fishing, swimming/wading, and boating. Year-round access to the boat ramp began in the winter of 1992 in response to the opening of winter fishing season on the Middle Fork

Willamette River. In 1993, outfitter guides officially began using Black Canyon as a take-out point .

Shady Dell's nine sites nestle between slack water from the Middle Fork, Highway 58 and steeply rising forest land. It is now managed as a group site on a reservation basis only due to its past history of low use and attractiveness to "live-in" campers during the past year.

In August 1997, Signal Point boat ramp was completed, providing low water access on the north side of the reservoir.

A 55 acre campground, Lakeview, is proposed at the Forest boundary, off Road 5824. A second proposal is for a campground just east of Goodman Creek, by Highway 58. It is the only site capable of development along the entire 17 mile shoreline on the south side of Lookout Point Reservoir. Both are part of a joint COE and USFS planning project for the entire Lookout Point Reservoir.

Dispersed Use

It was the intent of the Hardesty Concensus Group to offer a primitive recreation experience in the area around Hardesty Mountain. As the steep terrain offers few level areas to camp and few water sources, there is little dispersed camping activity. Most day-use consists of trail use or driving roads for hunting or gathering forest products.

There are 19 trails in this watershed; 85% of trail miles are accessed from Highway 58. Only Goodman Creek Trail lies within a riparian reserve. All other trails have short segments within riparian reserves, as they cross creeks. One third of current recreation trails are "way" trails - steep trails used as travel routes by former Forest Service employees to access work areas. Several trails accessed from Highway 58 continue to increase in popularity with different user groups. During wet weather, use accelerates deterioration of trail tread, decreasing most hikers' enjoyment.

Reconstruction of approximately three miles of the old Boundary trail (Eugene to Pacific Crest Trail) should be completed by the end of September, 1997. Also planned for completion in the next two years is reconstruction of the Lawler trail. Equestrians and mountain bikers prefer longer trails like these, and use is expected to occur soon after reconstruction. Using horseback trails scored second in the SCORP's desired activities, representing a 25% increase over current use; desire for off-road biking ranks eleven.

When the reservoir is down, motorcyclists, four-wheel drivers and off-highway vehicle owners (OHV) enjoy testing their driving skills on the mud flats.

> *"Although the lake is presently closed to ORV's (off road vehicle), the prohibition is difficult to enforce and low to moderate levels of unauthorized ORV use does occur, nearly entirely in the drawdown zone."* (COE, 1992)

The Army Corps of Engineers, however, is working on an OHV plan for the flats, designating use in Section 18, by Armet Creek.

Social

When cutting restrictions on National Forest lands began in 1994, private timberland owners were concerned that these management regulations might affect their lands as well. Several of the private timber lands were harvested soon after the Northwest Forest Plan was set in motion. The gas station/store at Hampton stopped selling gas when new restrictions on gas storage tanks went into effect. The latest owners replaced the tanks and are selling gas again, but the place is once again up for sale.

Because the entire Hardesty area is now managed as a LSR (Late Successional Reserve), few concerned citizens now contact the Lowell District about management of that area. Actions born during the protests of harvest in the Hardesty area, however, are now practiced nation wide. Forest harvest in the Pacific Northwest has dramatically declined as a result of disgruntled groups outside the Forest Service exerting influence over forest management practices.

Today, locals are more concerned with paying to park at trailheads. Many people regard this as unwanted government regulation of their "right" to use the forests and may link it with their anger against the Forest Service for the increasing regulation of timber harvest (not enough harvesting or too much harvesting, depending on their point of view). Time and society will determine the future management of our national forests.

Figure 14. Fly Fishing in Middle Fork of Willamette River near Black Canyon Campground (July 25, 1957)

CHAPTER 4

ISSUE 1: WATER QUANTITY AND QUALITY

Key Questions

1. *How have upstream management activities affected water quality and quantity?*

Water Quantity

Natural flow of the Middle Fork Willamette River has changed from historical times due to the installation of Hills Creek Dam above the city of Oakridge. The annual volume of discharge has not been modified but timing or average monthly discharge has been altered. Less water is released from Hills Creek Dam during the winter months and more water is released in late summer to early winter. The regulation of flow regimes provides flood protection during the winter and water supply in the spring. Conversely, more water is released in the late summer to early winter in preparation for the next flood season.

Hills Creek Dam has also altered instantaneous peak flows in the Middle Fork Willamette River. To provide flood protection for the Willamette Valley, water is stored in the reservoir later released when flood waters downstream have receded, thus eliminating channel building flows. This has caused the Middle Fork Willamette River to channelize, thus eliminating the interaction between river and floodplain.

Water Quality

As a result of the many activities during the last 150 years, water quality has changed since Euro-Americans first came into the Middle Fork Willamette basin. Little data on water quality is available for the analysis area. In a personnel communication with Gary Arnold of the Oregon Department of Environmental Quality he stated that *"it is thought that the water in the Middle Fork Willamette River is of good quality"* and that data from station at Jasper, Oregon indicated that water quality of the Middle Fork Willamette River was within ODEQ standards. However, he also stated *"that this may be due to the lack of data."*

Water quality may be affected by the abandoned Hines Mill at Westfir *(see page 36).* At this time, it is unknown if this site is affecting downstream water quality, and should be monitored.

Temperature has been monitored at the USGS gaging station since 1952. Data shows that the average monthly temperature for July and August has fallen approximately 4-5°F. This is due to the release of cold water from Hills Creek Reservoir, contributing approximately 31% of the annual discharge to the analysis area.

Issue 2: Vegetation

Key Questions

1. *Where and how much matrix land is available for timber harvest within the next decade?*

Timber availability will be assessed based on commercial thinning opportunities or harvest of mature timber in non-riparian matrix lands. Potential commercial thinning was considered on all previously harvested acres >31 years of age. Timber >80 years in age was considered mature.

Commercial Thinning Stands

Table 30 identifies potential commercial thinning opportunities within the WAA. Additional constraints may be identified during the planning process reducing these acres by excluding additional riparian areas or Survey and Manage Species habitat. Limited commercial thinning has been completed in some of these areas in the past.

GIS data was used to identify commercial thinning acres. Region 6 timber stand exam data completed in 1992 was used to identify availability for thinning. All acres are approximate

Table 30. Commercial Thinning Opportunities

Drainage	Matrix/Non-Riparian Acres >31 years
Rhodes	0
School	63
Cain/Armet	35
Carpet Hill/Hospital	29
Tire	102
Buckhead	306
Rock	13
Total Acres	548

Drainages with the largest quantity of potential commercial thinning are Buckhead (306 acres) and Tire (102 acres), providing 74% of the 548 acres of potential matrix thinning. The remainder of the drainages have smaller areas available *(see Table 30).*

In the Buckhead drainage, 129 acres need thinning (units 6005-144, 6005-130 and 6005-137). Data from 1992 shows the stand average for trees in these units to be 11.2"DBH, 9.1"DBH and 10.8"DBH, respectively. Tree mortality resulting from

competition can be expected to increase in these stands. The remainder of the 306 acres would need examination to confirm availability for thinning. Stands 6005-140 and 6005-132 will become available in approximately five years.

Tire Creek drainage will have over 102 acres in four stands ready for thinning in 5-10 years. Stand 6005-78 should be reexamined to determine whether it should be thinned this decade. Stocking was slightly lower than the average stand, so thinning may be required in five years. Stands 6005-51, 75 and 76 will not be ready for another 5-10 years.

School Creek has 63 acres of managed stands in unit 6008-103 and 6008-109. Both units are ready for thinning based on stand density levels, but the product size is under 10"DBH.

Armet has approximately 35 acres in managed stand 6007-123 ready for thinning; average DBH is 10.7". Cain has no stands available for thinning.

In Carpet Hill drainage, units 6007-123 is available for thinning with an average DBH of 10.7. Unit 6006-014 should be examined. Hospital drainage has no managed stands ready for thinning.

Mature Timber Stands

Potential harvest acres within the WAA are located north of Lookout Point Reservoir in matrix lands. Table 31 shows the acres of stands >80 years old which are available for harvest within each drainage and land management allocation. The data is derived from WNF GIS and reflects suitable forested acres of National Forest lands based on present classifications. Carpet Hill and Drone Timber Sale acres have been removed from Hospital and Tire drainage acres, respectively. Buckhead drainage acreage does not include the WNF seed orchard. Acres available for harvest will be reduced 15% for green tree retention areas within each harvest area. Other constraints may further reduce these acres during the timber sale planning process.

Management areas found in the WAA which may be entered to meet Probable Sale Quantity (PSQ) include:

- 14a General Forest maximum modification (MM); intensive forest management
- 11a Scenic-Modification (M) Middleground
- 11c Scenic-Partial Retention (PR) Middleground
- 11f Scenic-Retention (R) Foreground

Table 32 shows the percentage of proposed treatment by decade in each management area and the approximate acres scheduled for treatment by decade.

The scheduled treatment acres shown for Management Area 14a are estimated for a 100-year rotation. Rotations on general forest lands may vary from 80-120 years due to differences in culmination of mean annual increment (CMAI), prescription and resource constraints. Therefore, the actual scheduled treatment acres may vary from approximately 175-261 acres per decade.

Table 31. Stand Acres >80 Years Available for Harvest

Management Allocations	11a	11c	11f	14a	
Visual Quality Objective	M	PR	R	MM	
Drainage	Acres in Management Area				Total Acres
Armet/Cain	296	242	212	0	750
Buckhead	265	306	108	148	827
Carpet Hill/Hospital	567	41	62	53	723
Rhodes	0	166	82	5	253
Rock	103	87	95	1	286
School	133	86	3	76	298
Tire	540	94	36	1020	1690
Total Acres	1904	1022	598	1303	4827
Acres reduced by 15% for GTR	1618	869	508	1107	4102

Table 32. LRMP Decade Treatment Levels

Management Allocation (MA)	Total MA acres	% Treatment/Decade	Scheduled Treatment Acres/Decade
11a	3035	12	364
11c	1493	10	149
11f	1043	5	52
14a	2090	10	209

2. ***What was the historic fire occurrence within the Middle Fork Willamette and Tributaries analysis area? How did historic fire occurrence affect vegetation? Should we reinitiate this significant disturbance in the WAA?***

For historic fire occurrences refer to Chapter 3, Fire Regimes, page 45, and Human Uses, Reference Condition, page 90.

There is ample evidence that approximately 75% of the WAA, including the Middle Fork Willamette River valley and lower slopes of the foothills, were open woodlands and prairies prior to European settlement (see Chapter 3, page 90). Native Americans set fires on the valley floor which sometimes traveled unchecked until fall rains extinguished them. Vegetation was a savanna-like association of oak woodland *(Quercus garryana)* and grasses *(Bromus* spp., *Elymus glaucus, Fesctuca* spp., *Aira*

caryophyllea), typical of the interior valleys of western Oregon. This habitat is now confined to locations with isolated moisture and shallow soils, mainly along south-facing slopes and rocky bald areas. South-facing, drier slopes above Lookout Point Reservoir still exhibit some of this habitat in the Cloverpatch Bluffs and Tire Mountain meadow complexes. These areas are generally dominated by an Oregon white oak overstory with a very lush understory of bunchgrasses and herbaceous plants. Douglas fir was confined to riparian areas, with a sprinkling of incense cedar. In the prairies, young encroaching conifers were scorched often enough to maintain the oak prairie (early seral) community. Fire renewed wildlife forage and favored herbaceous species like camas, tarweed and berries, used as foodstuffs by Native Americans.

By 1857, Cadastral Surveys of the General Land Office had been completed as far east as the Oakridge area (General Land Office Map 1856-1869). Their maps note the presence of extensive areas of "Old Burns" in adjacent areas, mainly along south-facing slopes on the north side of the Middle Fork. Former Ranger A.J. Briem also notes that the earliest settlers observed "man-made" prairies along the Middle Fork from which trails led into the mountains, particularly to "trout streams and areas noted for their deer and elk" (1937).

Other evidence of fire may be found in the early records of sugar pine harvests near Oakridge. Sugar pine is an early seral species in the Douglas fir climax community. The presence of abundant sugar pine points to a frequent cycle of fire disturbance. Remnants of this type of community may be found in the Deception Rock area.

Under a high frequency/low intensity fire regime, fires consumed fine fuels and larger downed wood on a regular basis. Therefore, much less dead and downed woody debris accumulated on the forest floor than under current conditions.

By 1900 (our Reference Condition date), fire suppression had been in effect for 60 years. After Euro-American settlement and a reduction in the frequency and extent of fires, a mixed-conifer forest gradually replaced what was once prairie with scattered trees. Douglas fir began invading meadows on south slopes and outliving sugar pines. It crept up the slopes from riparian areas and continues to encroach on former prairies to this day. The remnant prairies of today probably have soils too shallow and droughty for Douglas fir to gain a strong foothold. Douglas fir dominates the former stands of mixed fir and pine. Fuel loading is higher than it was in the past, especially in the Tire Mountain area. Most biogeographical research of the area indicates that the transition from savanna to closed forest within the Willamette Basin will take place in a relatively short time in the absence of fire.

3. ***What and where is the potential for large fire occurrence in the watershed? What are the causal factors for this potential?***

Casual factors for large fire occurrence are fuels, ignition potential and aspect. Table 34 identifies potential for large fire occurrence in the WAA. The matrix was generated based on the following considerations:

Fuels:

For large fire occurrence fuels in the 0-3" size class have to be present in significant amounts to carry the fire. The only two seral stages with significant fuel loading are stand initiation and late successional old-growth. Fuel loading was considered *High* if common areas were composed of 50% or more SI or LSOG. Areas with greater than 30% but less than 50% SI or LSOG were considered to have *Moderate* fuel loading, and areas with less than 30% were classified as having *Low* fuel loading.

Ignition Potential:

Historically the most fires within this analysis area were caused by humans. Lightning was not factored into this matrix due to its unpredictability. Different human factors were given scores based on the probability of that event causing an ignition. Events and scores are delineated in Table 33. A collective score of 10+ points was considered *High*, 6-9 points was considered *Moderate*, and 0-5 points was considered *Low*.

Table 33. Large Fire Potential in Lookout Point Watershed Analysis Area

Potential Ignition Source	Points assigned
Railroad	3
State Highway	3
Residential Buildings	3
Timber harvest activities	3

Potential Ignition Source	Points assigned
Roads crossing drainages	2
Campgrounds	2
Recreation trails	2
Special use permits	1

Aspect:

Traditionally, the drier south and west aspects have had the greatest potential for large fire activity. Shady Beach, Warner, Pryor, and Westfir are all large fires that have burned in or near the Willamette corridor within the last ten years. All of these fires started on dry south or west aspects. Areas having more than 50% south and west aspects were considered *High*, areas having 25% to 50% south/west aspects were considered *Moderate*, and areas with less than 25% were considered *Low*.

The highest potential for large fire occurrences is in those areas with a high rating in fuels, ignition potential and aspect *(see Table 34)*.

Table 34. Large Fire Occurrence Potential in Lookout Point WAA

Drainages	Fuels	Ignition Potential	Aspect
Rhodes/School	High	Moderate	High
Cain/Armet/ Carpet Hill/Hospital	Moderate	Moderate	High
Tire	Moderate	High	High
Burnt Bridge/Buckhead	High	High	High
Goodman/Rolling Riffle/ Hazel/Fern	Low	High	Low
Crale/North/South Harper/Schweitzer	Low	High	Low
Duval/Rock/Whitehead/ Bridge/Dell	High	High	Low
Deception	Low	High	Low

4. ***Where and to what extent have natural and human caused disturbances affected special habitats and their contribution to biodiversity? What are future trends?***

Roads, trails and managed stands have all affected special habitats. Eighty-four percent of mesic meadows, 53% of dry meadows and 37% of rock gardens are traversed by roads or trails. The great majority of these intersections are trails, since the Patterson Mountain, Alpine, Cloverpatch Butte, and Tire Mountain Trails traverse special habitats. Hardwoods (64%) and shrub alder (41%) are special habitats affected by managed stands.

Future trends are positive. Forestwide standard and guideline FW-211 states that special habitats and their ecotones shall be maintained. These areas will be buffered from road construction and other management activities. New trail construction will avoid special habitats, skirting meadows and other disturbance-intolerant sites.

5. ***Are there opportunities for stand density management within LSR RO222 that will maintain consistency with LSR objectives and improve stand development? Where?***

Reforestation following harvest has left many well-stocked stands. These stands are reaching a size where thinning may be appropriate in order for the stand to develop late-successional characteristics such as increased bole size and limb diameters. If thinning is delayed, a potential loss of crown length with a reduction in growth and poor height to diameter ratio would produce spindly trees.

Stand management activities in LSR RO222 will focus on regeneration harvest units, previously thinned and natural stands <80 years in age. With treatment, these stands will acquire late-successional characteristics such as multiple layers, large trees and diverse plant species. Treatments may include thinning or release of advanced regeneration, underplanting, snag and down woody development, reforestation, or other treatments.

No previously thinned stands <80 years of age were identified in this area. Exam data was not available for natural stands and young stands in LSR RO222.

Acres of managed stands within the LSR, 31-80 years old, which may be suitable for stand density management are shown in Table 35. This information was gathered from 1997 GIS data and includes acres outside riparian areas.

Table 35. LSR Potential Stand Density Management Activities (Managed Stands)

Drainages	Managed Stands Acres
Crale	69
Deception	295
Dell	27
Duval	250
Goodman	268
Hazel/Fern/Rolling/Riffle	15
North/South/Schweitzer	71
Rock	115
Total Acres	**1110**

Issue 3: Aquatic Habitat and Species

Key Questions

1. ***What is the current status and available habitat for the Oregon chub? What are the trends? What are the recommendations to assist the recovery of this species?***

The Oregon chub is federally listed as an endangered species. Much of the species habitat has been altered or lost. The Oregon Department of Fish and Wildlife research branch has been actively inventorying existing and potential sites. The 1996 results indicate that most populations are stable or increasing. Two sites just outside the WAA, Minnow Pond and The Pit, have decreased in estimated population size. The Minnow Pond site still has an abundance of Oregon chub so this decrease is not a concern, but monitoring of this site will continue. Much of the habitat was lost due to fine sediments

from upslope filling the pond. The Pit site is within Dexter Reservoir which is a regulating reservoir with daily fluctuations. This site is not isolated from the reservoir and variations in population estimates could easily result from such variations in water level. New populations recently identified are outside the analysis area.

Compared to historic conditions, available habitat is extremely limited. Restoration and enhancement projects appear to be most successful when sites are isolated from non-native species.

All restoration projects and recent introduction sites are too new to determine if these projects are changing stock status. Continued monitoring will identify such changes.

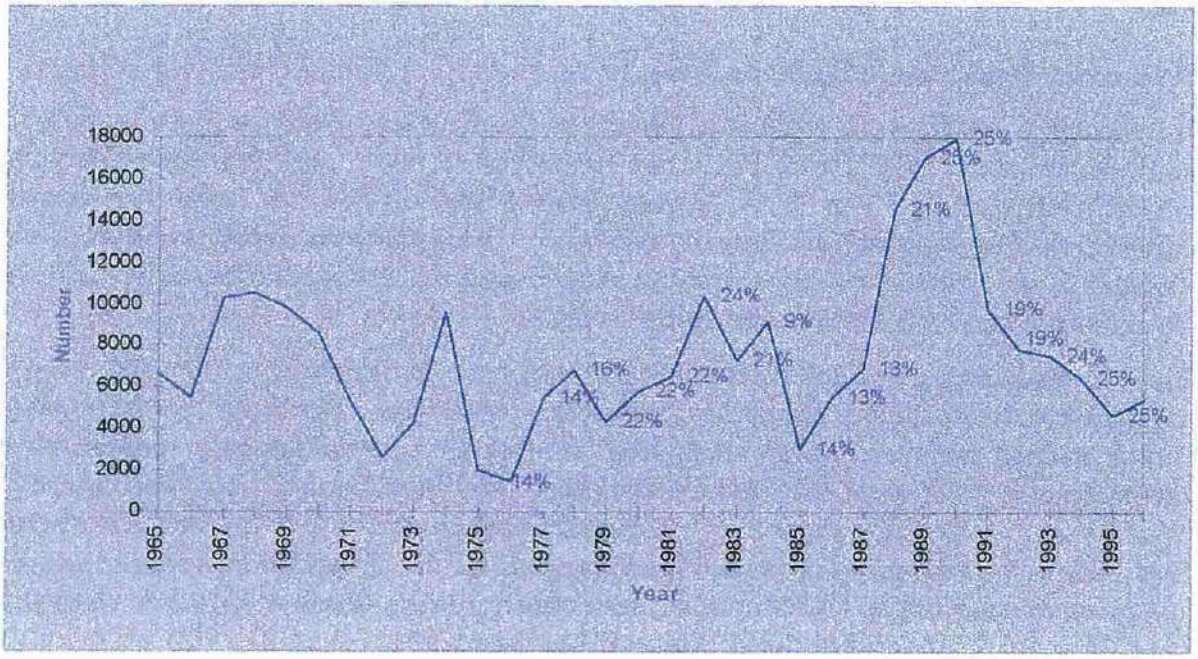
Trends are unknown, however current known populations appear to be stable. The Oregon Chub Working Group will continue to implement the Conservation Agreement. There will be no Recovery Team; however the Working Group will act as one. The Recovery Plan is currently being written by the US. Fish and Wildlife Service with input from the Working Group.

2. ***What is the current status and potential reintroduction for anadromous fish?***

Spring chinook are the only documented anadromous fish native to the Middle Fork Willamette River. Introduced stocks of winter and summer steelhead spawned in the upper Middle Fork Willamette River prior to the construction of Dexter and Lookout Point Reservoirs. Dexter Dam currently blocks all migration of anadromous fish. Adults are trapped at Dexter Reservoir and transferred upriver to the Oakridge Hatchery.

Spring chinook returns to Dexter Reservoir are shown in Figure 15. The graph depicts the percentage of fish migrating over Willamette Falls and returning to Dexter. It is

Figure 15. Number of Spring Chinook Returning to Dexter Dam



estimated that 20% of the spring chinook in the Willamette River migrated up the Middle Fork to spawn prior to dam construction. Current returns are generally within that estimate (COE, 1997). Reintroduction may be feasible since enough salmon are returning.

Public input encouraged the Oregon Department of Fish and Wildlife and the Army Corps of Engineers to consider potential passage facilities. A study conducted in 1997 considered several alternatives that included trapping/transferring adults at Dexter and trapping/transferring smolts in river channels at the head of either Lookout Point or Hills Creek Reservoirs. At this time, the preferred alternative is to trap smolts at the head of Lookout Point. However further studies are needed and no immediate funding is available. If public interest continues and funding becomes available, the anadromous runs previously found in the Middle Fork Willamette River may be reintroduced.

3. ***How diverse is the aquatic habitat and how have management activities affected these habitats? What are the trends?***

Aquatic habitat is unique in this WAA, as it is much more diverse than adjacent watersheds. Four types of habitat have been identified:

- The mainstem Middle Fork Willamette River
- Low-gradient habitat found in lower Buckhead Creek
- High-gradient tributary streams
- Lookout Point Reservoir.

These areas have all been affected by management activities. Stream habitat has been identified as *properly functioning* or *functional at-risk*, using definitions found in the Riparian Area Management Process for Assessing Proper Functioning Condition (USDI, 1993).

Mainstem Middle Fork Willamette River

The mainstem Middle Fork Willamette River has downcut and become more confined. Flow regulation at Hills Creek Dam has limited high flows and therefore reduced floodplain interaction. The valley bottom road (Highway 58) has affected channel confinement and impacted the riparian condition. Aerial photos dating back to 1944 indicated a much higher meander pattern and showed that the main flow with multiple side channels was on the north side of the valley.

This was particularly evident in the alluvial sections upstream from the mainstem's confluence with Buckhead Creek and below Black Canyon. Normally, rivers flowing through alluvial sections migrate across the floodplain. Loss of meander pattern and side channel habitat in these sections indicates that the channel has been altered. Recent stream inventories show that the alluvial reaches of the Middle Fork Willamette River lack big, deep pools, thereby limiting adult holding habitat in comparison to surveys conducted in the 1930s prior to dam construction. These areas have changed from a Rosgen 'C' channel to an 'F' channel *(see Map 29)*.

The alluvial section upstream from Buckhead Creek currently flows in one straight channel adjacent to Highway 58. This area is considered functional at-risk *(see Map 32)*.

The 1937 and 1938 stream inventory indicated that numerous cyprinids (minnow family) were found in side channel habitats. Native cyprinids include dace, redside shiners, Oregon chub, and northern squawfish. Current lack of side channels limits habitat for cyprinids and juvenile trout.

Recently, the removal of Westfir dam on the North Fork Middle Fork Willamette River increased coarse debris loading into the Middle Fork Willamette River. In addition the November, 1996 flood event deposited much of this material into the section of the Middle Fork between Deception and Buckhead Creeks. The river is currently moving this sediment around and aquatic condition and stability will continue to decline until dynamic equilibrium is reached. Aquatic habitat is then expected to improve. However very long term trends will again result in a decline of habitat since Hills Creek Dam is expected to continue to regulate extreme flows and Highway 58 will continue confining the channel.

Aquatic habitat within Black Canyon is in a *properly functioning* condition *(see Map 32)*. The 1996 ODFW stream survey indicated plenty of deep pools in this bedrock controlled reach. These pools provide good adult holding habitat. The low channel gradient suggests that this entrenched channel was originally and still is a Rosgen 'F' channel.

Buckhead Creek

Lower Buckhead Creek provides diverse habitat for many species, including Oregon chub, redside shiners, dace, trout, wood ducks, Northwestern pond turtles, red-legged frogs, great blue herons, bull frogs, good forage for bats, and many other kinds of waterfowl. Such diversity of habitat is unique in this and adjacent watersheds. However, as suggested in Chapter 3, page 59, this stream and pond habitat may have been created by redirecting Buckhead Creek north onto the flat directly below the railroad culvert. Even though aquatic habitat is diverse it is not as diverse as it could be.

Stream function is not healthy, as it has been channelized and should be more sinuous. Riparian condition is also very poor with non-native noxious weeds, such as scotchbroom and Himalayan blackberries, adjacent to the channel. In addition, riparian trees are predominantly hardwood, which could be expected in this low gradient floodplain habitat. However aerial photos from 1944 show a dense stand of large conifers. A very large disturbance to riparian vegetation is seen in the 1959 photos, with the construction of the BPA power line right-of-way. This poor riparian condition has allowed the stream channel to receive a high amount of solar exposure resulting in very warm temperatures. Eutrophication also appears in areas with limited flow where oxygen may be a concern.

The channel has aggraded with a high amount of deposition from the steeper reaches of Buckhead Creek. This was particularly evident after the November, 1996 flood event when large amounts of gravel were deposited just downstream of the railroad culvert. With berms confining the channel, the stream's lack of sinuosity and low gradient limit its ability to distribute this heavy bedload. This lack of flushing may also contribute to the poor water quality. Despite the apparent diversity of habitat, Buckhead Creek is considered *functional-at risk (see Map 32).*

The trend for Buckhead will continue to decline. However, habitat can improve with restoration efforts such as riparian planting and noxious weed control. A change in BPA right-of-way maintenance can also help improve aquatic conditions.

Tributary Streams

Only a few of the tributary streams within the WAA were surveyed. Overall conditions seem to be fairly good. Most of the streams are small with steep channel gradient limiting cutthroat trout habitat. Adult trout may migrate from the river or the reservoir to spawn in these tributaries. Many tributaries are blocked to migrants during the winter months when fish are spawning and the reservoir is at low pool. Railroad culverts may block migration to upper Buckhead Creek and other tributaries.

School Creek is in poor condition and considered to be *functional-at risk (see Map 32).* It is one of the drainages in the WAA with a high amount of earthflow terrain (20% of the drainage and 4.8 stream miles). It also has the highest road density (4.8 miles per square mile). In addition, riparian condition is very poor with a wide inner riparian of hardwoods (approximately 40 feet) and an outer conifer riparian where 50% of trees are <80 years old. This wide inner hardwood riparian may indicate past channel disturbance such as a debris flow, or may be a result of harvesting along the stream channel.

The overall channel stability is poor. The high level of fines and cobble embeddedness may be a result of high road density within earthflow terrain. Fine sediment limits macroinvertebrate habitat which provides an important food source for trout (no groceries in the stream). Fines may also embed gravels used for spawning, thereby limiting spawning habitat or even suffocating eggs already laid.

Deception Creek is also in poor condition and considered *functional-at risk.* It has limited large woody debris and pool habitat. It has a very poor riparian, especially in the first reach where the inner hardwood riparian width averages 67 feet. Much of the riparian was harvested and the wide hardwood riparian may be an indicator that some disturbance, such as a debris flow, affected the channel. Even with abundant shade from the hardwood riparian, stream temperatures were high during the survey (64°F at 1410 hours on August 8, 1996).

Bedload is very high resulting in a channel that appears to be out of dynamic equilibrium. Channel stability is poor but habitat and stability conditions improve upstream. A trailer park at the mouth of the stream is built on an alluvial fan from a past debris flow. Potential failure requires assessment.

Tire Creek is another tributary with a fine-sediment concern. The upper section flows through an earthflow terrain (29% of the drainage and 13.5 stream miles) and road density is high at 3.3 miles per square mile. This high road density is of particular concern in the fine-sediment source area of the earthflow terrain. However, habitat and riparian conditions suggest that it is in a *properly functioning* condition *(see Map 32)*.

Most of **Goodman Creek** has good habitat and is in a *properly functioning* condition *(see Map 32)*. Reach 1 had some past riparian harvest and instability concerns, but the amount of large woody debris was good and both stability and riparian conditions improved upstream. GIS riparian data indicated that 73% of the riparian trees in the drainage are >80 years old. Road density is still fairly high (2.9 roads per square mile), although one of the lowest densities in the WAA. There is a higher rate of natural slide frequency in the Goodman drainage and a failure at the end of Road 5833.

The **North, South** and **Schweitzer** drainage group also appears to be in good condition in comparison to the rest of the WAA. Riparian condition is very good with 79% of the riparian trees >80 years old. Road density is also the lowest at 2.4 miles of road per square mile. Earthflow is limited, comprising 4% of the drainage group or 1.4 stream miles. These streams are suspected to be in a properly functioning condition *(see Map 32)*.

The trend for these tributary drainages in the LSR is that the riparian condition will improve. However road failures may occur if lack of funding does not allow for road maintenance. Of particular concern are areas within earthflow terrain (soil Category 1) and those prone to steep debris slides (soil Category 3).

The trend for matrix land drainages is that riparian reserves will continue to improve under the current Standards and Guidelines. Road maintenance and reconstruction will continue based on timber sale dollars.

The trend for drainages with a high amount of earthflow and road density may depend on road maintenance. If road density remains high and if roads fail there will be an increase of fine sediment entering streams in these areas.

Lookout Point Reservoir

Early draw-down in Lookout Point Reservoir exposes shoreline and increases wave action resulting in bank erosion. Getting vegetation to grow along its banks has been difficult. A partnership involving the Forest Service and the Army Corps of Engineers was developed to explore new methods for vegetating banks along Lookout Point Reservoir. These projects are currently in monitoring status and a detailed report will follow completion.

Sport fishery is not very strong in Lookout Point Reservoir. This could result from a cumulative effect of erosion concerns, large numbers of squawfish (predators), few nutrients, and limited structure for habitat.

Budget and time constraints do not allow this WAA to analyze habitat conditions and trends in Lookout Point Reservoir.

Issue 4: Terrestrial Habitat and Species

Key Questions

1. ***How have species distribution and their habitats changed over time due to past vegetation manipulation activities? What are the future trends?***

Vegetation types and fire history of south-facing slopes on the north side of the Middle Fork suggest that this area was oak woodland and prairie. These historic habitat conditions were probably more conducive to early successional species or oak savanna habitat associates such as white-headed and acorn woodpeckers and Columbia white-tailed deer. With the influx of Euro-American settlers in the late 1800s, Native American burning ceased and fire suppression activities significantly increased. Over time, conifers encroached and developed in open savanna areas, resulting in more closed conifer forest conditions.

South of the river corridor, the northern aspect and moist conditions resulted in a predominance of coniferous forest which was not as conducive to maintenance burning by the Native Americans. A significant amount of younger contiguous stands in the Hardesty and Goodman areas indicate stand replacement events that occurred in the late 1800s. It is unclear whether these are associated with native burning or were caused by lightning.

As fire exclusion played a major role in conifer stand development, more interior forested conditions developed from the mid 1800s to the mid 1900s. Currently, these stands are even-aged and single-storied, just beginning to develop an understory reinitiation stage. Interior forest-related species are probably as abundant today as they were historically.

Timber harvest activity in the project area was not significant until the 1970s since stands in this area were not considered high priority for harvest due to their age and early stand development. As they rose in harvest priority and forest management activities increased in the WAA, fragmentation grew, leaving only a few large contiguous stands of late-successional forest habitat. These are located in the Hardesty Mountain, Deception Creek and Upper Tire Creek areas *(see Map 20)*. With these forest management activities came benefits to big game populations. Creation of forage intermixed with cover was beneficial to Roosevelt elk and black-tailed deer, which are more abundant today than historically.

Wildlife species and habitats have been affected by past management activities in the following ways:

- **Fragmentation of coniferous forests** in the WAA due to road building and associated timber harvest activity leaving only a few contiguous stands. Such

fragmentation is detrimental to species such as the Northern goshawk, American marten, pileated woodpecker, vaux's swift, fisher, olive-sided flycatcher, Hammond's flycatcher, Townsend's warbler, band-tailed pigeon, and numerous amphibian species. As conifer stands in LSR allocations develop, species will benefit from approximately 2/3 of the watershed.

The matrix portion will continue to support timber harvest activities and will not be conducive to long term occupancy by many of these species. Due to the visual allocations associated with matrix lands, harvest levels will be lower than on non-visual matrix lands, such as in the adjacent Winberry watershed.

- **Increased open road densities:** levels are especially high in the School, Rhodes, Carpet Hill, Whitehead, Goodman, Duval, Tire, and Buckhead Creeks. High road densities contribute to habitat fragmentation and provide increased public access affecting big game behavior. As deer and elk move to avoid human activity, they expend additional energy which may affect their health and survival during critical winter months. In addition, big game are more susceptible to poaching.

  Future trends will be mixed for big game. Open road densities will be reduced in LSR allocations due to diminished need and limited funding. A reduction in harvest activity will bring an associated decline in early successional forage. Matrix allocations will be affected differently, as continued harvest creates early successional forage along with a fairly well maintained road system.

- Past thinning and salvage activities have **decreased natural recruitment of snags and CWD**, especially in younger even-aged stands. Extensive past beetle-kill salvage has also contributed to low snag levels in portions of the WAA. This is evident in Goodman, Cloverpatch and Tire Creeks.

- **Northern spotted owl:** Suitable spotted owl habitat conditions are generally good within the watershed. Only one of 22 activity centers are below recommended minimum habitat thresholds for owl requirements. As matrix lands are harvested, owls located within the matrix will be affected and it will become increasingly difficult for pairs to successfully nest and raise their young. Current dispersal (11-40) conditions are adequate and should remain so as non-harvest allocations develop into late-successional forests.

  The spotted owl habitat layer in GIS (OHAB) does not accurately represent field conditions. Updating based on field surveys is necessary to accurately represent current habitat conditions.

- **Peregrine falcon:** A number of potential sites exist within the WAA both in matrix and LSR allocations. Discovery of waterfowl remains at one of these sites indicates possible peregrine activity. This could be a single bird indicating a potential for peregrine nesting to occur in the future. There is high potential for peregrines to nest in this WAA with suitable reservoir habitat capable of supporting a number of peregrine prey species.

- **Great gray owl:** Activity has been detected in a few locations in the WAA, both in matrix and LSR allocations. As matrix harvest continues, creating suitable foraging conditions for the owl, their presence should continue although much is unknown about their habitat needs and effects of disturbance.
- **Townsend's big-eared bat:** This species has been documented in the WAA in an old mine along the north shore road. A wildlife habitat enhancement project was implemented in 1995 to close this mine with a barrier designed to allow bat passage. Continued human disturbance and vandalism at this site has compromised the effectiveness of this project and bat use of the mine. No other known sites for Townsend's big-eared bat occur in the area, although geology in portions of the WAA indicates that there are other potential roost and hibernacula sites.
- **Red-legged frog:** Stream survey information and pond inventories indicate that this species is fairly abundant in portions of the watershed (ex. Deception, Duval. Goodman, and School Creek drainages). Continued protection of riparian areas, ponds and special habitats should ensure healthy populations of this species in the future.

Overall future trends for species and their habitats within this WAA will be closely associated with land allocations. As managed stands develop and mature within LSR RO222, late-successional associated species abundance will increase due to this no-harvest allocation. North of the river corridor, timber harvest and road activities will continue based on its matrix allocation. This will benefit big game populations and early seral dependent species, but further research and monitoring is needed to determine if no-harvest allocations (ex. riparian reserves, 100 acre cores and other withdrawn allocations) will provide adequate late-successional forest conditions for movement and dispersal of associated species.

Botany

Noxious weed populations have exploded with disturbance-causing activities, such as timber harvest and road building, creating an abundance of early seral habitats during the past 100 years. Weeds thrive in clearcuts until trees reach stem exclusion, at which point young trees will outcompete weeds for sunlight. Weeds may persist along roadsides indefinitely, especially if they are annually brushed, moved or graded, and road prisms are disturbed.

Loss of prescribed burning could have an effect on species diversity. Prior to European settlement in the WAA, fire was the dominant natural disturbance. Some plants need fire to germinate. Two such species documented in small quantities are sugar pine and branching montia. Sugar pine is confined to small stands in the Deception area. Branching montia has been documented from the Hardesty Mountain and Deception Rock area.

A decrease in prescribed burning has also contributed to the decline of dry meadow habitat and conversion of the dominant habitat type from oak grassland savannah to a conifer-dominated forest. Fires have been suppressed since the 1860s, allowing young

trees to establish in areas where they were formerly excluded by fire. This has changed the amount of prairie-type vegetation within the WAA and has perhaps decreased potential habitat for the sensitive Thompson's mistmaiden. On the other hand, fire prevention has benefited late successional old-growth species, which have increased during the past 100 years. However, much of this habitat is slated for timber harvest over the course of the next 80 years.

In certain parts of the watershed, a severe loss and fragmentation of riparian habitat could have affected the distribution of Survey and Manage species. Most of these unique species need trees as substrates to survive and an intact riparian area with its differing microclimates to find their optimum habitat. School, Crale, Duval, Rhodes, Buckhead, and Whitehead Bridge/Dell Creeks are areas of high concern for riparian species diversity.

2. ***Are there any priorities for maintaining or enhancing late successional forest conditions to provide for dispersal and movement of plant and animal species? If so, where?***

The land north of the Middle Fork Willamette River is designated as matrix allocation (excluding lower Buckhead and Burnt Bridge Creeks); LSR RO222 is located south of the river. The NWFP strategy set aside large reserve areas (LSRs) within the range of the northern spotted owl positioned across the landscape in such a way to provided habitat for and genetic interchange of dispersing juvenile owls. Dispersal habitat between these LSRs would be provided by no-harvest allocations in riparian reserves, 100-acre cores and other withdrawn allocations.

Considering current conditions within the WAA and presence of human-made obstructions to habitat continuity, there is a concern that successful movement and dispersal of late-successional forest related species between RO222 and LSRs to the north is compromised. Barriers include: Highway 58, Southern Pacific Railroad, Lookout Point and Hills Creek Reservoirs, BPA powerline right-of-way, and the communities of Westfir and Oakridge. In combination, these barriers could inhibit successful movement and dispersal of species requiring large home ranges between these LSRs. The only area where late-successional forest conditions could be effective in maintaining and/or providing dispersal and movement opportunities are between the upper end of Lookout Point Reservoir and Westfir city limits. This is in the Tire, Burnt Bridge and Buckhead drainages *(see Map 27)*.

Riparian conditions are marginal in the Buckhead drainage with 44% of the riparian reserves currently in stands <80 years old. The Burnt Bridge Creek drainage and the eastern portion of Tire Creek drainage contain some contiguous stands of late-successional forest. These stands could be important in providing short term late-successional forest conditions while adjacent riparian reserves recover.

3. ***Can the Buckhead Special Wildlife Habitat Area (BSWHA) be managed as late-successional habitat? Are there any proposed management activities not consistent with LSR objectives?***

The entire BSWHA as well as some adjacent upslope forested lands fall within LSR RO222. The Buckhead area consists of approximately 150 acres of relatively flat land which is part of the Middle Fork Willamette floodplain. Vegetative conditions vary from coniferous forest on higher elevations to hardwoods on low lying terrain adjacent to the river and Buckhead Creek due to changes in substrate and recent higher water events. Historically, the river in this area was very dynamic and changed courses or re-channelized during high water events. This natural occurrence has been eliminated from the system since the construction of Hills Creek dam, which controls a significant portion of flow in the river drainage above this area. Due to this constraint, it will be difficult and possibly undesirable to manage this area consistent with LSR objectives, i.e. "protect and enhance conditions of late-successional and old-growth related species including the northern spotted owl" (USDA, 1994b).

Two species from the USFS Regional Forester's Sensitive Species List are present in the BSWHA. These are the Oregon chub and Western pond turtle. These species are not necessarily associated with late-successional forests but rather with warm, slow-moving streams and ponds with solar exposure. Possible habitat improvement projects that could be inconsistent with LSR objectives include:

- creation of basking habitat for the Northwestern pond turtle by felling trees into ponds and streams,
- pond creation to enhance chub habitat,
- prescribed fire to enhance forage for big game (high use area) and nesting opportunities for the turtle,
- extensive scotch broom and Himalayan berry eradication (noxious weeds), and/or
- maintain the BPA right-of-way in a more open, noxious weed-free condition to promote Western pond turtle nesting success

Issue 5: Human Uses

Key Questions

1. ***What current or potential future effects do non-Forest Service special uses and right-of-ways, such as the railroad, Highway 58 and Bonneville Power Administration, have on species and habitats?***

The Lookout Point watershed serves as a throughway for a number of commercial activities. Portions of these commercial avenues of transport occur within unique or riparian habitats along the river and reservoir or through the Buckhead SWHA. As these commercial developments continue, there is a corresponding increase in detrimental impacts to native flora and fauna.

Bonneville Power Authority (BPA)

Creation of the right-of-way and subsequent maintenance to keep trees from growing under the powerlines have enabled Scotch broom and Himalayan blackberry populations to explode. During the spring one may follow a straight trail of yellow (Scotch broom in bloom) under the powerlines. The seed production of this species is very high and seeds are eaten and transported by wildlife into surrounding areas. The Buckhead Wildlife Area and North Shore Road are the most heavily infested areas in the WAA. This is in no small part due to seed dispersal from the BPA powerline right-of-way.

BPA line maintenance potentially conflicts with nesting activities of native species in the BSWHA. Scheduled vegetation removal and maintenance along the powerline may affect use of this area by the Northwestern pond turtle, great blue heron, Roosevelt elk, and certain waterfowl species. Culvert repair or cleaning on the BPA right-of-way access road could impact the Oregon chub and Northwestern pond turtle by substantially changing pond water levels during critical time periods.

Buckhead Creek has been channelized adjacent to the powerline right-of-way. It may have flowed directly into the Middle Fork Willamette River in the past rather than turning onto the flat terrain *(refer to Chapter 3, page 59)*. Buckhead Creek is now straight with no meander pattern, which is especially odd for such a low-gradient stream. The stream banks appear to have berms with riparian vegetation consisting primarily of scotch broom and Himalayan blackberry. Although this habitat may have been impacted by humans, it has potential to be diverse and complex. Aquatic habitat for the Oregon chub and other species has been simplified by the lack of meander pattern and poor riparian condition. This lack of meander has also affected availability of suitable nesting habitat for the pond turtle.

Noxious weed infestation (mainly Scotch broom and Himalayan blackberry) along the BPA right-of-way may affect the Western pond turtle's ability to successfully nest by encroaching on suitable nest sites.

Southern Pacific Railroad

The Southern Pacific Railroad line parallels the Middle Fork and Lookout Point Reservoir throughout the WAA. The track crosses the reservoir just above the mouth of Hospital Creek. There is a potential for a catastrophic spill to occur which could have detrimental effects on the aquatic system.

Telemetry work in 1997 on turtle movements within the Buckhead SWHA indicates that the railroad tracks themselves could be barriers to turtles moving upslope from the adjacent ponds to nest. Turtles were found during the nesting period on the railroad ties up against the rail itself. It seemed as though the turtle could not negotiate the rail to access suitable nesting habitat to the south of the tracks.

Reconnaissance along railroad lines adjacent to the Buckhead ponds revealed that Southern Pacific uses herbicide to manage vegetation along its tracks. Old creosote-treated railroad ties were found buried in soil immediately adjacent to the Buckhead

ponds and in forest adjacent to the tracks. These hazardous chemicals could be leaching into the Buckhead system over time, potentially affecting aquatic health.

Observations of railroad maintenance revealed that fill and debris were deposited directly into the reservoir. This may negatively affect aquatic life in the reservoir.

Coordination with SPR is lacking and it is not known whether they have specific management plans addressing impacts on species and habitat.

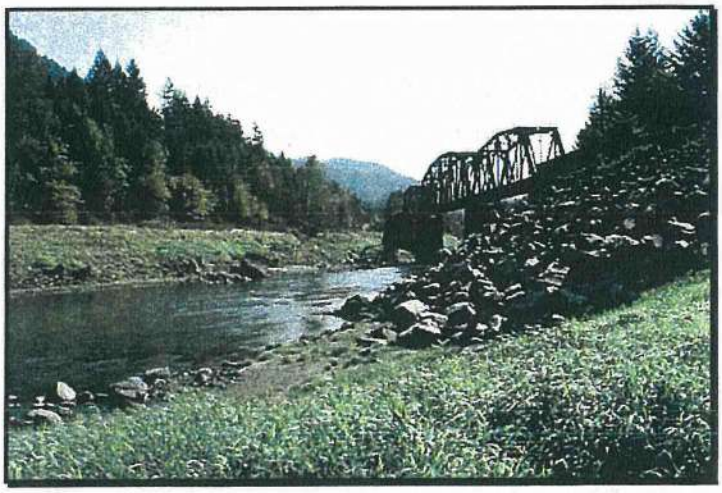


Figure 16. Railroad Trestle Crossing Middle Fork Willamette River at Hampton Campground

Highway 58

The highway creates a perfect corridor along which spotted knapweed seed, brought from the eastside of the Cascades on vehicles, can travel. It is constantly brushed and mowed (disturbed), creating a perfect habitat for this weedy species.

The only population of *Montia howellii* located on the Willamette NF is found adjacent to the highway in a turnout. There could be a potential adverse effect if habitat is bladed or ripped.

Issues Common to All

Three separate pairs of bald eagles are known or suspected to use the WAA for nesting and/or foraging. The one pair nesting in the WAA has had a fairly successful reproductive record during the past seven years. This, in spite of railroad and highway activity very close to the nest site. The birds seem to have adapted to this continuous noise level; it does not significantly affect their behavior nor reproductive success. There is a concern that increased OHV use of Hampton flats during reservoir drawdown could affect nest site selection and reproductive success in the future. This use is concentrated from November through March when critical courtship and nesting activities are taking place.

Activity in these special use areas and right-of-ways continue to create an ongoing threat of fire ignition from a number of different sources. In the Buckhead, Burnt

Bridge and Tire Creek areas, where the potential for catastrophic fire occurrence is high, it is possible that significant areas of late-successional forest habitat could be lost. This could be detrimental to successful dispersal and movement of late-successional forest species between LSRs.

Future upgrading of these right-of-ways (ex. widening of Highway 58) will continue to impact late-successional forest habitat, although the amount of habitat removed is not anticipated to be significant in contrast to mitigating transportation safety concerns.

Several railroad and highway culverts are migration barriers. Many of these streams have natural barriers just above these culverts, although others provide upstream habitat. These barriers are of particular concern when trout from the reservoir are migrating up tributaries to spawn during winter and spring months when the reservoir is at low pool.

2. *What are the trends of recreational and human use in the watershed?*

Between 1950 and 1989 the population of the Willamette Basin grew about 1.7% annually to a population of 1,915,000 in 1989. Visitor attendance is expected to increase during the next 25 years at the same rate as population (20-25%). More than 80% of recreation activities in Oregon take place in areas associated with water. Social and economic factors affect the demand for recreation opportunities and visitor behavior within the watershed.

Inappropriate wet season use of trails by all groups will continue to increase, as a growing and increasingly urban population turns to the out-of-doors for relaxation and education (SCORP, 1994). Users seek to satisfy their need to recreate in a "more primitive, or natural" setting causing an increase in competition for trails and dispersed sites among user groups. Operation of the reservoir directly affects recreational use of the river and its tributaries. When the water level is up, boat ramp use at Hampton increases, as does swimming at dispersed and developed sites around the reservoir. When down, more boats use Black Canyon boat ramp and the new Signal Point boat ramp; OHV operators use the exposed flats.

Recreation trends indicate that dispersed recreation demand will increase in the future *(see Figure 19, page 142)*. Trail use is among the highest growing recreation activities in the state and Oregon's economic strategy for the future includes a major focus on recreation and tourism (SCORP, 1994). These increasing pressures on recreational resources of the WAA pose management challenges to Federal agencies. Considering the cost of providing maintenance and development for recreation facilities, agencies are not likely to keep pace with demand.

In addition to recreation, there is a growing interest in using the natural environment as a place to nourish and heal humans, referred to as ecopsychology.

> *"In the last six years there has been a surge of interest in the healing effects of the outdoors....Some ecologists claim that alienation from nature accounts for our ability to destroy it without conscience."* (Tarken, 1997)

Educating visitors on minimum impact treatment of the National Forests benefits the forests now and in the future.

3. ***What effect will these trends have on forest management guidelines and on wildlife species and their habitats?***

As population in the area grows, there will be a greater demand on transport of toxic and hazardous materials by way of the railroad, highway and aircraft. This will increase susceptibility of this WAA to degradation from human impacts. Air pollution could rise due to development in adjacent metropolitan areas.

Trends indicate growing personal and commercial use within the WAA. Movement, migration and dispersal of certain wildlife and plant species will continue to be a problem along the Middle Fork Willamette River corridor. Highway 58 will be a main deterrent for species' movement between LSR RO222 and matrix lands. Increase in wildlife mortality is anticipated as highway traffic increases.

As commercial and personal use of the Middle Fork Willamette River increases from Westfir to the upper end of Lookout Point Reservoir, wildlife use along the river could be impacted. The only suitable habitat for the Harlequin duck in the WAA is along the river and both bald eagles and osprey use the river extensively for foraging.

Elevated levels of forest use and demand for maintenance of the current trail system, especially in LSR RO222, could also affect some species associated with late successional forest habitat such as the northern goshawk and spotted owl.

Off highway vehicle (OHV) use has substantially expanded in the draw-down zone of Lookout Point Reservoir. This activity is concentrated in the Armet/Hampton flats area, located within ¼ mile of the only known active bald eagle nest site in the WAA. Although these eagles have successfully reproduced young in past years, increased human uses might deter the eagles' preference to nest in this area. Continued monitoring is needed to determine impacts on this threatened species. OHV use is also detrimental to vegetation growing within the drawdown area. Roosevelt elk forage here extensively during the evening and night hours.

Demand for big game hunting areas, both accessible and quality unroaded areas, will continue to rise. This will require a sound Access and Travel Management Plan addressing future needs. In addition, potential harassment and poaching of big game could increase.

CHAPTER 5

ISSUE 1: WATER QUANTITY AND QUALITY

Key Questions

1. *How have upstream management activities affected water quality and quantity?*

Water quality data is lacking throughout the WAA. The Oregon Department of Environmental Quality has not listed any streams in this area on the 303(d) list. However, this is thought to be a result of limited data and not necessarily due to good water quality. The high frequency of vehicle and railroad travel within the WAA poses a possible threat of potential chemical spills. High use of the area has also resulted in a few disposal sites that should be monitored.

Hills Creek Dam regulates approximately 40% of the flow to the Middle Fork Willamette River within the WAA. Management of this flow has resulted in a loss of extreme flow events.

Roads have altered the hydrologic regime and contributed fine sediments to some drainages. Road failures have also effected water quality.

The following recommendations are suggested:

- Initiate a forum with other agencies and the public to discuss concerns, issues and recommendations regarding the Middle Fork Willamette River watershed. Consider forming a Watershed Council to address ongoing issues.
- Coordinate with Southern Pacific Railroad and Oregon Department of Transportation to ensure that emergency spill plans are activated in case of chemical spills. Monitor types of chemicals being transported.
- Coordinate with Southern Pacific Railroad and Oregon Department of Transportation in application of herbicides *(see Issue 5, page 137).*
- Coordinate with Oregon DEQ to test water quality from the vacated Hines mill site in Westfir, located upstream from the WAA.
- Coordinate with Oregon DEQ and Army Corps of Engineers to test soil for hazardous material at the "Water Tank" area. This was a storage area for the railroad and COE just west of Crale Creek adjacent to Lookout Point Reservoir.
- Coordinate with Oregon DEQ to test water quality in places where discarded railroad ties were found. There are two known sites. One is a pond just north of the railroad tracks and west of the Buckhead road where old ties were seen floating. The other is a spur road (west of the Buckhead Road and south of the railroad tracks) containing buried ties in waste material.
- Coordinate with the railroad to determine impacts from access roads constructed within the riparian zone of the Middle Fork Willamette River.

- The railroad was observed pushing soil and other debris into Lookout Point Reservoir from the Highway 58 side. Coordination may help determine if this kind of practice should continue.
- Continue working with Lane County on sidecast disposal along the North Shore Road. Find an alternative disposal site.
- Explore options to work with the USFS fire management department to develop off channel water pump chances so streams do not have to be altered.
- Upgrading or decommissioning roads should be considered through the Access and Travel Management process. This is particularly of concern in the LSR (where road maintenance will be limited) and within earthflow areas such as School Creek. Refer to Issue 3, Question 3, page 128, for a list of potential projects.
- Consider decommissioning or changing the Maintenance Level from II to I to reduce potential turbidity concerns *(see page 38).*

Data Needs

- ☆ Monitor stream temperatures to determine if any streams or the river should be listed as a water body of concern on the Oregon DEQ 303(d) list.
- ☆ The trailer park located at the mouth of Deception Creek is built on an alluvial fan deposition from a past debris flow. Conduct a stability analysis to determine if another debris flow may occur in Deception Creek which might impact the trailer park.

Issue 2: Vegetation

Key Questions

1. ***Where and how much matrix land is available for timber harvest within the next decade?***

Commercial Thinning Stands

An estimated 548 acres are available for potential thinning of stands >31 years old. From 1992 exam data, 268 acres have been identified as suitable in size and density for commercial thinning *(see Table 30, page 100).* These acres are located in Buckhead, Tire, Armet, and Carpet Hill Creeks. Re-examine and schedule the remaining acres.

- Commercial thin 129 acres in Buckhead drainage to prevent volume loss from mortality. Re-examine the other 177 acres and schedule treatments with priority given to thinning stands in the Buckhead drainage. This would support retaining Tire/Burnt Bridge Creeks as a dispersal corridor
- Commercial thin 63 acres in School Creek and 35 acres in Armet Creek drainages.

- In Tire Creek, re-examine all 102 acres on four units during the next five years and prescribe treatment type and date.
- Cain and Hospital Creek drainages provide no opportunities for commercial thinning this decade. Six units in these drainages were under the 31 year age limit and will need examination during the next 5-10 years.
- Rhodes Creek contains no acres for thinning.
- Rock Creek has 13 acres in unit 6009-019 requiring an exam to schedule treatment.
- Carpet Hill Creek has 33 acres in unit 6007-123 ready to thin (average DBH is 10.7"). Stand 6006-014 needs an examination.

Mature Timber Stands

Table 31 and Table 32, page 102, show the percentage of proposed treatment by decade in each management area and the approximate acres scheduled for treatment by decade. Acres of timber stands >80 years old available for treatment are shown in Table 36. No GTR or additional reductions are inferred in these numbers, but riparian acres are removed.

The scheduled treatment acres shown for Management Area 14a are estimated for a 100-year rotation. Rotations on general forest lands may vary from 80-120 years due to differences in culmination of mean annual increment (CMAI), prescription and resource constraints. Therefore, the actual scheduled treatment acres may vary from approximately 175-261 acres per decade.

Table 36 shows the location of acres available for scheduled harvest during the next decade by drainage.

Table 36. Location of Acres Available for Scheduled Harvest

Mgmt Alloc	Scheduled Harvest per Decade (Acres)	Drainages (acres available for harvest)		
		Available Acres **Greater Than** Scheduled Harvest/Decade	Available Acres **Less Than** Scheduled Harvest/Decade	Minimal Acres Available
11a	364	Carpet Hill/Hospital (567) Tire (540)	Armet/Cain (296) Buckhead (265) School (133) Rock (103)	Rhodes (0)
14a	209	Tire (1020)	Buckhead (148) School (76) Carpet Hill/Hospital (53)	Rhodes (5) Rock (1) Armet/Cain (0)
11c	149	Buckhead (306) Armet/Cain (242) Rhodes (166)	Tire (94) Rock (87) School (86)	Carpet Hill/Hospital (41)
11f	52	Armet/Cain (212) Buckhead (108) Rock (95) Rhodes (82) Carpet Hill/Hospital (62)	Tire (36)	School (3)

Late-successional forest enhancement and minimizing fragmentation should focus on inter-LSR dispersal of late-successional species. Identified areas of concern include the Tire, Burnt Bridge and Buckhead drainages *(see Chapter 4, Issue 4, Question 2, page 134).*

2. ***What was the historic fire occurrence within the Middle Fork Willamette and Tributaries analysis area? How did historic fire occurrence affect vegetation? Should we reinitiate this significant disturbance in the WAA?***

- Assemble an Interdisciplinary Team to write a plan using prescribed burning as a tool to manage the meadows above North Shore Road. This could be included as a proposal during timber harvest planning. Commercial tree removal between meadows may allow enlargement of these complexes to their former size. Prescribed burning would be used to:
  - ◊ increase forage for big game (native bunchgrass rejuvenation),
  - ◊ as a method to restore fire-tolerant species such as *Camas* and tarweed, and
  - ◊ as a method to control exotic species such as Scotch broom, St. John's wort and Himalayan blackberry, which are common invasives in these habitats.

  It may be unrealistic to consider burning Cloverpatch Bluffs where steepness of the area could preclude safe and effective treatment.
- Introduce prescribed underburns within timber sale areas. The objective would be to increase forage in the understory and to treat fine fuels. This may favor some rare herbaceous species such as *Montia diffusa*, whose seeds require some scarification (i.e. scratching or cracking of the seed coat) for germination. It would be helpful if timber sale boundaries followed natural topographic features to assure safe treatment of these areas (subwatersheds: Rhodes, School, Cain/Armet, Carpet Hill/Hospital, Rock, Tire, and Buckhead).

3. ***What and where is the potential for large fire occurrence in the watershed? What are the causal factors for this potential?***

Based on aspect, fuel loading and ignition potential, the Buckhead-Burnt Bridge Creek area of the watershed has the highest potential for a catastrophic fire.

The following recommendations are suggested:

- During ATM process, consider maintaining more roads in this area to facilitate initial attack vehicles.
- Mitigate fuel loading from all harvest activities by yarding tree tops from commercial thins and treating all regeneration units by broadcast burning or grapple piling/burning.

- A mitigation for smoke intrusion into the Oakridge/Westfir airshed is:

  When feasible, choose alternative forms of fuel treatments such as grapple piling/burning, hand piling/burning, strip covering/burning, and yarding specs rather than broadcast burning. These alternatives foster burning during the wet season, when prevailing winds and atmospheric instability help prevent smoke intrusion into the Oakridge/Westfir airshed.

4. ***Where and to what extent have natural and human caused disturbances affected special habitats and their contribution to biodiversity? What are future trends?***

- Use Access and Travel Management to recommend sites where special habitats impacted by roads may be restored. Restoration ranges from pulling culverts for natural drainage restoration to pulling fill and recontouring. Examples include:
  - Hardwoods — Road 5835/515 (Section 18)
  - Rock Garden — Spur off Highway 58 at MP 23 (Section 12)
  - Rock Outcrop — 5847/216/212 (Section 32)
  - Mesic Meadow — 5840/547 (Section 6)
- Integrate prescriptions for special habitats in timber sale planning process so degraded habitats may be restored and natural habitats may remain pristine.
- Route new trails around rather than through special habitats.

5. ***Are there opportunities for stand density management within the LSR that will maintain consistency with LSR objectives and improve stand development? Where?***

(See Table 35, page 106).

- The Umpqua NF is coordinating a LSR RO222 Assessment which is in its final draft form. All future treatments proposed in the LSR will be consistent with any agreements or exemptions identified in the assessment and will tier to treatment criteria specified.
- Examine all managed stand acres identified in Table 35, page 106, with priority given to Deception, Goodman, Duval, and Rock drainages. Prescribe and schedule treatments to maintain stand health and vigor and to develop stand structure for wildlife. Treat stands which have stocking levels conducive to tree mortality or need treatment to meet other objectives.
- Assess stand density of all managed stands 10-31 years old to determine treatment required to prevent early stand stagnation and promote development of old-growth characteristics, as well as retaining tree vigor and a suitable crown length. Failure to reduce stocking levels may delay development of late-successional characteristics.
- Determine if any natural stands are <80 years old and whether stand density management is necessary to maintain consistency with LSR objectives and improve stand development.

- Identify funding available for exams and stand density management so treatments can be scheduled to maximize benefits to the stand and maintain stand health.

Issue 3: Aquatic Habitat and Species

Key Questions

1. *What is the current status and available habitat for the Oregon chub? What are the trends? What are the recommendations to assist the recovery of this species?*

Continued involvement with the Oregon Chub Working Group will help implement the Conservation Agreement and Recovery Plan for this species. The main objectives of the Conservation Agreement are to restore habitat, reintroduce populations and educate the public. Following are a list of parameters to meet these objectives:

- Continue working with ODFW to monitor Oregon chub.
- Reintroduce and/or enhance habitat in isolated ponds or in ponds containing only native fish. Preferred habitat includes abundant aquatic vegetation, minimum water flow and depositional substrate.
- When possible include Northwestern pond turtle habitat enhancement with Oregon chub restoration efforts.
- Make the Oregon chub brochure available to the public at Ranger Stations and interpretive sites to educate the public and Forest Service employees on the habitat needs and importance of this species indigenous to the Willamette Valley.
- Develop other interpretive programs.

2. *What is the current status and potential reintroduction for anadromous fish?*

Coordinate with ODFW and Army Corps of Engineers to continue supporting the possible reintroduction of spring chinook into the upper Middle Fork Willamette River.

3. *How diverse is the aquatic habitat and how have management activities affected these habitats? What are the trends?*

Middle Fork Willamette River

The alluvial section of the Middle Fork has downcut and lost much of its pool habitat and meander pattern. Restoration or enhancement of this section of the river may require a change in regulation at Hills Creek Dam to reintroduce extreme flows to the system. This is not a realistic solution due to the presence of Highway 58, the town of Westfir and other low elevation areas. However, side channel habitat may be restored.

Data Needs

- ☆ Determine feasibility and process for side channel restoration.
- ☆ Monitor for harlequin ducks.

Lookout Point Reservoir

The reservoir was not fully analyzed in this document. Partnership with ODFW and Army Corps of Engineers is recommended to determine how the aquatic resource should be managed and develop detailed habitat enhancement projects. Some recommendations for the reservoir are listed below:

- Focus revegetation for erosion control on deep, fine soils (Category 1) to minimize effects of turbidity within the reservoir. Coordinate with Army Corps of Engineers.
- Maintain Northwestern pond turtle basking sites in coves, especially on the north side of the reservoir.

Data Needs

- ☆ Coordinate with COE to monitor turbidity in the reservoir.
- ☆ Monitor Northwestern pond turtle distribution and use of reservoir and adjacent uplands.
- ☆ Survey road and railroad culverts in tributaries entering the reservoir to determine if culverts are migration barriers for resident trout during spawning season. Identify first upstream natural barrier to determine if culvert replacement or modification would allow use of upstream aquatic habitat.

Buckhead

The Buckhead Area is a unique habitat in this WAA. A new habitat management plan is needed for this Special Wildlife Habitat Management Area (SWHMA). The stream appears to have been channelized and would benefit greatly by creating a meander pattern. However, the BPA powerline right-of-way would limit this type of restoration project. Some recommended projects are identified in Issue 5, Question 1, page 136; others are listed below:

- Riparian silviculture treatment to convert the Himalayan blackberry and scotch broom riparian to a conifer stand, like the one present in 1944 aerial photos.
- Oregon chub enhancement projects could be created by building off-channel ponds and side-channel habitat.
- The railroad culvert is a low flow barrier (if not a year round migration barrier). Aquatic habitat would benefit from its modification or replacement.
- Coordinate with BPA and Southern Pacific Railroad to recommend changes in management plans. *Refer to Issue 5, Question 1, page 136, for details.*
- Consult with ODFW in developing a strategy for bullfrog population control in the Buckhead area.

- Look at the potential for creating passage ways for turtles under the railroad tracks in known use areas (Turtle Tunnels).
- Based on telemetry results, develop and protect known Northwestern pond turtle nesting habitat. This includes vegetation management, such as removal of scotch broom, and construction of enclosures.

Data Needs

- ☆ Monitor temperature and biological oxygen demand (BOD) in Buckhead Creek and associated ponds.
- ☆ Continue herptile monitoring for red-legged frogs and other species.

Tributary Streams

The Aquatic Conservation Strategy specifies a strategic approach to aquatic habitat restoration. Priority is given to restoration and maintenance of the best habitat within the WAA so these areas can function as refugia habitat. This analysis has found Goodman, North, South, and Schweitzer drainages to be in the best condition within this WAA. Second priority is then given to those drainages in poor condition, especially where known restoration projects will benefit the habitat. These drainages are Deception and School Creek. Other restoration projects, such as in Tire Creek, were identified through stream inventories and local district knowledge.

Restoration projects will primarily focus on riparian silviculture treatments (to convert stands to conifers) and road restoration. Road restoration projects are identified below and should be considered during the Access and Travel Management Process. In general, all maintenance level I and II roads within the LSR should be evaluated for decommissioning. Road decommissioning may involve pulling culverts, leveling side cast material, filling ditches, outsloping, and revegetating with native vegetation. If decommissioning is not possible, roads should at least be enhanced so they can self-maintain. This is often referred to as "weatherizing." Weatherizing can involve building waterbars to improve drainage. These waterbars can be built adjacent to the culvert where keeping the road open to four wheel drives is important. Outsloping can also be accomplished to improve drainage. However, if this is done on roads where drainage would be diverted to flow over a steep side-cast slope, failures may occur. Therefore, outsloping should only be completed where appropriate.

Goodman Drainage

- Reach 1 has a wide, hardwood riparian zone. Riparian silviculture projects can help release the conifers adjacent to this channel.
- Decommission the last 1.5 miles of Road 5833. This road has been a chronic problem area and crosses over several tributaries in upper Goodman drainage.
- Decommission or weatherize the 5833.503 road system.
- Keep Road 5833.515 closed to motorized traffic or decommission.

North, South and Schweitzer Drainages

Upgrade or decommission the 5840.526 road system beyond Schweitzer Creek. A pump chance is located at Schweitzer, to which access should be maintained.

Data Need

- ☆ Determine if and where riparian silviculture is needed.
- ☆ Inventory aquatic habitat.

Deception Creek Drainage

- Reach 1 has a wide hardwood riparian. Riparian silviculture projects can help release the conifers adjacent to this channel.
- Large woody debris (LWD) is minimal in Reach 1. Instream placement of large wood may aid in channel stability.
- Road 5850.523 has cutbank and fill failure problems. Decommissioning is recommended for the series of roads off this system.

Data Needs

- ☆ Monitor water temperature.
- ☆ Red legged frogs are abundant in reach 1; only a few are found in reach 2. There may be an opportunity to monitor red-legged frog distribution habitat preference.
- ☆ Monitor for harlequin ducks.

School Creek Drainage

- Reach 1and 2 have wide, hardwood riparian zones. Riparian silviculture can help release the conifers adjacent to this channel.
- Road density is very high in this drainage. It is also a source of fine sediment. Cobble embeddedness is a concern within the channel. Road decommissioning should be considered through the Access and Travel Management Process.
- There is a dirt road accessing private land off Road 5823, at the junction of Road 5821. Drainage on this access road needs improvement.

Data Needs

- ☆ Monitor temperature.
- ☆ Determine if placement of LWD would provide stability and improve habitat in reach 1.

Tire Creek Drainage

Road density is high in this drainage and may contribute to fine sediment deposition in the stream. Road decommissioning should be considered through the Access and Travel Management Process.

Data Need

- ☆ An amphibian study is needed in this drainage. Torrent salamander and tailed frog habitat is found in the upper basin in a block of unharvested land. During the stream survey, an abundance of red-legged frogs and pacific giant salamanders were observed in the mainstem of Tire Creek.

Duval Drainage

The road crossing the east fork tributary to Duval Creek failed. This is the connector between Road 5847.542 and 5840.547. Material on both sides of the stream can be removed. Consider decommissioning both roads.

Whitehead and Bridge Drainage

Data Need

- ☆ Road 5847.216 failed at Whitehead Creek. This area should be examined to determine possible restoration.

ISSUE 4: TERRESTRIAL HABITAT AND SPECIES

Key Questions

1. ***How have species distribution and their habitats changed over time due to past vegetation manipulation activities? What are the future trends?***

Vegetation Management Recommendations

- Advocate for funding and develop strategy for stand density and other silvicultural treatments in managed stands within LSR RO222 to maintain health and accelerate growth toward late-successional forest conditions. Without some intermediate stand density treatment, these stands will stagnate and become increasingly susceptible to disease and falldown.
- Treatment prescriptions should focus on maintaining or enhancing species diversity within stands.
- A variety of silvicultural treatments will be utilized on matrix lands, including reforestation and regulated vegetation collection or management such as release and stocking level control. Activities such as pruning and fertilization may be used to

develop stands for certain products or maintain healthy habitats. Other treatments may be utilized as appropriate to meet resource objectives.

- Aggregate harvest units within matrix whenever feasible to minimize fragmentation and retain larger blocks of late-successional forest interior habitat as long as possible. This allows riparian reserves and other no-harvest allocations to recover from past harvest.
- Consider stand density management in managed stand portions of riparian reserves to avoid stand stagnation. This will also aid in enhancing these stands for Survey and Manage (C-3) species.

Botanical Recommendations

- Continue survey for sensitive plants during project planning.
- During weed treatment, make special habitats a high priority for treatment of both new and established weed infestations.
- Continue survey and treatment of noxious weed populations throughout the WAA. Target spotted and meadow knapweeds as highest priority for eradication (Highway 58 corridor, Roads 5824/120 and 5847/547). Survey for giant knotweed in the Willamette River corridor. Continue biological control for established infestations along roadsides.
- Use riparian silviculture techniques (planting conifers, release, if necessary) to accelerate growth of riparian stands for survey and manage riparian species. The highest priority should go to School, Crale, Buckhead, Duval, Rhodes, and Whitehead/Dell where more than $^1/_3$ of the riparian vegetation is in early seral condition.
- Where sugar pine is a natural component of the stand (ex. Deception), promote regeneration of this species by creating small openings within stands. This will also function to increase wildlife forage habitat.
- Consider use of prescribed burning as a technique to encourage fire-tolerant herbaceous species and as an experimental weed eradication on south-facing slopes above Lookout Point Reservoir *(see Issue 2, Question 2, page 123).*

Wildlife Recommendations

Data Needs

- ☆ Monitor potential sites for peregrine falcons using established survey protocol guidelines.
- ☆ Continue to monitor effectiveness of the mine closure which benefits the Townsend's big-eared bat. Ascertain whether continued human vandalism and disturbance at this site is influencing bat use of the cave.

Big Game

- Decrease open road densities in the watershed. Table 37 shows a recommended list of potential temporarily or permanent road closures consistent with current forest plan allocations and standards and guidelines. Closure is recommended based on impacts to big game and/or aquatic concerns *(see Issue 3, Question 3, page 126).*

Table 37. Recommended Road Closures by Drainage

School/Rhodes Creek	• 5823-104 just past the junction accessing Giustina land (approx. 1 mile). • 5823-108 (approx. 1 mile) • 5823-115 (approx. 1 mile)
Armet Creek	• 5824-116 closes approx. 3 miles of road including the 112, 113 and 116 spurs.
Tire Creek	• 5826-132 (approx. .5 mile) • 5826-133 (approx. 1 mile)
Goodman Creek	• 5833-504 (approx. 3 miles) • 5833 just past spur to BLM rock pit (approx. 6 miles) • 5833-507 (approx. 1 mile) • 5833-518 (approx. 1.5 miles)
Crale Creek	• 5835-515 already gated for Bald Eagle Management Area from Jan. 1 to Aug. 31. Extend season of closure to year round.
Schweitzer/ North/ South Creeks	• 5840-526 (approx. 3.5 miles)
Whitehead Creek	• 5847-546 (approx. 5 miles) • 5847-214 and 215 (approx. 1.5 miles) • 5847-216 (approx. 3 miles) • 5847-535 (approx. .3 mile)
Deception Creek	• 5850-523 (approx. 5.5 miles) Major maintenance problems • 5850-529 into Deception Rock (approx. 1 mile)

- Maintain adequate thermal cover in critical winter range portions of the watershed.
- Explore opportunities for establishing permanent foraging areas in LSR RO222 by maintaining or enhancing meadow habitats in areas where encroachment is occurring. Target areas of documented high big game use.

Snag Habitat

- Focus snag creation and CWD recruitment in younger natural and managed stands lacking these stand components. Rely on existing stand exam information or collect additional snag inventory data to support snag creation/inoculation work. Stands suspected of snag and CWD deficiency are found in the Goodman Creek, Carpet Hill, Armet, Hospital and Tire Creek drainages.
- Continue monitoring fungus inoculation of thinned natural stands in the Bridge Creek area. Inoculation was conducted in FY 1996 and a long term monitoring strategy has been established for assessing decay rates in treated trees.

Northern Spotted Owl

- Continue to analyze and monitor dispersal (11-40) conditions within the WAA.
- Maintain adequate 11-40 conditions in the interim until no-harvest allocations recover from past management activities.
- Relocate the 100-acre spotted owl core for activity center 2881. This core was established using limited field survey data. Survey information indicates activity has shifted to the upper end of the drainage. The emphasis of this 100-acre core relocation is to protect late-successional old-growth instead of the mature second growth where the core is presently located.

Data Need

☆ Update the OHAB layer in GIS based on field surveys to accurately represent current habitat conditions.

Great Gray Owl

- As timber sale activities are planned and implemented, monitor for GGO presence using latest recommended protocol guidelines.
- Implement habitat improvement projects for this species by maintaining natural meadow foraging areas and installation of artificial GGO nest platforms.

Red-legged Frog

- Assess stream survey information for distribution and abundance of red-legged frogs.
- Determine possible differences in habitat conditions based on presence/absence in certain drainage stream reaches (ex. Deception Creek).

- Continue to monitor other known red-legged frog breeding sites and survey newly discovered sites.

2. *Are there any priorities for maintaining or enhancing late successional forest conditions to provide for dispersal and movement of plant and animal species? If so, where?*

Emphasis should be on maintaining or enhancing late-successional forest conditions in Tire, Burnt Bridge and Buckhead drainages. Map 27 displays a potential area of concern regarding connectivity between LSRs. Identification of this area is based on concerns that development along the Middle Fork corridor could prove to be a major barrier for late-successional forest species movement and dispersal. Delineation of this area is accompanied with the following recommendations for late-successional forest habitat alteration:

- If regeneration harvest is planned in this area, create larger openings clustered around existing managed stands to minimize fragmentation.
- Stand enhancement activities (precommercial and commercial thinning) should be implemented in the Tire, Burnt Bridge and Buckhead drainages to promote stand development. Emphasis would be on the 300 acres currently available for commercial thinning in the Buckhead area *(see Issue 2, Question 1, page 122).*
- Maintain the contiguous stand of interior habitat in upper Tire Creek for as long as feasible.
- The Willamette NF LSR Assessment Team should assess the importance of this area as they consider inter-LSR dispersal conditions.
- Explore alternative prescriptions to maintain higher canopy closure in harvested stands of this area.
- Focus on pre-commercial and commercial thinning prescriptions (especially in no-harvest allocations) to encourage conifer growth and late-successional forest development.

Continue strategy identified in the Winberry Watershed Analysis to maintain ridgetop late-successional forest stands as a moderate priority for harvest due to the value of ridgetop stands as dispersal avenues for many wildlife and plant species. Maintain interdrainage connectivity by retaining late-successional forest stands along ridgetops (ex. upper reaches of East Fork School Creek, Carpet Hill Creek, and Hospital Creek).

3. *Can the Buckhead Special Wildlife Habitat Area (SWHA) be managed as late-successional habitat? Are there any proposed management activities not consistent with LSR objectives?*

Most recommendations and actions enhancing habitat for the Western pond turtle and Oregon chub will be consistent with late-successional forest objectives, although a few actions may not. Recommendations follow:

- Enhance conditions conducive to development of late-successional and old-growth forests; identify places in the SWHA where riparian silviculture (conifer planting in the understory) is appropriate. Some areas may be too moist to sustain conifer forests.
- Develop an updated Buckhead Management Plan which would include a desired future condition for the area and recommended activities for restoration of riparian species.
- Types of activities that will typically aid in habitat restoration for the Oregon chub and Western pond turtle include:
  - creation of basking habitat for the Northwestern pond turtle by felling trees into ponds and streams,
  - pond creation to enhance chub habitat,
  - prescribed fire to enhance forage for big game (high use area) and nesting opportunities for the turtle,
  - extensive scotch broom and Himalayan berry eradication (noxious weeds), and/or
  - maintain the BPA right-of-way in a more open, noxious weed-free condition to promote Western pond turtle nesting success

Figure 17. Buckhead Pond

Issue 5: Human Uses

Key Questions

1. *What current or potential future effects do non-Forest Service special uses and right-of-ways such as the railroad, Highway 58 and Bonneville Power Administration have on species and habitats?*

All recommendations listed below are accompanied by a basic suggestion to communicate effectively with the appropriate agency in voicing concerns and working together to solve some of the identified problems.

Bonneville Power Administration

- Address timing of regular maintenance activities within the Buckhead and North Shore areas due to conflicts with turtle nesting activity and big game use. It is critical that the areas designated remain undisturbed from May 1 to July 31 while turtles leave ponds to nest. Depending on where turtle nests are found, this window could be extended to avoid possibilities of nest destruction from maintenance activities. Big game use is high within the Buckhead SWHA throughout the year. Coordinate maintenance operations to reduce impacts on big game. Harassment of big game is most easily avoided by scheduling activities during summer months.
- Review Regional MOU with BPA and recommend reduction in maintenance intervals for felling of hazard trees. It is thought that this agreement is renewed once every 15 years. This would be applicable only within the SWHA and other identified critical areas along the BPA right-of-way.
- Alter maintenance schedule and methodology to fell only trees which could immediately affect powerlines. Cooperate with BPA in reducing maintenance interval to five years within the Buckhead SWHA.
- Inquire into potential herbicide use by BPA within the SWHA. Explore recommending alternative treatments if herbicides applied immediately adjacent to the aquatic system.
- Meet with BPA and Southern Pacific Railroad officials to update them on our concerns regarding wildlife habitat water quality.
- Explore alternative funding sources through the BPA as mitigation for impacts from right-of-way maintenance. This could include noxious weed control and maintenance and possible Western pond turtle enhancement work.

Southern Pacific Railroad

- Work with SP Railroad to determine if culverts presenting fish migration barriers can be removed if their removal provides access to suitable habitat upstream.
- Communicate concerns and coordinate cleanup of possible inappropriate disposal of waste material and used railroad ties adjacent the Buckhead area.

- Herbicide use along railroad lines could affect species and their habitat as a result of leaching or overland flows. This is of particular concern in the Buckhead pond area. Propose alternative methods of vegetation control along the railroad adjacent to the Buckhead system (manual or mechanized) and other areas of concern *(see Issue 1, page 121).*
- Assess the potential to provide turtle passage underneath the tracks to suitable nesting habitat opposite the Buckhead ponds.

Data Needs (Human Uses)

☆ Check on status of MOU and licensing timelines for BPA powerline maintenance through USFS lands.

2. *What are the trends of recreational and human use in the watershed?*

There is a growing demand for primitive and semi primitive settings, especially close to urban areas (SCORP, 1994). Careful planning, including a comprehensive analysis of the area's natural resources and human use patterns, will help determine the resource base's capability to support/sustain multiple uses, including recreation. Scientific information regarding carrying capacity (see Appendix B) of ecosystems is either inaccessible to recreation providers, or does not exist. To assure the future availability of a wide range of recreation opportunities and a healthy ecosystem, collaboration between federal agencies and the public is essential.

The following recommendations are suggested:

- Effectively use trail and OHV education to achieve the greatest benefit for recreation resources.
- Keep management areas designated for future recreation sites (Goodman creek and Lakeview campgrounds) available, to provide future recreation opportunities.
- Maintain and upgrade trails to accommodate higher levels of use as well as increased equestrian and mountain bike usage.
- Create a multi-agency partnership with Federal, State and local agencies to educate visitors in reducing their impacts on the environment when using natural settings (fire prevention, vandalism, water safety, off-highway vehicles, and littering).
- Work with the Army Corps of Engineers to develop an Off Highway Vehicle management plan in the draw-down area of Lookout Point Reservoir.

Data Need

☆ Conduct a Limits of Accessible Change (LAC) survey of the watershed recreation areas.

3. *What effect will these trends have on forest management guidelines and on wildlife species and their habitats?*

- As population increases in the adjacent metropolitan areas, demand for more accessible hunting areas will increase. Continue to manage open road densities to meet WNF LRMP standards and guidelines in conjunction with providing road accessible hunting areas.
- The entire WAA north of the Middle Fork Willamette River is high use big game winter range. Cooperate with ODFW in establishment of quality hunt areas with limited motorized access in the Carpet Hill and Tire drainages.
- As trail use increases from diverse user groups, the demand to maintain the system will increase, especially during seasons when wildlife could suffer impacts from maintenance disturbance (i.e. chainsaw operations and other mechanized activities). Educate the public regarding these activities' impacts on wildlife.
- Continue to assess use of OHVs in the draw-down zone of Lookout Point Reservoir and their potential impacts on bald eagles and other wildlife using the area.
- Update interpretive signs in the Buckhead Special Wildlife Habitat Area to accurately describe the uniqueness of the Buckhead system.
- Recommend a permanent restriction on firearms in the Buckhead SWHA. Due to the close proximity of Highway 58, Road 5821 and the nature trail, the area is not conducive to firearm discharge. Coordinate with USFS Law Enforcement and Oregon State Police.
- Recommend road management guidelines discouraging "tie-through" roads that could assist in successful poaching on USFS lands.
- Monitor Crystal Mine closure for bat use and human vandalism.

Data Need

☆ Monitor for presence of Harlequin ducks in the Middle Fork Willamette River above Lookout Point Reservoir and lower Deception Creek. Assess impacts of disturbance on the duck from increased recreational and commercial guide use of the river.

Figure 18. Hampton Campground

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Lookout Point WAA Vicinity Map

MAP 1

State of Oregon

Lane County

Lowell Ranger District

Lookout Point WAA

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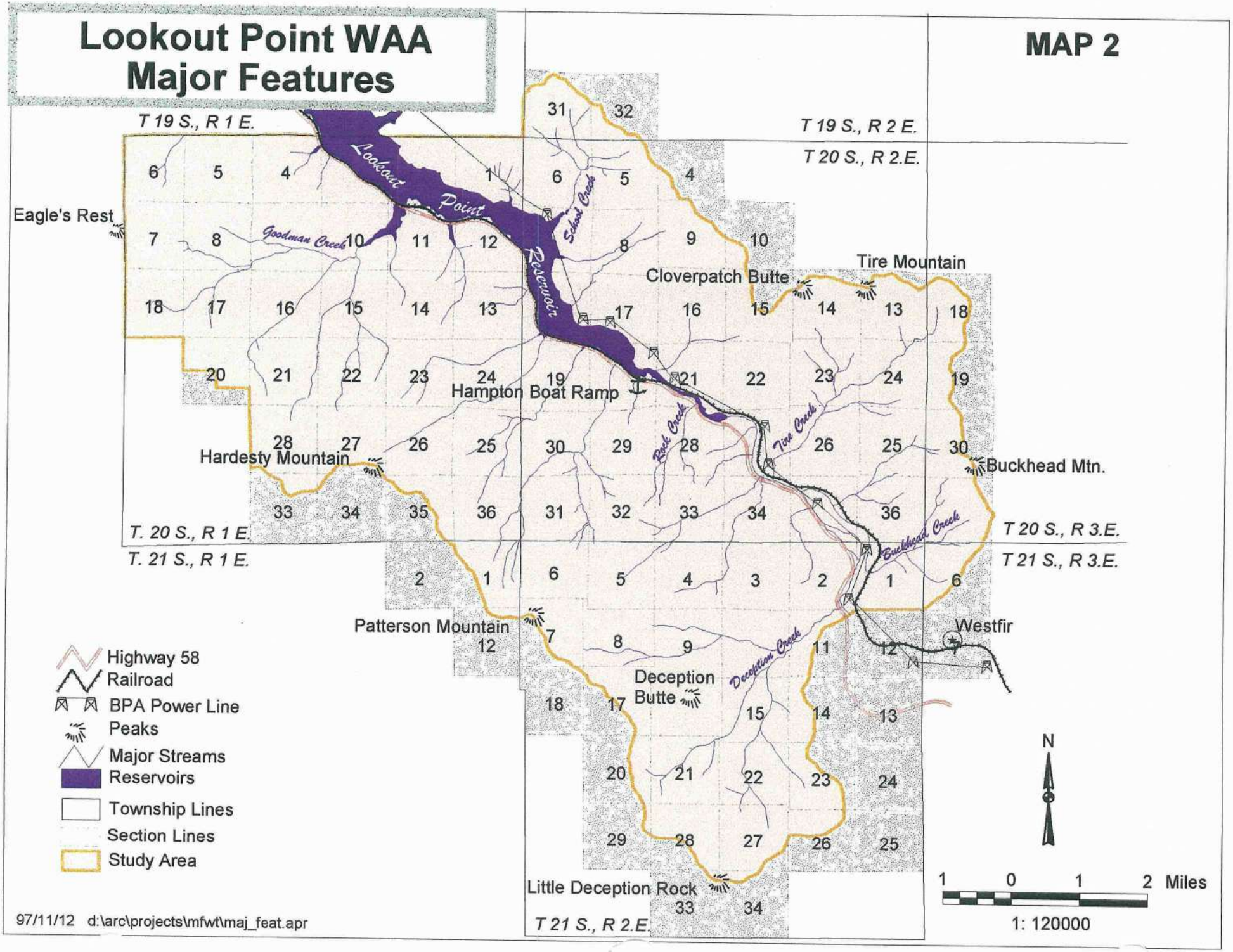
Lookout Point WAA
Major Features

MAP 2



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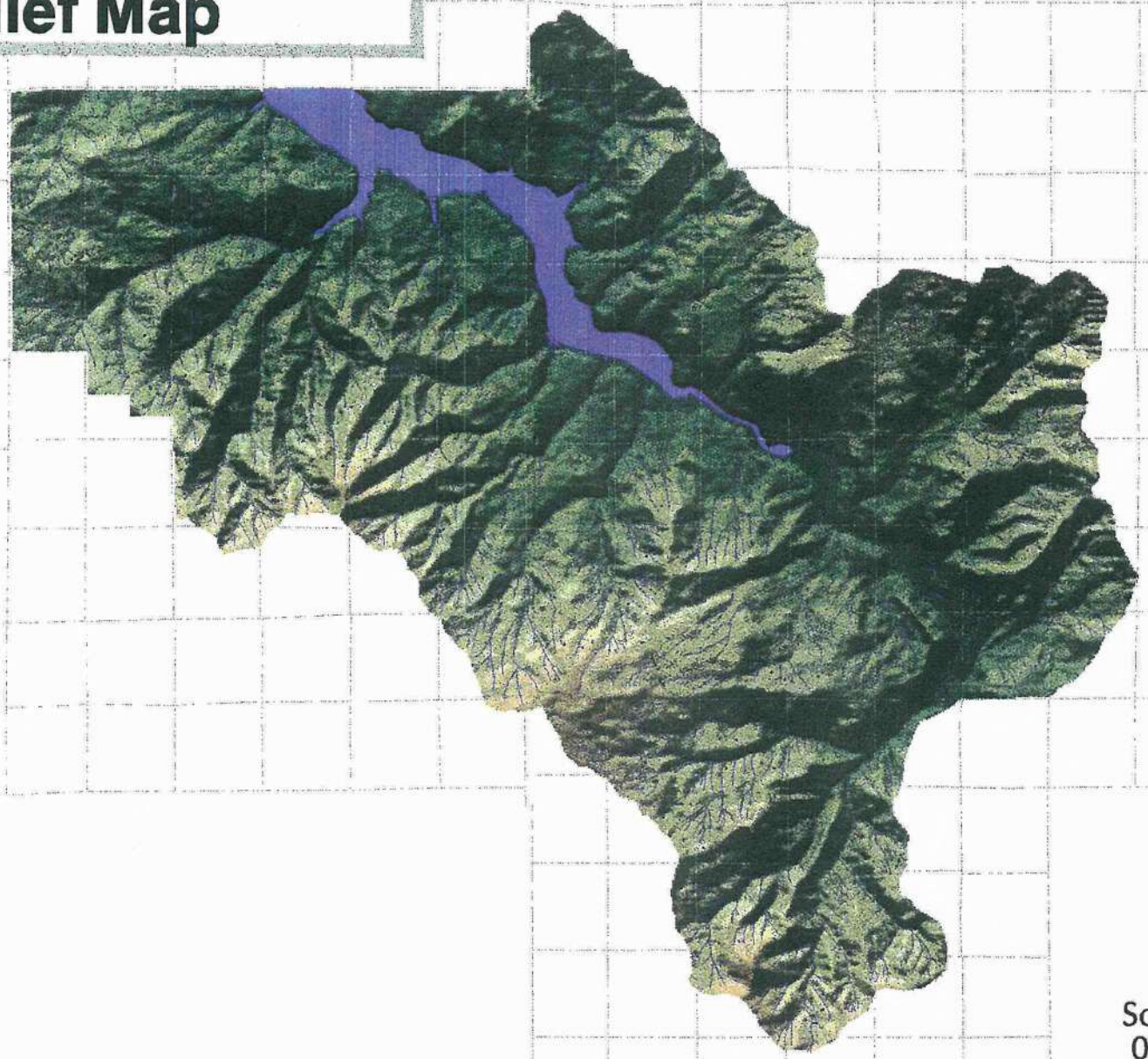
Lookout Point WAA Relief Map

MAP 3



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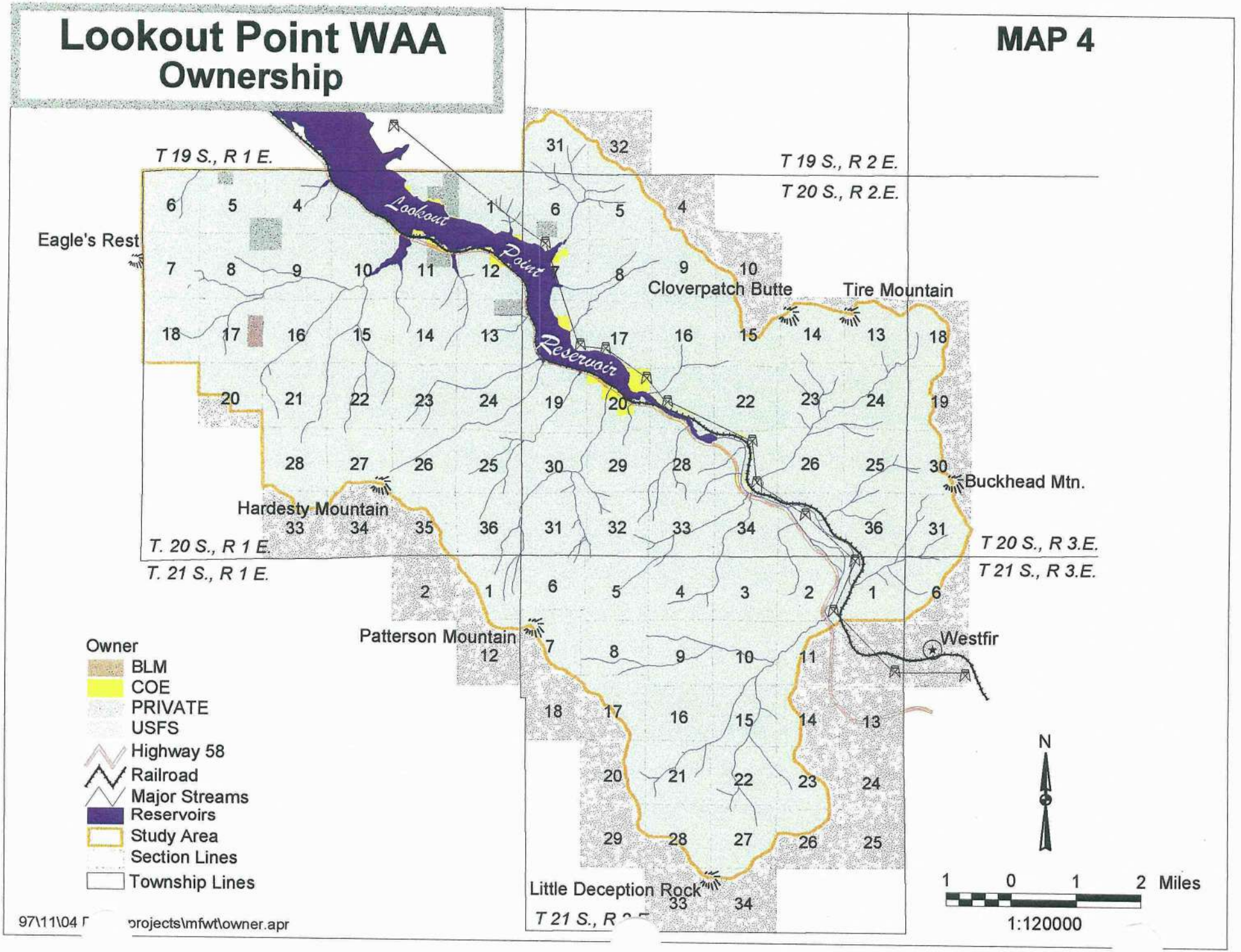
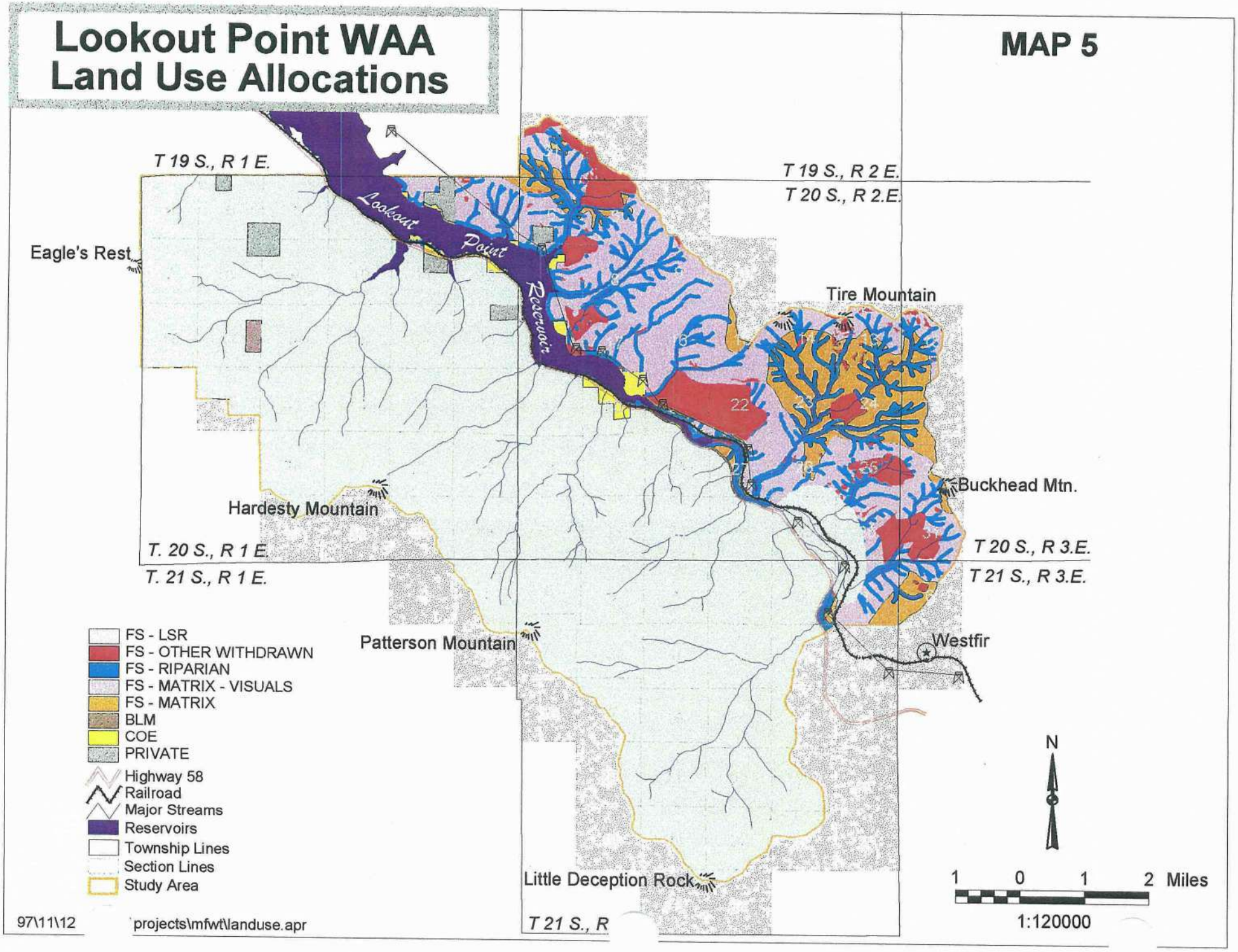
Lookout Point WAA
Ownership

MAP 4



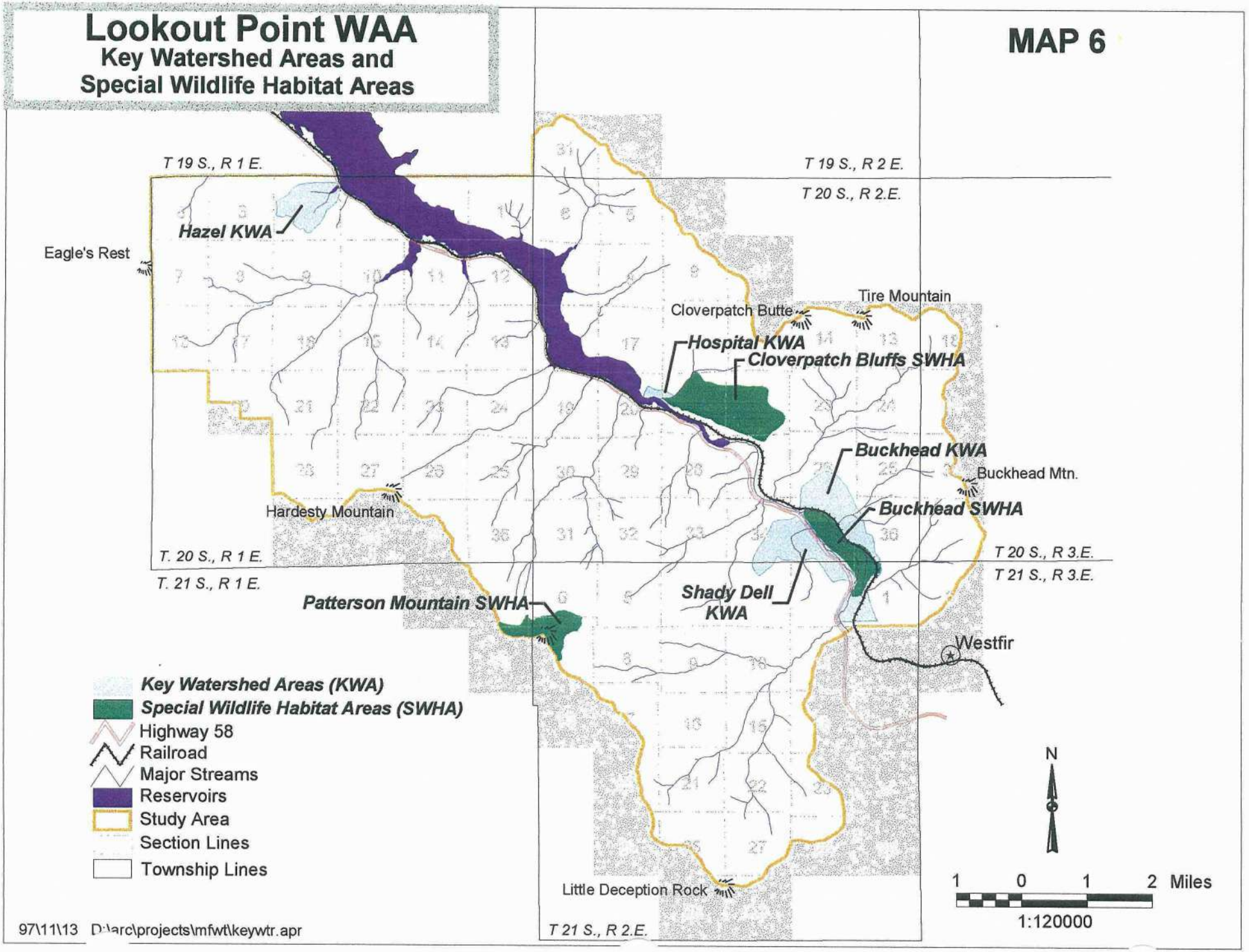
Lookout Point WAA
Land Use Allocations

MAP 5



Lookout Point WAA
Key Watershed Areas and Special Wildlife Habitat Areas

MAP 6



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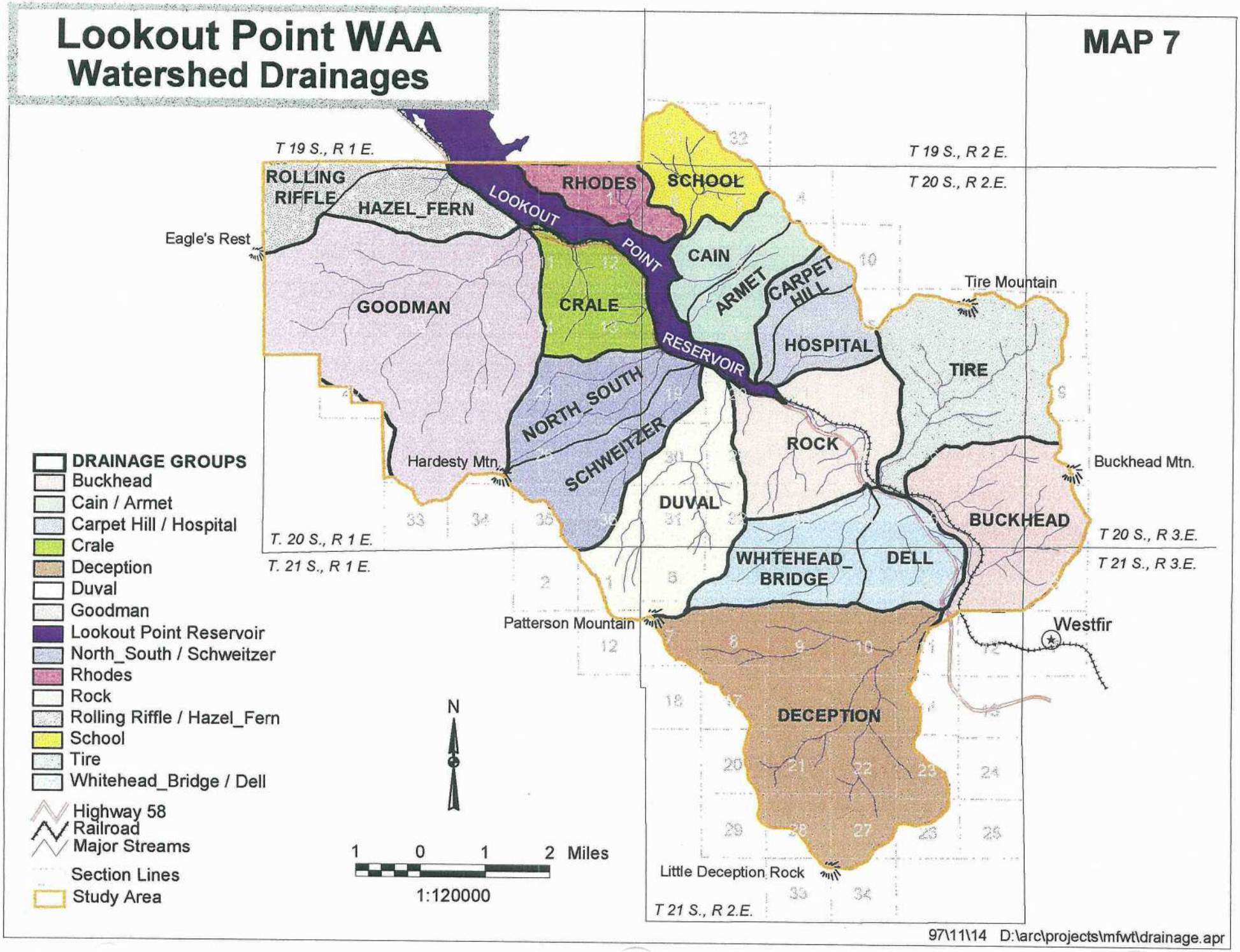
Lookout Point WAA
Watershed Drainages

MAP 7



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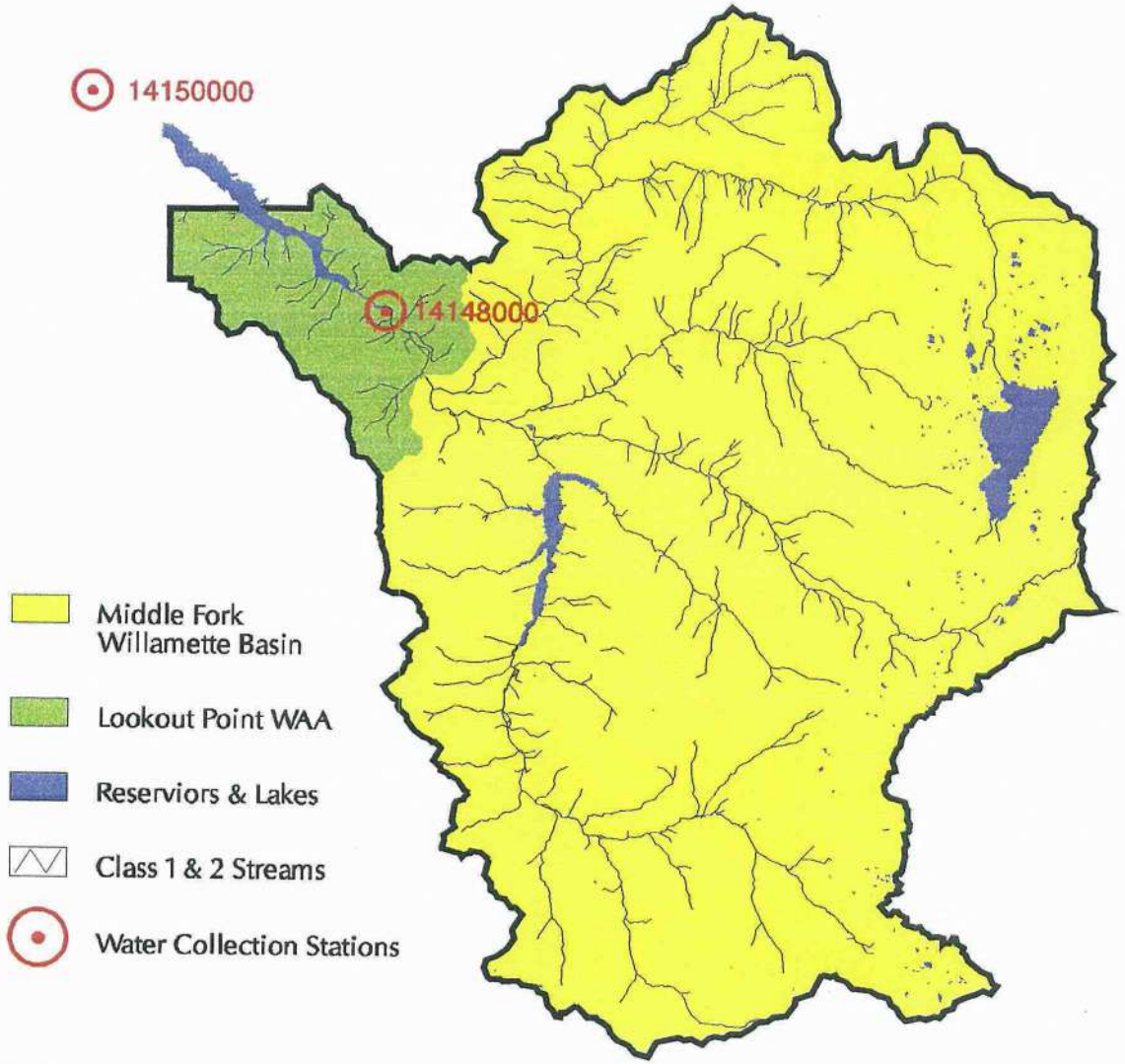
Lookout Point WAA
Middle Fork Willamette Basin
with Water Collection Stations

MAP 8



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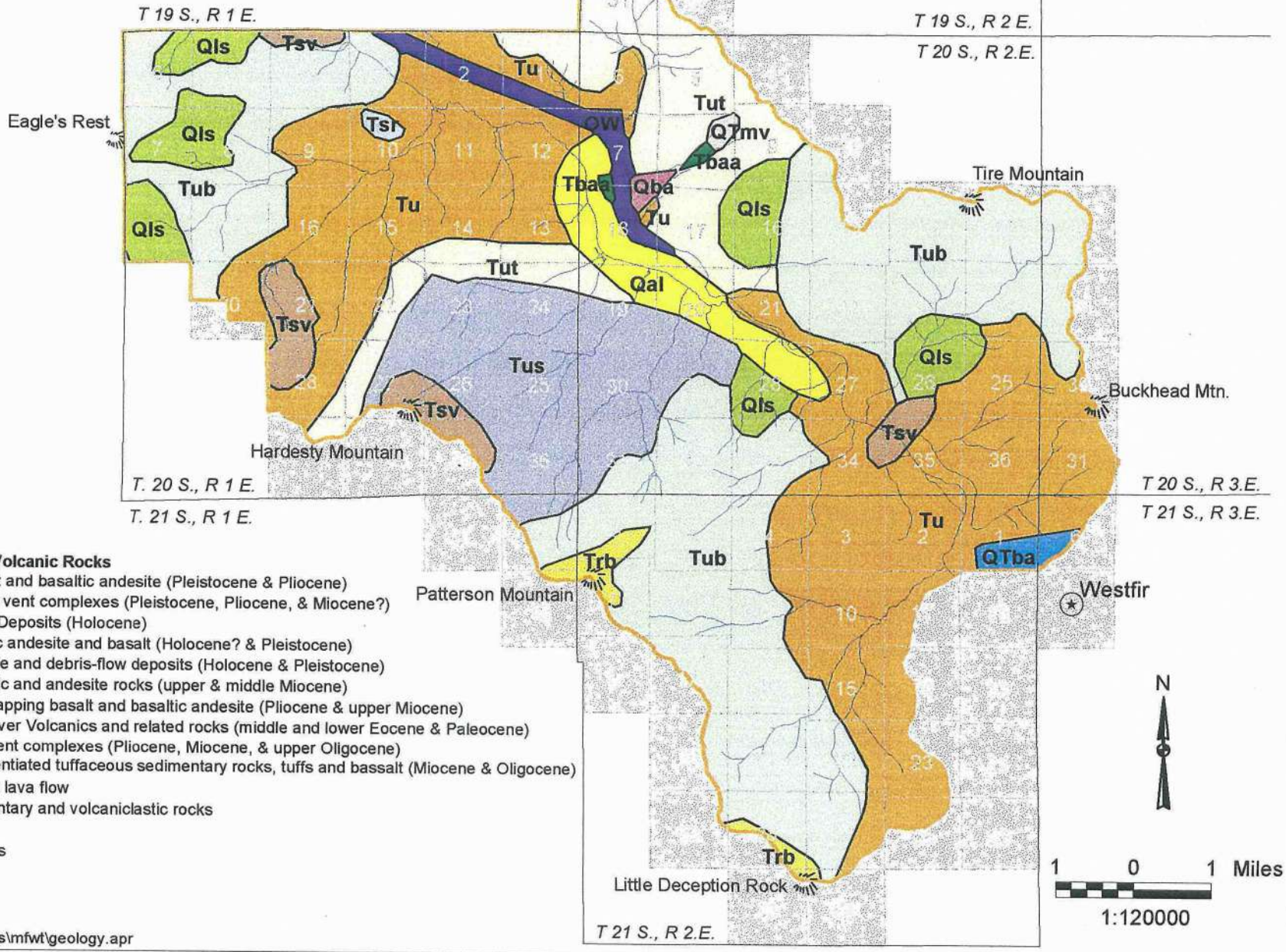
Lookout Point WAA
Geology

MAP 9



GEOLOGY

- OW - Water

Sedimentary and Volcanic Rocks

- QTba - Basalt and basaltic andesite (Pleistocene & Pliocene)
- QTmv - Mafic vent complexes (Pleistocene, Pliocene, & Miocene?)
- Qal - Alluvial Deposits (Holocene)
- Qba - Basaltic andesite and basalt (Holocene? & Pleistocene)
- Qls - Landslide and debris-flow deposits (Holocene & Pleistocene)
- Tbaa - Basaltic and andesite rocks (upper & middle Miocene)
- Trb - Ridge-capping basalt and basaltic andesite (Pliocene & upper Miocene)
- Tsr - Siletz River Volcanics and related rocks (middle and lower Eocene & Paleocene)
- Tsv - Silicic vent complexes (Pliocene, Miocene, & upper Oligocene)
- Tu - Undifferentiated tuffaceous sedimentary rocks, tuffs and bassalt (Miocene & Oligocene)
- Tub - Basaltic lava flow
- Tus - Sedimentary and volcaniclastic rocks
- Tut - Tuff
- Major Streams
- Study Area
- Section Lines

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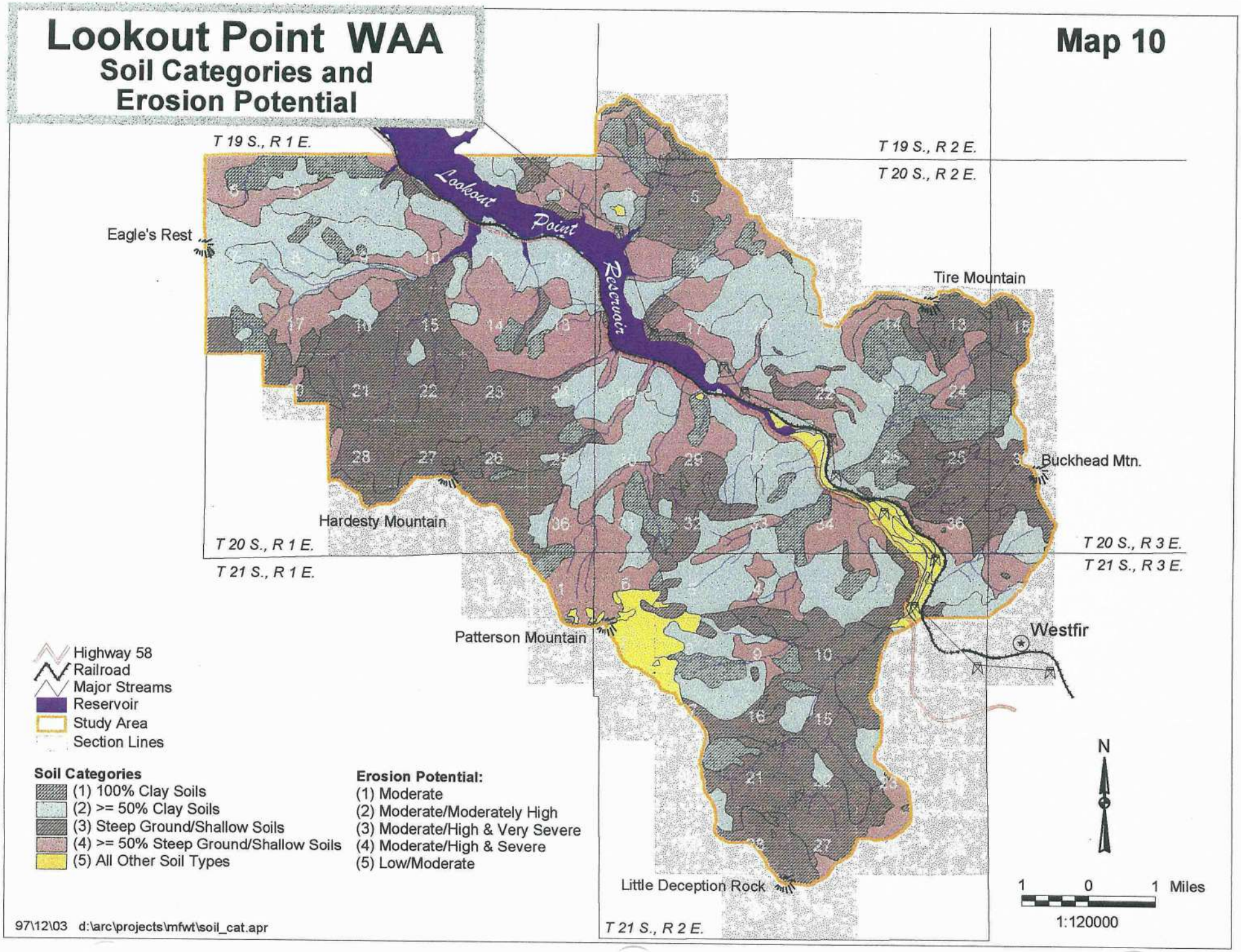
Lookout Point WAA
Soil Categories and Erosion Potential

Map 10



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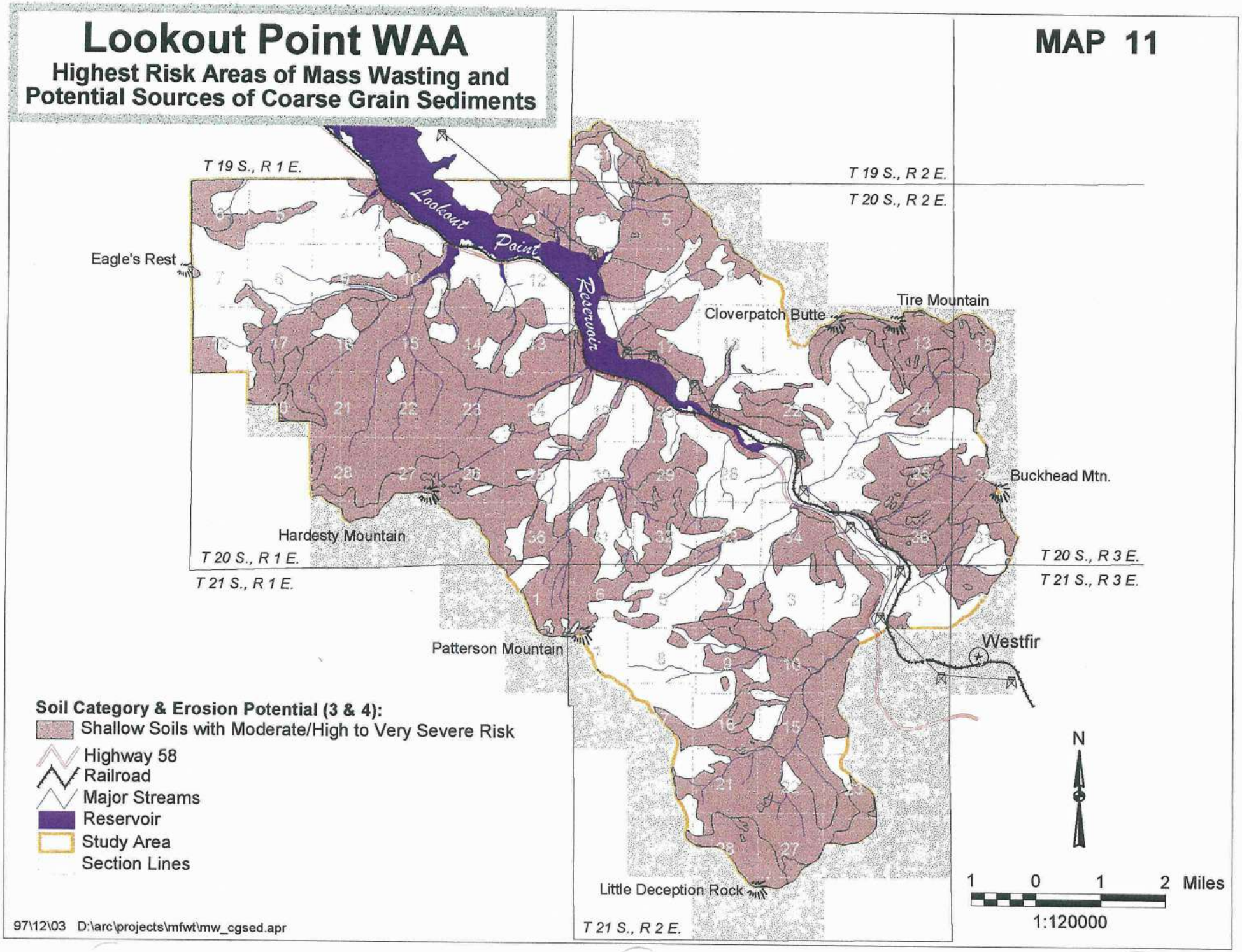
Lookout Point WAA

Highest Risk Areas of Mass Wasting and Potential Sources of Coarse Grain Sediments

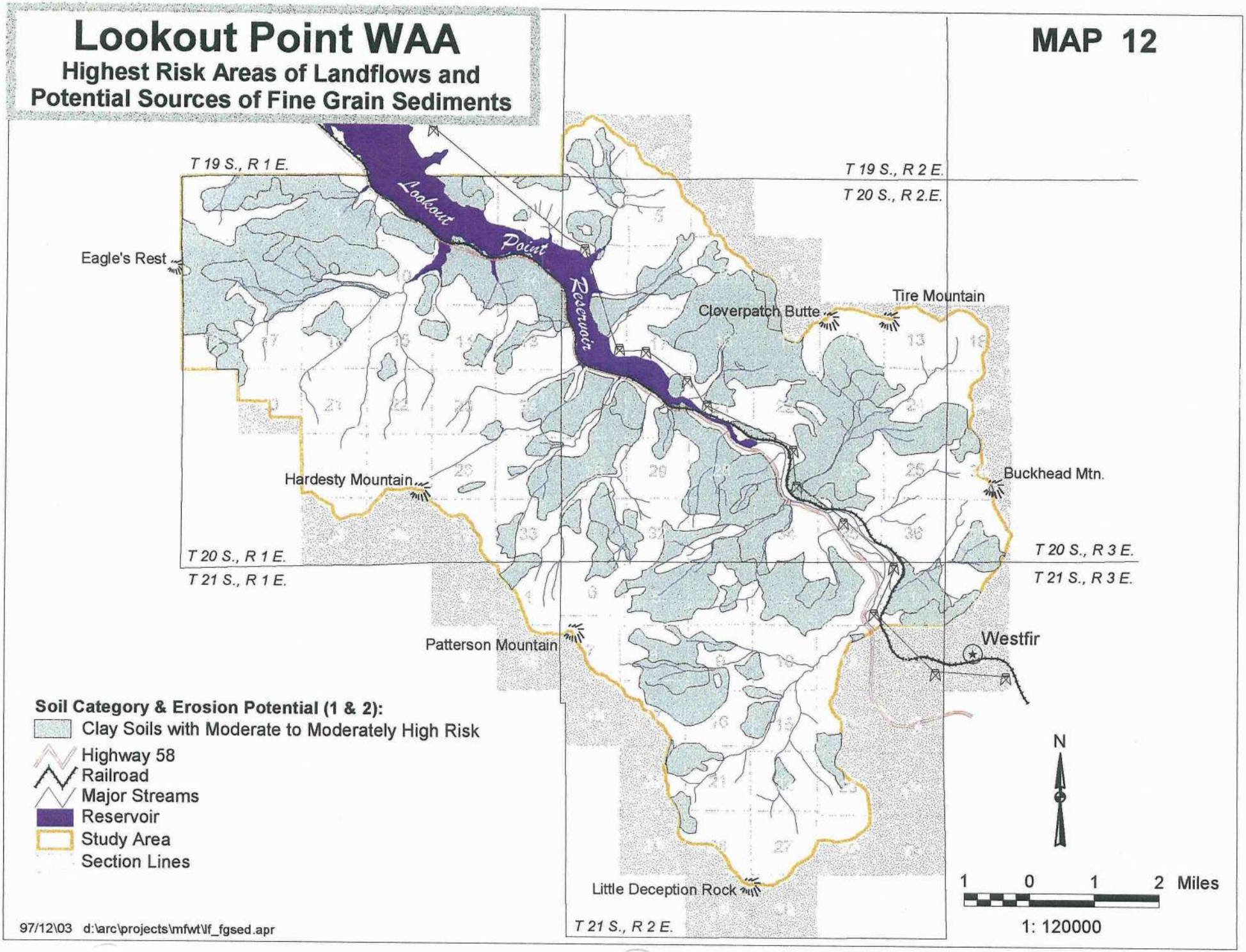
MAP 11



Lookout Point WAA

Highest Risk Areas of Landflows and Potential Sources of Fine Grain Sediments

MAP 12



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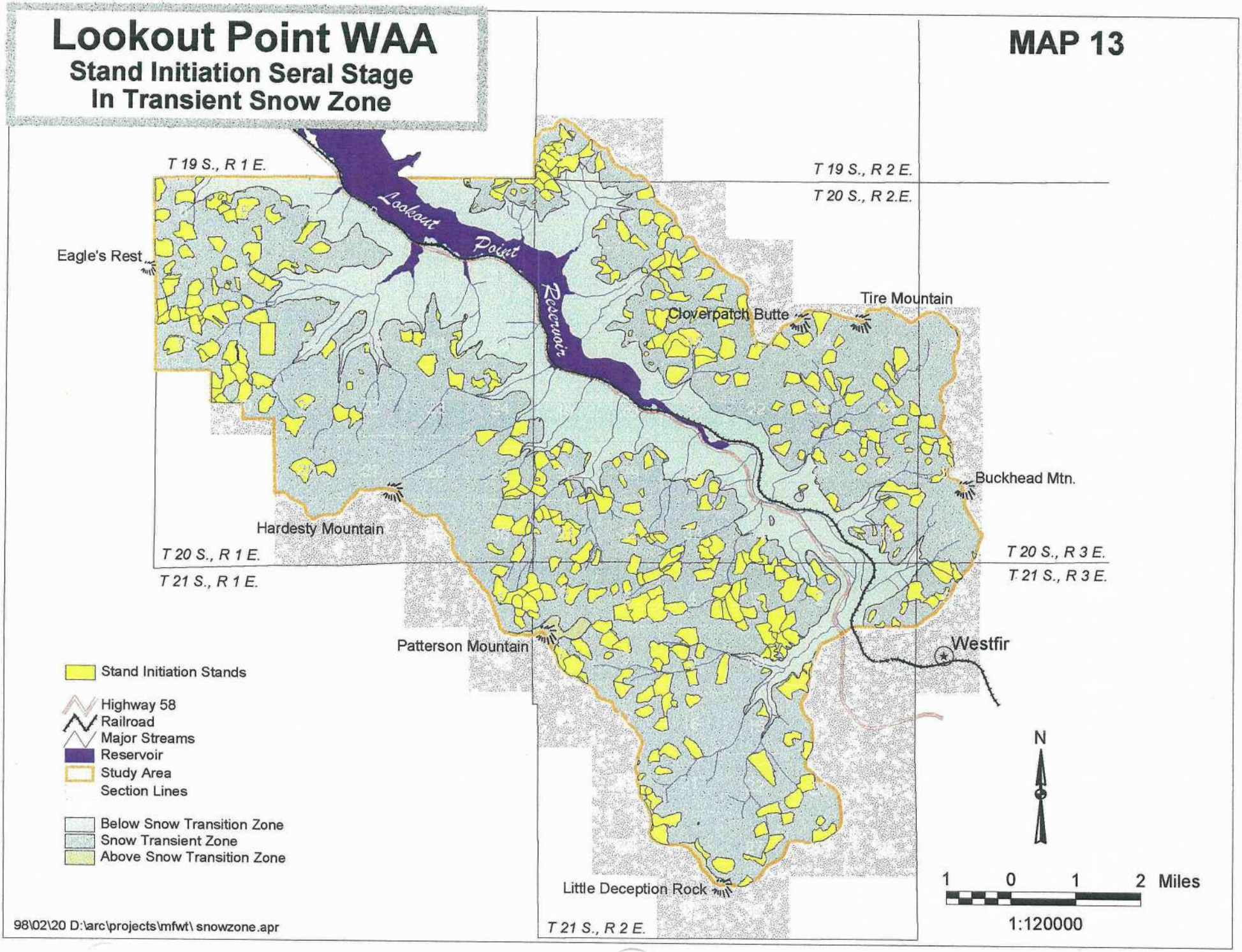
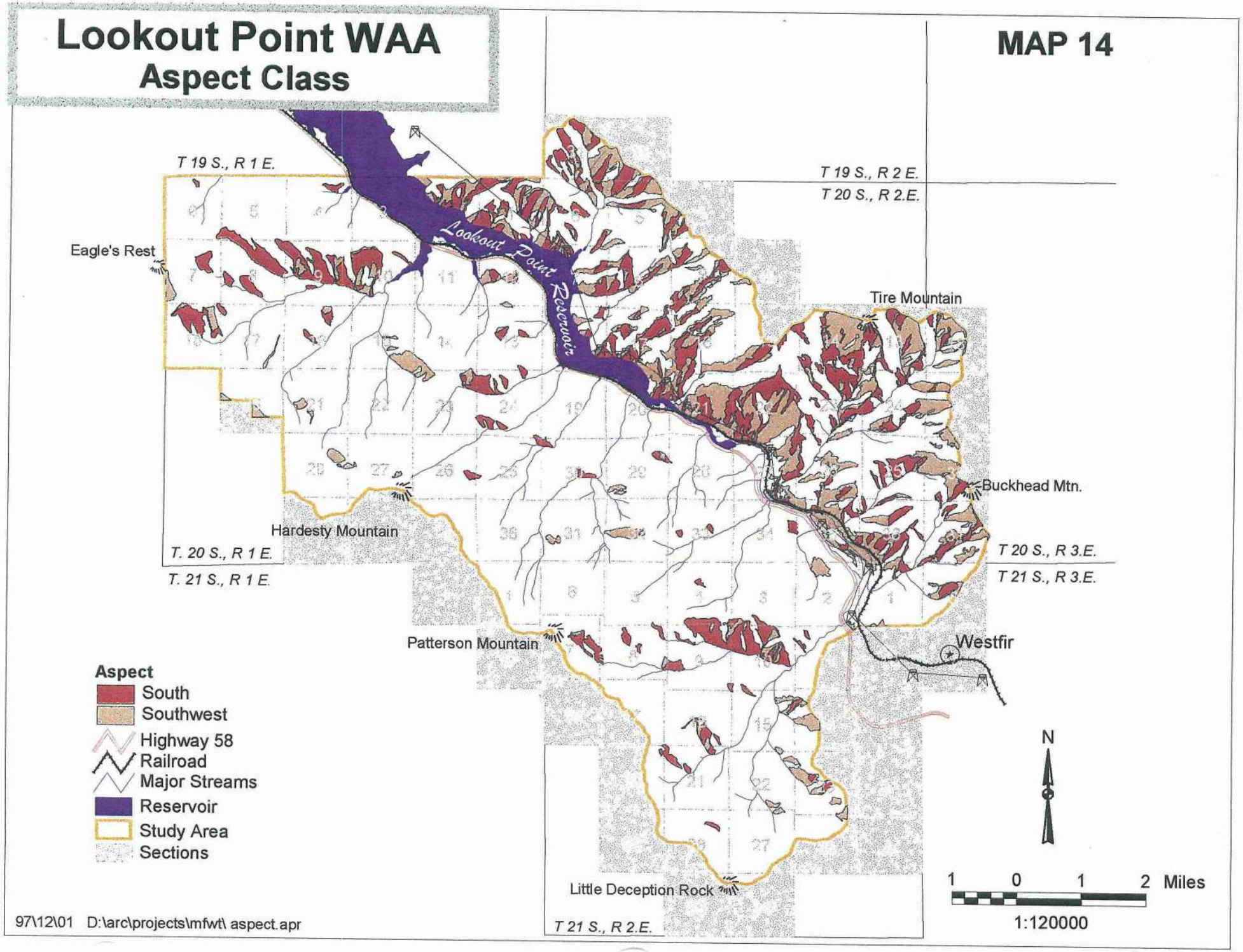
Lookout Point WAA
Stand Initiation Seral Stage In Transient Snow Zone

MAP 13



Lookout Point WAA
Aspect Class

MAP 14



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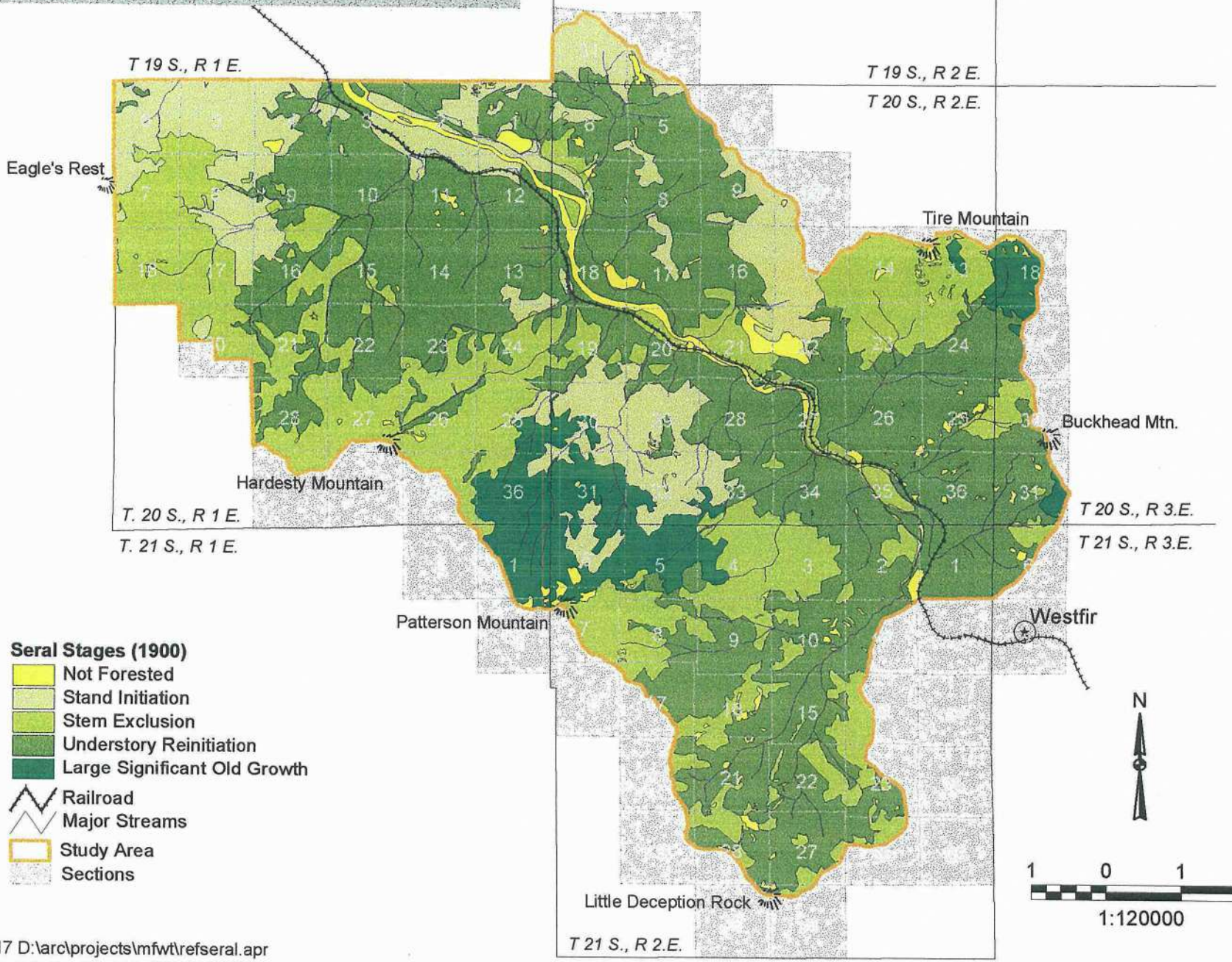
Lookout Point WAA
Reference Seral Conditions (1900)

MAP 15



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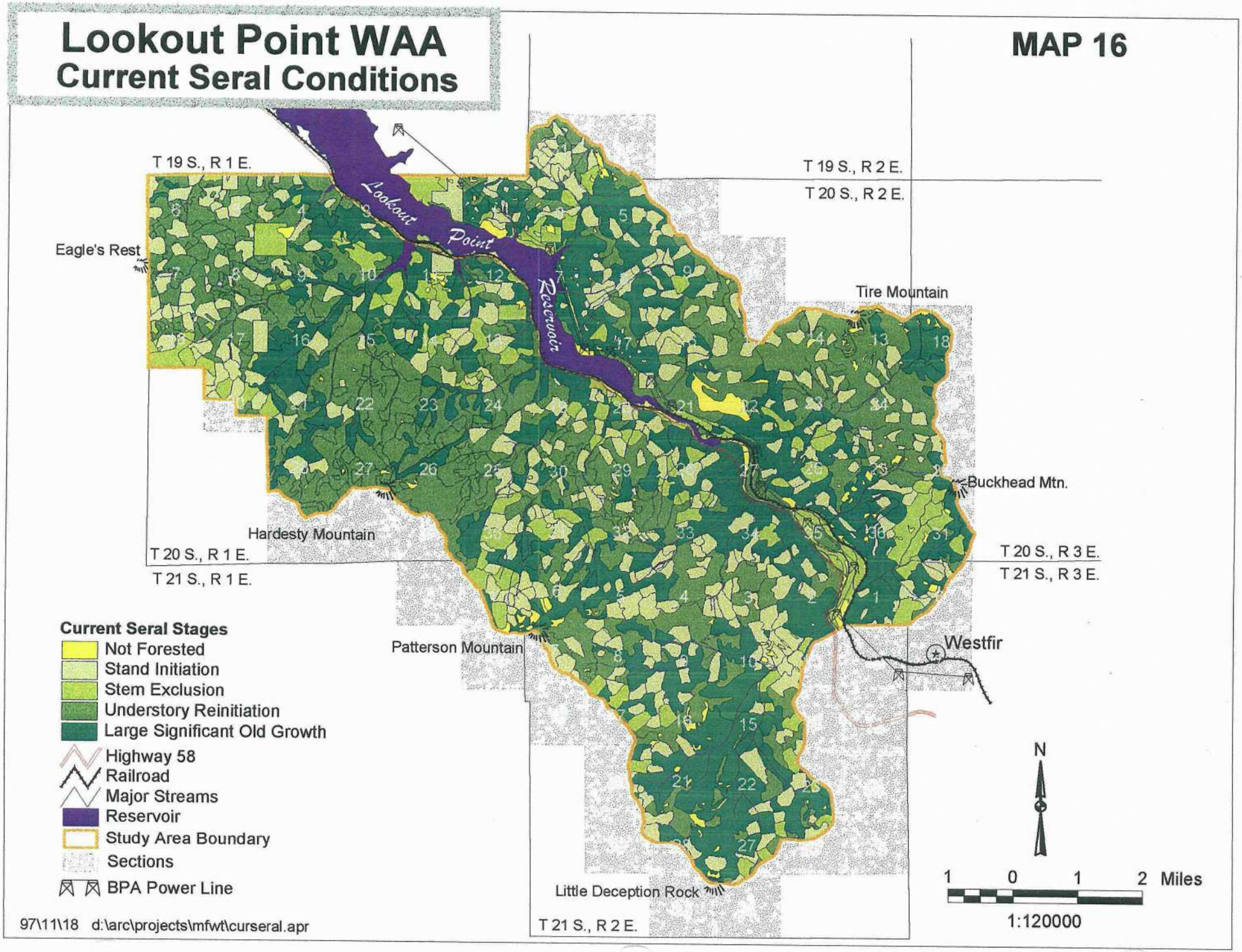
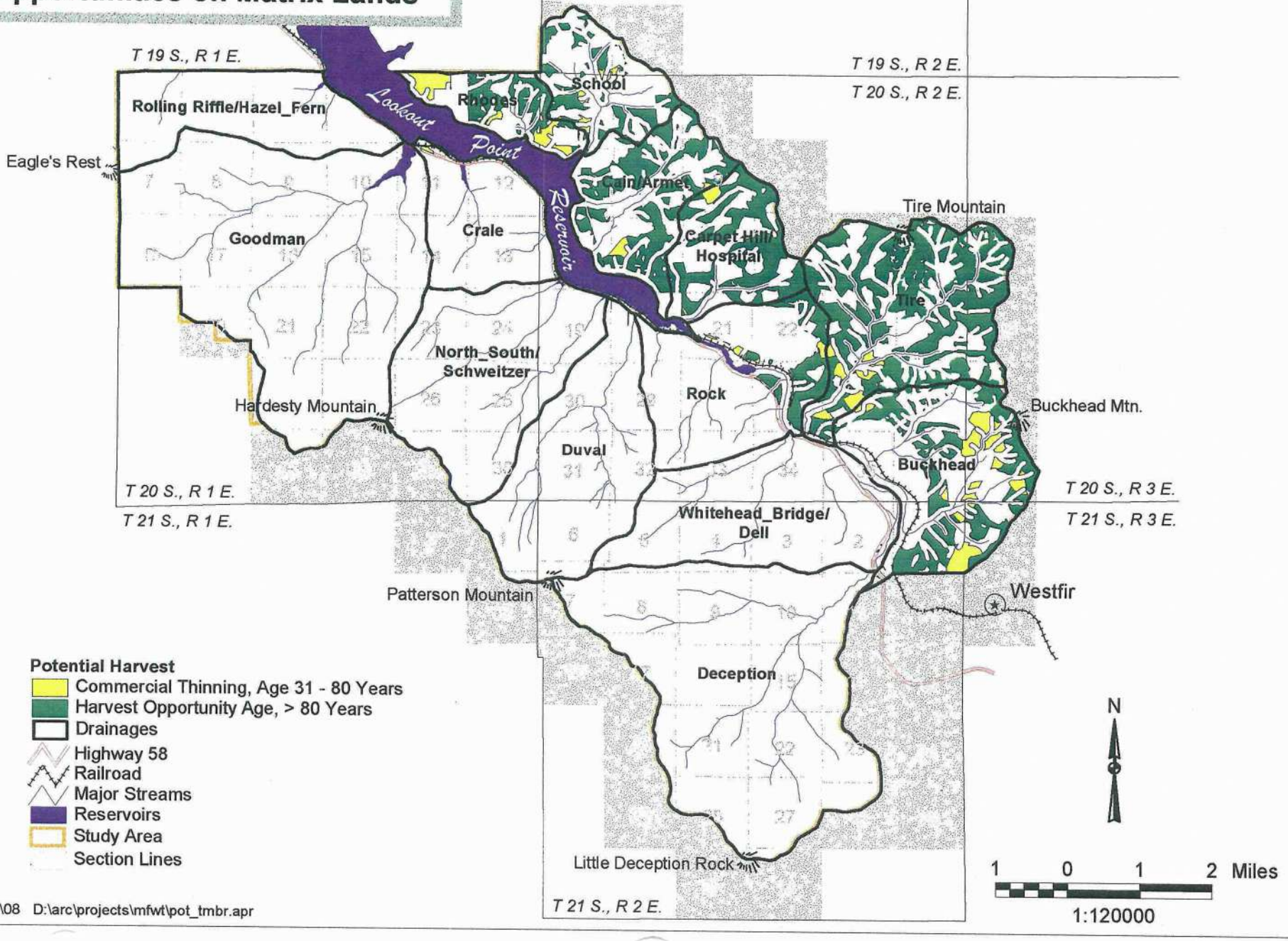
Lookout Point WAA
Current Seral Conditions

MAP 16



Lookout Point WAA
Potential Timber Management Opportunities on Matrix Lands

MAP 17



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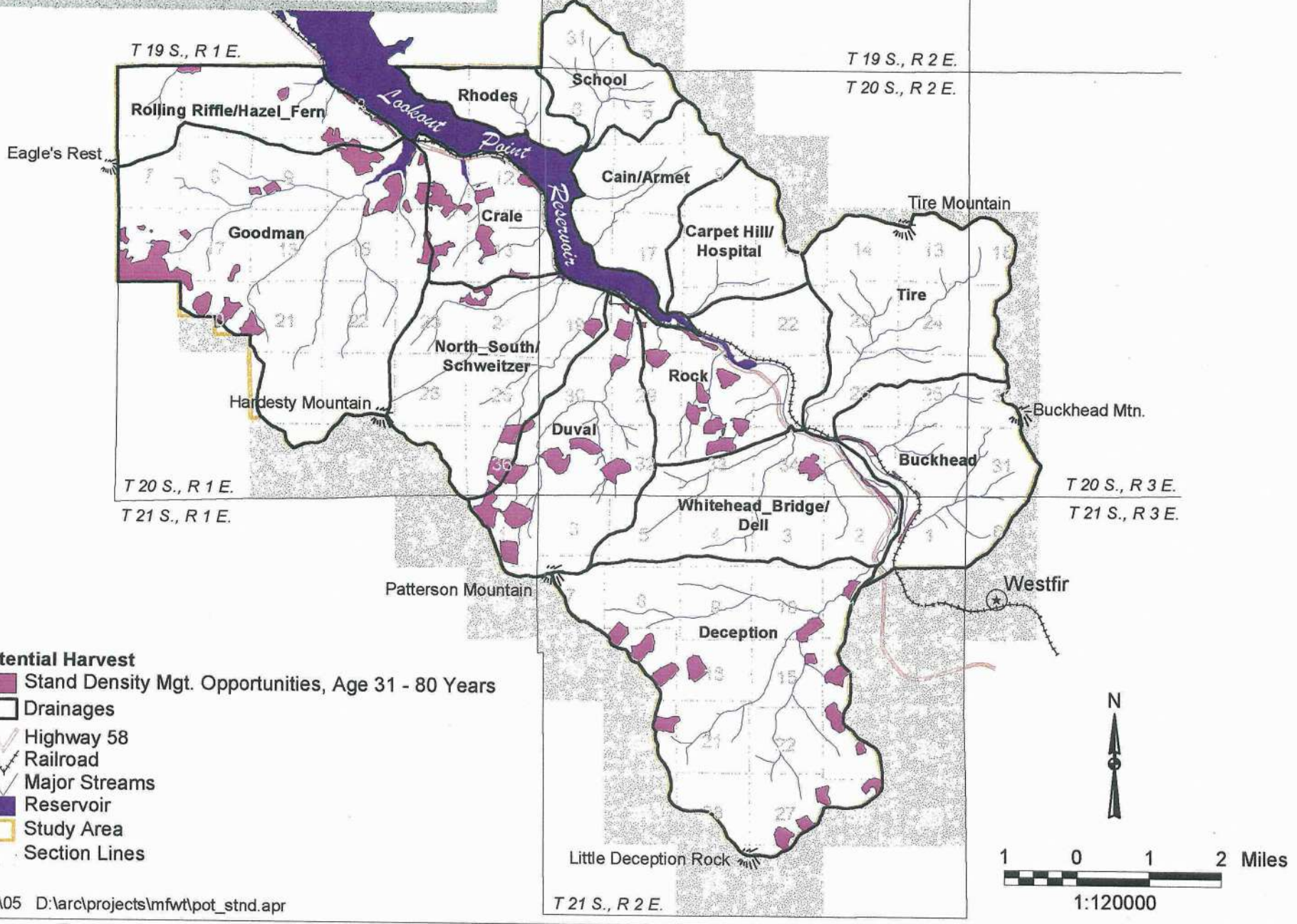
Lookout Point WAA
Potential Stand Density Management Opportunities in LSR RO222

MAP 18



Potential Harvest

- Stand Density Mgt. Opportunities, Age 31 - 80 Years
- Drainages
- Highway 58
- Railroad
- Major Streams
- Reservoir
- Study Area
- Section Lines

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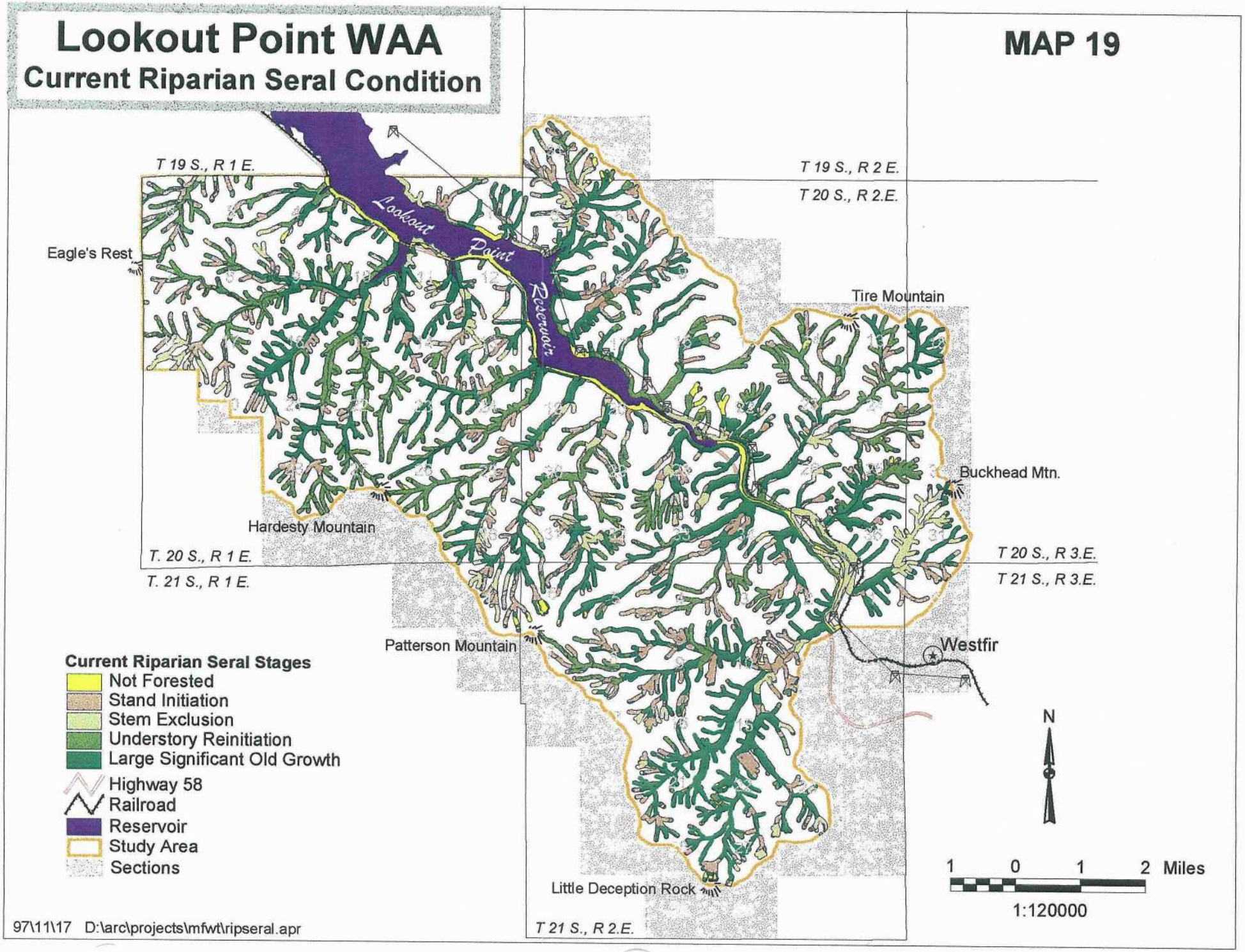
Lookout Point WAA
Current Riparian Seral Condition

MAP 19



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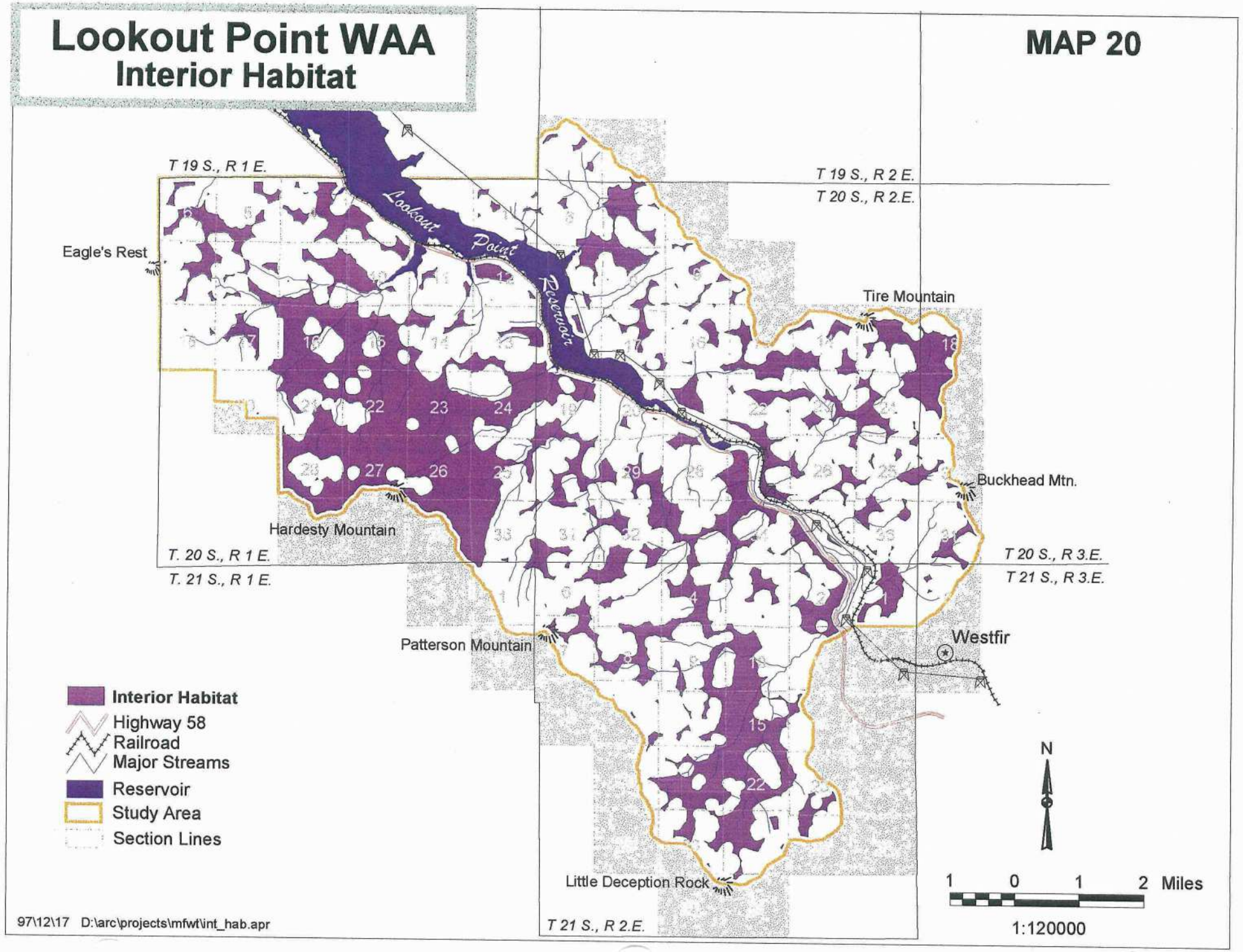
Lookout Point WAA
Interior Habitat

MAP 20



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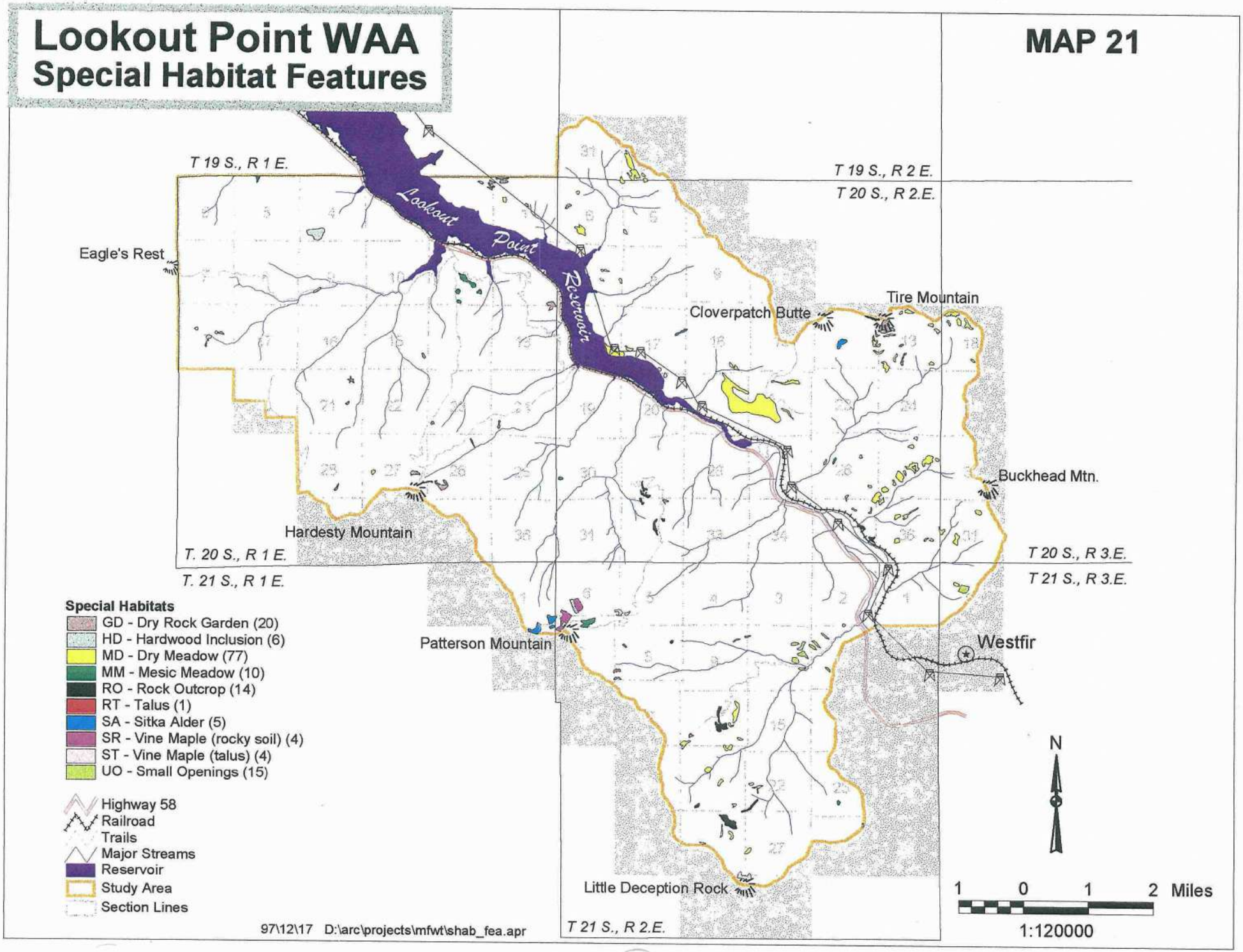
Lookout Point WAA
Special Habitat Features

MAP 21



Special Habitats

- GD - Dry Rock Garden (20)
- HD - Hardwood Inclusion (6)
- MD - Dry Meadow (77)
- MM - Mesic Meadow (10)
- RO - Rock Outcrop (14)
- RT - Talus (1)
- SA - Sitka Alder (5)
- SR - Vine Maple (rocky soil) (4)
- ST - Vine Maple (talus) (4)
- UO - Small Openings (15)

- Highway 58
- Railroad
- Trails
- Major Streams
- Reservoir
- Study Area
- Section Lines

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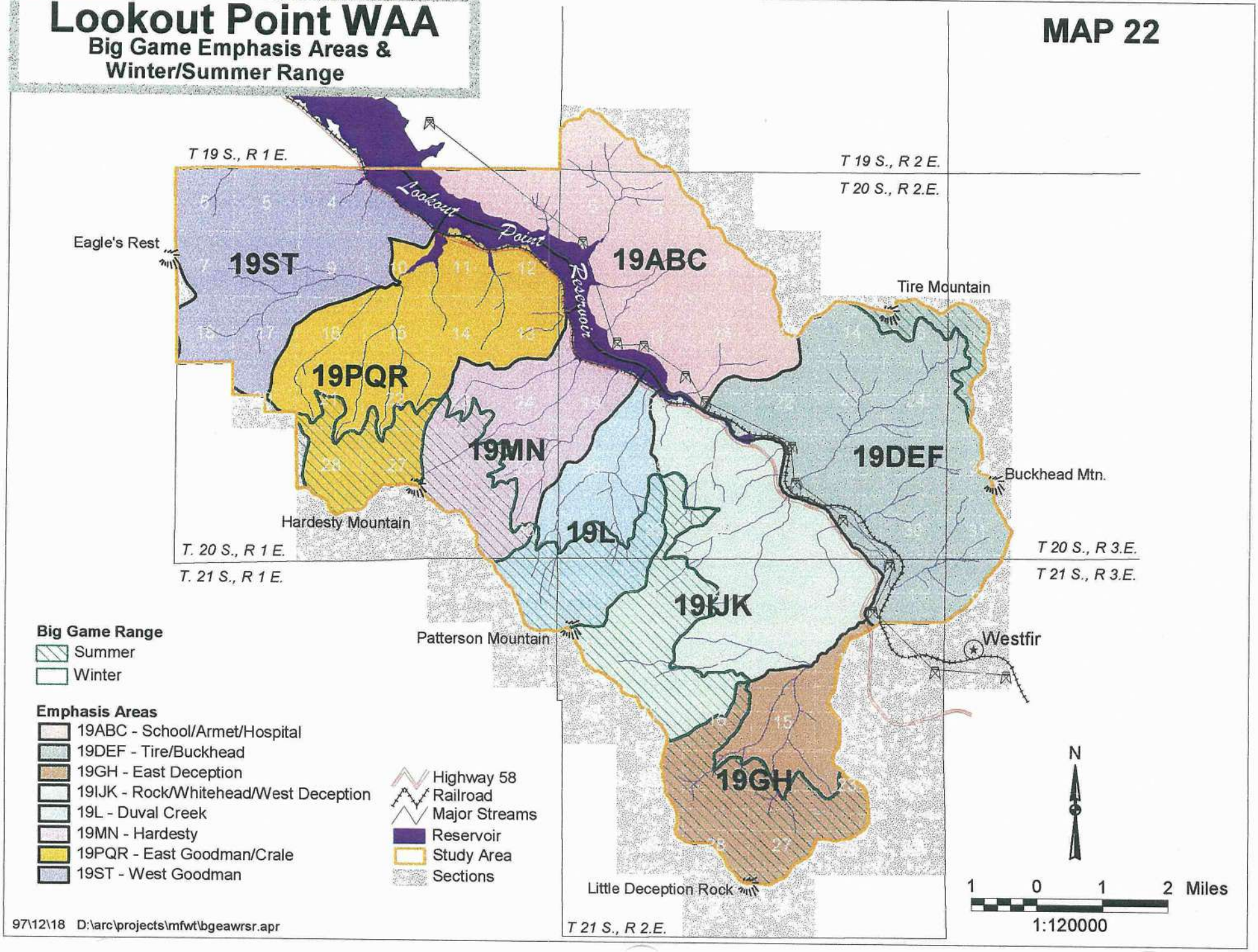
Lookout Point WAA

Big Game Emphasis Areas & Winter/Summer Range

MAP 22



Big Game Range

- Summer
- Winter

Emphasis Areas

- 19ABC - School/Armet/Hospital
- 19DEF - Tire/Buckhead
- 19GH - East Deception
- 19IJK - Rock/Whitehead/West Deception
- 19L - Duval Creek
- 19MN - Hardesty
- 19PQR - East Goodman/Crale
- 19ST - West Goodman

- Highway 58
- Railroad
- Major Streams
- Reservoir
- Study Area
- Sections

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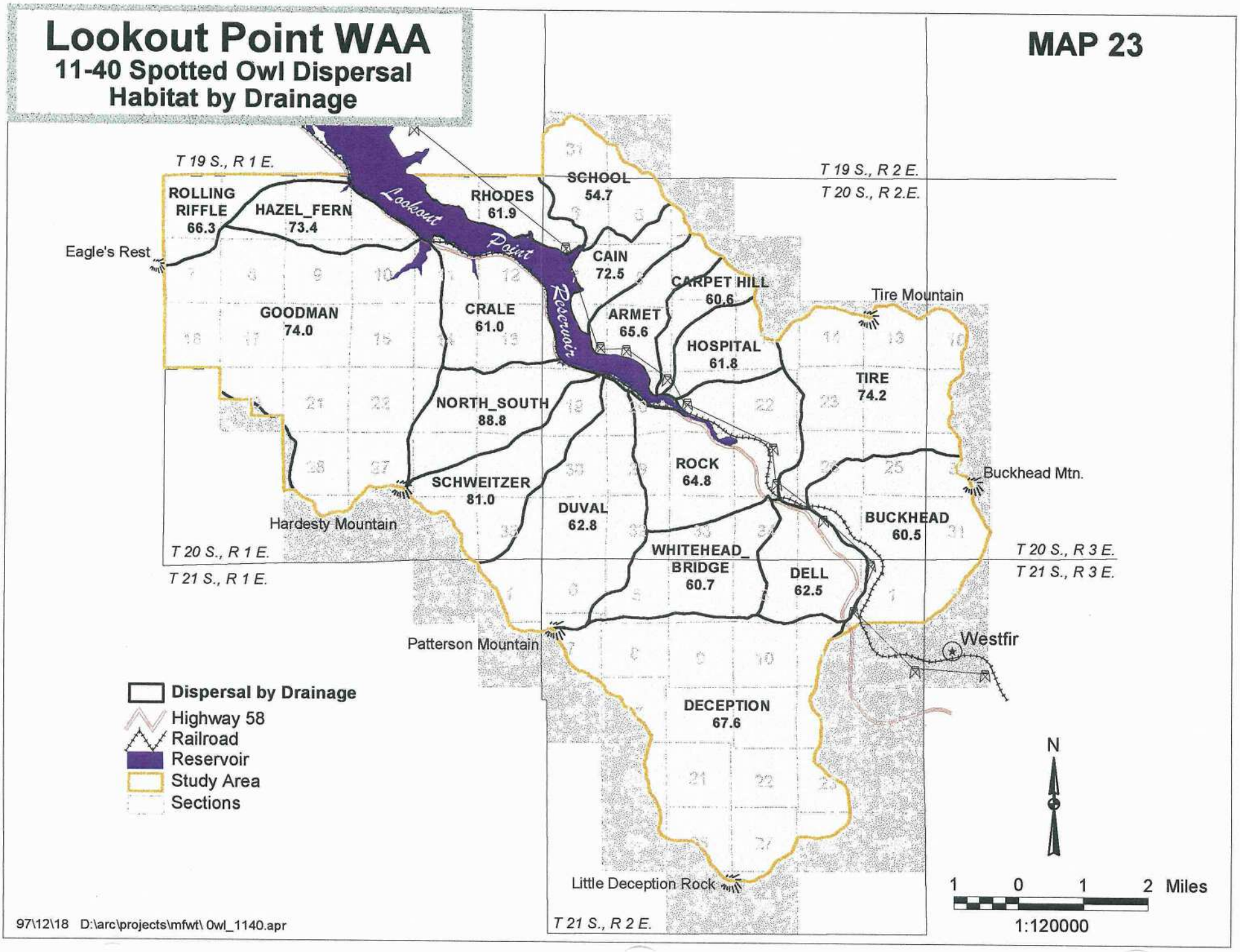
Lookout Point WAA
11-40 Spotted Owl Dispersal Habitat by Drainage

MAP 23



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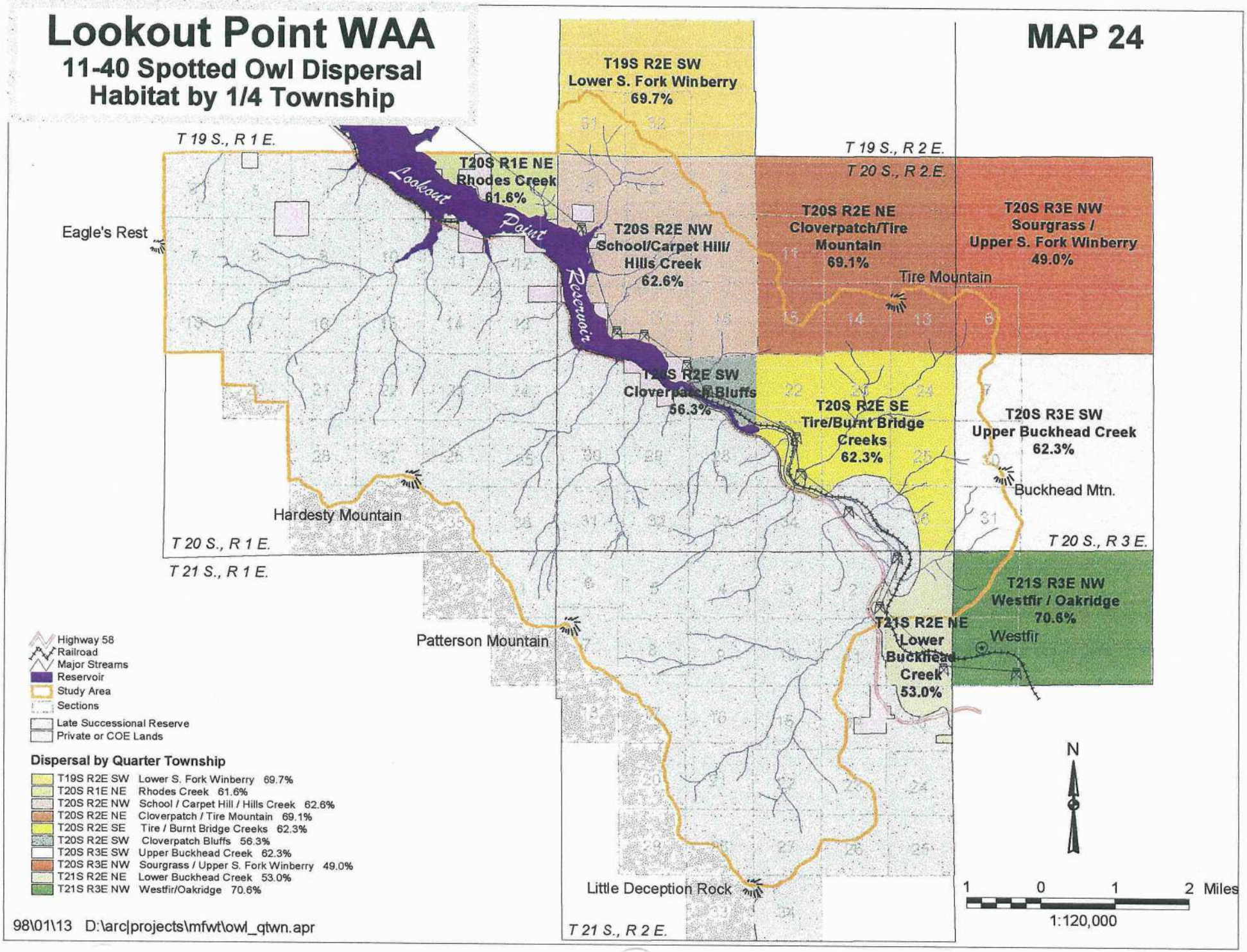
Lookout Point WAA

11-40 Spotted Owl Dispersal Habitat by 1/4 Township

MAP 24



Dispersal by Quarter Township

T19S R2E SW	Lower S. Fork Winberry	69.7%
T20S R1E NE	Rhodes Creek	61.6%
T20S R2E NW	School / Carpet Hill / Hills Creek	62.6%
T20S R2E NE	Cloverpatch / Tire Mountain	69.1%
T20S R2E SE	Tire / Burnt Bridge Creeks	62.3%
T20S R2E SW	Cloverpatch Bluffs	56.3%
T20S R3E SW	Upper Buckhead Creek	62.3%
T20S R3E NW	Sourgrass / Upper S. Fork Winberry	49.0%
T21S R2E NE	Lower Buckhead Creek	53.0%
T21S R3E NW	Westfir/Oakridge	70.6%

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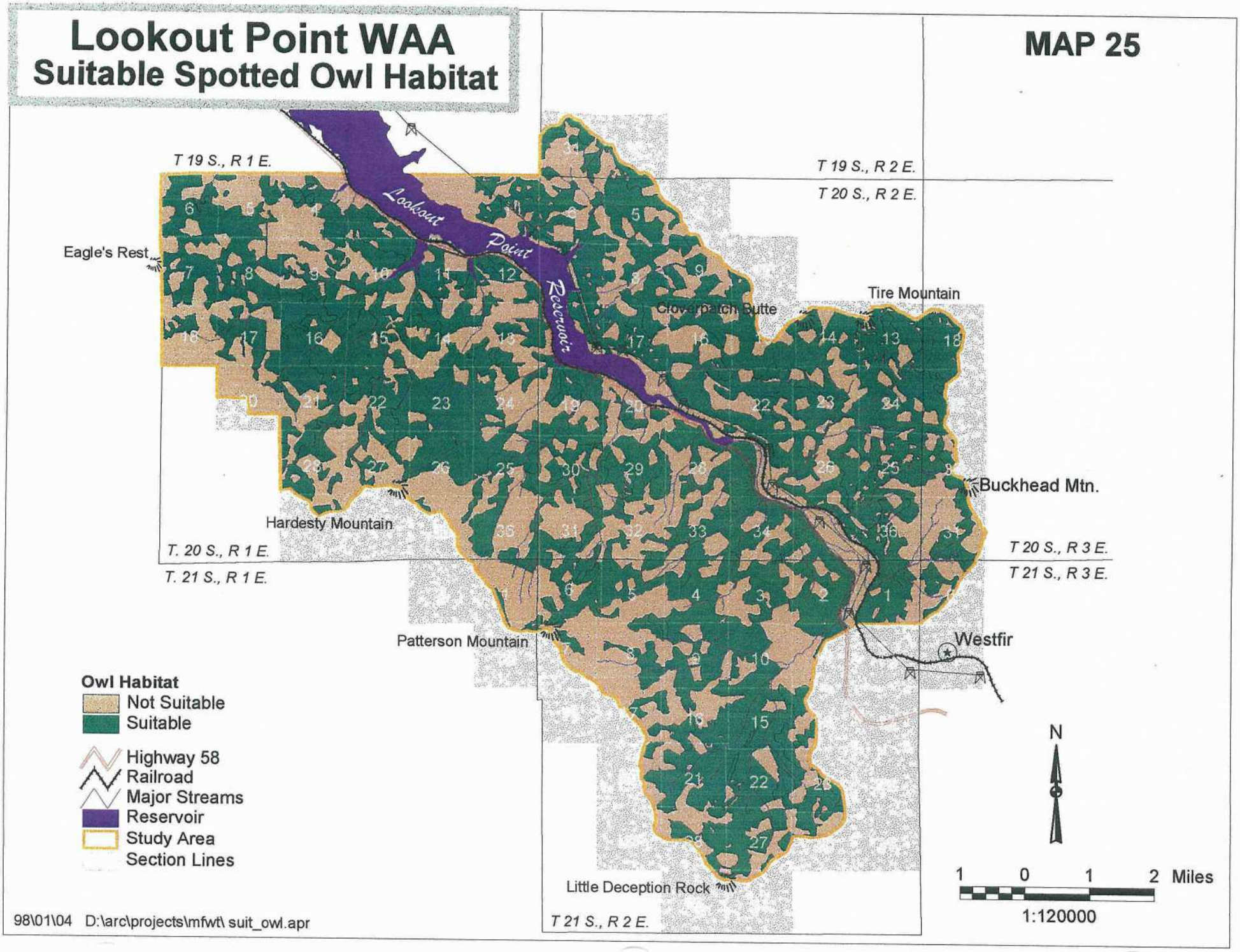
Lookout Point WAA
Suitable Spotted Owl Habitat

MAP 25



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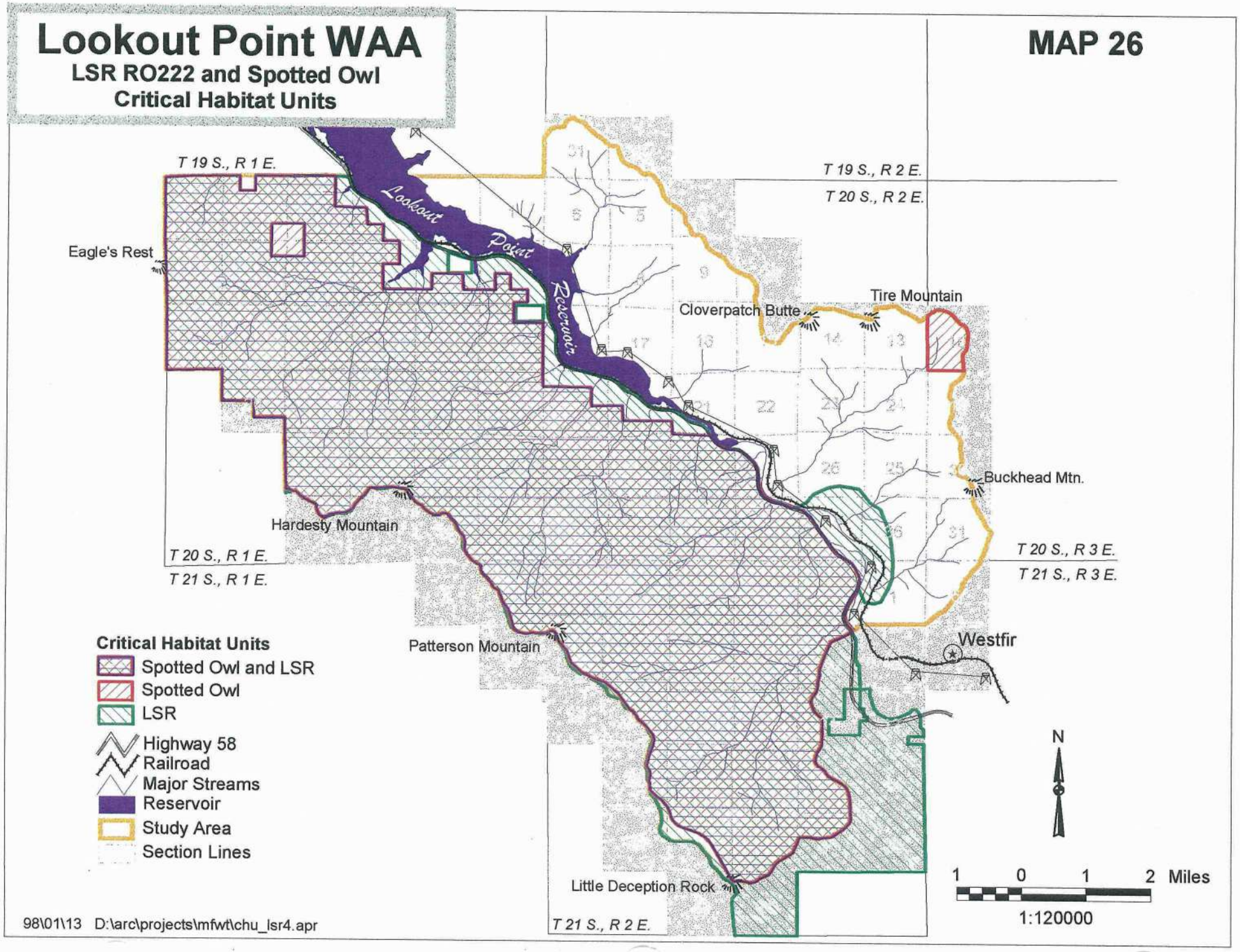
Lookout Point WAA

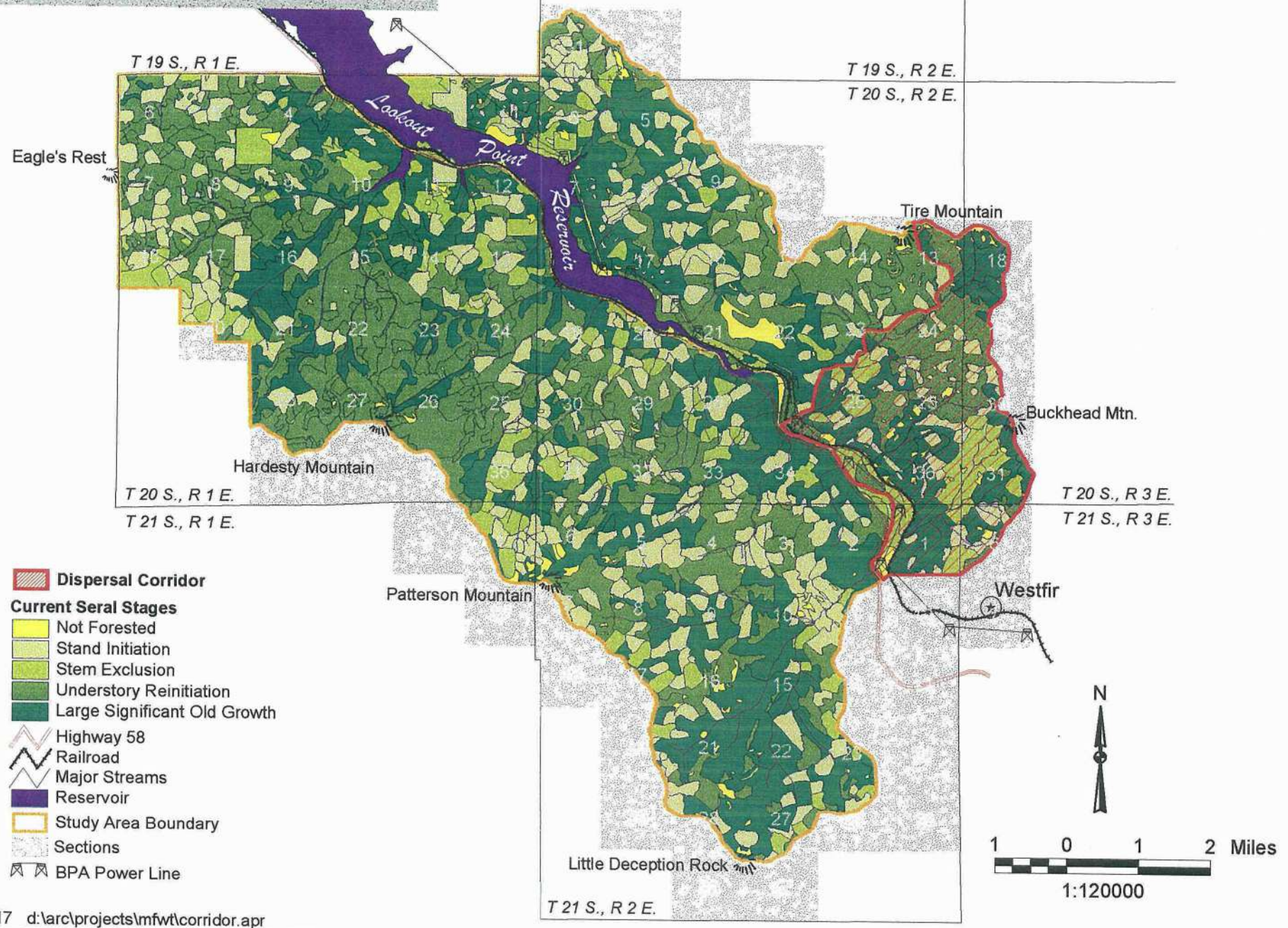
LSR RO222 and Spotted Owl Critical Habitat Units

MAP 26



Lookout Point WAA
Dispersal Corridor

MAP 27



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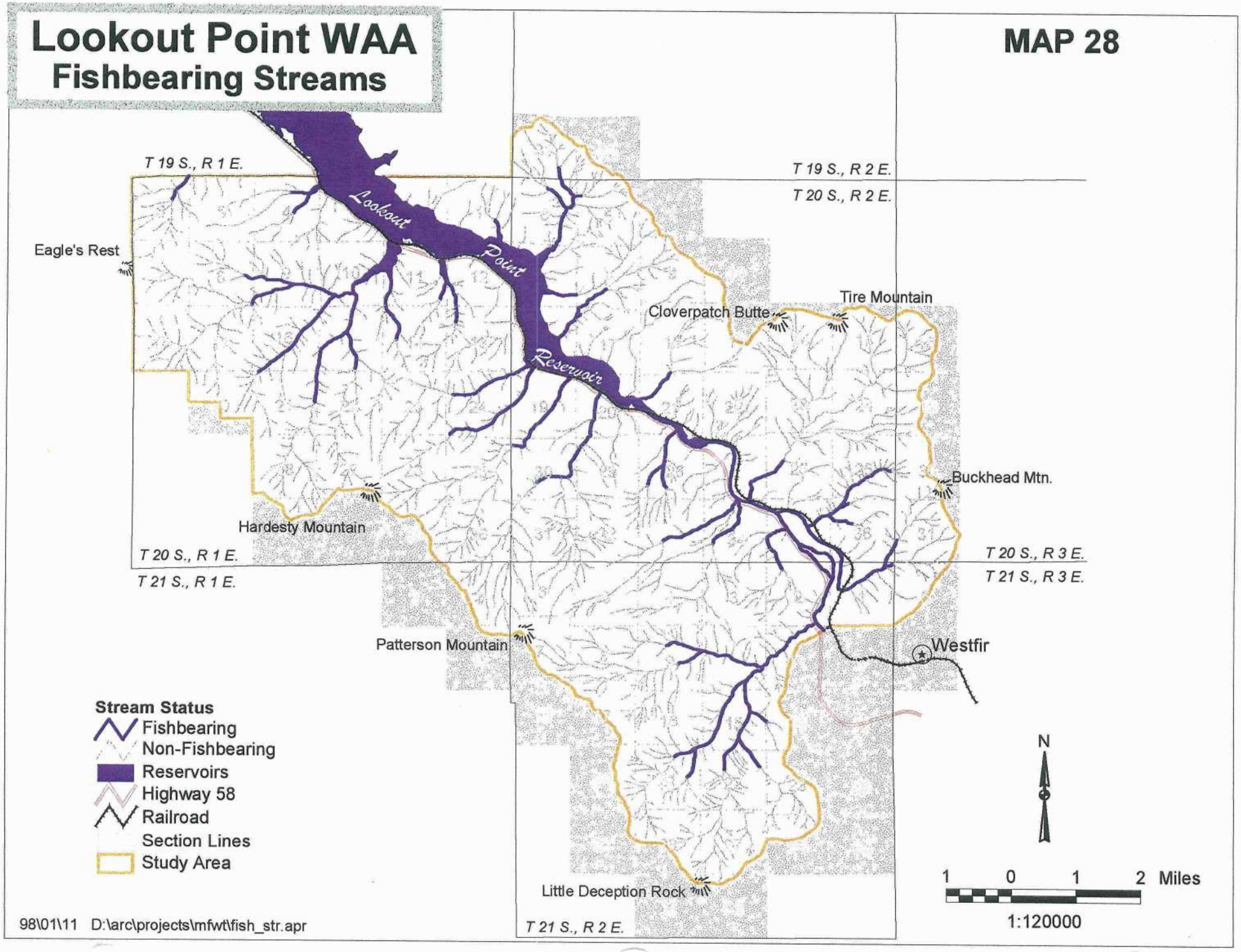
Lookout Point WAA
Fishbearing Streams

MAP 28



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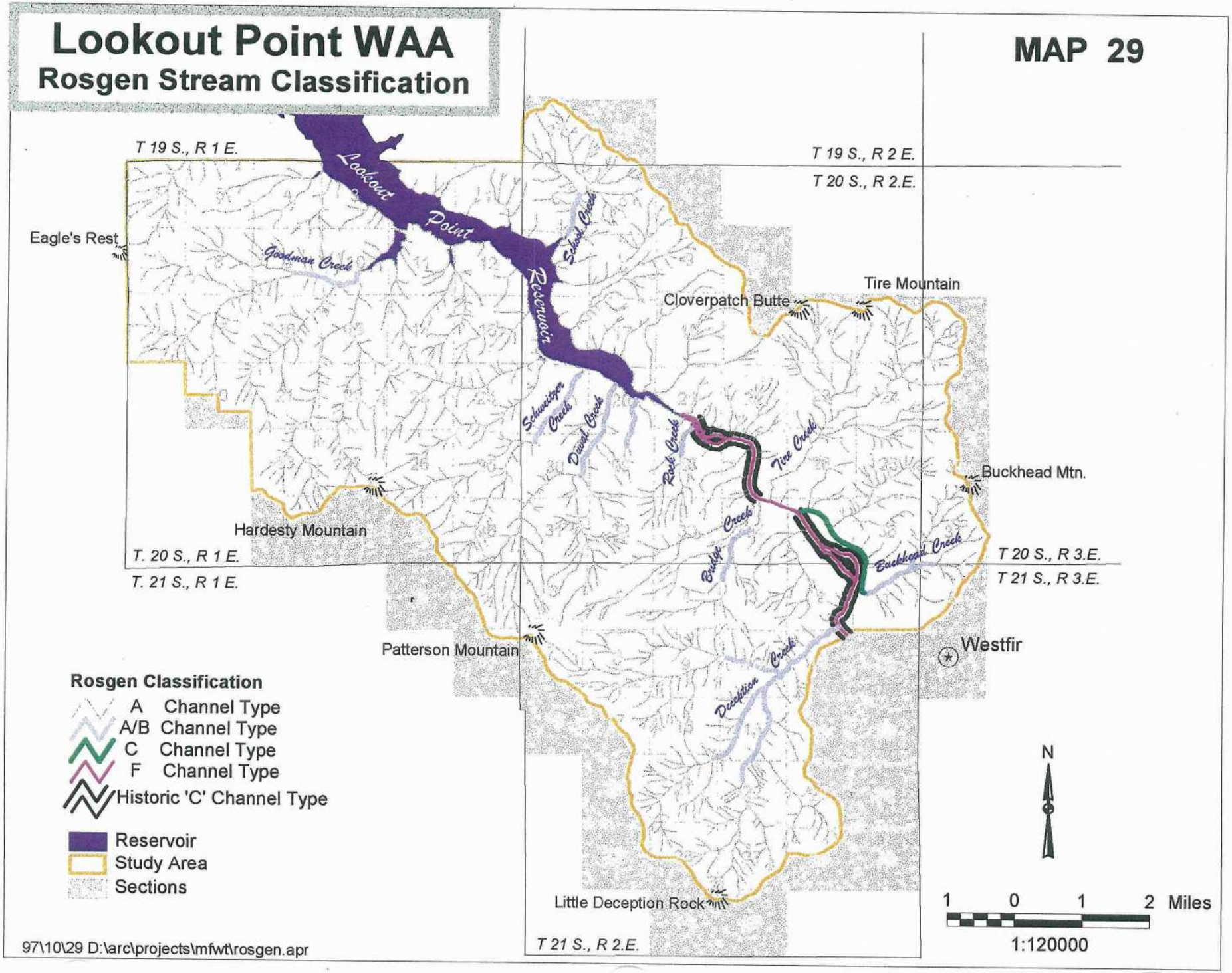
Lookout Point WAA
Rosgen Stream Classification

MAP 29



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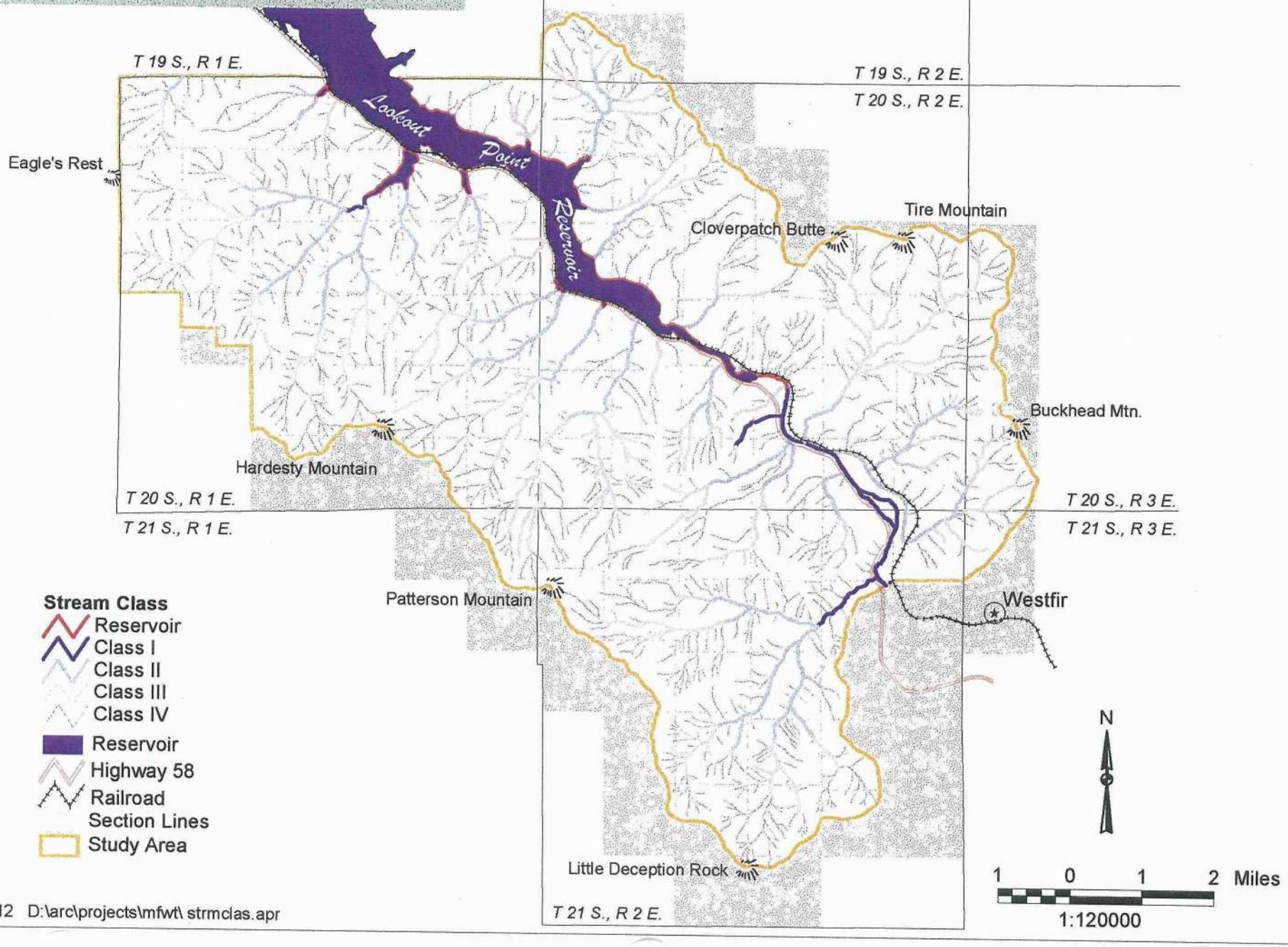
Lookout Point WAA
Stream Class

MAP 30



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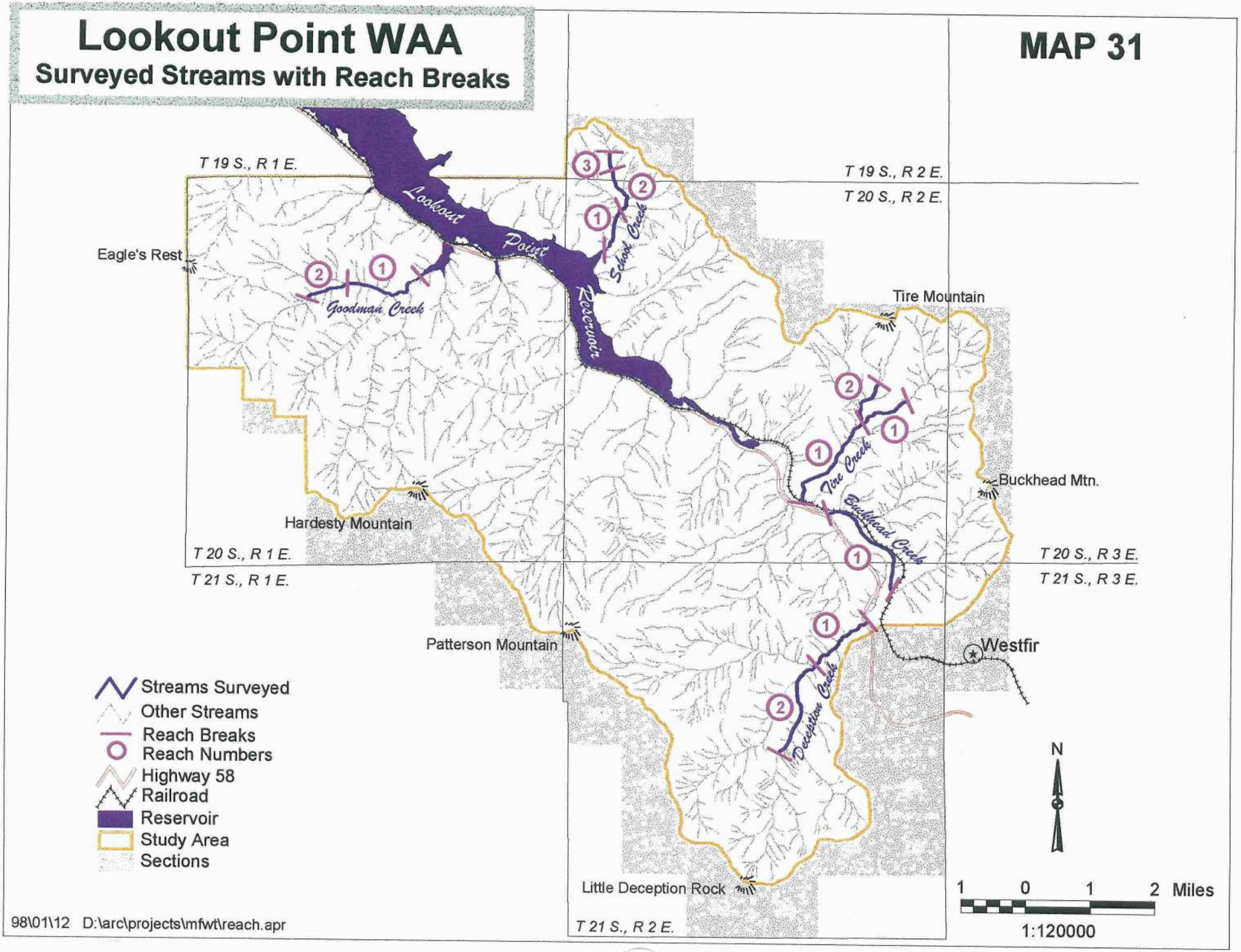
Lookout Point WAA
Surveyed Streams with Reach Breaks

MAP 31



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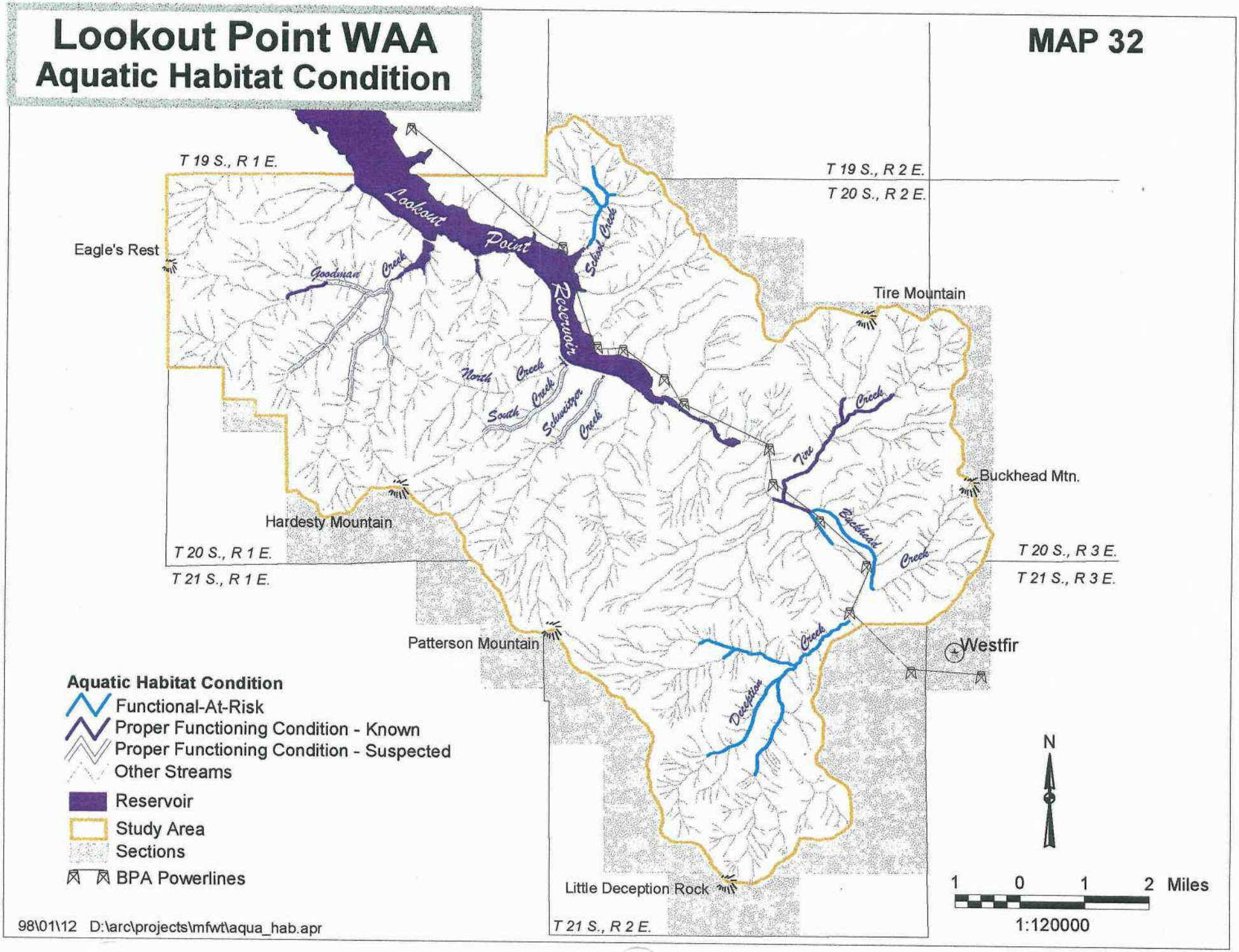
Lookout Point WAA
Aquatic Habitat Condition

MAP 32



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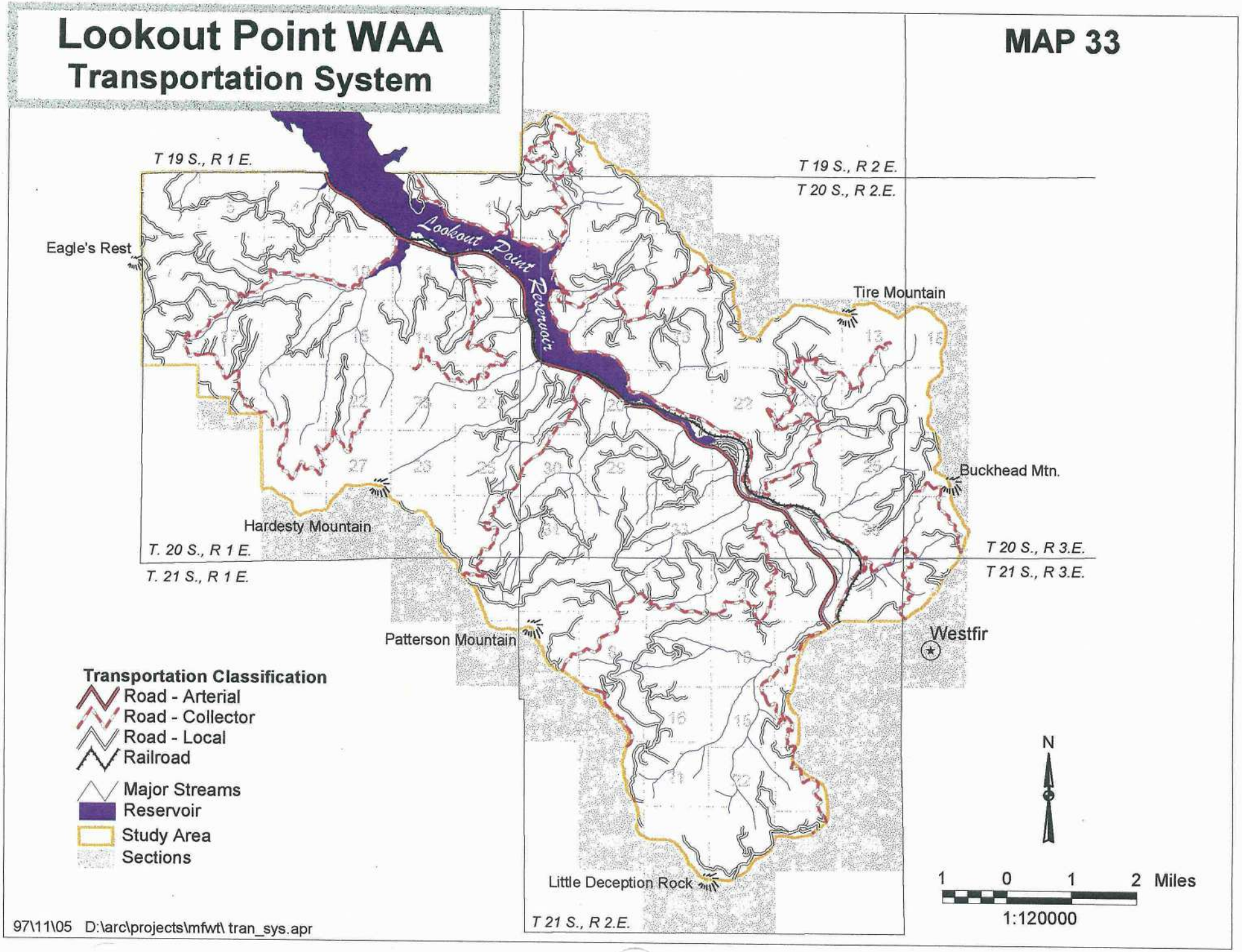
Lookout Point WAA
Transportation System

MAP 33



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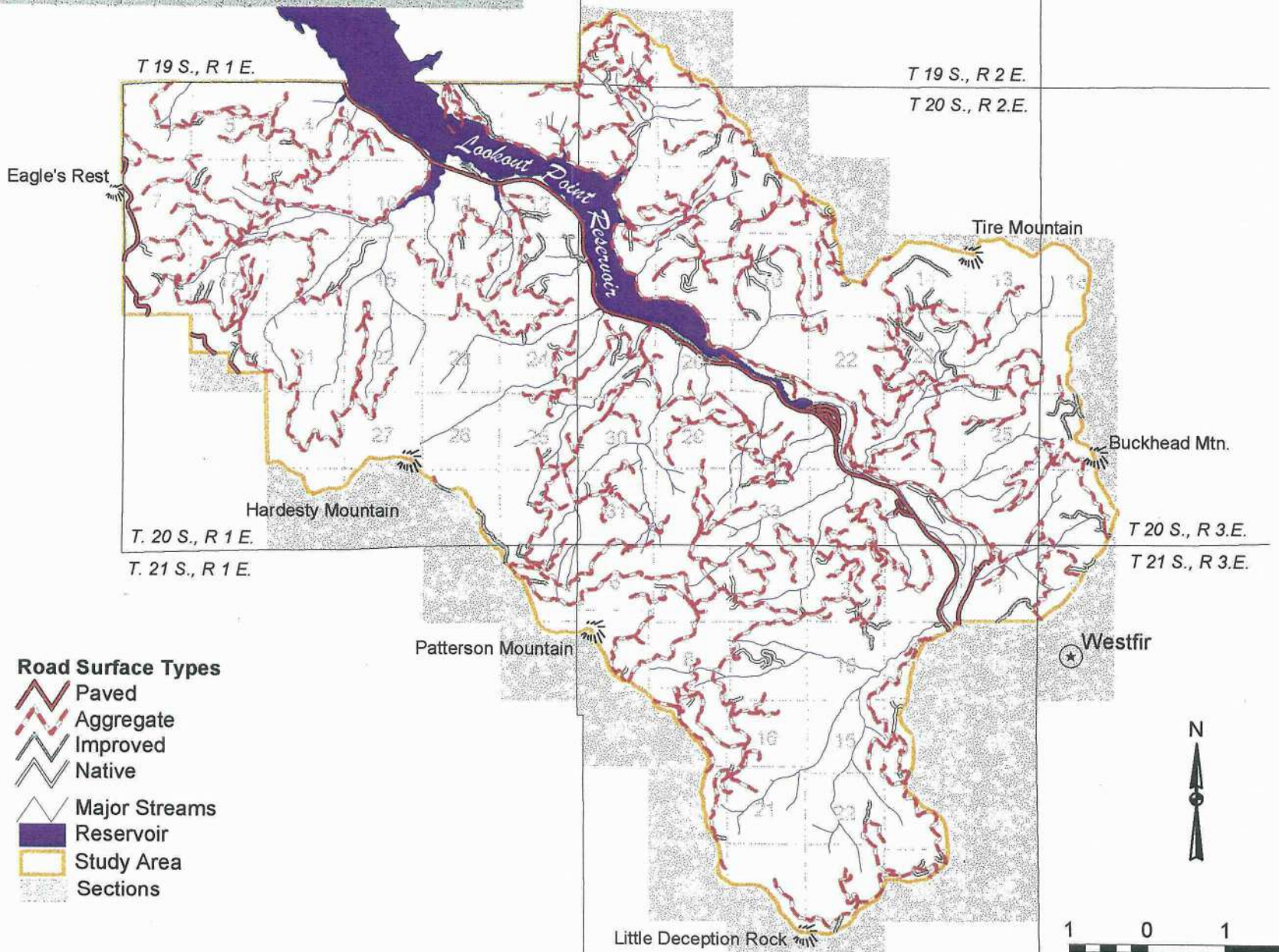
Lookout Point WAA
Road Surface Type

MAP 34



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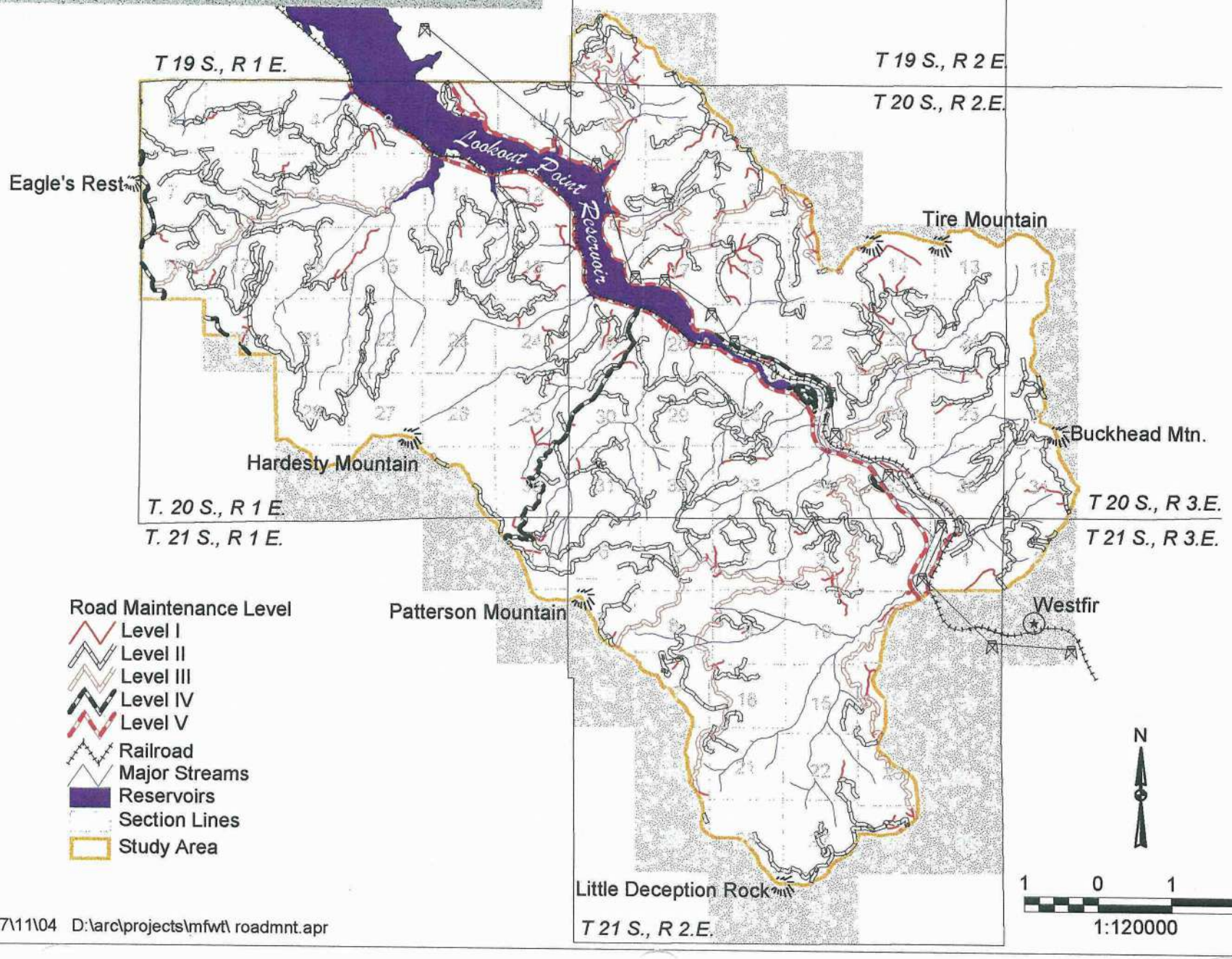
Lookout Point WAA
Road Maintenance Level

MAP 35



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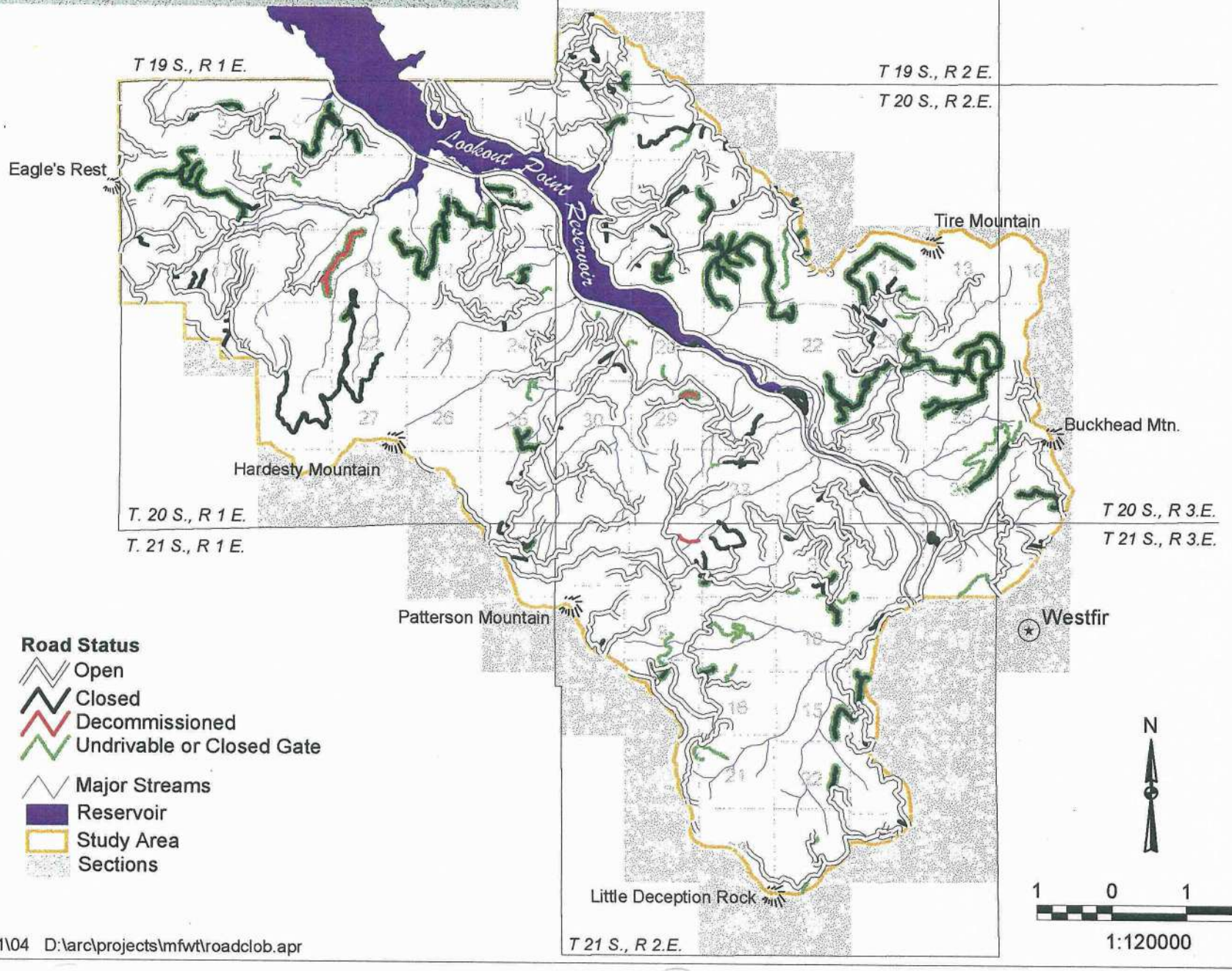
Lookout Point WAA

Closed & Decommissioned Roads

MAP 36



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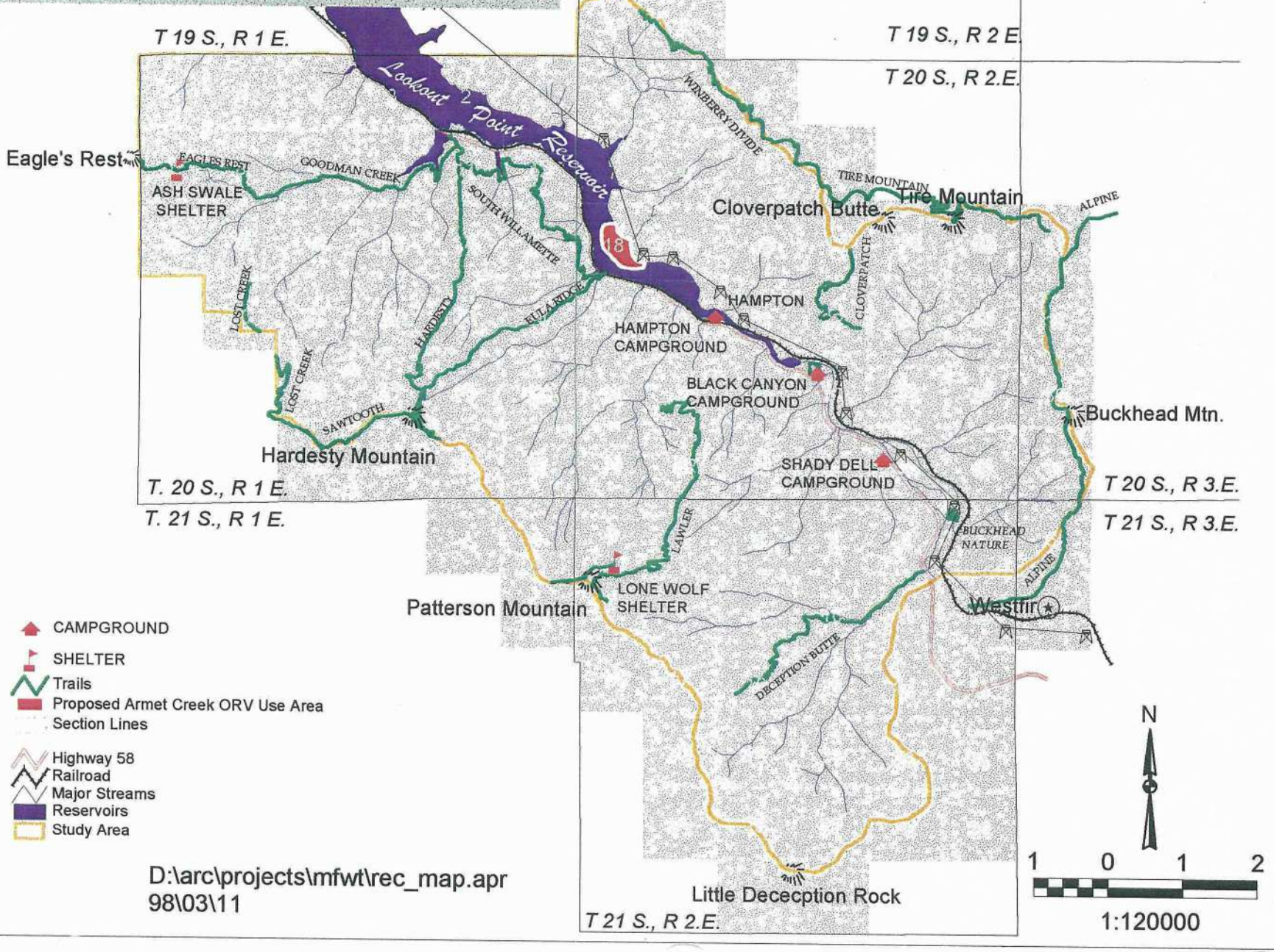
Lookout Point WAA
Recreation Features & Trails

MAP 37



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Appendix A: Acronyms

Acronym	What it means
100 Ac LSR	100 Acre Late Successional Reserve *(from ROD of NWFP)*
ATM	Access and Travel Management Plan
BLM	Bureau of Land Management (USDI) *(In Bibliography as* USDI Bureau of Land Management)
CCC	Civilian Conservation Corps
CCS	Cryptocrystalline Silicate (Archaeology)
cfs	cubic feet per second
COE	United States Army Corps of Engineers *(In Bibliography as* US Army Corps of Engineers)
CWD	Coarse Woody Debris
DBH	Diameter Breast Height
DEQ	Department of Environmental Quality
EIS	Environmental Impact Statement
FSEIS	Final Supplemental Environmental Impact Statement
GIS	Graphic Information Systems
GTR	Green Tree Retention
LRMP	Land and Resource Management Plan
LSOG	Late successional Old-Growth Seral Stage
LSR	Late-Successional Reserve
LWD	Large Woody Debris
LWM	Large Woody Material
MOU	Memorandum of Understanding
NWFP	Northwest Forest Plan
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
OHAB	Northern Spotted Owl Habitat Layer (GIS)
OHV	Off Highway Vehicle
ORV	Off Road Vehicles *(Users prefer term OHV)*

Acronym	What it means
PAOT	People At One Time
ROD	Record of Decision *(Northwest Forest Plan)*
S & G	Standards and Guidelines
SCORP	State Comprehensive Outdoor Recreation Plan
SE	Stem Exclusion Seral Stage
SI	Stand Initiation Seral Stage
SRI	Soil Resources Inventory *(Soils)*
UR	Understory Reinitiation Seral Stage
USDA	United States Department of Agriculture
USDI	United States Department of Interior
USFS	United States Forest Service (USDA) *(In Bibliography as* USDA Forest Service)
USFWS	United States Fish and Wildlife Service (USDI)
USGS	United States Geological Survey *(In Bibliography as* USDI Geological Survey)
WAA	Watershed Analysis Area

APPENDIX B: RECREATION

Recreation Carrying Capacity

Recreation carrying capacity is defined as the capacity of a recreation resource to provide opportunities for the long term, without significant degradation of the resource.

Social and resource capacity are two components of carrying capacity. *Social capacity* is the level of use a recreation area or resource receives, beyond which the recreational user's experience is less than reasonably satisfying. *Resource capacity* is the level of use a recreation resource receives, beyond which environmental deterioration is irreversible or degradation of the resource renders it unsuitable and unattractive for recreation use. When the social capacity is exceeded the result is overcrowding. Exceeding either portion of the carrying capacity constitutes overuse. Establishment of recreation resource carrying capacities is critical in recreation management and planning.

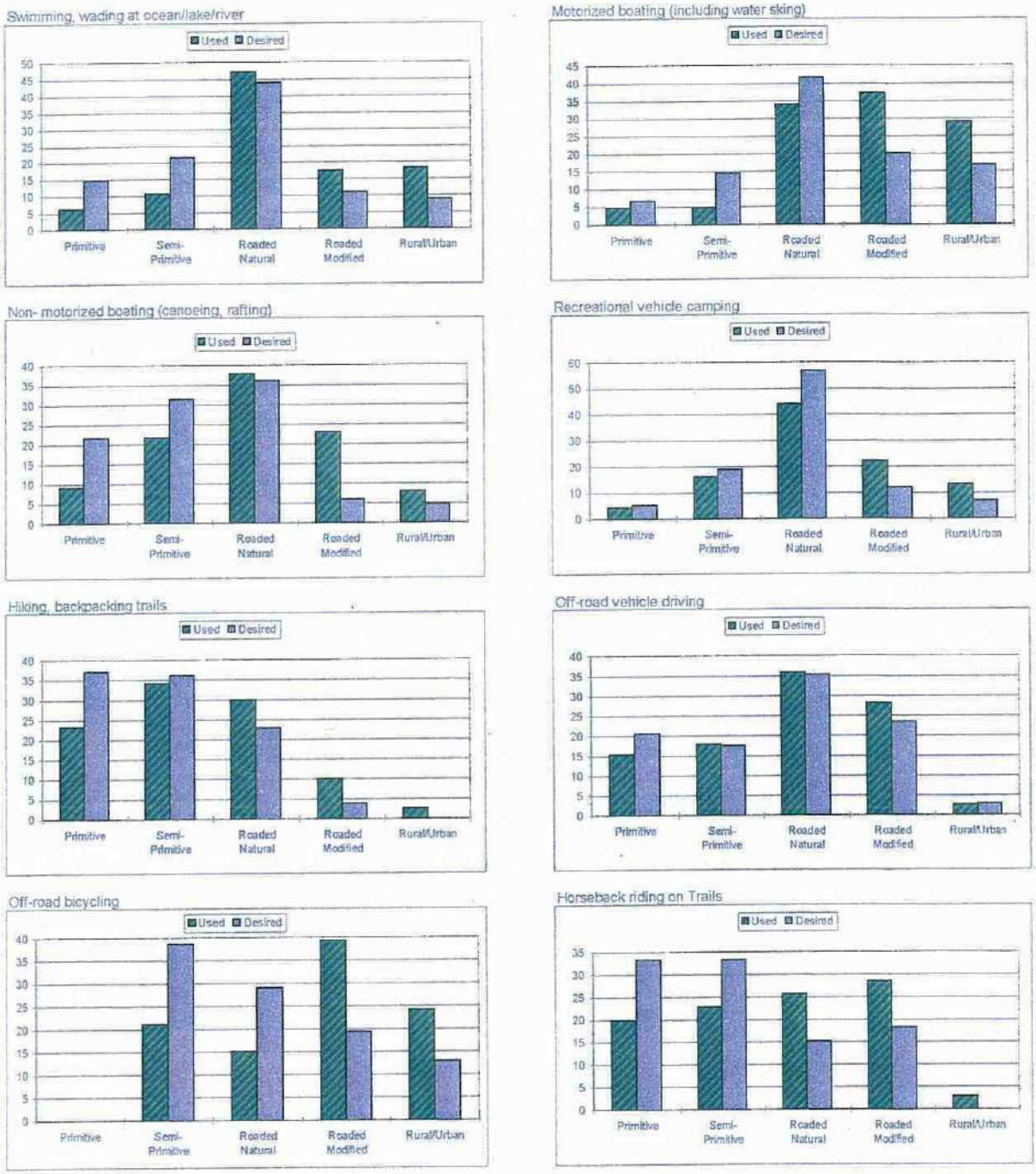
Statewide Setting Preference for Dispersed Activities

The graphs in Figure 19 compare activities in which people were actually involved to those they desired to participate in. These figures suggest a trend towards increased recreation use in all settings, especially primitive, semi-primitive and roaded natural.

During the four years since the Oregon SCORP was completed, the WAA has experienced a moderate increase in non-motorized boating, OHV driving, and hiking. Off-road bicycle use has increased greatly.

Recreation continues to climb despite increased camping costs and new (1997) user fees for parking at trail heads. This upward trend is expected to continue.

Figure 19. Statewide Setting Preference for Dispersed Activities



APPENDIX C: WILDLIFE

Table 38. USFWS Threatened, Endangered, Sensitive and Category 1 and 2 species. ROD Survey and Manage (C-3) Species. Appendix J2 Species and Other Species of Concern.

Species (*scientific name*)	Regional Foresters 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*)	S	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 gentilus*)		C2		
Greater sandhill crane (*Grus canadensis*)	S			
Common merganser (*Mergus merganser*)				❖

Table 37. USFWS Threatened, Endangered, Sensitive and Category 1 and 2 species. ROD Survey and Manage (C-3) Species. Appendix J2 Species and Other Species of Concern.

Species (*scientific name*)	Regional Foresters Sensitive Species List	Federal Register Notice of Review	ROD Table C-3 Survey and Manage Species (√)	Appendix J2 Species of Concern (√√)
Great gray owl *(Strix nebulosa nebulosa)* **ROD species of concern w/ protect. buffer**				
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*)				❖
Invertebrates				
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		

Table 37. USFWS Threatened, Endangered, Sensitive and Category 1 and 2 species. ROD Survey and Manage (C-3) Species. Appendix J2 Species and Other Species of Concern.

Species (scientific name)	Regional Foresters Sensitive Species List	Federal Register Notice of Review	ROD Table C-3 Survey and Manage Species (√)	Appendix J2 Species of Concern (√√)
Tombstone Prairie oligophlebodes caddisfly *(Oligophlebodes mostbento)*	S	C2		
One-spot rhyacophilan caddisfly *(Rhyacophila unipunctata)*	S	C2		
Molluscs				
Prophysaon coeruleum			☆	❖
Prophysaon dubium			☆	❖

Total = 40 species

Legend:

(S) = Species identified on the Regional Forester Sensitive species list

☆ = Survey and manage species identified in the ROD under table C-3

❖ = Species of concern recognized in Appendix J2 of the ROD

Federal Register Notice of review classifications:

(E) = Endangered (T) = Threatened

(C1) = Category 1: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.

(C2) = Category 2: Taxa for which existing information indicates may warrant listing, but for which substantial biological information to support a proposed rule is lacking.

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