A WATERSHED ANALYSIS and MANAGEMENT PLAN for BLM LANDS Within the Ginger Springs Recharge Area

BUTTE FALLS RESOURCE AREA

Medford District
Bureau of Land Management

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Town of Butte Falls, Ore.

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"Conservation is a state of harmony between men and land.
By land it is meant all of the things on, over, or in the earth.
Harmony with land is like harmony with a friend;
you cannot cherish his right hand and chop off his left.
That is to say, you cannot love game and hate predators;
you cannot conserve the waters and waste the range;
you cannot build the forest and mine the farm.
The land is one organism. Its parts, like our own parts,
compete with each other and cooperate with each other.
The competitions are as much a part of the inner workings
as the cooperations.
You can regulate them -- cautiously --
but you cannot abolish them."

Aldo Leopold

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A WATERSHED ANALYSIS and MANAGEMENT PLAN for BLM Lands Within the Ginger Springs Recharge Area

1.0 INTRODUCTION

1.1 PURPOSE

Watershed analyses are conducted in order to shift the focus from species and sites to the ecosystems that support them and to help understand the consequences of management actions before implementation of a plan. The watershed scale is selected because watersheds traditionally have a well-defined land area with a set of unique features, a system of recurring processes, and a collection of dependent plants and animals. The analysis process is issue driven and is incremental in that it can be amended as more information becomes available. It establishes the parameters from which recommendations are made. This analysis and the associated management recommendations however are not management decisions. Land management decisions are made in other project specific assessment documents (EA or EIS).

This watershed analysis will look at the Ginger Springs municipal watershed. This watershed is not defined by traditional landform patterns, although many of its processes are quite similar. This analysis area is geologic in form and defines a “recharge area”. This surface water catchment area intercepts, infiltrates and transports precipitation through the soil mantle and along impermeable geologic constraints and bedrock into Ginger Springs. Large concrete spring boxes collect the underground water for delivery to the Town’s reservoirs. “Recharge area” and “watershed” will often be used interchangeably in this document.

The objective of this analysis is to look at a "landscape", a sustainable unit, and describe its ecosystem structures and functions. An understanding of landscape level processes and interactions is essential to arrive at ecologically sound management planning. Answers do not always come easily and often require extensive resource surveys, creative thinking, and trial and error.

The principal purpose in managing on a landscape level is to provide for and sustain ecological health. A sustainable system has the ability to undergo change and recover by responding to and maintaining interactions. This is accomplished through the restoration or maintenance of diversity and complexity within an ecosystem.

Landscape analysis and design processes used in this analysis are based on the methodology outlined in *Ecosystem Analysis at the Watershed Scale, Federal Guide for Watershed Analysis (Ver.2.2).* This process divides the analysis into six steps: characterization of the watershed, identification of issues and key questions, description of current conditions, description of reference conditions, synthesis and interpretation of information, and recommendations. The recommendations will be developed into a management plan for the Ginger Springs recharge area.

The overriding focus of this analysis and management plan will be to set forth a process of understanding how the Ginger Springs recharge area derives its water and how the

land can be managed to protect the quantity and quality of water delivered to the spring source, assuring the Town of Butte Falls a safe and reliable supply of water.

1.2 WATERSHED LOCATION

The Ginger Springs Municipal Watershed is a geologically defined watershed located about 20 miles northeast of Medford, OR. (*Map 1*) Elevations in this watershed range from 2,950 feet at the Ginger Springs collection box to more than 4,200 feet on Salt Creek ridge. The area lies in Township 35 South, Range 2 East, Willamette Meridian, Jackson County.

This analysis and management plan is developed for the Ginger Springs recharge area (*Map 2*) that was identified by Ferrero Geologic (Ashland, OR) and is defined by geologic interfaces rather than by traditional topographic features (ridges and drainages). This geologic watershed boundary extends beyond ridgelines, as seen most significantly along its southern boundary where it drops into the Salt Creek watershed. Tilting, gently to the northeast, impermeable bedrock of the Old High Cascade formation intercepts rainfall percolating through the recharge area to "Ginger Springs". The Ferrero report details a "water budget" that accounts for an average annual precipitation that becomes spring discharge, stream runoff, and evapotranspiration (pp.9-10).

1.3 OWNERSHIP

The majority of the land in the Ginger Springs watershed is owned and managed as private, industrial forest land. (*Map 2*) As such, its history of logging has been one of varying degrees of harvesting, although the area most immediately surrounding and above the actual Ginger Springs (SW¼ NW¼ Section 14, T35S, R2E) has been lightly, but regularly, harvested. Recently, a change in the land ownership patterns was made when the historic long-term owner, Medite Corporation (MEDCO), divested their ownership to four major timber companies. The Ginger Springs recharge area, in addition to BLM, is owned and managed by four separate industrial timberland owners.

Table I
LAND OWNERSHIP

	BLM	Indian Hill	Superior Lumber	Lone Rock	KOGAP	Town of Butte Falls	Total
Ginger Springs Watershed (acres)	1355.2	1479.5	831.9	285.8	37.4	1.1	3990.9
Percent of Ginger Springs Watershed	34	37	21	7	1	.00003	100

The Bureau of Land Management's (BLM) ownership comprises approximately 34% of the area scattered throughout the watershed in various forms of partial or complete sections. (*Table I*)

1.4 BACKGROUND

The Town of Butte Falls lies approximately 30 miles northeast of Medford on the

forested edge of the southern cascades. The Ginger Springs municipal watershed serves this small (pop:410), rural community, which was incorporated in 1911.

The watershed itself has gone through an evolution of management through the years by its various owners. Its earlier days, due to the steep slopes, saw little timber harvesting activity. As the years went by and roads were built, selective harvesting began to occur throughout the area. Limited use of clearcutting was tried as land managers explored various methods of timber harvesting. The general emphasis though was always to protect the area immediately around Ginger Springs. In the mid-1980s a change in the private timberland owners led to an acceleration of harvesting throughout the watershed, but still with an eye to protecting the integrity of Ginger Springs. During this period of more intensive harvesting, conflicts over the use of herbicides in the watershed by the timberland owner developed with the Butte Falls town government. Periodic chemical analysis of the water has not revealed the presence of residual herbicides in the municipal water supply. Nevertheless, the town remains concerned about timber harvesting practices and the use of herbicides in the recharge area. Private timberland ownership, which constitutes the majority of the land base (66%), made another major shift in the winter of 1996 leaving the local citizens cautiously reserved in their outlook of the future management practices by the new owners.

Ginger Springs was established in 1914 by the Oregon State Watermaster with water rights to use 1.5cfs for domestic purposes. The Town's infrastructure system has gone through much evolution since it was originally installed with an open reservoir and wire-wrapped wooden pipes. It is now an aging system of leaking sixty-year old steel pipes and a series of three covered, concrete reservoirs in need of replacement as determined by the *Ginger Springs Water System and Source Master Plan*.

The Town is pursuing funding opportunities through grants and loans that will replace this water delivery infrastructure system. The system would be upgraded in pipe size, elimination of dead-end lines, installation of water meters, additional fire hydrants, and a new reservoir for additional storage capacity.

Consistent with the Town's Strategic Plan, the community is also planning to construct a water bottling plant that will bottle surplus water for the retail market.

The Town that was built in 1906 to accommodate the developing timber industry at the turn of the century intends to usher in the next century with its most abundant resource, *WATER*.

2.0 PLANNING AND OBJECTIVES

2.1 RELATIONSHIP TO APPROVED RMP AND SEIS RODs

The Ginger Springs Watershed Analysis and Management Plan outlines a strategy that is in conformance with the Record of Decision (ROD) for the Resource Management Plan (RMP) and the ROD for the Northwest Forest Plan. All BLM managed lands in the Ginger Springs watershed are classified as either Northern General Forest Management Area (NGFMA) Matrix lands (905.3 acres), Connectivity Block (274.7 acres), Riparian Reserves (114.0 acres), or Late-Successional Reserves (LSR) (61.2 acres) (*Table II*). The RMP-ROD defines Matrix lands as those federal lands outside of reserves and special management areas that are available for timber harvest at varying levels (page 38-39). The RMP-ROD additionally provides for silvicultural practices that control stocking, reestablish and manage

timber stands, establish and manage desired non-conifer vegetation, and acquire desired vegetation characteristics within Riparian Reserves needed to attain Aquatic Conservation Strategy (ACS) objectives (page 195). This document is consistent with the objectives of the ACS and Riparian Reserve management direction.

Table II
BLM LAND ALLOCATION

Matrix	Connectivity Block	Riparian Reserves	Late-Successional Reserves	Total
905.3 acres	274.7 acres	114.0 acres	61.2 acres	1355.2 acres
67%	20%	8%	5%	100%

The Ginger Springs recharge area was designated as a "community watershed" in the Medford District RMP-ROD (pg. 42) with direction to prepare a watershed management plan for BLM lands in conjunction with the Town of Butte Falls. The overriding goal through this effort would be to maintain water quality by appropriate federal land management practices rather than by the treatment of water to reclaim its quality components. This, in the long term, is the most effective method of assuring delivery of high quality municipal water.

The development of this plan is consistent with the management objectives of Socioeconomic Conditions (pg. 80-81) of the RMP-ROD by the allocation of special area designations. This designation would "help rural, resource-based communities develop and implement alternative economic strategies as a partial substitute for declining timber-based economies." The completion of a BLM watershed management plan will be a crucial step in establishing appropriate water quality land management practices for the Ginger Springs recharge area. The Ten Year Vision Statement in the Butte Falls Strategic Plan (1991) sees "its own water bottling operation as a community business, based on the principles of conservation and beneficial use." A comprehensive BLM management plan, with a focus on maintenance and restoration of key impact zones, will be a significant feature to the viability of the Butte Falls vision.

Although the Town owns none of the land in its municipal watershed, the Town's primary objective should be to facilitate and encourage management decisions of all the forest landowners that will maintain the quality of the water delivered to Ginger Springs.

2.2 MANAGEMENT PLAN OBJECTIVES AND RATIONALE

The primary objective of the Ginger Springs Watershed Management Plan is to provide guidance for the management of Bureau of Land Management lands inside the boundary of the Ginger Springs recharge area. Although the overall ownership of the watershed by the BLM is small (34%) and scattered, the consequences of agency actions could be significant in combination with the actions of neighboring private timberland owners. The primary focus of this management plan will be to identify the significant water quality maintenance components and develop a plan that manages and restores, as appropriate, those features that would assure high water quality to the residents of Butte Falls.

Therefore, the objectives of this plan will be to: a) pursue a timber harvesting plan that is consistent with maintaining a healthy stand of timber, providing the best possible canopy

cover through the stand's growth cycle; b) develop a silvicultural plan for young stands that will encourage their growth to achieve a mature state as rapidly as possible, without the use of chemicals; c) maintain timber stands in a condition that does not encourage the development of catastrophic fire; d) meet minimum snag and coarse woody debris requirements; e) maintain long-term soil productivity; f) meet road management objectives to minimize erosion and sedimentation; and g) meet ROD Standards and Guidelines to ensure protection of Survey & Manage and Protection Buffer Species.

By assuring the overall health of the forest in the Ginger Springs recharge area, the BLM will be helping to assure the overall quality/quantity of water that will, in the long run, provide for a social, physical, and economic health of the Town of Butte Falls.

2.3 RELATED MANAGEMENT OBJECTIVES/PROGRAMS

A brief analysis of the Ginger Springs municipal watershed was completed within the *Central Big Butte Watershed Analysis* by the Butte Falls Resource Area in June 1995. The *Little Butte Creek Watershed Analysis* was completed by an interagency team of BLM and Forest Service staff in November 1997 covering portions of the upper Salt Creek ridge. There was no acknowledgment of the Ginger Springs recharge area in this document.

This analysis and plan was developed in reference with two reports that were prepared for the Town of Butte Falls: *Ginger Springs Geohydrologic Study (Phase IA)* completed in July 1991 by Ferrero Geologic, Inc. (Ashland, OR) and the *Ginger Springs Water System and Source Master Plan* completed by H.G.E., Inc. Engineers and Planners (Coos Bay, OR) in March 1993. Management goals for Managed Watershed were reviewed in the Rogue River National Forest's *Land and Resource Management Plan*, 1990 (pp 4-275 through 290). *Oregon Wellhead Protection Program Guidance Manual* (DEQ & OHD) was reviewed for compatibility.

3.0 WATERSHED ANALYSIS

3.1 CHARACTERIZATION OF THE WATERSHED (Step 1)

Identify the dominant physical, biological, and human processes or features of the watershed that affect ecosystem functions or conditions. The relationship between these ecosystem elements and those occurring in the river basin is established. Identify the most important land allocations, plan objectives and regulatory constraints that influence resource management in the watershed. The watershed context is used to identify the primary ecosystem elements needing more detailed analysis in subsequent steps.

The Ginger Springs analysis area is located northeast of Medford in the Rogue River Basin and the Western Cascade Geological Province. This analysis area is a geologic area inside (primarily) the fifth field Big Butte Creek Watershed with geologic interfaces extending into the neighboring Little Butte Creek watershed (*Map 3*). The analysis area covers approximately 3,991 acres, located in Township 35 South, Range 2 East of the Butte Falls Resource Area, Medford District, Bureau of Land Management.

The watershed topography is typically flat to gently sloping terrain with broad low gradient drainage ways. Side slopes are typically less than 35 percent but can approach 50 percent in some areas.

The majority of the Ginger Springs recharge area lies within the Transient Snow Zone (TSZ), a zone ranging in elevation from 3,500 - 4,500 feet where rain on accumulated snow pack is most likely to occur contributing to steambank flooding and high turbidity conditions (*Map 4*). Eighty-five percent of the watershed lies in the TSZ (3,394 of the 3,991 acres). Thirty-three percent of the TSZ occurs on BLM lands (1,150 acres).

The geology of the recharge area is characterized by volcanic rocks, primarily basalt and andesite, of the Western Cascade Geologic Province. These Western Cascade volcanics were tectonically tilted to the northeast and overlain by volcanics of the Eastern Cascade Province. Remains of the younger Eastern Cascade province volcanics are evident as remnant intercanyon flows and on ridges.

The geologic boundary of the recharge area is defined by the contact between Tertiary pyroclastic rocks and Tertiary basalt of the Western Cascades. The pyroclastic rocks form an impermeable layer that concentrates the groundwater flow to Ginger Springs. The stratigraphically lower, low permeability, pyroclastic unit concentrates and carries groundwater in ancient buried stream channels. Springs occur where the modern drainages cut into these old stream channels, or at joints or fractures that intersect the old channels. Three zones of influence were determined by the Ferrero study (*Map 5*). A "Zone of Influence" is an area, due to a geologic contact between the older and newer geologic formations, that may provide an opportunity for surface disturbances or contamination to influence subsurface groundwater. One high influence zone occurs directly above the Ginger Springs collection boxes on private land (144 acres). Moderate influence zones were identified near modern stream channels (902 acres - 230 acres on BLM). The remainder of the watershed was assessed as low influence (2945 acres - 1125 acres on BLM) (*Ferrero*).

The climate of the area is generally warm and dry with typically cool, wet winters and hot, dry summers. Summer temperatures range from the high 70s to the low 90s. Occasional daytime temperatures in the summer may reach 100E Fahrenheit (F). Winter lows drop regularly to 10E to 20E F. Annual precipitation averages 35 inches. Most of the precipitation occurs between mid-October to mid-April as rain or snow. The winter snow zone usually occurs above 4,000 foot elevation. Snow accumulates on the upper ridges making roads over Salt Creek ridge typically impassable during the winter months.

Freezner and Geppert soils have both formed from the same geologic parent materials which are volcanic rocks primarily of andesitic mineralogy. As a result, the soils in this analytical area have weathered to soil textures that are predominantly clay loams, silty clay loams, and clays. Clay content ranges between 20% and 35% in the Geppert soil and 35% to 50% in the Freezner soil. The amount of rock fragments in the subsoil differ greatly between the Freezner and Geppert soils. Freezner soils typically have less than 35% rock fragments in the subsoil whereas the Geppert soils range from 50% to 80% rock fragments in the subsoil. These physical properties influence the permeability and infiltration rate of these soils giving the recharge area its aquitard and aquifer characteristics. Both soils are classified as well drained. The Geppert soil, due to less clay content and a greater amount of rock fragments in the subsoil, is considered to have greater potential for more rapid water conductivity through the soil profile. For these reasons, the conductivity of water through the Freezner soils would be somewhat less. On a relative scale, both soils would have sufficient clay content to slow water movement through the soil profile enough to potentially filter particles larger than the clay fraction of the soil. The characteristics of the underlying

geologic material would also greatly influence the filtering capability of any groundwater within the recharge area.

3.1.1 VEGETATION The major vegetative zone within the Ginger Springs watershed is mixed conifer. The mixed conifer zone (*Franklin and Dryness*) has forests containing Douglas-fir, sugar pine, ponderosa pine, incense cedar, white fir, pacific madrone and oak tree species. The mixture and abundance of species varies from stand to stand. Typically, Douglas-fir is the most common tree species, followed by white fir, incense cedar and lesser amounts of ponderosa pine, sugar pine, and hardwoods.

Within this forest zone, further classification of plant series and associations have been described in *Preliminary Plant Associations of the Southern Oregon Cascade Mountain Province* (*Atzet and McCrimmons*). Using this field guide, two plant series, Douglas-fir and white fir, are present in the watershed. Plant series are based upon plant species, geology, soils, terrain, topographic features, and plant response to management activities.

The landscape pattern of seral stages has largely been the result of logging. The interface of private and federally managed lands typically represents the area of greatest contrast of stand structure. Table III and Map 6 shows the distribution of different size classes (forest structure) on all lands in the recharge area.

Table III
FOREST SIZE CLASSES
All Owners

Size Classes	BLM		Private		Total	
	Acres	%	Acres	%	Acres	%
0" - 5"	296	21	1131	79	1427	36
5" - 11"	43	5	818	95	861	21
11" - 21"	133	23	453	77	586	15
> 21"	883	79	234	21	1117	28
	1355		2636		3991	100

3.1.2 WILDLIFE The Ginger Springs watershed provides habitat for approximately 150 wildlife species. See Appendix A for a list of species with special status and habitat which are known or suspected to be present in the watershed.

One Threatened and Endangered (T&E) species, the northern spotted owl, is known to be present inside the recharge area. This site has a designated 100 acre “core area”. Three spotted owl sites have been identified adjacent to the recharge area.

A great gray owl (state sensitive and protection buffer species) nest site has been located in Section 25. Presence, but no known nest site, has been determined for another great gray owl in Section 27.

Section 25 is designated as a Connectivity block. Connectivity blocks are sections within Matrix lands which are designated to have higher amounts of intact late-successional habitat. These blocks supplement connectivity between the Riparian Reserves and the 100

acre spotted owl LSRs to improve late-successional connectivity across the landscape for old-growth.

Approximately 1/3 of the southwestern part of the watershed is designated "Big Game Winter Range and Elk Management Area" (*Map 7*) in the Medford District RMP. This is an area designated to provide thermal and hiding cover, and foraging habitat for deer and elk.

3.1.3 FISH Three major creeks flow through the northern part of the watershed: Hukill Creek, Ginger Creek and Doubleday Creek. These creeks are high gradient headwater streams which drain into the South Fork Big Butte Creek, outside the recharge area, near the Town of Butte Falls (*Map 2*). Resident cutthroat trout (*Oncorhynchus clarki*) are present in Doubleday Creek extending approximately ½ mile into the recharge area and to the pump chance in Hukill Creek in section 15.

The southern part of the recharge area includes the headwaters of Lick Creek and other unnamed tributaries to Salt Creek. Cutthroat trout tend to inhabit small headwater streams and are found in several Little Butte Creek tributaries, all outside the recharge area. Anadromous fish are present in Big Butte Creek and in Lick Creek near the confluence with Little Butte Creek, both outside of the analysis area.

3.1.4 RIPARIAN There are approximately seven miles of intermittent and/ or perennial non-fish bearing streams and approximately seventeen miles of ephemeral streams in the recharge area. Riparian areas are important aquifers contributing much of the surface waters to local year-round stream flows. Riparian areas also provide important habitat for riparian-dependent wildlife species, a transition zone between aquatic and upslope habitat, and dispersal corridors for terrestrial wildlife. Riparian habitats typically contain a greater wildlife species diversity and abundance than upslope habitats.

Riparian areas also help filter overland flow sediments before entering streams and may affect groundwater quality where stream channels intersect ancient streambeds. These areas provide an important role in surface and subsurface water quality maintenance. The Zone of Influence-2 areas tend to follow, in varying widths, the stream and riparian courses.

There is one constructed pond on BLM lands in the area located in T35S, R2E, Section 27, SE¼, SE¼ (*Map 7*).

3.1.5 FIRE Fire historically was the dominant agent of change in this watershed, as it was for most of the Rogue Basin. Traditionally, these stand types would have experienced low to moderate intensity underburns and an occasional severe stand replacement fire. On the average, an underburn every 30 to 75 years may have been expected. When this cycle was disrupted, for whatever reason, a stand replacement fire would increase in likelihood. Low to moderate severity underburns would have reduced the influence of true-fir in the ecosystem. In those periods of fire absence, the true-fir would expand its role in the ecosystem thereby promoting the opportunity for the higher severity stand replacement fire.

3.1.6 GRAZING Cattle grazing is authorized in the Perry School and Ginger Creek Pastures of the Summit Prairie Allotment, as well as the Esmond/Wasson and Baker Mountain pastures of the Big Butte Allotment, portions of which lie within the Ginger Springs recharge area (*Map 9*). As a regulated and compatible use of public lands, grazing has occurred since 1946.

Forage is found primarily along roads, in cut-over timber harvest units, along creeks, and in glades and meadows that dot the slopes of the watershed. The condition of the forage available for use by livestock remains fair to good. Both species diversity and percent ground cover remain high, securing the stability of the soil, reducing the turbidity in creeks and streams, and ensuring the future demand for forage.

3.1.7 HUMAN USES Within a mile and immediately north of the Ginger Springs recharge area is the Town of Butte Falls. Besides providing for the Town's water supply from Ginger Springs, its forests have provided town residents, and no doubt other users, the common forest-use opportunities: logging (employment), hunting (subsistence and recreation), wood cutting (winter comfort), non-commercial forest products foraging, casual recreation, etc. There has been limited development of mineral sites, primarily rock pits, throughout the recharge area. There are approximately 29 miles of roads in the Ginger Springs recharge area and are generally characterized to be in a stable condition.

There are no archaeological sites recorded in the watershed. However, archaeologists have found a number of isolated tools associated with Native American hunting on BLM land. The watershed provided hunting grounds for native people living in settlements around the falls on Big Butte Creek and along Little Butte Creek.

Due to the relative flatness in the topography in the watershed, a major portion of this area has been tractor yarded multiple times. This has resulted in an extensive network of skid trails, roads, and landings. The number of roads and the amount of compacted ground creates the potential for increases in the magnitude and frequency of high stream flows, limiting infiltration, redirecting ground flow, resulting in increased sediment and turbidity in the local stream courses. These flow increases can destabilize stream channels and accelerate sedimentation rates.

Human activity in the area creates the opportunity for contamination of soil and water. The improper use of chemicals; pesticides to control unwanted vegetation and rodents, fertilizer to accelerate tree growth and petrochemicals to run machinery, when used or stored improperly, create the possibility to affect surface water, and possibly ground water, quality. The impact of the prescribed and proper use of chemicals on subsurface water is not known.

3.2 IDENTIFICATION OF ISSUES and KEY QUESTIONS (Step 2)

Focus the analysis on the key elements of the ecosystem that are most relevant to the management questions and objectives, human values, or resource conditions within the watershed. The applicability of the core questions and level of detail needed to address applicable core questions is determined. Rationale for determining that a core question is not applicable are documented. Additional topics and questions are identified based on issues relevant to the watershed. Key analysis questions are formulated from indicators commonly used to measure or interpret the key ecosystem elements.

The Ginger Springs water source is currently classified by the Oregon Health Division (OHD) as "ground water sources" (*Appendix B*). Treatment of the water is limited to chlorination that is automatically metered into raw water based on turbidity fluctuations. It is commonly felt by local residents, that the Ginger Springs water is of consistently high quality, and that the quantity of water from the springs has been more than adequate for the vast majority of the year. The water delivery, being unmetered, periodically in hot summer

months gives concerns for water conservation needs. As a community watershed, the overriding objective of this analysis and plan will be to maintain the "health of the watershed" as it relates to the delivery of high quality water. The intention of this process will be to develop a set of land management practices that will afford protection of the systems that are integral to maintaining water quality and quantity. This will, in the long term, provide a more practical and cost effective method at protection of the resources instead of more costly systems for water treatment.

The commonly held view of the Ginger Springs source is that it is isolated from surface water influences. Though not fully understood at this point, a compilation of precipitation and turbidity data (*Charts 1-2*) seems to indicate that there is a "hydraulic connection" between the surface waters and underground flows. Significant spikes in turbidity follow periods of very heavy winter rain. Some jumps in turbidity however are not in response to precipitation. Chart 3 shows a significant change as a result of a large earthquake event and Chart 4 shows an increase with no apparent correlation.

Water quantity delivered out of Ginger Springs is unknown. It has been measured as a result of timing the refilling of an empty reservoir, but the seasonal fluctuations are unmetered and consequently not understood.

Additionally, surface water that flows through this recharge area will be reviewed as a secondary water concern. Attending to the management of surface water flows can only have a beneficial influence on underground water movement.

Five resource management issues have been identified that have the potential to affect water quality/quantity.

- ***FIRE*** - how the use of controlled fire along with vegetation manipulation can help achieve management objectives and reduce the risk of stand replacement fires.
- ***GRAZING*** - how a managed grazing program affects the overall condition of the riparian areas and the quality of surface water.
- ***RISK OF CONTAMINATION*** - how the use of petrochemical dependent equipment and other chemicals in the watershed may affect water quality. How microbiologic contaminants, such as *E. Coli*, *Cryptosporidium*, *Giardia* and other viruses their move through surface and subsurface water. Where are and how do noxious weeds spread through the watershed. What is the effect of sedimentation on surface water quality as a result of poor water/soil infiltration.
- ***VEGETATION CONDITION/FOREST HEALTH*** - how the existing distribution of vegetation age classes affects the overall health of the forest, and its ability to be resilient to catastrophic fire and the ever present pressures of insect and disease.
- ***TIMBER HARVEST ON MATRIX LANDS IN A COMMUNITY WATERSHED*** - how opportunities for timber harvest, within the scope of the RMP, may impact overall water quality concerns, and the cumulative effects of the vegetation condition on the overall landscape.

The values and uses associated with the watershed have been identified in order to focus this analysis on the key elements that are determined to be most relevant to management questions, human values, and existing resource conditions. Key questions were designed to address the issues and focus on those elements that influence and are influenced by humans.

3.2.1 FIRE

a. What is the overall risk/hazard of catastrophic fire in the Ginger Springs

watershed?

b. What BLM-OI units have the highest risk for catastrophic fire. How could these risks be prioritized?

c. What areas in the Ginger Springs watershed are most vulnerable to damage from a catastrophic fire?

3.2.2 GRAZING

a. What affect does grazing have on the riparian vegetation?

b. How does grazing influence water quality and sediment delivery to the aquatic system?

c. What affect does grazing have on sensitive plant and wildlife species?

3.2.3 CONTAMINATION (CHEMICAL, BIOLOGIC, PHYSICAL)

a. What are the potential sources of chemical contamination?

b. What are the potential sources of biologic contamination?

c. What are the potential sources of physical contamination?

d. What are the areas most vulnerable to contamination?

3.2.4 VEGETATION CONDITION/FOREST HEALTH

a. What is the current distribution and trends of plant communities and seral stages in the watershed?

b. What is the historic distribution and amount of size classes (natural range of variability) in the watershed?

c. How have human-caused changes affected the landscape pattern of vegetation and structure?

d. How does management of private lands affect the attainability of desired future conditions?

e. What activities or trends in populations or habitats affect the wildlife?

f. What are the opportunities to enhance wildlife habitat in the watershed across federal ownership?

g. What is the current road density for the watershed and what is the considered and acceptable number of miles of roads per section?

h. What sensitive plants and animals are in the watershed?

I. What are the recovery needs of T&E plants and animals in the watershed?

j. What were the natural disturbance events that created and occasionally altered forest patterns and structures?

k. Have current forest conditions affected tree vigor growth or encouraged disease or insect problems? If so, where do the problem areas exist?

l. What are the management needs to enhance forest conditions in other land use allocations?

3.2.5 MATRIX LAND TIMBER HARVEST

a. What is the compatibility of timber harvest on designated Matrix lands that are in a community's municipal watershed?

b. How will cumulative effects (TSZ, compaction, clearcutting) influence the implementation of timber harvesting objectives on matrix lands?

3.3 DESCRIPTION OF CURRENT CONDITIONS (Step 3)

Develop information relevant to the issues and key questions identified in step 2. This

section provides for additional detail than found in the Characterization section. The current range, distribution and condition of the relevant ecosystem elements are documented.

3.3.1 VEGETATION Forest landscapes are described as having three elements: matrix, patches, and corridors (*Diaz and Apostol*). The structure, amount and spatial arrangement of these three elements affect the resiliency, species diversity, and biological and physical processes within a forest landscape.

3.3.1.a MATRIX

The matrix is defined as the most connected portion of the landscape. *(This is not to be confused with Matrix land allocation designation as described in the RMP.)* It is the predominant vegetative type and therefore exerts the strongest influence over the movement of living and non-living things across the landscape (fire, wind, plants, animals, people, insects, disease).

Within the Ginger Springs recharge area, the dominant vegetative type (matrix) is early-successional forest (< 40 years old) created through logging. These stands are either recent clearcuts or small diameter even-aged plantations that have little structural diversity. Because these stands are the dominant landscape feature, they also provide the strongest influence over landscape processes (fire, tree growth, nutrient cycling, disease, insects, wind, snow storms, water flow, and erosion).

The rate of structural change in young stands is relatively rapid, compared to slower changing mature or old-growth stands.

Tree growth and vigor within young stands is generally good until the canopy begins to close. Crown closure reduces sunlight and, along with increased stand density, results in slower growth and sometimes tree mortality. As tree vigor declines, trees become susceptible to insect infestation and disease infection.

Young stands exist across the landscape on both federally managed lands and private lands. (*Map 6*)

3.3.1.b PATCHES

Patches are areas distinctly different from the landscape around them. As a result of logging, late-successional forests have become the patches within the Ginger Springs watershed. The origin of these stands are the result of periodic fires, both low to moderate underburns, and stand replacement fires. These older patches are considered stable in the absence of disturbance. The older the stand, the less likely the stand's structure and composition will quickly change. However, periodic disturbances such as fire, insects, disease or windstorms can quickly alter this stability.

The checkerboard ownership pattern has resulted in a highly fragmented landscape, with the majority of the mature stands located on federally managed lands (*Table III*). The location and amount of older stands within the matrix has created a high degree of contrast and edge effect across the watershed.

Contrast is the degree to which adjacent forest stands differ from each other. For example, there is a high amount of contrast between a recent clearcut and a mature forest stand, in both the plant and animal species present, and in its physical characteristics.

Edge represents the interface area between two distinctive vegetative size classes. Environmental conditions (temperature, light, wind, and humidity) are different within this area, resulting in a drier, windier microclimate along the stand edge. Generally, a 500-foot wide strip adjacent to the edge is affected. The altered microclimate in this area causes a

change in species mix and density of herbaceous vegetation and shrub species. Patches that are 25 acres or less are, effectively, all edge.

Recent wind and snow storms have resulted in some blowdown of trees in the watershed creating disturbances within the patches.

Mistletoe infection is common in Douglas-fir, white fir, and incense cedar within the watershed. Each tree species is infected by a different type of mistletoe. Douglas-fir mistletoe is the most common and of the most concern. The severity of Douglas-fir mistletoe varies from stand to stand and causes growth loss, top kill, and individual tree mortality. Mistletoe reduces tree vigor and increases tree susceptibility to insects and disease. A tree with a mistletoe rating of 1 or 2 has approximately a 5 percent volume loss, ratings of 3 or 4 result in a 25 percent volume loss, and ratings of 5 or 6 result in a 50 percent volume loss. (*Appendix C*)

Laminated root disease also occurs in small discrete pockets in some stands. The level of infection has not had a significant influence on stand vigor.

The level of insect activity generally appears to be low within the watershed. Douglas-fir bark beetle and the flatheaded wood borer are present in some older stands and having some effect on the poor vigor trees.

3.3.1.c CORRIDORS

Corridors provide travel routes for plants, animals and people between similar size classes or vegetative types. Roads, Riparian Reserves, and streams are the primary corridors in the Ginger Springs watershed.

3.3.2 WILDLIFE

3.3.2.a THREATENED AND ENDANGERED SPECIES (T&E)

Four northern spotted owl sites are present in the area, one within the watershed and three others immediately adjacent to the watershed. The owls adjacent to the watershed likely forage and roost within the watershed. Three sites have a 100-acre activity center designated as late-successional reserve (LSR) and are restricted to most management activities. Sixty-one acres of LSR is within the Ginger Springs watershed. The LSR within the spotted owl activity centers, together with the Riparian Reserves, were designed to mitigate timber harvest effects by providing for distributed patches and corridors of late-successional forest. These areas provide dispersal habitat for mobile species (such as the northern spotted owl) and habitat for non-mobile species (such as mollusks, red tree voles, as well as plants, fungi, lichens, and bryophytes).

One of the owl sites was discovered after January 1, 1994, and has not been given an activity center, although a pair status was confirmed in 1995. A pair has been located each year since initial confirmation. All of the owl sites are below 40 percent suitable habitat (nesting, roosting, foraging) within the provincial radius (1.2 miles).

No other T&E species are known to be present within the watershed.

3.3.2.b SENSITIVE SPECIES

Great gray owls, a ROD survey and manage species, are present within the watershed. One nest is known to be present in section 25 (1998). Great gray owl responses were recorded during protocol surveys in 1997 and again in 1998 in section 27. However, subsequent follow-up visits were unable to locate these owls during the daytime, and pair status for this area is undetermined.

Western pond turtles have been observed in the pump chance on Hukill Creek on

private land in section 15, but have not been observed within the watershed. The only habitat within the watershed are the pump chances in sections 22 and 27. These ponds are adequate to provide suitable habitat for the western pond turtle.

Pileated woodpeckers are present in the area. These woodpeckers are dependent upon large diameter snags for nesting and roosting. Their excavated cavities are used by other species for nesting and denning. These birds and mammals are considered "secondary cavity nesters". Secondary cavity nesters, which are on sensitive species lists and suspected to be present in the watershed, are flammulated owls, pygmy owls, northern saw whet owls, western bluebirds, ringtails, clouded salamanders, fishers, and pine martins.

3.3.2.c OTHER WILDLIFE SPECIES - ELK & DEER

Approximately 1/3 of the southwestern part of the watershed is designated "Big Game Winter Range and Elk Management Area" (*Map 7*) in the Medford District RMP. This is an area designated to provide thermal and hiding cover, and foraging habitat for deer and elk. Guidelines for big game management areas are to close all roads except major collectors and arterials between November 15 and April 1, minimize new road construction, maintain 20 percent thermal cover (70 percent canopy closure, 40 feet minimum height, and large enough to avoid edge effects), and to restrict activities so as to avoid disturbance between November 15 and April 1 (RMP pg. 48).

Big game animals, such as deer and elk, may create opportunities for surface water contamination (physical and microorganism) in their use of the recharge area habitat as they seek water, forage and cover.

3.3.2.d CONNECTIVITY BLOCK

Section 25, T35S, R2E is designated as a connectivity block in the ROD. Under this designation, a minimum of 25 percent of the area would be maintained in late-successional condition. The area would function to provide connectivity for northern spotted owl and other late-successional dependent species across the landscape.

3.3.2.e SNAGS AND COARSE WOODY DEBRIS (CWD)

Large diameter snag densities across the landscape in the watershed appear to be low, due in part to the acreage within the watershed in early-successional stages. Snag densities on BLM-administered lands are higher. The large snags provide habitat for a number of species on the sensitive species list.

Large coarse wood also provides important habitat in the watershed. Many species of invertebrates, amphibians, reptiles, birds, and mammals use these structures for all or part of their life cycles. The coarse wood is important in nutrient cycling, holding moisture during dry times and providing a substrate for fungi and invertebrates. These organisms are an important food source for other invertebrates, amphibians, mammals and birds. Coarse wood also provides cover, nesting, resting, and rearing habitat for wildlife. Riparian inventories indicate that the amounts of large coarse wood in the watershed is low along the streams. Informal surveys of the uplands have also supported that observation. (*Appendix D*)

3.3.3 FISH The uppermost extent of cutthroat distribution in Ginger Creek has been determined to be near the watershed boundary in section 23. Cutthroat presence in Doubleday Creek extends approximately ½ mile into the watershed nearly to the south section line of section 23. Cutthroat distribution in Hukill Creek extends to the pump chance in

section 15. Cutthroat abundance has been determined to be good in the stream reaches surveyed.

3.3.4 RIPARIAN Current BLM preliminary assessment of aquatic habitat in survey reaches of Ginger and Doubleday Creek, indicate both creeks are considered to be in fair to good condition and are improving. This is based on riparian zones continuing to progress away from early-successional clearcuts towards later successional habitats and roads stabilizing or being improved. Percent pool area and residual pool depth were features in poor to fair condition. There is evidence of high sediment levels in some of the streams.

Streams on BLM lands were surveyed to determine the functioning condition of the riparian area. One intermittent stream in section 21 was determined to be functioning-at-risk. A perennial stream (Ginger Creek) and a fish-bearing stream (Doubleday Creek) surveyed in section 23 rated as functioning-at-risk. The intermittent stream in section 25 was not inventoried. One intermittent stream in section 27 rates as functioning-at-risk. The intermittent stream in section 35 rated as functioning-at-risk.

Large wood in the streams and adjacent riparian areas is mostly lacking. Riparian conditions, which are considered to be functioning-at-risk, are due to a lack of large conifers and a high number of unsurfaced roads and skid trails in the watershed. Disruption of their natural state by compaction or road building activities has the potential to change the timing of runoff and peak flows in these local streams. Riparian areas are dominated by smaller, early-successional trees, due to the lack of riparian protection in past harvesting practices, where little or no riparian buffer was left intact.

The riparian areas provide cover and travel corridors for wildlife. Deer and elk use the cooler riparian corridors in times of warm weather, and can take advantage of the more dense cover in the late-successional riparian areas when stressed by heat or human pressures. Most of the riparian zones provide adequate hiding cover, but thermal cover for big game is not abundant along many of the riparian areas in recent clearcuts. Elk and deer are present throughout the year. Big game animals (and other mammals) can be a source of microorganism contamination to surface waters.

During the grazing seasons (mid-April to late July) cattle will seek shade and water in riparian areas. The effect of grazing in or near riparian areas on water quality is unknown. Water tests have not been done to determine the presence of fecal coliforms or other microorganism contamination.

There is one constructed pond on BLM lands in the watershed, the Salt Creek Ridge Pond, located in T35S, R2E, section 27, SE¼, SE¼. (*Map 7*) It has a water right with permitted uses: livestock and wildlife watering, prescribed fire, and road operations.

3.3.5 FIRE Over the past century, fire suppression has altered the fire cycles in southwest Oregon mixed conifer forests. The historic fire cycle was 30 to 75 years in this area. The absence of fire, through suppression, has changed the make-up of the forest to fire-intolerant, shade-tolerant conifers and has decreased the occurrence of species such as ponderosa and sugar pines. This conversion from open-pine or Douglas-fir stands to dense white fir stands has created stands that are stressed, increasing their risk to insect and disease problems. Horizontal and vertical structure has also changed. Surface and ladder fuels have

increased, resulting in a higher chance of crown fires, which were historically rare. This condition is changing forests of low-severity fire regime, to high-severity, which is characterized by infrequent, high intensity, stand replacement fires. Fire is now an agent of ecosystem instability, as it creates major shifts in forest structure and function. Clearcutting in this watershed has created changes in vegetation patterns that would not have occurred naturally over such large areas. These younger stands are more susceptible to fire.

Fire risk is defined as the likelihood of various ignition sources causing a fire that threatens valuable resources, property, and life. The higher values at risk within the Ginger Springs recharge area are the integrity of the groundwater system for the Town of Butte Falls (through its loss of protective canopy cover, especially in Zone of Influence 1 and 2) and forest resources (e.g. old-growth stands, plantations, late-successional reserves). Lightning-caused ignition occurs infrequently with most strikes hitting the Salt Creek ridge. The highest risk of human-caused ignition would occur along roads and from land management activities. In the period between 1987 to 1994, approximately 20 lightning down-strikes were recorded in the watershed. Few fire starts were identified as human-caused. All fires were confined to less than one acre. The general aspect of the recharge area is north, which typically has lower temperatures and higher fuel moistures, resulting in a low fire risk.

Hazard risk is based on the vegetation occurring at and near the point of ignition. The type, arrangement, volume, and condition of vegetation has an effect on the threat of ignition, rate of spread, and difficulty of control. Stands 0"-11" dbh are typically Fuel Model 5, 11 or 12 (*Appendix E*) in this watershed. Fuel Models 5 and 11 have lower fire intensities, however, they can have higher rates of spread. The precommercial thin units in this watershed are Fuel Model 12. This model can have high rates of spread and high intensity fires. There are approximately 2,736 acres of 0" - 11" class stands (including private). These stands have a high hazard rating. Stands that are larger than 11" dbh have Fuel Models of 8 or 10. The smaller second-growth stands tend to be Fuel Model 8. Fires would be confined to the litter layer and have low intensities and low spread rates. Mature and old-growth stands are Fuel Model of 10. Low rates of spread usually occur with smaller areas of higher intensity. Stands with greater than 11" dbh are assigned a low hazard rating. There are approximately 1,255 acres with this rating.

The Ginger Springs recharge area is under the fire protection of the State of Oregon, Department of Forestry, with a guard station near the Town of Butte Falls. The USDA Forest Service also has an office in Butte Falls with equipment and personnel available for fire control.

3.3.6 GRAZING An annual meeting with livestock operators, timber company representatives, water commission members, and state and federal agents is held to discuss the grazing program.

Late-spring through mid-summer cattle are dispersed throughout the Perry School, Ginger Creek, Baker, and Esmond/Wasson pastures in the Big Butte and Summit Prairie allotments (*Map 9*). Small bands of cattle migrate through the pastures, searching for forage and water. The livestock tend to move where they can find adequate forage and water, and consequently remain well dispersed throughout the recharge area during the grazing season. The livestock operators monitor their livestock during the grazing season making sure they

are grazing where they should be, staying out of riparian areas except to water and seek shade. When livestock are found to have been in one area for the maximum amount of time, they are moved to other areas. If livestock are known to cause problems, they are either moved to other areas, or removed from the allotment altogether. Table IV illustrates the pasture, acreage, number of cattle, and the season of use for each. Livestock numbers shown below are based on both federal and private lands. The Perry School Pasture is used on alternate years.

The grazing season in the recharge area typically ends by mid-summer, long before the seasonal fall rains begin. By the end of the grazing season sources of drinking water for the livestock are limited to the accessible roadside perennial stream crossings. Most of these areas are out of the recharge area boundary.

Rangeland improvement projects are maintained by the lessees annually, or when conditions warrant. Fall gathering generally takes the ranchers a week at the end of the grazing season. Difficulties arise when management facilities (fences, water tanks, spring developments) are destroyed, when livestock are shot or stolen, or when moved (intentionally or inadvertently) to other areas.

Table IV
GRAZING PASTURES

	Total Acres	Authorized Use	Grazing Dates
Perry School Pasture	5900	254 cattle	April 16 - May 31
Ginger Creek Pasture	5839	117 cattle	June 1 - July 31
Esmond/Wasson Pasture	1656	528 cattle	April 16 - June 30
Baker Mountain Pasture	2812	115 cattle	April 16 - May 31

3.3.7 HUMAN USES Humans have used the Ginger Springs watershed for thousands of years. Native Americans hunted and fished throughout the area before the appearance of white settlers, leaving scattered evidence of their passing in the occasional artifacts found. In 1872, water rights for irrigation were secured for 1.26 cfs from Hukill Creek for use on a large natural meadow south of where the original townsite of Butte Falls would be surveyed (*Watermaster*). With the establishment of the Town of Butte Falls in 1906, there became a need for a reliable and clean source of water because of recurring "summer sickness" problems (*Abbott*). This may have been associated with shallow hand-dug wells in the town inhabited with the typical-for-the-day barnyard livestock and irrigated pastureland upslope and adjacent to town. That need for clean water was filled at Ginger Springs. A water right was issued to the Town in 1914 that delivered fresh, clean water from an open reservoir through wooden pipes. Ginger Springs was encapsulated in two concrete spring boxes to better protect the spring sites in 1975.

The hillsides above Butte Falls no doubt saw regular use by local hunters/gatherers of game animals and forest fruits. As access was developed through the recharge area,

sources of wood to heat the town's homes was exploited. With the advent of mechanized equipment and truck travel, the area above town was developed with road systems that brought extensive logging on both private and federal ownership. The increased intensity of land management practices have often included the use of herbicides to manage unwanted vegetation to promote conifer growth. This practice has caused considerable concern from local Butte Falls residents. Logging activity in the watershed, though intensively done in many areas, has usually been managed with greater care in the area immediately around Ginger Springs. The density of roads (of record) in the Ginger Springs recharge area is 4.6 miles per square mile (*Appendix F*). The overall condition of these roads is considered to be stable. Off-highway vehicle (OHV) use occurs in the watershed on system roads and off-roads. There is no documentation of the extent of OHV use or damage. Dispersed unregulated camping, primarily during hunting season, occurs in the recharge area, especially in areas near water or developed ponds.

Microorganism contamination, such as *Cryptosporidium* and *E. coli*, represent a growing concern in municipal water supplies. These microorganisms are small (3-5F*m*) parasites living in the intestinal tracts of most animals (wild and domestic). Oocysts are passed through feces and are commonly found in surface waters, especially water passing through areas of heavy fecal residues (pastures). Poor hand-to-mouth hygiene, that has been in contact with infected water, can cause human infections resulting in gastrointestinal illness, usually resolving itself within two weeks. Some infections from Giardia can result in long-lasting illnesses. The recharge area contains no pasture land with confined livestock. Cattle are free ranging, usually in groups of 4-8, and move to wherever favorable forage can be found.

Contamination of surface water streams by microorganisms and viruses seem inevitable given the nature of the spread mechanism. Testing for microorganism contamination of the three major streams in the recharge area has not been done. The possibility of a hydraulic connection between the surface waters of riparian areas or other Zones of Influence to ground waters could provide the mechanism to transport microbes from surface waters. Charts 1-2 presents evidence that, at least during heavy precipitation times, this connection may exist. Particles suspended in surface water, including microorganisms, are filtered by the clay fraction of the soil mantle as the water moves towards the groundwater aquifer. Groundwater stored in the aquifer improve the quality of water because the conditions are usually unfavorable for bacteria (*EPA*). The Public Works Department of Butte Falls tests a water sample monthly for total coliform. Testing has not revealed a presence of coliforms.

There has been a limited amount of rock pit development in the watershed. There is the possibility that, in the course of opening a pit, (especially one that has been drilled and shot), fractures in rock strata may create opportunities for the transfer of contaminated material or water into subsurface geologic formations.

There is no record of any chemical spills occurring in the recharge area.

Surveys for noxious weeds have been completed on roads leading to BLM lands and no noxious weeds were identified.

3.4 DESCRIPTION OF REFERENCE CONDITIONS (Step 4)

Explain how ecological conditions have changed over time as a result of human influence

and natural disturbances. A reference is developed for later comparison with current conditions over the period that the system evolved and with key management plan objectives.

3.4.1 VEGETATION Forest ecosystems are complex, dynamic, and always changing. Changes occur as elements and processes are altered by both coarse filter (e.g., stand replacement fires) and fine filter (e.g., individual tree mortality) events. Ecosystems can adapt to these changes and can function well under a range of conditions. Within this "natural range of variability", biological and ecological functions are sustainable. When an element or process is outside of this range, that element and those depending upon it may not be sustainable (*USDA, 1993*).

Utilizing fire history information, existing age-class distribution, and forest survey documents, a general re-creation of vegetative conditions prior to logging can be made. From this baseline information, assumptions and inferences can be made specific to individual elements, processes, or components and how they may have functioned under "natural" conditions.

Prior to the advent of logging, approximately 90 percent of the commercial forest land within the recharge area contained large-size forests. This estimate is based upon detailed forest surveys completed during the 1930s. Large-size class is defined as Douglas-fir and ponderosa pine >22" dbh, and white fir >16" dbh.

The natural range of variability is further defined in an ecosystem health study for national forest lands (*USDA, 1993*). The Ginger Springs area is part of the Upper Rogue River basin that was analyzed. Although the analysis was focused only on lands administered by the Forest Service, the vegetative composition, climate, and landform characteristics of the area are similar to adjacent Rogue River National Forest lands.

The analysis addressed the historic range of riparian and terrestrial elements within the Upper Rogue River basin (*Table IV*). The historic range was defined as the conditions that existed before timber harvesting began in the early 1900s. Because of the same general geographic location, BLM and Forest Service managed lands probably had similar historic conditions as cited in the study.

Although based on a larger scale than the Ginger Springs watershed, the study supports the earlier forest surveys that the "historic" landscape contained contiguous stands of primarily older forests. It provides a picture of what the desired range of vegetative conditions may be.

In the pre-logging influenced forest, vegetation patterns were largely similar at a landscape level. Vegetation patterns were uniform with late-successional forests providing large contiguous areas of interior forest habitat. Fragmentation of late-successional forests was limited and occurred in areas where stand replacement fires left patches of "green" stands interspersed between fire-killed stands. The amount of edge between early- and late-successional vegetation was naturally low and occurred in areas where stand replacement fires provided the abrupt transition between early- and late- successional forests. Although the forest landscapes were more uniform, the canopy openings were variable in size.

Table V
HISTORIC RANGE OF CONDITIONS

Upper Rogue River Basin - Early 1900s

	Historic Range by percent
Riparian Vegetation	
Early-Successional conditions	10 - 40
Late-Successional conditions	45 - 75
Terrestrial Vegetation	
Early-Successional/no snags	<2
Early-Successional/with snags	10 - 40
Late-Successional/single layer	<2
Late-Successional/multi-layer	45 - 75

Widespread vegetative changes due to disease and/or insects were most likely minimal. Mortality was probably limited to individual trees or small groups of trees.

Dwarf mistletoe, especially in the Douglas-fir overstory was probably common, but with minimal intensification. Periodic underburning maintained open stands of mixed conifers and hardwoods. Mistletoe brooms on smaller Douglas-fir trees probably increased torching and tree mortality, thereby regulating mistletoe severity and spread in the understory.

Some insect populations may have increased to moderate levels following fires due to fire induced stress (cambial damage and/or crown scorch) or during long periods of drought.

Root diseases were present and provided small gaps in the forest canopy. Large areas of root rot were probably minimal due to periodic underburns which maintained disease resistant seral species and wider tree spacing.

3.4.2 WILDLIFE Information is not available about specific wildlife population numbers in the area prior to European settlement, nor after the early settlers arrived. Anecdotal information from historical recollections indicate game was abundant. Elk, deer, black bear, cougar, and grizzly bear were commonly mentioned in early documents, and the population numbers probably were much higher than today's numbers.

Based on the information of historic vegetative conditions with 45 to 75 percent of the forest as late-successional, multi-layered, it is assumed that the numbers of late-successional dependent species would have been much higher than is present today.

3.4.3 FISH Conjecture may lead us to believe that, historically, populations of resident trout were more abundant through the lower reaches of the perennial streams. Absence of roads and culverts, and the general overall late-successional characteristics of the riparian areas most likely contributed to the higher trout abundance.

3.4.4 RIPARIAN The riparian areas of the recharge area were characterized by diversity of species and stand structure. These areas were intact, with openings created by fire or windthrow. Riparian areas created a dense continuous corridor, providing shade and a unique microclimate for the stream and wildlife.

3.4.5 FIRE The historic fire regime of this recharge area was characterized by periodical and widespread fires resulting from hot, dry summers and no fire control. These frequencies ranged from 10 to 30 years on south slopes to 75 to 100 years on north slopes.

The more frequent south slope fires consumed understory and ground fuels, leaving a large gap between the ground and overstory vegetation. This reduced the possibility of crown fires. Fire intensities were usually low because frequent fires limited the time for fuel accumulation. Forests created by frequent, low intensity fires were open, even-aged stands with a mosaic of even-aged groups. Ponderosa pine were the most common species, as they are the most resistant, followed by sugar pine, Douglas-fir, and white fir. Frequent fire had a major effect on young trees, favoring ponderosa pine as a dominant species and white fir as the least dominant (resistant). In the absence of fire, Douglas-fir would become the dominant species, as they are more tolerant of understory competition and shade than the pine species and could survive the hotter, drier growing conditions better than white fir.

Less frequent north slope fires allowed for more understory and ground fuel build-up, which set the stage for a greater possibility of a stand replacement fire. Moderate fire intensities caused spot crown fires which created a mosaic of stand ages. Forest stand's became multi-layered, as the cycle between fires allowed for natural regeneration, primarily favoring Douglas-fir. White fir was also present, due to its shade tolerance and would have time to reach a fire resistant size before the next fire cycle. Shade intolerant species, such as ponderosa pine and sugar pine, would become most prevalent only after a stand replacement event. In the absence of fire, Douglas-fir and white fir would become the dominant species, both in the overstory and understory until a stand replacement fire.

3.4.6 GRAZING Grazing has, to some degree, been a part of the forest ecosystem since the advent of the first Euro-Americans. When settlers first moved into this area, they relied on livestock for a portion of their red meat demands. Livestock were turned out in areas where grass occurred and gathered up as the need arose. Prior to the Taylor Grazing Act of 1934, livestock grazing was essentially unregulated. Cattle and sheep grazed wherever there was available forage. While overutilization of this resource devastated much of the vegetation in the arid west, the Pacific northwest forage remained relatively unchanged. Steep mountain terrain, higher precipitation amounts, and dense timber stands made accessibility by livestock very difficult. Inadequate water and a sparse forage kept livestock wandering, never settling in one area for too long. As lands became more intensively managed under the Taylor Grazing Act, livestock grazing became more regulated (*Our Public Lands*).

With the harvesting on forested lands, new grazing areas opened up. Until new conifer regeneration growth creates a closed canopy, harvest units provide a mix of native and non-native forage for livestock, as well as wildlife. As old cutting units grow and other timbered areas harvested, livestock migrated to the changing forage sources. For this reason, no areas tend to be severely overutilized by livestock.

3.4.7 HUMAN USES Before the arrival of white settlers in the 1860s, native peoples used the area seasonally for hunting and fishing. As elsewhere in the region, they would have used fire to maintain open areas and promote good forage for game. The extent of their influence in the Ginger Springs watershed itself is unknown.

3.5 SYNTHESIS AND INTERPRETATION OF INFORMATION (Step 5)

Compare the current condition with reference conditions of specific ecosystem elements and explain significant differences, similarities or trends and their causes. The capability of the system to achieve key management plan objectives is also evaluated.

3.5.1 VEGETATION The trend within this watershed over the past 50 years has been one of structural, habitat and species simplification, some of the changes from historic levels include:

1. The current landscape pattern has been shaped predominantly by logging. Historically, the landscape pattern was a result of disturbances, such as: fire, windthrow, insects, disease, that were partially regulated by environmental gradients, such: as climate, soils, and landform.
2. Logging and road construction have created a landscape that is more fragmented and has greater edge and patch densities than historic levels. Large blocks of mature forests are now mosaics of young plantations, mature forests, and stands modified by varying degrees by logging.
3. Reduced interior habitat for species associated with late-successional forests.
4. A shift in abundance and species composition of soil and canopy arthropods towards those most associated with early-successional stands.
5. In older forests, a shift from stands containing early-seral species, such as, ponderosa pine and sugar pine to mid- to late-seral species, such as, Douglas-fir and white fir due to fire exclusion and the harvest of high value seral overstory trees.
6. Post harvest treatments have modified the natural process of vegetative succession; the temporal and spatial occurrence of herbaceous, shrub, and hardwood species have been altered by management treatments (i.e., slashing, burning, brushing, girdling, herbicides, scalping, fertilization). The treatments are not always representative of natural processes and their effects upon long-term forest health and processes is unclear.
7. In remaining older stands, stand densities have increased, thereby increasing soil moisture and nutrient demands resulting in increased tree stress and larger numbers of trees predisposed to insect or disease attack.
8. The low thinning effect of fire is absent.
9. Vertical canopy structure has increased in existing late-successional stands.
10. Mistletoe ratings in infected Douglas-fir trees have increased. Understory trees historically killed by periodic underburns have become infected. Growth and volume losses will continue to increase in trees with a mistletoe rating greater than 3.

The cumulative effects of these changes have affected the ecological processes and functions within this landscape. The extent and the degree of change can be assessed by comparing the current conditions with the "natural range of variability" (*Table VI*). Within this "natural range of variability", biological and ecological functions are sustainable. Elements and processes outside of this range and those depending upon it may not be sustainable.

Simplification of forest landscape pattern, structure, and diversity may lead to increases in pest populations, disease, and pathogen occurrence. Homogenizing forest landscapes reduces natural controls and barriers that regulate the type and extent of disease

and insects.

The pattern of forest communities and age classes influences the habitat of natural predators, distribution of food sources for insects and pathogens, and the ability of insects or diseases to survive and spread. Larger areas of early-successional stands are present today than historically occurred. These stands have limited structural and species diversity and if stressed, may be more susceptible to disease and insect outbreaks.

Table VI
TERRESTRIAL FOREST CONDITION
HISTORIC AND CURRENT LEVELS

	Upper Rogue River Historic Range by percent	Overall Ginger Springs Current Level by percent	1998 Federal ownership in Ginger Springs by percent *
Early-Successional / No Snags	< 2	68	25
Early-Successional / With Snags	10-40	< 1	< 1
Late-Successional / Single Layer	< 2	6	9
Late-Successional / Multi-layered	45-75	25	65

* Based on Operations Inventory data.

3.5.2 WILDLIFE The trend within the watershed has been a loss of old-growth habitat and a resulting loss of old-growth dependent wildlife species. Old-growth vegetation has been harvested within the watershed with the exception of one unentered 40-acre stand (T35S, R2E, section 21, NW¼SW¼). There has been an increase in early- to mid-seral vegetation. This has resulted in a shift toward early- to mid-seral associated wildlife species.

Checkerboard ownership of public and private lands, as well as past harvest practices, have resulted in a highly fragmented vegetative landscape pattern. This fragmentation makes those species which depend upon old-growth and late-successional habitat more vulnerable to predation and temperature extremes and reduces gene flow, particularly in species with low mobility. Highly fragmented landscapes can have excessive amounts of edge influence. Edge effect can alter air temperatures and relative humidity up to 500 feet into the stand and can have a negative effect on old-growth dependent species. Under the Northwest Forest Plan, connectivity between late-successional patches would be provided in riparian buffers, owl LSRs, and 15 percent late-successional retention within Matrix lands. Most riparian buffers do not provide late-successional habitat in this area, due to past harvest practices.

3.5.2.a THREATENED AND ENDANGERED SPECIES

Owl habitat suitability rating was given to public lands within the recharge area. The McKelvey rating (*Map 8 & Appendix G*), is based on a visual interpretation of aerial photos and MICRO*STORMS forest operations inventory descriptions to determine habitat suitability. Based on the McKelvey rating, "Habitat 1" provides nesting, roosting, and foraging opportunities for spotted owls and "Habitat 2" provides dispersal, or roosting and foraging habitat. In the Ginger Springs recharge area, 542 acres provides spotted owl

"Habitat 1" (13.6 percent of the area) and 239 acres (6 percent of the area) was determined to be "Habitat 2".

Section 25 is a designated connectivity block. Approximately 25 to 30 percent of the section will be managed in a late-successional condition to provide habitat for old-growth and late-successional dependent species.

3.5.2.b SENSITIVE SPECIES

Many of the wildlife species on the BLM and Oregon Department of Fish and Wildlife sensitive species list are cavity dependent or make use of cavities for some part of their life cycle. Species that could be present within the Ginger Springs watershed include several bat species (silver haired, fringed myotis, long-eared myotis, long-legged myotis and pallid bats), clouded salamander, flammulated owl, great gray owl, pygmy owl, pileated woodpecker, western bluebird, western gray squirrel, American martin, and ringtail. Current population numbers and trends for these species are unknown. With the continued loss of old-growth and mature tree habitat, increased forest fragmentation, and road system disturbance, habitat for these animals is reduced and population numbers are expected to be affected.

Goshawk have been reported in the area but have not been confirmed. Goshawks (Bureau and state sensitive species) depend on large, older, open forested stands with high canopy cover, and are highly susceptible to human disturbances.

3.5.2.c OTHER WILDLIFE SPECIES - ELK/DEER

Elk and deer habitat has increased with the increase of shrubs and grasses of the early-seral forest stage. Elk are an "edge" species, moving into the cover of a dense forest during the day and foraging in the more open areas in the early and later part of the day and evening. The increased fragmentation and early- to mid-seral stages with brush and grass have improved elk and deer foraging and hiding cover.

Approximately 41 percent of the Ginger Springs recharge area is within the RMP "Big Game Winter Range and Elk Management Area" (*Map 7*). Within these areas, specific guidelines are outlined in the RMP (pg.48). The road density throughout the watershed averages 4.6 miles per square mile.

3.5.2.d CONNECTIVITY BLOCK

Section 25 contains a connectivity block. Connectivity blocks are sections of land with special land allocations which supplement late-successional "connections" across Matrix lands. Management of connectivity blocks call for 150-year rotation, with 25 percent of the block to be maintained in a late-successional condition in accordance with RMP-ROD guidelines.

Areas suitable for regeneration harvest within this section should leave a minimum 12-18 trees per acre greater than 20 inches dbh. Size and arrangement of the late-successional connectivity will provide effective habitat to the greatest extent possible.

3.5.2.e SNAGS AND COARSE WOODY DEBRIS (CWD)

Snags and CWD are important to the landscape because they provide nutrient recycling as well as being a host for many fungi, bryophytes, mosses, invertebrates, herps, small mammals, etc. which are an important part of the food web of the forest. Snags also provide nesting habitat for many species of birds, from woodpeckers to nuthatches and bluebirds, as well as bats, which move through the forest and forage on insects, helping to maintain a healthy forest ecosystem. (*Appendix D*)

Low numbers of snags and low amounts of CWD are present in the Ginger Springs

recharge area. This is primarily due to past harvest practices, leaving much of the area in early- to mid-seral stages. Salvage sales after windstorm events can reduce the number of snags and new windthrow. Theft of snags and windthrown trees for firewood further reduces snag and CWD numbers below threshold levels needed for wildlife in the watershed.

3.5.3 FISH Anadromous fish population numbers in the Rogue River Basin have declined in the past 25 years. This can, in part, be attributed to multiple landscape management practices. Although anadromous fish do not occur within the Ginger Springs recharge area, activities within the watershed can affect the quality of aquatic habitats outside the watershed. Loss of riparian vegetation leads to higher stream temperatures and loss of CWD recruitment in the streams. Increased harvesting activities has led to a greater number of roads, more compacted soils, and less vegetation in the upland clearcuts that hold soils in place during storm events and periods of high runoff. This can increase the amount of sediment reaching the streams and can result in the loss of spawning habitat and macro-invertebrate prey species for juvenile and resident fish. This can occur outside the watershed, but can be directly attributed to activities within the recharge boundaries.

3.5.4 RIPARIAN The trend for the condition of Riparian Reserves has been that of a fragmented ecosystem. Timber harvesting and road construction has changed the nature of these riparian corridors from contiguous diverse corridors, to fragmented narrow strips of patchy vegetation. The diversity of species and stand structure has declined due to land management activities in the watershed.

3.5.5 FIRE Ecosystems are dynamic, not static. They change as a result of fire, wind storms, volcanic activity, and climatic changes. Fire has played a major role in the development and maintenance of the ecosystem. Plants have adapted to fire by developing unique characteristics, such as dormant seed, fire resistant tissues, sprouting and rapid growth. Direct effects on the ecosystem include: plant mortality, consumption of woody debris, blackened soil, and contaminated air. Indirect effects include: affected quality and quantity of forage, water quality and quantity, insect infestations, and change to site moisture and temperature.

Fire suppression and intensive logging has radically changed the fire frequency, stand structure, and species composition within the Ginger Springs recharge area. Prior to settlement in the area, approximately 90 percent of the watershed was large-size forests (>21"dbh). Today, due to logging, approximately 28 percent large-size forests remain in the watershed. Approximately 2,300 acres in the watershed are young growth stands (<11" dbh), which are highly susceptible to catastrophic fire. Private timberlands will probably remain in an early-seral condition, through intensive management practices. Due to the absence of fire, stand composition and structure has changed. Stands contain a higher percentage of shade tolerant species and have higher densitiesof understory trees and brush. The forest floor has greater levels of ground fuels. Higher stand densities result in increased stress, allowing for disease and insect attacks. Increased mortality of trees adds to fuel loadings. Because of these factors, older stands develop a higher risk for catastrophic fire. Younger stands that have had recent management activities (brushing, precommercial thinning) are at a high risk for fire starts, especially when adjacent to roads.

Low-intensity wildfire is capable of removing soil cover. Resulting erosion usually occurs for only a few years after a low-intensity fire. Reestablishment of a vegetation cover

will slow the erosion process over time. A high-intensity fire creates high erosion and landslide potential on steeper slopes as resulting soil sterilization inhibits regrowth. Catastrophic fire may create long term negative impacts to both the quality and maintenance of uniform volume of Ginger Springs discharge. With lack of soil cover, evapotranspiration would decrease and runoff would increase, decreasing recharge to the groundwater springs. An overall negative impact to the Springs may result from a change of recharge timing and increased runoff.

3.5.6 GRAZING Livestock grazing has helped to stabilize the western forest ecosystems of Oregon. Livestock wander from area to area searching for forage. To a degree the supply of forage is dependent on timber harvesting. This process, while providing forage for livestock, can be beneficial to the growth of young conifers in plantations by reducing surrounding vegetation (grass, weeds, shrubs).

There is one developed watering site in the recharge area, and several areas where the intersection of roads and gentle slopes of stream channels allow cattle access to water. The length of time cattle spend near streams and springs will depend on the available forage near the water. Limited trampling damage has occurred near the Salt Creek Ridge pond and in Doubleday Creek near Road 35-2E-23.4. Its effect on water quality is unknown.

The likelihood of large increases in livestock use in the watershed is minimal, due primarily to stabilized forage production under current management and the likelihood that more forage (extensive additional harvest units) will not become available.

3.5.7 HUMAN USES The current condition of the entire watershed is a result of human and natural factors. Human factors have particularly influenced the watershed in the last century, after the arrival of Euro-Americans and the removal of native people.

Social, cultural, and economic development pressures applied from influences ranging far beyond local and regional forces have shaped this area. Two major world wars, intent on supplying Allied needs, a post-war demand for a developing economy, along with the regular need for forest products of a growing and developing nation, have helped shape the nature of the Ginger Springs watershed as we see it today. Private and federal timberland management was committed through the last five decades to assist in this development. Roads were built, rock pits opened, areas (large and small) of old-growth forests harvested, sometimes light entries and sometimes intensive clearcuts, have inalterably changed the landscape. The natural ecosystems do not function the same as the reference area and it is unclear to what extent the overall impact these changes have made on the functioning of this small watershed, especially in regards to how the quality of spring water is affected as precipitation recharges the area.

Water quality, as measured by turbidity, indicates seasonal fluctuations depending on rainfall. It is unclear if the source of periodic turbidity peaks are related to transported clay material through the soil mantle or the result of high volume water flows through underground stream channels creating disturbances in bedrock sediments. Spikes in turbidity have also been noted in the middle of summer following weeks of no rain.

The municipal water is tested monthly for total coliforms. Regular testing has indicated an absence of coliforms. Likewise, tests for pesticides and other chemicals have produced “none-detected” results (*Shipley*). To the extent it has been studied, and understood, the quantity and quality of Ginger Springs water has remained historically

adequate and of a consistently high quality. The Springs true seasonal discharge is not known.

The municipal use of approximately one cfs of water from Ginger Springs for the Town's use has removed that amount of water that would normally flow into the stream channel of Ginger Creek. Irrigation water diverted from Hukill Creek to pastures south of Town has removed portions of that stream's flow into Big Butte Creek. Roads throughout the watershed divert water via ditches and culverts away from natural channels providing an unnatural source of sediment into streams with their periodic high velocity runoff through ditches. Several large culverts (below the recharge area) probably inhibit natural movement of native fish. Harvesting patterns on private and federal lands may alter the soil infiltration rate of precipitation and may have an influence on the effect of snow duration on the slopes possibly affecting the recharging mechanism for Ginger Springs groundwater.

The altered vegetation patterns have influenced wildlife species composition and use. The frequency of roads have applied an unnatural pressure on the movement and use of the wildlife in the area. The normal use of the area by humans has created opportunities for the introduction of an array of contaminants into surface and (possibly) subsurface water. Accessibility throughout the watershed creates the opportunity for the introduction of non-native and noxious plants to become established. The unauthorized use of timberland resources (primarily firewood) is acknowledged.

But that's not to say that all of this is bad. The use of the Ginger Springs watershed by humans has created liveability, employment, and recreational enjoyment for untold numbers of people, both locally and regionally, for nearly a century.

4.0 WATERSHED MANAGEMENT PLAN (Step 6)

Brings the results of the previous five steps to conclusion, focusing on management recommendations that are responsive to watershed processes identified in the analysis. By documenting logical flow through the analysis, issues and key questions (step 2) are linked with the step 5 synthesis and interpretation of ecosystem understandings. Monitoring activities are identified that are responsive to the issues and key questions. Data gaps and limitations of the analysis are also documented.

The RMP-ROD (pgs. 20-21) describe a *MANAGEMENT VISION* that merits repeating.

"The BLM will manage land and natural resources under its jurisdiction in western Oregon to help enhance and maintain the ecological health of the environment and the social well being of human populations.

There are several basic principles supporting this vision:

- *natural resources can be managed to provide for human use and a healthy environment;*
- *resource management must be focused on ecological principles to reduce the need for single resource or single species management;*
- *stewardship, the involvement of people working with natural processes, is essential for successful implementation;*
- *the BLM cannot achieve this vision alone but can, by its management processes and through cooperation with others, be a significant contributor to its achievement; and*

, *a carefully designed program of monitoring, research and adaptation will be the change mechanism for achieving this vision."*

4.1 GENERAL RECOMMENDATIONS

The following recommendations are the result of incorporating objectives and concerns of the resources previously identified. These recommendations will be, in some cases, more restrictive than the Medford District RMP direction. Sensitivities, and to a degree the unknown effects, of managing the landscape overlying a municipal watershed led to a conservative approach at silvicultural harvest systems, interpreting the effects of the Transient Snow Zone on the movement and recharge of water through the geologic formations, and minimizing the influence of physical, biological and chemical contaminants in the Riparian Reserves and Zone of Influence-2.

Table VI summarizes the overall landscape management goals for the Ginger Springs watershed. The specific recommendations found in Section 4.2 will be designed to move each Operations Inventory unit, and (in time) the entire BLM portion of the Ginger Springs landscape, towards a more balanced vegetative structure that will:

< be stable in its ecological function, providing habitat for mature and late-successional forest species,
< be resistant to catastrophic fire,
< provide for a reasonable accommodation of natural resource products,
< and most importantly maintain the productivity and efficiency of the Ginger Springs watershed for the residents of Butte Falls, who rely on these forested slopes to produce it's water.

Table VI
TERRESTRIAL FOREST CONDITION
CURRENT LEVELS and FUTURE GOALS

	Overall Ginger Springs Current Level by percent	1998 Federal ownership Ginger Springs by percent *	2048 Federal ownership Goals by percent
Early-Successional / No Snags	68	25	22
Early-Successional / With Snags	< 1	< 1	7
Late-Successional / Single Layer	6	9	13
Late-Successional / Multi-layered	25	65	58

* Based on Operations Inventory data.

These management recommendations are intended to retain as much of the late-successional forest within the recharge area as possible. Some late-successional stands are deteriorating to the point where long-term sustainability is in question. This may be the result of natural factors such as age, disease or insect infestations, or human-caused alterations from

previous management activities. With or without management, these stands will shift back towards early-successional conditions, resulting in the estimated 17 percent decline in late-successional multi-layered stands.

4.1.1 VEGETATION

4.1.1.a SEEDLING and EARLY-SERAL VEGETATION CLASSES

Objective: Enhance structural diversity of existing, young even-aged forest stands.

Recommendations:

1. No thinning or brushing treatments would occur until stand height exceeds 15 feet or is over 20 years old.
2. Improve horizontal and vertical diversity in even-aged plantations by creating canopy gaps, encouraging species diversity (hardwoods and conifers) and maintaining unthinned clumps. Thin to differing residual densities, dependent upon site productivity and conifer species targeted. Target stands for thinning that have greater than 350 trees per acre and are 10-20 years of age. Thinning densities should reflect TSZ canopy development goals (>60%). Manage competing brush to improve plantation tree growth and treat fuels to reduce fire hazard.
3. Consider pruning as an option for improving wood quality development and increasing diameter growth on selected trees of early-seral stands.

Objective: Manage early-seral stage OI units that have Riparian Reserves and Zone of Influence - 2 to minimize disturbance.

Recommendations:

1. Within the Riparian Reserve, maintain a 100 foot “no cut” buffer. Beyond the “no-cut” area but still within the area of the “one-site tree”, maintain a canopy closure of 60% to 70%.
2. In the Zone of Influence 2, maintain a canopy closure of 60 - 70%.

4.1.1.b MID-SERAL, MATURE, AND LATE-SUCCESSIONAL VEGETATION CLASSES

Objective: Increase growth, quality, and vigor of individual trees.

Recommendations:

1. Reduce timber stand densities when the stands have a relative density index of over 50 percent. Develop silvicultural prescriptions to decrease the number of trees per acre (or basal area) to a relative density index of approximately 35 percent.
2. Use pruning as an option on selected dominant trees to improve wood quality and increase diameter growth on fast-growing pole stands.
3. Commercial thinning should be targeted at dense, disease-free conifer stands that are less than 150 years old, with relative densities greater than 50 percent, with crown ratios greater than 30 percent, and with growth rates slowing. Desired growth rate is 15/20 inches or greater per ten-year period.

Objective: Design and develop a diverse landscape pattern and contiguous areas of multi-layered, late-successional forest over time.

Recommendations:

1. Prescribe silvicultural treatments that promote contiguous areas of mature

and late-successional forest land.

2. Management activities should be focused towards precommercial and commercial thinning, unevenaged regeneration harvest, and salvage opportunities.

3. In the short term, a modified even-aged regeneration harvest that creates an early successional stand should be limited to insect & disease, windthrow, fire salvage, or stands which are deteriorating to the point where the integrity of the stand is threatened. On these harvested areas, maintain long-term site productivity and biological legacies by retaining coarse woody debris (CWD), snags, and, depending on land allocation, 6 to 8 or 12 to 18 large-diameter green trees per acre.

4. Promote and improve species diversity by encouraging natural levels of diversity found in native plant communities. Utilize plant association principles to describe and define desired levels of species diversity.

5. Use landscape design to maintain designated patches of untreated vegetation in strategic locations (Riparian Reserves, wildlife corridors, areas between existing tree plantations, shrublands, etc.)

Objective: Manage stands to minimize disturbance in Riparian Reserves and Zone of Influence 2.

Recommendations:

1. Within the Riparian Reserve, maintain a 100 foot "no cut" buffer. Beyond the "no-cut" buffer but still within the area of the "one-site tree" maintain a canopy closure of 60% to 70%.

2. In the Zone of Influence 2, maintain a canopy closure of 60-70%.

Objective: Create openings and suitable seedbeds to promote the establishment and growth to pine species, incense cedar and Douglas-fir. Increase/maintain the species composition of these species where they are under-represented or may suffer from competition stress.

Recommendations:

1. Use the group selection method to create openings of ¼ to 2 acres. Approximately 5 to 20 percent of the commercial forest lands would receive the group selection method of harvest with a random pattern of group distribution across the landscape.

2. Maintain vigor of dominant sugar and ponderosa pine trees by release cutting all vegetation within 15 feet of the dripline of the crown. Crown ratios of treated trees should be greater than 30%.

Objective: Assure survival of individual trees with late-successional characteristics by reducing vegetative competition in second-growth timber stands.

Recommendation:

1. Reduce competition in Matrix lands by removing second-growth trees that surround trees with late-successional characteristics. Create a 15- 25 foot crown space between the old-growth tree and the remaining second-growth trees. Cut only trees that do not have crowns entwined with the late-successional tree. Girdle entwined crowns of second growth tree and leave to deteriorate in place.

Objective: Design silvicultural prescriptions to manage Douglas-fir dwarf mistletoe infestations.

Recommendations:

1. Keep the mistletoe infestations confined to draws. Minimize ridge top infestations. Treatment options may include:

A. Delay management entry.

1. If the infected stand is important for the maintenance of landscape diversity, wildlife values, water quality or refugia for late-successional associated species, delay entry until the adjacent areas have recovered to desired conditions.

2. The stand is lightly infected (MTR <3) (*Appendix B*) and growth rates are greater than $15/20^{th}$ inch per ten-years.

B. Convert infested stand to non-hosts species: ponderosa pine, sugar pine, incense cedar, white fir, and hardwood species.

1. Establish non-host species in a 50 foot buffer strip around the perimeter of the stand to prevent Douglas-fir mistletoe infection.

2. Interplant with non-host species.

C. When mistletoe infection is widespread throughout the stand and the average mistletoe rating is 4 or greater, a regeneration harvest is an option. Leave a minimum of 6-8 green trees per acre greater than 20 inches dbh.

1. Always leave the least infected trees in the overstory, clump reserve trees to minimize infection potential.

2. Plant non-host conifers.

3. Remove all infected intermediates and regeneration during first harvest.

D. Group select - If mistletoe occurs in discrete pockets, group select the infected pocket, remove all understory Douglas-fir greater than three feet in height and plant with non-host species.

E. Sanitation harvest - Reduce or eliminate the amount of mistletoe in a stand. Remove the most heavily infected trees.

1. Remove trees with mistletoe in the top one-half of the crown.

2. Leave vigorous ponderosa pine, sugar pine, incense cedar, white fir, and hardwood species.

3. Retain Douglas-fir trees in the following order:

a. Uninfected dominants and co-dominants.

b. Dominants and co-dominants with mistletoe in the lower one-third of the crown.

c. Dominants and co-dominants with mistletoe in the lower one-half of the crown.

d. Dominants and co-dominants with mistletoe in the lower two-thirds of the crown.

e. Intermediates with no visible mistletoe.

f. Intermediates with mistletoe in the lower one-half

of the crown.

g. Any tree with good vigor in the understory.

Objective: Use selection silvicultural methods to manage for root rot (*Phellinus weirii* and *Armillaria ostoyae*) where prevalent in forest stands.

Recommendations:

1. Use single tree and group selection methods to control the spread of the root rot.
2. Plant resistant species in openings created by tree mortality.
3. Use selection silvicultural methods to develop diverse stand structure and species composition over time in the infected areas.

Objective: Reduce the fire hazard in timber stands by decreasing the ladder fuels.

Recommendations:

1. Decrease the ladder fuels by thinning from below, pruning on selected dominant trees, slashing, hand piling, and lop&scatter slash in dense stands. These treatments should eliminate fire fuels to a height of 6 to 12 feet above ground level.
2. Form a mosaic of vegetative patterns by leaving untreated vegetation patches scattered throughout the landscape.

Objectives: Provide for well distributed coarse woody debris (CWD). Reserve the largest CWD already on the ground from removal. Look for opportunities to recruit CWD to areas lacking in material.

Recommendations:

1. Leave a minimum of 120 linear feet of decay class 1 and 2 logs per acre greater than or equal to 16 inches in diameter at the large end and 16 feet in length in regeneration harvest areas.
2. Amounts of CWD can be modified in areas of partial harvest to reflect the timing of stand development cycles that provide for snags and subsequent CWD from natural suppression and overstocking mortality. The advantages of treatment to improve habitat conditions beyond natural conditions should be assessed. The amount of CWD to leave should fall within a range of the average natural distribution. Leave green trees as a future source of CWD. Fall green trees into units lacking in CWD to begin the long-term process of course wood recruitment.
3. Perform surveys to determine average amounts of CWD over the landscape for the commercial timber land base and the respective vegetation zones.
4. Gradually recruit CWD levels over time in partial harvest areas that are appropriate for the site. It may take two to three stand entries to acquire desired amounts of CWD, especially in regard to large-end log diameter requirements.
5. Increase CWD in plantations where site preparation has reduced its volume. Falling trees from along the edge of adjacent mature stands into plantations to provide this material. When available, use tree species other than Douglas-fir for CWD. This would minimize the buildup of Douglas-fir bark beetle populations. If Douglas-fir is used for CWD, do not exceed more then 2 pieces per acre.

4.1.1.c TRANSIENT SNOW ZONE (TSZ)

Objective: Reduce the potential for altering the timing, magnitude, duration, frequency and spatial distribution of peak stream flows.

Recommendation:

1. Manage vegetation within the TSZ to maintain adequate canopy closure. The following crown closure percentages (based on acombination of conifers and hardwoods) listed by forest zone, tree species, and aspect are considered to represent full hydrologic recovery.

MIXED CONIFER ZONE

Series	Aspect	% Canopy Closure
Douglas-fir	north	70
Douglas-fir	south, west, east	60

WHITE FIR ZONE

Series	Aspect	% Canopy Closure
White fir	all	70

4.1.2 WILDLIFE

Objective: Maintain or enhance current native terrestrial wildlife populations and distribution.

Recommendations:

1. Develop and maintain a diverse distribution of seral stages of the various plant communities found in the watershed.
2. Maintain adequate numbers of snags and amounts of CWD for those species that require these special habitats for breeding, feeding, or sheltering.
3. Identify and protect, maintain or improve dispersal corridors within the watershed and between adjacent watersheds.
4. Close roads where road densities are greater than 1.5 miles per square mile in big game winter range and elk management areas.
5. Rehabilitate shrub/winter-range for deer and elk.

Objective: Ensure management activities do not lead to listing of special status species as threatened or endangered.

Recommendations:

1. Inventory special status species suspected to occur in the watershed.
2. Protect, maintain, or improve habitat conditions as necessary for those special status species found.

4.1.3 FISH

Objectives: Maintain viable cutthroat fish populations at all life stages throughout their habitat. Maintain or enhance aquatic wildlife populations including listed and proposed-for-listing species, their distribution, habitat, and long-term sustainability. Restore and protect aquatic habitat for all resident fish. Maintain and enhance in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing.

Recommendations:

1. Ensure that management activities on public lands meet the Aquatic

Conservation Strategy (ACS).

2. Restore and/or diversify fish habitat to maintain pool habitat, fish cover, spawning gravels, and bank stability.

3. Replace existing stream crossings, as needed, to facilitate fish passage for all fish species and age classes during all flow conditions.

4. Minimize grazing impact to streambanks and riparian areas.

5. Reduce stream substrate embeddedness by minimizing erosion to improve interspace habitat available for insects, fish, and amphibians.

6. Identify roads contributing to excessive sediment delivery to streams. Correct areas with inadequate road drainage to reduce sediment delivery to aquatic habitats. Replace culverts in streams identified as insufficient to carry 100-year flood events.

7. Coordinate with private timberland owners to improve aquatic habitat.

4.1.4 RIPARIAN

Objectives: Maintain and enhance Riparian Reserves habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species, especially taking into consideration long-term plant community changes. Maintain Riparian Reserves whose climax vegetation structure includes conifers in a range of stand conditions possessing late-successional characteristics. Manage for Riparian Reserves that will support a diversity of native plants, provide canopy closure that maintains stream temperatures, provide connection habitat, support healthy populations of wildlife species. Riparian Reserves and Zone of Influences serve as effective filters of sediment from upslope sources, and promote a future diverse, large, conifer component which contributes to high quality riparian and aquatic habitat.

Recommendations:

1. Manage conifers to promote future large wood recruitment in Riparian Reserves. The target is 40 to 100 pieces per mile of large wood material (greater that 24 inches in diameter and 50 feet in length) in stream channels.

2. Inventory and prescribe restoration measure for roads in riparian zones.

3. Implement riparian management activities in Riparian Reserves to increase the large conifer component in streams flowing through early- and mid-seral stands.

4. Along fish-bearing streams where a thinning unit will reduce the canopy closure to less than 60%, leave a “two-site tree” buffer. The first site tree distance shall be a “no-cut” buffer. The second site tree distance should leave a canopy closure greater than 60%.

5. Along perennial and intermittent streams where thinning units will reduce the canopy closure to less than 60%, leave a “one-site tree” buffer. The first 100 feet will be “no-cut” and the remainder should leave a canopy closure greater than 60%.

6. When a harvest treatment along any stream reduces the canopy closure to less than 40%, maintain a one site tree “no-cut” buffer.

7. No equipment is permitted to operate within 100 feet of the stream.

8. Where possible, obliterate existing roads, skid trails, and landings within Riparian Reserves and relocate them in less sensitive areas. Revegetate these

areas to native species.

9. Stabilize roadways that are not obliterated that are within Riparian Reserves to control sediment.

10. Identify specific grazing problems in Riparian Reserves, especially wetlands and streambanks, and institute corrective measures.

11. Maintain or improve vegetation and habitat within a one-site tree length of headwater springs and wetlands for amphibian, macroinvertebrates, and other wildlife. Consider fencing springs, seeps, and water developments to protect water quality and riparian ecosystems.

Objective: Improve riparian vegetation condition.

Recommendation:

1. Utilize "Key to Determining Active Management in Riparian Reserves" (*Appendix G*) to prioritize areas needing enhancement projects to accelerate riparian vegetation condition to "properly functioning".

Objective: Maintain the integrity of Zone of Influence - 2.

Recommendations:

1. In Zone of Influence - 2 that are coincident with a Riparian Reserve and in stands over twenty years of age, maintain a "no-cut" buffer of 100 feet on each side of the stream. The remainder of the Zone and the area outside of the "no-cut" buffer would be managed to maintain a canopy closure of 60 to 70 percent.

2. In Zone of Influence - 2, not associated with a Riparian Reserves, maintain 60 to 70 percent crown closure.

4.1.5 FIRE

Objective: Promote long-term resistance to stand replacement wildfires by reducing fuel hazard.

Recommendations:

1. Treat areas of continuous high hazard fuels in order to reduce the size and intensity of wildfires. High priority to consider are areas adjacent to roads and areas of high values at risk (Riparian Reserves and Zone of Influence - 2).

2. Develop strategy to reduce fuel hazard in previously harvested areas that contain heavy fuel loading (Fuel Models 11 and 12).

3. Treat fuels created by management activities, concurrently with timber sale or stand improvement contracts.

Objective: Improve firefighter and public safety conditions for future wildfire incidents.

Recommendation:

1. Maintain current fire access routes. These routes are needed to allow quick response times to wildfire starts and as escape routes for firefighters and the public.

Objective: Minimize effects of prescribed fire and wildfire on soil integrity.

Recommendations:

1. Review fuel models in Riparian Reserves and Zone of Influence 2. Develop a hazard reduction plan.

2. Implement cool prescribed burns designed to maintain 50 percent duff and litter on site. Treat Fuel Models 11, 12 and 13 slash, especially in Zone of

Influence - 2.

3. A resource advisor will be assigned to wildfires on BLM land.

4. Use only retardants approved for use in municipal watersheds for fire suppression efforts.

4.1.6 GRAZING

Objective: Manage livestock in a manner that maintains or improves Riparian Reserves to meet the goals of the Aquatic Conservation Strategy.

Recommendations:

1. Review non-appropriated waters and springs for the development of spring box/trough improvements that would attract cattle away from stream channels and riparian areas.

2. Manage salt blocks to minimize impacts in riparian areas.

3. Stress the importance of "properly functioning" riparian areas in the issuance of grazing authorizations.

Objective: Continue to provide livestock forage on designated allotments to maintain existing grazing levels, without compromising the ecological integrity of the uplands.

Recommendations:

1. Allotment plans will reflect need to maintain high quality water courses.

2. Develop management strategies at annual allotment planning meeting, in consultation with the permittee, to resolve resource conflicts.

3. Where water quality conflicts cannot be resolved or mitigated, relocation or removal of livestock will be considered.

4. Update allotment plans as needed.

Objective: Prevent or discourage the spread of noxious weeds and non-native plant species.

Recommendations:

1. Survey area for presence of noxious weeds.

2. Use grazing systems designed to encourage native grasses and discourage non-native annual grasses on upland range. Where this is not possible or practical, set livestock forage utilization limits and distribution requirements that do not contribute to further increase of non-native species on the range.

3. Emphasize prevention activities. Minimize ground disturbance in the watershed. Use native species from local gene pools when plant materials are needed for project use. If the native species are unavailable or unsatisfactory, use non-invasive or non-persistent non-native species. Clean vehicles and equipment after being in known noxious weed infestation areas.

4. Consider use of sterile and/or competitive grasses on disturbed sites to prevent encroachment of noxious weeds, especially on low elevation sites. Later, if appropriate, convert to native species.

5. Use alternatives to herbicides in treatment of noxious weeds.

4.1.7 HUMAN USES

Objectives: Maintain and promote contacts with local groups, landowners, and community leaders to facilitate continuing dialogue on the management of public lands in the Ginger Springs recharge area. Provide opportunities to exchange information concerning land management actions within the area.

Recommendations:

1. Inform Town officials of proposed land management activities, sufficient of allow an opportunity for comment prior to decision-making.
2. Utilize local avenues of communication, such as Butte Falls Bulletin, Upper Rogue Independent, school newsletters and bulletin boards. Use local meeting spots for formal and informal meetings with residents to discuss issues of local concern.

Objective: Manage the transportation system to serve the need of the users and meet the needs identified under other resource programs. Maintain a transportation system that minimizes erosion.

Recommendation:

1. Develop and implement Transportation Management Objectives (TMO) for roads in the watershed.
2. Develop plans for decommissioning/obliterating roads in sections with greater than four miles per square mile.
3. Improve or install new drainage systems and surfacing on non-system roads near Riparian Reserves.

Objective: Maintain a transportation system that meets the Aquatic Conservation Strategy and Riparian Reserves objectives.

Recommendations:

1. Evaluate the condition of all roads in Riparian Reserves.
2. Reconstruct, stabilize, reroute, decommission, close, or obliterate roads, landings, and skid roads that pose a substantial risk to Riparian Reserves and aquatic ecosystems.

Objective: Reduce opportunities for contamination in the watershed. Maintain/develop integrity of Zone of Influence - 2.

Recommendations:

1. Within Zone of Influence - 2, minimize new road construction, new skid trail development, and look for opportunities to stabilize these existing features. Avoid storing equipment within these areas.
2. No fuel storage within the watershed during non-working hours.
3. Use approved absorbent materials under stationary equipment.
4. Properly dispose of all oil, fuel, and filters.
5. Use chemical toilets in watershed at all project sites.
6. Use a dust palliative that contains no asphalt or solvents.
7. Prohibit the use of herbicides, insecticides and rodenticides in the watershed.
8. Prohibit the use of fertilizers in the watershed.
9. Work with community to develop a hazardous materials emergency management plan.
10. Work with community to develop signs to identify Ginger Springs watershed boundary for the traveling public.

Objectives: Rehabilitate disturbed areas due to past mineral activity. Reduce sediments and pollutants from rock quarries.

Recommendations:

1. Evaluate and prioritize known disturbed mineral extraction areas for rehabilitation.
2. Develop rehabilitation plans for targeted areas.
3. Restrict development of new quarry sites.

Objectives: Minimize effects of contamination sources from recreational activities. Minimize and/or reduce unauthorized use, including dumping on federal land.

Recommendations:

1. Monitor known dispersed recreation sites for sources of contamination.
2. Rehabilitate area that have received resource damage as the result of unauthorized activity.
3. Utilize law enforcement resources when appropriate.

4.2 OPERATIONS INVENTORY (OI) UNIT RECOMMENDATIONS

The management recommendations made in this section for each OI unit will describe, in as much detail as is possible - or reasonable - specific actions that could be set upon in the next 30-50 year period. This time frame was felt to be reasonable to get young plantations to a point where subsequent actions will progress them to a desired future condition, mature stands to a point of development that meets landscape goals and older forests that need to have insect/disease concerns dealt with in the context of overall landscape involvement.

Management recommendations during the next 30-50 years may change as the result of disturbance events, such as, fire, insects, disease, or wind. Dependent upon the severity of these events, salvage or other management treatments may occur. This is indeed the "living" part of this document. As stands develop, change through disturbance (natural or man-caused) or as knowledge of how the geologic processes in the recharge area expand, this plan will evolve to best fit the long term goals.

General forest conditions on BLM managed lands should be considered poor to moderate. Current stand conditions would tend to magnify rather than resist a build-up of insects and disease. The ability of the watershed to recover from these types of disturbances without significantly altering forest structure and composition is low.

Stand conditions will need to be monitored annually to assess any detrimental changes or insect build-up. Of particular concern is the Douglas-fir weakened by dwarf mistletoe. These trees have a greater susceptibility to insect attack and consequently rapid mortality.

All units are in Township 35 South, Range 2 East. Numbers displayed are (in order) Section-OI number. Each OI unit will be described in terms of its general present condition and what the overriding objectives are for the long-term management of the unit. Specific to the resource issue recommendation will follow, as appropriate. Refer to 1996 aerial photographs in Appendix.

15- 003 Description: 10 acres, ponderosa pine plantation planted in 1965, 170 trees per acre (TPA). The area is generally characterized with a lack of CWD, snags or availability of recruitment material for these features.

Objective: Increase LSR habitat condition for adjacent northern spotted owl nest site. Minimize fuel loading, especially along roadside. Although the entire OI unit (27 acres) is not within the Ginger Springs watershed, the entire OI unit will be managed as if it were in the watershed.

4.2.1 VEGETATION: Collect stand exam information (species, diameter, crown ratios, growth rates and tree height) to determine: 1). The potential to enhance the presence and growth of Douglas-fir within the stand. Dependent upon the distribution, amount and condition of Douglas-fir, release from competing trees and shrubs may be appropriate. 2). The potential for pruning, utilizing Organon (growth and yield model) to project pruning effects upon tree and stand development (diameter growth, height growth and mortality rates).
4.2.2 WILDLIFE: Active northern spotted owl nest site has been identified in an adjacent mature timber unit. The future development of this OI unit will be to develop foraging habitat.
4.2.3 FISH: Hukill Creek is a fish-bearing stream. No current recommendations.

4.2.4 RIPARIAN: Create Riparian Reserve OI unit. See General Recommendations for RIPARIAN (4.1.4).
4.2.5 FIRE: Treat thinning activity fuels, especially along roads.
4.2.6 GRAZING: Repair/maintain fence along Road 33-2E-10.
4.2.7 HUMAN USES: Review watershed protection measures (4.1.7) when unit is involved in contract work. Incorporate measures as appropriate.

15- 005 Description: 11 acres, ponderosa pine plantation planted in 1965, 170 TPA. The area is generally characterized with a lack of CWD, snags or availability of recruitment material for these features.
Objective: Develop/manage stand to create a diversity of vegetative structure. Although the entire OI unit (24 acres) is not within the Ginger Springs watershed, the entire OI unit will be managed as if it were in the watershed.
4.2.1 VEGETATION: Collect stand exam information (species, diameter, crown ratios, growth rates and tree height) to determine: 1). The potential to enhance the presence and growth of Douglas-fir within the stand. Dependent upon the distribution, amount and condition of Douglas-fir, release from competing trees and shrubs may be appropriate. 2). The potential for pruning, utilizing Organon (growth and yield model) to project pruning effects upon tree and stand development (diameter growth, height growth and mortality rates).
4.2.2 WILDLIFE: Develop opportunities for foraging habitat.
4.2.3 FISH: No recommendations.
4.2.4 RIPARIAN: No recommendations.
4.2.5 FIRE: Treat thinning activity fuels, especially along roads.
4.2.6 GRAZING: No recommendations.
4.2.7 HUMAN USES: Review watershed protection measures (4.1.7) when unit is involved in contract work. Incorporate measures as appropriate.

21- 001 Description: 28 acres, plantation resulting from 1990 clearcut and overstory removal. Plantation is medium vigor ponderosa pine and Douglas-fir 5-10 feet tall. 200 TPA.
Objective: Maintain site to develop vegetation cover for Riparian Reserve, Zone of Influence 2, and TSZ protection. The area is generally characterized with a lack of CWD, snags or availability of recruitment material for these features. Although the

entire area is not in Zone 2, the entire unit will be treated as such.

4.2.1 VEGETATION: Review MICRO*STORMS data. No further silvicultural treatments, until completion of a thorough stand survey. Vegetation treatments in Riparian Reserves and Zone of Influence should reflect different objectives than common plantation objectives. Prohibit use of pesticides for gopher control.

4.2.2 WILDLIFE: Recruit CWD from adjacent unit 003.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: Create Riparian Reserve OI unit. See General Recommendations for RIPARIAN (4.1.4).

4.2.5 FIRE: Hand pile slash in entire unit following any fuel-loading activities.

4.2.6 GRAZING: Salt block livestock away from Riparian Reserve area.

4.2.7 HUMAN USES: Maintain road closure blockade on Road 35-2E-22.

21- 002 Description: 38 acres, 250 year old, old-growth Douglas-fir stand. Canopy closure 86%. This unit has had no past management entry.

Objective: No entry. This is a unique stand due to its "natural" condition. It provides excellent habitat for old-growth dependent species and thermal cover for big game species. This unit will provide a ready source of recruitment CWD for adjacent unit 004 along its west boundary.

4.2.1 VEGETATION: Defer entry for this 50 year planning cycle.

4.2.2 WILDLIFE: No recommendations.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: No action.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: No recommendations.

21- 003 Description: 22 acres, 210 year old, old-growth Douglas-fir stand. Canopy closure 86%. Limited selection and salvage logging in the early 70s. Douglas-fir bark beetles and flatheaded fir borers are active adjacent to Road 35-2E-10 and along the stand edges.

Objective: Unit lies within TSZ and easternmost one-half of unit is in Zone of Influence 2. Canopy cover should be maintained at no less than 60%. This unit will provide a ready source of future CWD recruitment for adjacent units 001 and 005.

4.2.1 VEGETATION: Sanitation entry ONLY in this unit to maintain tree vigor and canopy closure levels of stand for TSZ and Zone of Influence protection.

4.2.2 WILDLIFE: No recommendations.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: Lop and scatter hand pile concentrations.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: Review watershed protection measures (4.1.7) when unit is involved in contract work. Incorporate measures as appropriate.

21- 004 Description: 7 acres, plantation resulting from 1990 clearcut, Douglas-fir and ponderosa pine (160 TPA) are low to medium vigor and suffer from frost, browse and

gopher damage. The area is generally characterized with a lack of CWD, snags or availability of recruitment material for these features.

Objective: Unit is in TSZ and Big Game Winter Range. Big game thermal cover needs are being met in unit 002. Units 004 and 007 provide valuable forage. Plantation management goals will be to focus on developing a closed canopy for this plantation. Future PCT recommendations should develop and maintain canopy closure for TSZ protection.

4.2.1 VEGETATION: No further silvicultural treatment until a thorough unit assessment is completed. PCT and brush treatments should reflect canopy closure goals. Prohibit use of pesticides for gopher control.

4.2.2 WILDLIFE: Recruit CWD from adjacent unit 006.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: Evaluate and treat activity fuels.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: Review watershed protection measures (4.1.7) when unit is involved in contract work. Incorporate measures as appropriate.

21- 005 Description: 25 acres, plantation resulting from 1990 clearcut, Douglas-fir and ponderosa pine (160 TPA) are low to medium vigor and suffer from frost, browse and gopher damage. The area is generally characterized with a lack of CWD, snags or availability of recruitment material for these features.

Objective: Unit is in TSZ. Plantation management goals will be to focus on developing a closed canopy for this plantation. Future PCT recommendations should develop and maintain canopy closure for TSZ and Zone of Influence protection.

4.2.1 VEGETATION: No further silvicultural treatment until a thorough unit assessment is completed. PCT and brush treatments should reflect canopy closure goals. Prohibit use of pesticides for gopher control.

4.2.2 WILDLIFE: Recruit CWD from adjacent units 003, 006 and 008.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: Evaluate and treat activity fuels.

4.2.6 GRAZING: Livestock salting should occur south of road (away from Zone of Influence 2).

4.2.7 HUMAN USES: Review watershed protection measures (4.1.7) when unit is involved in contract work. Incorporate measures as appropriate.

21- 006 Description: 10 acres, stand age 220 years old. Canopy closure 44%. The area has been heavily partial cut. There is no record of previous silvicultural treatments. Along the stand edges, Douglas-fir bark beetles and flatheaded fir borers are active and causing tree mortality of poor-vigor trees. In the southwest corner, an area 1-2 acres in size is severely affected, with the insects causing significant mortality.

Objective: Unit is in TSZ and Big Game Winter Range. Due to previous entries there is probably a lack of CWD. Condition of stand provides virtually no thermal cover nor canopy protection for TSZ. See VEGETATION.

4.2.1 VEGETATION: Schedule regeneration harvest in year 2010. Stand condition is “unraveling” and will only become productive and functioning through the establishment of

a newly regenerated stand. In the southwest corner, sanitation salvage trees undergoing attack before the emergence of beetles the following spring. Trees in excess of CWD or wildlife needs may be removed from the site.

4.2.2 WILDLIFE: CWD requirements must be met prior to timber removal. Maintain at least 2 snags per acre. As unit currently exists it provides no thermal cover. While adjacent units (002 and 003) are functioning, begin new thermal cover recruitment through stand regeneration.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: Treat activity fuels following entry depending on fuel loadings.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: Review watershed protection measures (4.1.7) when unit is involved in contract work. Incorporate measures as appropriate.

21- 007 Description: 12 acres, plantation resulting from 1990 clearcut, Douglas-fir and ponderosa pine (160 TPA) are low to medium vigor and suffer from frost, browse and gopher damage. The area is generally characterized with a lack of CWD, snags or availability of recruitment material for these features.

Objective: Unit is in TSZ and Zone of Influence 2. Plantation management goals will be to focus on developing canopy closure of plantation. Future PCT recommendations should develop and maintain canopy closure for TSZ and Zone of Influence protection.

4.2.1 VEGETATION: No further silvicultural treatment until a thorough unit assessment is completed. PCT and brush treatments should reflect canopy closure goals. Prohibit use of pesticides for gopher control.

4.2.2 WILDLIFE: Recruit CWD from adjacent unit 008.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: Evaluate and treat activity fuels.

4.2.6 GRAZING: Livestock salting should occur south of road (away from Zone of Influence 2).

4.2.7 HUMAN USES: Review watershed protection measures when unit is involved in contract work. Incorporate measures as appropriate.

21- 008 Description: 13 acres, stand age 220 years old. Canopy closure 44%. The area has been heavily partial cut. There is no record of previous silvicultural treatments.

Objective: Unit is in TSZ and Zone of Influence 2. Maintain/develop canopy closure of existing mature timber stand. Due to previous entries there is probably a lack of CWD. This unit may provide a source of future CWD recruitment for adjacent units 005 and 007.

4.2.1 VEGETATION: Limit future entries to *light* sanitation/salvage. Canopy closure to be developed towards 60%$^{+}$.

4.2.2 WILDLIFE: CWD requirements must be met prior to timber removal. Maintain at least 2 snags per acre.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.
4.2.5 FIRE: Lop and scatter hand pile concentrations after harvest activities.
4.2.6 GRAZING: Livestock salting should occur south of road (away from Zone of Influence 2).
4.2.7 HUMAN USES: Review watershed protection measures when unit is involved in contract work. Incorporate measures as appropriate.

23- 002 Description: Approximately 43 acres of a 59 acre OI unit, stand age 250 years old, old-growth Douglas-fir that has had a variety of light partial cut entries. There is no record of silvicultural treatments in this unit.
Objective: The primary objective will be the maintenance of a relatively tight canopy closure that will accomplish several important functions. The maintenance of dispersal habitat for adjacent northern spotted owl core area and related LSR dependent species, to minimize the spread and intensification of mistletoe and to provide for protection of Zone of Influence-2. This unit is not in the TSZ.
4.2.1 VEGETATION: This unit can provide a ready source of future CWD recruitment for adjacent units 003 and 900. Limit treatments to light sanitation/ salvage activity that would not open canopy sufficient to exceed objectives for dispersal habitat, mistletoe intensification (60%-70%) and Zone of Influence protection. Very long term objectives may dictate a regeneration harvest to control mistletoe when adjoining units are providing dispersal habitat.
4.2.2 WILDLIFE: Maintain canopy closure at greater than 60% for dispersal habitat from 004 (owl core area). This will maintain connectivity function for LSR.
4.2.3 FISH: No recommendations.
4.2.4 RIPARIAN: No recommendations.
4.2.5 FIRE: See General Recommendations for FIRE (4.1.5).
4.2.6 GRAZING: No recommendations.
4.2.7 HUMAN USES: No recommendations.

23- 003 Description: 14 acres, primarily ponderosa pine, with possibility of other volunteer conifers. Plantation established in 1965 by aerial seeding. 194 TPA resulting from a 1985 PCT. The area is generally characterized with a lack of CWD, snags or availability of recruitment material for these features.
Objective: With what little there may be to work with in this plantation, begin to create some vegetation and structural diversity. This unit is one of the few that is outside the TSZ, making canopy closure not an immediate issue. Although the entire OI unit (19 acres) is not within the watershed, the entire OI unit will be managed as if it were in the watershed.
4.2.1 VEGETATION: Collect stand exam information (species, diameter, crown ratios, growth rates and tree height) to determine: 1). The potential to enhance the presence and growth of Douglas-fir within the stand. Dependent upon the distribution, amount and condition of Douglas-fir, release from competing trees and shrubs may be appropriate. 2). The potential for pruning, utilizing Organon (growth and yield model) to project pruning effects upon tree and stand development (diameter growth, height growth and mortality rates).
4.2.2 WILDLIFE: Recruit CWD from adjacent unit 002. Survey SE corner of unit for CWD and snag opportunities.

4.2.3 FISH: No recommendations.
4.2.4 RIPARIAN: Delineate new Riparian Reserve unit.
4.2.5 FIRE: Post-release treatment survey for fuel loading. Treat roadside slash.
4.2.6 GRAZING: Assess opportunities to attract livestock from Doubleday Creek.
4.2.7 HUMAN USES: Review condition of full length of Road 23.6 for stabilization treatment. Tokyo-Ginger EA recommends full decommissioning of Roads 23.3 and 23.4. Review watershed protection measures (4.1.7) when unit is involved in contract work. Incorporate measures as appropriate.

23- 004 Description: Approximately 48 acres of a 63 acre OI unit, 250 years old, old-growth Douglas-fir stand. Area has been lightly partial cut in the 1960s.
Objective: This unit will be managed as a LSR owl core area.
4.2.1 VEGETATION: No recommendations.
4.2.2 WILDLIFE: No recommendations.
4.2.3 FISH: No recommendations.
4.2.4 RIPARIAN: No recommendations.
4.2.5 FIRE: No action.
4.2.6 GRAZING: No recommendations.
4.2.7 HUMAN USES: Review condition of Road 35-2E-23.0 for stabilization needs and Road 35-2E-23.1 for obliteration.

23- 005 Description: 29 acres, 250 years old, old-growth Douglas-fir stand. 1966 selection-cut removed 12MBF per acre. Stand appears to be fairly intact.
Objective: Maintain high percentage canopy closure to preserve dispersal habitat, TSZ and mistletoe spread/intensification objectives.
4.2.1 VEGETATION: Limit harvest in this unit to sanitation/salvage and release of early-seral species, especially non-mistletoe infected and resistant species. Target MTR 5 and 6 for removal. Openings created for sanitation should not exceed 1/4 acre.
4.2.2 WILDLIFE: Maintain diversity of stand structure and retain some mistletoe trees for habitat.
4.2.3 FISH: No recommendations.
4.2.4 RIPARIAN: No recommendations.
4.2.5 FIRE: Lop and scatter handpile concentrations after harvest activities.
4.2.6 GRAZING: No recommendations.
4.2.7 HUMAN USES: Review watershed protection measures (4.1.7) when unit is involved in contract work. Incorporate measures as appropriate.

23-006, 011,901 Description: Approximately 35 of 103 acres in 3 OI units. Doubleday Creek.
Objective: Maintain and enhance Riparian Reserve and Zone of Influence 2.
4.2.1 VEGETATION: No recommendations.
4.2.2 WILDLIFE: No recommendations.
4.2.3 FISH: Maintain large wood source for fish structure.
4.2.4 RIPARIAN: Doubleday Creek. Delineate Riparian Reserves. See General Recommendations for RIPARIAN (4.1.4).
4.2.5 FIRE: No action.
4.2.6 GRAZING: Attract cattle out of creek if congregations are detected.

4.2.7 HUMAN USES: Road 23.04 is scheduled for decommissioning.

23-007 Description: 4 acres, 250 years old, old-growth Douglas-fir stand. 1966 selection-cut. Stand appears to be fairly intact.

Objective: Maintain high percentage canopy closure to preserve dispersal habitat and mistletoe spread/intensification objectives.

4.2.1 VEGETATION: Recommend a Management Decision (MD06) for canopy retention for this small acreage due to inaccessibility caused by Riparian Reserves and private property on all sides.

4.2.2 WILDLIFE: No recommendations.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: No recommendations.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: No recommendations.

23-008 Description: 29 acres, stand age 250 years old, old-growth Douglas-fir that has had a variety of partial cutting entries. Stand is in a fragmented condition with some moderate to severe mistletoe infection areas. There is no record of silvicultural treatments in this unit. Most of this unit is out of the TSZ.

Objective: Get control of stands loss of function due to severe mistletoe infection.

4.2.1 VEGETATION: Annually monitor stand condition to assess insect population build-up or rapid decline due to mistletoe intensification. If insect populations increase and begin to infest the Douglas-fir, schedule a NGFMA regeneration harvest as soon as possible. Otherwise, defer entry in this unit for next ten years. In 2010, develop a regeneration harvest plan to control mistletoe infestation.

4.2.2 WILDLIFE: Develop recommendations with harvest plan.

4.2.3 FISH: Implement measures to control sediment resulting from logging activity.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: A regeneration harvest will require a broadcast burn or excavator piling to treat fuels prior to planting.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: Evaluate positioning a new road, accessed from Doubleday Road, that will enable cable yarding harvest. Existing road in bottom of unit is scheduled for full decommissioning under the Tokyo-Ginger timber sale, including removal of major culvert. Review watershed protection measures (4.1.7) when unit is involved in contract work. Incorporate measures as appropriate.

23- 012 Description: 48 acres, stand age 250 years old, old-growth Douglas-fir that has had a variety of light partial cut entries. There is no record of silvicultural treatments in this unit.

Objective: The primary objective will be the maintenance of a relatively tight canopy closure that will accomplish several important functions. The maintenance of dispersal habitat for adjacent northern spotted owl core area and related LSR dependent species, a tight canopy to accomplish TSZ objectives and to minimize the spread and intensification of mistletoe.

4.2.1 VEGETATION: This unit can provide a ready source of future CWD recruitment for

adjacent unit 900. Limit treatments to light sanitation/salvage activity that would not open canopy exceeding objectives for mistletoe intensification (60%-70%) and TSZ.

4.2.2 WILDLIFE: Maintain canopy closure at greater than 60% for dispersal habitat from 004 (owl core area). This will preserve connectivity function for LSR.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: Lop and scatter hand pile concentrations after harvest activities.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: Review watershed protection measures (4.1.7) when unit is involved in contract work. Incorporate measures as appropriate.

23-013 Description: Approximately 25 acres of 43 acre OI unit. Ginger Creek.

Objective: Maintain and enhance Riparian Reserve and Zone of Influence 2 characteristics.

4.2.1 VEGETATION: No recommendations.

4.2.2 WILDLIFE: No recommendations.

4.2.3 FISH: Review with fisheries biologist.

4.2.4 RIPARIAN: Delineate Riparian Reserves. See General Recommendations for RIPARIAN (4.1.4).

4.2.5 FIRE: No action.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: No recommendations.

23-014 Description: 12 acres, stand age 250 years old, old growth Douglas-fir that has had a variety of light partial cut entries. There is no record of silvicultural treatments in this unit.

Objective: The primary objective will be the maintenance of a relatively tight canopy closure that will accomplish several important functions. The maintenance of dispersal habitat for adjacent northern spotted owl core area and related LSR dependent species, a tight canopy to accomplish TSZ objectives and to minimize the spread and intensification of mistletoe.

4.2.1 VEGETATION: Light sanitation/salvage activity that would not open canopy exceeding objectives of TSZ or mistletoe intensification (60%-70%).

4.2.2 WILDLIFE: Maintain canopy closure at greater than 60% for dispersal habitat from 004 (owl core area). This will preserve connectivity function for LSR.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: Lop and scatter hand pile concentrations after harvest activities.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: Review watershed protection measures (4.1.7) when unit is involved in contract work. Incorporate measures as appropriate.

23- 900 Description: 9 acres, Douglas-fir progeny test site established in 1983. 380 TPA. This can best be described as the classic even-aged, monoculture stand. This progeny site is currently fenced to exclude big game.

Objective: Due to the intensive nature of this progeny unit's site preparation, the area

has ***NO*** CWD, snags or near-term availability of recruitment material. Maintain long term progeny program objectives while creating stand structure.

4.2.1 VEGETATION: Prescription should initially target thinning to 300 TPA. With genetics program manager, identify family reps to reserve for long term needs. Target 10%-20% of high quality trees for pruning. Retain hardwoods that might be present and release when possible.

4.2.2 WILDLIFE: Recruit CWD from adjacent unit 002.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: Delineate Riparian Reserve to create new unit. See General Recommendations for RIPARIAN (4.1.4).

4.2.5 FIRE: Thinning progeny unit should be done by girdling trees greater than six inches dbh and left to deteriorate standing in place. Fall trees less than six inches dbh and slash material to a depth not to exceed twelve inches in depth. Pull slash from 100 feet of edge of unit along road, hand pile and burn or chip. This will minimize on-the-ground fuel loading.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: Remove fence material prior to management entry. Review watershed protection measures (4.1.7) when unit is involved in contract work. Incorporate measures as appropriate.

25- 007 Description: 18 acres, Douglas-fir (predominately) approximately 60 years old. Light to moderate mistletoe infections.

Objective: Minimize spread and intensification of mistletoe by deferral of harvest.

4.2.1 VEGETATION: At this point given the widespread distribution and low severity rating of mistletoe in the section, harvest deferral will maintain the integrity of the stand by minimizing the mistletoe intensification. Consider regeneration harvest at a time when growth rate drops below 10/20th per decade. Review stand condition in 2015.

4.2.2 WILDLIFE: Harvest deferral will maintain habitat conditions suitable for hiding and thermal cover for deer and elk and foraging habitat for owls.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: Delineate Riparian Reserve.

4.2.5 FIRE: No action.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: No recommendations.

25- 008 Description: 17 acres, Douglas-fir (predominately) approximately 60 years old. Light to moderate mistletoe infections. This is a fire origin stand with no past management.

Objective: Although the stand structure is not entirely suitable as LSR habitat, in its intact and unentered condition this unit can provide acreage to meet the 25%-30% LSR condition requirement. Delaying harvest will also limit the spread and intensification of mistletoe

4.2.1 VEGETATION: No action. Review in 2015

4.2.2 WILDLIFE: No recommendations.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: No action.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: No recommendations.

25- 009 Description: 182 acres, Douglas-fir stand 170 years old. This unit has been selectively logged in 1964 and 1976. Moderate to heavy mistletoe infections. Additional OI unit extends outside watershed for total of 249 acres.

Objective: This large OI unit has multiple objectives. Approximately 50 acres in the northern portion should be deferred from harvest in order to meet LSR condition requirement acreage. An owl core of approximately 125 acres in the center of the section will provide a great gray owl nest core area. The remainder of the unit has high risk mistletoe infection areas. Harvest should attempt to accommodate maintaining a minimum 60% canopy cover for TSZ.

4.2.1 VEGETATION: No entry in northern half of the OI unit, this area has sufficient canopy closure to minimize the rate of dwarf mistletoe spread and intensification in Douglas-fir. On the west side of the main ridge and between OI 007 and 110, an approximate 14 acre area has moderate to heavy Douglas-fir mistletoe infection. This area should be scheduled in FY 2000 for a connectivity regeneration harvest to minimize volume losses.

On the east side of the main ridge, a laminated root rot pocket approximately 5 acres in size is causing significant tree mortality. This area should be scheduled in FY 2000 for a connectivity regeneration harvest, followed by planting resistance species such as sugar and ponderosa pines, incense cedar and hardwoods.

Through the southern end of this unit and adjacent to the blocked Road 35-2E-25.1 should be scheduled for a sanitation salvage in FY 2000 to remove high-risk trees and Douglas-fir with MTR 5 or 6. Also, adjacent to and above this road, large sugar pine should be released from the competition of surrounding vegetation. This strategy will maintain the presence of sugar pine by reducing their susceptibility to mountain pine beetle attack. All trees and shrubs under the sugar pine crown and within 15' of the dripline should be removed. Sugar pines selected for this treatment should have full healthy crowns with crown ratios of at least 30%.

4.2.2 WILDLIFE: Maintain protection buffer around great gray owl nest site. Seasonal restriction around nest site from 1 February to 1 August. Defer harvest in northern portion of unit to maintain acreage needs for LSR 25%-30% requirements. Maintain at least 3 snags per acre throughout unit. Reserve “deformed” trees and small “leaners” in owl nest site for habitat and rearing needs. Leave all snags that don’t need to be felled for safety concerns.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: Lop and scatter, handpile in the sanitation salvage areas. Broadcast burn in regeneration unit.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: Review General Recommendations for HUMAN USES, (4.1.7). In regeneration harvest areas, utilize well-spaced existing skid roads. Deep rip skid roads to relieve compaction effects. Confine logging of salvage in southern “finger” to what is accessible from existing skid roads. Sugar pine release trees should be logged from approved designated skid trails. Barricade spur Road 35-2E-25.1. Consider development of future access needs into deferred portion of unit.

25- 110 Description: 14 acres, Douglas-fir (predominately) approximately 60 years old. Light to moderate mistletoe infections.

Objective: Maintain unit as LSR allotment to meet 25%-30% requirement.

4.2.1 VEGETATION: No action. Review stand conditions in 2010
4.2.2 WILDLIFE: No recommendations.
4.2.3 FISH: No recommendations.
4.2.4 RIPARIAN: No recommendations.
4.2.5 FIRE: No action.
4.2.6 GRAZING: No recommendations.
4.2.7 HUMAN USES: No recommendations.

25- 111 Description: 46 acres, Douglas-fir stand 170 years old. Light to moderate mistletoe infections.

Objective: Maintain unit as LSR allotment to meet 25%-30% requirement.

4.2.1 VEGETATION: No action. Review stand condition in 2010.
4.2.2 WILDLIFE: No recommendations.
4.2.3 FISH: No recommendations.
4.2.4 RIPARIAN: Delineate Riparian Reserve.
4.2.5 FIRE: No action.
4.2.6 GRAZING: No recommendations.
4.2.7 HUMAN USES: No recommendations.

27- 001 Description: 8 acres, stand age 80 years old, the result of an overstory removal harvest (1990). A stocked, natural stand of 12"-16" dbh white fir and Douglas-fir. Light to moderate mistletoe infections. Stand vigor medium to high, low brush competition.

Objective: TSZ protection. Delay entry.

4.2.1 VEGETATION: Review mistletoe condition in 2010.
4.2.2 WILDLIFE: Reserve remaining overstory trees for future wildlife trees.
4.2.3 FISH: No recommendations.
4.2.4 RIPARIAN: No recommendations.
4.2.5 FIRE: No action.
4.2.6 GRAZING: No recommendations.
4.2.7 HUMAN USES: No recommendations.

27- 002 Description: 11 acres, 80 years old, dense even-aged Douglas-fir stand. MTR 0-2 in interior of stand. MTR 2-4 along exposed southern edge.

Objective: TSZ protection.

4.2.1 VEGETATION: Delay harvest entry. Survey the perimeter (50' width) of the adjacent plantation (016) to determine species composition and the potential risk of Douglas-fir mistletoe infection from 002. If an infection risk is present, fall all mistletoe infected Douglas-fir that are 30-40' of 002 edge. Infected trees within 20' from edge may also be girdled to provide snags. Dependent upon the number of infected trees and CWD needs, excess trees may be salvaged. To minimize the potential for Douglas-fir beetle infestation, do not create more than two Douglas-fir trees per acre for CWD or snags. Review stand for thinning in 2010 and regeneration harvest in 2025.

4.2.2 WILDLIFE: Although on the low end of the CWD scale, falling MTR 2-4 trees along edge of unit into unit 016 will begin to provide CWD in deficient unit. Unit provides suitable

thermal cover.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: Lop and scatter concentrations of fallen tree crowns. Review following treatments in 2010 and 2025.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: No recommendations.

27- 003 Description: 11 acres, 200 years old, Douglas-fir. Open canopy (60%) with good crown vigor. Mixed conifer second-growth. Light to moderate mistletoe infections (MTR 0-3).

Objective: TSZ and Zone of Influence protection.

4.2.1 VEGETATION: Delay harvest entry. Sanitation-fall MTR 2-4 Douglas-fir along 30'-40' of edge into 016. Consider girdling for snag creation. To minimize the potential for Douglas-fir beetle infestation, do not create more than two Douglas-fir trees per acre for CWD or snags.

4.2.2 WILDLIFE: No recommendations.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: Delineate Riparian Reserves. See General Recommendations for RIPARIAN (4.1.4).

4.2.5 FIRE: Lop and scatter concentrations of fallen tree crowns.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: No recommendations.

27- 004 Description: 13 acres, 140 years old, dense second-growth (primarily Douglas-fir) stand. Light to moderate mistletoe infections (avg. MTR 2). Canopy closure 70+%. Crown vigor good.

Objective: TSZ protection through maintenance of canopy closure.

4.2.1 VEGETATION: Delay harvest entry. Sanitation-fall MTR 2-4 Douglas-fir along 30'-40' of edge into 016. To minimize the potential for Douglas-fir beetle infestation, do not create more than two Douglas-fir trees per acre for CWD or snags. 4.2.2 WILDLIFE: Unit is providing excellent thermal cover. No action.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: Lop and scatter concentrations of fallen tree crowns.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: No recommendations.

27- 006 Description: 33 acres, 90 years old, mixed-conifer stand resulting from overstory removal. Light to moderate mistletoe infestations on edges adjacent to 015.

Objective: TSZ protection through maintenance of canopy closure.

4.2.1 VEGETATION: Delay harvest entry. No immediate need for treatment. Sanitation-fall MTR 2-4 along northern edge into unit 105. To minimize the potential for Douglas-fir beetle infestation, do not create more than two Douglas-fir trees per acre for CWD or snags.

4.2.2 WILDLIFE: Unit provides good thermal cover.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: Delineate Riparian Reserve along southern boundary. See General Recommendations for RIPARIAN (4.1.4).

4.2.5 FIRE: Lop and scatter concentrations of fallen tree crowns.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: No recommendations.

27- 007 Description: 20 acres, mixed-conifer stand resulting from 1990 overstory-removal, 15-25 feet tall of a medium-high vigor. Madrone clumps present. Brush competition is light.

Objective: Develop young plantation with a canopy closure that affords TSZ and Zone of Influence protection. Develop unit species diversity.

4.2.1 VEGETATION: Complete thorough stand exam prior to PCT entry. PCT should achieve structural diversity and leave sufficient trees to develop closure goals (>300TPA). Thin madrone clumps, leaving the largest stem of each clump.

4.2.2 WILDLIFE: Recruit CWD from adjacent unit 006.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: Delineate Riparian Reserve area in south edge of unit. See General Recommendations for RIPARIAN (4.1.4).

4.2.5 FIRE: Following PCT treatments, review fuel loading treatments along roads and Riparian Reserve.

4.2.6 GRAZING: Salt block and stock watering tank opportunities to attract livestock from Riparian Reserves.

4.2.7 HUMAN USES: Review Road 35-2E-27.5 for condition and closure.

27- 008 Description: 2 acres, 80 years old, pole-sized, Douglas-fir island stand. No previous harvest history.

Objective: Maintain canopy closure for TSZ and Zone of Influence protection.

4.2.1 VEGETATION: Delay harvest entry. No action.

4.2.2 WILDLIFE: Provides thermal cover for deer and refugia for small mammals.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: Review for Riparian Reserve allocation.

4.2.5 FIRE: No action.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: No recommendations.

27- 009 Description: 18 acres, 90 years old, Douglas-fir stand. Canopy closure 85%. Light to moderate mistletoe infestations. Some laminated root rot in the stand.

Objective: Maintain TSZ protection. Although mistletoe is in this stand, the general overall condition is much better than adjoining stands. Low priority for treatment.

4.2.1 VEGETATION: Delay entry to minimize mistletoe intensification. This unit will provide a ready source of CWD recruitment for adjacent unit 015. Sanitation-fall MTR 4-5 timber along 30'-40' of edge into 015. To minimize the potential for Douglas-fir beetle infestation, do not create more than two Douglas-fir trees per acre for CWD or snags.

4.2.2 WILDLIFE: Stand provides excellent thermal cover for big game.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: Delineate Riparian Reserve. See General Recommendations for RIPARIAN (4.1.4).

4.2.5 FIRE: Lop and scatter tree crowns.
4.2.6 GRAZING: No recommendations
4.2.7 HUMAN USES: Avoid mistletoe edge treatment within 100 feet of road.

27- 010 Description: 92 acres, canopy closure 66%, heavily partial cut 250 year old stand. Moderate to heavy mistletoe infection, throughout this stand. In the northern portion of this OI, trees weakened by mistletoe, changes in microclimate and tree senescence are being infested by beetles and borers resulting in rapid tree decline and mortality.
Objective: Minimize timber volume/value losses by regenerating areas heavily infested with insects or mistletoe. Salvage the remaining areas to recover value that otherwise would be lost. TSZ protection in remainder of unit.

4.2.1 VEGETATION: Schedule a FY 2000 NGFMA regeneration harvest (6-8 TPA >20"dbh, 2 snags per acre and 120 linear feet of CWD) for the portion of the unit west and north of OI 014 and small pocket on the rocky knob south of OI 014; approximately 20 acres. Schedule a FY 2000 NGFMA regeneration harvest (6-8 TPA >20"dbh, 2 snags per acre and 120 linear feet of CWD) for the southeast corner (between 015 and 009); approximately 5 acres. Trap gophers in the proposed harvest units the year prior to harvest to reduce gopher populations.

In the remaining portion of the OI, salvage high risk trees and Douglas-fir trees with a MTR 5 or 6. In the northern portion of the OI, survey the southern and eastern perimeter (50' width) of the adjacent plantation (OI 014) to determine species composition and the potential risk of Douglas-fir mistletoe infection. If an infection risk is present, fall all mistletoe infected Douglas-fir that are within 30'- 40' of the stand edge. Infected trees may also be girdled to provide for snags, the girdled trees should be at least 20' in from the edge. Dependant upon the number of infected trees and CWD needs, excess trees may be salvaged.
4.2.2 WILDLIFE: Great gray owl nest site suspected to be south of unit 014. If identified, activity should be restricted 1 February to 1 August. This unit will provide a ready source of future CWD recruitment for adjacent units 014/015. Fall MTR 5-6 trees occurring in a 30 foot strip into adjacent units 014/015. Trees within 100 feet of a road should be removed to eliminate theft opportunity.
4.2.3 FISH: No recommendations.
4.2.4 RIPARIAN: No recommendation.
4.2.5 FIRE: In areas suitable, excavator pile regeneration harvest units and hand pile remainder. Avoid broadcast burn to minimize development of gopher forage. Lop and scatter activity slash in salvage units.
4.2.6 GRAZING: No recommendations.
4.2.7 HUMAN USES: Utilize existing skid roads during regeneration harvest and site preparation. Do no mistletoe edge treatments within 100 feet of roads. Use equipment and fuel storage requirements found in general recommendations (4.1.7).

27- 011 Description: 42 acres, old-growth, lightly partial-cut Douglas-fir stand 250 years old. Canopy closure 76%. Light to moderate mistletoe infections.
Objective: Intact and stable stand. Maintain canopy closure at 60-70 % for TSZ and Zone of Influence protection.

4.2.1 VEGETATION: Delay harvest entry till 2010. This unit can provide a ready source of future CWD recruitment for adjacent unit 015. Fall infected trees on the edge into 015 and sanitation fall all mistletoe infected trees (MTR 5-6) within a 30'-40' width along the edge.

Infected trees may also be girdled to provide for snags. The girdled trees should be at least 20' in from the edge. Dependent upon the number of infected trees and CWD needs, excess trees may be salvaged.

4.2.2 WILDLIFE: Maintain 300 foot buffer along natural meadow in southwest corner. Unit provides excellent hiding and thermal cover. Defer entry for habitat maintenance.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: Lop and scatter concentrations from fallen tree crowns. Review after activities in 2010.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: Review Road 35-2E-34 for some level of compatible closure.

27- 012 Description: 67 acres, partial-cut, Douglas-fir stand, 190 years old. Canopy closure 66%. Light to moderate mistletoe infestation. Stand vigor is marginal to moderate. Objective: TSZ protection.

4.2.1 VEGETATION: Delay harvest entry. Review stand in 2010.

4.2.2 WILDLIFE: Confirm nest site of reoccurring observations of great gray owl. This unit can provide a ready source of future CWD recruitment for adjacent unit 014. Sanitation-fall MTR 5-6 trees along common edge of 012 and 014 into plantation.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: Lop and scatter concentrations of fallen tree crowns.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: No recommendations.

27- 013 Description: 8 acres, 200 years old, Douglas-fir stand. Canopy closure 70%. Light to moderate mistletoe infections.
Objective: TSZ protection.

4.2.1 VEGETATION: Delay harvest entry. Review stand in 2010.

4.2.2 WILDLIFE: No recommendations.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: No action.

4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: No recommendations.

27- 014 Description: 40 acres, clearcut, broadcast burned and planted in 1991. Unit has had multiple gopher baiting projects. 146 TPA. The area is generally characterized with a lack of CWD, snags or availability of recruitment material for these features.
Objective: Maintenance of Douglas-fir on perimeter of unit boundary from mistletoe. Recruit CWD from adjacent edges of 010 and 012. Prohibit use of pesticides for gopher control. TSZ protection through development of plantation canopy.

4.2.1 VEGETATION: Sanitation-fall mistletoe infected trees from the edge of units 010 and 012 into unit. Use trapping for gopher control. Maintain at least 300 TPA through early-seral stages for TSZ protection. To minimize the potential for Douglas-fir beetle infestation, do not create more than two Douglas-fir trees per acre for CWD or snags.

4.2.2 WILDLIFE: Seasonal restriction for activity near great gray owl nest site from 1

February to 1 August. Recruit CWD from adjacent units.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: See General Recommendations for FIRE (4.1.5).

4.2.6 GRAZING: Salt block livestock away from plantation to minimize damage.

4.2.7 HUMAN USES: Fall mistletoe trees within 100 feet of a road away from the road to minimize theft opportunities. Review Road 35-2E-27.3 for closure.

27- 015 Description: 34 acres, clearcut, broadcast burned and planted in 1991. Unit has had multiple gopher baiting projects. Replanted 1998 - 346 TPA. The area is generally characterized with a lack of CWD, snags or availability of recruitment material for these features.

Objective: Maintenance of Douglas-fir on perimeter of unit boundary from mistletoe. Recruit CWD from adjacent units 009, 010 and 011. Prohibit use of pesticides for gopher control. TSZ protection through development of plantation canopy.

4.2.1 VEGETATION: Sanitation-fall mistletoe infected trees from the edge of units 009, 010 and 011 for CWD. Trap gophers for control. Maintain at least 300 TPA through early-seral stages for TSZ protection. To minimize the potential for Douglas-fir beetle infestation, do not create more than two Douglas-fir trees per acre for CWD or snags.

4.2.2 WILDLIFE: Recruit CWD from adjacent units.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: See General Recommendations for FIRE (4.1.5).

4.2.6 GRAZING: Salt block livestock away from plantation to minimize damage to young conifers.

4.2.7 HUMAN USES: Do not fall mistletoe trees within 100 feet of road, to minimize theft opportunities. Review General Recommendations for HUMAN USES (4.1.7). Maintain road block for Road 35-2E-27.1.

27- 016 Description: 27 acres, clearcut, scarified and ripped, piled and broadcast burned in 1991. 179 TPA, primarily ponderosa pine and Douglas-fir, medium vigor. The area is generally characterized with a lack of CWD, snags or availability of recruitment material for these features.

Objective: Maintenance of Douglas-fir on perimeter of unit boundary from mistletoe. Recruit CWD from adjacent units 002, 003 and 004. Prohibit use of pesticides for gopher control. TSZ protection through development of plantation canopy.

4.2.1 VEGETATION: Sanitation-fall MTR 5-6 trees from along edges of units 002, 003 and 004 for CWD. Trap gophers for control. Maintain at least 300 TPA in plantation through early-seral stages for TSZ protection. To minimize the potential for Douglas-fir beetle infestation, do not create more than two Douglas-fir trees per acre for CWD or snags.

4.2.2 WILDLIFE: Recruit CWD from adjacent units.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: See General Recommendations for FIRE (4.1.5).

4.2.6 GRAZING: Salt block livestock away from plantations to minimize damage.

4.2.7 HUMAN USES: No recommendations.

27- 017 Description: 7 acres, 200 years old, primarily Douglas-fir stand. Moderate to heavy mistletoe infections.
Objective: TSZ protection. Keep the mistletoe in check.

4.2.1 VEGETATION: Delay harvest entry. Review unit condition in 2010
4.2.2 WILDLIFE: No recommendations.
4.2.3 FISH: No recommendations.
4.2.4 RIPARIAN: See General Recommendations for RIPARIAN (4.1.4).
4.2.5 FIRE: No action.
4.2.6 GRAZING: No recommendations.
4.2.7 HUMAN USES: No recommendations.

27- 018 Description: 5 acres, 250 years old, Douglas-fir stand.
Objective: TSZ protection.

4.2.1 VEGETATION: Delay harvest entry. Review mistletoe condition in 2010.
4.2.2 WILDLIFE: This unit is providing important thermal and hiding cover.
4.2.3 FISH: No recommendations.
4.2.4 RIPARIAN: No recommendations.
4.2.5 FIRE: No action.
4.2.6 GRAZING: No recommendations.
4.2.7 HUMAN USES: No recommendations.

27- 019 Description: 4 acres, 90 years old, primarily Douglas-fir stand.
Objective: TSZ protection. This unit will provide a ready source of future CWD recruitment for adjacent unit 105. Light to moderate mistletoe infections.

4.2.1 VEGETATION: Delay harvest entry. Sanitation-fall mistletoe infected trees from 30'-40' of the edge into OI 105.
4.2.2 WILDLIFE: No recommendations.
4.2.3 FISH: No recommendations.
4.2.4 RIPARIAN: Delineate Riparian Reserve. See General Recommendations for RIPARIAN (4.1.4).
4.2.5 FIRE: No action.
4.2.6 GRAZING: No recommendations.
4.2.7 HUMAN USES: Do not fall mistletoe trees within 100 feet of road.

27- 105 Description: 19 acres, "natural" type stand, primarily Douglas-fir and incense cedar of medium vigor. Light to moderate mistletoe infections. The result of an overstory removal harvest. Stand age approximately 20 years old. 286 TPA.
Objective: TSZ protection.

4.2.1 VEGETATION: Complete a thorough stand exam to assess long term needs and possibilities of the unit. Maintain at least 300 TPA for TSZ protection. Recruit CWD from adjacent edge of unit 019. Review unit for precommercial thinning treatment in 2025 to control TPA. Develop vegetation diversity by reserving largest hardwoods throughout unit.
4.2.2 WILDLIFE: Recruit CWD from MTR 5-6 in adjacent units 006 and 019.
4.2.3 FISH: No recommendations.
4.2.4 RIPARIAN: Delineate Riparian Reserve. See General Recommendations for RIPARIAN (4.1.4).
4.2.5 FIRE: No action. Review in 2025 after any PCT or CT activity.
4.2.6 GRAZING: No recommendations.

4.2.7 HUMAN USES: No recommendations.

27- 993 Description: OI unit created to record a developed pond.
Objective: Revise this unit to reflect Riparian Reserve unit incorporating other necessary acreage in adjoining units. Riparian Reserve, TSZ and Zone of Influence protection.

4.2.1 VEGETATION: Use Riparian Reserve Treatment Key to evaluate Riparian Reserve for necessary intervention.
4.2.2 WILDLIFE: No recommendations.
4.2.3 FISH: Fish biologist review.
4.2.4 RIPARIAN: Major headwaters of perennial steam.
4.2.5 FIRE: No action.
4.2.6 GRAZING: Salt block in timbered units to attract livestock away from Riparian Reserve. See General Recommendations for GRAZING (4.1.6)
4.2.7 HUMAN USES: No recommendations.

33- 001 Description: 1 acre of 66 acre OI unit is in the watershed. 200 years old, Douglas-fir stand.
Objective: Buffer meadow that occurs in southwest corner of section 27.

4.2.1 VEGETATION: No treatment.
4.2.2 WILDLIFE: This acre provides part of the "meadow buffer".
4.2.3 FISH: No recommendations.
4.2.4 RIPARIAN: No recommendations.
4.2.5 FIRE: No action.
4.2.6 GRAZING: No recommendations.
4.2.7 HUMAN USES: Post and paint buffer boundary reserve prior to Bieber-Wasson timber sale.

35- 001 Description: 40 acres of an 88 acre OI unit in watershed. Unit is the result of a 1963 partial cut that removed the largest trees. Scattered pockets, generally less than 1 acre, of 12-16" Douglas-fir and white fir interspersed between shrub openings and pockets of submerchantable conifers. Douglas-fir mistletoe is present in some of the larger trees with an average MTR of 2. The area is generally lacking in a variety of snag classes and CWD.
Objective: TSZ protection. Hang onto this. It's the only timber surrounded by clearcuts.

4.2.1 VEGETATION: Retain for structural diversity and canopy closure. Once the adjacent clearcuts have trees at least 10'-15' in height (approximately 10 years), target mistletoe infected trees for removal and thin submerchantable and merchantable pockets. 4.2.2 WILDLIFE: Leave for refugia for the wide variety of terrestrial and avian wildlife. There is an adjacent, but out of the watershed, owl core area that may require seasonal restrictions.
4.2.3 FISH: No recommendations.
4.2.4 RIPARIAN: Delineate Riparian Reserve.
4.2.5 FIRE: No action.
4.2.6 GRAZING: Salt block to attract livestock away form adjacent plantations.
4.2.7 HUMAN USES: No recommendations.

35- 002 Description: 22 acres of 78 acre OI unit in watershed. Unit is the result of overstory removal in 1990. 1998 PCT/hardwood/brush control results in 176 TPA. The area is generally characterized with a lack of CWD, snags or availability of recruitment material for these features.

Objective: TSZ protection. Although the entire OI unit is not within the watershed, the entire OI unit will be managed as if it were in the watershed.

4.2.1 VEGETATION: Limit future and additional treatments to maintenance of stand and brush components, with the long term goal of developing canopy closure.

4.2.2 WILDLIFE: There is an adjacent, but out of the watershed, owl core area that may require seasonal restrictions.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: Delineate Riparian Reserve.

4.2.5 FIRE: Treat heavy fuel loadings adjacent to Doubleday Road (for 150 feet) to minimize risk of fire start and spread into plantation.

4.2.6 GRAZING: Encourage livestock dispersal with salting.

4.2.7 HUMAN USES: No recommendations.

35- 011 Description: 33 acres, tractor piled and ripped unit, planted (predominately pine) in 1991. 183 TPA. The area is generally characterized with a lack of CWD, snags or availability of recruitment material for these features.

Objective: TSZ protection.

4.2.1 VEGETATION: Complete a thorough stand exam to assess long term needs and possibilities of the unit. Efforts should be directed at developing canopy closure for TSZ protection. Prohibit use of pesticides for gopher control.

4.2.2 WILDLIFE: No recommendations.

4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: See General Recommendation for FIRE (4.1.5). Evaluate slash after treatments.

4.2.6 GRAZING: Encourage livestock dispersal by salt blocking in 001.

4.2.7 HUMAN USES: Consider compatible obliteration of Road 35-2E-26.1.

35- 012 Description: 29 acres of 40 acre OI unit. Clearcut, unknown site prep, originally planted in 1990. '97 record suggests condition of unit is "unknown" and needs to be surveyed. 214 TPA. Although the entire OI unit is not within the watershed, the entire OI unit will be managed as if it were in the watershed.

Objective: TSZ protection. The area is generally characterized with a lack of CWD, snags or availability of recruitment material for these features.

4.2.1 VEGETATION: Complete a thorough stand exam to assess long term needs and possibilities of the unit. Prohibit use of pesticides for gopher control. Develop plantation to meet canopy closure goals.

4.2.2 WILDLIFE: There is an adjacent, but out of the watershed, owl core area that may require seasonal restrictions.

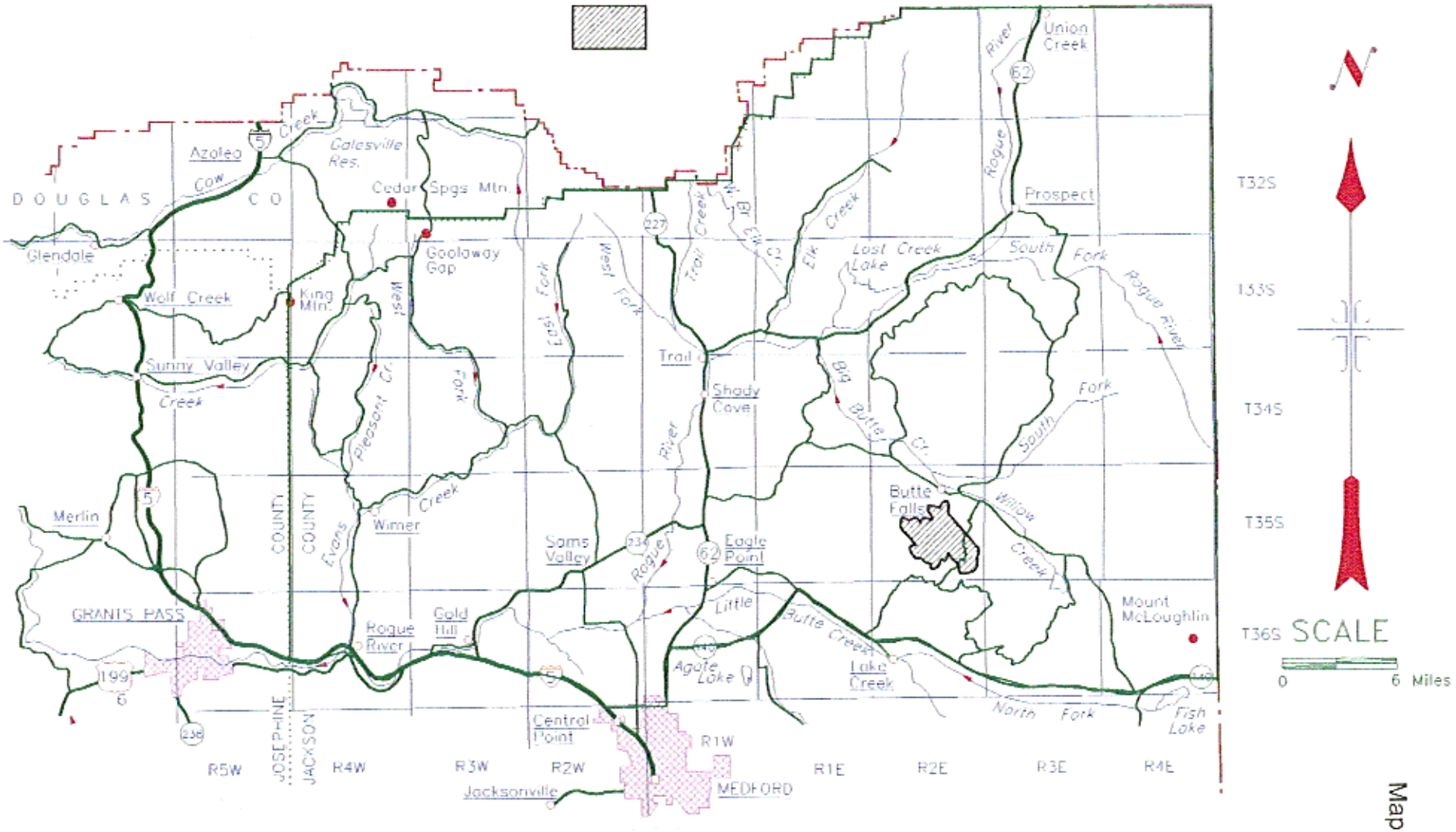
4.2.3 FISH: No recommendations.

4.2.4 RIPARIAN: No recommendations.

4.2.5 FIRE: See General Recommendations for FIRE (4.1.5). Evaluate roadside slash after treatments.

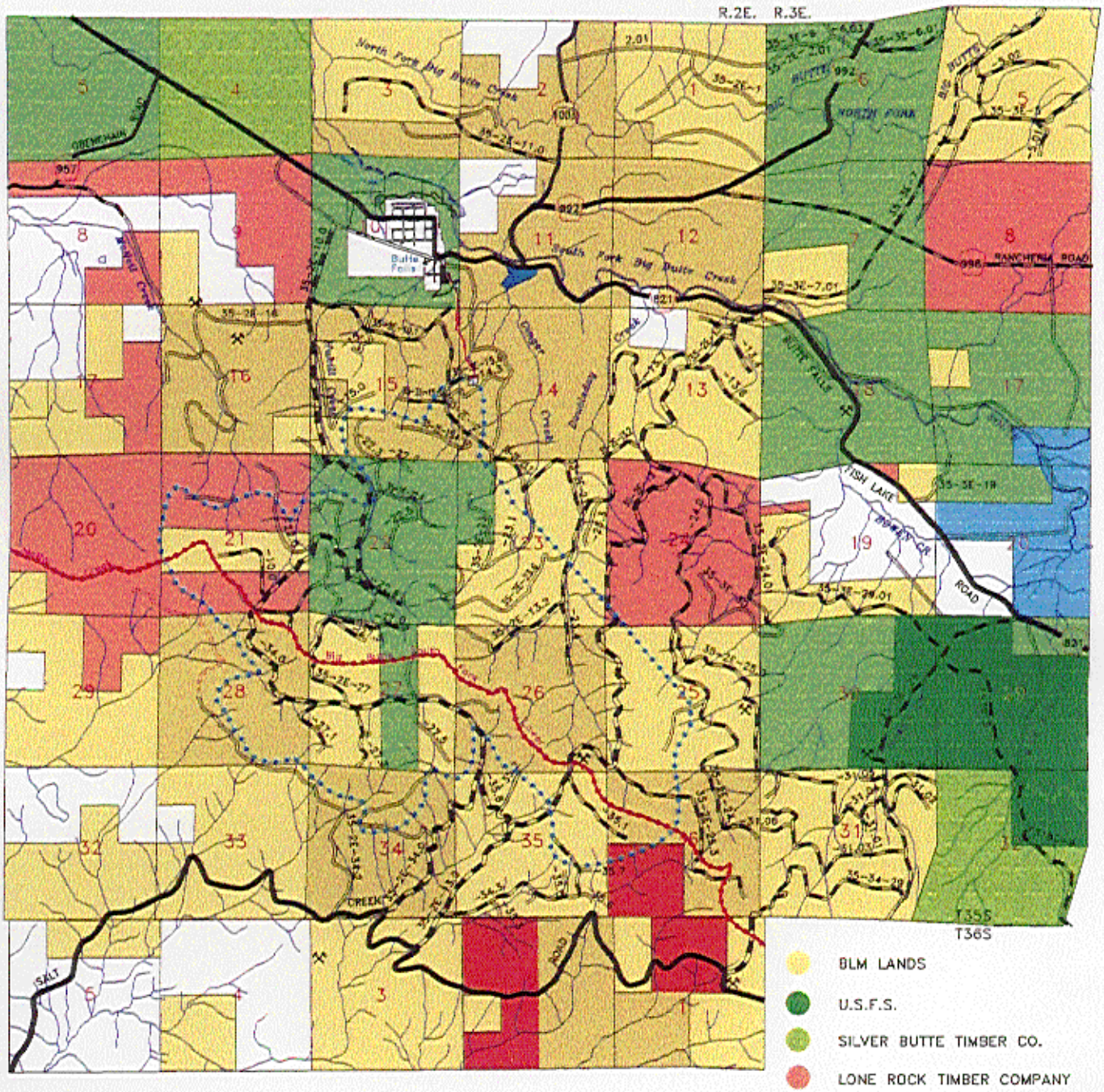
4.2.6 GRAZING: Encourage livestock dispersal throughout unit.
4.2.7 HUMAN USES: No recommendations.

BUREAU OF LAND MANAGEMENT
Butte Falls Resource Area
Ginger Springs Recharge Area
General Location Map



Map 1

GINGER SPRINGS MUNICIPAL WATERSHED



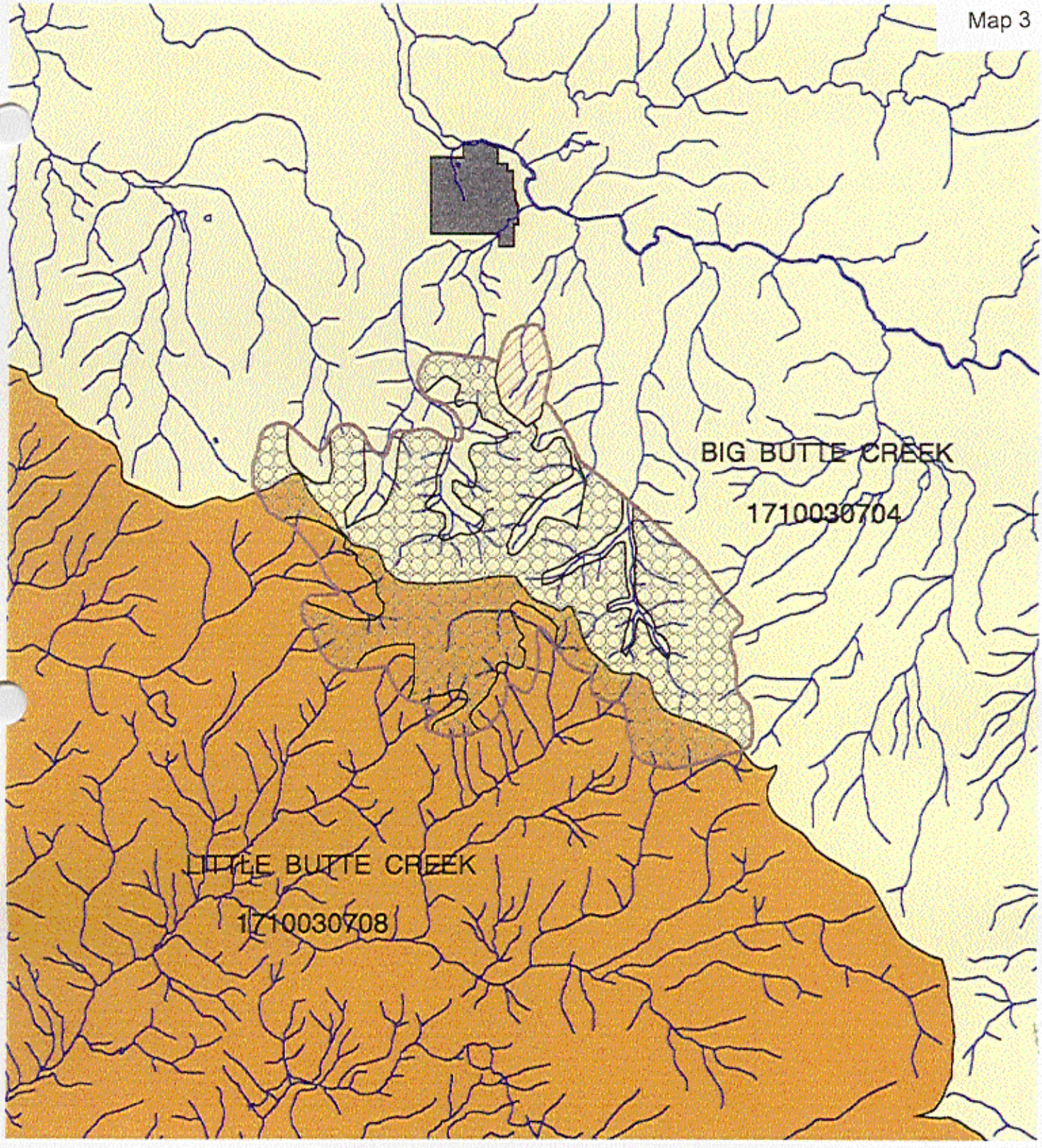
PAVED ROAD
ROCKED ROAD
NATURAL SURFACE ROAD
GINGER SPRINGS (3,991ac.) RECHARGE AREA
FIFTH FIELD WATERSHED BDY.
SPRINGS TO RESERVOIR PIPELINE

BLM (O&C) = 1,355 ac.
INDUSTRY = 2636 ac.
TOWN OF BUTTE FALLS = 2.5 ac.

N

1000 0 2000 4000
SCALE IN FEET

BLM LANDS
U.S.F.S.
SILVER BUTTE TIMBER CO.
LONE ROCK TIMBER COMPANY
SUPERIOR
INDIAN HILL
KOGAP
FISH HATCHERY
MEDFORD WATER COMMISSION
PRIVATELY HELD



GINGER SPRINGS GEOLOGIC WATERSHED
FIFTH FIELD WATERSHEDS - INFLUENCE ZONES

GEOLOGIC WATERSHED INFLUENCE ZONES
- HIGH
- MODERATE
- LOW
- STREAMS
- BUTTE FALLS

FIFTH FIELD WATERSHED
- 1710030704
- 1710030708

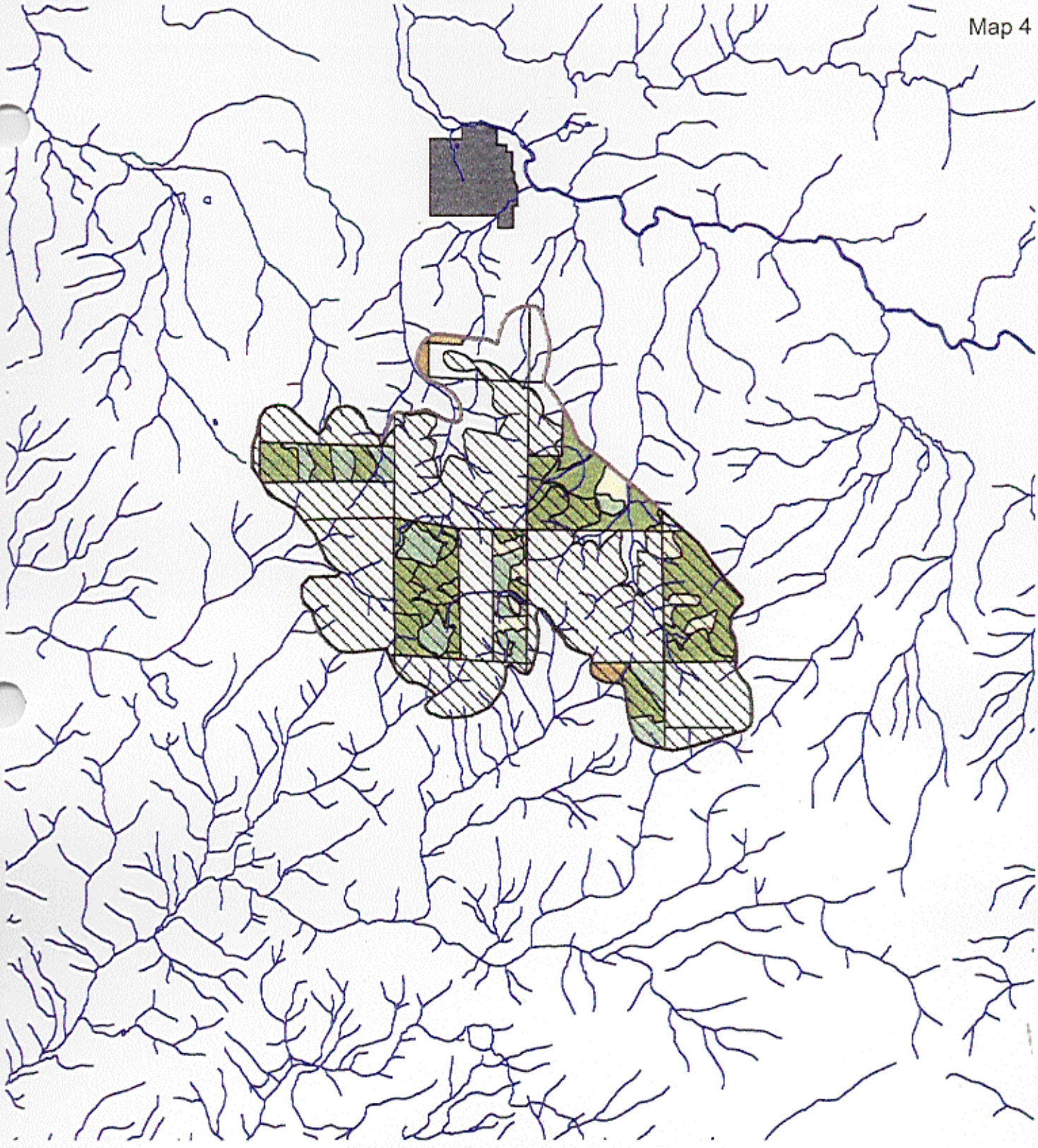
N

SCALE 1:63,000

1 0 1 2 Miles

TCOFFEY 12/30/97

Map 4



GINGER SPRINGS GEOLOGIC WATERSHED
FOREST OPERATIONS INVENTORY UNITS ,SIZE CLASS AND TRANSIENT SNOW ZONE

TRANSIENT SNOW ZONE 3500-4500'
GEOLOGIC WATERSHED
PROPERTY LINES
STREAMS
FOI UNITS - LG^(DOM. SP. SIZE)

1 - 0-5" -296 AC
2 - 5-11" -43 AC
3 - 11-21" -133 AC
4 - 21+" -883 AC
BUTTE FALLS

SCALE 1:63,000

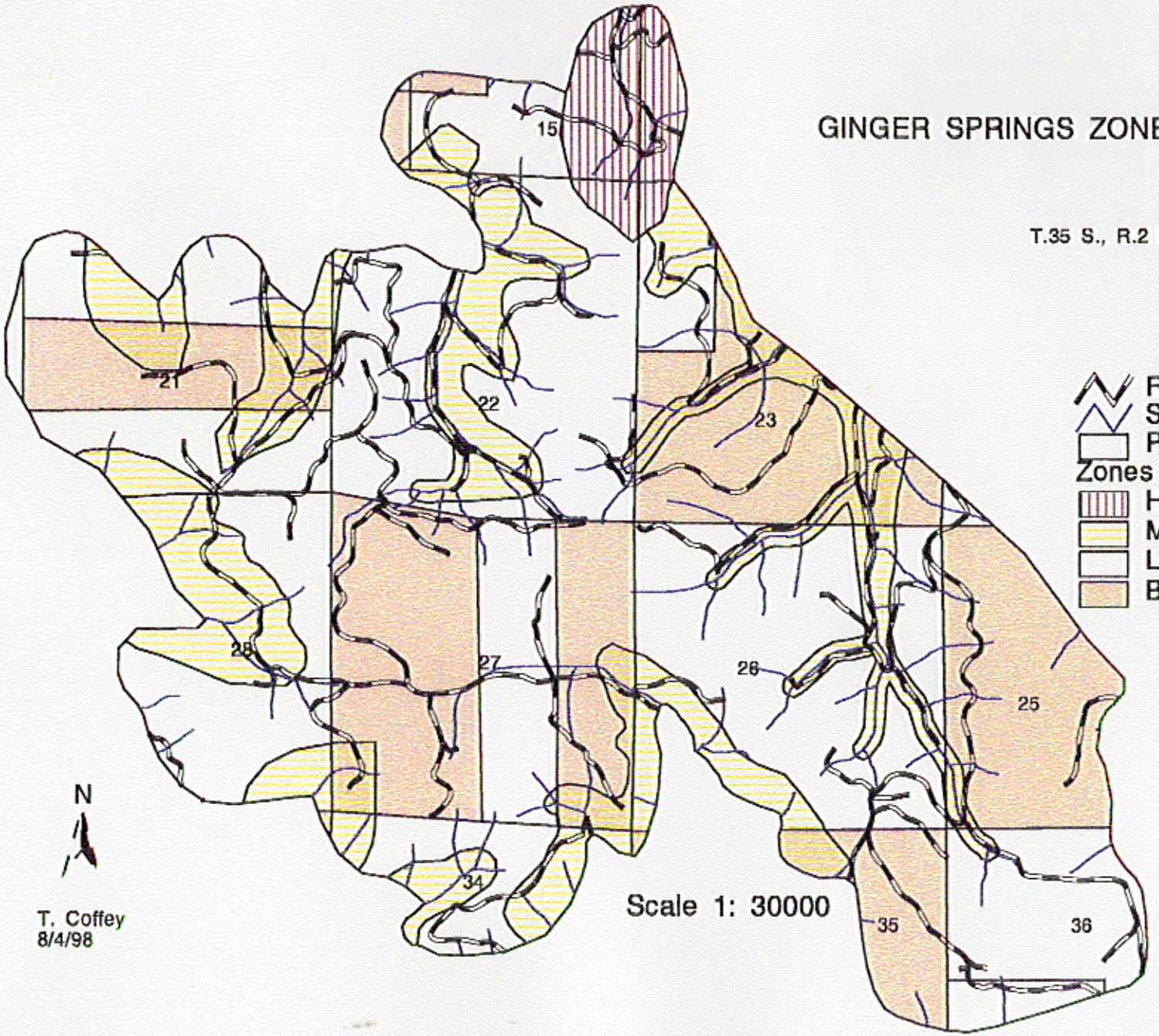
1 0 1 2 Miles

N

TCOFFEY 12/30/97

GINGER SPRINGS ZONES OF INFLUENCE

T.35 S., R.2 E.



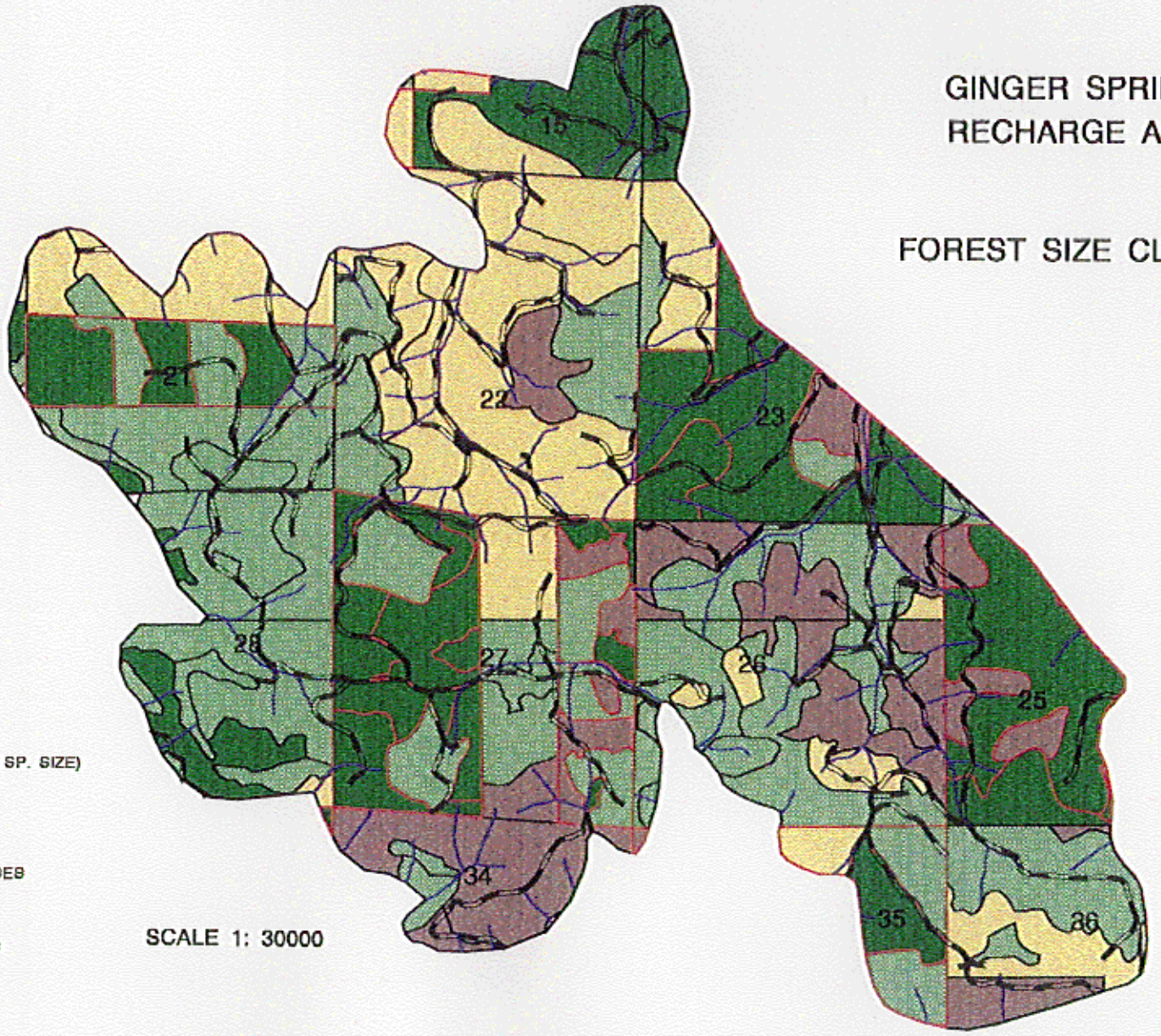
Scale 1: 30000

T. Coffey
8/4/98

Map 5

GINGER SPRINGS RECHARGE AREA

FOREST SIZE CLASSES



N

PAR 8/4/98

SCALE 1: 30000

LEGEND

Roads
Streams

BLM FOI UNITS - LG^(DOM. SP. SIZE)

1 - 0-5" -296 AC
2 - 5-11" - 43 AC
3 - 11-21" - 133 AC
4 - 21+" - 883 AC

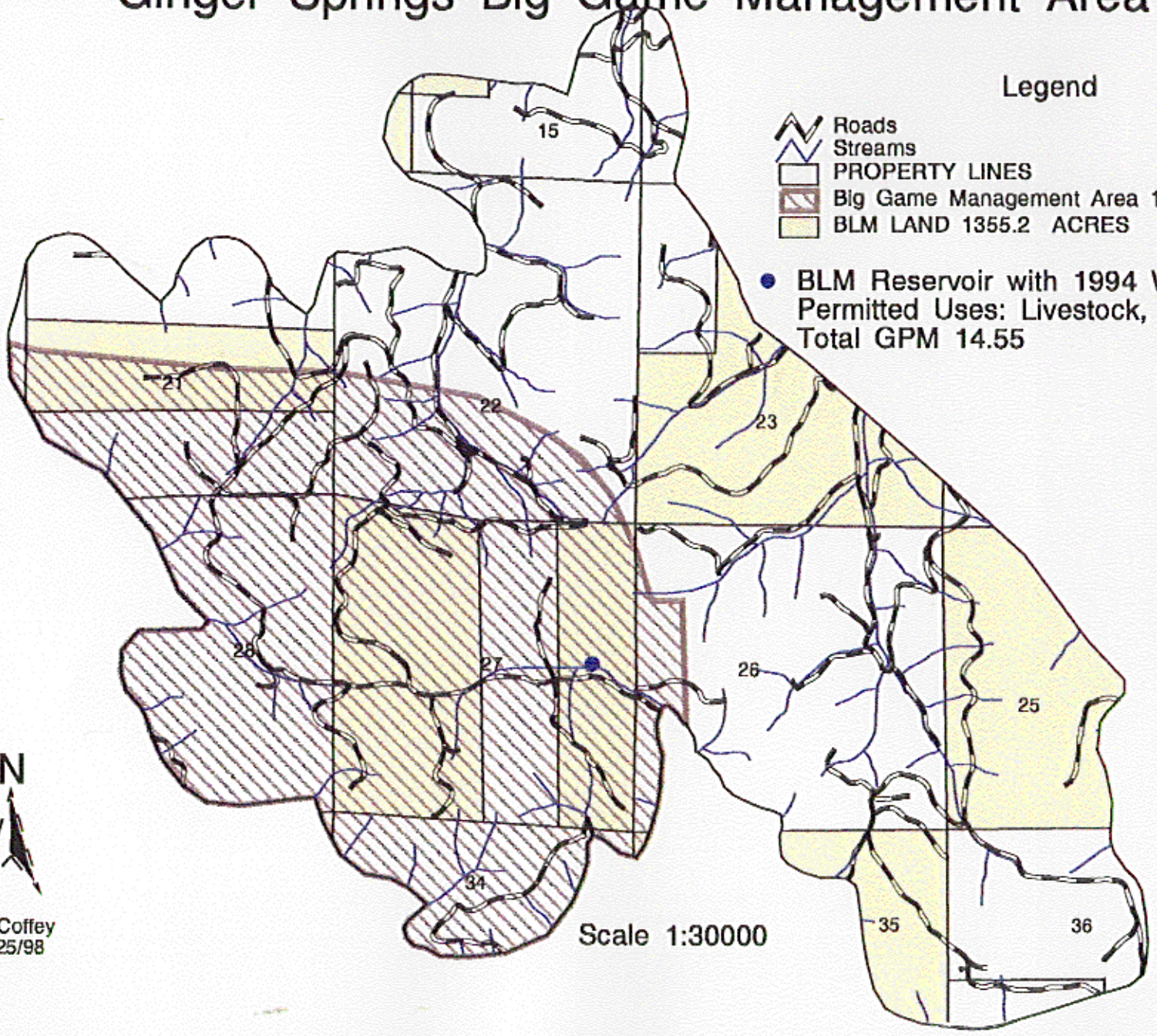
PRIVATE FOI - SIZE CLASSES

1 - 0-5" - 1131 AC
2 - 5-11" - 818 AC
3 - 11-21" - 453 AC
4 - 21+" - 234 AC

PROPERTY LINES

Map 6

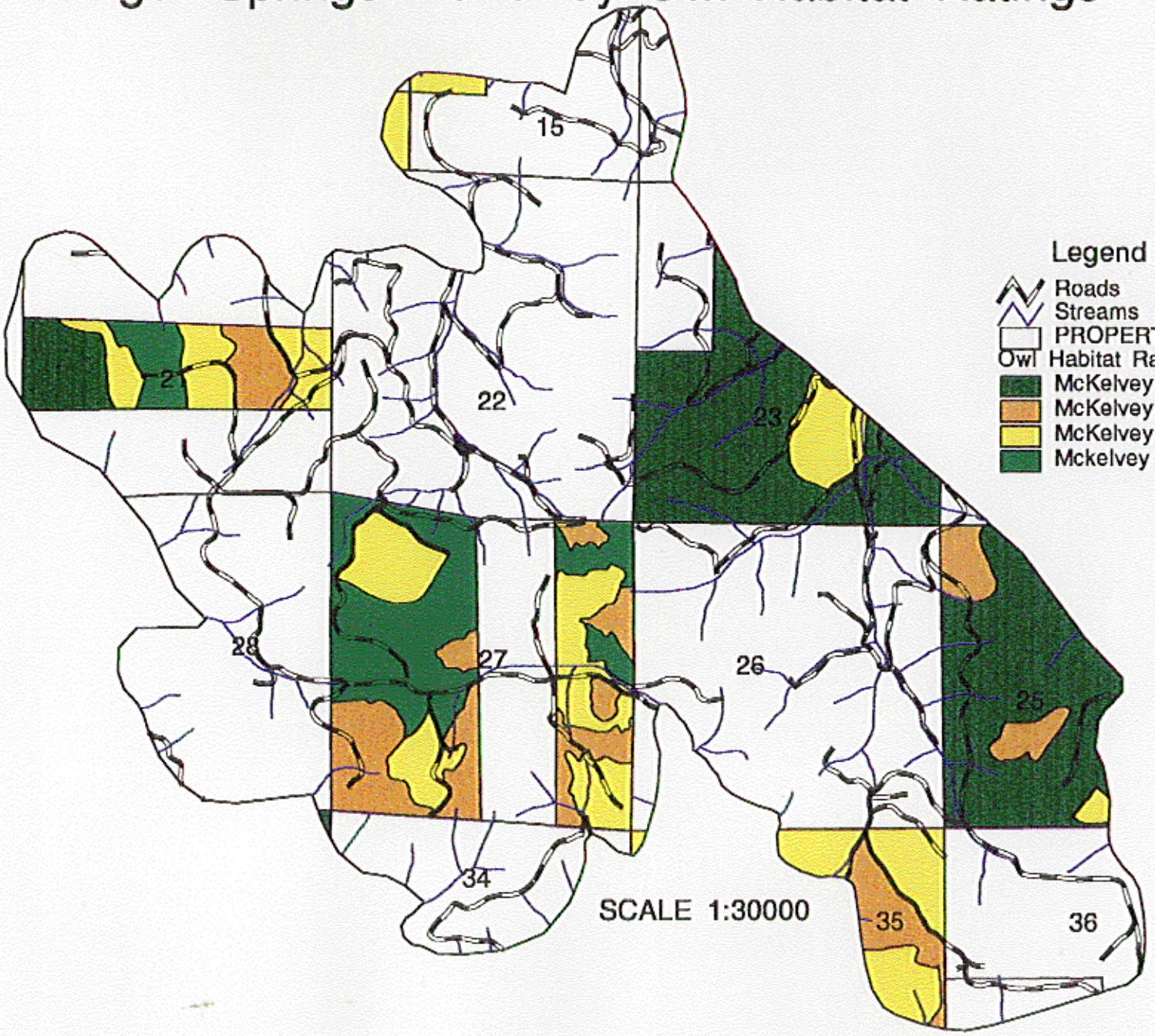
Ginger Springs Big Game Management Area



T.Coffey
8/25/98

Map 7

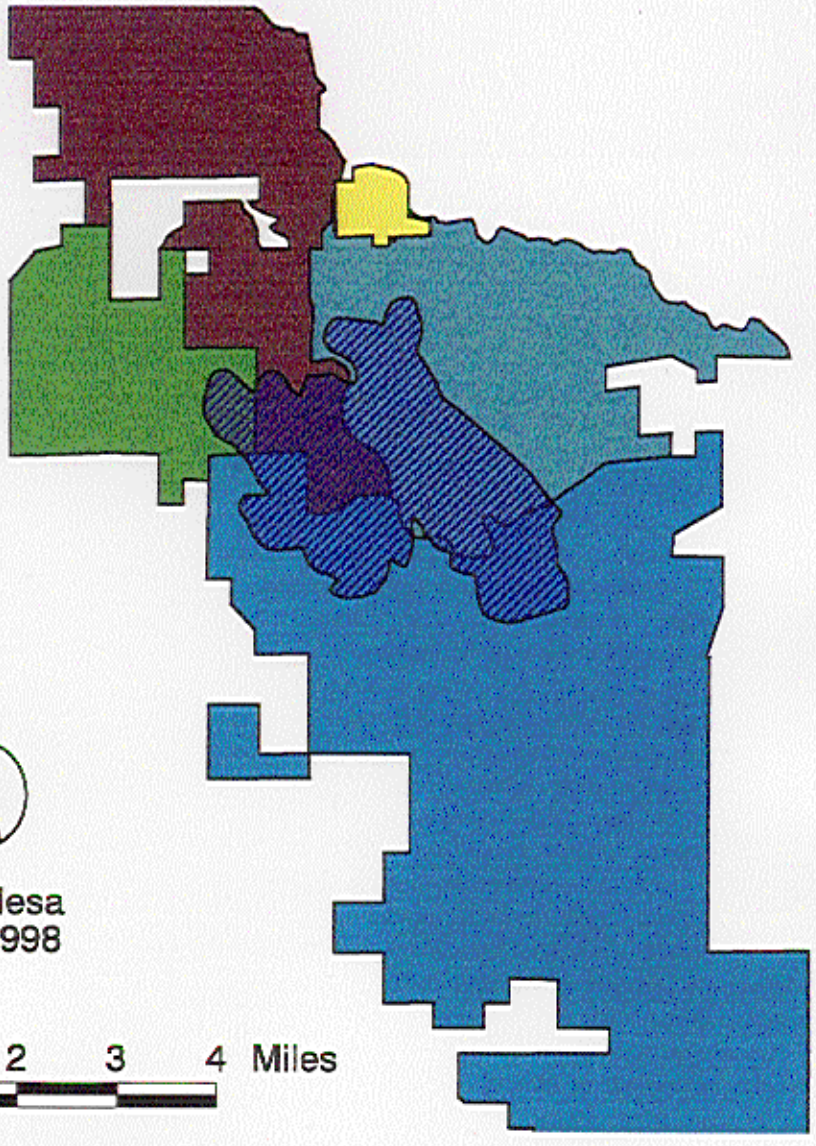
Ginger Springs McKelvey Owl Habitat Ratings



T.Coffey
8/3/98

Map 8

Ginger Springs Recharge Area and Grazing Pastures



B. Budesa
Aug. 1998

1 0 1 2 3 4 Miles

ACREAGE OF GRAZING PASTURES WITHIN RECHARGE AREA

- BUTTE FALLS
- GINGER SPRINGS RECHARGE AREA

- BAKER MT. - 208 ac.
- GINGER CR. - 1,661 ac.
- PERRY SCHOOL - 707 ac.
- WASSON CANYON - 1,415 ac.

BUTTE FALLS RESOURCE AREA
1998 SPECIAL STATUS SPECIES OCCURRENCE

PROJECT NAME: Ginger Springs Recharge Area

U.S. FISH & WILDLIFE T&E SPECIES					
SPECIES	STATUS	RANGE (Y/N)	P/A	HABITAT QUALITY	LEVEL OF SURVEY
Peregrine falcon	FE, SE, 1	Y	A	Absent	None
Bald eagle	FT, ST, 1	Y	A	Low	None
Northern spotted owl	FT, ST, 1	Y	P	Medium	Thorough

STATE, BUREAU, ONHP, SPECIES of CONCERN					
SPECIES	STATUS	RANGE (Y/N)	P/A	HABITAT QUALITY	LEVEL OF SURVEY
Cascades frog	SoC, SV, BS, 3	Y	A	Low	Limited
Clouded salamander	SU, BS, 3	Y	U	Medium	None
Foothill yellow legged frog	SoC, SV, BS, 3	Y	U	Medium	None
Northern red legged frog	SoC, SU, BS, 3	Y	A	Low	Limited
Tailed Frog	SoC, SV, BS, 3	Y	U	Low	None
Western pond turtle	SoC, SC,BS, 2	Y	A	Low	Limited
Western toad	SV, 3	Y	U	Low	Limited
California mountain kingsnake	SV, AS, 3	Y	U	Low	None
Common kingsnake	SV, AS, 3	Y	U	Low	None
Sharptail snake	SV, AS, 4	U	U	Low	None
Acorn woodpecker	SU, 3	Y	A	Low	None
Black backed woodpecker	SC, AS, 4	Y	U	Medium	None
Flammulated owl	SC, AS, 4	Y	U	Low	None
Great gray owl	SV, AS, SM, 4	Y	P	Medium	Thorough
Greater sandhill crane	SV, 4	Y	A	Low	None
Lewis' woodpecker	SC, AS, 3	Y	U	Low	None
Northern goshawk	SoC, SC, BS, 3	Y	Y	Meduim	Thorough
Northern pygmy owl	4	Y	S	Medium	Incidental

SPECIES	STATUS	RANGE (Y/N)	P/A	HABITAT QUALITY	LEVEL OF SURVEY
Northern saw whet owl	AS	Y	S	Medium	Incidental
Olive sided flycatcher	SV, 3	Y	S	Medium	None
Pileated woodpecker	SV, AS, 4	Y	P	Meduim	Incidental
Three-toed woodpecker	SC, AS, 4	N	A	Low	None
Tricolored blackbird	SoC, SP, 2	N	A	Low	None
Western Bluebird	SV, 4	Y	S	Medium	None
White headed woodpecker	SC, 3	N	A	Low	None
American martin	SV, 3	Y	U	Low	None
Fisher	SoC, BS, SC, 2	Y	U	Low	None
Fringed myotis	SoC, SV, BS, 3	Y	U	Medium	None
Long eared myotis	SoC,BS, SU, 4	Y	U	Medium	None
Long legged myotis	SoC,BS, SU, 3	Y	U	Medium	None
Pallid bat	SV, 3	Y	U	Medium	None
Red tree vole	SoC, SM	N	A	High	Thorough
Ringtail	SU, 3	Y	U	Low	None
Silver haired bat	SU, 3	Y	U	Low	None
Townsend's big eared bat	SoC,SC,BS,SM,2	Y	U	Low	None
Yuma myotis	SoC, BS, 4	Y	U	Low	None
Western gray squirrel	SU, 3	Y	P	High	Incidental
Burnell's False Water Penny Beetle	SoC, BS, 4	U	U	Low	None
Denning's Agapetus caddisfly	SoC, BS, 3	U	U	Low	None
Green springs Mountain faurlan caddisfly	SoC, BS, 3	U	U	Low	None
Schuh's homoplectran caddisfly	SoC, BS, 3	U	U	Medium	None
Siskiyou caddisfly	SoC, BS, 3	U	U	Low	None
Siskiyou chloealtis grasshopper	SoC, BS, 3	U	U	Low	None
Mardon skipper butterfly	BS, 2	U	U	Low	None
Franklin's bumblebee	SoC, BS	U	U	Low	None

Status:
FE - USFW Endangered - in danger of extinction throughout a significant portion of its range.
FT - USFW Threatened - likely to become endangered species within the foreseeable future.
SoC - Taxa whose conservation status is of cocern to the USFW (many previously known as category 2 candidates), but for which further informaiton is needed.
SE - State Endangered - in danger of extinction in the state of Oregon.
ST - State Threatened - listed as likely to become endangered by the state of Oregon.
SC - State Critical - listing is pending, or appropriate, if immediate conservation action is not taken.
SV - State Vulnerable - listing not imminent, and can be avoided through continued or expanded use of adequate protective measures and monitoring
SP - State Peripheral or naturally rare - populations at the edge of their geographic range, or historically low numbers due to limiting factors.
SU - State Unknown - status unclear, insufficient information to document decline or vulnerability.
SM - Survey & Manage - Forest Plan ROD directs protection of known sites and/or survey for new sites
BS - Bureau Sensitive (BLM) - eligible for addition to Federal Notice of Review, and known in advance of official publication. Generally these species are restricted in range and have natural or human caused threats to their survival.
AS - Assessment Species (BLM) - not presently eligible for official federal or state status, but of concern which may at a minimum need protection or mitigation in BLM activities.

1 - Oregon Natural Heritage Rank, threatened with extinction throughout its range.
2 - Oregon Natural Heritage Rank, threatened with extinction in the state of Oregon.
3 - Oregon Natural Heritage Rank, more information is needed before status can be determined, but may be threatened or endangered in Oregon or throughout range.
4 - Oregon Natural Heritage Rank, of conservation concern. May be rare, but are currently secure. May be declining in numbers or habitat but still too common to be considered as threatened or endangered. May need monitoring.

P/A Presence:
P - Present
S - Suspected
U - Uncertain
A - Absent
T - Possibly transitory

Habitat quality:
H - High
M - Medium
L - Low
A - Absent

SPECIAL STATUS WILDLIFE SPECIES -- 1998
HABITAT AND OCCURRENCE IN THE BUTTE FALLS RESOURCE AREA

THREATENED AND ENDANGERED SPECIES

Peregrine falcon (*Falco peregrinus*)

Primary habitat is tall cliffs. Two confirmed active sites occur in the Medford district. Occasional sightings are made during the winter months, but these are thought to be migrating individuals. Forest lands provide habitat for prey species for peregrine falcons. Prey is mostly birds, especially doves and pigeons. Peregrines also prey on shorebirds, waterfowl, and passerine birds.

American bald eagle (*Haliaeetus leucocephalus*)

Six nest sites are known in the Medford BLM district, with 2 on adjoining private lands. Four of these are within the Butte Falls Resource area. In Oregon, the majority of nests (84%) are located within one mile of lakes, reservoirs, large rivers, and coast estuaries. Nest trees are larger, dominant or co-dominant trees in the stand and are usually components of old growth or older second growth forests. Prey is fish, waterfowl, small mammals (rabbits, etc.), and carrion.

Northern spotted owl (*Strix occidentalis caurina*)

Old growth coniferous forest is preferred nesting, roosting and foraging habitat, or areas with some old growth characteristics with multi-layered, closed canopies with large diameter trees with an abundance of dead and down woody material. Northern spotted owls commonly nest in cavities 50 or more feet above the ground in large decadent old growth trees. Other nest sites include large mistletoe clumps, abandoned raptor nests, and platforms formed by whorls of large branches. Over 200 northern spotted owl "core areas", 100 acres of the best habitat around activity centers for known sites (as of 1/1/94) have been designated and mapped as late successional reserves. Prey is primarily small arboreal mammals, such as flying squirrels, woodrats, voles, etc. and occasionally small birds.

STATE, BUREAU, ONHP, SPECIES of CONCERN

Cascade frog (*Rana cascade*)

Found in the Cascade mountains, above 2600 feet, on the east side of the District. They are most commonly found in small pools adjacent to streams flowing through meadows. They are also found in small lakes, bogs, and marshy areas that remain damp thorough the summer.

Clouded salamander (*Aneides ferreus*)

Habitat requirements are forest and forest edges from sea level to 1500 meters. There is a correlation between clouded salamander abundance and large conifers as well as down woody material. They occur mainly under loose bark in decayed, standing and fallen snags, and stumps. They have been found as high as 20 feet in trees. May also be found in cracks in cliff rocks, under moss and leaf litter.

Foothill yellow legged frog (*Rana Boylii*)

Habitat is permanent streams with rocky, gravelly bottoms. Distribution is west of the Cascade crest from sea level to 1800 feet. These frogs are closely associated with water.

Northern red legged frog (*Rana aurora*)

Red legged frogs prefer slack water of ponds and low gradient streams with emergent vegetation for reproduction. These frogs are found in lower elevations and can be found during the summer

months up to 1000 feet from standing water in humid, old growth forests and moist meadows.

Tailed frog (*Ascaphus truei*)

Habitat is cold, fast flowing permanent streams in forested areas. Temperature tolerance range is low, 41-61 degrees fahrenheit. Tailed frog are closely tied to water.

Western toad (*Bufo boreas*)

Largely terrestrial, found from sea level to high mountains. They often use rodent burrows. They are nocturnal during dry weather, and may forage in daytime on rainy or overcast days. Optimal habitat is humid areas with dense undergrowth. They have been found beneath bark and within decayed wood in large Douglas fir logs, especially those partially submerged in water. Breed in ponds, pools, and slow moving water in streams. In the Oregon Cascades, they may prefer mud bottomed shallows of lakes and ponds.

Western pond turtle (*Clemmys marmorata marmorata*)

Live in most types of freshwater environments with abundant aquatic vegetation, basking spots, and terrestrial surroundings for nesting and over-wintering. Some northwestern pond turtles leave water in late October to mid-November to overwinter on land. They may travel up to 1/4 mile from water, bury themselves in duff and remain dormant throughout winter. Turtles have been found to generally stay in one place in areas with heavy snowpack, but may move up to 5-6 times in a winter in areas with little or no snow. General habitat characteristics of overwintering areas appear to be broad. There may be specific microhabitat requirements, which are poorly understood at this time. In many areas, predation on the hatchlings and competition from bullfrogs, bass, and other exotic species is limiting population levels. Adult turtles are relatively long lived, but as the adults age, recruitment is not occurring at levels which can maintain future healthy populations.

California mountain kingsnake (*Lampropeltis zonata*)

Habitat includes oak and pine forests. Found under or inside rotting logs and in talus areas. They are not common, and are mostly found in the western part of the District.

Common kingsnake (*Lampropeltis getulus*)

In Oregon, they are found only in Douglas, Jackson, and Josephine Counties in the more mesic river valleys. Common kingsnake inhabit oak/pine woodlands, open brushy areas, and river valleys, often along streams, and in thick vegetation. They may also be found in farmlands, especially near water areas.

Sharptail snake (*Contia tenuis*)

Habitat is conifer forests and oak grassland edges. Found in rotting logs, moist talus, under rocks, boards, or other objects, mostly in interior valleys.

Acorn woodpecker (*Melanerpes formicivorus*)

Habitat is oak woodlands or pine forests where oak trees are abundant.

Black-backed woodpecker (*Picoides arcticus*)

Presence is undetermined in the Medford BLM district. Has been documented in Cascade Mountains in Jackson County and in the Siskiyou Mountains in Josephine County. In Oregon, the black-backed woodpecker tends to occur in lower elevation forests of lodgepole pine, ponderosa pine, or mixed pine/conifer forests. Dead trees used for foraging have generally been dead three years or less.

Flammulated owl (*Otus flammeolus*)

Habitat is a mosaic of open forests containing mature or old-growth ponderosa pine mixed with other tree species. In California, habitat included conifer and black oak. Nests mainly have been located in abandoned Northern flicker or pileated woodpecker cavities. The presence of dense

conifers for roosting may be a necessary habitat components. Feeds mostly on insects. May also eat other arthropods and small vertebrates.

Great gray owl (*Strix nebulosa*)

Habitat preference is open forest or forest with adjoining deep-soil meadows. Nest in broken top trees, abandoned raptor nests, mistletoe clumps, and other platforms created by whorls of branches. Majority of nests in one study were in over-mature or remnant stands of Douglas fir and grand fir forest types on north facing slopes. Probably found in low densities across the district.

Greater sandhill crane (*Grus canadensis tabida*)

A spring and summer resident of Oregon, sandhill cranes roost, nest, and rear young in wet meadows, including wild, irrigated hay meadows and shallow marshes. The cranes may use agricultural croplands for feeding during non-nesting season. Sandhill cranes have been observed on the Ashland Resource Area near Howard Prairie and Hyatt Lake and in the Butte Falls Resource area near the communities of Prospect and Butte Falls.

Lewis' woodpecker (*Melanerpes lewis*)

These woodpeckers breed sparingly in the foothill areas of the Rogue and Umpqua river valleys in Douglas, Jackson, and Josephine counties. Habitat preference is hardwood oak stands with scattered pine near grassland shrub communities. Breeding areas in the Rogue valley are uncertain. In some locales, the woodpeckers breed in riparian areas having large cottonwoods and in oak conifer woodlands. They usually do not excavate nest cavities, but most often use cavities excavated by other woodpecker species. They winter in low elevation oak woodlands.

Northern goshawk (*Accipiter gentilis*)

Goshawks are found in a variety of mature forest types, including both deciduous and conifer types. Dense overhead foliage or high canopy cover is typical of nesting goshawk habitat. Perches where they pluck their prey, known as plucking posts, are provided by stumps, rocks, or large horizontal limbs below the canopy.

Northern pygmy owl (*Glaucidium gnoma*)

Believed to be present across district. Population numbers and trends are unknown. Habitat needs are not clear, but the species is regularly recorded in forested areas of numerous types and age classes in Oregon, most commonly along edges of openings such as clearcuts or meadows. Nests in tree cavities excavated by woodpeckers. Feeds on insects, small vertebrates and birds.

Northern saw-whet owl (*Aegolius acadicus*)

Believed to be present across the district. Population numbers and trends are unknown. Habitat is dense conifer and mixed conifer/hardwood forests. Nest in abandoned woodpecker holes and natural cavities. Feed on small mammals and birds.

Olive sided flycatcher (*Contopus borealis*)

Fairly common in coniferous forests, burns, and clearings. Often perches high on tall conifer or snag at edge of clearcut. Feeds on insects and other invertebrates, including caterpillars.

Pileated woodpecker (*Dryocopus pileatus*)

Pileated woodpeckers are common across the Medford BLM district. They are found mainly in old growth and mature forests, but can feed in younger forests and clearcuts. A new nest is excavated each year. They mainly use dead trees that have the strength to handle a nest cavity that averages 8 inches wide and 22 inches deep ($\geq$20 inches dbh). Pileated woodpeckers excavate an new nest each year, and need 1-2 hard snags per 100 acres. Studies show that the pileated woodpeckers need about 45 large trees with existing cavities in their home range (300-1000 acres) to provide roosting habitat.

Three toed woodpecker (*Picoides tridactylus*)

Presence is undetermined in the Medford BLM district. Range is along the crest of the Cascade Range and eastward. Generally found in higher elevation forests, above 4000 feet. In eastern Oregon, three-toed woodpeckers nest and forage in lodgepole pine forests. They are occasionally found roosting in hemlock and Engelmann spruce trees in mature and over mature mixed conifer forests. Bark beetle larvae are primary food source.

Tricolored blackbird (*Agelaius tricolor*)

Tricolored blackbirds are found in the interior valleys of southern Oregon, near freshwater marshes and croplands. Individuals have been reported near Roxy Ann Peak, in Sams valley, and near Table Rock.

Western bluebird (*Sialia mexicana*)

In western Oregon, western bluebirds nest in open areas near farms and in clearcuts in standing snags. They nest in natural cavities, old woodpecker holes, and in nest boxes.

White headed woodpecker (*Picoides albolarvatus*)

Presence in the BLM Medford district is undetermined. White headed woodpeckers occur in ponderosa pine and mixed ponderosa forests. They forage mainly on trunks of living conifers for insects. Nest cavities are within 15 feet of ground in dead trees which have heart rot. Standing and leaning snags and stumps are used. Area is in periphery of known range.

American martin (*Martes americana*)

Martin inhabit mature and old growth forests that contain large quantities of standing and downed snags and other coarse downed woody material, often near streams. They often use down logs for hunting and resting. They feed on small mammals, birds, fruits, and insects.

Fisher (*Martes pennanti pacifica*)

Habitat is mature and old growth forests. They appear to be closely associated with riparian areas in these forests. In a study done in Trinity County, California, a preference was shown for conifer forests with some hardwoods present. They seem to prefer 40-70% canopy cover. They mainly use large living trees, snags and fallen logs for denning. Occasional sightings on the Medford district, but little information is available as to distribution and density.

Fringed myotis bat (*Myotis thysanodes*)

Fringed myotis is a crevice dweller which may be found in caves, mines, buildings, rock crevices, and large old growth trees. They have been captured in openings and in mid-seral stage forest habitats. Food consists of beetles, butterflies, and moths.

Long eared myotis (*Myotis evotis*)

A crevice dweller found in coniferous forests in the mountains. Individuals are frequently encountered in sheds and cabins. They have also been found beneath the loose bark of trees. They seldom reside in caves, but may occasionally use caves as a night roost. They are not known to occur in large colonies.

Long legged myotis (*Myotis volans*)

Long legged myotis is an open forest dweller which is found in small pockets and crevices in rock ledges, caves, and buildings. When in caves, they hang in clumps in deep twilight zones.

Pallid bat (*Antrozous pallidus*)

This bat is a crevice dweller. Rock crevices and human structures are used as day roosting sites. Recent radiotelemetry studies indicate that these bats also use interstitial spaces in the bark of large conifer trees as a roost site. One colony of pallid bats was observed roosting in a hollow tree. Food consists of beetles, grasshoppers, moths, and other insects found on or near the ground or on grasses or shrubs.

Red tree vole (*Arborimus pomo*)

An arboreal vole which lives in Douglas fir, spruce, and hemlock forests. Food consists entirely of needles of the tree in which they are living. They build a bulky nest, up to the size of a half bushel measure in the branches, usually near the trunk, 15-100 feet above the ground. The nest becomes larger with age, and may be occupied by many generations.

Ringtail (*Bassariscus astutus*)

Ringtails are most commonly found in areas having cliffs, rocky terrain near water, riparian hardwoods, and sometimes conifers. They nest in hollow trees, brush piles, caves, and abandoned buildings. They are encountered infrequently across the District.

Silver-haired bat (*Lasionycteris noctivagans*)

The species is a tree dweller, living mostly under bark and in tree trunks. It may also be found roosting in foliage of trees. Silver haired bats are rarely found in human structures.

Townsend's big-eared bat (*Plecotus townsendii*)

Roost in mines, caves, cavities in trees, and attics of buildings. They have low tolerance to changes in temperature and humidity and removal of trees around these sites may change airflow patterns to make the area less desirable as a hibernaculum, maternity, or roosting site. Food consists primarily of moths, and other arthropods.

Yuma myotis (*Myotis Yumanensis*)

Yuma myotis is commonly found in human structures, closely associated with water nearby. They will use caves as night roost areas. The species is colonial and hangs in a closely clumped group, often under bridges, in mines and caves.

Western gray squirrel (*Sciurus griseus*)

Arboreal squirrel that is found in oak, oak-pine, hardwood-mixed conifer, and mixed conifer forests. Feeds mostly on acorns and conifer seeds. Nests in tree cavities or in nests made of sticks and shredded bark.

Burnell's false water penny beetle (*Acneus burnelli*)

This species has not been found in the Medford BLM district, but could be present. Adults are found along small, rapid, low elevation streams, frequently near waterfalls. Larvae were found in rapid sections of a stream in pools of quiet water protected form any current by large boulders. This species has been found in Coos Co., Upper Middle Creek, 15 miles SW of Powers, OR.

Denning's agapetus caddisfly (*Agapetus denningi*)

This species has not been found in Medford BLM district, but could be present. No habitat information is available. The only information available is from the life history of *A. taho*, a similar species, which is found in cool, mid to large size streams of moderate gradient in forested areas over a large elevation range. A single specimen was collected in Rogue River National Forest.

Green springs Mountain farulan caddisfly (*Farula davisi*)

Species of *Farula* inhabit cool, highly humid areas. This species was collected near a small stream with a marshy area nearby. One is probably the habitat. Two adult specimens were collected from Green Springs Mountain, 10 miles east of Ashland near a large stream.

Schuh's homoplectran caddisfly (*Homoplectra schuhi*)

Larvae are found in spring-seepage habitats in forested montane areas. *Homoplectra sp*. are found in streams with moderate to close shading from a forest canopy with most sites having a mixed deciduous- conifer canopy. The distribution of the species appears to be limited with specimens found in the Cascade and Coast range mountains of southwestern Oregon and northern California, where suitable habitat is found.

Siskiyou caddisfly (*Tinodes siskiyou*)

Adult collection records indicate the larvae are associated with mid-size streams, with moderate to dense shading from a mixed hardwood/conifer overstory. Adults have been collected adjacent to both cool, spring-fed streams and from streams with a high annual temperature range. Members of this genus have been found from the coastal mountains of northern Calif. and from 2 disjunct populations in Oregon, one from the Squaw Lakes region of the Rogue River National Forest, 10 miles SW of Medford.

Siskiyou chloealtis grasshopper (*Chloealtis aspasma*)

This species has been found in the Siskiyou Mountains near Mt. Ashland and near Willow Lake. Appears to be associated with elderberry plants. Females lay eggs in the pith of elderberry plants.

Mardon skipper butterfly (*Polites mardon*)

Only known in four localities, two in Washington state, one in Del Norte County coastal mountains, and the fourth in high mountain meadows along the summit of the Cascade Mountains in Jackson and Klamath Counties. They are found in wet mountain meadow habitats.

Franklin's bumblebee (*Bombus franklini*)

Franklin's bumblebee has been found in herbaceous grasslands between 1400-4000 ft. elevation. Activity spans the entire blooming season, so they do not appear restricted to a particular host or flower. Adults probably present and in active flight from May (on warm sunny days) through early September. Range restricted to southwestern Jackson County, Oregon, perhaps southeastern corner of Josephine Co., perhaps part of northern California.

(503) 731-4381
FAX (503) 731-4077
TDD-Nonvoice (503) 732-4031

Appendix B

Oregon

DEPARTMENT OF
HUMAN
RESOURCES

HEALTH DIVISION

August 29, 1994

BUTTE FALLS, TOWN OF
SCOTT MALLORY
PO BOX 268
BUTTE FALLS OR, 97522

Dear Water System Operator:

The sources your water system uses are classified as ground water sources. Ground water sources do not need to report turbidity readings to the Drinking Water Program. You may take readings for your own use but please do not send the reports in.

So you may save time and postage by keeping the reports at your end.

If you have any questions please give me a call.

Patrick Meyer MPH, RS
Monitoring and Compliance
Drinking Water Section

Barbara Roberts
Governor

800 NE Oregon Street # 21
Portland, OR 97232-2162
(503) 731-4030 Emergency
(503) 252-7978 TDD
Emergency

24-26 (Rev. 1-92)

The 6-Class Dwarf Mistletoe Rating System

Frank G. Hawksworth

Instructions

Step 1—Divide live crown into thirds.

Step 2—Rate each third separately. Each third should be given a rating of 0, 1, or 2 as described below.

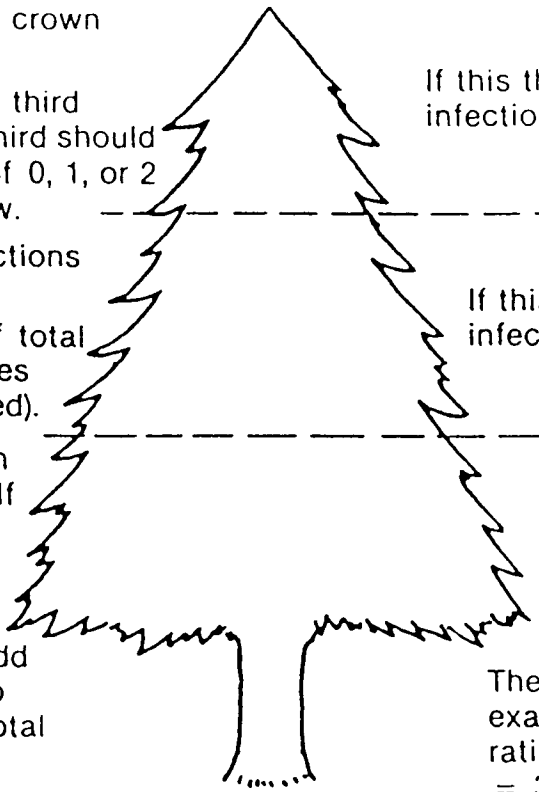
0—No visible infections

1—Light infection (one-half or less of total number of branches in the third infected).

2—Heavy infection (more than one-half of total number of branches in the third infected).

Step 3—Finally, add ratings of thirds to obtain rating for total tree.

Example



If this third has no visible infections, its rating is 0.

If this third is lightly infected, its rating is 1.

If this third is heavily infected, its rating is 2.

The tree in this example will receive a rating of 0 + 1 + 2 = 3.

FACTS ABOUT DWARF MISTLETOE
THE BASIS FOR MANAGEMENT

1. Dwarf mistletoe requires a living host to survive - once a tree or branch is cut, the dwarf mistletoe dies.

2. Dwarf mistletoe usually infects a single host species or group of closely related species.

3. Dwarf mistletoe spreads slowly - seed dispersal from a tall tree rarely exceeds 30 to 40 feet.

4. Dwarf mistletoe spreads laterally one to two feet per year in even-aged stands.

5. Dwarf mistletoe's infection in the upper crown is more serious than lower crown infections.

6. Vigorous, young mistletoe plants are more infectious than old brooms.

7. Regeneration less than 10 years-old or less than 3 feet tall will likely escape infection from overstory trees.

8. Vigorous trees with rapid height growth can outgrow light to moderate infection by dwarf mistletoe.

9. Dwarf mistletoe has a long life cycle; mature plants develop from seeds in four to six years.

10. Dwarf mistletoes infection rating increases by one class every 12 to 15 years.

11. Little growth impact occurs on trees with a dwarf mistletoe rating of 3 or less.

12. Lateral spread of dwarf mistletoe is more rapid in open (thinned) than in closed (unthinned) stands.

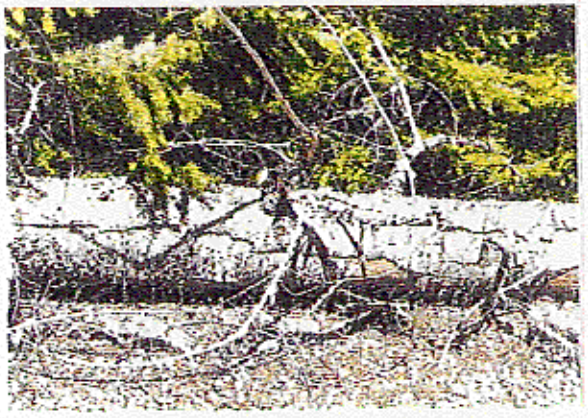
13. One infected overstory tree can result in dwarf mistletoe infections over one acre by the end of a rotation.

14. Heavily infected trees produce fewer seeds and seeds of lower quality.

15. Heavily infected trees are more likely to die than lightly infected or healthy trees.

SNAGS and COARSE WOODY DEBRIS (CWD) CLASSES

Log Class 1



Log Class 2

Log Class 3

Log Class 4

Log Class 5

Snag Characteristics	Snag Decomposition Class				
	1	2	3	4	5 1/
Limbs and branches	All present	Few limbs, no fine branches	Limb stubs only	Few or no stubs	None
Top	Pointed	Broken			
Diameter, broken top	- - - - Increasing at decreasing rate - - - -				
Height	- - - - Decreasing at decreasing rate - - - -				
Bark remaining %	100	- - - - Variable - - - -			20
Sapwood presence	Intact	- - - - Sloughing - - - -			Gone
Sapwood condition	Sound, incipient decay, hard, original color	Advanced decay, fibrous, firm to soft, light brown	Fibrous, soft, light to reddish brown	Cubical, soft, reddish to dark brown	
Heartwood condition	Sound, hard, original color	Sound at base, incipient decay in outer edge of upper bole, hard, light to reddish brown	Incipient decay at base, advanced decay throughout upper bole, fibrous, hard to firm, reddish brown	Advanced decay at base. Sloughing from upper bole, fibrous to cubical, soft, dark reddish brown	Sloughing, cubical, soft, dark brown; or, fibrous, very soft, dark reddish brown, encased in hardened shell
Estimated age at which snags reach a deterioration state:					
3.6-7.2 in. DBH 2/	0-4	5-8	9-16	17	Fallen
7.6-18.8 in. DBH 3/	0-5	6-13	14-29	30-60	>60
>18.8 in. DBH 4/	0-6	7-18	19-50	51-125	>125

1/ Mostly remnant snags.
2/ Characteristic in Douglas-fir forests 80 years old; mean DBH 5.4 ± 1.2 in.
3/ Characteristic in Douglas-fir forests 80-200 years old; mean DBH 12.8 ± 2.8 in.
4/ Characteristic in Douglas-fir forests 200 years old; mean DBH 38.8 ± 16.4 in.

Source: Brown, E. R., tech. ed. 1985. Management of wildlife and fish habitats in forests in western Oregon and Washington. Part 1 - Chapter Narratives. Publ. R6-F and WL-192-1985. Portland, OR: U.S. Department of Agricultur Forest Service, Pacific Northwest Region. 136.

COARSE WOODY DEBRIS	
TREE DBH	NUMBER OF PIECES PER TREE 16" x 16'
16"	1
20"	1
22"	2
24"	3
26"	4
28"	4
30"	5
32"	5
34"	6
36"	6
38"	6
40"	6
42"-50"	7
52"-58"	8
60"	9

FUEL MODELS FOR GINGER SPRINGS RECHARGE AREA

HIGH RISK

Fuel Model 5

Description: Recent, treated (broadcast burned or machined piled) clearcuts on both private and BLM managed lands characterize this fuel model. Herbaceous vegetation, grasses and shrubs, such as madrone, vine maple and manzanita occupy most of the area. Small conifer seedlings less than 3 feet in height, and pockets of advanced reproduction are also present. Fuels are made up of litter cast by shrubs, grasses and forbs. Fuel loading is approximately 4 tons per acre.
Fire Behavior: These fires are generally not very intense because surface fuel loadings are light, the shrubs are young with little dead material, and the foliage contains little volatile material. Although fires in this fuel model are of low intensity, they can have high rates of spread, making control difficult. Young conifers would be killed by crown scorch and some soil cover would be consumed.

Fuel Model 11

Description: Young conifer stands that have had some light brushing or thinning treatments. Conifers are generally less than 6 feet in height. Also, recent light partial cuts and commercial thinning fall into this model. Treatment slash and herbaceous material provide the dominate fuel source. Fuel loading is approximately 12 tons per acre.
Fire Behavior: The spacing of the light fuel load, shading from the overstory, or the age of the fine fuels can contribute to limiting the fire potential. Fire intensity is low to moderate but fire spread can be high. Fire scorch would kill most of a short overstory, and remove most soil cover in the younger stands. Commercial-sized stands could suffer some mortality and soil cover loss. Soil damage could occur where there are heavy concentrations of fuel.

Fuel Model 12

Description: The area is dominated with slash, much of it less than 3 inches in diameter. Recent untreated clearcuts, heavy partial cuts, and precommercial thinning areas fit this model. The fuel loading is approximately 35 tons per acre.
Fire Behavior: Rapidly spreading fires with high intensities capable of generating firebrands can occur. When fire starts, it is generally sustained until a fuel break or change in fuels is encountered. The high fire intensity could cause soil damage and kill the young overstory trees. Fire intensity is moderate to high, with high

rates of spread, making control difficult.

LOW RISK

Fuel Model 8

Description: Closed canopy stands of short-needled conifer or hardwoods that have leafed out support fire in the compact ground litter layer. This layer is mainly needles, leaves and occasionally twigs, as there is usually little undergrowth present. Representative types are second growth conifer and hardwood stands. Fuel loading is approximately 5 tons per acre.

Fire Behavior: Slow burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional heavy fuel concentration and flare up. Only under severe weather conditions do these fuels pose fire hazards. Normally, these fire can be controlled by direct attack. Little soil damage or stand mortality occurs.

Fuel Model 10

Description: Typically, mature and old growth stands represent this type. Dead-down fuels include greater quantities of 3 inch and larger limbwood resulting from over maturity or natural events that create a large load of dead material on the forest floor. Fuel loading is approximately 12 tons per acre.

Fire Behavior: These fires burn in the surface and ground fuels with greater intensity than other timber litter models. Crowning out, spotting, and torching of individual trees are more frequent in this fuel situation, leading to potential fire control difficulties. Under extreme weather conditions, stand replacing crown fires could develop due to the abundance of ladder fuels.

Ginger Springs Recharge Area
Road Density and Stream Crossing

T35S R3E Section	ownership	watershed acres	watershed square miles	road miles	miles per square mile	miles per full section	watershed stream crossing
14	Indian Hill	42.4	.07	0.54	7.71	6.96	0
15	IndianHill/BLM	183.8	.29	1.49	5.14	5.85	0
20	Lone Rock	10.2	.02	0	N/A	N/A	0
21	LoneRock/BLM	441.5	.69	2.23	3.23	3.98	1
22	Superior	601.1	.94	5.67	6.03	6.69	4
23	BLM/Superior	383.5	.60	3.07	5.12	6.11	6
24	Lone Rock	7.7	.01	0.17	N/A	N/A	0
25	BLM	274.6	.43	1.43	3.33	4.55	1
26	Indian Hill	565.5	.88	4.24	4.82	4.73	6
27	BLM/Superior	605.4	.95	4.57	4.81	4.57	5
28	Indian Hill	354.9	.55	1.81	3.29	3.40	1
33	BLM	1.3	.00	0	N/A	N/A	0
34	Indian Hill	167.5	.26	0.93	3.58	4.66	1
35	BLM	126.7	.20	0.75	3.75	5.41	0
36	IndianHill/KOGAP	224.8	.35	1.72	4.91	4.48	0
TOTAL		3390.9	6.24	28.62	4.59		25

N/A = Not Analyzed in this watershed analysis.

McKelvey Rating Definitions

The McKelvey classes come from the McKelvey model, a model developed to predict spotted owl populations based on habitat availability for given times. McKelvey classes rate an OI unit for how functional the unit is for spotted owl habitat. This information is available for every OI unit in MICRO*STORMS.

Class 1* Meets all life requirements (optimal). Nesting, foraging, roosting and dispersal. Canopy closure greater than 60%. Canopy structure usually multi-layered and diverse and includes snags, mixed species, and large "wolf trees".

Class 2 Meets foraging, dispersal and roosting. Canopy closure greater than 60%. Open enough below canopy to permit flight. Canopies can be single layered.

Class 3 Meets no known requirements for spotted owls. Doesn't provide nesting, foraging, roosting, or dispersal. Canopy closure 40% or less. Doesn't meet requirements due to some kind of disturbance, but has the biological potential to develop into Class 1 or 2.

Class 4 Meets no known requirements for spotted owls. Doesn't provide nesting, foraging, roosting or dispersal. Canopy closure 40% or less. Doesn't meet requirements due to site limitations and would not likely have the potential to develop into Class 1 or 2. Examples could include oak woodlands, serpentine areas, etc.

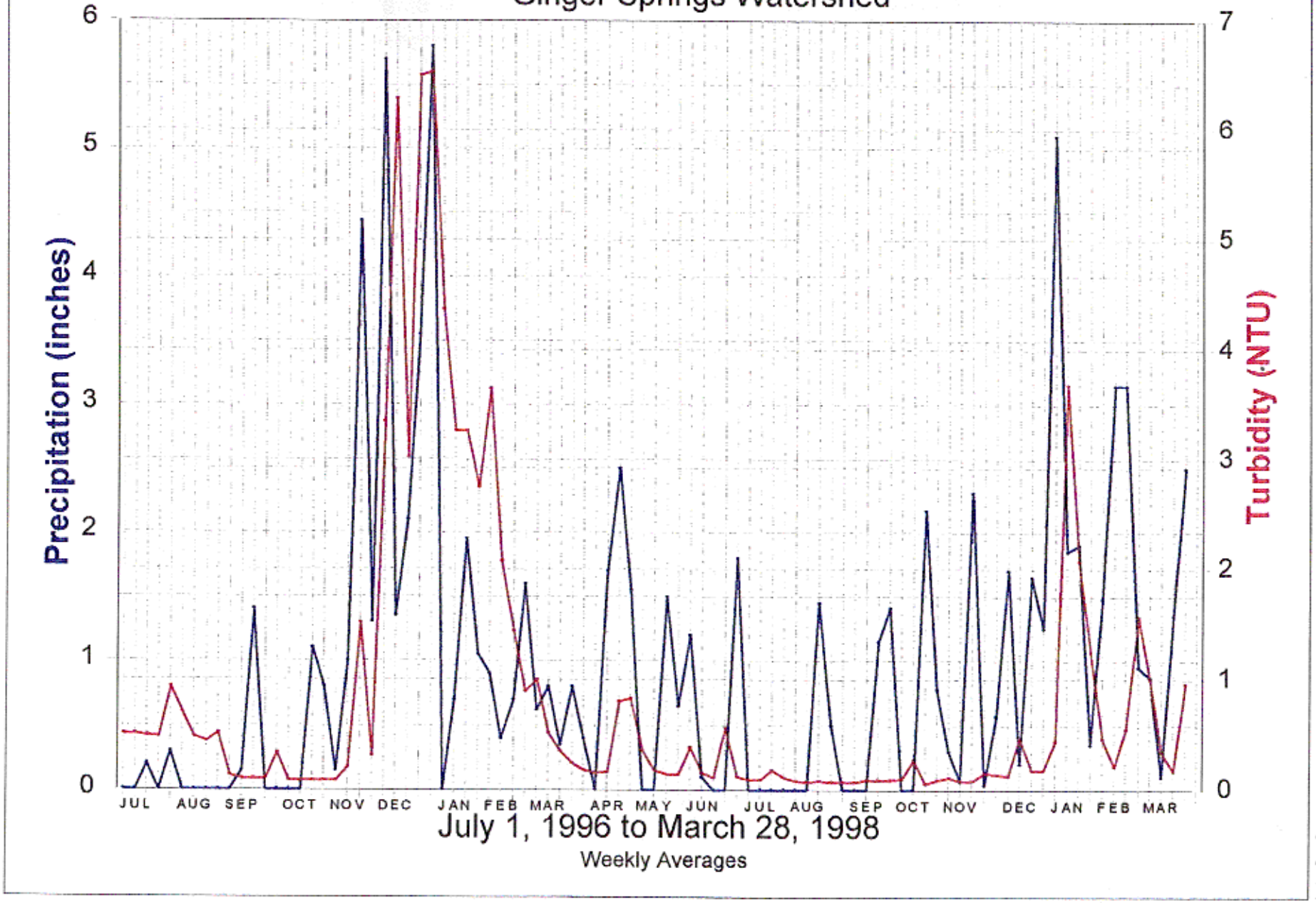
Class 5 Provides for spotted owl dispersal habitat only. Canopy closure between 40% and 60%. Needs to be open enough below canopy to allow for flight and avoidance of predators. Has the biological potential to develop into nesting, foraging, or roosting habitat.

Class 6 Provides for spotted owl dispersal habitat only. Canopy closure between 40% and 60%. Needs to be open enough below canopy to allow for flight and avoidance of predators. Not currently meeting nesting, roosting, or foraging requirements due to site limitations and would not likely have the potential to develop into Class 1 or 2. Examples could include low site lands, woodlands, serpentine areas, etc.

*The McKelvey classes are also interchangeably referred to as Habitat 1, Habitat 2, etc.

RAINFALL and TURBIDITY

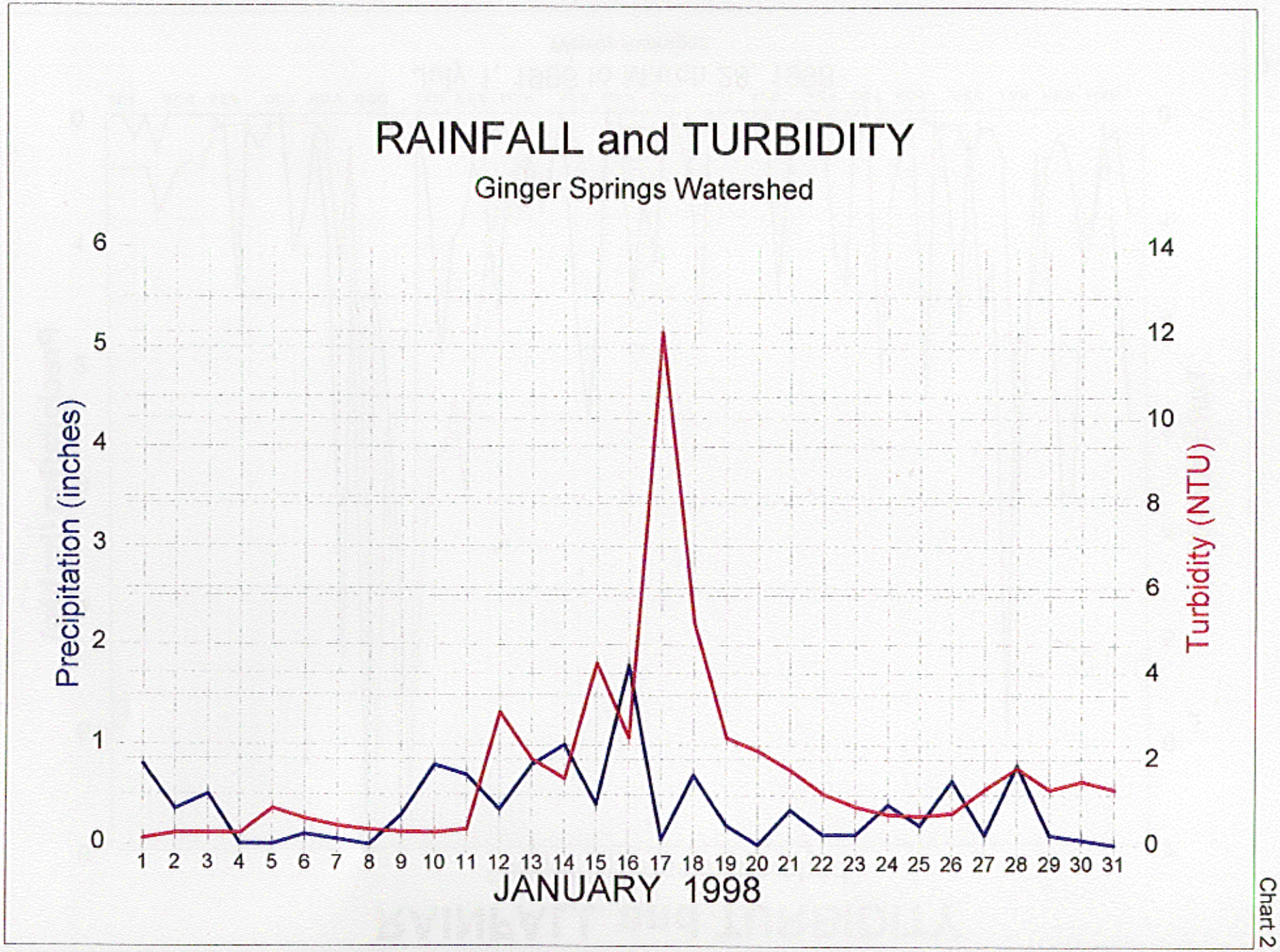
Ginger Springs Watershed



July 1, 1996 to March 28, 1998

Weekly Averages

Chart 1


RAINFALL and TURBIDITY
Ginger Springs Watershed
Precipitation (inches)
Turbidity (NTU)
0
1
2
3
4
5
6
0
2
4
6
8
10
12
14
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
JANUARY 1998
Chart 2

RAINFALL and TURBIDITY

and the Klamath Falls earthquake

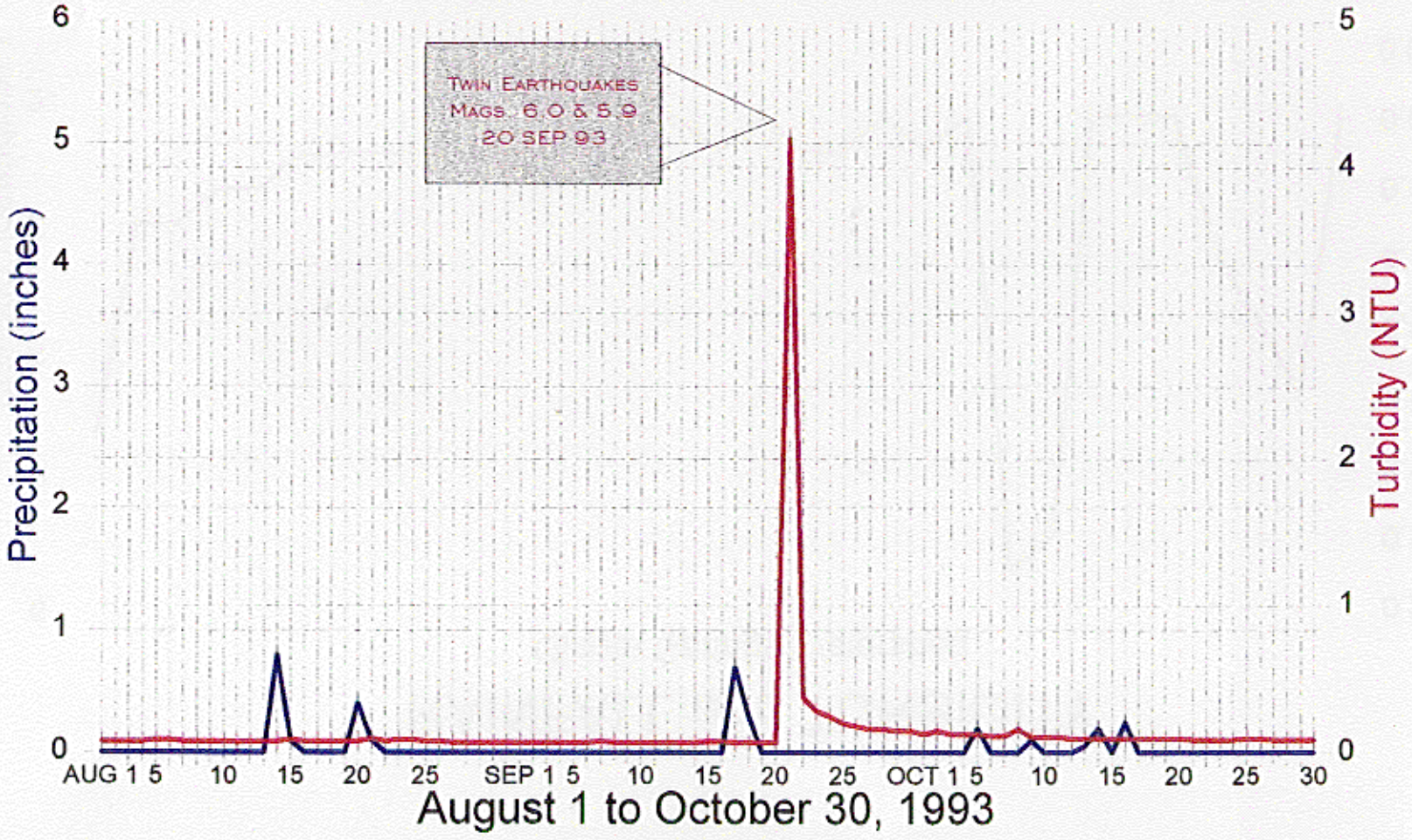


Chart 3

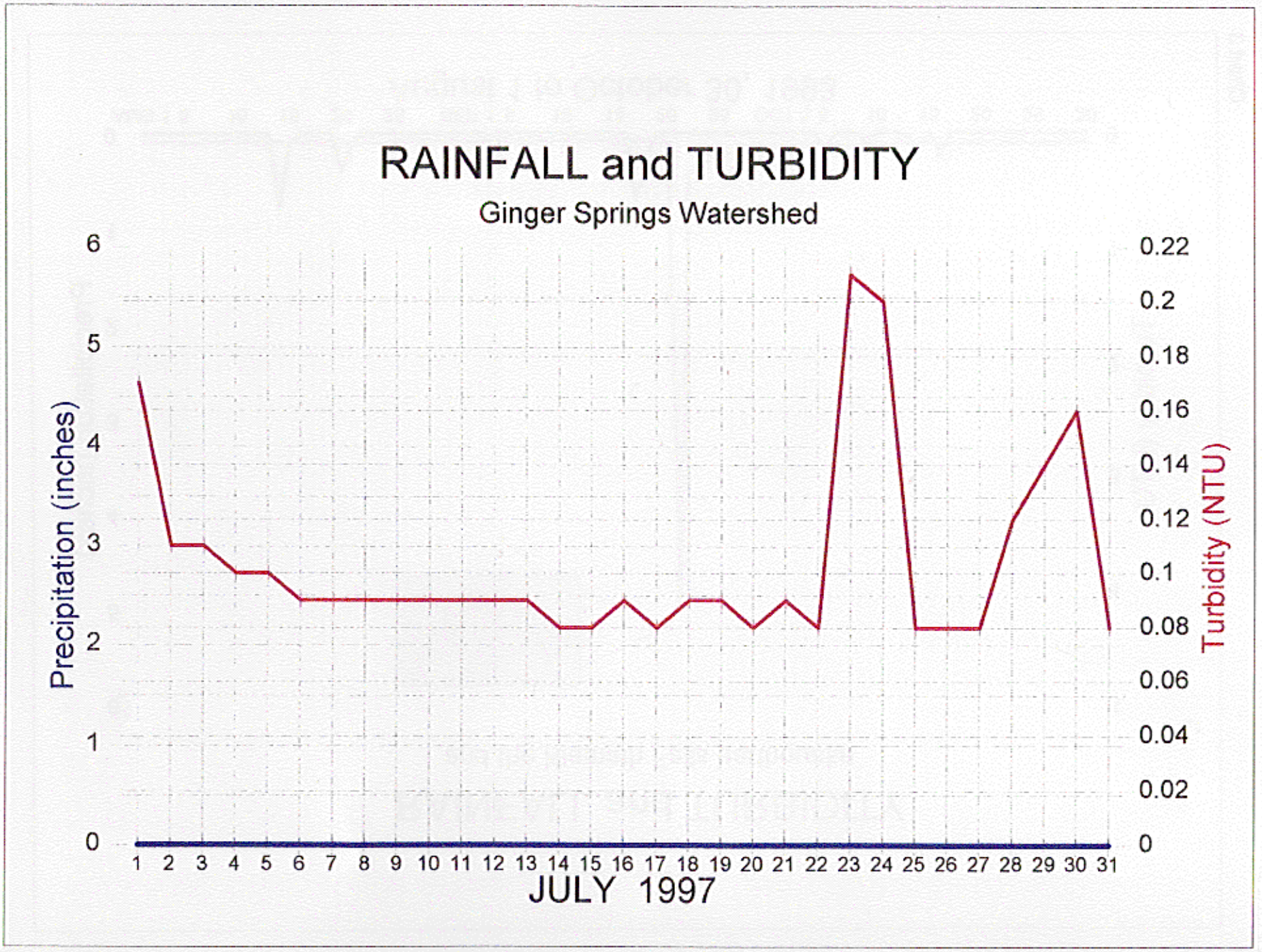

RAINFALL and TURBIDITY
Ginger Springs Watershed
Precipitation (inches)
Turbidity (NTU)
0
1
2
3
4
5
6
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
0.22
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
JULY 1997

Chart 4

Ginger Springs
Glossary

Anadromous Fish - Fish that migrate as adults from the ocean into fresh water streams where they spawn. Young fish then return to the ocean to mature.

Archaeological Site - A geographic locale that contains the material remains of prehistoric and/or historic human activity.

Broadcast Burn - A controlled fire that burns within defined boundaries to achieve management objectives.

Canopy Closure - The more or less continuous cover of branches and foliage formed collectively by adjacent trees and other woody species in a forest stand. Where significant height differences occur between trees within a stand, formation of a multiple canopy (multi-layered) condition can result.

cfs - cubic feet per second (volume flow rate of water)

Coarse Woody Debris (CWD) - Portion of tree that has fallen or been cut and left in the woods. Usually refers to pieces at least 16 inches in diameter (small end) and 16 feet in length.

Coliform - Microorganisms found in the intestinal tracts of humans and animals. Their presence in water indicates fecal pollution and potentially dangerous bacterial contamination by disease-causing microorganisms.

Connectivity - Habitat that provides components of older forest characteristics for spotted owl dispersal and other species' natural habitats.

Core Area - That area of habitat essential in the breeding, nesting, and rearing of young up to the point of dispersal of the young. Spotted owl core areas include 100 acres of the best northern spotted owl habitat to be retained as close to the nest site or activity center as possible.

Corridors - Provides routes between similar seral stages or vegetative types. Corridors may include roads, riparian areas, power lines, timber stands.

Cover - Vegetation used by wildlife for protection from predators, to mitigate weather conditions, or to reproduce.

Cumulative Effect - The impact which results from identified actions when they are added to other past, present, and reasonably foreseeable future actions regardless of who

undertakes such other actions. Cumulative effects can result from individually minor but collectively consequential actions taking place over a period of time.

Density Management - Forest stands are thinned or partially harvested to maintain or enhance forest health, stand structure and function for wildlife purposes or for purposes other than growth and yield.

dbh (Diameter at Breast Height) - The diameter of a tree measured 4½ feet above the ground.

Early-successional conditions - The stages in forest development that includes seedlings, saplings, and poles.

Ecosystem - An interacting natural system including living organisms and the non-living environment. Ecosystems may vary in size. For example: the community of microorganisms in water < the lake which contains the water < the watershed the lake resides in < and the mountain range containing the watershed.

Edge Effect - A biological effect that occurs in the transition zone where two plant communities or successional stages meet and mix.

Environmental Assessment (EA) - A systematic analysis of site-specific activities used to determine whether such activities have a significant effect of the quality of the human environment. Assessment leads to a decision as to a formal environmental impact statement is required and aids an agency's compliance with National Environmental Protection Agency (NEPA) when no Environmental Impact Statement is necessary.

Environmental Impact Statement (EIS) - A formal document to be filed with NEPA that considers significant environmental impacts expected from implementation of a major federal action.

Ephemeral Stream - Streams that flow only in direct response to storm precipitation, and whose channel is above the water table.

Fifth Field Analytical Watershed - A drainage basin comprised of several smaller watersheds.

Forest Health - A condition which expresses the forest's relative ability to remain productive, resilient, and dynamically stable over time and to withstand the effects of periodic natural or man-caused stresses such as drought, insect attack, climatic change and changes in management practice and resource demands.

Fuel Model - The collections of fuel properties, such as fuel volume, depth, distribution and size.

Geohyrdrologic Watershed - A watershed in which the groundwater flow is concentrated by geologic constraints.

Green Tree Retention - A stand management practice in which live trees as well as snags and large down wood are left as biological legacies within harvest units to provide habitat components over the next management cycle.

Hiding Cover - Generally, any vegetation used by wildlife for security or to escape from danger. More specifically, any vegetation capable of providing concealment (e.g., hiding 90 percent of an animal) from human view at a distance of 200 feet or less.

Hyperzoic - Subterranean riparian area.

Intermittent Stream - A stream channel which shows annual scour or deposition within a well defined channel. Flow of water is usually seasonal in nature, carrying water primarily as storm runoff.

Landscape Pattern - The number, frequency, size, and juxtaposition of landscape elements which are important to the determination or interpretation of ecological processes.

Landscape - An area composed of interacting ecosystems that are repeated because of geology, landforms, soils, vegetation, climate, and human influences.

Late-successional conditions - The stages in forest development that includes mature and old-growth stands, generally over 80 to 200 years of age.

Late-Successional Reserve (LSR) - A land allocation with an objective to protect and enhance condition of late-successional and old-growth forest ecosystems which serve as habitat for late-successional and old-growth dependent species.

Matrix - Generally the predominant vegetative type that exerts the strongest control over the movement of living and non-living things across the landscape (fire, wind, plants, animals, people). The matrix affects the rate at which various disturbances move through the landscape.

Matrix Lands - Federal land outside of reserves and special management areas that will be available for timber harvest at varying levels.

Mitigating Measures - Modifications of actions which (a) avoid impacts by not taking a certain action or parts of an action; (b) minimize impacts by limiting the degree or magnitude of the action and its implementation; (c) rectify impacts by repairing, rehabilitating, or restoring the affected environment; (d) reduce or eliminate impacts over time by preservation and maintenance operations during the life of the action; or (e) compensate for impacts by replacing or providing substitute resources or environments.

Monitoring - The process of collecting information to evaluate the effectiveness of objectives and anticipated results of a management action, or if implementation is proceeding as planned.

Noxious Weed - A plant specified by law as being especially undesirable, troublesome, or difficult to control.

OHV (Off Highway Vehicle) - Any motorized track or wheeled vehicle designed for cross country travel over natural terrain.

OI (Operations Inventory) *Unit* - Mapped forest stands that have similar size trees and structural characteristics.

Patches - Distinct areas different than the general landscape around them.

Peak Flow - The highest amount of stream or river flow occurring in a year or from a single storm event.

Perennial Stream - A stream that typically flows year-round.

Plant Association - A plant community type based on land management potential, successional patterns, and species composition.

Plant Community - An association of plants of various species found growing together in different areas with similar site characteristics.

Prescribed Fire - Introduction of fire under controlled conditions for vegetation management purposes.

Protection Buffer Species - Rare and locally endemic species identified in FSEIS ROD which have specific management guidelines for occupied sites. These sites become managed late-successional areas.

Relative Density - Measure of “crowding” in a stand of trees. It compares the number of trees present to the number of trees that the site has resources (water, nutrients, sunlight) to support.

Resource Management Plan (RMP) - A land use plan prepared by the BLM under current regulations in accordance with the Federal Land Policy and Management Act (FLPMA).

Right-of-Way - A permit or an easement that authorizes the use of public lands for specified purposes, such as roads, pipelines, telephone lines, electric lines, reservoirs, and the lands covered by such an easement or permit.

Riparian Buffer - A minimum “no cut” zone where no action will occur. This width is determined by the stream flow characteristics.

Riparian Reserves - Land allocation that designates areas along streams, wetlands, lakes, ponds, and unstable areas where the conservation of aquatic and riparian dependent resources receives primary emphasis.

Riparian Zone - A geomorphic area containing an aquatic ecosystem and adjacent upland areas that directly affect it.

Ripping - The process of mechanically breaking up or loosening compacted soil to assure better penetration of roots, lower soil density, and increased microbial and invertebrate activity.

Rotation - The planned number of years between the reestablishment of an even-aged forest stand and its final cutting.

Seral Stages - The series of relatively transitory plant communities that develop during ecological succession from bare ground to the climax stage. There are five stages:

> *Early-Seral Stage* - The period from disturbance of a site to the time when vegetation crowns close and conifers or hardwoods dominate the site (approximately 0 to 20 years). This stage may be dominated by grasses and forbs or by sprouting brush or hardwoods. Conifers develop slowly at first and gradually replace grasses, forbs, or brush as the dominant vegetation. Forage may be present. Hiding or thermal cover may not be present except in rapidly sprouting brush communities.
>
> *Mid-Seral Stage* - The period from crown closure to the time when conifers would begin to die from competition (approximately age 20 to 40). Stands are dense and dominated by conifers, hardwoods, or dense brush. Grass, forbs, and herbaceous vegetation decrease. Hiding cover for big game is usually present.
>
> *Late-Seral Stage* - The period when conifers would begin to die from competition to the time when stand growth slows (approximately age 40 to 100). Forest stands are dominated by conifers or hardwoods. Canopy closure often approaches 100 percent. Stand diversity is minimal. Conifer mortality rates and snag formation are rapid. Big game hiding and thermal cover is present. Forage and understory vegetation is minimal except in understocked stands or in meadow inclusions.
>
> *Mature-Seral Stage* - This stage exists from the point where stand growth slows to the time when the forest develops structural diversity (approximately age 80 to 200). Conifer and hardwood growth gradually decline. Developmental change slows. Larger trees increase significantly in size. Stand diversity gradually increases. Big game hiding cover, thermal cover, and some forage are present. With slowing growth, insect damage increases and stand breakup may begin on drier sites. Understory development is significant in response to openings in the canopy created by disease, insects, and windthrow. Vertical diversity increases. Larger snags are formed.
>
> *Old-Growth* - This stage constitutes the potential plant community capable of existing on a site given the frequency of natural disturbance events. For forest communities, this stage exists from approximately age 200 until when stand

replacement occurs and secondary succession begins again.

Site Class - A measure of an area's relative capacity for producing timber or other vegetation.

Site Preparation - Any action taken in conjunction with a reforestation effort (natural or artificial) to create an environment that is favorable for survival of suitable trees during the first growing season. This environment can be created by altering ground cover, soil or microsite conditions using biological, mechanical, or manual clearing, prescribed burns, herbicides or a combination of methods.

Snag - Any standing dead, partially-dead, or defective tree at least 20 inches d.b.h. and at least 20 feet tall. A hard snag is composed primarily of sound wood, but not necessarily merchantable. A soft snag is composed primarily of wood in advanced stages of decay and deterioration and generally not merchantable. Snags have high value for wildlife.

Soil Compaction - An increase in bulk density (weight per unit volume) and a decrease in soil porosity (air spaces) resulting from applied loads, vibration, or pressure.

Soil Productivity - Capacity or suitability of a soil for establishment and growth of a specified crop or plant species.

Special Forest Products (SFP) - Firewood, shake bolts, mushrooms, ferns, floral greens, berries, mosses, bark, grasses, etc., that could be harvested in accordance with the objectives and guidelines in the RMP.

Stand Density - An expression of the number and size of trees on a forest site. May be expressed in terms of numbers of trees per acre, basal area, stand density index, or relative density index.

Stream Reach - An individual stream segment that has beginning and ending points at a stream confluence. Reach end points are normally designated where a tributary confluence changes the channel character or order. Although reaches identified by BLM are variable in length, they normally have a range of ½ to 1½ miles in length unless channel character, confluence distribution, or management considerations require variance.

Structural Diversity - Variety in a forest stand that results from layering or tiering of the canopy and the die-back, death and ultimate decay of trees. In aquatic habitats, the presence of a variety of structural features such as logs and boulders that create a variety of habitat.

Succession - A series of dynamic or gradual changes following disturbance by which one group of plants succeeds another through stages leading to the climax stage. The

developmental series of plant communities is called a sere and defined stages are called seral stages.

Survey and Manage Species - Species identified as being at risk from management activities which are not protected by special land allocations. Four Survey and Manage strategies are identified: Strategy 1: Manage known sites. Strategy 2: Survey prior to ground disturbing activities. Strategy 3: Extensive surveys required. Strategy 4: General regional surveys. For a list of S&M species see ROD page C49-61.

Thermal Cover - Cover used by animals to lessen the effects of weather.

Threatened and Endangered Species (T&E) - (*Threatened*) Any species defined through the Endangered Species Act as likely to become endangered within the foreseeable future throughout all or a significant portion of its range and published in the Federal Register. (*Endangered*) Any species defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range and published in the Federal Register.

Transient Snow Zone - An area in the landscape between the elevations of 3,500 feet and 4,500 feet where a mixture of rain and snowfall occurs. Rain-on-snow events occur in this area when a rain storm occurs on top of an existing snow pack. Such events can result in rapid increases to peak flows of streams.

Turbidity - A cloudy condition in water due to suspended silt or organic material.

Water Quality - The chemical, physical, and biological characteristics of water.

Wood Routing - Movement of CWD through the aquatic system.

Zone of Influence - Areas in the watershed that are routes of potential contamination to the groundwater by surface influences. These areas typically in conjunction with riparian reserves or where soil permeability is high.

Ginger Springs Bibliography

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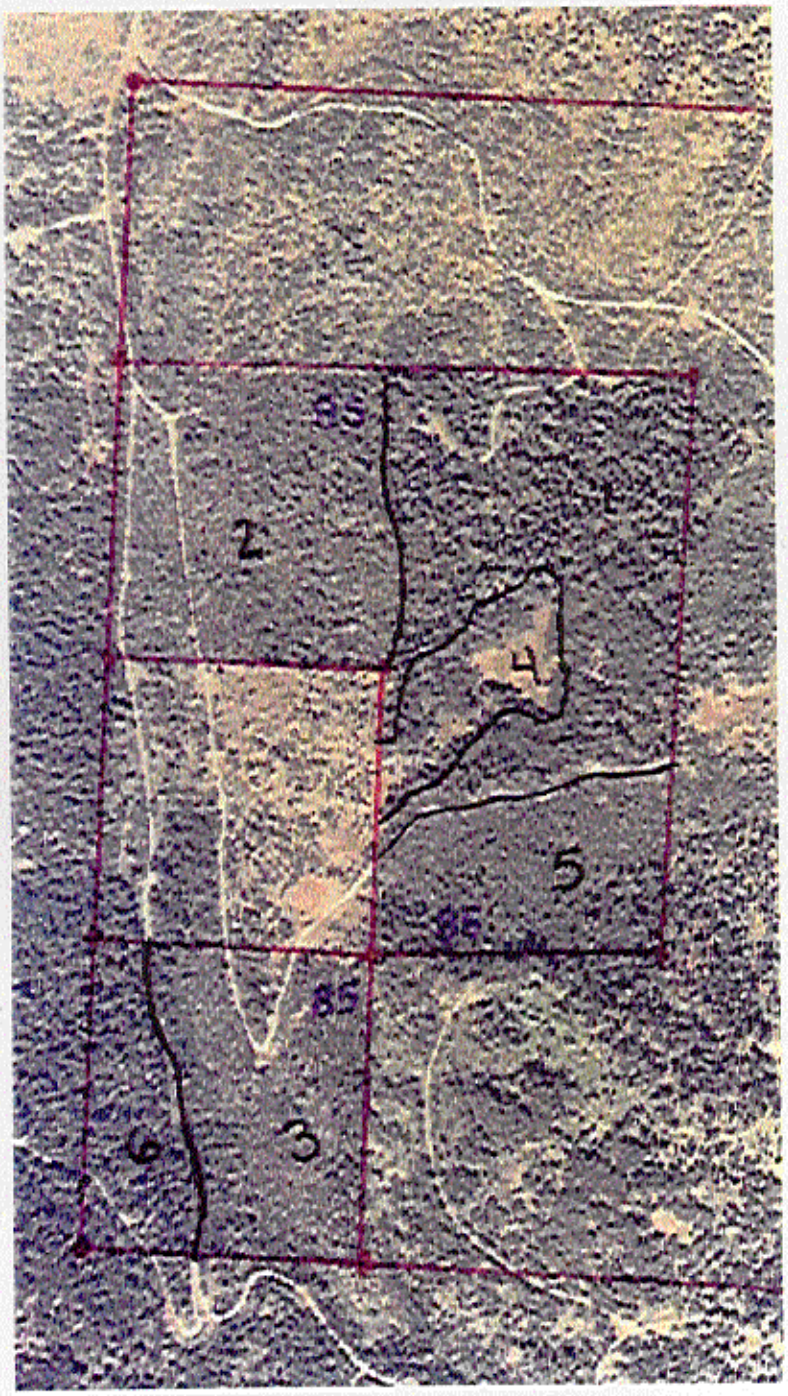
Ginger Springs Recharge Area
T35S, R2E, Sec 15, W1/2



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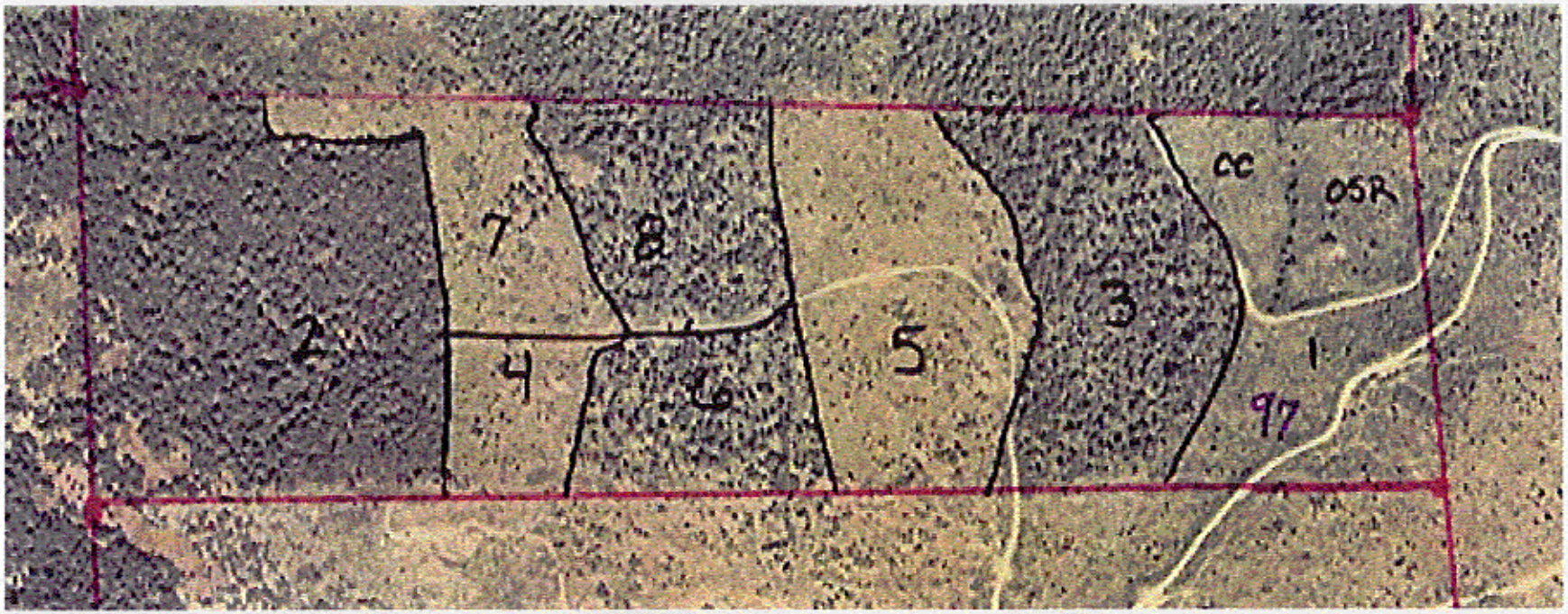

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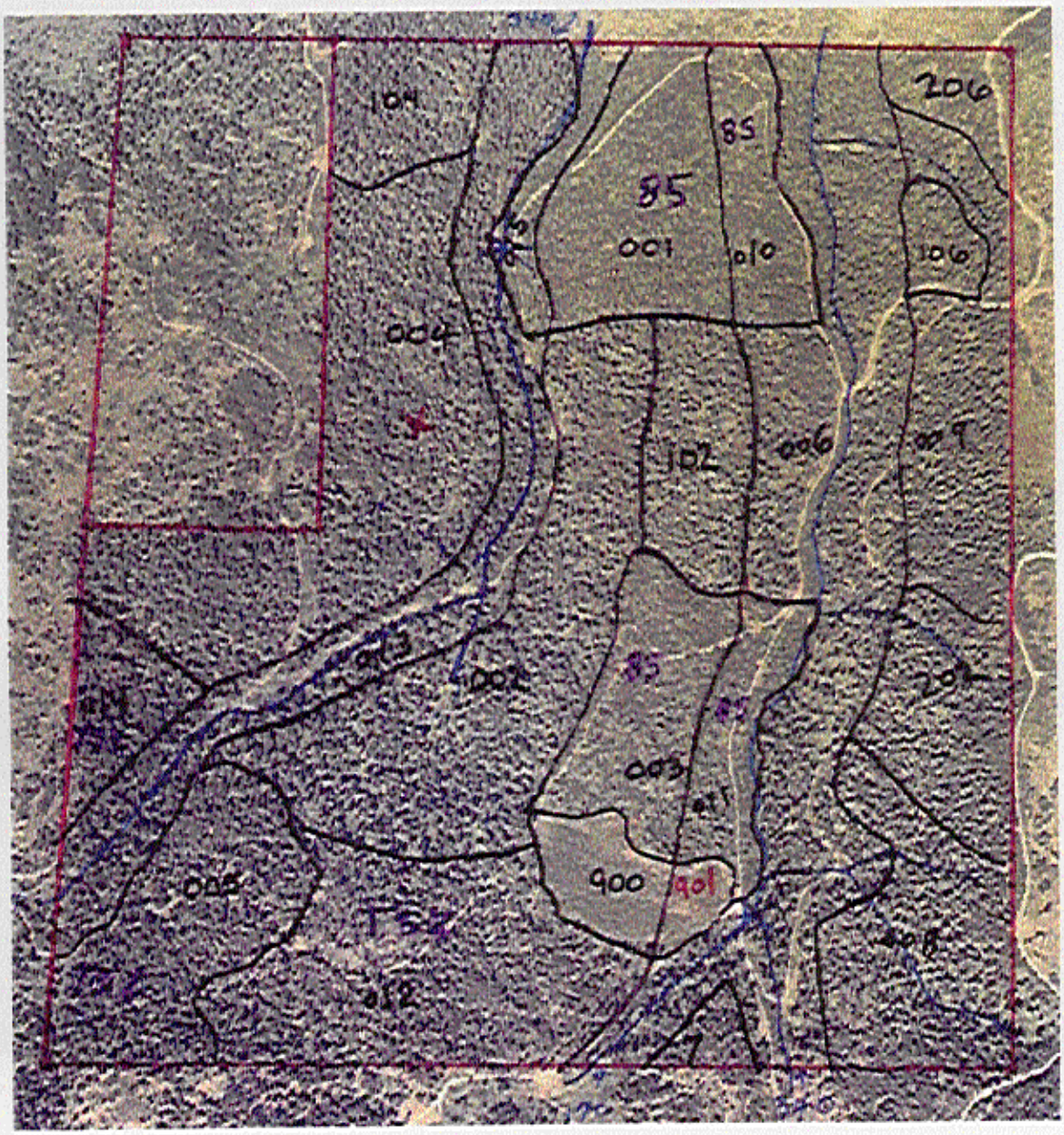

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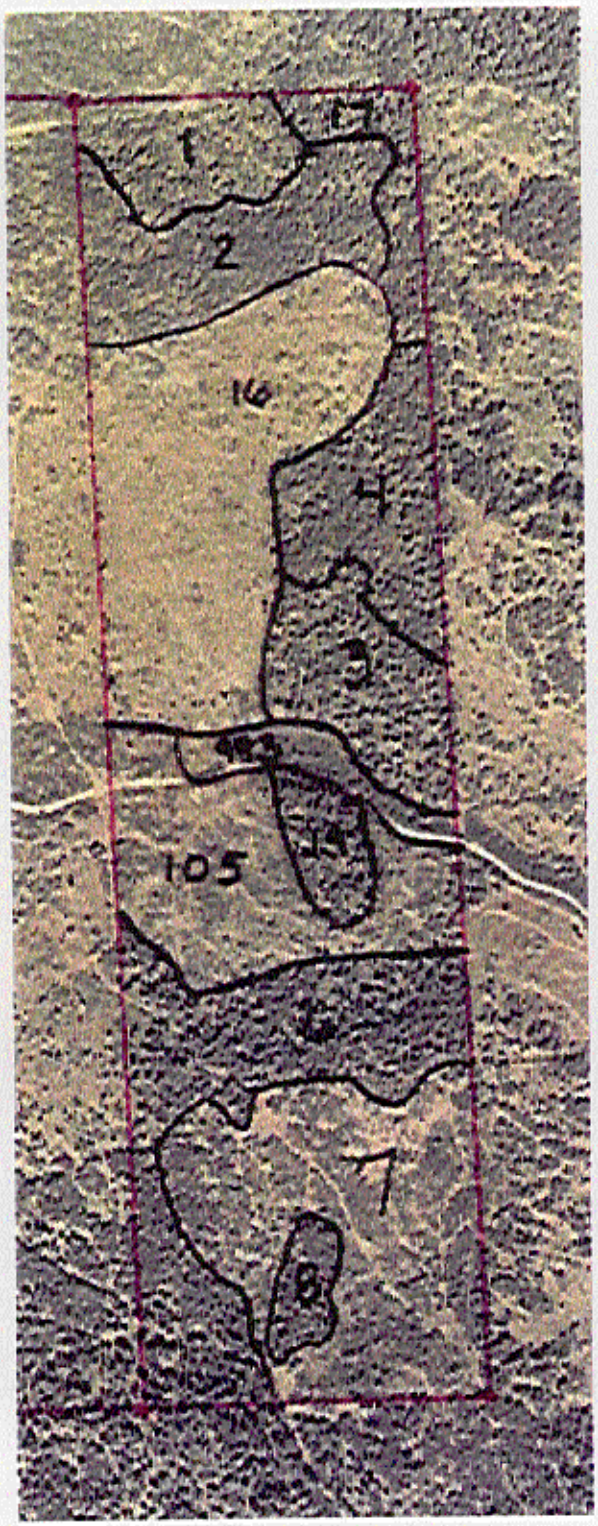
T35S, R2E, Sec 25

Ginger Springs Recharge Area
T35S, R2E, Sec 27, W1/2

Ginger Springs Recharge Area
T35S,R2E, Sec 27, E1/2E1/2



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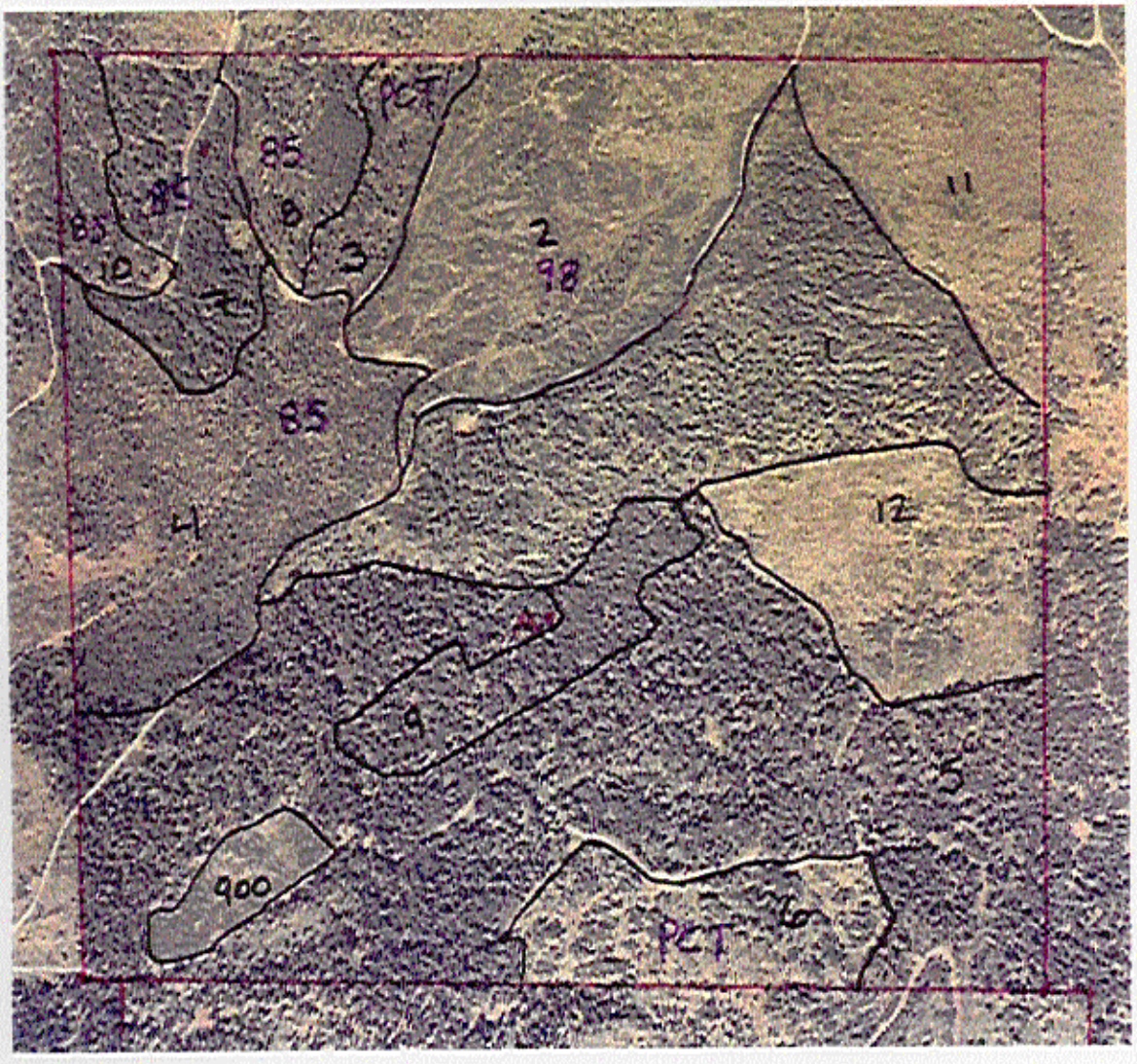

Ginger Springs Watershed Analysis and Management Plan

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