Williams Watershed Analysis

Grants Pass Resource Area
Medford District Office
Bureau of Land Management
U.S. Department of the Interior

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WILLIAMS WATERSHED ANALYSIS

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I. INTRODUCTION

Federal agencies are required to conduct watershed analyses to shift their focus from species and sites to the ecosystems that support them, in order to understand the consequences of management actions *before* implementation. The watershed scale was selected because every watershed is a well-defined land area having a set of unique features, a system of recurring processes, and a collection of dependent plants and animals. Watershed analysis is not a decision-making process but rather a stage-setting process. The result of a watershed analysis establishes the context for subsequent decision-making processes, including planning, project development, and regulatory compliance.

The watershed analysis process is a procedure used to characterize the human, aquatic, riparian, and terrestrial features, conditions, processes, and interactions (collectively referred to as "ecosystem elements") within a watershed. It provides a systematic way to understand and organize ecosystem information. A watershed analysis enhances the ability of federal agencies to estimate direct and cumulative effects of management activities and guide the general type, location, and sequence of appropriate management activities within a watershed. The watershed analysis process is also an interactive process that will incorporate new data and management strategies to reflect changing social issues. This process is conducted by an interdisciplinary group of resource specialists. Public involvement is encouraged in the form of a town meeting and by news letter releases and letters to the locals citizens of the watershed analysis unit (WAU).

The process for conducting an ecosystem analysis at a watershed scale involves six steps: 1) the watershed is characterized through the identification of its ecosystem elements; 2) key issues and questions are identified for the ecosystem elements and management objectives of the watershed; 3) the current condition of the watershed is described by answering the key questions and describing current distribution, range and condition of the relevant ecosystem elements; 4) describes the changes in ecological conditions over time as a result of human influence and/or natural disturbances; 5) compares the information accumulated in steps 3 and 4 to explain significant changes in ecological conditions and their probable causes. The capability of the system to achieve key management plan objectives is also evaluated; and 6) brings to conclusion the results of the previous steps, focusing on management recommendations that are responsive to watershed processes identified in the analysis. Data gaps and limitations of the analysis are also documented.

II. CHARACTERIZATION OF THE WATERSHED

The Williams WAU is located approximately 12 miles south of the community of Grants Pass and 20 miles west of the city of Medford in the southwest corner of Josephine County (Map 1). Elevations range from 1,200 feet near the Applegate River to 6,680 feet on the top of Sugarloaf Peak. Most areas fall within the 2,000-4,000 foot range.

OREGON

KLAMATH MOUNTAINS PROVINCE

WILLIAMS

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GENERAL LOCATION OF THE
KLAMATH MOUNTAINS PROVINCE
AND THE WILLIAMS WATERSHED

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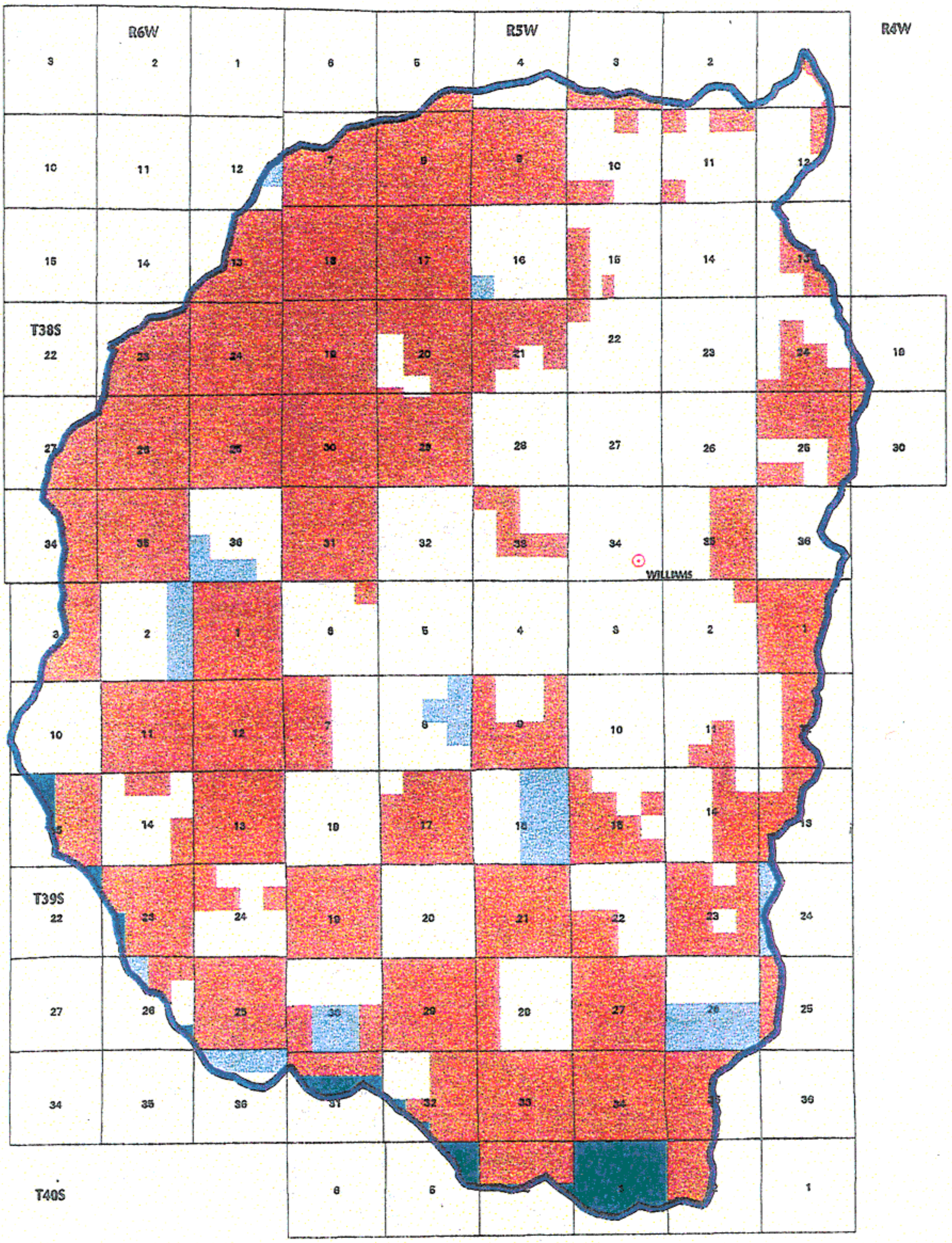

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GOVERNMENT OWNERSHIP
WILLIAMS WATERSHED

LEGEND

BLM
JOSEPHINE COUNTY
WATERSHED BOUNDARY
USFS
JACKSON COUNTY

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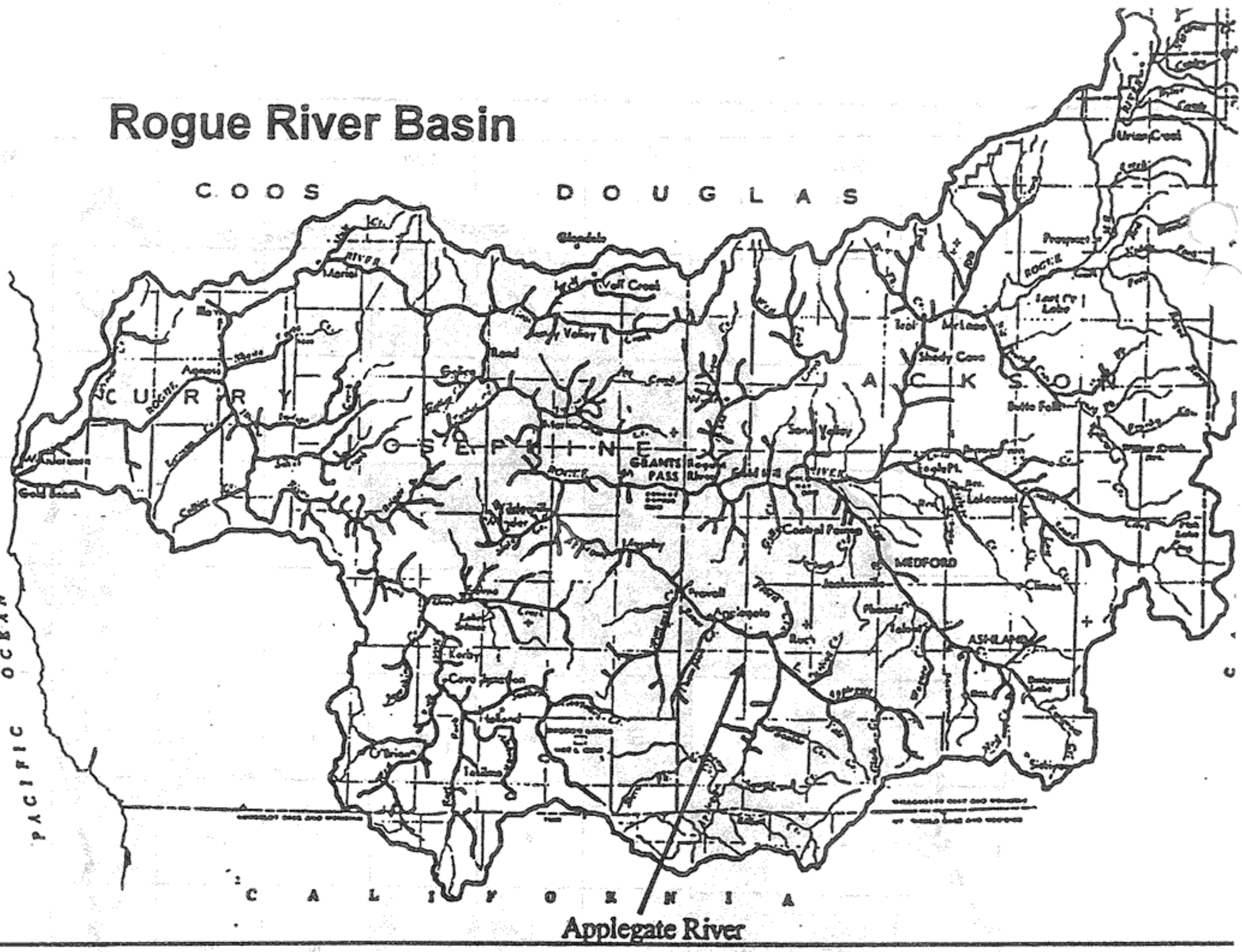
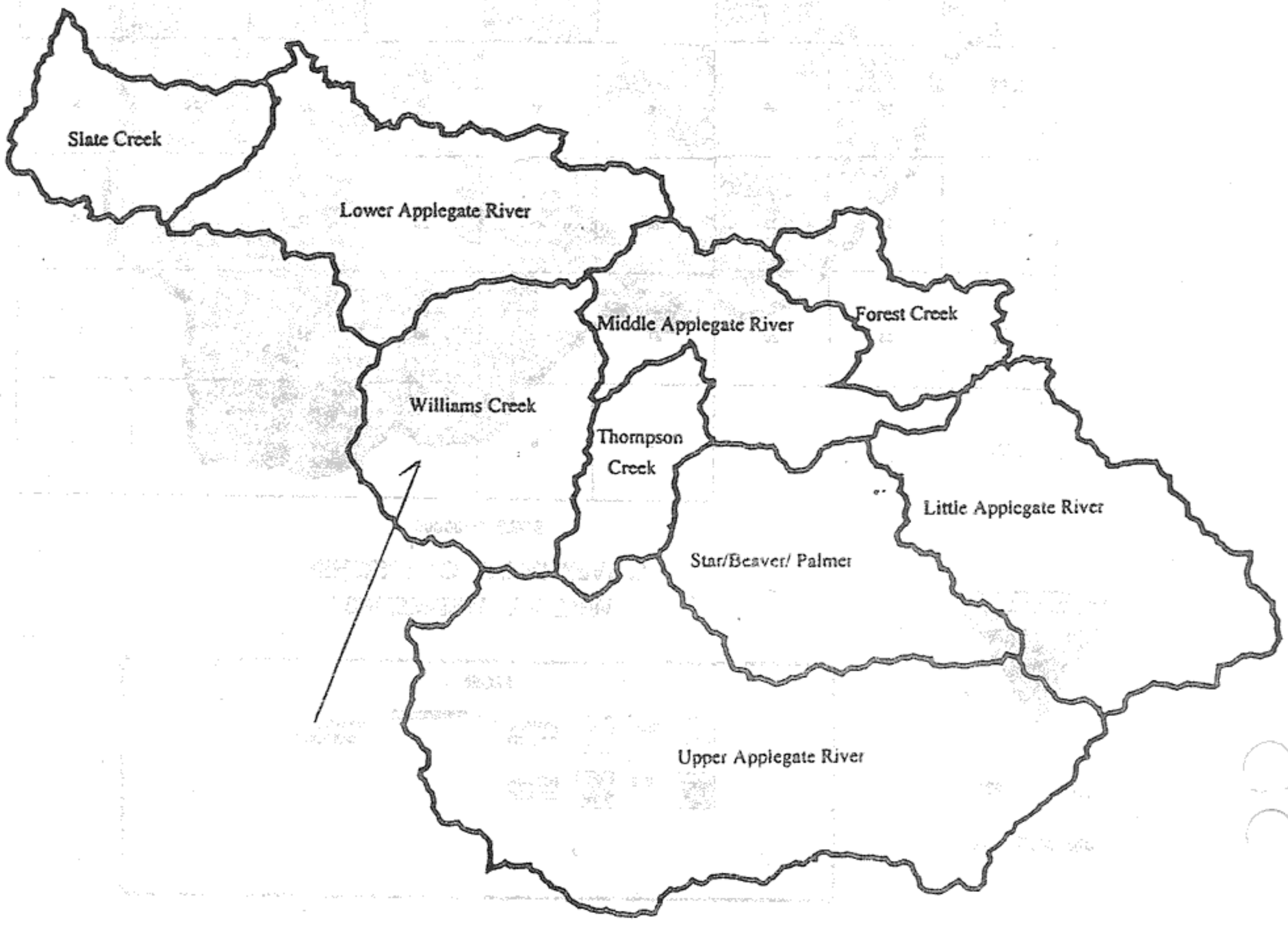
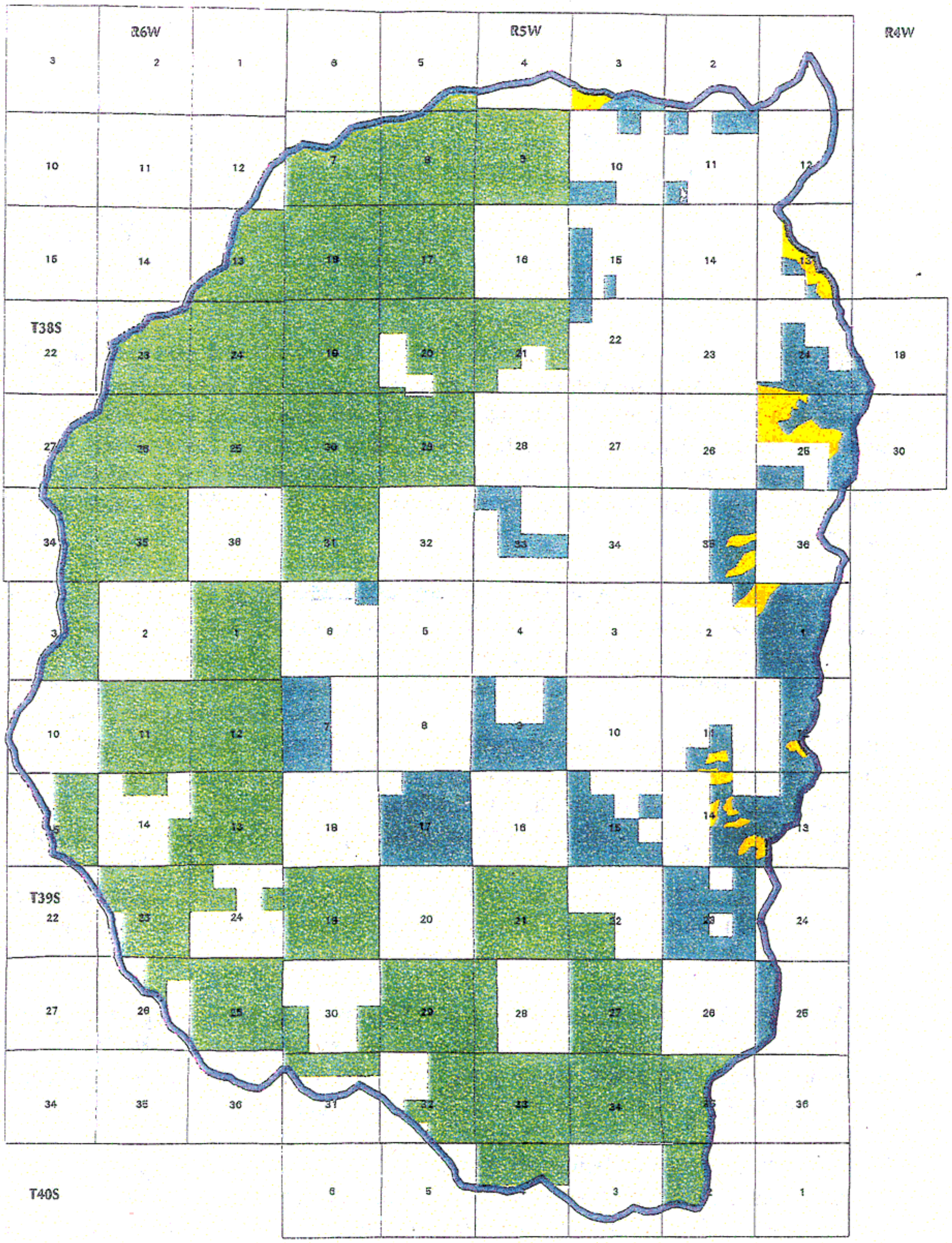
Rogue River Basin



Major Sub Watersheds of the Applegate River Watershed





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LAND-USE ALLOCATIONS
WILLIAMS WATERSHED

LEGEND

- LSR
- MATRIX NONVEG.
- MATRIX BASE
- PROVOLOT NURSERY
- MATRIX TPCC WITHDRAWN
- WATERSHED BOUNDARY

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Federal lands within the watershed (Map 2) are managed by the Grants Pass Resource Area, Medford District, Bureau of Land Management (BLM) and the U.S. Forest Service (USFS), i.e., the Applegate Ranger District of the Rogue River National Forest and the Illinois Valley Ranger District of the Siskiyou National Forest. There are approximately 51,971 acres within the WAU. The BLM administers 26,990 acres (52%) and the Forest Service administers approximately 819 acres (1.5%) of the WAU. The USFS portion is primarily located in the Sugarloaf Peak area and the Pipe Fork drainage.

Josephine County owns approximately 1,670 acres (3.2%) with the remaining 22,492 acres being privately owned by commercial timber companies and individuals. The ownership pattern is a modified checkerboard pattern with two large BLM managed blocks in the southeast the northwest corners of the WAU (Map 2). Most of the private lands are located along the mainstem and the East and West Forks of Williams Creek. The Williams WAU is unique in that it is the only tributary to the Applegate River which contains an established community.

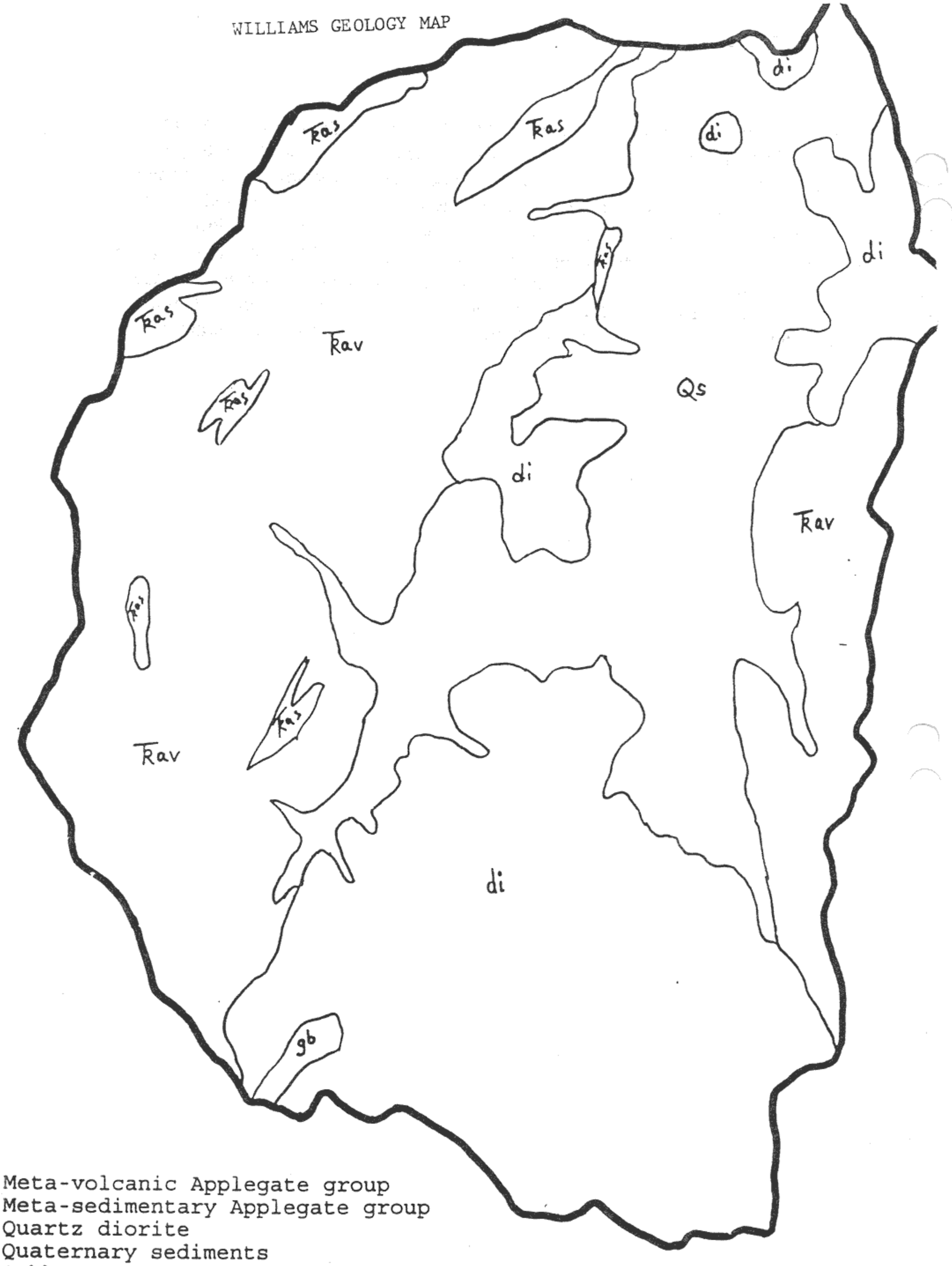
Land allocations in the WAU are designated in the Northwest Forest Plan's record of decision (ROD) and the Medford District Resource Management Plan (RMP). These land allocations include Adaptive Management Areas (AMAs), Late Successional Reserves (LSRs) (Map 3), Big Game Management Areas (BGMAs), Research Natural Areas (RNAs), Riparian Reserves, forest matrix, and 100-acre core areas for the northern spotted owl. The WAU also contains critical habitat for the northern spotted owl as designated by the Endangered Species Act (ESA). The Medford District RMP has designated Greyback Glades and Pipe Fork as RNA/ACEC (Area of Critical Environmental Concern). The RMP also designates the Williams WAU as an elk management area (equivalent in land area to BGMAs). The RNA/ACEC and BGMAs are double designation (or overlap) land allocations from the Northwest Forest Plan. They also overlap the spotted owl critical habitat designation under the ESA. Each classification is to be managed differently but all are essential components to the management of the Klamath Province ecosystem.

The Williams WAU is located within the Applegate River basin (Map 4) which is a tributary of the Rogue River. There are 13 primary drainages located in the WAU: Baltimore/China, Clapboard, Glade Fork, Lone Goodwin, Lower Williams, Pennington, Pipe Fork, Powell, Bill, Right Hand West Fork, Rock Creek, West Fork, and Williams.

The Klamath Province is delineated by the geology and vegetation types of southwest Oregon and northwest California (Map 1- shows only that portion of the Klamath Province located within Oregon.) The Williams Creek WAU currently makes up that portion of the Klamath Province in which an oceanic plate subducted along the continental margin. Most of the rock formations (Map 5) are interpreted to have been portions of an ophiolite suite (ancient sea floor rocks) or island-arc volcanic deposits. The structural pattern of the Klamath Mountains Province consists of four north-trending arcuate belts of rock which are convex to the west. The oldest belt (to the east) and the successively younger belts (to the west) are each bounded by east-dipping thrust faults along which older rocks have overridden younger rocks. The Williams Valley is primarily

made up of the Applegate geologic group and associated ultramafic rocks as well as younger intrusive rocks. The Applegate geologic group is mainly volcanic in origin and was apparently deposited in a submarine environment from the Western Paleozoic and Triassic Belt. All of the layered volcanic and sedimentary rocks in the watershed conform to the regional trend of the Klamath Mountains Province striking north to north-east and generally dipping steeply to the east. Most of these rocks are tightly folded with axial planes that also dip to the east. The Williams Valley was formed when easily erodible rocks, such as the granite pluton south of Williams, weathered into a relatively narrow valley with a few low rounded hills surrounded by steep mountainous terrain.

WILLIAMS GEOLOGY MAP



Trav -- Meta-volcanic Applegate group
Tras -- Meta-sedimentary Applegate group
di -- Quartz diorite
Qs -- Quaternary sediments
gb -- Gabbro

MAP 5

A. Erosion Processes

The dominant erosion processes are surface erosion and mass wasting. The majority of the eroded soils result from overland flows of water on the steep mountainous sideslopes of the watershed. Once the soil particles are detached they readily move downslope. This process is particularly apparent in previously managed areas such as clearcuts and along roads. This anthropogenic erosion increases dramatically following timber harvest and, except for areas of mass failures, returns to near preharvest levels within approximately eight years. Road prisms produce elevated amounts of eroded soil particles for decades and will never reach preconstruction levels as long as the road is used. Erosion from roads is important as most of these soil particles enter waterways and become sediments.

Mass wasting occurs at the higher elevation on the mountainous sideslopes at the south end of the Williams Watershed. Soils that were formed from highly weathered granite are particularly susceptible to slope failures. Although this phenomenon occurs naturally it is acerbated by management activities. The probability of mass wasting highly increases when roads cut through head walls of drainage patterns. These areas of mass wasting take decades for the degree of erosion to return to natural levels. Many times the soil mass continues to creep downslope for years before settling into a stable component of the topography.

B. Hydrology

The dominant hydrologic characteristics of the Williams Watershed consist of total discharge, low summer flows, peak flow events, and ground water recharge. Since the majority of the Williams Watershed is located within the transient snow zone elevation, rapid snow melt and/or rain on snow events occur frequently. Under these occurrences, total discharge becomes a problem. Although the past decade has been characterized by drought conditions, the winter of 1995 demonstrated a 5 to 10 year flood event in this watershed as a result of rain falling on a moderate snow pack. This peak flow event caused East and West forks of Williams creek to breach its channel depositing sediments into the narrow flood plains. On the other end of the hydrologic spectrum, summer low flows exist during years of below normal rainfall. This phenomenon has been prevalent during the 1980s and early 1990s. Water availability for beneficial uses is limited during the summer months as a result of the low pool to riffle ratio that occurs in most of the streams. Ground water discharge also occurs as a result of the snow pack slowly melting into the mountain soils as well as from water that infiltrates from the streams in the valley bottom. When rapid melting of the snow pack occurs, less water is available for ground water distribution. Stream length and pools have decreased as the creeks in the valley floor have straightened and loss sinuosity, thus, lessening avenues of ground water recharge.

C. Vegetation

The existing vegetative conditions across the landscape of the Williams Watershed are highly variable. This is the result of both natural and human influences.

The climate becomes much drier as one moves from west to east across the watershed, especially at the lower elevations. This is evident from the distribution of the major plant series within the watershed. The west side is dominated by highly productive plant series that require greater amounts of precipitation. The east side is an aggregation of more drought tolerant climax species. The northwest portion of the Williams Watershed is dominated by Douglas-fir series. In the southwest portions tanoak series and tanoak/Douglas-fir grouping predominate with white fir at the higher elevations along the perimeter of the watershed. The southern portion, primarily high elevation, is dominated by the White Fir series. The valley floor is primarily used for agriculture and grazing. These agricultural areas were originally covered with open pine stands and oak savannahs. There are still stands of pine in the northern most portion of the watershed and along the perimeter of the valley floor, although the density is much higher than it was at the turn of the century. The northwest boundary of the watershed is very dry in comparison to the other portions and is a mixture of white oak, chaparral, mixed pine, and some Douglas-fir. The riparian areas of this watershed contain Port-Orford cedar (POC), which has a very limited range in northwest California and southwest Oregon.

D. Stream Channel

The Williams Watershed consists of steep (45-70%) mountainous slopes surrounding a relatively flat valley bottom. This northerly oriented horseshoe shaped valley ranges in elevation from 1,200 to 6,680 feet above sea level. As a result of the steep sideslopes, water very efficiently drains to the valley floor. Most of the streams are Rosgen classification A3a+ which basically means they are steep, narrow, entrenched channels with predominantly cobble substrate. This is the result of rapid flowing water carrying away the gravel, sand, and clay components. At the toe slopes of the mountains where the stream gradient lowers, class B1 and B2 streams occur. In these areas the channel widens but maintains a moderate width/depth ratio. These channels are also moderately entrenched with stable banks. On the valley floor Williams Creek is classified as an F4 with a high width to depth ratio, low gradient, and a gravel substrate. Past land development of the valley floor has altered Williams Creek thus lowering the sinuosity and meander ratio.

E. Water Quality

Water flowing through the WAU is used for agriculture, domestic use, and as habitat by salmonoids, sculpins, amphibians, and invertebrates. The fishes, amphibians, and invertebrates, that are native to this watershed, require abundant cool, non-polluted water. The domestic and organic agriculture users require abundant non-polluted water, and the conventional agricultural users require abundant water. Non-polluted water is defined as water meeting or exceeding the State of Oregon water quality standards. Cool water is defined as water less than 60 degrees fahrenheit as this is optimal fish habitat. Abundant water would be defined as enough water to

provide for habitat, domestic use, and agricultural purposes.

F. Wildlife Species and Habitats

Wildlife habitats, like the vegetation of southwest Oregon, are extremely diverse. Habitat types vary greatly from the valley floor to the peaks of the Siskiyou Mountains. Terrain, climatic factors, and vegetation combine to create a wealth of wildlife habitats. The majority of the Williams Watershed is dominated by forests of conifers in various stages of stand development and a significant hardwood component. Habitats found on the valley floor include grasslands, oak savannahs, pine forest, chaparral, and riparian. The upland habitats, though dominated by coniferous forest, include meadows, riparian areas, chaparral, cedar swamps, alder thickets, and a variety of other unique areas. Historically, many of these habitats were created and maintained by disturbance events, particularly fire. Each plant community provides conditions that fulfill certain wildlife species needs. Wildlife require food, water, shelter, and space to breed and raise young during their lifetime. Some species are "specialists" and have adapted to a particular habitat, while others are "generalists" and utilize a great deal of different plant communities to fulfill their needs. The Williams Creek Watershed provides a variety of habitat that meets the needs for the diversity of wildlife.

The Williams Creek WAU contains a diverse array of wildlife. There at least 11 species of bats, 12 species of amphibians, 18 species of reptiles, hundreds of species of birds, and many thousands of species of insects. All but three indigenous mammals (grizzly bear, wolf, and wolverine) are thought to occur in the watershed.

Habitats that are an issue in the Williams WAU are late-successional coniferous forest, pine-oak savannah, and riparian habitats. All of the previously mentioned habitats have been impacted by human activity in this WAU. Late-successional habitat has been fragmented and total acres have been reduced. Overall, the total acres of pine-oak savannah have been reduced by conversion for agricultural purposes or by fire suppression, which has allowed Douglas-fir to invade those areas previously occupied by pine and oak. Habitats for special status terrestrial species, currently representing a small percentage of the WAU, are moderately to highly fragmented. Big game habitat effectiveness has been reduced by the high road density over much of the WAU.

1. Special Status Species

There are 54 potential sensitive species in the WAU (19 birds, 13 mammals, 7 amphibians, 5 reptiles, 8 insects, and 1 mollusk). The habitat requirements for these animals vary from species to species, however, the majority require undisturbed late-successional forest. Oak/savannahs and riparian habitat are the second and third most important habitat for sensitive species in the watershed. The northern spotted owl is the only listed species known to be present in the WAU. There are three other listed species which could occur in the WAU. Sixteen federal candidate species (both plants and animals) are known to occur in the WAU, as well as many others which are possibly present. In addition to the federally listed and candidate species, there are survey

and manage species designated in the Northwest Forest Plan ROD (Section C-49) which will be covered separately.

Table 1 lists the known and potential special status species found in the watershed, along with legal status and level of survey to date. This list includes species officially listed, proposed for listing, and candidate species being reviewed by the U.S. Fish and Wildlife Service.

Table 1
Special Status Species - Vertebrates

COMMON NAME	SCIENTIFIC NAME	PRESENCE	STATUS	SURVEY LEVEL
Gray wolf	Canis lupus	absent	FE,SE	none to date
White-footed vole	Aborimus albipes	unknown	FC,SP	none to date
California red tree vole	Aborimus pomo	suspected	FC	none to date
Fisher	Martes pennanti	suspected	FC,SC,AS	none to date
California wolverine	Gulo gulo luteus	historic	FC,ST	none to date
American marten	Martes americana	suspected	SC,AS	none to date
Ringtail	Bassacriscus astutus	suspected	SU	limited surveys done
Peregrine falcon	Falco peregrinus	unknown	FE,ST	none to date
Bald eagle	Haliaeetus leucocephalus	unknown	FT,ST	some surveys done
Northern spotted owl	Strix occidentlis	present	FT,ST	complete survey
Marbled murrelet	Brachyramphus marmoratus	unknown	FE,SC	some surveys done
Northern goshawk	Accipiter gentilis	present	FC,SC,AS	some surveys done
Mountain quail	Oreortyx pictus	present	FC	none to date
Pileated woodpecker	Dryocopus pileatus	present	SC,AS	none to date
Lewis' woodpecker	Melanerpes lewis	suspected	SC,AS	none to date
White-headed woodpecker	Picoides albolarvatus	suspected	SC,AS	none to date
Flammulated owl	Otus flammeolus	suspected	SC,AS	none to date
Purple martin	Progne subis	unknown	SC,AS	none to date
Great gray owl	Strix nebulosa	present	SV,AS	limited surveys done
Western bluebird	Sialia mexicana	present	SV,AS	none to date
Acorn woodpecker	Melanerpes formicivorus	present	SU	none to date
Tricolored blackbird	Agelaius tricolor	unknown	FC,SP	none to date
Black-backed woodpecker	Picoides arcticus	suspected		none to date
Northern pygmy owl	Glaucidium gnoma	present	SU	limited surveys done
Grasshopper sparrow	Ammodramus savannarum	unknown	S?	None to date

Table 1 Special Status Species - Vertebrates				
COMMON NAME	**SCIENTIFIC NAME**	**PRESENCE**	**STATUS**	**SURVEY LEVEL**
Bank swallow	Riparia riparia	migratory	SU	none to date
Townsend's big-eared bat	Plecotous townsendii	present	FC,SC	limited surveys done
Fringed myotis	Myotis thysanodes	present	FC,BS,SV	limited surveys done
Yuma myotis	Myotis yumanensis	present	FC	limited surveys done
Long-eared myotis	Myotis evotis	present	FC	limited surveys done
Hairy-winged myotis	Myotis volans	present	FC	limited surveys done
Pacific pallid bat	Antrozous pallidus	unknown	SC,AS	limited surveys done
Western pond turtle	Clemmys marmorata	present	FC,SC	limited surveys done
Del Norte salamander	Plethodon elongatus	present	FC,SV	limited surveys done
Siskiyou mountain salamander	Plethodon stormi	unknown	FC,SV	limited surveys done
Foothills yellow-legged frog	Rana boylii	present	FC,SU	limited surveys done
Red-legged frog	Rana aurora	unknown	FC,SU	none to date
Clouded salamander	Aneides ferreus	present	SC,AS	limited surveys done
Southern torrent salamander (variegated salamander)	Rhyacotriton variegatus	suspected	FC,SV	limited surveys done
Black salamander	Aneides flavipunctatus	present	SP,AS	limited surveys done
Sharptail snake	Contia tenuis	suspected	SC	none to date
California mountain kingsnake	Lampropeltis zonata	present	SP,AS	incidental sightings
Common kingsnake	Lampropeltis getulus	present	SP,AS	incidental sightings
Northern sagebrush lizard	Sceloporus graciosus	suspected	FC	incidental sightings
Tailed frog	Ascaphus truei	present	sv,as	incidental sightings

STATUS ABBREVIATIONS:

FE--Federal Endangered
FT--Federal Threatened
FP--Federal Proposed
FC--Federal Candidate
SE--State Endangered
ST--State Threatened
SC--ODFW Critical
SV--ODFW Vulnerable
SP--ODFW Peripheral or Naturally Rare
SU--ODFW Undetermined
BS--Bureau Sensitive
AS--Assessment Species (BLM)

* See Appendix ? for definitions.

2. Special Status Aquatic Species

Most BLM streams are located in narrow floodplains or canyons and are inhabited mostly by trout, steelhead, and a few coho salmon. Williams Creek has approximately 71 miles of stream habitat (Map 6) for salmonids which includes winter steelhead, coho, fall chinook salmon, and resident cutthroat trout. Miles of habitat is represented as follows: coho, 25 : chinook, 10;

steelhead, 34; and trout, 52. Nongame species utilizing stream habitat include speckled dace, pacific lamprey, sculpin, and redside shiners. Mungers Creek has the highest potential for anadromous fish production.

Coho salmon are considered at moderate risk of extinction. Coho salmon and steelhead are proposed as threatened or endangered in the Rogue River basin (Table 2). Coho salmon are considered by the Oregon Department of Fish and Wildlife as depressed in the Applegate River Basin.

Stream habitat in the WAU provides habitat for two species of anadromous fish stocks that are at risk. Currently these streams are below the optimum condition for anadromous fish.

Table 2
Special Status Aquatic Species Inhabiting the Williams Creek Watershed

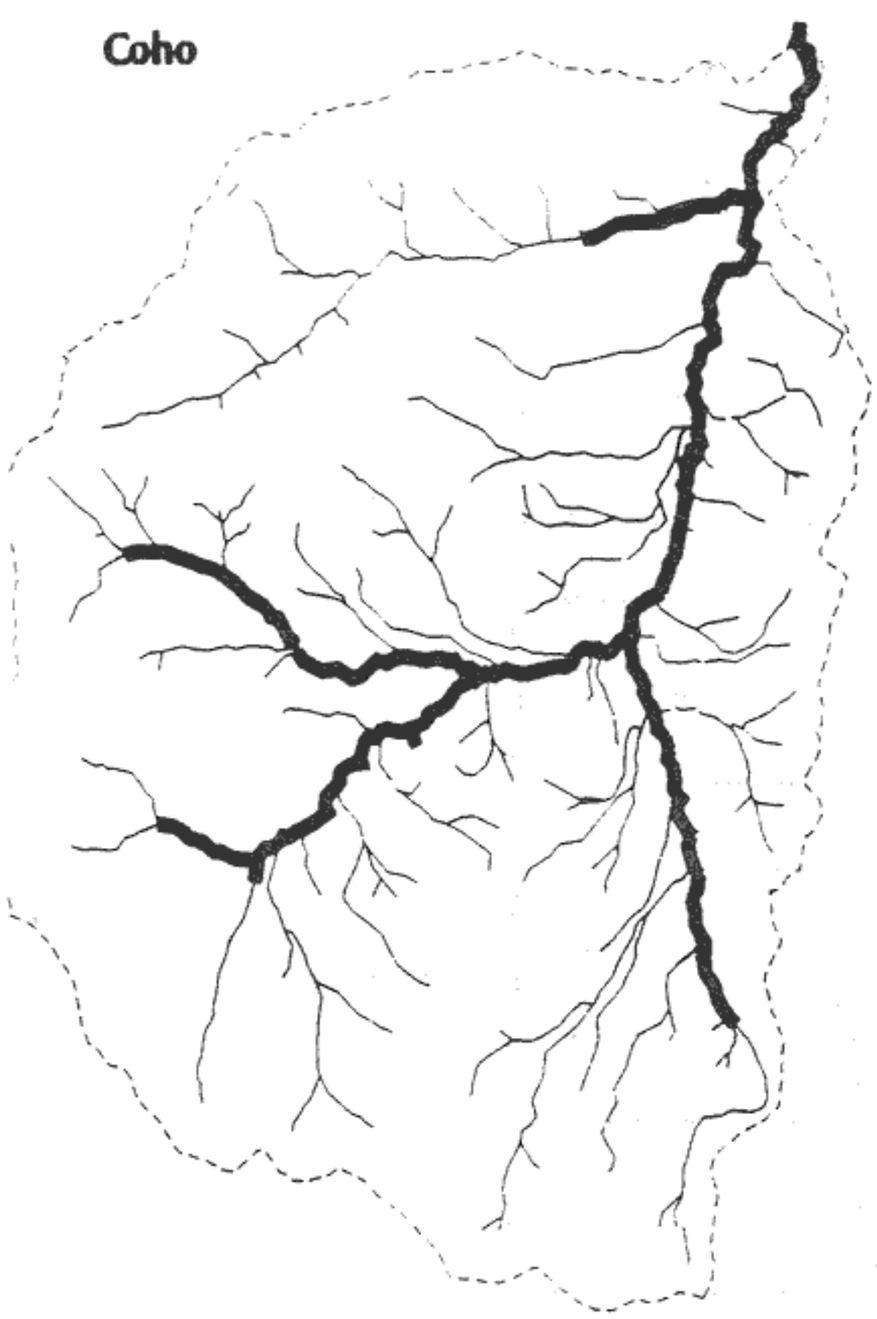
SPECIES	STATUS
Steelhead	• National Marine Fisheries Service proposes threatened status for wild steelhead in southern Oregon and northern California (3/12/95). • Summer steelhead: American Fisheries Society "at risk" (Nehlsen et al. 1990)
Coho salmon	• All coastal stocks have been petitioned for threatened or endangered status (federal) • American Fisheries Society "at risk" (Nehlsen et al. 1990) • State of Oregon sensitive (ODFW 1992)
Pacific lamprey	• Federal category 2 (USDI 1994)

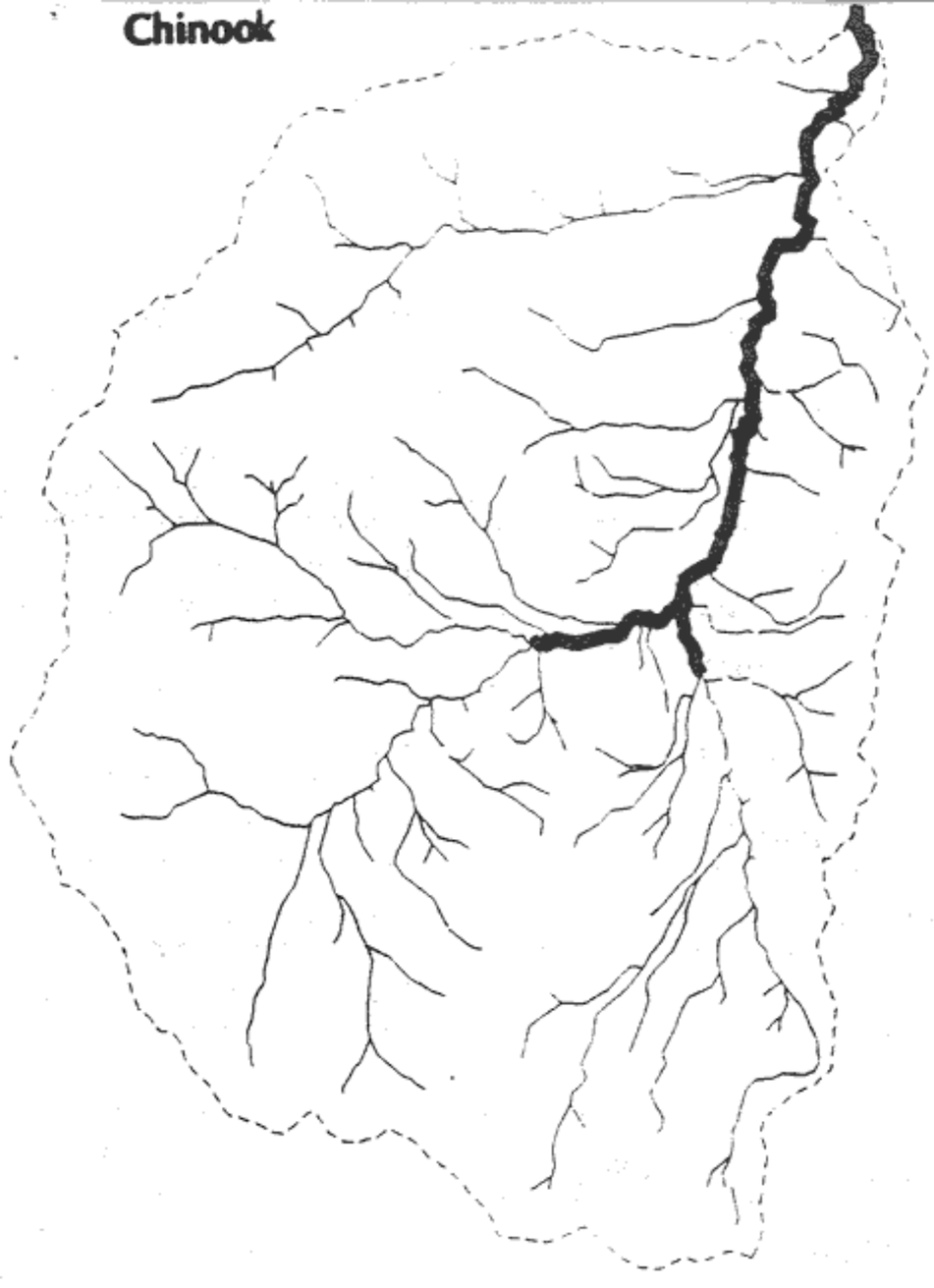
3. Special Status Invertebrate Species

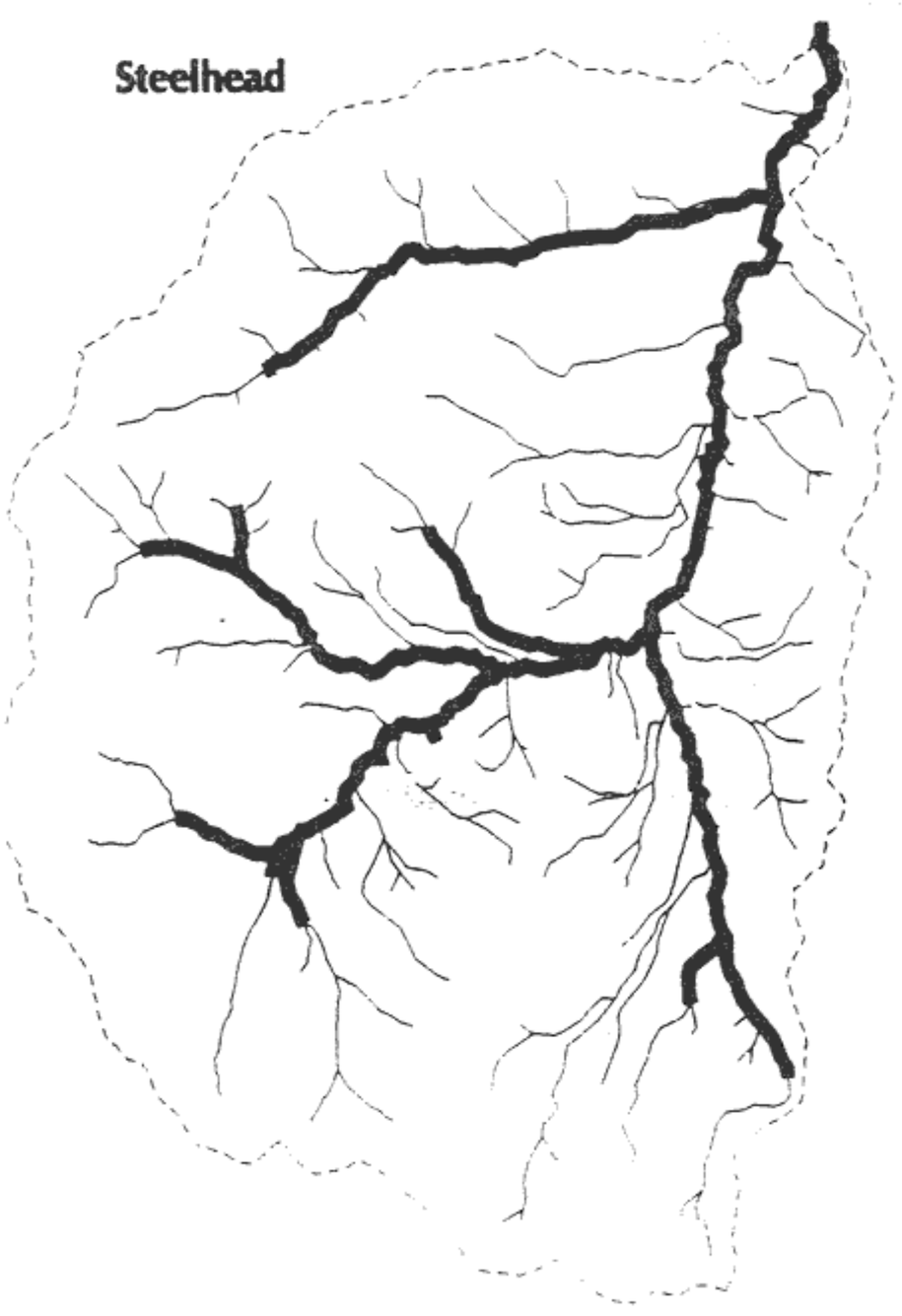
Table 3
Special Status Species - Invertabrates

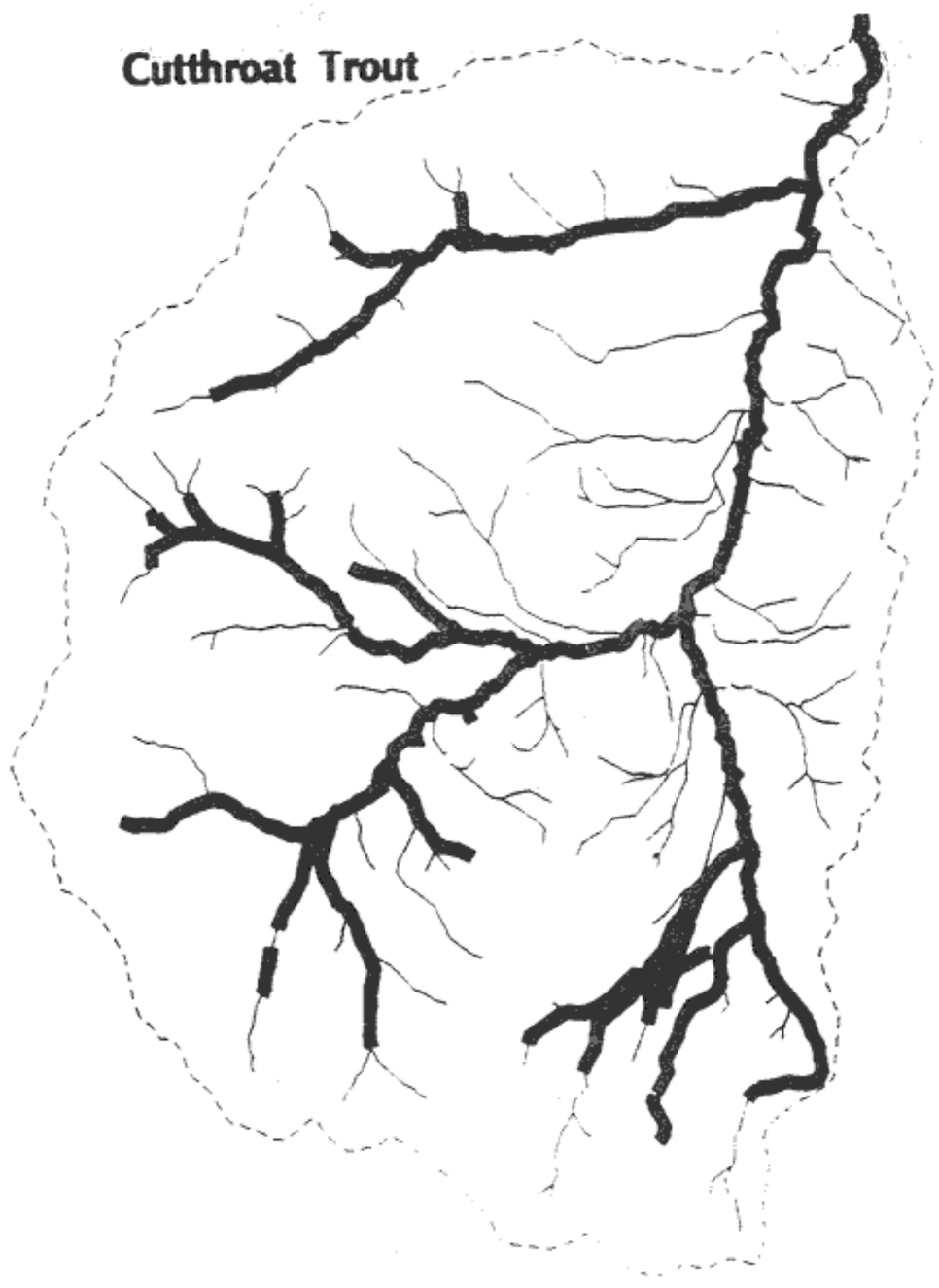
COMMON NAME	PRESENCE	STATUS	SURVEY LEVEL
Burnells' false water penny beetle	unknown	FC	none to date
Denning's agapetus caddisfly	unknown	FC	none to date
Green springs mountain farulan caddisfly	unknown	FC	none to date
Schuh's homoplectran caddisfly	unknown	FC	none to date
Obrien rhyacophilan caddisfly	unknown	FC	none to date
Siskiyou caddisfly	unknown	FC	none to date
Alsea ochrotichian micro caddisfly	unknown	FC	none to date
Franklin's bumblebee	unknown	FC	none to date
Oregon pearly mussel	unknown	FC	none to date

FC--Federal candidate
* See Appendix for definitions.









APPROXIMATE DISTRIBUTION OF

SALMONID FISHES

WILLIAMS WATERSHED BOUNDARY

DISTRIBUTION OF FISH

4. Survey and Manage Species - Wildlife

Table 4 presents the species that are to be protected through survey and management guidelines as outlined in the ROD for amendments to Forest Service and Bureau of Land Management planning documents within the range of the northern spotted owl. This table also describes the level of protection and the amount of surveys conducted to date. It is suspected that the current late successional reserve (LSR) network will not meet the needs of these species. Consequently, further restriction within matrix lands is necessary to ensure long-term viability of their populations. All known sites will receive some level of immediate protection. Surveys for new sites in proposed projects (that will be implemented in 1997 or later) must be conducted for red tree vole, Del Norte salamander and the five species of bats.

Table 4
Survey and Manage Species in the Williams Creek WAU and Level of Protection

SPECIES	PRESENCE	PROTECTION LEVEL
Siskiyou mountain salamander (Plethodon stormi)	Unknown	Manage known sites and survey prior to activities, within matrix land buffer length of 1 potential site tree or 100 feet.
Del Norte salamander (Plethodon elongatus)	Present	Manage known sites and survey prior to activities, within matrix land buffer length of 1 potential site tree or 100 feet.
White-headed woodpecker (Picoides albolarvatus)	Suspected	On Matrix land no cutting snags 20" DBH or over. Maintain green trees to provide for 100% population potential
Black-backed woodpecker (Picoides pubescence)	Unknown	On Matrix land no cutting snags 20" DBH or over. Maintain green trees to provide for 100% population potential
Flammulated owl (Otus flammeolus)	Unknown	On Matrix land no cutting snags 20" DBH or over. Maintain green trees to provide for 100% population potential
Great gray owl (Strix nebulosa)	Present	1/4 mile protection zone around nest sites, survey prior to activities, 300 foot buffers of meadow and natural openings.
Fringed myotis (Myotis thysanodes)	Present	Manage known sites and survey prior to activities
Silver-haired bat (Lasionycteris noctivagans)	Present	Manage known sites and survey prior to activities
Long-eared myotis (Myotis evotis)	Present	Manage known sites and survey prior to activities
Long-legged myotis (Myotis volans)	Present	Manage known sites and survey prior to activities
Pallid bat (Antrozous pallidus)	Suspected	Manage known sites and survey prior to activities
Red tree vole (Aborimus pomo)	Suspected	Manage known sites and survey prior to activities

5. Neotropical Migratory Birds

Neotropical migrants are species of birds that winter south of the Tropic of Cancer and breed in North America. More than twenty years of breeding bird surveys (BBS), breeding bird censuses (BBC), winter bird population studies, and Christmas bird counts indicate that many species of birds are experiencing a precipitous population decline. This is particularly true for birds that utilize mature and old-growth forest either in the tropics, in North America, or both (DeSante & Burton, 1994). Rates of declines are well documented for birds on the east coast of North

America and less so on the west coast. In 1992 the Bureau of Land Management signed a multi-agency agreement called "Partners in Flight." The purpose of this program is to establish a long-term monitoring effort to gather demographic information and, in addition, to try and determine to what extent deforestation and forest fragmentation on the temperate breeding grounds, versus that on the tropical wintering grounds, is causing the decline in populations.

The Williams Creek Watershed contains a number of neotropical migrants that utilize various habitats. Studies conducted on the Medford district have found that neotropical migrants comprise between 42 and 47 percent of the breeding species at lower elevation forest dominated by Douglas-fir (Janes, 1993). In higher elevation forests, dominated by White fir, neotropical migrants are less abundant contributing to a smaller portion of the bird species present. Table 5 lists the known and suspected neotropical migrant bird species found in the watershed including the habitat utilized and national population trends. Habitats of particular concern are valley brushfields, old-growth, riparian, and oak woodland communities. When reviewing habitat types, it is important to keep in mind that most neotropical migrants will often utilize more than one habitat type during the breeding season. Overall, 46 percent of these birds are habitat generalists using 4 or more habitat types, while 34 percent are habitat specialists utilizing 1 or 2 habitats. In old-growth habitat west of the Cascades, 2 of 32 species of neotropical migrants are known habitat specialists.

Table 5 - Neotropical Migratory Birds

COMMON NAME	PRESENCE	TREND*
Green-winged teal	suspected	insufficient data
Sora	unknown	insufficient data
Turkey vulture	present	decline
Osprey	present	stable or increasing
Flammulated owl	unknown	insufficient data
Common nighthawk	present	insufficient data
Rufous hummingbird	present	decline
Calliope hummingbird	suspected	insufficient data
Western kingbird	present	insufficient data
Ash-throated flycatcher	present	insufficient data
Western wood-pewee	unknown	decline
Olive-sided flycatcher	present	decline
Hammond's flycatcher	suspected	insufficient data
Dusky flycatcher	suspected	insufficient data

Table 5 - Neotropical Migratory Birds		
COMMON NAME	**PRESENCE**	**TREND***
Pacific-slope flycatcher	present	insufficient data
Vaux's swift	present	decline
Tree swallow	present	insufficient data
Northern rough-winged swallow	suspected	insufficient data
violet-green swallow	suspected	decline
Cliff swallow	suspected	insufficient data
Barn swallow	suspected	decline
House wren	present	insufficient data
Blue-gray gnatcatcher	unknown	insufficient data
Swainson's thrush	present	decline
Solitary vireo	present	insufficient data
Warbling vireo	present	insufficient data
Townsend's warbler	unknown	insufficient data
Hermit warbler	present	insufficient data
Black-throated gray warbler	present	insufficient data
Nashville warbler	present	insufficient data
Macgillivray's warbler	present	insufficient data
Yellow warbler	suspected	insufficient data
Orange-crowned warbler	suspected	decline
Common yellowthroat	suspected	stable/increase
Yellow-breasted chat	present	insufficient data
Wilson's warbler	present	decline
Brownheaded cowbird	present	decline
Northern oriole	present	decline
Western tanager	present	decline
Chipping sparrow	suspected	decline
Green-tailed towhee	suspected	stable/increase
Black-headed grosbeak	present	stable/increase
Lazuli bunting	present	insufficient data

* Based on information from partners in flight in Oregon and might not necessary represent nationwide figures.
** Known habitat specialist

6. Game Species

The species of game animals located within the Williams Creek Watershed are elk, black-tailed deer, black bear, mountain lion, wild turkey, ruffed grouse, blue grouse, western grey squirrel, mountain and valley quail. The Williams Creek Watershed is located in the Applegate Big Game Management Unit. The management of game species is the responsibility of the Oregon Department of Fish and Wildlife (ODFW). The entire watershed is open to hunting during the appropriate season for game species. Information from the ODFW regarding present trends of game animals indicate that black-tailed deer populations are overall stable and meet department goals in this watershed. Elk are present in small remnant populations and there are no departmental plans to increase their numbers due to lack of public winter range. Projected trends for elk in the watershed are for a slow population increase.

Black bear populations are extremely hard to monitor due to their secretive nature. Populations for the watershed appear to be stable. Cougar sightings in the watershed have increased with the overall population on the rise.

In general, all of these game species are habitat generalists that benefit from edge habitats. Past land management practices, both on private and federal lands, have increased the overall amount of forest edge within the watershed. In addition the numbers of roads has also increased which, in turn impacts, the suitability of all habitat types. High road densities have been shown to have negative effects on deer and elk populations. One of these effects is increased poaching opportunities. Local citizens groups have expressed concern over the increased level of poaching they have seen, especially for black bears. For this and other species their numbers could be expected to increase with a reduction in road density.

7. Non-native Species

A number of non-native species have become established in the watershed. Introduced exotic species compete with native animal species for food, water, shelter and space. Bullfrogs (Rana catesbeiana) directly compete with native frogs and also consume young western pond turtles (Clemmys marmorata). Opossums (Dedelphis virginiana) have similar niches with our native striped skunk (Mephitis mephitis) and raccoon (Procoyon lotor). They also consume young birds, amphibians, and reptiles. Other introduced species include European starlings (Sturnus vulgaris), ring-necked pheasants (Phasianus colchicus), and turkeys (Meleagris gallopavo). All of these species have some negative impacts on native flora and fauna.

G. Plant Species and Habitats

1. Special Status Plant Species

The responsibilities of the Medford District botanical program include the active management and protection of special status and survey and manage species, special areas, and native plants,

as well as each of their habitats. Vegetation within the Medford District, especially the Grants Pass Resource Area, represent some of the highest ecological diversity in the United States. The protection of this diversity is a high priority in all watersheds.

Only a small portion in the southwest part of the Williams Watershed has had significant surveys completed for special status plants and these surveys were in conjunction with timber sales. Eight special status plant species (Table 6) have been located and of these two are federal candidates, three are survey and manage species (one plant is both a federal candidate and a survey and manage species), one is a Bureau assessment species, three are Bureau tracking species, and one is a yet-to-be-categorized species originally thought to be extinct in the area.

The objectives for management of special status plants and their habitats, as described in the Draft Medford District Botany 2000, are listed in Appendix 2.

Table 6 - Special Status Plant Species		
SPECIES NAME	**SPECIES STATUS**	**HABITAT**
Cypripedium fasciculatum	SM/FC2	moist to dry mixed evergreen with filtered sun
Cypripedium montanum	SM/BT	moist to dry mixed evergreen with filtered sun
Allotropa virgata	SM	dry mixed evergreen
Sedum radiatum ssp.depauperatum	FC2	dry, rocky outcrops
Hieracium bolanderi	BA	open, gravelly, serpentine soils
Mimulus douglasii	BT	open, gravelly, sometimes serpentine
Linanthes bolanderi	BT	dry woodlands, chaparrel
Lonicera interrupta	BT	dry slopes,ridges mixed evergreen

FC = Federal candidate,
SM = Survey and manage as designated in the SEIS ROD
BA = Bureau assessment
BT = Bureau tracking

All the species listed above (with the exception of survey and manage species which will be discussed in the next section) were not found in abundance in any areas surveyed. These species tend to be distributed in the drier, rockier portions of the watershed. For example, the primary habitat of Sedum radiatum ssp. depauperatum, Hieracium bolanderi and Mimulus douglasii, are rocky outcrops and/or dry, rocky areas. The latter two are found, in particular, where serpentine influenced soils exist in a small portion of the watershed near Mungers Butte. The abundance of these species may be much more extensive, but the amount of habitat surveyed has been minimal since it is not associated with productive timber areas.

Required actions must take place for special status species by protection category as directed by the Oregon and Washington BLM state offices (memorandum 11/90). All special status species require environmental clearances before projects begin (except for Bureau Tracking species). Federally listed, proposed, or candidate species, and Bureau sensitive species require protection and/or mitigation of impacts. Federally listed species require formal consultation with the U.S. Fish and Wildlife Service (USFWS) if proposed actions "may adversely effect" those species or their habitats. Proposed to be listed species require an informal conference with USFWS. The USFWS recommends that technical assistance requests be made on proposed actions affecting federal candidate species. This would be necessary, therefore, for Sedum radiatum ssp. depauperatum and any other federal candidates found in the future.

BLM has assigned special status to eighteen liverwort species, seventeen moss species, and twenty lichen species. No inventory or survey work has been initiated on these species in project areas basically due to lack of expertise for nonvascular plants. Some of these species will be inventoried as part of the survey and management protocol recommended in the supplemental environmental impact statement (SEIS) ROD.

2. Survey and Manage Species - Plants

Cypripedium fasciculatum, Cypripedium montanum and Allotropa virgata (clustered ladyslipper, mountain ladyslipper and candystick, respectively) are all listed survey and manage species in the SEIS ROD. These species are associated with old growth habitats and exhibit slow establishment and growth rates. The species tend to be found in small, scattered populations over a broad range of forest habitats (candystick is primarily in drier forest habitats). The species are also dependent upon mycorrhizal relationships for their existence. The species are very long-lived and a single plant may take years (as many as 20 years for C. fasciculatum) before flowering occurs or before emergence. Both ladyslippers require canopy cover of at least 60 percent. For the candystick, more emphasis needs to be placed on reducing mechanical disturbance and ensuring downed, woody material remains in population areas. All three species are thought to benefit from fire which reduces herbaceous layer competition. Research into fire's role and the use of prescribed burning in improving habitat were encouraged in the SEIS.

The abundance and distribution of Allotropa virgata is not clear in the Williams Watershed. Before it was listed as a survey and manage species, the plant was not designated with any special protection status. Therefore, the plant was not actively sought out during plant surveys. The populations that have been found in the watershed are located in dry, Douglas-fir plant series in the western portion of the watershed. Only four populations have been found but this is most likely due to the lack of surveys completed.

The distribution of Cypripedium fasciculatum and C. montanum appears to be mostly in the eastern portion of the watershed. Both species are located in Douglas-fir plant series with mature and large pole condition classes, primarily on northerly facing aspects, where surveys have been completed. It is important to note, however, that only a very small portion of this habitat has been surveyed for these species. C. fasciculatum is the most abundant of these species with 16 populations known in the watershed. These populations are not very extensive consisting of ten plants or less.

3. Additional Survey and Manage Species

In addition to those species listed in the previous tables, the Northwest Forest Plan ROD tables on page C-49, list 234 species of fungi, 81 species of lichens, 23 species of bryophytes, and 41 species of mollusks. Very little data is available on these species, even basic data such a physical descriptions, known range, or habitat requirements are not available. An interagency committee is currently gathering all available data into a central location so it will be more accessible. As a

result of the lack of knowledge about these species it is unknown if they occur or even have the potential to occur in the WAU.

H. Human Uses

1. Human Values

The Williams WAU is a primary base for the rural community of Williams and as a rural residential area. A diverse group of people make their homes in the Williams Valley. Conflicting views and values are often an issue in the Williams WAU. Many of the people who live in the valley do so for the quality of life that it offers. Some of the values that contribute to the quality of life are the visual aspects, the natural and, to some, the religious qualities of the land, and the native wildlife and their habitats.

2. Commodity Extraction

Commodity extraction usually takes the form of logging or special forest products but does include some sporadic mining. Approximately 439 miles of road (including both private and public roads) have been constructed to allow access for this commodity extraction.

3. Agriculture

Agricultural practices in the valley bottom lands include cattle and other exotic species ranching, dairy farming, row crop farming, and nurseries. Several of the nurseries and farms in the valley are organic operations which require water free from pesticides and herbicides.

4. Fire

In its historical or natural role, fire is a necessary component to preserve the natural habitats of vegetation, wildlife, and fisheries. As a result of fire suppression and past vegetative management practices, wildfire has become a very destructive force in the Klamath Province. Lightning occurrence data for 1985 to 1993 shows there has been 205 lightning strikes within the watershed boundary and 127 others within a mile of the boundary. Location is nearly uniform, with the possible exception of the valley floor areas which experience slightly fewer occurrences. Lightning-started fires are possible at any location throughout the watershed. Large fire potential exists throughout the watershed due to the buildup of fuels (both live and dead), overstocking of conifers and hardwoods, and the presence of less fire resistant species which have invaded in the absence of fire occurrence.

The majority of the fires have occurred in the more densely populated areas of the watershed.

Lightning has caused 78 (41%) of those fires. The remaining 114 fires (59%) are human caused. Fires have been kept small since 1967 with only six fires over 10 acres. The human-caused fire occurrence in the watershed generally occurred on private lands at low elevations or on BLM lands due to burning.

The intensity of presettlement fires encompassed a wide range of fire severity with many fires, or large portions of fires, burning at low to moderate severity. The postsettlement period of the 1870-1930 appears to indicate an increase in fire severity (as evidenced by stand age). Since the advent of successful fire exclusion through suppression, fires on any large scale have been lacking in the watershed. This would indicate that future fires have a greater potential to become high severity fire events. High hazard areas constitute 28 percent of the total watershed with 51 percent being on BLM lands. High hazard areas are distributed throughout the watershed and many of these areas are on or adjacent to BLM land in the rural interface area and within residential zones. Thirty-nine percent of the watershed is classified as LOW hazard. Of this 39 percent, 13 percent (6,764 acres) is grasslands and agricultural land, leaving only 26 percent of the WAU in LOW hazard areas. Field work is needed to refine this classification in order to pin point the potential problem areas.

III. ISSUES AND KEY QUESTIONS

A. Key Issues

1. Vegetation

As a result of human activities, the existing vegetation in the WAU has been changed drastically from the range of naturally occurring conditions. Issues directly tied to vegetation in its current condition are:

(a) High fire hazard due to heavy fuel loadings.
(b) Fragmented wildlife habitat created by logging.
(c) The loss of wildlife habitats that are maintained by the occurrence of frequent low intensity fires.
(d) Forest health.

2. Water Quality

Hydrologic processes have been altered in the Williams WAU due to highly erosive soils, high road density, and a high percentage of the area in clearcut-equivalent acres. All of these factors are major contributors to reduced water quality in the WAU. Soil erosion is occurring in several sub-watersheds. Water temperature, sedimentation, and nutrient loading have increased in the mainstem and tributaries of Williams Creek due to agriculture, domestic water use, and timber management. Water recharge areas have been changed by road construction which disturbs

subsurface water flows and surface drainage patterns. The above changes have resulted in increased peak flows and reduced summer minimum flows.

3. Species and Habitats

There are a large number of sensitive species that inhabit the Williams WAU. The majority of these species are listed as sensitive as a result of habitat removal and/or degradation (fragmentation, etc). Under the current forest plan, many of these species that are dependent on late-successional forest or healthy riparian vegetation, will experience an increase in both habitat quantity and quality. Continued existence of sensitive species in the Williams WAU is dependent on maintenance and improvement of the habitats required by those species.

4. Human Use

Human use in the Williams WAU includes agriculture, commodity extraction, mining, and a rural community, with its associated rural housing. Commodity extraction often conflicts with the values of the many of the people living in Williams WAU. Values which are important to the people living in the valley include but are not limited to:

(1) Visuals- including vistas from homes, major roads, trails, and stands of old-growth and mature forest.
(2) Religious sites- currently only one of these sites is known and is located in T. 38 S., R. 6 W., section 14, above the East Fork of Williams Creek.
(3) Quality of life- as it's associated with living in a small community and rural setting.
(4) Wildlife species and their habitats.

Commodity extraction is another major human use in the WAU. Often the commodities are removed by businesses that are not located within the WAU and the resources are shipped out of the WAU for processing and sale. As a result, any jobs created through processing WAU commodities are not available to area residents.

Commodity or resource extraction include:

(1) logging,
(2) mining,
(3) special forest products, and
(4) illegal activities, such as poaching, which remove an unknown amount of resources.

Land use allocations in the WAU will dictate much of the direction that management will take now and in the future. Major land allocations are as follows:

(1) late successional reserves (LSRs),
(2) riparian reserves,
(3) spotted owl core areas,
(4) elk management areas, and
(5) administratively withdrawn areas.

5. Fire Hazard and Risk

Past fire suppression has created conditions in the Williams WAU that consist of large acres of overstocked stands resulting in high fire hazard areas. The Williams WAU also has a high ignition potential (considering the large number of people living in the rural interface), high value private homes, unique wildlife habitats, and valuable commodities. These factors combined cause the existing fire hazard and extent of risk in the WAU to become an issue.

Air quality under existing management criteria is not an issue in the Williams WAU at this time. However, as an attempt is made to return to a more natural system of more frequent low intensity fires in the Klamath Province, air quality will likely become an issue.

B. Key Questions

1. Vegetation

(1) What are the existing vegetation patterns in the Williams WAU?
(2) What were the processes involved in creating this pattern?
(3) Are these vegetative patterns within the range of naturally occurring conditions?
(4) What are the vegetative communities that exist in the Williams WAU?
(5) Are these vegetative communities within the range of naturally occurring conditions?
(6) Are the species that are currently present within these communities within the range of naturally occurring conditions?
(7) What are the processes involved in the creation of these plant communities?
(8) What are the species of introduced plants and plant pathogens in the Williams WAU and what has been their effect on native plants and plant communities?
(9) What are the management objectives as described in the higher level planning documents for LSRs, riparian reserves,

matrix/adaptive management area (AMA), and timber productivity capability classification (TPCC) withdrawn lands?

(10) What management options/activities are available for use in maintaining or improving late successional forest characteristics in the LSR (ROD C-9)?

(11) What silvicutural prescriptions are available and are they compatible with the LSR objectives?

(12) What methods (mechanical, manual, biological, prescribed fire, etc.) are available and are they compatible with the objectives of the LSR?

(13) What silvicultural prescriptions and methods are available to meet the aquatic conservation strategy (ACS) (ROD B-9)?

(14) Are these techniques and prescriptions compatible with the objectives of the aquatic conservation strategy (ACS)?

(15) What is forest health as applied to the Williams WAU?

(16) Should forest health be applied at the tree, stand, watershed, or province level?

(17) What is the current status and trend of forest health in the Williams WAU?

(18) What is the potential of the Williams WAU to produce commodities?

(19) What are the acreages of each land use allocation within the WAU?

(20) What commodity productions are compatible with the objectives of the land use allocations of the higher land use plans?

2. Water Quality

(1) What are the factors affecting the water quality in the Williams WAU?

(2) Are these factors within the range of naturally occurring conditions?

(3) What are the management opportunities to improve water quality in the Williams WAU?

(4) What are the major contributors to the water quantity issue in the Williams WAU?

(5) Are these factors within the range of naturally occurring conditions?

(6) What are the management or educational opportunities available?

3. Species and Habitats

(1) What are the special status species that occur in the Williams WAU?

(2) What are the species that are listed under the Endangered Species

Act?

(3) What are the federal candidate species?

(4) What are the sensitive species (Bureau sensitive or State-listed species)?

(5) What are the survey and manage species (ROD C-49) that occur in the WAU?

(6) What are the population levels or relative abundance of those special status species that occur in the WAU?

(7) What are the major habitat associations that exist in the WAU?

(8) What is the condition and trend of these habitat associations?

(9) What is the spatial arrangement of these habitats across the WAU?

(10) Are these habitats within the range of naturally occurring conditions?

(11) Are there management opportunities to increase or stabilize declining habitats?

(12) Can the management objectives or goals be obtained using manual, mechanical, biological, or prescribed fire?

(13) What exotic species have been introduced into the Williams WAU and what effect have they had on native wildlife?

4. Human Uses

(1) What are the future trends of human populations in the Williams WAU?

(2) What will the distribution of the population look like?

(3) Will there be enough resources like water to support the human and natural ecosystem?

(4) Will there be an increased risk of major wildfires?

(5) What will be the major commodities produced on federal lands?

(6) Will the values of the people living in the WAU be compatible with commodity extraction?

(7) What are the management or educational opportunities to mitigate the impacts created by commodity extraction on public values?

(8) Are there opportunities to form cooperative management areas or groups?

(9) What would these groups focus on?

(10) Improved fisheries habitat in Williams Creek both on private and public lands.

5. Fire

(1) What is the risk of large-scale, high severity fire within the Williams watershed and what is the level of fire susceptibility/sensitivity of the various components of the ecosystem?
(2) Can late successional forest be reasonably protected given the level of risk?
(3) Can wildfire protection goals for resource management objectives be adequately mitigated by an active fuels management program (manual, mechanical, biological treatments, and prescribed burning)?
(4) Are coarse woody debris, snags, duff, and litter retention goals compatible with the management of risk of wildfire?
(5) What is the natural role of fire within the Williams WAU?
(6) Can the natural role of fire be simulated by prescribed fire treatments and or other management actions?
(7) What were the natural structural components of the vegetation in the watershed prior to fire suppression?
(8) Are the natural coarse woody debris, duff, litter, and snag component levels attainable given the changes in vegetation caused by fire suppression, the level of risk and fire susceptibility of the ecosystem, and the feasible risk reduction mitigation that might be considered?
(9) What social and political concerns will affect fire protection, fire use, and fuel treatment programs?
(10) Can an active fuels management program that includes manual, mechanical, biological, and prescribed fire treatments decrease overall particulate matter emissions and impacts within the Williams WAU?
(11) Does an emissions trade-off analysis adequately project changes in actual or potential emissions?
(12) Can air quality impacts from prescribed underburning be managed or mitigated to acceptable levels?
(13) What are the cumulative impacts from a fuels management program within the Williams WAU?

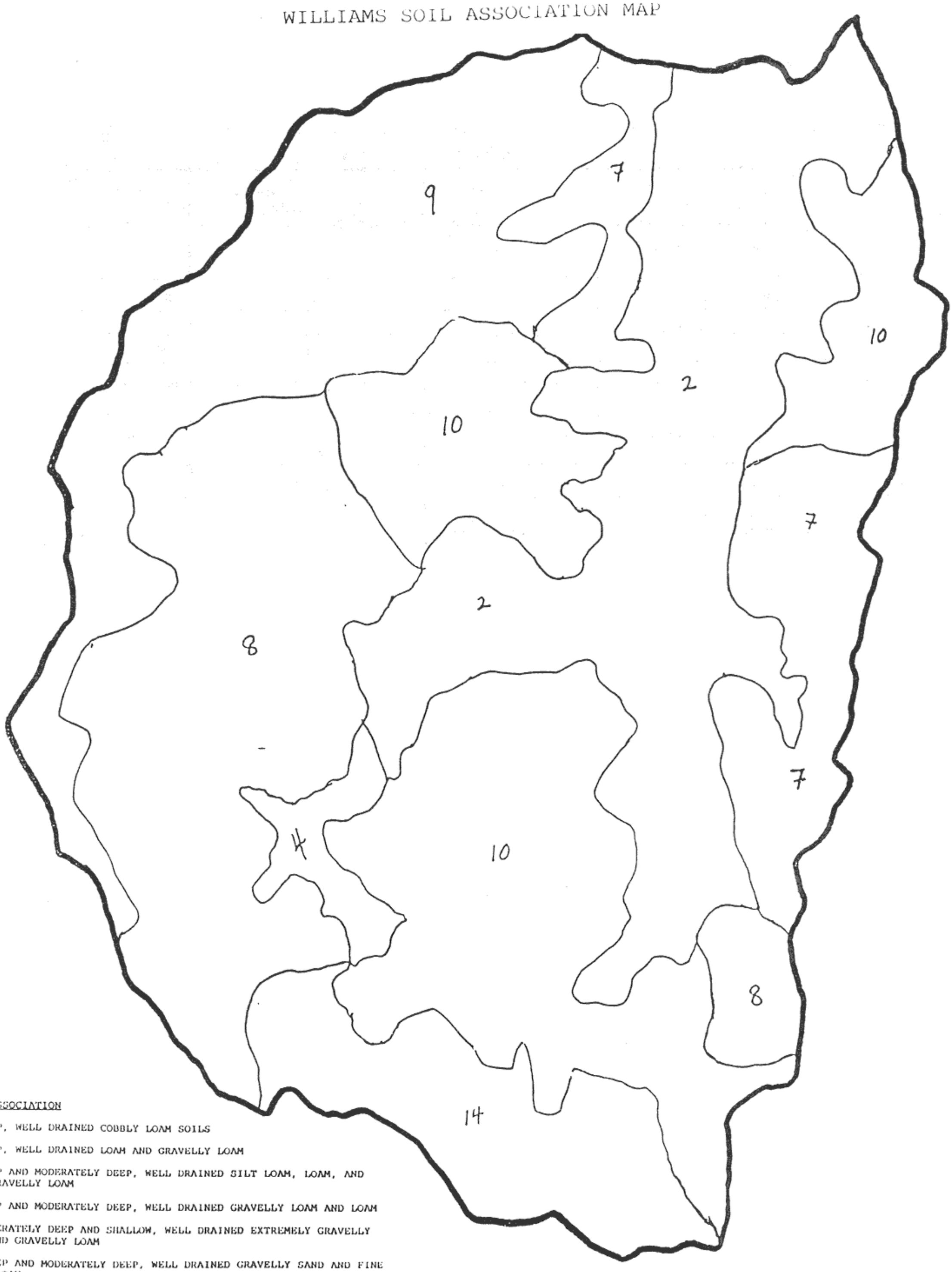
IV. CURRENT CONDITIONS

A. Erosion Processes

Soils in Table 7 below were formed in alluvium and colluvium from meta-volcanic and meta-sedimentary parent materials. The Siskiyou, Tethrick, Crannler, Goodwin, and Rogue soils were formed mainly from granite rocks. The Pollard, Josephine, Speaker, Manita, Vannoy, and Voorhies soils were formed from slaty siltstone. The Beekman, Vermisa, and Colestine soils were formed dominantly from shale and altered basalt. The Takilma, Foehlin, and Kerby soils are bottomland soils that were formed from a mixture of rocks and soils washed in. Although all soils are of mixed mineralogy, the parent material from which they were formed has a major influence on the soil characteristics.

Table 7 - Soil Characteristics Chart					
MAP UNIT #	**SOIL SERIES**	**DEPTH TO BEDROCK**	**% SLOPE**	**SURFACE TEXTURE**	**EROSION HAZARD**
2	Takilma, Foehlin, Kerby	40 inches or more	0 to 3	ex.cob. loam, gr.loam, loam	slight
4	Pollard, Abegg	40 inches or more	3 to 12	loam, gr.,loam	slight
7	Vannoy, Manita, Voorhies	20 to 40 inches or more	20 to 55	silt loam, loam, v.,gr.loam	moderate to high
8	Josephine, Speaker, Pollard	20 to 40 inches or more	20 to 55	gravelly loam, loam	moderate to high
9	Beekman, Vermisa, Colestine	12 to 40 inches or more	20 to 65	ex. grav. loam, gr.loam	moderate to high
10	Siskiyou, Tethrick	20 to 40 inches or more	20 to 55	gravelly sandy loam	high
14	Crannler, Goodwin, Rogue	20 to 40 inches or more	35 to 65	v.stony sandy loam	high

WILLIAMS SOIL ASSOCIATION MAP



SOIL ASSOCIATION

--DEEP, WELL DRAINED COBBLY LOAM SOILS

--DEEP, WELL DRAINED LOAM AND GRAVELLY LOAM

--DEEP AND MODERATELY DEEP, WELL DRAINED SILT LOAM, LOAM, AND VERY GRAVELLY LOAM

--DEEP AND MODERATELY DEEP, WELL DRAINED GRAVELLY LOAM AND LOAM

--MODERATELY DEEP AND SHALLOW, WELL DRAINED EXTREMELY GRAVELLY LOAM AND GRAVELLY LOAM

--DEEP AND MODERATELY DEEP, WELL DRAINED GRAVELLY SAND AND FINE SANDY LOAM

ODERATELY DEEP AND DEEP, WELL DRAINED VERY STONY SANDY LOAM

B. Hydrology

Table 8 - Summary of Cumulative Impacts Analysis on Hydrological Process				
CUMULATIVE ANALYSIS AREA	**EQUIVALENT CLEARCUT**	**COMPACTED AREA**	**TRANSIENT SNOW ZONE OPENINGS**	**AVERAGE DENSITY PER SEC.**
Powell Cr.	5.3%	7.1%	10.2%	3.7 miles
Glade Pipe	5.6%	5.3%	1.5%	3.4 miles
Lone/Goodwin	29.4%	14.2%	45.1%	17 miles
Williams Cr.	3.9%	4.5%	0	5.7 miles
Lower Williams Cr.	6.4%	6.1%	43.0%	4.6 miles
Clapboard Rock	7.2%	6.7%	13.1%	7.1 miles
Swamp Munger	10.2%	5.9%	12.5%	8.4 miles
Right Hand Bill	12.7%	6.6%	25.2%	7.5 miles

Conclusion: All cumulative analysis areas except for Powell and Glade Pipe have high road densities which increases surface water and sedimentation rates to the hydrologic system. The Lone/Goodwin analysis area has been highly impacted by past management activities. The high road density, combined with the large amount of area in clearcut-equivalent condition located in transient snow zones (TSZs), appears to be the primary contributor of fine sediment problem in the Lone/Goodwin area. The Swamp Munger and Right Hand Bill have been moderately impacted by past management activities. The rest of the analysis area is in a hydrologically stable condition.

C. Vegetation

Existing vegetation conditions were described and mapped for features such as major plant series, existing condition class with respect to size, structure, and stand intactness (previous harvest history).

1. Major Plant Series

Major plant series (Map 8) is an aggregation of plant associations with the same climax species dominants. It defines the potential natural vegetation that would exist on the site at the climax stage of plant succession or the end point of succession. The major plant series also tells us something about site productivity and site potential.

The plant series listed below were identified and mapped within the Williams Watershed. Site productivity in terms of basal area per acre is described for each series. Basal area is defined as the area of the cross section of a tree stem near its base, generally at breast height (4.5 feet above the ground) and inclusive of the bark (USDI, 1994).

R6W R5W R4W

T38S

T39S

T40S

SCALE 1:100000

PLANT SERIES
WILLIAMS WATERSHED

JULY 12 1995

John McGlothlin

LEGEND

- NONVEG.
- CHAPARRAL
- TANOAK
- PINE/ D.FIR
- DOUGLAS FIR
- NONFOREST
- WHITE OAK
- TANOAK/ D.FIR
- OTHER PINES
- WHITE FIR
- BLM LANDS
- WATERSHED BOUNDARY

The following basal area production rates are on a per acre basis. Basal area in a plant series is not limited to the tree species that series is named for. For example, basal area in the Douglas-fir series can be from Douglas-fir, madrone, sugar pine, or any other tree species present on the site.

Douglas-fir is the most common tree species in southwestern Oregon. Sites within the Douglas-fir series are similar to tanoak in productivity with basal areas averaging 254 square feet (Atzet and Wheeler, 1984). Douglas-fir tends to produce conditions that favor fire wherever it occurs. This species is self-pruning, often sheds its needles and tends to increase the rate of fuel buildup and fuel drying (Atzet and Wheeler, 1982). Due to the success of fire suppression efforts over the last 70 years, overall cover of this species has increased.

Sites in the white fir series are also considered productive with basal area averaging over 341 square feet (Atzet and Wheeler, 1984). The white fir series is widespread, diverse, and productive (Atzet and McCrimmon, 1990). White fir's thin bark provides little insulation during low intensity under burns until tree diameters reach at least 8 inches. Moreover, the tolerant nature of white fir which allows branches to survive close to the ground, makes the lower crown a ladder to the upper crown (Atzet and Wheeler, 1982). Due to the success of fire suppression efforts over the last 70 years, white fir occupancy has increased.

In general, tanoak sites are considered productive. Average total basal area for this series is 262 square feet (Atzet and Wheeler, 1984). The tanoak series occurs where both soil and atmospheric moisture are plentiful. The series occurs most frequently on cooler aspects with fine textured soils (Atzet and Wheeler, 1984). Fire is the principal enemy of individual tanoak trees (Tappeiner and others, (1990). Due to the success of fire suppression efforts over the last 70 years, overall cover of this species has increased.

Forests in the ponderosa pine series average approximately 170 square feet of basal area. This series is relatively rare as ponderosa pine does not often play the role of a climax dominant (Atzet and Wheeler, 1984). This series tends to occupy hot, dry aspects that burn frequently. Ponderosa pine regeneration is restricted by reducing the number of fire events. Due to the success of fire suppression over the last 70 years, overall cover of this series has decreased (Atzet and Wheeler, 1982).

The tanoak/Douglas-fir grouping is a mix of tanoak and Douglas-fir. There is not enough data to distinguish which species is climax.

The pine/Douglas-fir grouping is a mix of either knobcone pine or ponderosa pine and Douglas-fir. There is not enough data to distinguish which species is climax.

The white oak series occurs at low elevations and is characterized by shallow soils. Although Oregon white oak is usually considered a xeric species, it also commonly occurs in very moist

locations - on flood plains, heavy clay soils, and on river terraces. On better sites, white oak is out competed by species that grow faster and taller (Stein, 1990). Average basal area is 46 square feet. Water deficits significantly limit survival and growth (Atzet and McCrimmon, 1990). White oak has the ability to survive as a climax species as it is able to survive in environments with low annual or seasonal precipitation, droughty soils, and where fire is a repeated natural occurrence (Stein, 1990). Fire events in this series are high frequency and low intensity (Atzet and McCrimmon, 1990). Due to the success of fire suppression over the last 70 years, the prominence of this series has declined.

Chaparral is an aggregation of several shrub/brush species that may include wedgeleaf ceanothus, manzanita, and Live Oak.

The nonforest classification refers to areas that do not fit into one of the recognized natural plant series classifications, such as farmland, pasture lands, orchards, gravel streambeds, etc.

The nonvegetative classification refers to areas such as rock quarries or gravel storage sites.

Port-Orford cedar is quite common in the riparian areas of this watershed. These areas of Port-Orford cedar were not separated out as a series because the actual amount of acreage at an individual site along any one stream is extremely small. There is a rich mixture of ground and shrub species, including many special status plants that are endemic to these sites. Huckleberry oak, coffeeberry, azalea, and myrtle are the most common shrub species. (See the Port-Orford cedar location, Map 9.)

Productivity in the Port-Orford cedar series is very similar to that seen in the white fir series. Average basal area is 341 feet. In some areas, Port-Orford cedar and white fir can occur as co-climax species (Atzet and Wheeler, 1984). Port-Orford cedar is rare where fire is common, nevertheless, its resistance to fire is high due to thick bark. This characteristic makes Port-Orford cedar a good candidate as a source for fire dating (Atzet and Wheeler, 1982).

Table 9 - Major Plant Series						
	BLM Lands		Non-BLM Lands		All Lands	
Series Name	Acres	%	Acres	%	Acres	%
Douglas-fir	14,046	52%	9,662	39 %	23,728	46%
White fir	3,935	15%	2,256	9%	6,191	12%
Tanoak	4,698	17%	794	3%	5,492	11%
Pine	454	2%	2,229	9%	2,683	5%
Pine/Douglas-fir grouping	2,185	8%	543	2%	2,728	5%
Tanoak/Douglas-fir grouping	469	2%	2,106	8%	2,575	5%
White oak	271	1%	682	3%	953	2%
Chaparral	644	2%	180	< 1%	824	2%
Nonforest	241	< 1%	6,523	26 %	6,764	13%
Nonvegetative	8	< 1%	0	0	8	< 1%

* The total percentage amounts may equal more than 100 percent due to rounding of the percentage number.

R6W R5W R4W

T38S

T39S

T40S

SCALE 1:100000

APPROXIMATE LOCATION OF PORT ORFORD CEDAR ON BLM LANDS IN THE WILLIAMS WATERSHED

LEGEND

- KNOWN POC LOCATIONS
- PROBABLE POC LOCATIONS
- KNOWN INFECTED LOCATIONS
- BLM LANDS
- WATERSHED BOUNDARY

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N

2. Existing Vegetation Condition Classes

Existing vegetation conditions (Map 10) are grouped into eight classes. The size ranges for classes five through eight were limited by how the existing data is stored in the BLM's Micro*STORMS land database.

Table 10 - Existing Vegetation Conditions

Class	Description
1	Grass, forbs, herbaceous vegetation
2	Shrubs, nonforest land, usually natural shrub fields
3	Hardwood/woodland, includes nonforest and low site lands, could include commercial lands dominated with hardwoods
4	Early, 0 - 5 years stand age
5	Seedlings/saplings, 0 - 4.9" dbh
6	Poles, 5 - 11" dbh
7	Mid, 11 - 21" dbh
8	Mature/old-growth, 21" + dbh

For all land ownerships in the Williams Watershed, the current condition by size class is shown in the following table.

Table 11 - Existing Condition Classes

	BLM Lands		Non-BLM Lands		All Lands	
Condition Class	Acres	%	Acres	%	Acres	%
#1 Grass/forbes	54	< 1%	6,115	24%	6,169	12%
#2 Shrubs	455	2%	334	1%	789	2%
#3 Hardwoods	561	2%	924	4%	1,485	3%
#4 Early	747	3%	89	< 1%	836	2%
#5 Saplings	2,122	8%	373	1%	2,495	5%
#6 Poles	3,105	12%	3,305	13%	6,410	12%
#7 Mid	4,363	16%	13,229	53%	17,602	34%
#8 Mature	15,475	57%	607	2%	16,082	31%
Nonvegetative	59	< 1%	0	0	59	< 1%

* Because of rounding, percentages may add up to more than 100%

R6W

R5W

R4W

T38S

T39S

T40S

SCALE 1:100000

EXISTING VEGETATION CONDITION CLASS
WILLIAMS WATERSHED

JULY 12 1995

John McGlothlin

LEGEND

- NON-VEGETATED
- BRUSH
- EARLY SEEDLING/ SAPLING
- POLES
- MATURE
- GRASS
- HARDWOODS
- LARGE POLES
- BLM LANDS
- WATERSHED BOUNDARY

N

The above condition classes in themselves do not describe the structural characteristics of the vegetation and its degree of intactness (open vs. closed canopy, partial cut previously, never entered, etc.). Lumping the stands into one diameter range will often not permit us to assess the functional characteristics of the class for vegetative and habitat assessments. Natural stands in the Klamath Province are rarely single size class, single- storied stands. They are generally multi-aged, multi-storied stands that contain trees in a variety of different sizes. As an example, a class 7 in a Douglas-fir stand on the west side of the watershed could be much different than a class 7 in a ponderosa pine stand on the east side of the watershed. This is because the ponderosa pine stand will naturally have a much more open canopy. For these reasons, two other qualitative descriptors have been added which can provide additional information for the condition classes. These are the McKelvey Rating System and whether the stand is intact or not.

Whether or not a stand is intact gives one an indication of whether the stand has been modified through previous management activities. Intact, unharvested stands of a given condition class may function differently than partial cut stands of the same condition class. An intact rating is given if less than 30 percent of the acreage of a stand has had any previous harvest activity (including mortality salvage). In the Williams Watershed, 25 percent of the land base is considered intact. The number exceeds 43 percent when looking at federal lands only.

The McKelvey Rating System is as follows:

Class 1- Spotted owl nesting, roosting, and foraging habitat
2- Spotted owl roosting and foraging habitat
3- Currently does not meet 1 or 2 criteria
4- Will never meet 1 or 2 criteria
5- Currently does not meet 1 or 2 criteria, but meets dispersal
6- Will never meet 1 or 2 criteria but meets dispersal

Table 12 - McKelvey Rating Classes

Class	BLM Lands		Non-BLM Lands		All Lands	
	Acres	%	Acres	%	Acres	%
# 1	3,918	15%	422	2%	4,340	8%
# 2	6,920	26%	175	< 1%	7,095	14%
# 3	7,567	28%	10,064	40%	17,631	34%
# 4	2,670	10%	8,671	35%	11,341	22%
# 5	5,298	20%	3,873	16%	9,171	18%
#6	519	2%	1,770	7%	2,289	4%

* The percentages may total more than 100% due to rounding of the numbers.

D. Stream Channel

The upper elevations of Williams Creek are composed of narrow canyons with steep sideslopes. The middle elevations are canyons with some smaller floodplain sideslopes. Lower Williams Creek is a wide alluvial valley. Most BLM streams are located in narrow floodplains or canyons and are inhabited mostly by trout, steelhead, and a few coho salmon.

Riparian habitat condition information is not yet available. Riparian habitat conclusions are subjective and based on best professional judgment.

Williams Creek and most tributaries have been channelized from agricultural practices, mining, and road construction. Channelizing has prevented the streams from meandering and forming side channels. Meandering side channels provide more fish habitat or refugia than a single channel. Channelizing the streams has disconnected the floodplain with the channel and has probably decreased fish rearing capability over the past century. Presently there is no connectivity between the stream and the floodplain in the low gradient alluvial valley. Few, if any, side channels exist for fish rearing. Channelization causes water flows to accelerate and decreases fish and insect production.

Timber harvest activities reduced the occurrence of large woody material (LWM) in streambeds and eliminated the potential for future LWM by removing some conifers in the riparian zones. Recruitment of LWM in stream channels in the near future is low. Large woody material provides nutrients to riparian areas and streams, nutrients for terrestrial and aquatic insects, habitat, shade, and food for fish.

Road construction commonly occurs adjacent to streams. Roads act as heat sinks transferring an inordinate amount of heat to riparian areas, consequently, increasing the stream water temperature.

Cattle grazing has exacerbated the slow regeneration of conifers and/or the total decline in conifer reestablishment due to soil compaction in the riparian areas. The result is lack of stream bank stability and stream channels with little or no structure.

Approximately 80 miles of perennial and intermittent streams were surveyed for functioning condition on BLM lands. Functioning condition relates to the streams ability to provide water and habitat for designated beneficial uses. The beneficial uses identified in the Williams Creek Watershed were aquatic habitat (both direct and indirect), domestic purposes, and agricultural purposes. The table below approximates the preliminary results of the survey by showing the amount of stream that falls into the different condition class categories.

Table 13 - Stream Condition Class Categories						
Habitat Type	**Proper Function Cond.**	**Functioning-at-Risk**			**Nonfunct. Cond.**	**Total Miles**
		Trend Up	Trend not Apparent	Trend Down		
Stream miles	44	11.5	11.0	11.5	2.0	80

E. Wildlife Species and Habitats

1. Valley Floor

The valley floor is approximately 4 miles in width, 9 miles in length, and lies predominately south to north. The majority of the valley floor is under private ownership and is utilized for homesite, crop, and livestock production. Homesites are scattered throughout the valley in rural fashion, with the town of Williams having the largest concentration of human population. The valley is largely broken up by homesites, roads, and fences, however, open tracts of grassland still remains. The dominant feature of the valley floor is Williams Creek and its tributaries. Remnant stands of oak and ponderosa pine savannahs are located at the valley edge and represent a small percent of the original habitat that dominated the valley floor in presettlement times. With the elimination of fire for nearly 80 years, pine, fir, and cedar have become firmly established in the understory of oak woodlands, threatening their existence. Other threats to these habitats include urbanization, introduction of exotic plants, and changes in natural drainage patterns. Historically oak/pine savannahs provided nesting habitat for various species, acorns for wildlife forage, and winter range for big game. Currently oak woodlands are very limited in both quantity and quality. They have been identified as one of the five critical habitats by the Oregon/Washington neotropical bird working group (see Table 5 for further information on habitat needs, condition and populations of neotropical birds found in the watershed). Ponderosa pine stands have been out-competed by less fire intolerant species and high graded throughout the watershed. Large ponderosa pine snags are being lost in the watershed at a faster rate than they are reoccurring. The loss of these habitat types will continue to contribute to the decline of associated snag-dependent species of wildlife. Maintenance and restoration of oak woodlands and ponderosa pine stands are a high priority in this watershed.

Federally administrated tracts of public land are scattered throughout the valley. The largest tract is located at the north end of the watershed. The Provolt Seed Orchard was farmland purchased by the federal government in order to establish a seed source for the production of conifers. The seed orchard is largely agricultural land but contains riparian habitat along Williams Creek and the main stem of the Applegate River. The habitat along the Applegate River provides a home for a number of species less common in the remaining part of the watershed. The remaining federally administered land on the valley floor is composed of smaller tracts of land (20-80 acres) that is dominated by stands of ponderosa pine (Pinus ponderosa), Oregon white oak (Quercus garryana), and increasing numbers of invading Douglas-fir (Pseudotsuga menziesii). These

stands provide hiding and thermal cover for a number of species, including raccoons (Procyon lotor), grey fox (Urocyon cinereoargenteus), and black-tailed deer (Odocoileus hemionus). Any future manipulation of these stands should take into account the value these areas have as wildlife habitat.

2. Uplands

Timber harvest and other management activities have altered wildlife habitat by changing species composition and removing or degrading habitat. Prior to settlement of the valley by European/Asian people, the uplands were dominated by older forests and therefore species that require older forest habitat were more abundant. Past harvest activities have replaced these forests with younger stands of trees. Large contiguous blocks of older stands that have interspersed smaller blocks of younger stands have been replaced with large contiguous blocks of younger stands interspersed smaller blocks of older stands. Select species of trees were favored over others in reseeding and replanting efforts, creating a less diverse community. The conversion of older stands into younger stands (i.e., clearcuts) has benefitted species that utilize early seral stages and disturbed habitats. This has had a negative effect on species that utilize late-successional forests.

The fragmentation of late-successional forest habitat in the watershed is of particular concern. Species dependent on these habitats such as the American marten (Martes americana), the fisher (Martes pennanti), and the northern spotted owl (Strix occidentalis) have limited habitat in the WAU. Many of the remaining older stands no longer serve as habitat for late-successional dependent species due to their irregular shape and small size causing an increase in the amount of edge effect in the stand. The edge to interior ratio effects how useful the stand is for late-successional species. Stands with a great deal of edge, no longer function as interior forest. The micro-climatic changes of "edge effect" can be measured up to 3 tree lengths in the interior of the stand (Chen, 1991). Isolated patches of late-successional habitat may be too small to support the maximum diversity of species. In heavily fragmented habitats, larger predator species that naturally occur at low densities are lost first (Harris and Gallagher, 1989). The California wolverine (Gulo gulo luteus) utilize high elevation undisturbed habitat. Their population is now in jeopardy partially due to fragmentation. Fragmented habitat leads to an isolated species population which loses genetic vigor and is the most serious threat to biological diversity (Wilcox and Murphy, 1985). Intact late-successional habitat corridors are critical for ensuring genetic flow, natural reintroduction, and successful pioneering of species into previously unoccupied habitat. Wildlife disperses across the landscape for a number of reasons including food, cover, mates, refuge, and to locate unoccupied territories. The vast majority of wildlife species must disperse during some stage of the life cycle (Harris and Gallagher, 1989). Dispersal corridors function well when they provide at least hiding and resting cover. Species that depend on late-successional forest are poor dispersers and more vulnerable to extinction in fragmented landscapes than species associated with early successional forests (Noss, 1992). This is

particularly true for flightless species such as the fisher (Martes pennanti). Fishers are reluctant to travel through areas lacking overhead cover (Maser, 1981) and are at risk of genetic isolation.

Timber harvest has also negatively impacted the quantity and quality of standing dead (snags) and downed woody material in managed portions of the watershed. Snags and downed wood provide food and shelter for more than 100 species of wildlife in western Oregon (Brown et al. 1985). For some species, the presence or absence of suitable snags will determine the existence, or localized extinction, of that species. The hardness (decay stage) of a snag is an important factor in determining its use by individual species and its ability to provide suitable nesting and/or foraging habitat for those species. Woodpeckers, like the pileated woodpecker (Dryocous pileatus), often choose hard snags (stage 1) for nesting whereas wrens and chickadees use the softer stage 2 and 3 snags. The use of snags as a foraging substrate also changes with time as the decay stage changes. As a snag decomposes, the insect communities found within it changes. Evans and Conner (1979) identified three foraging substrates provided by snags: the external surface of the bark, the cambium layer, and the heartwood of the tree. All species of snags in all stages of decay are useful for wildlife.

Snags are also used as food storage sites and as roosting/resting sites for many species. A variety of mammals, birds and some owls use snags to cache prey and other food items. Vacated nesting cavities are often used by wildlife for protection from inclement weather or hot summer days. The marten (Martes americana) often use snags as resting and hunting sites. A pileated woodpecker may use up to 40 different snags for roosting.

Snags continue their function as a key element of wildlife habitat when they fall to the ground as down logs. Once again down log use by individual species is dependent on the decay stage of the log. The larger the diameter of the log and the longer its length, the more functional it is for wildlife. Depending on the decay stage of the log, it can be used as sites for lookout, nesting, denning, foraging, thermal cover, food storage, etc.

Road building has several effects on wildlife and its habitat. The construction of roads contributes to the delivery of sediment into an aquatic system which can negatively effect fish by filling pools, embedding spawning gravel, and smothering eggs. Roads also lead to increased disturbance, such as poaching, and decreased habitat effectiveness for many species. Increased disturbance to deer and elk increase their metabolic rate and decrease their reproductive success (Brown, 1985). The WAU has had a large increase in the road density on federal land since the World War II.

3. Aquatic

The Williams Creek drainage contains a number of fish-bearing streams including: Powell, Mungers, China, Swamp, Williams, Bill, Bear Wallow, Rock, Lone, Clapboard Gulch, Glade Fork, East Fork, and Honeysuckle creeks and a number of unnamed tributaries and gulches. Riparian habitat along the valley floor has been dramatically altered on both private and federal

land. Historically, the entire valley floor served as a flood plain with sloughs and backwaters adding to the overall complexity of the system. Keystone aquatic species, such as beaver, modified the environment by adding woody material to the streams and aiding in water storage. The riparian area resisted burning, allowing conifers to mature, resulting in heavy loading of large woody debris in the streams. This material added to the overall complexity of the aquatic system which is lacking today. Harvest of conifers within the riparian zone has taken place on both private and federal land. Presently the riparian zone on private lands generally consists of a narrow band of hardwoods with some areas lacking any vegetation at all. The condition of the riparian zone on federal lands varies from intact late-successional stands in parts of the upper portions of the watershed to narrow bands of hardwoods. Water withdrawals are known to have occurred for mining and agricultural purposes in the early 1900s. Currently water is being withdrawn for domestic purposes and irrigation. A portion of the Williams Creek drainage is no longer capable of supporting salmonids during the latter part of the summer, due to water quality and quantity. This in turn affects a number of species such as the belted kingfisher (Ceryle alcyon), mink (Mustela vison) and otter (Lutra canadensis) that relied on the fish as a food source. There is a need for the federal, state, and county governments to join efforts with the public to improve the condition of Williams Creek and its tributaries.

4. Fisheries Habitat

Fish Barriers - A diversion dam exists at the confluence of Williams Creek and Powell Creek. Irrigation withdrawals remove water from Williams Creek and cause an intermittent streamflow and isolated pools during late summer and early fall. This is a major limiting factor for juvenile salmonid production.

Six culverts restrict or prohibit passage of juvenile salmonids. None of the culverts are capable of passing peak flows and debris for a 100 year run-off event.

Table 14 - Status of Culverts and Fish Passage at Road Crossings in Williams Creek								
Stream	Road #	Quarter Section		Culvert Dimensions LxWxH (ft)	% Slope	Culvert Outfall Drop (ft)	Passage	
							Steelhead	Cutthroat
Williams Creek								
Wallow #1	38-5-15	17	SE	85x7	10	1.5	N	N
Wallow #2	38-5-17	18	SE	60x5	5	3.0	NA	N
E. Williams #1	39-5-23.1	23	N	45x6x4 45x4	3 3	1.0 1.0	Y Y	N N
W. Williams #3	39-5-16.1	18	NW	65x12x87	7	2.0	P	N
Rt. Fk. W. Williams	39-5-16.1	18	NW	65x12x8	5	1.5	P	N

5. Macroinvertebrates

Bill Creek, Pipe Fork Creek, and East Fork Williams Creek are indicative of the lack of cool water, habitat complexity, and diversity required for adequate fish production (Table 15). Scouring of the streambed frequently occurs and inhibits cool water macroinvertebrate production. Higher flows than historical levels develop when there is a lack of pools from a meandering channel and a lack of large woody material. Scouring of the stream will occur under these conditions. Historically, the meandering stream channels dissipated the stream flow energy and produced pools for fish rearing.

Table 15 - Williams Creek Watershed Benthic Macroinvertebrate Bioassessment Rating (Wisseman 1992)			
Creek	Riffle Habitat	Margin Habitat	Detritus Habitat
Bill Creek	medium	medium - high	medium
Pipe Creek	medium - high	high	high
E. Fork Williams Creek	medium	medium	medium

80 - 100% : High habitat/biotic integrity
60 - 79% : Moderate habitat/biotic integrity
40 - 59% : Low habitat/biotic integrity
<40% : Severe habitat/water quality limited

6. Flows and Temperatures

The lack of water flow in Williams Creek Watershed is a major limiting factor for fish production. Flows in late summer and fall are intermittent and the water forms pools of isolated fish populations. Water temperature is high and oxygen levels are low during this time. This watershed receives an adequate amount of precipitation to sustain fish populations. Since

European settlement, irrigation diversions have resulted in decreased fish populations.

Tributaries to Williams Creek including the west and east forks are below optimum for fish production (Table 16). The mainstem of Williams Creek below the confluence of the west and east forks severely limits or prohibits fish production.

Salmonids prefer water temperatures at 58 degrees (SAT, 1995). Temperatures in excess of 58 degrees may cause secondary infections, decrease growth, mortality, decreased condition factor, and fitness. Fish population viability decreases with temperatures above 58 degrees.

Diel fluctuation is one of the primary factors affecting salmonid survival. Fluctuations greater than 10 degrees F for durations of one week or more can be detrimental. Temperatures over 58 degrees for extended time periods can produce secondary and latent mortalities. Seven day average temperatures (Table 16) do not depict the complete impact of high fluctuating temperatures for long durations. Summer stream temperatures are influenced greatly by the number of springs and irrigation withdrawals in the watershed. The amount of shade, topography, and large woody material in the stream also have a great influence on stream temperatures.

Table 16 - Seven Day Average High Stream Temperatures

Subwatershed	Temperature (°F)	Rating
Bill Creek	61.4	< Optimum
Glade Fork Creek	63.2	< Optimum
Pipe Fork Creek	60.0	< Optimum
Powell Creek	67.0	< Optimum
Rock Creek	61.6	< Optimum
Williams at mouth	73.8	Severely limits fish production
Williams/East Fork/above Glade	62.9	< Optimum
Williams/West Fork/above tributary section 19/18	61.4	< Optimum
Tributary to Williams/@ section 19/18	60.4	< Optimum

Table 17 - Highest Maximum Daily Temperature and Highest Mean Diel Fluctuation			
Subwatershed	**Temperature (°F)**	**Rating**	**Highest Diel Temperature (°F)**
Bill Creek	62.6	< Optimum	5.4
Glade Fork	64.4	< Optimum	5.4
Pipe Fork	60.8	< Optimum	4.5
Powell Creek	68.2	< Optimum	4.3
Rock Creek	62.6	< Optimum	3.6
Williams at Mouth	75.2	Severely limits fish production	9.9
Williams/East Fork/above Glade	64.4	< Optimum	5.4
Williams/West Fork/above tributary section 19/18	64.4	< Optimum	5.4
Tributary to Williams/@ section 19/18	64.4	< Optimum	5.4

Ratings:
Optimum = < 60 degrees Fahrenheit (preferred water temperatures for extended periods with low variability in diel fluctuation)
Less than optimum = 60 - 70 degrees Fahrenheit (tolerable with increased potential for secondary mortality, especially for extended and frequent periods with high variability in diel fluctuation
Limiting= 70 - 75 degrees Fahrenheit (lethal or intolerable/extremely high potential for mortality, especially for extended and frequent periods with high variability in diel fluctuation)

7. Special and Unique Habitats

Special and unique habitats are those habitats that either are naturally scarce (caves, springs, mineral licks, etc.), rare because of human influence (low elevation old-growth, oak/grasslands etc.), or because of natural cycles (snags, meadow production, etc.). Often these habitats receive a greater level of use by wildlife than surrounding habitats or are essential for certain aspects of a particular animals life history (ex. hibernation).

Management of unique habitats varies with the type of habitat (Appendix 3). Some habitats are best left alone (mineral licks, rocky outcrops, bear wallows, etc.,) while other habitats may benefit from active management. Meadows, oak/grasslands, and brushfields that are dominated by senescent vegetation, or are being invaded or replaced by conifers, can benefit from reintroduction of fire. Most habitats are beneficial for wildlife when isolated from human disturbance.

Big game winter range is limited in the Williams Creek WAU. Winter range is generally defined as land found below 2,000 feet in elevation and ideally would have a mixture of thermal cover, hiding cover, and forage. Historically the valley floor and adjacent slopes served as winter range for deer and elk. Increased urbanization, agriculture, and fire suppression have altered the quantity and quality of winter range. Much of remaining winter forage is in poor condition due to fire suppression and the introduction of exotic plant species. Currently, the Oregon

Department of Fish and Wildlife views the lack of winter range as the limiting factor in expansion of elk in the valley (Wolfe, pers. comm.). There are 654 acres of big game winter range administered by the BLM in the WAU (see Map 1). The condition of this habitat is not known at this time.

Fawning areas are critical for successful reproduction of deer and elk populations. Key components include quality forage, water, cover, and gentle warm slopes. These areas should be free from human disturbance, especially immediately after fawning. Fawning areas on federally administered lands are found on the oak/pine savannahs existing on the east side of the watershed. Fawning areas on private land exist throughout the valley portion of the watershed but vary in quality, due primarily to disturbance.

Dispersal corridors into other watersheds aid in gene-pool flow, natural reintroduction, and successful pioneering of species into previously unoccupied habitat. Generally these corridors are located in saddles, low divides, ridges, and along riparian areas. Without such corridors, many isolated wildlife habitats would be too small to support the maximum diversity of species. An important dispersal corridor exists between the Thompson Creek and Williams Creek watersheds in T. 39 S. , R. 5 W., Section 25. This area is a natural low divide between the two drainages. An independent study, sponsored by The Klamath Forest Alliance and conducted by Dr. Reed Noss, has identified Wildeer ridge as the primary dispersal corridor between the Siskiyou Mountains and the Kalmiopsis Wilderness (Noss, 1994). Identification of other dispersal corridors use by late-successional species should be a top priority.

8. Wildlife Special Status Species and Habitats

There are a variety of threats to special status species in the WAU. Specific threats vary with the each animal and its particular life history. In the early 1900s, predator species such as grizzly bears and wolves were eliminated from the watershed by bounty hunters and trappers (wolves remain on the list due to sightings of large canids of unknown origin in southwestern Oregon).

Other species are considered naturally rare in the area since the watershed is at the edge of their range. Species such as the ringtail cat (Bassariscus astutus), and mountain and common kingsnakes (Lampropeltis spp.) are examples of animals that have a natural limited range in the state. These species are more vulnerable to extirpation due to their limited numbers. Local actions such as removal of rock at the quarry at Marble Gulch may have a negative effect on these snake populations which use these micro-sites as the primary habitat.

Species, such as the peregrine falcon, have declined due to actions found on a broader scale. The use of organo-chloride compounds in the agricultural industry has led to a tainted food supply. These compounds in their prey cause eggshell-thinning and have reduced the recruitment of young birds in the falcon's population.

Inadvertent disturbance by humans is enough, in some cases, to cause problems with some

species. Peregrine falcons may abandon their nests if disturbed by humans. The Townsend's big-eared bat (Plecotus townsendii) is extremely sensitive to human disturbance. Female bats will often abandon their young or move them to less optimal sites if disturbed.

Of particular concern are those species that have become listed species due to recent change of forest age and structural characteristics. Due to forest management practices, there has been a shift from older, structurally-diverse forest, to younger, structurally-impoverished forest in the watershed. Consequently, species that utilize older forests as primary habitat have declined. The American marten (Martes americana), Pacific fisher (Martes pennanti) and northern spotted owl (Strix occidentalis caurrina) are considered sensitive species due to this shift. As the population of a species declines, individuals become increasing isolated, hindering their ability to find each other and reproduce. Isolated populations can become genetically impoverished which may lead to deleterious effects. Species depending on late-successional forest are poor dispersers and more vulnerable to extinction in fragmented landscapes than species associated with early successional stages (Noss, 1992).

Special status species have evolved with and benefitted from natural disturbance events of the past such as fire, windstorms, insect infestations, landslides, etc. These events created and maintained a mosaic of wildlife habitats Fire was the dominant natural disturbance agent within the watershed prior to settlement and was frequent and of low intensity. Fires maintained the diversity of plants and habitats that in turn benefitted the diversity of wildlife. Communities, such as oak savannahs, were dependent on fire to remove thatch and prevent less fire adapted trees and shrubs from dominating the site. Fire also thinned stands of scrub oak helping produce savannahs dominated by large, fire resistant individuals. Chaparral communities of manazanita (Arctostaphylos spp.) and ceanothus were maintained by intermittent fire that burned the senescent vegetation and prepared the seed and soil for the next generation. Brush stands which are primary habitat for a number of species, including California towhee (Pipilo fuscus) and the orange-crowned warbler (Vermivora celata), are in decline throughout the watershed now that fire is suppressed.

Old-growth mixed conifer forests also benefitted from frequent fire events. Low intensity fires burned off the forest litter and understory vegetation creating open conditions beneath the forest canopy. This produced stable, fire resistant stands, that allowed for mature trees to become very large in size. North facing slopes, which had a longer interval between burn events than south facing slopes, developed forest stands that consisted of more canopy layers providing a greater number of available niches for wildlife species.

Fire suppression within the watershed began soon after the turn of the century. Habitats and species that benefitted from fire disturbance have been negatively effected by this action. Oak savannahs and pine stands have been invaded by fire-intolerant species such as Douglas-fir. As these species became dominant they out competed the fire tolerant oak and pine and are replacing them. Brush stands and meadows that were historically swept by fire have become full of decadent vegetation providing less nutritional value for browsing wildlife species. These

habitats are slowly becoming replaced by invading conifers. Fuel loads underneath mature conifer stands have increased as have the presence of fire intolerant species such as tanoak (Lithocarpus densiflorus) and white fir (Abies concolor). The fire regime has now converted from low intensity ground fires to high intensity stand replacing fires. Currently, old-growth stands with fuel levels above historic quantities are in danger of a stand-replacing fire event. In general, with the advent of fire suppression, the overall diversity, quality, and quantity of habitats has diminished within the watershed. Distribution of these habitats across the landscape has become increasingly rare. Habitats within the watershed have become increasing more homogeneous and less diverse. The composition and population of wildlife species, consequently, has also changed from species that utilized fire-created and maintained habitat, to species that profit from fire-intolerant vegetation and an abundance of down woody material.

Table 18 - Williams Watershed Special Status Species Habitat

SPECIES (COMMON NAME)	HABITAT ASSOCIATION	SPECIAL HABITAT FEATURE	CONCERN
Gray wolf	generalists	large blocks of unroaded habitat	extirpated
White-footed vole	riparian	alder/mature riparian	naturally rare, modification/loss of habitat from development
California red tree vole	mature/old growth conifer	mature Douglas-fir trees	declining habitat quality/quantity from logging
Fisher	mature/old growth riparian	down wood/snags	declining habitat quality/quantity & fragmentation from logging
California wolverine	generalists	large blocks of unroaded habitat	declining habitat quality/quantity & fragmentation from logging and road building, human disturbance
American martin	mature/old growth	down wood, living ground cover	declining habitat quality/quantity & fragmentation
Ringtail	generalists	rocky terrain, caves, mine adits	northern limit of range
Townsends big-eared bat	generalists	mine adits, caves	disturbance to nurseries, hibernacula & roosts, closing mine adits
Fringed myotis	generalists	rock crevices & snags	disturbance to roosts and colonies
Yuma myotis	generalists	large live trees with crevices in the bark &	limited mature tree recruitment
Long-eared myotis	generalists	large live trees with crevices in the bark	limited mature tree recruitment
Long-legged myotis	genralist	large live trees with crevices in the bark	limited mature tree recruitment
Pacific pallid bat	generalists	snags, rock crevices	general rarity/disturbance/snag loss
Peregrine falcon	generalists	cliff faces	low numbers, prey species contaminated with pesticides
Bald eagle	lacustrine/rivers	large mature trees with large limbs near water	populations increasing

Table 18 - Williams Watershed Special Status Species Habitat			
SPECIES (COMMON NAME)	**HABITAT ASSOCIATION**	**SPECIAL HABITAT FEATURE**	**CONCERN**
Northern spotted owl	mature/old growth	late successional mature forest with structure	declining habitat quality/quantity & fragmentation
Marbled murrelet	mature/old growth	large limbed trees,high canopy closure	declining habitat quality/quantity
Northern goshawk	mature/old growth	high canopy closure forest for nest sites	declining habitat quality/quantity & fragmentation, human disturbance
Mountain quail	generalists		no concern in the watershed
Pileated woodpecker	large trees	large diameter snags	snag and down log removal from logging,salvage & site prep
Lewis' woodpecker	pine/oak woodlands	large oaks,pines & cottonwoods adjacent to openings	declining habitat quality/quantity fire suppression,rural & agriculture development, riparian modification
White-headed woodpecker	pine/fir mountain forests	large pines living and dead	limited natural populations,logging of large pines and snags
Flammulated owl	pine/oak woodlands	pine stands & snags	conversion of mixed-aged forest to even-aged forests
Purple martin	generalists	snags in burns with excavated cavities	salvage logging after fire and fire suppression
Great gray owl	pine/oak/ true fir/ mixed conifer	mature forest with adjoining meadows	declining quality/quantity of nesting and roosting habitat
Western bluebird	meadows/ open areas	snags in open areas	snag loss/fire suppression competition with starlings for nest sites
Acorn woodpecker	oak woodlands	large oaks	declining habitat quality/quantity
Tricolored blackbird	riparian	wetlands, cattail marshes	limited & dispersed populations, habitat loss from development
Pygmy nuthatch	pine forests	large dead & decaying pine	timber harvest of mature trees, salvage logging
Black-backed woodpecker	pine	snags and pine	removal of mature insect infested trees
Williamsons sapsucker	montane conifer forest	trees with advanced wood decay	removal of heartrot trees,snag removal,conversion to managed stands
Northern pygmy owl	mixed conifer/	snags	snag removal, depend on woodpecker species to excavate nest cavities
Grasshopper sparrow	open savannah	grasslands with limited shrubs	limited habitat, fire suppression, conversion to agriculture
Bank swallow	riparian	sand banks near open ground or water	general rarity, declining habitat quality

Table 18 - Williams Watershed Special Status Species Habitat			
SPECIES (COMMON NAME)	**HABITAT ASSOCIATION**	**SPECIAL HABITAT FEATURE**	**CONCERN**
Western pond turtle	riparian/uplands	marshes, sloughs ponds	alteration of aquatic and terrestrial nesting habitat,exotic species introduction
Del Norte salamander	mature/old growth	talus	declining habitat quality/quantity & fragmentation
Siskiyou mountain salamander	closed canopy forest	talus	declining habitat quality/quantity & fragmentation
Foothills yellow-legged frog	riparian	permanent streams with gravel bottoms	water diversions, impoundments, general declines in genus numbers
Red-legged frog	riparian	marshes,ponds & streams with limited flow	exotic species introduction loss of habitat from development
Tailed frog	riparian	cold fast flowing streams in wooded area	sedimentation and removal of riparian vegetation due to logging, grazing & road building
Clouded salamander	mature	snags & down logs	loss of large decaying wood due to timber harvest and habitat fragmentation
Variegated salamander	riparian	cold, clear seeps & springs	water diversions & sedimentation from roads & logging
Black salamander	generalists	down logs, talus	limited range, lack of data
Sharptail snake	valley bottoms low elevation	moist rotting logs	low elevation agricultural and development projects that remove/limit down wood
California mountain kingsnake	habitat generalists	habitat generalists	edge of range, general rarity, collectors
Common kingsnake	habitat generalists	habitat generalists	edge of range, general rarity, collectors
Northern sagebrush lizard	open brush stands	open forests or brush with open understory	edge of range, fire suppression

9. Threatened and Endangered Species Habitats

The only threatened and endangered animal species known to occur in the watershed is the northern spotted owl (Strix occidentalis caurina).

The amount of spotted owl habitat on federally administered lands (BLM and USFS) in the watershed is summarized in Table 19. This habitat was analyzed (Map 11) using the McKelvey Rating system (see Table 12) for explanation). The amount of suitable spotted owl habitat by drainage can be found in Table 19.

There are 3,911 acres of spotted owl nesting, roosting, and foraging habitat found on federal land

in the WAU (7.5 percent of watershed). The largest contiguous blocks are located in the Powell Creek, Rock Creek and Pipe Fork drainages. The remaining suitable habitat in the watershed is heavily fragmented with little occurring outside the LSR.

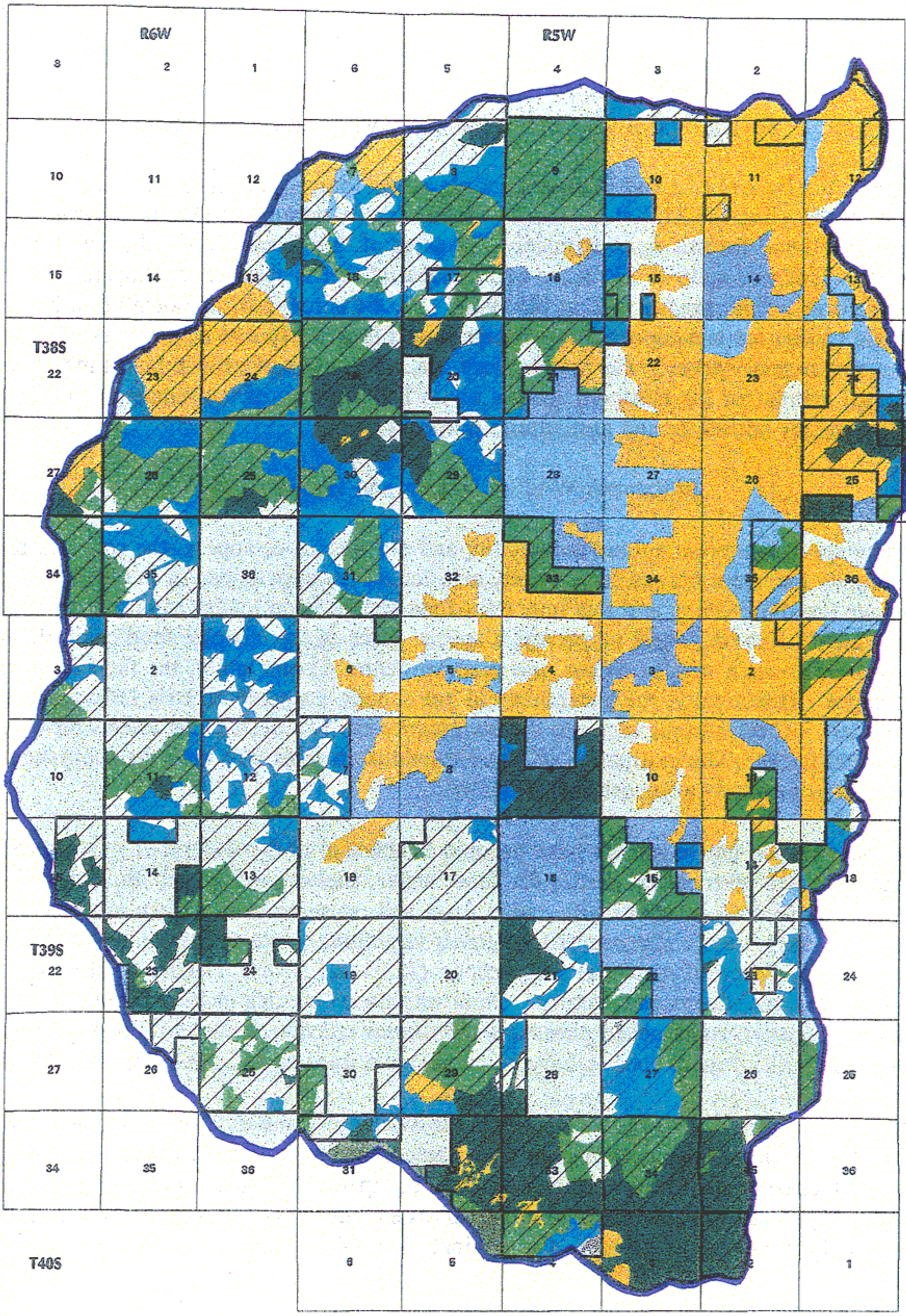
The Williams Creek WAU has 6,927 acres (13 percent) of spotted owl roosting and foraging habitat. The largest patches are found in the Powell Creek drainage. Patches of suitable roosting habitat on the eastern half of the watershed are naturally limited due to exposure. These areas should be maintained in their present conditions for dispersal into the Thompson Creek drainage.

Dispersal habitat for spotted owls is defined as stands that have a canopy closure of 40 percent or greater and are open enough in the understory to allow for flight. This habitat is scattered throughout the watershed but it is more limited on the eastern half of the watershed.

The majority of the Williams Creek WAU is composed of stands that currently do not meet the needs of late-successional forest-associated species but has the potential in the long term to become suitable spotted owl habitat. Approximately 7,573 acres (14.5 percent) of the watershed meets this criteria.

Two 100-acre core spotted owl areas have been established outside the late-successional reserve. Core areas are withdrawn from the timber base for the protection of specific owl sites. These core areas only apply to owl sites that have been active since 1985 and located prior to January 1, 1995.

Table 19 - Acres of Old-Growth, Mature, and Dispersal Habitat by Drainages on Lands Administered by the Federal Government			
DRAINAGE	**OLD-GROWTH (MCKELVEY #1)**	**MATURE (MCKELVEY #2)**	**DISPERSAL (MCKELVEY #3)**
Baltimore/China	511 Acres	337 Acres	175 Acres
Clapboard	87 Acres	513 Acres	197 Acres
Glade Fork	100 Acres	586 Acres	499 Acres
Lone Goodwin	75 Acres	180 Acres	819 Acres
Lower Williams	130 Acres	296 Acres	48 Acres
Pennington Creek	46 Acres	101 Acres	205 Acres
Pipe Fork	668 Acres	51 Acres	10 Acres
Powell Creek	473 Acres	1632 Acres	964 Acres
Right Hand Bill	231 Acres	422 Acres	1036 Acres
Right Hand West Fork	330 Acres	398 Acres	864 Acres
Rock Creek	823 Acres	552 Acres	660 Acres
West Fork	217 Acres	47 Acres	1118 Acres
Williams	124 Acres	556 Acres	101 Acres



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SPOTTED OWL HABITAT RATINGS
WILLIAMS WATERSHED

LEGEND

- NONVEG (Not Rated)
- (1) OPTIMAL
- (2) MEETS FORAGING, DISPERSAL, ROOSTING
- (3) MEETS NO REQUIREMENTS; HAS POTENTIAL TO BECOME 1 OR 2
- (4) MEETS NO REQUIREMENTS; NOT LIKELY TO BECOME 1 OR 2
- (5) DISPERSAL ONLY; HAS POTENTIAL TO BECOME 1 OR 2
- (6) DISPERSAL ONLY; NOT LIKELY TO BECOME 1 OR 2
- BLM LANDS
- WATERSHED BOUNDARY

JULY 12 1995

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10. Special Status Species Habitat on Private and County Lands

In 1995, the Bureau of Land Management classified forest types on private and county lands in the WAU using the McKelvey model. Nonfederally administered land is virtually void of late-successional forest. Approximately 422 acres of this forest remained at the time of analysis. There is another 175 acres of private land that is suitable roosting/foraging habitat. The majority of the private land in the WAU (10,064 acres) has the potential to become suitable habitat for late-successional species, but it is unlikely that landowners will choose to forgo commercial harvest. Currently, there are 3,873 acres of private land functioning as dispersal habitat for the Northern spotted owl. The majority of the remaining private land is being used for homesites and agricultural purposes.

11. Introduced Wildlife Species and Habitats

As new species enter an animal community and old species disappear, the role that remaining community members play is significantly effected. Fish populations in the Williams Creek drainage are diminishing and this important food source is no longer available for other community members. Each player has a special place in the intricate food chain that benefits the community as a whole. When new members enter a community, the food chain is set out of balance. Historically, the watershed did not contain Largemouth bass (Micropterus salmoides). Their introduction into the community has had deleterious effects on turtles, frogs, and ducks. The extirpation of historic wildlife species will limit the ecosystems capabability to return to its original condition.

A number of non-native species have become established in the watershed. Introduced exotic species compete with native species for food, water, shelter, and space. Bullfrogs (Rana catesbeiana) directly compete with native frogs and consume young Western pond turtles (Clemmys marmorata). Opossums (Dedelphis virginiana) have similar niches with our native striped skunk (Mephitis mephitis) and raccoon (Procoyon lotor). Opossums also consume young birds, amphibians and reptiles. Other introduced species include European starlings (Sturnus vulgaris), ring-necked pheasants (Phasianus colchicus), and wild turkeys (Meleagris gallopavo). All of these species have some negative impacts on native flora and fauna.

Increasing urbanization of the valley limits the availability and quality of habitat for wildlife. As the human population continues to grow, resources are further stretched. As the remaining oak/savannahs are further degraded, as riparian/wetland habitat is being drained of water, and as older forests continue to be harvested, these dwindling habitats become increasingly important to conserve the original biota of this area.

F. Habitats of Special Status and Survey and Manage Plants

A more homogenous landscape due to fire suppression has had negative affects on special status and survey and manage plants. A mosaic of habitats over a landscape not only promotes a diversity of wildlife species but also more diverse array of native plants.

As mentioned earlier, the habitat needs of the special status plants listed were open, dry, rocky areas with or without serpentine influenced soils. These areas are not in abundance in the watershed. Where they do exist, the current conditions, due to fire suppression, have increased the amount of brush dominating the understory. This increase in brush is out of the natural range of variation for these open areas which causes a reduction in special status plant habitat.

All three species of survey and manage plants are dependent upon fire for their existence and closed-canopy old-growth forest characteristics for their continued survival. As the herbaceous layer within forest stands fills in due to the elimination of low intensity fire, these species will not be able to compete effectively for available space. Continued harvesting of older forest stands will create canopy openings fragmenting the closed-canopy habitat thus discouraging population expansion. As this habitat decreases, the chances of survival for these three slow-growing species will dwindle. In fact, the ladyslipper is considered to be in danger of extinction due to a reduction in closed-canopy habitat (according to a species analysis done for the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl- ROD).

Another threat to native vegetation, in general, is the increasing spread of noxious weeds in the watershed. Plants, such as the star thistle, have invaded many of the pastures and are most commonly found along roadsides throughout the watershed. Noxious weeds are very effective competitors over native vegetation and can easily turn, for example, a once diverse grassland into a monoculture. Star thistle's main mode of transport is by vehicles along road corridors. It establishes itself readily along these road corridors as well as other types of disturbed areas.

G. Human Uses

The existing human population in the Williams WAU is **2,713** (1990 census data) and is growing at a rate of **8.8 percent** since 1980. This trend in population growth is expected to continue or increase. As more people build their homes in this valley, resources, such as water and valley floor habitats, will continue to be negatively impacted.

Commodities on federally administered land will become limited. As a result, the level of commodity extraction will be reduced.

The majority of BLM-managed lands in the WAU were in the commercial forest base under the previous forest plan. As a result, timber harvest on those lands reached an all time high in the 1980s. Under the current Medford District RMP, 66 percent of the BLM lands in the WAU are in

the late successional reserve (LSR) and available for only very limited timber harvest (ROD pages C-11 and 12). Lands that are designated as timber matrix lands make up 34 percent of the BLM-managed lands in the WAU. Of that 34 percent, 11 percent is withdrawn from the timber base due to its incapability to produce commercial forest. Timber stands have previously been entered for harvest on approximately 2,798 acres of matrix lands, leaving only 3,284 acres remaining for harvest entry at this time. Timber harvest on the remaining acres must retain, in most cases, at least 16 large trees per acre (in accordance with the guidelines of the ROD, page C-42). As a result of the above restrictions and guidelines, the timber harvested from BLM-managed lands will be substantially less than under the previous RMP.

In the 1990s, harvest levels from private lands in the WAU have been higher than past levels. These current levels are expected to continue. The remaining trees on the majority of private land are just now reaching a merchantable size after the first harvest entry in the 1940s and 1950s. We (the BLM) expect this timber to be harvested as soon as it reaches this merchantable stage.

1. Mining

As of November 18, 1994, there are approximately 55 placer claims located within the WAU. In general, these types of claims occur in places where gold can be obtained by washing an alluvial such as sand and gravel along waterways.

As of this same date, there are also approximately 55 lode, or hardrock, mining claims located within the WAU. A lode claim is generally found where valuable mineral deposits exist within solid rock, such as gold found at the contact point between quartz and slate. These lode deposits are normally mined by tunneling underground.

There are two millsite claims located within the watershed. Millsites are designated areas to be used or occupied only for mining or milling purposes in connection with an adjacent lode or placer claim. Millsites may only be located on lands that are nonmineral in character.

There is one tunnel site claim within the watershed. Tunnel site claims involve similar mining principles, however, the location of a tunnel site claim involves different locating, monumenting, and recording procedures.

New claim information, current status of existing claims, etc., is subject to periodic change. Mining claims may be delineated at any time and can be abandoned at any time when a claimant fails to pay the annual rental fees or complete the annual assessment work.

2. Active and Proposed Mining Operations

There has been seven BLM mining notices submitted for operations proposed on BLM lands within the WAU. Six of those notices involve dredging; one is a notice for operations at a lode claim. It is unknown how many casual use claims there are at present. No plans of operation

exist within the WAU at this time.

There are no mining notices or plans of operation filed on Forest Service lands within the watershed (see Appendix 4 for definitions of levels of mining activities on BLM and Forest Service land).

3. Road Density and Condition

Before settlement of the west, ground disturbances were mainly caused by animal trails and forces of nature. As the west developed, trails became narrow roads used to transport people and supplies. These roads were generally natural surface with the amount of sediment flow depending upon use, location, weather conditions, and soil type. As the use of these roads increased over the years, the roads themselves changed in design. Many of today's highways began as trails and are now widened, realigned, and surfaced to meet the change and increase in vehicular traffic. Even with the increase in traffic flow, crushed rock surfacing, asphalt, modern techniques in road stabilization, and improved road drainage have actually decreased sedimentation and erosion compared to the original natural surfaced roads.

Many of the roads in the Williams Watershed have been constructed based on the public's need for access. Some of these roads were built over lands that had little or no original disturbance and range in design from natural to asphalt surfaced.

Road construction and improvement across BLM managed lands was based mainly on timber management as directed under federal O&C land management. Many natural surfaced roads remained opened for administrative access after timber sales were completed. These roads are known to be major contributors to sediment flow creating higher turbidity levels in streams. All BLM roads in the Williams Watershed will be evaluated during the watershed analysis for present use, future needs, and environmental concerns to determine whether the road should be closed, improved, or remain as it exists.

There are currently 417.27 total road miles (Table 20) in the Williams WAU which equates to a total road density of approximately 5.14 miles of road per square mile.

The Williams Watershed varies in road density and type of roads within the drainage area. The average road density on BLM land in the Williams Watershed is 4.54 miles per square mile. The road density on federally-administered lands within the WAU should begin to decrease as a result of land allocations and guidelines issued in the current Medford District RMP and the Northwest Forest Plan ROD. The areas of high road density on BLM land within the Williams Watershed will be addressed and recommendations brought forth during the continued development of the Williams Watershed Analysis document.

The BLM has no authority over private land use. Many natural surfaced road systems are built over private lands and are a major source of erosion and sedimentation into streams. This is a

concern in the Williams Watershed and will require community involvement by private land owners to establish a policy on private land transportation management. On private land within the WAU, many of the existing roads have revegetated and are no longer useable. Increased timber harvest on these lands in the past five years has, however, re-established many of these overgrown roads. This trend is expected to continue as the remaining trees on private land grow to commercial size. Currently the road density on private land within the watershed is 5.80 miles of road per square mile.

The majority of the roads that are newly constructed or rebuilt on private lands will be a natural surface and their ground-disturbing activities will continue to cause problems with erosion and siltation in the local streams. Timber harvest on private land, for the most part, will be conducted using the most economical system (tractor yarding) thus increasing the erosion and siltation problem at least in the short term.

Table 20 - Road Information Generated from BLM Records

ROAD OWNERSHIP	SURFACE TYPE	MILES
BLM	PRR	29.80
BLM	GRR	02.85
BLM	NAT	44.01
BLM	ABC	20.26
BLM	ASC	68.44
BLM	BST	25.74
PRIVATE	UNK	226.17
Total Road Miles		417.27

LEGEND
PRR = Pit Run Rock
GRR = Grid Rolled Rock
NAT = Natural Surface
ABC = Aggregate Base Coarse
ASC = Aggregate Surface Coarse
BST = Bituminous Surface Treatment
UNK = Unknown/Various Types

4. Fire

The existing fire situation has been created by 70-80 years of successful fire suppression and by 100 years or more of forest management. The most common ignition source of naturally-occurring fires is lighting. However, with the arrival of people in the forest the number of successful ignitions has increased. The following definitions and tables describe the current fire situation in the Williams WAU.

Hazard--current condition of the fuel profile. Stated as low, moderate, or high based on vegetation condition, fuel continuity, aspect, position on slope, slope percents, access, etc.

Risk--ignition sources (human and lightning). Stated as low, moderate, or high based on historical lightning activity, human use such as residential and rural interface areas, recreation activity, and transportation routes. Includes land ownership and values at risk within the assessment area.

Ratings can be given for individual components of the assessment area (e.g. stands by serial stage, geographic areas within assessment area, etc.,) or for the assessment area as a whole. Information would be used for analysis in conjunction with data on areas of high value. This is done to identify an overall risk potential to resource loss from wildfire and to identify priority areas requiring efforts to minimize that potential for loss.

HIGH hazard areas are shown on Map 12 and Table 21. These areas constitute 28 percent of the total watershed. Fifty-one percent of BLM lands are classified as HIGH hazard. HIGH hazard areas are distributed throughout the watershed and many of these areas are on or adjacent to BLM in the rural interface area and within residential zones. Thirty-nine percent of the watershed is classified in LOW hazard. This figure includes the 6,764 acres of grassland and agricultural land. If these LOW hazard areas are subtracted, then only 26 percent of the watershed is in LOW hazard. Field work is needed to refine this classification in order to identify point the potential problem areas.

Table 21 - Hazard Classification in the Williams Watershed

OWNERSHIP 51,927 ACRES	HIGH HAZARD	MODERATE HAZARD	LOW HAZARD
BLM ACRES 26,951	13,613 51%	8,430 31%	4,908 18%
OTHER OWNERSHIP ACRES 24,976	1,060 4%	8,505 34%	15,411 62%
TOTAL ACRES PERCENT	14,673 28%	16,935 33%	20,319 39%

a. Risk

Risk areas are shown on Map 13 and Table 22. Assumptions used in assigning HIGH, MODERATE, and/or LOW status were ignition source (human-caused and lightning) and frequency.

Human risk is high in the populated areas. Lightning risk is moderate for the entire watershed.

Table 22 - Risk Classification in Williams Watershed			
OWNERSHIP 51,927 ACRES	**HIGH RISK**	**MODERATE RISK**	**LOW RISK**
BLM ACRES 26,951	4,511 17%	13,551 50%	8,889 33%
OTHER OWNERSHIP ACRES 24,976	15,992 64%	3,899 16%	5,085 20%
TOTAL ACRES PERCENT	20,503 39%	17,450 34%	13,974 27%

Human risk is high in the center and eastern half of the watershed which are mainly the valley floors and foothills within the watershed. Thirty-nine percent of the watershed is classified as HIGH risk. Due to the fact that fire burning upslope is more difficult to control, the potential for a large fire is higher than what may be expected by looking at the numbers. Risk will continue to increase as rural interface growth continues and will increase the percentage of area in the HIGH risk category.

b. Values at Risk

Values at risk are shown on Map 14 and Table 23. Assumptions used in assigning HIGH status are in four categories:

(1) Special Areas--Williams late successional reserve (LSR) and Provolt Seed Orchard are the only two areas identified.

(2) Silviculture Areas (young timber)--Stands with condition class 4 and 5 (age 0-5 and seedlings/saplings 0-5" dbh) were considered HIGH by silviculturists. These areas had a high susceptibility to stand replacement fires as well as the monetary investments previously made in the stands. Data was based on BLM classification.

(3) Wildlife Areas (mature timber)--Stands with condition class 7 and 8 (trees 11-21"dbh and mature timber 21" dbh+) and with McKelvey ratings of 1 and 2 were considered HIGH by wildlife biologists. This was due to the value of mature timber as habitat. Data was based on BLM classification. All the late successional reserve area was included as a HIGH value.

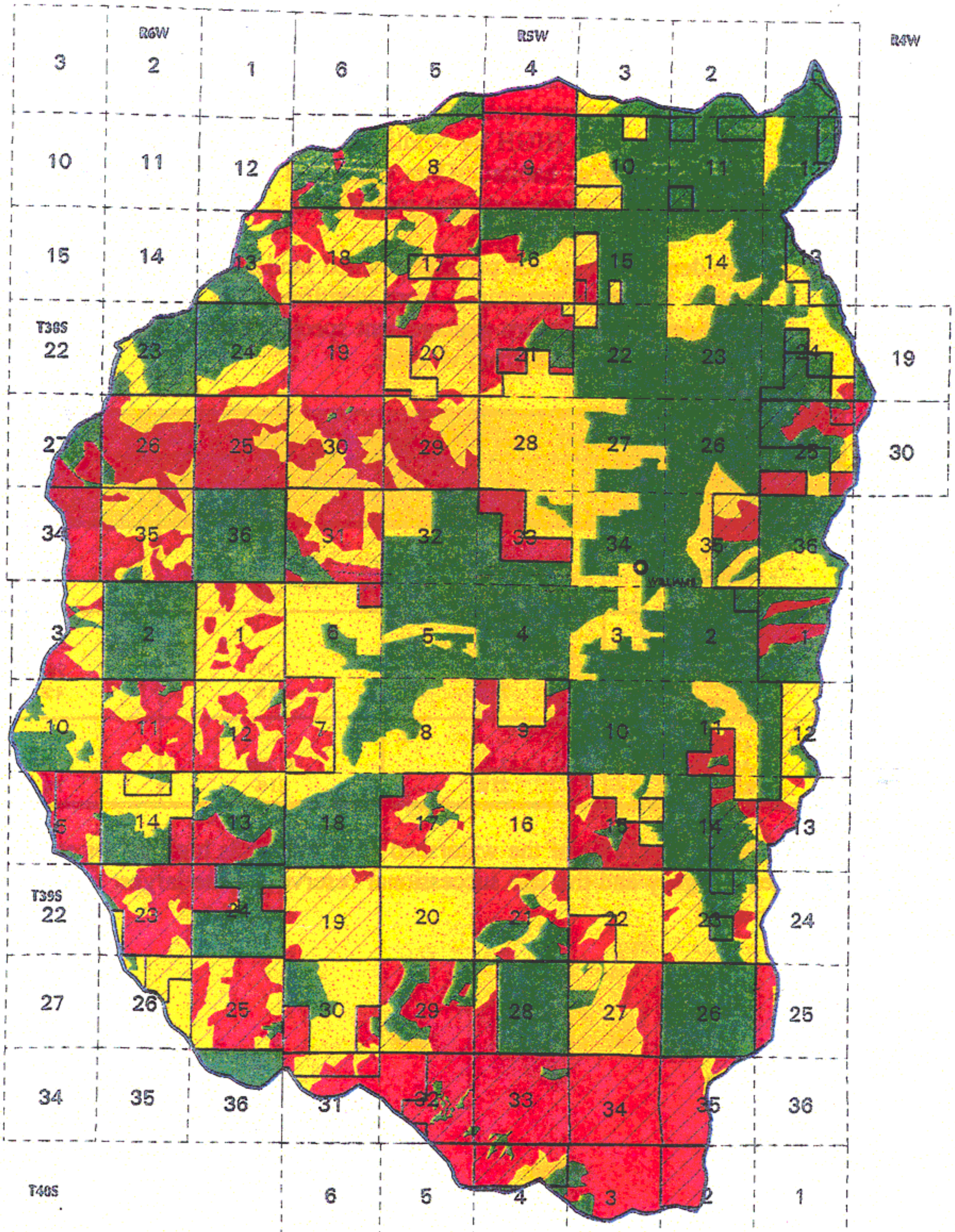
(4) Residential Areas--All privately-owned lands, especially those areas with homes and other structures, were identified from aerial photos and were considered, by

the fire management specialist, to have a HIGH value at risk due to potential loss from wildfire.

Table 23 - Value at Risk Classification, Williams Watershed

OWNERSHIP 51,927 ACRES	HIGH VALUE	MODERATE VALUE	LOW VALUE
BLM ACRES 26,951	19,038 70%	5,298 20%	2,615 10%
OTHER OWNERSHIP ACRES 24,976	18,188 73%	5,795 23%	993 4%
TOTAL ACRES PERCENT	37,226 72%	11,093 21%	3,608 7%

A total of 37,226 acres (72%) of the watershed is identified as high values at risk. The residential area category and the late successional reserve are the largest number of acres in the high value areas.



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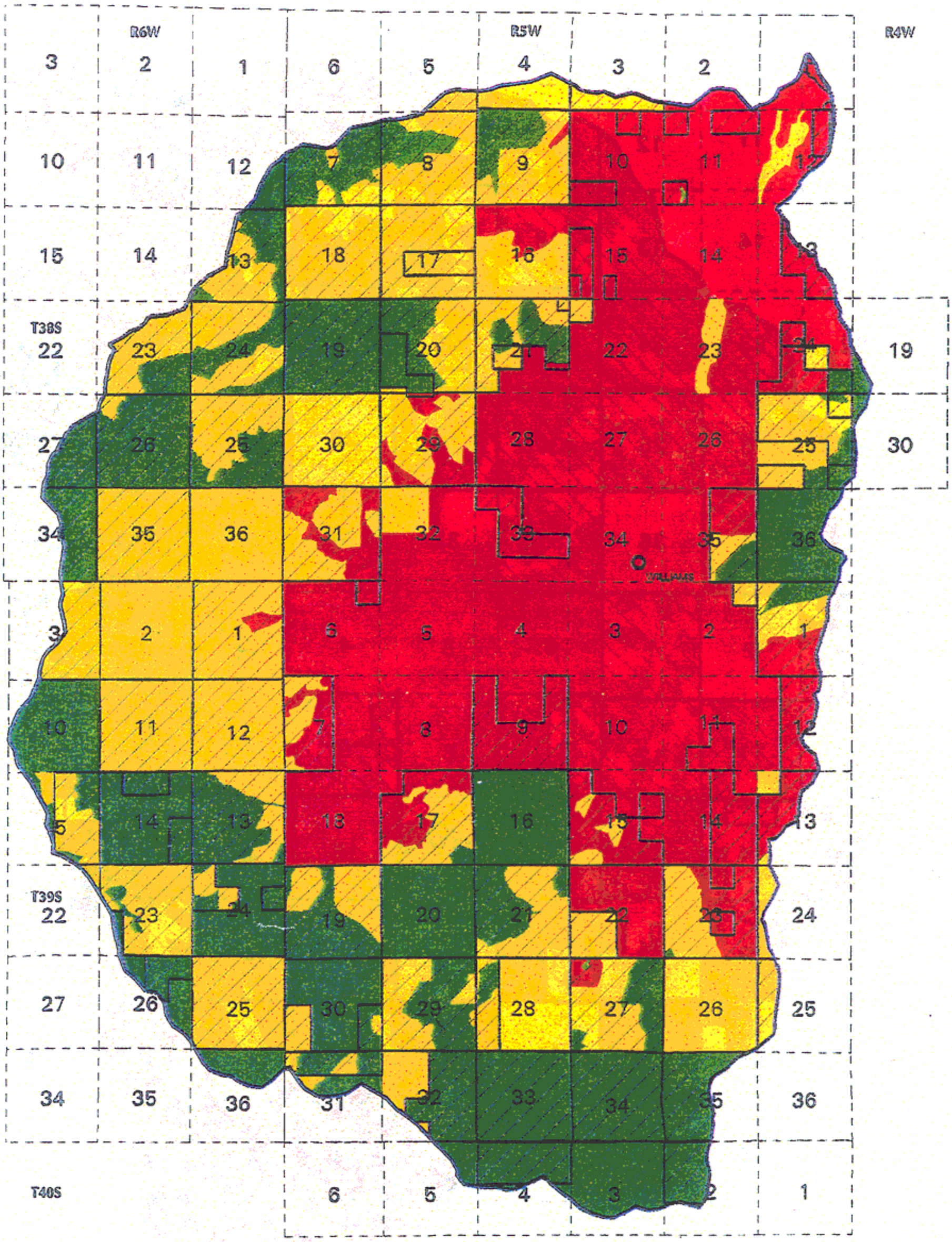
FIRE HAZARD RATING
WILLIAMS WATERSHED

January 30 1996

John McGlothlin

LEGEND

HIGH
LOW
WATERSHED BOUNDARY
MEDIUM
BLM LANDS



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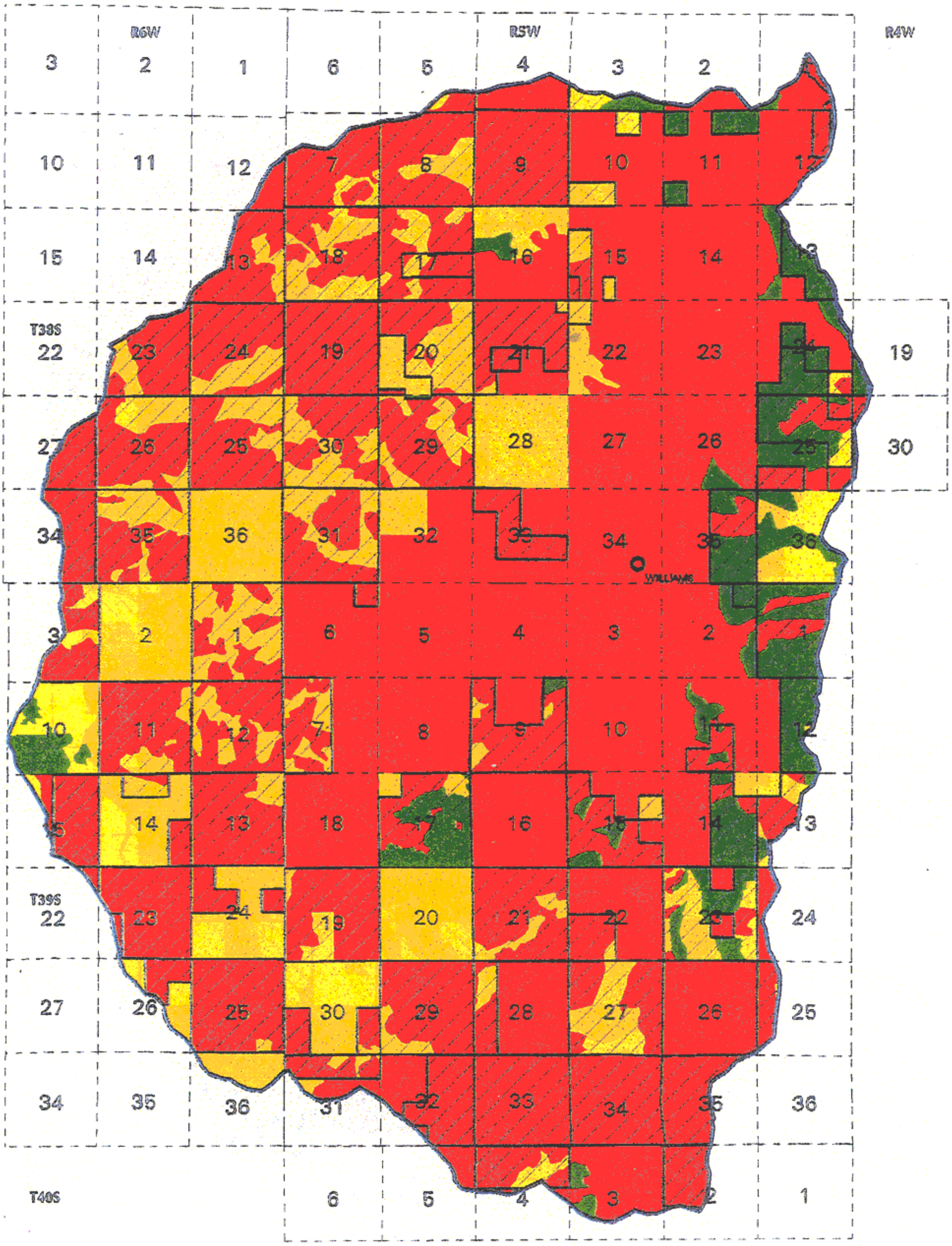
FIRE RISK RATING
WILLIAMS WATERSHED

LEGEND

HIGH
LOW
WATERSHED BOUNDARY
MEDIUM
BLM LANDS

January 30 1996

John McGlothlin



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VALUE-AT-RISK RATING
WILLIAMS WATERSHED

LEGEND

HIGH
LOW
WATERSHED BOUNDARY
MEDIUM
BLM LANDS

January 30 1996

John McGlothlin

c. Fire Concern Areas

Fire concern areas are those that classified as high in all three categories (risk, hazard, and value at risk). These are shown on Map 15 and Table 24. Only BLM-administered lands had areas classified as high in all three categories. This method identified areas of **immediate** concern. This does not mean that other areas do not require, or deserve, attention or investment in treatments that prevent or reduce the effects of fire.

Table 24 - Fire Concern Areas

OWNERSHIP 51,927 ACRES	HIGH CONCERN AREAS
BLM ACRES 26,951	
OTHER OWNERSHIP ACRES 24,976	
TOTAL ACRES PERCENT	

d. Fire Facilities

There are 10 pump chances within the entire watershed and one other within a mile of the watershed boundary. The distribution is not uniform. Reliable water sources are lacking in the southern and eastern portions of the watershed. The valley floors and foothills have only private sources available with few developed sites. There are two heliponds (Mungers Ridge and Low Divide) and a ODF Guard Station in Williams. A Remote Automated Weather Station (RAWS) is located at Provolt Seed Orchard.

5. General Description of Air Data Elements

Airshed class boundaries were established by the Oregon Smoke Management Plan (OSMP) as part of the State Implementation Plan (SIP) of the Clean Air Act. Class I areas include designated wilderness areas and Crater Lake National Park. Class I areas have visibility improvement plans which restrict burning during the summer period. Class II areas are all other areas. These areas follow the smoke management plan.

Special protection zones (SPZ) are those areas that incorporate the population centers of Grants Pass, Medford/Ashland, and Klamath Falls which are currently in violation of the national ambient air quality standards for PM 10. They are classified as nonattainment areas for this

pollutant. The zone is approximately a 20 mile radius from these urban areas. Additional restrictions on prescribed burning are imposed when air quality conditions reach "yellow" or "red" levels. The Grants Pass SPZ may no longer be in effect after 1995 if Oregon Department of Environmental Quality removes this designation due to the fact that Grants Pass is now meeting the required air quality standards.

Smoke and air quality issues and concerns, not covered by the Smoke Management Plan, could include rural towns, communities, or residents within or adjacent to the analysis area. Currently, coordination is lacking between Oregon and California in regard to smoke management impacts. This will need to be addressed for project planning impacts.

6. Special Forest Products

Special forest products are those materials that occur naturally in the forest and are sold by the BLM. These items cover a wide range of materials (Table 25): examples include firewood, mushrooms, and Christmas trees. Future use of these materials is expected to increase as new uses are developed for current materials and as new markets are developed for additional materials (Table 26).

R6W R5W R4W

T38S

T39S

T40S

WILLIAMS

SCALE 1:100000

FIRE CONCERN AREAS
WILLIAMS WATERSHED

LEGEND

HIGH FIRE CONCERN AREAS

BLM LANDS

WATERSHED BOUNDARY

January 30 1996

John McGlothlin

Table 25
Special Forest Products Known to be Harvested in Williams Watershed (based on BLM permit sales)

PRODUCTS	**VALUE**	DEMAND	**CURRENT SUPPLY**	**CURRENT SOURCE OF PRODUCT**	**POTENTIAL SUPPLY**	**POTENTIAL SOURCE OF PRODUCT**	**CURRENT MARKET**
FIREWOOD							
Commercial	MED	HIGH	LOW	Slash from timber sales.	MEDIUM	Hardwood thinning; larger-sized PCT material; slash from timber sales; standing hardwoods along roads; preharvesting timber sale units.	Williams and Grants Pass residents; Murphy and Grants Pass wholesalers.
Personal	MED	HIGH	LOW		MEDIUM		Williams residents.
POLES							
Commercial	MEDIUM	LOW	HIGH	Overstocked stands/understory thinning.	HIGH	Larger-sized DF PCT units; pre-harvesting commercial thinning units.	Grants Pass fence companies; White City, Central Point mills.
Personal	LOW	LOW	HIGH		HIGH		
HERBS							
Horsetail	LOW	LOW	MED	Along roads and cutbanks.	MED	Along roads and cutbanks.	Williams company processes for pharmaceutical use.
Usnea (lichen)	LOW	LOW	HIGH	Grows on trees and shrubs.	HIGH	Harvest from timber sale units.	
MANZANITA	LOW	MEDIUM	HIGH	Along roads; Serpentine areas; historically burned over areas.	HIGH	Same.	Floral, craft, and bird perch markets. Glendale wreath-making company.
BURLS							
Madrone	HIGH	MED/HI	MED/LOW	Matrix Lands. Very scattered.	MED	LSR Lands.	Selma and Grants Pass buyers; primarily exported.
Big Leaf Maple	HIGH	HIGH	LOW		LOW		
BOUGHS							
Port-Orford cedar	HIGH	HIGH	LOW	Younger trees along roads; Higher elevations; Williams Bough Stewardship Area.	MED	Plant decommissioned roads with bough species; manage for increased bough production; establish more stewardship programs.	Numerous buyers on the south coast; Glendale; Myrtle Creek. Mainly shipped to Washington State for processing, then to eastern U.S./overseas.
Shasta fir	HIGH	HIGH	LOW		LOW		
Incense cedar	MED/HIL	MED/HI	LOW/MED		MED		
White fir	OW	LOW	MED		MED		
Sugar and ponderosa pine	LOW	LOW	MED		MED		

Table 25
Special Forest Products Known to be Harvested in Williams Watershed (based on BLM permit sales)

PRODUCTS	**VALUE**	DEMAND	**CURRENT SUPPLY**	**CURRENT SOURCE OF PRODUCT**	**POTENTIAL SUPPLY**	**POTENTIAL SOURCE OF PRODUCT**	**CURRENT MARKET**
CHRISTMAS TREES							
Shasta fir	HIGH	HIGH	LOW	Trees within the road prism; trees outside of plantations; PCT projects.	LOW/MED	Plant decommissioned roads; culture overstocked units in stewardship programs.	Local residents for personal use; Local commercial sales; California markets.
White fir	MED	MED	MED		MED		
Douglas-fir	LOW	LOW	HIGH		HIGH		
Pine	LOW	LOW	MED		HIGH		
TRANSPLANTS							
Personal	LOW	LOW	HIGH	Small trees/plants within road prism or in clumps.	HIGH	Along roads; thin overstocked areas.	Local residents.
FLORAL GREENERY							
Beargrass	MED	HIGH	LOW	Understory vegetation.	MED	Locate and/or culture patches; Plant decommissioned roads; stewardship programs.	Local residents sell to coastal floral wholesalers.

Table 26
Potential Special Forest Products Known to Occur in WAU

PRODUCTS	USES	ACTIVE MARKETS EXIST (Y/N)	ESTIMATED SUPPLY
Lichen	dye/floral/pharm	Y	high
Mosses	craft/floral/pharm	Y	med
Fungi			
Boletus	food	Y	varies
Coral	food	Y	varies
Chanterelle	food	Y	varies
Picture conk	craft	Y	med
Herbs			
Arnica	pharm	Y	low
Ferns	floral/transplant	Y	med
Horsetail	floral/pharm	Y	med
Lomatium	pharm	N	low
Pearly everlasting	floral/transplant	Y	med
Spikenard	pharm	Y	med
St. John's wort	dye/pharm	Y	med
Vanilla leaf	floral/potpourri/transplant	Y	low
Yarrow	floral/pharm/transplant	Y	low
Yerba santa	pharm	Y	low
Trees/shrubs			
Blackcaps	food/transplant	N	med
Blueblossom ceanothus			
California hazel	floral	N	med
Chinquapin	floral	Y	med
Dogwood	floral/food/transplant	N	med
Elderberry	floral/transplant	Y	low
Huckleberry	food/pharm	Y	med/low
Jeffery pine	floral	Y	med
Live oak	cones	Y	low
Oceanspray	floral	Y	med
Oregon boxwood	floral	Y	high
Oregongrape	floral/transplant	Y	med
Prince's pine	floral/food	Y	med
Red alder	food	Y	low/med
Red currant	floral/woodcraft	Y	low/med
Thimbleberry	floral	Y	low
Vine maple	food/pharm	N	low/med
White oak	transplant/woodcraft	Y	med
Yew	floral/mushroom logs	Y	med
	fence post/pharm	Y	low

V. REFERENCE CONDITION

A. Vegetation

The vegetative conditions found in the watershed today differ in some ways from the historic conditions. Prior to Euro-American settlement in the mid to late 1800s, natural disturbances, primarily from fire, were common. Additionally, Native Americans were known to have used fire frequently to provide better habitat for some plants and animals. These disturbance patterns resulted in dynamic forest ecosystems that changed constantly over time. Disturbance has played a vital process role in providing for a diversity of vegetative types, structures, and for maintaining sustainable densities over time.

The disturbance patterns changed significantly with the advent of white settlement. Mining, ranching, settlement, fire suppression, timber harvest, and road building replaced wildfire as primary disturbance agents. These actions have not been evenly distributed across the landscape of the Williams Watershed.

At the turn of the century, the 1916 O&C land survey notes and field notes of the cadastral surveys were examined to try and assess vegetative conditions in the watershed. The 1916 O&C revestment surveys were done to determine the economic worth of the land at that time, how much timber volume was present, and how the land should be used. Every 40 acre piece of O&C land was surveyed to establish, correct and re-set township, range and section corners. When section corners were set, short notes were taken on the land form, soil, timber, and shrubs in the understory. Although some of the notes were difficult to comprehend they gave us clues as to what the general landscape looked liked at that time.

The landscape was in more of an open condition in 1916 than at the present time. In general, the trees were of larger diameters with less undergrowth. There were more sugar and ponderosa pines interspersed throughout most of the stands of timber.

Aerial photographs of the watershed in 1953 show that most of the private forest lands had recently been harvested which most likely occurred in the late 1940s and early 1950s, just after World War II. The tree size supported this, in that the private forest lands were predominantly covered by pole and large pole-sized stands in the 40-50 year age class.

B. Erosion Process/Hydrology/Stream Channel/Water Quality

The presettlement conditions in the Williams Valley consisted of many miles of streams that ran clear, cool water most of the year. Mountain streams such as Powell Creek, Mungers Creek, Rock Creek, and Lone Creek had riparian areas with lush vegetation that shaded the water and stabilized the banks. Since there were few roads or trails in the valley, the waters ran clear and the channel substrate was not embedded with sediments. Williams Creek, in the lower portion of the watershed, meandered through the valley bottom. This creek had a high sinuosity ratio with

lots of bends and turns. Farming had not begun so water was not diverted out of streams for irrigation purposes and, as a result, there was an abundant amount of water all year long. Williams Creek had a low width to depth ratio with an adequate flood plain and stable well-vegetated banks. High water, that would occur during the winter and spring, would efficiently transport sediments through the system and cause the stream to change its course. As the streams changed course, large conifers growing along the banks would fall into the streams becoming large woody debris. Most of the upland landscape was well-vegetated with mature species that shaded the snow pack so that more water was absorbed in the soil and less run-off occurred. The soil held the water longer, so it filtered slowly, leaving more water available during the summer months. Springs that are fed by the soil moisture were able to add more water to the stream systems as they were not tapped for domestic purposes.

C. Species and Habitats

A pre-European/Asian depiction of the Williams Creek Watershed was dramatically different from what one would see today. Native Americans were managing the landscape for the habitats and products they needed to survive. Fire was used extensively to burn-off undesirable vegetation, and to promote growth of desired species. Wildlife was extremely important to these people, not only for food, but for clothing and shelter. Human exploitation of wildlife resources was still at a recoverable level. Each species maintained its role in the intricate food chain where their presence benefitted the community as a whole. Large predator species, such as grizzly bear, and wolf (Canis lupus), were present in the watershed (Bailey, 1936). These, along with cougar (Felis concolor) and black bears, helped maintain the balance of species such as Roosevelt elk (Cervus elaphus) and black-tailed deer (Odocoileus hemionus). Predators species kept herbivores in balance with the amount of available vegetation. Predators species were also beneficial to other community members, like ground nesting birds, since they ate small to medium-sized mammals, such as the raccoon (Procyon lotor), which fed on the young birds. Carcasses were also made available in winter benefitting species anywhere from the striped skunk (Mephitis mephitis) to the black-capped chickadee (Parus atricapillus).

The landscape was open and the movement of animals was unrestricted. Many animals would migrate with the seasons to take advantage of food, shelter, and water. Black bears in the early spring sought green grass to activate their digestive systems. Winter kills that remained around were utilized by the bears at this time. During early summer, California ground-cone (Orobanche spp.) became an important part of the bear's diet until berries became available in the late summer or early fall. As fall approached, the salmon would return to the river, spawn and die. These dead salmon would provide an abundant food source for a host of consumers. Deer and elk also followed the seasons. Winter was primarily spent in the oak savannahs, but as the seasoned progress the deer and elk would enter the uplands until fall arrived. Other species, such as the wolverine (Gulo gulo luteus), remained at high elevation throughout the year. The wolverine is a opportunistic predator and feeds on animals such as porcupine (Erithizon dorsatum), as well as occasional winter kills.

1. Valley Floor

Historically, the valley floor was dominated by an open stand of large conifers and oak/grasslands kept free of brush due to fire. This habitat-type provided nesting habitat for various species, mast crops of acorns for wildlife forage, and big game winter range. A variety of bird species, such as acorn woodpeckers (Melanerpes formicivorus), western blue birds (Sialia mexicana), and the Lewis' woodpeckers (Melanerpes lewis), were intricately tied to these stands of trees. The open condition and the abundance of grass was highly beneficial to a number of game animals and ground nesting birds. These areas were utilized by deer and elk for forage and by valley quail (Callipepla californica) for nesting. In turn, game animals provided sustenance for a host of predator species. Grey foxes (Urocyon cinereoargenteus) primarily used the valley and nearby brushy slopes as their habitat.

2. Uplands

The area found above the valley floor was generally dominated by conifers. The east side of the watershed differed from the west, north, and south. The east side was dominated by species that tolerate dry conditions, such as Oregon white oak (Quercus garryana) and ponderosa pine (Pinus ponderosa). This portion of the watershed burned frequently, eliminating brush species and allowing for grass to dominate the herbaceous layer. Stands of conifers found on north facing slopes were usually composed of Douglas-fir (Pseudotsuga menziessii), sugar pine (Pinus lambertiana), and incense cedar (Calocedrus decurrens). These stands experienced replacement fires and were often devoid of large amounts of down woody material.

The other portions of the watershed retained more moisture then the east side and contained more diverse vegetation. This area was characterized by forest in various stages of stand development due to disturbance events, such as fire. The amount of old-growth forest found in the watershed is unknown, however, it was more common than today. Species that benefitted from these forests, like pileated woodpeckers (Dryocopus pileatus), northern flying squirrels (Glaucomys sabrinus), and red tree voles (Phenacomys longicaudus), were found in greater numbers than they are presently. Dispersal of animals, recolonization of former habitats, and pioneering into unoccupied territories, was accomplished more easily than it is today due the connectivity of the older forest stands. Species that benefitted from edge environments, like striped skunks (Mephitis mephitis), were less common in the uplands than they are today.

3. Riparian

Prior to the settlement of the valley, streams flowed pristine from their source to the Applegate River. Water quality was most likely extremely high. Seeps, springs, and snows all contributed to keeping the water cool. Due to the mature nature of most of the high-elevation forest, winter snowpack would remain for longer periods of time than they currently do. During the winter and spring, occasional floods would flush the system of sediment that was normally deposited from natural slides and erosion. Upland stream courses were primarily lined by conifers with a narrow

band of deciduous trees and generally had well-defined entrenched channels. As the streams dropped to the valley floor, wide flood plains developed and they began to meander taking on a variety of courses from year to year. This highly sinuous stream system consisted of undercut banks, oxbows, and had an accumulation of large woody material creating an extremely diverse aquatic system. Here, the riparian zone would also widen with deciduous trees playing a more important role than they did in the uplands. Conifers near the streams resisted burning allowing them to mature, becoming large woody material in the stream courses.

A myriad of wildlife species also added to the diversity. Beavers (Castor canadensis) acted as a keystone species creating backwater sloughs behind their dams and adding finer woody material to the stream. This fine material particularly benefitted fish providing them with hiding cover. Species such as ducks and geese also benefitted from the creation of ponds which provide nesting habitat.

The diversity of wildlife species was not restricted to the surface. Below the surface, a profusion of aquatic insects took advantage of the variety of available niches. These insects, in turn, supported a assortment of vertebrate species including anadromous fish. As the adult fish returned to their native streams their carcasses would produce a rich source of food for the valley. Minks (Mustela vision), American black bears (Ursus americanus), grizzly bears (Ursus arctos), bald eagles (Haliaeetus leucocephalus), and number of other scavenger species would benefit from this annual event.

One can only postulate what past occurrences of special status/survey and manage species of plants were since no historic records are available on these species. Dry, rocky areas would have been more open because of frequent, low intensity fires. In these areas, there was probably a higher diversity of herbaceous species, possibly plants that are now on the special status list were more prevalent in the vegetative composition of such habitats.

The Douglas-fir plant series was less prevalent in the past but was still the most common series on north facing slopes. Due to the frequency of fire and less canopy disturbance from timber harvesting, the survey and manage species now occurring in these habitats were probably more abundant. The complex life history of these plants probably prevented them from being a dominant species in the herbaceous layer. However, these plants probably occurred more frequently and with higher numbers of individuals in each population in the watershed.

Another postulation that could be made is that some species, now considered special status in other watersheds, may have existed on the valley floor in the Williams Watershed. For instance, such species as Lomatium cookii, which now exists only in two disjunct areas around Cave Junction and in the Rogue River Valley, could easily have existed in the watershed, especially before its valley bottom grassland habitat was reduced because of agriculture. This plant is proposed to be listed as endangered due to loss of habitat.

D. Human Uses

1. Social

Native Americans (Takelma and Athapaskan tribes) inhabited southwest Oregon at the time of contact. Takelma people occupied most of the Rogue Valley and the Athapaskans occupied lands from the coast to the Applegate River and Galice Creek. Though Athapaskan people were comparatively new arrivals to this area (arriving on the coast about 1500-1000 years earlier) those people who lived in the Williams Valley practiced a way of life similar to that of their Takelma neighbors.

The earliest accounts of Takelma Indians, as observed by visitors to southwest Oregon, occurred around the 1830s. They were seldom seen since they usually remained hidden in the mountains. The Takelma occasionally fired arrows at the white settlers, and their horses and mules, and sometimes rolled boulders down the hills into their camps.

The permanent winter shelter of the Takelma involved pine boards against a vertical pole frame of a semi-subterranean structure of a rectangular shape. In the summer, they traveled to fishing sites and berry picking locations at some distance from their permanent villages. Here they erected brush structures around a fire pit.

Athapaskan shelters were constructed by excavating a hole in the ground 12-16 feet square, and 4-5 feet deep. Boards or thatch were placed on top as a roof.

The subsistence of both the Takelma and Athapaskan Indians depended on acorns, camas bulbs, manzanita berries, fish, and deer. Important items were tanned hides, baskets, and stone and wood pipes. Other items included redheaded woodpecker scalps, dentalium shells, canoes, sinew-backed bows, and stone-tipped arrows.

The life ways of the Takelma and Athapaskan Indians drastically changed in the years between 1851-56 through their involvement in the Rogue Indian Wars. Both tribes were confronted by hundreds of hostile white miners. The attacks were repeated with the burning of villages, the raping of the tribal women, the destruction of their food resources, and the wanton massacre of Indians at the Table Rock Reservation. The Indians who survived the bloody conflicts were removed by the U.S. Army to the Siletz and Grand Ronde reservations in northwest Oregon.

2. White Exploration of the Pacific Northwest

European exploration of Oregon came first from the sea. The Spanish were the first to visit the north Pacific around 1542. Other voyages occurred thereafter by the Spanish, the British, the French, and the Russians. Between 1785 and 1820, there was a high interest in the fur resources in the Pacific Northwest. Fur traders came to southwest Oregon in 1792 and began trading off the mouth of the Umpqua River and near Cape Blanco.

Land based exploration began in the early 1800s. Lewis and Clark explored the area west of the

State of Missouri between 1804-1806 ending their travels at the mouth of the Columbia River on the Pacific Ocean.

John Jacob Astor sent parties by land and sea in 1810 to establish a permanent white settlement at the mouth of the Columbia. The settlement was established as a fur-trading post and subsequently named Astoria. During the war of 1812, Astor's fur-trading company was sold to the North West Company which merged in 1821 with the Hudson Bay Company. The entry of the Hudson Bay Company into the Oregon Territory in the 1820s, set the stage for land based explorations that would, within a few short years, penetrate southwest Oregon and draw that region's resources into the sphere of traders from distant places.

White pioneers began settling along the upper Rogue River in 1851. Prospectors from California crossed the Siskiyous and camped in the Illinois Valley. David "Coyote" Evans, Joel Perkins, and another man named Long established ferries at a crossing on the Rogue River between the valley and the mouth of the Applegate. Of this earliest settlement, A.G. Walling wrote in 1884: "Other than these, there were no houses or cabins between the South Umpqua and Yreka; or in other words, southwest Oregon was uninhabited by whites except for the few employees of the ferries and the transient travelers who might be upon the road, or rather trail, leading from California to the Columbia."

3. Early Claims to the Pacific Northwest

In the early nineteenth century, four international powers sought control of the Pacific Northwest: Spain, Russia, Great Britain, and the United States. By 1819 Spain relinquished all claims to the Pacific Northwest, and the Russians followed in 1824 by agreeing to stay in Alaska. Great Britain and the United States jointly occupied the area until 1846, when the present boundary was established at the forty-ninth parallel. Fortunately, the boundaries were established diplomatically with few disputes between the powers.

4. Nineteenth Century Development Including the Mining Frontier

The discovery of gold in the Sierra foothills of California in 1848 led to the expansion of several mining frontiers in the American West in subsequent years. The mineral resources of the Illinois Valley in Oregon were first discovered in 1851 and first mined in 1852. The new discovery launched several decades of intensive gold mining in southwestern Oregon. By 1853 miners were at work along the Applegate and Illinois Rivers, Galice Creek, and several smaller water courses in the Siskiyou Mountains.

Gold remained the cornerstone of mineral development in Josephine County. Mining began in the Applegate Valley, around Williams, very soon after the discovery of gold on Josephine Creek in 1852 and continued throughout the early 1900s. Historic mining districts within the Williams WAU are Powell Creek and Williams Creek.

The needs of the miners in the Rogue Valley in 1852-53 created a tremendous market for merchants eager to sell tools, clothing, food, liquor, and other commodities. Initially supplies flowed into the region from Scottsburg on the Umpqua River far to the north, or from Yreka in California to the south. By 1853, Crescent City was ready to become an important port of entry for the white population in the interior of southwest Oregon. In that year, the Cold Mountain Spring Trail was built from the Applegate River south to Kerbyville connecting with trails running north from Crescent City. By 1858, the route from Crescent City to Kerby and on to Jacksonville had become a wagon road. Tri-weekly stage service between Jacksonville and the Smith River also began in 1858.

In 1855 Camp Spencer was built near Williams Creek and the Applegate River. This camp was a temporary camp for the Oregon Mounties who volunteered during the Rogue River Indian War.

In 1859 the town of Williamsburg, now Williams, was founded. The town was named for Captain Robert Williams of the Oregon Volunteers. Williamsburg was a typical small mining village with stores, hotels, saloons, etc. The post office was established in 1860 and discontinued in 1861. When the town became Williams, a post office was formed there in 1881.

In 1872, Congress passed what is now known as the General Mining Law. This law, along with earlier less encompassing mining laws, formed the foundation for the rules and guidance of prospecting, development, occupancy, and finally patenting, of many mining areas in the west. This law, along with several amendments, is still in effect following several challenges in the courts and in Congress.

In the 1870s the Oregon and California Railroad was built from the south into the Rogue Valley reaching Grants Pass in the 1880s. Although "Yankees" and others of northern European stock seemed to be dominant in the region, the region's mining population was actually an assortment of different nationalities and races. A few of the place-names within the region echo the area's past ethnic diversity: French Gulch, Portuguese Creek, China Gulch.

5. Gold Mining

In the late 1850s, the Williams Valley caught up to the rest of the region experiencing rich gold strikes that drew a rush of miners and gave rise to the mining town of Williamsburg. Much of the soil that covered the alluvial flats was turned over, washed into sluice boxes, and deposited elsewhere. Large placer mines were operated in Bamboo and Ferris Gulch, which required large ditches and diverted water from Williams Creek to the operations (McKinley, 1995).

Another type of gold mining, lode mining, occurred at various locations in the Williams Watershed. Lode mining involves the extraction of gold bearing quartz and the pulverizing of the rock by an arrastra, or a rod or ball mill.

Over the past several decades gold mining has continued in various degrees in southwest Oregon.

The mining of gold in the Williams area today involves some hard rock mining and some placer mining on a small scale.

During WWII most gold mining was curtailed and most of the mines were shut down due to the of War Production Board Order L-208 (1942). In the early 1970's, the federal government allowed gold to be competitive on the free market. This accounted for the increase in the price of gold, in the late 1970s and early 1980s, which rocketed to around $800.00 an ounce resulting in quite an increase in mining activity. The price stabilized to near $400.00 later where it sits today.

There are several old ditches in the area that appear to have been tied to mining. Most are falling apart and no longer carry water, however a few continue in good enough condition to be used for irrigation.

6. Historical Fire Regimes

The historical fire regime of the Williams Watershed was dominated by a low-severity regime at the lower elevations and transitions into the moderate-severity regime at its higher elevations. The low-severity fire regime is characterized as frequent (1-25 years) fires of low intensity. The moderate-severity fire regime is characterized as less frequent (25-100 years) fires that are partial stand-replacement fires and includes significant areas of high and low severity (Agee, 1990).

a. Low-Severity Regime

Fires in a low-severity regime are associated with ecosystem stability, as the system is more stable in the presence of fire than in its absence (Agee, 1990). Frequent, low severity fires keep sites open so that they are less likely to burn intensely even under severe fire weather. With the advent of fire suppression, the pattern of frequent low-intensity fire ended. Dead and down fuel and understory vegetation are no longer periodically removed. This establishes a trend toward increasing the amount of available fuels present and a longer interval between fire occurrence. This, in turn, creates a situation for higher intensity, stand replacement fires rather than the historical stand maintenance fires.

b. Moderate-Severity Regime

Fires in a moderate-severity regime show a wide range of effects from high to low severity. The overall effect is a patchiness over the landscape as a whole. The individual stands will often consist of two or more age classes (Agee, 1990). Two and three-storied stands are a result of repeated low to moderate severity surface fires which produce multiple even-aged stories. The layered understory vegetation often contributes to the intensity of the fire. Waxy-leafed shrubs and trees can carry flames into the overstory creating a high-intensity fire. The exclusion of fire tends to increase the extent of high-intensity burned areas. Areas at highest elevations are in this regime, along with cool, moist aspects and locations.

c. Former Low-Severity Regime Areas

In Douglas-fir/hardwood forest shade tolerant and less fire resistant conifer and hardwood trees become established in both the overstory and understory. Douglas-fir increases producing a multilayered stand. The probability of stand replacement type of fire is much higher due to the fuel ladder created by the understory vegetation and woody debris buildup. This tendency for increasing fuel buildup over time is kept in relative equilibrium by the natural fire scenario. The stability of this vegetation pattern is not as great as the former because of lack of disturbance.

In the oak woodlands, once common on the dry sites and lowlands, fire exclusion has lead to massive conifer tree invasion. Conifer invasion produces a dense understory, replacing the formerly open oak understory. This creates a fuel ladder and high fire hazard. Over time, Douglas-fir will overtop Oregon white oak and the shade-intolerant mature oaks will die (Agee, 1993).

The transition between the oak woodlands and the Douglas-fir/hardwood forest was historically a Douglas-fir/ponderosa pine mixture. These areas were lower elevational bans and not very extensive. The exclusion of fire tends to eliminate the pine, due to overcrowding, causing increased competition for resources and shading. The pine component in these stands has been increasingly declining in the past decades. In addition, these stands were among the first to be harvested and converted to other uses by early settlers.

d. Former Moderate-Severity Regime Areas

Plant series within this historical regime consist of those at the higher elevations and cooler, moist sites within the watershed. These are mainly the tanoak and white fir series. The white fir plant series in the Williams Watershed is at the lower elevational range (Agee, 1993). Fire return intervals for white fir in the watershed most likely are typical of those recorded elsewhere in the Siskiyou Mountains, at a range of from 9-42 years (Agee, 1993). Frequent low-intensity fire maintains a cyclic stability in fuel loads and understory plant biomass. The low-flame length determines the future canopy dominants by selectively favoring a species, such as sugar pine and ponderosa pine, over white fir and incense cedar (the former being more resistant to fire when small). As the fire return interval increases, the proportion of white fir in the overstory increases. The decades of effective fire suppression are readily evident in stands in the white fir series. The pre-settlement tree dominants are still alive on these sites and the understories are typically thick carpets of white fir.

Tanoak stands are the result of frequent and moderate to high intensity surface fires. The build up of layered understory vegetation can contribute to high-intensity fires due to waxy-leafed shrubs and trees carrying flames into the overstory. Tanoak will sprout from the roots following intense fires. A solid canopy of tanoak will form. If Douglas-fir is mixed in with the stand, it will take up to 30 or more years to outgrow and dominate the tanoak. In older stands, when Douglas-fir begins to break-up, tanoak is established in the understory and released. Tanoak will also

release following partial cutting of the overstory Douglas-fir. Very high intensity fires or successive intense fires may result in nearly pure tanoak stands. These stands exist in small areas throughout the watershed where the series are found and are especially prevalent on south aspects.

VI. SYNTHESIS AND INTERPRETATION

A. Erosion Processes

Erosion underwent a dramatic increase from pre-European settlement levels to current conditions. This increase is directly related to the human extraction of commodities or land use. Mining initiated in the mid 1800s destabalized stream banks, removed vegetation and straightened stream channels all increasing erosions process. Timber harvest began near the same time and slowly increased until 1990. The operation required the construction of roads to harvest and remove the product. Timber harvest practices have improved through the years but impacts such as roads and clearcut harvest systems still dramatically increase erosion rates. The potential to recover this watershed to the reference conditions will be limited by existing roads, new roads, timber harvest, agricultural use, and future mining. Private timber lands are interspersed with the federal lands and many of the roads built by the BLM are used by private companies or individuals in management of their lands. As a result these roads cannot be decommissioned and will continue to increase erosion. Roads on private lands will probably continue to be managed under existing conditions which will also limit the system's ability to recover. BLM roads that are natural surface and are actively eroding can be decommissioned, closed, or surfaced to limit erosion problems. Harvest systems on federal land will be modified to leave green trees on the harvest areas which should reduce potential erosion problems. The recovery potential of the system will be some what limited by existing roads and by activities on private lands.

B. Hydrology

Timber harvest and road construction have modified the hydrology of this watershed. Harvest has removed canopy cover which moderated water run off, snow capture, and melt rates which resulted in lower peak flow and increased summer flows. Roads modify subsurface flow systems by diverting those flows to the surface and to other channels. Harvest on private lands is expected to continue to use clearcut methods. Existing roads will continue to alter subsurface flows. The potential of the Williams system to be rehabilitated to the reference condition will be limited by timber harvest and roads.

C. Vegetation

The trend in vegetative conditions in the Williams Watershed is an increasing density and a shift from historically dominant species to species that historically were found primarily in the understory. Ponderosa pine and sugar pine were far more prevalent and often dominated forests stands. Oak woodlands dominated the valley floor and dry lowland slopes. Douglas-fir and

tanoak are the dominant overstory species found in most of the Williams Watershed today.

The effects on the existing vegetative conditions from fire suppression and replacing the natural disturbance pattern with human disturbances, such as logging, farming, and settlement, have generated two areas of concern:

(1) Fire suppression has resulted in many of the forests in the watershed reaching very high densities that are not sustainable over time.

(2) The past harvesting patterns in the watershed, particularly on the private forest lands, have resulted in a predominance of the forests with 1-2 age and size classes.

The vegetative and structural conditions of the forests in the watershed have seldom been constant and have changed frequently with the historic disturbance patterns. Disturbance has played a vital role in providing a diversity of vegetative species and structure and for managing vegetation density over time. The presence of fire, insects, disease, periods of drought, and resultant tree mortality have always been components of these ecosystem processes but have occurred within a range of natural conditions. Maintaining vegetative diversity and densities that are sustainable over time are important terrestrial and riparian ecosystem processes that have been impacted by the shift from frequent, low intensity wildfire to human-related disturbances and fire suppression. When forest density, species composition, structure, insects, disease, catastrophic wildfire, and tree mortality occur outside the range of natural conditions, some component of the ecosystem processes has been impacted. This is the current trend for many of the forests in the Williams Watershed.

When forests remain at unsustainable densities for too long, a number of trends begin to occur that effect forest health. Species composition, relative density, percent live crown ratio, and radial growth are all indicators of how forests can be expected to respond to environmental stresses.

Forests of the Klamath Mountain Province are known for their rich species diversity. This diversity is not only an important habitat quality for plants and animals but also to the forest stands because they are much better able to withstand environmental stresses, such as drought, attacks by insects, and disease. Species, such as ponderosa and sugar pine, California black oak, and Pacific madrone have historically been important components of the forests of the Williams Watershed. These are considered mid-seral species and, to flourish, require the less dense, more open canopy conditions that existed in the forests of the watershed prior to fire suppression. As stand densities increase beyond the range of natural conditions, these species drop out and the forests become dominated by late-seral climax dominants, such as Douglas-fir at lower elevations and true fir at higher elevations. Forests composed of climax dominant species, as is the trend in the watershed, are more unstable and become increasingly vulnerable to environmental stresses.

Relative density is a measure of the density of a forest that compares the current density with the

biological maximum density. It is expressed in percent. The threshold of concern for relative density is 60 percent. When relative densities exceed 60 percent, tree mortality begins to occur from competition.

Percent live crown ratio and radial growth are physiological indicators of a tree's ability to produce food and defensive compounds. Healthy live crowns are essential for healthy trees. The threshold of concern for live crown ratio is 40 percent. When the average live crown ratios of forests drop much below 40 percent, the forest canopy's ability to support vital processes becomes diminished. Live crown ratios begin to recede as forests remain in an over-dense condition for too long. When live crown ratios are reduced too far, trees are unable to respond to the release and density thinning and partial cutting prescriptions may no longer be a forest management option. Similarly, radial growth rate is an indicator of whether trees have sufficient resources to support vital physiological processes. Low production of stem wood per unit of foliage has been associated with a tree's inability to accumulate reserves or to produce defensive compounds. Stem growth only occurs once the resource demands of foliage and root growth have been accommodated. When trees are not able to produce sufficient photosynthate and defensive compounds they become increasingly vulnerable to insect and disease attacks.

Periods of extended drought are not particularly harmful to trees if densities are maintained within the range of historic natural conditions or if trees are have well-developed root systems and canopies that capture sufficient sunlight so they can photosynthesize when conditions are suitable. The accelerated mortality occurring in the forests of southwestern Oregon during the recent drought period is a result of the over-dense conditions in the forests. Insect activity and population levels in the forests of southwestern Oregon, including the Grants Pass Resource Area, have shown a marked increase since 1989. Overstocking is probably the most predisposing factor to vulnerability to bark beetle attacks on most sites in the Williams Watershed.

The capability of the ecosystem to restore the Williams Watershed vegetation to natural conditions, as we understand them from the historical documents, is very limited and dangerous. Fire is the process that the system would uses to lower densities and clear out competing understory vegetation. Due to the high densities in the forest stands (live fuels), the high build up of dead and down fuels, the checkerboard ownership of private and government lands, and the residential rural interface it is impossible to allow the natural fire regime to control forest densities at this time. At the present time, a naturally occurring fire, such as one caused by lightning, would have a high potential to be an intense stand replacement fire.

1. Late-Successional Reserves

The Williams Watershed falls within the East Illinois Valley/Williams-Deer LSR. The LSR is managed to protect and enhance late-successional and old-growth forest ecosystems, which serve as habitat for associated species (including the northern spotted owl and marbled murrelet). Since the objective is to maintain a functional, interacting, late-successional and old-growth ecosystem, natural ecosystem processes such as low level disturbances will be maintained.

Late successional forests provide certain attributes that are often missing from early-successional and managed forests. These can include: large, live old-growth trees, snags, downed logs, woody material in streams, multiple-layered canopies, canopy gaps, and species diversity. A primary objective of this LSR is to protect these attributes where they presently exist and to manage for them where they currently do not exist.

Another important objective of LSRs is the connectivity they provide for a network of old-growth forest ecosystems. The East Illinois Valley/Williams-Deer LSR provides an important east-west tie from the Siskiyou Mountains to the Cascade Range.

A spotted owl density study area was established in the Williams-Deer portion of this LSR over five years ago. Intensive inventory and monitoring over that time has established that a viable population of spotted owls exists in the LSR. Maintaining this viable population is an important function of the LSR.

Direction from the ROD explains that any silvicultural manipulations proposed for LSRs have two principal objectives:

(1) The development of old-growth characteristics including snags, logs on the forest floor, large trees, and canopy gaps that enable establishment of multiple tree layers and diverse species composition; and

(2) The prevention of large-scale disturbances by fire, wind, insects, and diseases that would destroy or limit the ability of the reserves to sustain viable forest species populations.

While prevention of large-scale disturbance is a general objective listed in the ROD for all of the range of the northern spotted owl it is not always desirable in all ecosystems. Periodic large-scale disturbances have historically been a part of the ecosystems of the Siskiyou Mountains. Periodic large-scale disturbances often provide the diversity of habitat conditions that are necessary to maintain species viability.

Many acres of forest within the established LSRs are young stands created through past management practices. Silvicultural manipulation of these early-successional forests can accelerate the development of some of the structural and compositional features of late-successional forests. Direction in the ROD states that stand management inside of LSRs should focus on stands that have been regenerated following timber harvest.

2. Special and Unique Designations

A research natural area (RNA) of 518 acres has been designated at Pipe Fork Creek in the Williams Watershed (located in T. 39 S., R. 5 W., section 35 and T. 40 S., R. 6 W., section 2). This area is the site of the eastern-most population of Port-Orford cedar in Oregon. This area is

also free of the Port-Orford root fungus Phytophthera lateralis. It will serve as a baseline/research area for botanical and natural systems in the Port-Orford plant/Oregon grape and the Port-Orford cedar/salal communities. This area will be closed to timber harvest, off-highway vehicle use, and mineral entry.

Port-Orford cedar (POC) is the primary shade tolerant conifer species along many streams is northwestern California. It can regenerate under its own canopy providing stream shading and habitat for a number of wildlife species (Jimerson, 1994). In a study conducted by Jimerson and Creasy (1991), Port-Orford cedar appeared to have the highest species richness of the 5 primary vegetation series found in northwest California. In areas that have not had commodity production occur, stand age frequency shows a dominance by older stands (Jimmerson, 1994).

Phytophthera lateralis, a root fungus which kills POC is found in the Williams Watershed. It is an exotic species whose spores are carried by water. It is transported by animals, vehicles, people and along streams during wet weather. Although the pathogen is not threatening the viability of POC it has the potential to accelerate the death rate POC.

Grayback Glade RNA has also been designated in T. 39 S., R. 5. W., sections 28, 29, 32, 33 and T. 40 S., R. 5 W., section 4. This 1,069 acre is area set aside for baseline/research of white fir, Port-Orford cedar, and aquatic first order streams in the eastern Siskiyous. The RNA will be closed to timber harvest, off-highway vehicle use, and mineral entry. No surface disturbance will be allowed within 100 feet of the boundary.

RNAs are designated primarily with scientific and educational activities as the principal form of resource use for the short and long term. Management plans for both RNAs need to be written which will describe objectives essential to permitting natural processes to continue and to promote research and educational pursuits. The plans should include inventory and monitoring strategies for the areas. An important first step would be to complete a baseline inventory of resources for each area and to promote active research in the area through outreach to educational institutions.

D. Stream Channel

The segment of Williams Creek located in the alluvial valley was intensively mined in the mid 1800s straightening and probably moving the stream coarse from its original channel. Agricultural use since that time has kept the stream from regaining its sinuosity and reconnecting itself to the flood plain. Vegetation along the main stem of Williams Creek has also been maintained in an altered state as a result of agricultural use. This portion of Williams Creek will continue to have its recovery potential limited by residential and agricultural use and private ownership. Other smaller streams located on private forest lands have the potential to be at least partially rehabilitated under the Oregon Forest Practices Act. However, these streams will most likely never be allowed to accumulate large down wood to improve structure and dissipate flow energy. Smaller streams, located on federal lands, will have the potential to reach a level of

complete or near complete rehabilitation if they are managed under the aquatic conservation strategy (ACS). Streams located adjacent to existing roads that can not be closed will be limited in their recovery potential.

E. Water Quality

Water quality has been degraded from the reference condition by mining, timber harvest, road construction, agricultural use and residential development. The systems ability to fully recover will be limited by many of the above problems. As mentioned earlier many of the existing roads cannot be decommissioned or blocked due to existing needs and legal easements. Agriculture use will continue and probably show a downward trend. Residential use will most likely increase and occupy those agriculture lands being lost thus increasing water use from the ecosystem. Timber harvest on public lands will decrease under current forest plans as will road densities. However, logging will continue on private timberlands which will require high densities of natural surface roads. Timber harvest on many of the private lands will also continue to employ clearcut harvest systems which will continue to degrade water quality. Water quality in the Williams WAU can be partially rehabilitated, however, water quantity is currently below the existing needs and there is no solution to this problem.

F. Species and Habitats

The trend for species of concern varies with ownership and plant community. In general, habitats on private lands have undergone the most significant change from historic conditions. Public lands have undergone less of a dramatic change but are notably different from conditions found in presettlement times. Expected trends on private lands are nearly impossible to gauge, but there is a tendency for short term rotation on forest lands (60-80 years) and heavy use of most native grasslands, riparian, and oak woodlands for agriculture and homesites. Native plant communities such as grasslands, pine stands, oak savannahs, old-growth forest, and their associated animal communities should be considered at risk on private lands.

Trends for habitats found on federally-administered lands are determined by the Northwest Forest Plan. Broadly speaking the Williams WAU is composed of LSR, and matrix land. LSR comprises 38 percent of the watershed. Expected trend for the LSR is a gradual increase in forest with old-growth conditions. Ideally, as this area becomes older forest, stable populations of species requiring this forest type will also be established. The success of the reestablishment of population of old-growth associated species will depend on a species dispersal capability, the condition of habitat on matrix land, and the ownership pattern. Matrix land comprises 11 percent of the watershed. Matrix land will be primarily managed for timber extraction with a trend toward younger forests. Expected habitat trend for each plant community can be found in the following narrative. Table 27 shows the expected trend for species and habitat in the WAU.

The settlement of the WAU, and the subsequent division of land between the public and private ownership, has limited the ability of the federal agencies to restore historic conditions in the

WAU. Currently, the checkerboard ownership pattern of federal land and the limited federal control of some plant communities prohibits the recovery of species of concern without the private landowner's cooperation. This is particularly true for native grasslands, oak savannahs, and riparian habitats.

1. Riparian

The majority of low-gradient stream habitat found in the WAU is under private ownership. Expected trends for these areas are that they will remain static or decrease in quality due to increased human population and demand on resources. Quality of riparian habitat on federally-administered lands should increase under the new forest plans. Recovery of the aquatic biodiversity on these lands is limited due to the condition of private land in the WAU. Cooperative agreements of all parties within the WAU would be necessary to ensure a continued viable population of fish and wildlife.

2. Grasslands

Grassland habitat in the WAU primarily occurs on the valley floor, with the majority being under private control. Currently, this habitat is being used for agricultural purposes and has limited value for native wildlife. Expected trend for private grasslands is to remain static or slightly decrease in its current condition. This plant community and associated wildlife should be considered at risk in this watershed. The majority of federally administered grasslands have largely been ignored by the agencies. Current condition of these grasslands is expected to

continue to degrade in the near future until such time that the agencies begin to manage these areas.

3. Brush

Brush (chaparral) is primarily located on south facing slopes and the eastside of the watershed. Brush communities are seen by most private landowners as undesirable and often removed. The trend for private land is for the quantity of brush stands to remain static. Fire suppression on federally-managed lands has led most brush stands to become senescent. The trend for this habitat type on these lands is a decrease until a management strategy has been developed for these sites.

4. Pine Habitat

Mature pine habitat on private lands has largely been harvested. Expected trend is for continued harvesting of this habitat on a short term rotation basis. Fire suppression on federally-managed lands has led to an increase in fire intolerant species that directly compete with pines. The majority of pine habitat found in the timber base has been harvested. The remaining pine habitat, located on land withdrawn from the timber base, has largely been ignored. The expected trend

for federal managed land is an increase in mature pine habitat in the LSR. Pine habitat found outside the LSR will be continue to be available for timber harvest. Pine habitat found on withdrawn land will continue to degrade in quality until a management strategy has been developed.

5. Oak Woodlands

Oak woodlands within the watershed are disappearing more rapidly than they are regenerating. The precise amount of this habitat type that was historically found in the WAU is unknown but current quantity of this habitat is thought to be a fraction of what historically occurred. Expected trends on private lands for oak woodlands is expected to remain static or decline. The majority of federally-controlled oak woodland is found on land withdrawn from the timber base and largely remain unmanaged. Natural disturbance, such as fire, has been reduced and, therefore, many of these stands are in poor condition. The expected trend is for further habitat degradation until these problems can be addressed with a management strategy.

6. Old-Growth Forest

Old-growth forest on private land is virtually nonexistent in this watershed. Due to short rotation period of privately-managed forest lands, the expected trend is for any remaining older forest to be harvested. Federally-administered old-growth forest is expected to recover in the LSR. Old-growth associated species should recover in the LSR in the long term. Quantity and quality of old-growth forest in matrix land is expected to decrease.

7. Species

Recovery of native biodiversity on federally-owned land is limited by availability of a species to repopulate habitat and land ownership patterns. Species extirpated from the watershed, such as grizzly bears and wolves, have no local populations to reintroduce themselves regardless of habitat quality. Currently Oregon is not included in the recovery plans for these two species. Species such as the wolverine that have remnant populations in the province may have the ability to recover in this watershed but, due to the checkerboard ownership pattern, the federal government has limited options at supplying the remote habitat these species require. The expected trend for the remaining sensitive species can be found in the following table.

Table 27 - Expected Habitat Trend for Special Status Species on Federal Land

COMMON NAME	HABITAT	EXPECTED HABITAT TREND
Gray wolf	generalist, prefers remote tracts of land	increase habitat if target road density for the williams big-game area is met.
White-footed vole	riparian alder/ small streams	increase in habitat as riparian areas recover from past disturbance.
Red tree vole	mature conifer forest	increase as forest within late-successional reserve matures.

Table 27 - Expected Habitat Trend for Special Status Species on Federal Land		
COMMON NAME	**HABITAT**	**EXPECTED HABITAT TREND**
California red tree vole	mature conifer forest	increase as forest within late-successional reserve matures.
Fisher	mature conifer forest	increase as forest within late-successional reserve matures.
California wolverine	remote/high elevation forest	increase habitat if target road density for the williams big-game area is met.
American marten	mature conifer forest	increase as forest within late-successional reserve matures.
Ringtail	rocky bluffs, caves and mines	possible decrease in habitat as hard rock mines/quarries reopen.
Peregrine falcon	remote rock bluffs	possible decrease in habitat as hard rock mines/quarries reopen
Bald eagle	riparian/mature conifer forest	increase as forest within late-successional reserve matures.
Northern spotted owl	mature conifer forest	increase as forest within late-successional reserve matures.
Marbled murrelet	mature conifer forest	increase as forest within late-successional reserve matures.
Northern goshawk	mature conifer forest	increase as forest within late-successional reserve matures.
Mountain quail	generalist	lose of foraging areas as forest within late-successional reserve matures.
Pileated woodpecker	mature conifer forest/ snags	increase as forest within late-successional reserve matures.
Lewis' woodpecker	oak woodlands	decrease until lands managed
White-headed woodpecker	high elevation mature conifer forest	increase as forest within late-successional reserve matures
Flammulated owl	mature ponderosa pine/mature douglas- fir forest	increase in mature forest within late-successional reserve / possible decrease in mature pine forest unless disturbances such a fire reintroduced.
Purple martin	forage in open areas near water/cavity nesters	increase as riparian areas recover and forest mature
Great gray owl	mature forest for nesting/meadows & open ground for foraging	possible decrease in foraging habitat as young stands mature / increase in nesting habitat as forest mature.
Western bluebird	meadows/open areas	decrease as clearcuts recover
Acorn woodpecker	oak woodlands	decrease until management strategy developed
Tricolored blackbird	riparian habitat/cattails	stable
Black-backed woodpecker	high elevation mature conifer forest	increase as forest within late-successional reserve matures
Northern pygmy owl	conifer forest/snags	increase as forest within late-successional reserve matures
Grasshopper sparrow	open savannah	decrease until management strategy developed for savannah habitat
Bank swallow	riparian	increase as riparian habitat recovers
Townsend's big-eared bat	mine adit/caves	stable
Fringed myotis	rock crevices/snags	increase as forest within late-successional reserve matures

Table 27 - Expected Habitat Trend for Special Status Species on Federal Land		
COMMON NAME	**HABITAT**	**EXPECTED HABITAT TREND**
Silver-haired bat	conifer forest	increase as forest within late-successional reserve matures
Yuma myotis	large trees/snags	increase as forest within late-successional reserve matures
Long-eared myotis	large trees/snags	increase as forest within late-successional reserve matures
Hairy-winged myotis	large trees/snags	increase as forest within late-successional reserve matures
Pacific pallid bat	large trees/snags/rock crevices	increase as forest within late-successional reserve matures
Western pond turtle	riparian/uplands	increase as riparian habitat recovers
Del Norte salamander	mature forest/talus slopes	stable
Foothills yellow-legged frog	riparian/permanent flowing streams	increase as riparian habitat recovers
Red-legged frog	riparian/slow backwaters	increase as riparian habitat recovers
Clouded salamander	mature forest/snags/down logs	increase as forest within late-successional reserve matures
Southern torrent salamander (variegated salamander)	riparian/cold permanent seeps/streams	increase as riparian habitat recovers
Black salamander	talus/down logs	increase as forest within late-successional reserve matures
Sharptail snake	valley bottom	stable
California mountain kingsnake	generalist	stable
Common kingsnake	generalist	stable
Northern sagebrush lizard	open brush stands	stable
Tailed frog	riparian/mature forest	increase as riparian habitat recovers

G. Aquatics

1. Stream and Riparian

The future trend in aquatic habitat conditions in the Williams Creek Watershed will be influenced by three major factors: the successional stage of vegetation in riparian transition zones; the amount of stream flow between early summer and fall; and the rate and magnitude of sediment delivery. Expected habitat trend in each of the watershed's fishery streams will vary with ownership.

Some landowners may invest considerable effort to reforest stream side areas. Stream and riparian habitat on most private forest and agricultural lands will not improve on a subwatershed scale without strong incentives for landowners to restore and protect these habitats over the long term. The trend is for the quality of stream and riparian habitat on private land to decrease as logging continues in previously unentered or lightly harvested timber stands.

Revised state forest practice rules probably will not maintain or reduce stream temperatures because they allow extensive timber harvesting as close as 20 feet from fish-bearing streams. There are no setback or shade requirements on class 3 and 4 streams on private or state land. A no-cut 75 foot buffer strip is necessary in most cases to maintain or lower water temperatures. In addition, largest diameter conifers (often with the fullest canopy and best potential for shading) between 20 and 75 feet from streams will probably be cut when they reach commercial size.

The amount of coarse woody material in streams on private land that has been harvested will diminish due to natural processes or salvage. It will not be replaced to any appreciable degree because largest conifers in riparian transition zones will be logged when they reach commercial size.

Roads on private woodlands and commercial forest land will be primarily covered by natural surfaces with inadequate drainage. Tractor yarding will continue to be the most frequently used yarding method, even on steep slopes. Water bars will often be ineffective.

Riparian conditions, as well as the recruitment of large woody material to streams, will improve on public land as the BLM and USFS implement projects under the ACS.

The BLM and USFS will undertake watershed restoration projects to reduce sediment sources.

Seventy percent of the fish habitat, class 3 and 4 stream miles, and the acreage in any subwatershed, must be managed under ACS objectives before we can expect stream sedimentation and water temperatures to decrease. The 70 percent level is in the professional opinion of the resource area fisheries biologist and is not based on scientific research.

Boulders and rubble, rather than large wood, play the major role in creating fish habitat in larger streams (i.e., >3rd order) when stream gradient exceeds 5 percent. However, large woody material continues to be important in the steeper class 3 and 4 streams to dissipate stream energy (i.e., forming a stepped channel profile), controlling the movement of sediment and small organic matter, and providing habitat for amphibians. Its also important as downed wood in the riparian transition zone.

Irrigation water diversions will continue to limit quality and quantity of habitat for fish and other aquatic species.

2. Riparian Condition and Stream Water Temperature

Age and structural diversity of vegetation in streamside areas on public land will increase in response to BLM and USFS actions that meet ACS objectives in riparian reserves. Stream shade and coarse woody material will also increase. Water temperatures will decrease over time from class 3 streams on public lands. Temperatures may not decrease substantially over time because of private land ownership in the lowlands. Water temperatures on private lands are dependent

upon the rate of riparian regeneration. Tree growth in the riparian areas on private lands is not anticipated to recover at a fast rate.

The legacy of historic mining and land clearing near streams on the lower river and water diversions will also prevent any appreciable decline in river temperature. Water temperatures in the lower 10 miles of Williams Creek are expected to remain above optimum for salmonids, some amphibians, and aquatic macroinvertebrates, regardless of the water year because water rights are over-appropriated.

In the **desired future condition**, the riparian zones would be in proper functioning condition. In other words, they would support a diversity of native plants, provide for streambank stability, provide shade to maintain water temperature, provide connectivity to other habitats, and support healthy populations of native plant and animal species. Microclimate and ecological conditions found in unmanaged systems would be restored and maintained. Eighty percent stream shading or maximum site potential should be achieved. Average daily maximum water temperature during July and August at the mouth of Williams Creek would not exceed 60 degrees F.

3. Coarse Woody Material

The greatest potential for improvement in complexity of fish habitat on a small watershed scale (smaller than a subwatershed) over the long term will be on federally-owned lands. All streams on public land will become more effective at dissipating stream flow energy, scouring pools, providing complex habitat for fish, amphibians, and invertebrates, and will be more retentive of organic detritus.

Class 3 and 4 streams on forested private land may become less capable of controlling movement of sediment and fine organic material and providing habitat for amphibians because the amount of coarse woody material will decrease over time. It will probably never recover to premanagement conditions without substantial improvements to current state forest practice rules. Riparian transition zones will remain in early and mid successional stages on private lands.

In the **desired future condition**, large woody material in streams would be well distributed and abundant, forming frequent pools and providing complex cover for aquatic organisms in both winter and summer. It may be appropriate to adopt the standard for Columbia River Basin streams east of the Cascades (Chen 1994) on an interim basis because there currently are no standards for interior southwest Oregon. It is expected that ODFW will develop them in the near future from a rapidly growing stream survey database for this region.

Proposed interim standards for good habitat:
At least 20 key pieces per mile ($\geq$24 in. diameter and at least twice the bankfull width).

4. Sedimentation

Stream sedimentation is expected to decrease in class 3 and 4 streams on federally-owned lands if there is full implementation of the ACS in all watershed restoration activities (assuming new activities will not contribute to existing sedimentation problems). However, there may not be an appreciable change in the amount of sediment deposition in class 1 and 2 streams if road construction standards and tractor logging practices do not substantially improve on private lands. Many roads and tractor skid roads on private lands do not receive regular maintenance nor are most of them designed with adequate drainage or erosion control features. These problems are expected to continue unless more restrictive state and county laws are created and enforced. Sediment from these areas can be expected to adversely impact streams on public and other private lands downstream.

In the **desired future condition**, erosion and sedimentation would be in balance with stream transport capacity, resulting in pools with good depth and cover and less than 20 percent embeddedness of riffle substrate.

5. Stream Flow

Intensity and frequency of peak flows, if they have occurred as a result of management activities, will diminish as vegetation grows in previously harvested areas, and as road mileage is reduced to meet objectives of the ACS. Potential indirect adverse effects of altered peak flows on salmonid reproduction would diminish. This assumes that timber harvest on private land will continue at no greater than the present rate and that new road construction on private land will not offset efforts to reduce road mileage on public lands.

Water diversions will continue to compound problems caused by drought by limiting the quality and quantity of habitat for aquatic life.

The **desired future condition** is to maintain, or return to, natural streamflow quantity from April through October. Remove all barriers to juvenile salmonids. All culverts on streams with gradients of 3 percent or better should have a natural streambed and no pool below the culvert. This is an important criteria for maintaining juvenile salmonid migrations under varying physiological conditions.

6. Aquatic Species

Williams Creek summer steelhead and coho salmon are at moderate and high risk of extinction, respectively (FSEIS 1994). Implementation of the ACS on public land will improve watershed health. However, potential for recovery of anadromous fish habitat is only fair, even though about 53.5 percent of the watershed is in federal ownership. Current resource management practices on private lands and water diversions, which are beyond the scope of the ACS, will continue to limit potential for recovery of salmon and steelhead habitat and populations. The ACS must be applied equally across all ownerships to achieve potential for recovery of at-risk

fish stocks. In addition, innovative ways must be found to fully restore natural flows to the **river** during summer.

Fewer sediment and temperature tolerant aquatic insect taxa will be present in class 3 and 4 streams as watershed conditions improve. Collector-dominated communities in these small streams would gradually shift to scrapers and shredders as canopy closure and the conifer component increases. Composition of aquatic macroinvertebrate communities in the **river** and in most other fish habitat will probably remain much as it is. Private lands represent about 47 percent of the watershed and fish habitat will continue to be managed intensively for wood production and livestock pasture.

Populations of the foothill and tailed frogs will probably increase in response to less sediment and cooler water temperatures. However, positive habitat changes for these animals may take decades.

Factors outside the watershed that will continue to influence escapement of anadromous fish to the watershed include ocean productivity, recreational and commercial harvest, predation in the ocean and freshwater, habitat changes due to human developments in floodplains, and migration and rearing conditions in the Rogue and Applegate rivers. Equal effort must be given to correcting human-related factors that limit fish survival in freshwater and marine environments. Habitat for Pacific lamprey in the middle and lower Rogue River is expected to remain stable at moderate to poor condition.

The **desired future condition** for the Williams Creek Watershed is to be a functioning ecosystem, sustaining healthy populations of anadromous and resident fishes, amphibians, and aquatic invertebrates. Benthic macroinvertebrate bioassessment scores for riffle, margin, and detritus habitats would be 70-80 percent of potential in the lower and middle Rogue River and over 90 percent of potential in other streams (Wisseman 1995a).

A sustainable and functioning ecosystem in the Williams Creek Watershed will require that the ACS be applied equally across all ownerships and that anadromous fish populations and habitats are properly managed beyond borders of the watershed. Restoring a natural streamflow regime during summer is also crucial for recovery of the aquatic ecosystem.

7. Special Status/Survey and Manage Plant Species and Habitats

If the current processes dominating the landscape continue in the Williams Watershed, the chance of reducing special status and survey and manage plant populations is possible. These reductions will be occur due to the continued lack of fire in the ecosystem, a continued reduction in closed canopy Douglas-fir forests outside the LSR and continued unchecked spread and introduction of noxious weeds into the watershed.

The continued increase in domination of brush in once open, rocky areas will eventually reduce the rare plants in this habitat. Management of these brushfields may enhance population numbers for the special status plants that exist there.

It appears with fire suppression and continued timber harvesting, the trend in forested communities in the watershed is toward a reduction in overall canopy closure and an increase in fuels and herbaceous layer coverage. Such trends could negatively impact the amount of habitat available for survey and manage species. It is important, therefore, to actively manage for Cypripedium and Allotropa virgata habitat. In the case of these species, mitigation measures proposed during timber harvest activities include survey for and protection of all known populations. This mitigation includes both protection from ground disturbing activities, such as skidding or tree felling, and the management of canopy closure to provide at least 60 percent canopy closure (in the case of the Ladyslippers only). Specific protocols for the plants are currently being prepared by the Regional Ecosystem Office which may require even more stringent mitigation methods. The protocols will include criteria for establishing a prescribed burning program.

Closed canopy Douglas-fir forests should increase under the current management guidelines within the boundaries of the LSR. Increased closed-canopy forest coupled with frequent low intensity underburns, could increase the available habitat for Cypripedium and Allotropa virgata.

The role of fire in the health of these species is likely to have been important in their distribution and abundance but fire effects studies are lacking. There is a good opportunity for developing studies in the Williams Watershed, especially with Cypripedium fasciculatum, which is found in more locations. Before this can be done, though, more thorough surveys of the watershed must take place in order to locate populations large enough to perform such studies. Research was encouraged to be performed in adaptive management areas in the supplemental environmental impact statement (SEIS). Any active management program should also include a prescribed burning program.

Monitoring information on whether mitigation measures implemented for timber sales are working to protect these species is needed. A formal monitoring program needs to be established to follow trends in Cypripedium populations subjected to timber sales versus those left in untouched.

In order to reverse the trend in increasing noxious weed infestations, the location and extent of noxious weeds in the Williams Creek Watershed must be documented. There is general knowledge regarding which species are a problem in the watershed but none have been mapped and identified for future eradication projects. Eradication efforts could be done through contract or through such programs as Jobs in the Woods when effective methods are known. Research should be initiated on those species without known eradication methods to determine the most effective treatments.

Monitoring strategies for monitoring the success of eradication efforts will also need to be initiated.

Another means of reducing the influx of noxious weeds is to consider this threat when planning all ground disturbing activities, especially road building. Any restoration efforts in these construction activities or in road decommissioning activities must be done using District approved seed mixes, ideally all of native species origin. Actively promoting the growth of native plants in any restoration efforts will help to reduce the avenues for the continued spread of noxious weeds.

VII. RECOMMENDATIONS

Management strategies and goals will vary depending on which land allocation the projects are located in. The majority of lands in the Williams WAU are located in the LSR and or riparian reserves. Both of these allocations will be managed to maintain or improve existing conditions for those species requiring late-successional or riparian habitat. Forest matrix lands in the WAU fall into the AMA allocation. This allocation gives the BLM an opportunity to develop new and innovative ways to extract commodities while maintaining valuable habitats or habitat components. Riparian reserves established in the Northwest Forest Plan are for the protection of aquatic and terrestrial species. These buffers can be adjusted if sufficient data is available to indicate that narrower buffer reserve widths would protect all of the sensitive and survey and manage species present in the WAU. At this time, it is not known which of the survey and manage species may occur in these riparian reserves. It is therefore recommended that riparian buffers in the Williams WAU remain at the current levels recommended in the ROD.

Table 28 - Desired Future Conditions

DESIRED FUTURE CONDITION	PRIORITY AREA	MANAGEMENT RECOMMENDATIONS	ECOSYSTEM LIMITATIONS
Within the forest matrix AMA maintain 80% of the commercial forest lands within a relative density range of 35-65% to provide for proper physiological functioning of trees and to keep mortality rates within the range of natural conditions.	To be determined.	Utilize thinning, group selection and/or prescribed fire to reduce the density of overstocked stands.	Prescribed fire may be limited by proximity of rural residences
Maintain species and structural compositions of forests to within the range of natural conditions.	To be determined.	Maintain and restore pine where ever possible through density management prescriptions. Maintain the naturally occurring hardwood component through density management prescriptions. Maintain multi-storied stands, including hardwood structure in that condition where they presently exist.	Prescribed fire use may be limited by the proximity of residences.
	To be determined.	Provide for structural characteristics in even aged single structure stands, including young, planted stands through gap introduction, variable spacing, thinning, and hardwood development enhancement.	
Restore seral stages of the major plant series to sustainable and desirable seral conditions within their historic range.	To be determined.	Utilize prescribed fire and thinning to restore white oak and pine series communities to more open, early to mid-seral conditions. Reduce invading Douglas-fir on these sites, restore native grasses and forbs.	Prescribed fire use may be limited by proximity of residences.

Table 28 - Desired Future Conditions			
DESIRED FUTURE CONDITION	**PRIORITY AREA**	**MANAGEMENT RECOMMENDATIONS**	**ECOSYSTEM LIMITATIONS**
Maintain a variety of seral stages, structures and species compositions across the watershed so that no one condition predominates.	To be determined.	The largest condition class of the watershed is the mid-size class. Accelerate the development of these stands into the mature condition class though thinning, patch cuts and prescribed fire.	
Reduce or eliminate Port-Orford root rot (Phytophthera lateralis).	To be determined.	Check areas for root rot resistant trees and then treat non-resistant infected trees by removal or girdling. All treatments will be consistent with the Aquatic Conservation Strategy and Riparian Reserves guidelines.	Erosive soils and steep unstable slopes could limit the amount of acceptable disturbance to stream banks and channels.
Development of old-growth characteristics in lands designated as LSR including snags, logs on the forest floor, large trees, and canopy gaps that enable establishment of multiple tree layers and diverse species composition.	LSR land that currently overstocked with young vigorous stands. Low Divide area, contains several large stands that meet the above criteria.	Accelerate development of old-growth characteristics through thinning, patch cuts hardwood enhancement and prescribed fire.	When thinning this type of stand a large amount of fuel is created. The problem is the treatment or removal of this material.
Reduce road densities to 1.5 miles per section.	High priority areas will be those with highly erosive soils and high road densities.	The primary method will be road decommissioning. Roads that may be necessary for future actions by may be barricaded or gated.	Road densities goals may not be attained due to road right of ways, primary connector roads, fire management requirements and silvicultrual
Maintain or improve water quality	Entire watershed.	Road closures, surface essential roads, No clearcuts, work with state watermaster to identify and stop illegal water diversions, educated public water users on alternative irrigation techniques.	Williams Creek water is over appropriated and state issued water rights are very difficult and emotional issues. Water save through change in irrigation techniques may be used by another irrigator and not benefit aquatic species.

Table 28 - Desired Future Conditions			
DESIRED FUTURE CONDITION	**PRIORITY AREA**	**MANAGEMENT RECOMMENDATIONS**	**ECOSYSTEM LIMITATIONS**
Improve riparian habitat	Main stem of Williams Creek, West Fork Williams Creek, Lone Creek, Bill Creek, Rock Creek, and Goodwin Creek.	Planting of riparian species including conifers,thinning of hardwoods and over dense stands of conifers to promote large wood (conifers) and canopy closures to provide shade.	A large percentage of the of the degraded riparian habitat is located on private property.
In stream reaches that can not or will not be allowed to grow large conifers for structure provide manmade structures to substitute.	Private lands along the main stem of Williams Creek.	Form a cooperative management unit with the private landowners along Williams Creek. Provide educational programs to inform the public about benefits of structure in streams. Provide technical expertise on projects designed by the Cooperative.	Funding for these programs may be hard to find. Private citizens may not wish to join cooperative management area.
Reduce and/or improve stream crossing(areas where roads cross streams).	Entire watershed.	Replace conventional culverts with bottomless arches on fish streams that exceed 3% gradient.	Funding for these projects will be the major limitation.
Maintain and/or improve special and unique habitats.	Entire watershed. Many of these habitats are located at low elevations near the rural interface areas. Examples of these habitats are pine oak woodlands, dry meadows, talus slopes and rock outcrops.	Use both mechanical methods and prescribed fire to reduce competing vegetation. Protect areas from road construction and logging	Funding. Prescribed fire use may be limited in the rural interface are due to proximity of residences.
Develop a management plan to stop the introduction of exotic species and to eradicate exotic species already present in the watershed.	Entire watershed.	Work with the State and private citizens to develop plans and to inform the public about techniques and the benefits. Use only native plants to rehab disturbed areas.	Funding

A. Monitoring

Monitoring of management activities, both past and present, is essential to determine if the objectives of the proposed activities are being achieved. Monitoring will also determine how sensitive species are responding to recovery or management plans which were prepared to ensure their survival. Implement monitoring that is required by the ROD page E-1.

Table 29 - Monitoring			
MONITORING	**PROPOSED LOCATION**	**METHODS**	**LIMITATIONS**
Monitor proposed timber harvest activities to determine success of silvicultural prescriptions in obtaining the desired results.	Panther Gap timber sale	Stand exams	Funding
Monitor special status species habitat	Williams LSR. Low elevation pine oak woodlands, talus slopes, caves and mines, rock outcrops and known cypripidium faciculatum locations	Photo plots, Stand exams and satellite photo data.	Funding
Monitor spotted owl populations to determine the success of the recovery plan	Entire watershed.	Use established spotted protocol.	Funding
Monitor riparian and fish habitat projects to determine effectiveness of restoration projects	Streams where restoration projects will be located.	Photo points. Established stream survey protocols.	Funding

B. Recommended Research

Conduct research on the effects of prescribed fire on Cypripidium faciculatum located in the AMA.

Use the old-growth stands located in the area of Clapboard Gulch to design and test silvicultural prescriptions that maintain old-growth characteristics in a standss through time. This research will be needed if entry into the existing LSRs is a future goal. The vegetation (Douglas-fir/tan oak) in the Clapboard Gulch area is the only vegetation in the AMA that is similar to that of the Williams LSR.

C. Data Gaps

1. Botanical

Survey information on special status (including survey and manage) plants in the watershed.

Information on the location of special status nonvascular plants.

Information on the effects of fire on special status plants.

Effectiveness monitoring on special status plants.

Location and extent of noxious weeds (mapping and identification) for future eradication and

monitoring the success of eradication.

2. Wildlife

Information on absence/presence of the majority of the sensitive species, including survey and manage species, that could be utilizing the watershed is lacking.

The population level of sensitive species (except spotted owls) found in the watershed is not well understood.

Surveys for suspected species should be considered a top priority to establish some level of baseline data.

Location and condition of special and unique habitats. General surveys need to be conducted to determine locations and condition of these habitats.

3. Fisheries/Aquatics

Physical and biological stream and riparian data analysis won't be completed until September 1996.

Habitat condition and trends.

Spawning surveys.

Stream inventory data available to date.

Riparian condition.

Distribution and relative abundance of trout.

Competition between fish species.

Percent of anadromous fish produced in Williams Creek versus Applegate and Rogue rivers.

All requirements of nonsalmonid fish.

The number of resting pools for chinook.

Habitat requirements and population status of the Pacific lamprey in Williams Creek.

Distribution, population status and habitat requirements of the tailed frog, foothill yellow-legged frog, Cascades frog, and Pacific giant salamander in the watershed.

The importance of Williams Creek for fluvial cutthroat and juvenile anadromous fish that rear in the Applegate River.

The presence, distribution, and relative abundance of the redside shiners in Williams Creek.

Absence/presence and distribution of resident trout in all streams in the watershed.

4. Air Quality

Names and addresses of individual members of public.

Emission levels in tons/acre. Partial data gap.

Baseline emissions in tons/acre, plant association/type, weather, and fuel parameters. Partial data gap.

Theoretical emissions in tons/acre, plant association/type, weather, fuel parameters. Partial data gap.

Consumption Predictions in tons/acre, plant associations/type, weather, fuel parameters, plus CONSUME model predictions, RXWINDOW prescription model. Partial data gap.

Fuel model; FBPS models (13).

Fuel profile - dead/down in tons/acre by timelag fuel classes, arrangement, continuity, age.

Fuel profile - (live) species, density, canopy closure, ground cover.

Duff levels (pre-burn and post-burn) measured in inches. Partial data gap.

Large woody material (pre-burn and post-burn). Need diameters, lengths, decay classes, and numbers per acre.

5. Human Uses

Burned area - TRS, lat. and long. (if available), size, cause, date, fire number, Burn intensity, veg type map overlay; of occurrence and table. Limited historical data.

Fuel model- FBPS models (13). Exact locations missing.

Fuel profile (dead and down) in tons/acre by timelag fuel classes, arrangement, continuity, age.

Fuel profile (live) in tons/acre. Species, density, canopy closure, ground cover. Partial data gap.

Large woody material - Diameter, length, decay class, numbers/acre. Limited data.

Snags - Diameter, height, decay class, numbers/acre. Limited data.

Burned area (wildfire or prescribed) - Date, intensity, fuel type, size. Limited data.

Human use and access - Transportation routes, activities planned, use patterns and types. Partial data gap.

Water sources - Location of pump chances, heliponds, engine and tender fill points, Ponds. Partial data gap.

Water source issues - Conditions of water sources, issues associated with use (POC disease, wildlife, water rights, etc.).

Locations of permanent helibases/helispots/airstrips.

APPENDIX 1 - ANIMALS

Special status species are animals that are recognized by the federal or state government as needing particular consideration in the planning process due to low populations, restricted range, threats to habitat, and for a variety of other reasons.

State listed species - those species identified as threatened, endangered, or pursuant to ORS 496.004, ORS 498.026, or ORS 546.040.

Bureau assessment species - are plant and animal species that are found on list 2 of the Oregon Natural Heritage Data Base and those species on the Oregon List of Sensitive Wildlife Species (ORS 635-100-040) and are identified in BLM Instruction Memo No. OR-91-57.

Bureau sensitive species - those species eligible for federal listed, federal candidate, state listed, or on list 1 in the Oregon Natural Heritage Data Base, or approved by the BLM state director.

APPENDIX 2 - PLANTS

1). Listed and Proposed Listed Species - Those species that have been formally listed by the U.S. Fish and Wildlife Service as endangered or threatened or officially proposed for listing. Enhance or maintain critical habitats and increase populations of threatened and endangered plant species on BLM-managed lands to restore species and populations to historic ranges. This must be consistent with approved recovery plans and BLM land use plans after consultation with federal and state wildlife agencies.

2). Survey and Manage Species - Both nonvascular and vascular plant species identified as needing special management attention by the SEIS ROD (Table C-3). Vascular plants must be managed at known sites and located prior to ground-disturbing activities. Nonvascular plants must also be inventoried extensively.

3). Candidate and Bureau Sensitive Species - Includes federal or state candidate species and those species that the BLM is concerned with becoming federal candidates. Manage the habitat to conserve and maintain populations of candidate and Bureau sensitive plant species at a level that will avoid endangering and further necessitating the federal or state listing those species as endangered or threatened.

4). State-Listed Species and Their Habitats - Those plants listed under the Oregon Endangered Species Act. Conservation will be designed to assist the state in achieving their management objectives.

5). Bureau Assessment Species - Those species considered by the State BLM office to be important to monitor and manage but not at as crucial of a level as candidate or Bureau sensitive species. Manage, where possible, so as not to elevate their status to any higher level of concern.

6). BLM Tracking Species - Not currently special status species but locations are tracked during surveys to assess future potential needs for protection.

7). Special Status Species Habitat - Maintain or restore community structure, species composition, and ecological processes of special status plant habitats.

APPENDIX 3 - SPECIAL AND UNIQUE HABITATS

Low elevation old-growth forest (late-successional forest) is that forest found below 3,000 feet in elevation, with a multi-canopy structure, dominated by large trees, snags, and large downed logs. Historically, this type of forest was common in the southern, western, and northern portions of the watershed, particularly on north facing slopes. Due to the mild climate found at low elevations, and the wide variety of niches, these forests have a greater diversity of wildlife species. Currently, this forest type is restricted to remnant stands throughout the WAU. Many of these stands are too small in size to meet the needs of some late-successional species.

Snags and down logs play a role in forest ecology that remains largely unclear. The importance of this resource to wildlife is critical with at least 100 species of birds, herptiles, and mammals dependent on snags or down logs (Brown, 1985). The amount of dependency varies from species to species, with some forms of wildlife such as woodpeckers, clouded salamanders (Aneides ferreus), and bats being obligates to this resource. Other forms of wildlife, such as the American black bear, will use this resource for a portion of their life cycle (denning and over-wintering). The absence of this resource can be a limiting factor controlling the population of certain species. Its absence may also disrupt natural dispersal patterns, gene flow, and the possibility of reestablishing populations in a given area. Studies have shown that long term trends in population of three snag-dependent species of woodpeckers in the Pacific Northwest have declined, possibly due to intense forest management practices (Brown, 1985). Current figures for the amount of snags and down logs across the landscape are not available but is known to vary with plant series and past management practices. In general, it is believed that current snag levels in managed stands are below what naturally occur in unmanaged stands. For example, species like the clouded salamander (Aneides ferreus) require the microhabitat provided by bark sloughing off the logs. Small mammals, such as red-backed voles (Clethrionomys occidentalis), burrow inside the softer logs.

Rocky outcrops found throughout the watershed contribute to the overall structural diversity of the landscape and provide critical habitat for a number of obligate species. Outcrops function to provide shelter from adverse weather conditions, predator-free nesting areas, and stable micro-climates for hibernating species. There are no large rock features in the WAU but there are numerous smaller features that provide habitat for a variety of species. These outcrops potentially provide primary habitat for species such as the ring-tail (Bassacariscus astutus), black swifts (Cypseloides niger), and a number of reptiles including the western rattlesnake (Crotalus viridis).

Caves and mine adits play a critical role in the life history of a number of invertebrates and vertebrates providing shelter from environmental extremes, seclusion, and darkness. Caves and mines are the primary habitat for species such as the Townsend's big-eared bat (Plecotus townsendii), a category 2 species. Other species, such as the bushy-tailed woodrat (Neotoma cinerea) and the cave cricket (Ceuthophilus spp.) use caves as a primary residence. These sites are also used seasonally as swarm sites (breeding sites) for bats, den sites for porcupine

(Erethizon dorsatum), etc. Recreational use of caves limits their value for wildlife; displacing easily disturbed species. There are no known natural caves in the WAU, but there are a number of mine adits located in the watershed.

Talus is the natural accumulation of rock, generally at the base of a cliff or on a slope, which provide habitat for a number of species. These unique habitats are found dispersed throughout the watershed and provide stable micro-niches for species of reptiles, amphibians, and mammals. The amount of dependency on talus varies from species to species, with species such as the Del Norte salamander (Plethodon elongatus), a federal candidate species, being totally dependent on the presence of talus. Other species such as the western rattlesnake (Crotalus viridis) might only use talus during a portion of its life history, in this case for hibernation.

Meadows under federal ownership are uncommon in the watershed. Meadows were often the first places homesteaders applied for patent, and thus, were readily converted to agricultural lands. Another threat to this habitat is tree encroachment due to the disruption of the natural fire cycle. Meadows are the primary habitat for a number of species, such as California vole (Microtus californicus) and the western pocket gopher (Thomomys mazama). They are also the primary feeding locations for species such as the great grey owl (Strix nebulosa) and the American black bear (Ursus americanus). Serpentine areas of pine savannah partially function as dry meadows, but generally lack "habitat edge" and hiding cover that create greater habitat diversity.

Brushfields are an important vegetative feature for a diverse group of wildlife, and has been identified by Oregon/Washington neotropical bird working group as one of five critical habitat types. Mast crops produced by species such as California coffeeberry, green and white leaf manzanita provide food for species ranging from the black bear to a diverse array of bird species. Buck and deerbrush are important components in the diet of black-tail deer, particular during the winter. Brushfields also offer nesting and hiding cover for a number of reptile, mammals, and bird species. This habitat type is generally created during large disturbances such as fire, logging, or is the product of certain soil types. Within the WAU brushfields tend to be found on south and east facing slopes, high on the ridge, or in peridotite soils.

Bear wallows are unique habitat features that are utilized by a variety of wildlife. Bear wallows generally begin as a shallow marsh with the rolling action of a bear creating a pool. Often this is the only surface water available in the immediate area drawing in other wildlife. These sites are used for generations and are marked with a "signature" tree (generally incense or Port-Orford cedar in our area). A number of bear wallows occur in the Powell Creek and Rock Creek drainages.

Mineral licks offer an important supplement for a variety of wildlife and are critical for certain obligate species such as band-tailed pigeon (Columba fasciata) (Jarvis et al, 1993). At this time

there are no known mineral licks within the WAU.

Springs and seeps are the primary habitat for a number of sensitive invertebrates and amphibians and are utilized by a wide array of wildlife. Species such as the variegated salamander (Rhyacotriton variegatus), a federal candidate species, utilizes small streams and seeps as their primary habitat (Nussbaum et al, 1983). Two springs in the WAU have been developed to provide surface water for wildlife. These springs were developed in such a way that the water is briefly brought to the surface before returning back to the natural subsurface flow.

Oak woodlands are a rich resource providing nesting habitat, mast crop production, big game wintering range, and sheltered fawning areas. Historically oak/pine grasslands dominated the valley floor. Increased agricultural use, urbanization, introduction of exotic plants, and changing of natural drainage patterns have all contributed to restricting native oak/grasslands to remnant stands. Most federally managed oak woodlands occur in isolated patches on the valley floor and on the east side of the watershed.

APPENDIX 4 - MINING REGULATIONS

Lands administered by the BLM have three levels of mining activities:

1. **Casual use** (lowest level of activity) - Casual use includes those operations that result in only negligible disturbances. These types of operations usually involve no use of mechanized earthmoving equipment or explosives and do not include residential occupancy. No administrative review of these types of operations is required.

2. **Casual use below a disturbance level of five acres** (most common) - This level of operation requires the operator to file a mining notice pursuant to the BLM surface management regulations. This mining notice informs the authorized officer of the level of operation that will occur, the type of existing disturbance at the location of the operation, the type of equipment to be used in the mining operation, and the reclamation plans following the completion of the mining activities. Mining notices involve an administrative review of the mining operation, i.e., access routes used, if unnecessary or undue degradation will occur, or if the activities would interfere with any threatened or endangered species.

3. **Plan of operation** - Required for mining activities that meet any of the following criteria:

    a. Proposed operations that may exceed the disturbance level of five acres;
    b. Activities above casual use in specially designated areas such as Areas of critical environmental concern (i.e., Eight Dollar Mountain), lands within an area designated as wild or scenic, and areas closed to off road vehicle use; or
    c. Activities that are proposed by an operator who, regardless of the level of operations, has been placed in noncompliance for causing unnecessary or undue degradation.

The review of the plans of operation involves a NEPA environmental review to be completed no later than 90 days from the date of the submission of the plan.

The Forest Service recognizes two levels of mining activities:

1. **Mining Notices** include all proposed activities that would not cause significant surface disturbances. These types of activities **do not require** an administrative review involving NEPA. They include all mining activities that would probably be considered casual use by the BLM.

2. **Plan of operation** required for all proposed mining activities that would cause significant surface disturbances. These activities **do require** a NEPA review.