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CHAPTER 1
Introduction

Location - The Vida/McKenzie Watershed is east of Eugene/Springfield and covers 96,330 acres (see Map). The watershed is in the Willamette Province established by the Forest Ecosystem Management Assessment Team (FEMAT) and the Regional Ecosystem Office (REO), and is located in the McKenzie Resource Area of the Eugene District, Bureau of Land Management. The McKenzie River flows through the Vida/McKenzie Watershed.

The Vida/McKenzie Watershed provides a wide range of uses and a variety of commodities to the local area and Lane County. Demands on the watershed range from providing forest products for the economy to recreation opportunities for local residents, Eugene/Springfield residents,and recreationists in general. Natural and management processes have shaped the landscape into its present form. This analysis will discuss the process and recommend watershed management from an interdisciplinary view. It is not a decision document but a guide for management.

What Is Watershed Analysis - Watershed analysis is a systematic procedure for characterizing watershed and ecological processes to meet specific management and social objectives. Throughout the analytical process the Bureau of Land Management (BLM) is trying to gain an understanding about how the physical, biological, and social processes are intertwined. The objective is to identify where linkages and processes (functions) are in jeopardy and where processes are complex. The physical processes at work in a watershed establish limitations upon the biological relationships. The biological adaptations of living organisms balance in natural systems; however, social processes have tilted the balance toward resource extraction. The BLM attempt in the Vida/McKenzie analysis is to examine resource information and understand where physical, biological, and social processes are or will be in conflict.

What Watershed Analysis Is NOT - It is not an inventory process, and it is not a detailed study of everything in the watershed. Watershed analysis is built around the most important issues. Data gaps will be identified and subsequent iterations of watershed analysis will attempt to fill in the important pieces.

A watershed analysis is not intended to be a detailed, site-specific project plan. Watershed analysis provides the framework in the context of the larger landscape and looks at the "big picture." It identifies and prioritizes potential project opportunities.

Watershed analysis is not completed under the direction and limitations of the National Environmental Policy Act (NEPA); when specific projects are proposed, more detailed project level planning will be done. An Environmental Assessment will be completed at that time. Watershed analysis is not a decision making document.

Products and Outcomes of Watershed Analysis - The Vida/McKenzie watershed analysis will provide the following:

- A description of the resources' conditions, needs, and recommendations.
- Spatially explicit information that will identify processes and functions operating within the watershed, and help facilitate environmental and cumulative effects analysis for NEPA.
- Identification of data gaps.
- A description of how the resources are interrelated.

The Legal Basis for Watershed Analysis - Watershed analysis focuses on implementing the Aquatic Conservation Strategy (ACS) of the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl* and the *Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl* (S&Gs). The ROD states that "Watershed Analysis is required in Key Watersheds, for roadless areas in Non-Key Watersheds, and Riparian Reserves prior to determining how proposed land management activities meet Aquatic Conservation Strategy objectives. Ultimately, watershed analysis should be conducted in all watersheds on Federal lands as a basis for ecosystem planning and management" (USDA, USDI Record of Decision, 1994). Watershed analysis is also in conformance with the Eugene District Record of Decision and Resource Management Plan (ROD/RMP), June 1995.

The term "Forest Plan" is used to denote the document that contains the ROD and Standards and Guidelines. The Forest Plan provides a scientifically sound and legally responsible approach to managing Federal forest lands that takes into consideration all elements of the ecosystem. It focuses on reducing fragmented late-successional forests and restoring watersheds to provide healthy riparian and fish habitats. The Forest Plan is notable for focusing on all the components that make up the ecosystem rather than focusing on a single resource.

Steps Utilized in Watershed Analysis - Steps utilized in watershed analysis include the following:

- Identify characteristics of the watershed
- Identify issues and key questions
- Assemble analytical information
- Analyze information using the Federal Agency Guide, the Eugene District Guide, or Washington's TFW (Timber, Fish, Wildlife) process
- Describe Present Conditions
- Describe Historical Conditions
- Arrange and Interpret the Information
- Make Recommendations

Management Direction and Data Utilized - The following core team was formed to conduct the Vida/McKenzie watershed analysis. These members relied on a network of District personnel to aid in data gathering and arrangement.

Member	Responsibility
Mabel Alejandro	Physical
Bill Dean	Biological
Karen Dodge	Fisheries
Dale Hanson	Geographical Information System
Lynn Larson	Vegetation
Jean Nelson-Dean	Social
Emily Rice	Area Manager
Don Wilbur	Central Cascade Adaptive Management Area Representative
Patricia Wilson	Team Lead

The following contributed input but were not on the core team.

Member	Responsiblity
Cheshire Mayroshn	Botany
Mike Southard	Historical Information
Steve Steiner	Hydrology
Jeanne Hutcheson	Editorial Assistant

This analysis was conducted using existing data; the time frame for analysis completion did not allow for additional data/information collection. Weyerhaeuser Company conducted a watershed analysis for the Lower McKenzie watershed north and south side. Weyerhaeuser analysis complied with the Washington State Standard Methodology for conducting Watershed Analysis according to the Washington Forest Practices Board (version 2.1). Weyerhaeuser and BLM signed a Memorandum of Understanding to share data. Various elements of Weyerhaeuser's analysis were reviewed, and the V/M core team decided to use the data and interpretations for some of those elements. The elements/areas where Weyerhaeuser's data/interpretations are used are noted in the representative narratives. Maps created for those elements are a composite of BLM and Weyerhaeuser data/interpretations.

Public Involvement - Summer and Fall 1995 Eugene District's Project and Planning Focus mailer included an announcement about the beginning of the Vida/McKenzie watershed analysis process and who to contact for more information. An announcement was also included in the Fall 1995 issue of the Central Cascade Adaptive Management Area mailer. Information was also sent to the McKenzie Watershed Council to notify them of this effort and ask for comments. Information from the various surveys that have been conducted in the McKenzie River Drainage were used in this analysis.

CHAPTER 2
Characterization

The purpose of this chapter is to place the Vida/McKenzie Watershed in context within the river basin and province, and to briefly analyze and described the dominant physical, biological, and social features, and characteristics and uses of the watershed.

Social

The communities included in this watershed analysis are Vida, Leaburg, and Walterville. These communities are strung out along the Lower McKenzie River corridor, which connects to the larger metropolitan areas of Springfield and Eugene. In addition there are residential areas spread throughout the area with considerable residential development in progress.

The area at the time of Euro-American contact was occupied by the Mohawk band of the Kalapuya and the Upper Santiam band of the Molala. Historically, the area was used for timber harvesting, mining, farming (orchards and grains), and raising stock. Vida, Leaburg, and Walterville lie along the route of the McKenzie Wagon Road, which is approximately the same route of today's State Highway 126.

Transportation

State Highway 126, which follows the McKenzie River for most of the analysis area on the northern side of the river, is the main transportation route to and through the area. Deerhorn Road, which parallels Highway 126 on the southern side of the river from Hendricks Bridge Wayside Park below Walterville to just west of the community of Leaburg, is a major route for local traffic. Other roads into the communities and forest roads branch out from these major routes. An important link in the local transportation routes is Goodpasture Covered Bridge, which is located one-half mile west of Vida. Goodpasture Bridge, constructed in 1938, is culturally important as well. It appears in the National Register of Historic Places and is a source of pride to area residents.

State Highway 126 also serves as a transportation link between the communities of Eugene and Springfield to the communities east of the Cascades, including Sisters, Bend, and Redmond. This link influences the area by having a large amount of vehicle traffic moving through the area to recreation opportunities farther upriver to wilderness areas or east of the Cascades for hiking, camping, and skiing.

Recreation

Recreational uses of the local area include fishing, rafting, boating, kayaking, picnicking, boat launching, wading, sunbathing, hiking, wildlife and scenic viewing, and hunting. Developed and primitive recreation facilities in the area are day-use sites mostly used for fishing, boat launching, hiking, and picnicking. The fishery resource of the McKenzie River is nationally recognized. Important sources of the fish in the river are the 2 fish hatcheries, one for trout and one for salmon, located within the analysis area.

The McKenzie River corridor has been the focus of several tourism efforts. Most of those efforts have been directed at the areas farther upriver than the analysis area that are less residentially developed.

Land Management

Most of the lands in the analysis area are managed as forest land both private and public. All of the private forest land is used for timber production mainly by 2 major landowners, Weyerhaeuser (46% of the land base) and Giustina (10.5% of the land base). Several other timber companies own additional smaller pieces. Federal forest land is administered by the BLM (11.4%) and the U.S. Forest Service, Willamette National (3.9%).

Of the lands included in the analysis area 18.6 percent of the land is in private ownership for purposes other than timber production. The land ownership pattern is described as follows:

Private Industrial Forestry	65%
Small Private Ownership	19%
Federal	15%
State and City	1.2%

During the 1980s and 1990s the areas in the Lower McKenzie Valley have increasingly become bedroom communities for commuters from Eugene and Springfield.

Most of the agricultural use of the area is in the lower portions of the analysis area. Production of holly, filberts, and fruits is popular and has been since early Euro-American settlement of the area. Several areas raise traditional livestock including cows, sheep, and chickens. Along with these traditional stocks several exotic species are raised including llama, ostrich, buffalo, deer, and elk.

Land Use Allocation on Federal Lands

An estimated 15 percent of the watershed is in Federal land ownership (BLM 11%, Forest Service 4%). The following indicates the acres by land use allocation.

Allocation	Acres	Percentage
Adaptive Management Area (AMA)	9,545	64
General Forest Management Area (GFMA)	4,378	29
District Designated Reserve	1,012	7

Approximately 4 percent of the Adaptive Management Area in this watershed is designated as a Late-Successional Reserve.

Central Cascades Adaptive Management Area (CCAMA)

The Central Cascades Adaptive Management Area is a landscape consisting of 158,000 acres of both USFS and BLM lands designated to encourage the development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives. Part of this landscape (about 9,545 acres) is located in the Vida/McKenzie Watershed Analysis Area. Objectives for management in the CCAMA consist of (1) developing and testing new management approaches to integrate and achieve ecological and economic health and social objectives, (2) contributing substantially to the achievement of SEIS/ROD objectives, including provision of well-distributed late-successional habitat outside reserves, retention of key structural elements of late-successional forests on lands subjected to regeneration harvest, restoration and protection of riparian zones, and provision of a stable timber supply, and (3) developing research on ecosystem and landscape processes and its application to forest management in experiments and demonstrations at stand and watershed levels.

This watershed analysis boundary includes only part of the CCAMA and is an Issue in this document with associated questions. It also is in the "recommendation" sections.

Physical

Climate

The watershed has a maritime climate characterized by mild temperatures and a long frost free growing season. WInters are wet with prolonged cloudy/overcast periods. Summers are characterized by fair, dry weather for extended periods of time produced by high pressure systems. Annual precipitation ranges from 50 inches at the western edge of the watershed to 84 inches at the eastern edge, with the majority occurring between October and April.

Elevation ranges from 580 to 4,400 feet (Weyerhaeuser 1995). Precipitation at the lower elevations is primarily in the form of rain, with snow occurrence increasing as elevation increases.

Hydrology

The Vida/McKenzie Watershed has a drainage area of approximately 150 square miles. The western sub-watersheds of this analysis area are primarily in the rain dominated precipitation zones. The eastern sub-watersheds are also largely rain dominated but have a higher percentage of area in the peak rain-on-snow precipitation zones. Gate Creek is the main tributary to the McKenzie River in this watershed. The Gate Creek sub-watersheds represent approximately 25 percent of the analysis area. Other tributaries in this watershed include Ritchie, Johnson, Cogswell, Finn, Indian, Trout, Holden, Lane, Toms, Haagen, and Boulder Creeks.

Flow has been regulated on the McKenzie River since 1963 after the Smith River and Cougar Dams were constructed; Blue River Dam was constructed in 1968. These dams are located upstream of this watershed on major tributaries of the McKenzie River.

Also located in this watershed is Leaburg Dam that has 2 power canal diversions within the analysis area. Leaburg Canal is between river mile 33 and river mile 38.8; Walterville Canal is between river mile 20.5 and river mile 28.5. These canals divert a significant amount of the flow from the main stem. It is estimated that on an annual basis one-third to one-half of the main stem flow is diverted through the canals.

This watershed contributes approximately 20-25 percent of the flow of the McKenzie basin. Influences from road and harvest activity in this watershed have likely altered the timing and magnitude of flows from historic conditions. Regulation of flow for power and flood control purposes has somewhat overshadowed these influences on the McKenzie River. The influence on flow from activities on public lands is considered to be low because of the minimal amount of public lands and roads within the watershed.

Channel Morphology

North Side - Most channels in all gradients on the north side of the McKenzie River are confined. As a result, there are very few low gradient reaches that are able to freely form pools and riffles without forcing elements such as bedrock or in-channel obstructions (e.g., Large Woody Debris (LWD) and boulders). Pool size and frequency have thus declined from historical levels, particularly in the main stem north and south forks of Gate Creek. Channel simplification has resulted in a predominance of plane-bed morphology rather than the expected pool-riffle type in these areas. These are the response reaches where most of the fish productivity takes place in a healthy system.

The high gradient confined channels on the north side of the McKenzie River in this WAU are often very steep and, while they transport material very efficiently, they are resistant to morphological change with the exception of those imposed by debris jams. Because of the steep volcanic character of the area landslides, both large and small, are common and large amounts of material are routinely delivered to the streams. These eventually blow out and result in debris torrents. Johnson, Holden, Cogswell, Indian, and North Fork Gate creeks have experienced debris torrents since the mid 1940s that affected 22 stream miles (14 of these are fish bearing miles).

South Side - McKenzie River tributaries flowing from the south are generally small, bedrock controlled, moderate to high gradient, and confined. Most are step-pool or cascade systems. Little large wood is present. The few large pieces of wood present are found mostly in debris jams, but function by trapping sediments rather than creating larger or deeper pools. These dams have debris torrent potential and recent torrents have scoured parts of Ritchie and Taylor Creeks. Channels are almost entirely source/transport systems with the river being the functional response area. Many of these streams have waterfalls not far upstream from the mouth that are barriers to fish passage (although isolated populations are found above most of these).

McKenzie River - The McKenzie channel has been simplified in much of the WAU primarily because of Leaburg Dam and removal of large wood to satisfy recreation and infrastructure safety concerns. Small substrates accumulate behind the dam resulting in a predominance of large cobbles/boulders for some distance downstream. Farther down are gravel bars, islands, and side channels that favor fish spawning and rearing especially on the south side.

Soils

The Vida/McKenzie watershed analysis area is dominated by highly productive and resilient soils, which occupy 62 percent of the area (see Soil Resiliency Units Map). These soils are found on gentle to steep topography. They are generally deep and highly permeable, have silty clay loam, clay loam or cobbly loam textures, and have high levels of organic matter, nutrients and plant available water. Less than 4 percent of the analysis area is occupied by soils with low productivity and resiliency. These soils are generally shallow cobbly or stony loams, have a high volume of rock fragments in the soil volume, and are often associated with rock outcroppings. Over half of the soils with low productivity are found in the steep, higher elevations in the northeastern portion of the analysis area. Thirty-one percent of the soils in the analysis area have moderate levels of productivity and resiliency. These soils are moderately deep to deep and have clay loam or cobbly loam textures. They are generally found on steep slopes in the northeastern portion of the analysis area where their productivity is compromised by moderate to high levels of rock fragments.

Most of the analysis area is occupied by soils in the udic (moist) moisture regime. Thirteen percent of the soils have a xeric moisture regime, and are generally found at lower elevations in the McKenzie River Valley and foothills. Ninety-one percent of the soils in the Vida/McKenzie analysis area have a mesic temperature regime. The remaining soils have a cryic temperature regime and occupy the cooler, higher elevation sites in the northeastern portion of the analysis area.

Erosional Processes and Sediment Delivery

Mass wasting, hillslope, and road-related erosion are the dominant erosional processes functioning within the watershed. These processes were each analyzed to determine their relative importance within the analysis area, their potential for delivery of (fine) sediments to aquatic resources, and the importance of human activities in changing erosional rates and sediment delivery to streams.

Mass Wasting Assessment - Mass wasting is the downslope movement of soil and rock material through a variety of landslide movement mechanisms. It is a natural process in the analysis area due to the presence of weak rock overlying more competent rock on steep slopes, particularly in the northeastern portion of the area. Under natural conditions, sediment and wood delivered to streams are essential elements of channel geometry and function ultimately to form fish habitat. However, increases in landslide occurrence as a result of human or management activities can overwhelm the system's natural ability to process sediment.

A mass wasting potential map of the Vida/McKenzie area (see Mass Wasting Potential Map) was developed by stratifying the landscape into areas with a High, Moderate, or Low potential for mass wasting and subsequent delivery to streams. Twenty-one percent of the area was identified as having a high potential for mass wasting and delivery. Most of the high potential area is located east of Indian Creek, where the topography is the steepest. The predominant type of landslides are shallow, rapid landslides, and debris torrents.

The major source of fine and coarse sediments to streams in the analysis area is from mass wasting. Management activities have increased mass wasting and sediment delivery rates above natural background levels, primarily as a result of road-related failures. Road-related failures are primarily associated with sidecast road construction on steep slopes and, to a lesser extent, cutbank failures, stream crossing failures, headwall crossing failures, and poor road drainage.

Surface Erosion Assessment - Hillslope erosion occurs in areas where detachable (low soil strength) soils on moderate to steep slopes are exposed to rainfall and overland flow. The occurrence of overland flow can be increased by human activities that result in soil compaction or a reduction in the protective surface organic layer.

The relative potential of hillslope-related surface erosion for the Vida/McKenzie watershed analysis area was analyzed by developing a soil erosion potential map (see the Hillside Erosion Potential Map) based on topography (slope steepness) and soil erodibility (soil K-factor). Only 2 percent of the analysis area is in the High Erosion Risk Class. Surface erosion and overland flow are uncommon in this landscape because the soils are strong and resist detachment, even under bare soil conditions, and because of the presence of surface organic layers minimizing the opportunity for soil detachment and overland flow. When soil is exposed and eroded, it is rarely delivered to the stream system due to the high permeability of the soils and the discontinuous nature of the exposed soil patches. Nineteen percent of the watershed was classified as having a moderate soil erosion potential. This group is typified by high strength soils occurring on very steep topography.

Fine sediment delivered to streams as a result of hillslope erosion is below estimated background levels and very minor when compared to the quantity delivered to streams from mass wasting.

Road-Related Erosion - Sediment production for the Vida/McKenzie watershed analysis area was assessed using the method described in the Washington Department of Natural Resources Watershed Analysis Manual (Version 2.0, 1993). This analysis estimates sediment production from the road surface using characteristics such as road drainage system density, traffic level, road surface type and cutslope and fillsope vegetative cover. For the analysis area located south of the McKenzie River, the results indicate road erosion and delivery of fine sediment to streams is occurring at a rate far less than natural background levels (10-43% of background). Roads within the Boulder Creek subwatershed have the highest potential for delivery (43%), followed by Osborn, Alder, Haagen, and Ritchie Creek subwatersheds.

The analysis of roads located north of the McKenzie River showed that under current moderate haul levels, the South Fork (Gate Creek), North Fork (Gate Creek), North Fork North Fork (Gate Creek), Indian, and Holden Creek subbasins deliver fine sediment to streams at a rate of 50 to 100 percent of natural background levels. In the Washington Manual guidelines, when land-use generated fine sediment yields are 50 to 100 percent of background fine sediment yields, the sediment may be chronically detectable in these subbasins. The sediment yields in these subbasins is in part explained by the large proportion of midslope roads present in the subbasins that often have very high delivery rates. Other factors increasing sediment production and delivery to streams are the presence of many midslope and ridge top roads lacking cutslope ditches and lacking vegetation on the cutslopes.

Comparison of Sediment Sources in the Analysis Area - Mass Wasting from landslides is the major contributor to sediment yield in the Vida/McKenzie analysis area. The contribution of sediment from roads and hillslope erosion is proportionately far less, although cumulatively may be significant within a given subbasin. Areas that may be affected by accelerated rates of fine sediment delivery from management related landslides and road erosion are Johnson, Indian, North Fork North Fork (Gate Creek), North Fork (Gate Creek), South Fork (Gate Creek), and Boulder Creek subbasins. Limited channel surveys indicate excessive fines is not a widespread problem in these subbasins, but indications are that some streams have suffered from excessive fines in the recent past. The area most affected by increased fine sediment yields is Gate Creek and its tributaries and Toms Creek area where there are few BLM lands. However, since the affects of accelerated fine sediment levels are cumulative and sometimes locally significant, road and channel surveys on BLM lands are needed to verify potential erosion sources and channel lengths suffering from accelerated fine sediment yields.

Biological

Vegetation

The watershed area is a mixture of ownerships. The checkerboard pattern of BLM lands and the large single parcel of the National Forest constitute the federal ownership within the analysis area. The majority of other ownerships are private industrial forest lands, followed by agriculture lands and rural residential properties in the lower McKenzie River basin. These commercial forests and agriculture lands are intensively managed and contribute very little to mature or late seral stage forest habitats.

The Vida/McKenzie Watershed supports a wide variety of plants. Although few botanical surveys have been conducted (9% of BLM lands), 2 Federal Candidate species and 1 survey and manage species exist in the watershed. There are 67 exotics species including 5 noxious weed species.

Aster vialis is a Federal Candidate species and a survey and manage species. There are 2 Aster vialis sites designated for a total of 42 acres. Cimicifuga elata is also a Federal Candidate species. There are 2 Cimicifuga elata sites designated for a total of 35 acres. Allotropa virgata is a survey and manage species that is suspected to occur in the watershed.

The current forest landscape pattern in the Vida watershed is recently harvested lands, remaining stands of young and mature second growth conifer with isolated pockets of old-growth Douglas-fir. The past timber management has fragmented the original forest vegetation with large tracts of early seral stage conifers. Most of the remaining large tracts of mature timbered acres are BLM or National Forest ownership.

The Vida/McKenzie watershed natural vegetation composition was influenced by a series of stand replacement fires. The dry East winds that blow down the river valley in late summer were certainly a contributing factor to the fire frequency and intensity. The most recent of these stand replacement forest fires occurred in the last part of the nineteenth century and subsequently large stands of even-aged second growth timber were established within an entire sub-drainage. Late seral stage conifer stands were still the most predominate forest type within the boundary of the watershed during this presettlement period.

The Vida watershed vegetation is composed primarily of the Douglas-fir and Western Hemlock forest series. These two forest series are commonly found on the low to mid elevations throughout the Central Oregon Cascades. Along with Douglas-fir and western hemlock, the most common associates are western redcedar, incense cedar, grand fir and western white pine. Hardwood species include bigleaf maple, red alder, golden chinquapin and pacific madrone.

Some of the most productive forest lands on the District are found within the watershed. Conifers can potentially grow to 120 inches in diameter, reaching heights of over 300 feet and living to 800+ years. As a result of the productive capabilities of these forest lands, this watershed has provided large quantities of high quality wood products to local economies during the last four decades.

Fisheries

The McKenzie Watershed supports resident populations of rainbow trout (McKenzie redsides), cutthroat trout, bull trout, mountain whitefish, and numerous non-salmonids such as sculpins, dace, shiners, suckers, stickleback, and occasionally sturgeon. The basin is also an important spawning/rearing area for anadromous spring chinook salmon and summer steelhead trout.

Rainbow trout are abundant in the main stem McKenzie River and most of its tributaries with gradients <7 percent and mean water depth of >6 inches (including Leaburg Canal). The "McKenzie redside" rainbow trout are native to the river. Other stocks have been introduced.

Cutthroat trout are ubiquitous and may be commonly found in streams with up to 17 percent gradient and drainage area of >140 acres, although they may be found in smaller streams as well, especially during winter flows or high water years.

Bull trout, a proposed candidate species for T&E listing, inhabits the main stem McKenzie River in the Watershed Analysis Unit (WAU). They are mainly distributed from Leaburg dam upstream to Tamolitch Falls, but do not use WAU tributaries because they lack the consistent flows and the very cold water bull trout require. They are piscivorous and are the top fish predator in the McKenzie River. As such they may use large tributaries such as Gate Creek for foraging.

Spring chinook enter the McKenzie River in spring/early summer where they live until the early fall spawning period. In the WAU they spawn primarily in the McKenzie River, particularly along the south bank, and in the main stem of Gate Creek. Smaller McKenzie tributaries are probably used by juveniles for rearing. Most young migrate from the McKenzie during their first winter, but some stay through the next summer before migrating. Before the construction of dams approximately 18,000 adults per year returned to the McKenzie River to spawn (McKenzie Watershed Council 1996). The population has declined substantially from historic levels and only 3,500 fish entered the McKenzie River in 1995. It is not known how many of these were wild fish. The McKenzie run has no T&E status but, as long running Columbia Basin fish, they are potentially at risk.

Summer steelhead, an introduced fish, generally spawn in lower gradient tributaries, especially Gate Creek. Young may stay in their natal stream to rear or move into the McKenzie River. Freshwater residency time can range from 1 to 4 years, with a similar range for ocean residency. About 10 percent of steelhead passing Leaburg Dam are wild fish.

Fish habitat for virtually all species and life stages is potentially abundant based upon rainfall and physical stream characteristics. However, very little quality habitat is present in this WAU. The primary culprit is lack of large structure elements (boulders and large wood). These elements force development of pools and gravel bars, sort and trap sediments, create side channels for juvenile rearing, and generally turn a simple hydraulic pipeline into a complex of habitats that promote fish survival, growth, and an increase in population size.

Terrestrial - Wildlife

Habitat conditions are the prime determinants of wildlife abundance both in the number of species and the number of individuals, and their distribution. The abundance of most wildlife species is directly dependent upon the condition of available habitat, whether used for breeding, feeding, or resting (shelter USDA, 1985). The Vida/McKenzie Watershed supports a wide variety of wildlife species. Although few wildlife surveys have been conducted, Appendix WL lists the species known or suspected to inhabit this watershed. Of the species known or suspected to occur, there are 2 threatened species; 30 candidate species (16 vertebrates and 14 invertebrates); and 31 species identified as Bureau Sensitive, Bureau Assessment, or Bureau Tracking (Appendix WL). In addition, this sub-basin supports a number of recreationally important species such as Roosevelt elk, black-tailed deer, mountain lion, and black bear. The scope of this analysis cannot cover all of these specie so only those of significant concern (Special Status) or high profile (big game) will be included (Appendix WL2).

Conifer forests contain the most abundant habitat types in the Vida/McKenzie Watershed. Forests in western Oregon were dominated by large interconnected blocks of mature and older conifer forests prior to European settlement. Forest habitats within this landscape were both structurally and vegetatively very complex. Early seral habitats now dominate the landscape, interspersed with small, isolated patches of older forest, which are often fragmented by roads and young conifer plantations. Nearly all habitats have been simplified both vegetatively and structurally. Forest practices and land ownership patterns have created sharp habitat boundaries, providing conspicuous contrast between adjacent habitats. These habitat alterations have substantially reduced the populations of many wildlife species associated with riparian and old forest habitats. Streams, riparian areas, ponds, and associated wetlands are probably the second most available habitats, and the most heavily used areas by wildlife.

Species and habitat information in this document mainly reflect conditions on public lands (except where otherwise noted) as data on private ownerships is not available. In general most private lands in the watershed are intensely managed for timber production and, because of this, these lands rarely contain forests over 60 years old and do not provide much mature or old growth habitat. Additionally, since most of the management activities are directed toward maximizing timber volume, very few trees are left standing or down, which is necessary for certain wildlife.

Bald Eagle (Federally Threatened) - There is one pair of nesting bald eagles located in the southern portion of the watershed. These are year around residents and this watershed does not receive any significant use by other bald eagles during the winter. The Bureau has 2,752 acres of forested lands designated for bald eagle management within this watershed, and these lands are fairly well distributed throughout the watershed.

Northern Spotted Owl (Federally Threatened) - There are 6 known spotted owl sites located within the Vida/McKenzie Watershed, and 4 sites that are outside of the boundary but their historic home ranges extend into the watershed. These owl sites are distributed evenly across the landscape with most sites being associated with BLM and Forest Service administered lands. While spotted owl habitat is fairly well distributed (on BLM and Forest Service administered lands), throughout the watershed there is a greater concentration of blocked habitat located in the northern portion of the watershed.

Great Gray Owl (Protection Buffer Species of the Northwest Forest Plan) - Only one historic sighting of great gray owls exists for this watershed and occurred in the Mt. Hagen Block. There is no other information on abundance or distribution of great gray owls or their habitat in this watershed.

Red Tree Vole (Survey & Manage Species) - There is no information on abundance or distribution of the red tree vole in the Vida/McKenzie Watershed. Population ecology of this species is not well understood (FSEIS Appendix J2, 1994). Melotti (personal comm. 1995) recently documented red tree voles in the McKenzie Resource Area (through analysis of spotted owl pellets) at spotted owl sites 12 miles to the north and 9 and 11 miles to the south. Corn and Bury (1988) captured red tree voles 7 miles east of the Vida/McKenzie Watershed in the H.J. Andrews Experimental Forest; 96 percent of BLM and Forest Service lands contain potential habitats and are relatively well distributed in the watershed.

Evening field slug, Oregon megomphix, Blue-gray tail-dropper, Papillose tail-dropper, Papillose tail-dropper, Oregon slender salamander (Survey & Manage or Bureau Sensitive, or both) - There is no information on abundance or distribution of these species or their habitat in the Vida/McKenzie Watershed. Potentially, these species could occur within the Vida/McKenzie Watershed.

Roosevelt Elk (high profile species) - The McKenzie Unit is a productive unit with a healthy elk population. Analysis of population trends over the past several years indicates a current population of about 4500 elk. Elk continue to expand their range within the unit and are increasing in numbers in many areas. Elk surveys indicate a long-term increasing trend in population numbers. Survey data are from counts on winter range located on Forest Service land to the east of the watershed. Much of the western portion of the unit (where Vida/McKenzie Watershed lies) has not been surveyed. Elk appear to be rapidly expanding within the western portion of the unit. The Vida/McKenzie Watershed elk are resident year round.

Most of the BLM and Forest Service lands are in forested conditions that provide relatively good thermal and hiding cover for elk. Most of the adjacent private lands are probably providing foraging habitat. With the relatively well distributed public lands for cover, and the intermixed private lands for forage, elk habitat is fairly well distributed across the landscape.

Bats (Federal Candidate Species) - There is no information on abundance or distribution of these species or their habitats in the Vida/McKenzie Watershed. There are 5 species of bats that are Federal Candidates (category 2) that have the potential to inhabit this watershed (Hayes, unpublished report).

Water Quality Assessment

Surveys conducted by the McKenzie River Watershed Council and the Central Cascades AMA indicate McKenzie River residents and user groups are concerned about the water quality of the McKenzie River. The McKenzie River provides waters for 200,000 residents of Eugene/Springfield area. The McKenzie River is considered to have high quality water, and the community is interested in maintaining this high level of water quality to support the scenic qualities of the river, as well as other uses such as drinking water, fish and wildlife habitat, and water contact recreation.

As designated in the Oregon Administrative Rules, the beneficial uses of water for the McKenzie River and its tributaries are: water supply (public, private, and industrial); irrigation and livestock watering; anadromous fish passage, spawning, and rearing; resident fish, aquatic life, and wildlife; hunting and fishing; boating and water contact recreation; aesthetic quality; and hydro power. The primary beneficial uses of water considered by the Oregon Department of Environmental Quality for the McKenzie River are aesthetics, aquatic life, and water contact recreation. The parameters evaluated in support of these uses are dissolved oxygen, bacteria, pH, chlorophyll a, toxic compounds and total phosphorus. The results of monitoring by DEQ indicate possible violation of numerical standards for the temperature and toxic compound (arsenic) water quality standards. Fish habitat and aquatic life beneficial uses have also been impacted by human activities within the lower McKenzie River in the form of decreased flows as a result of diversions, lack of appropriate fish screens at the Walterville Hydroelectric Plant and loss of large woody debris and associated habitat in the tributaries to the River.

Given the small, scattered nature of the BLM ownership within the analysis area, it is unlikely activities on BLM lands will have any impacts on the beneficial uses of water in the McKenzie River proper. However, BLM management activities may affect beneficial uses of water within the tributaries. Beneficial uses with the greatest potential of being impacted by activities on BLM lands are aquatic life and fisheries, and private (drinking) water supplies. Impacts are in the form of road-related barriers to fish migration, and road-related erosion accelerating the delivery of sediment to streams. The information available indicates neither of these problems appears to be widespread on BLM lands, and are more local in nature. However, given the high degree of public concern for the quality of water and protection of resources associated with the McKenzie River, it would be desirable to acquire more information identifying the location of road stream crossings and channel lengths where water quality conditions are not supporting beneficial uses of water on BLM lands.

CHAPTER 3
Values/Issues and Key Questions

Chapter 2 identified a variety of uses, values, and dominant features associated with the Vida/McKenzie Watershed. The purpose of Chapter 3 is to focus the analysis on the key ecosystem values/uses and dominant features most relevant to management decisions, human values, or resource conditions within the watershed. Since the Federal ownership in the watershed is 15 percent, the key issues and questions were developed not only to focus on key ecosystem features but also on features where Federal decisions could play a major role in their conditions/functions.

The core team identified 5 major values/issues for the Vida/McKenzie Watershed Analysis. After identification of these issues, the core team then selected a series of key questions to assist in addressing each issue, which were not ranked in any priority.

Major Values/Issues

The 5 values/issues for this watershed are as follows.

- Human Uses
- Water Quality & Sediment Delivery
- Habitat Diversity - Terrestrial
- Aquatic Habitat
- Central Cascade Adaptive Management Area (CCAMA)

The following is a description of these values/issues and a list of key questions for each.

1. Human Uses - This issue will focus on the value of this watershed to the local communities and visitors.

a. Community Values/Aesthetics

What do people value within the community? and how does BLM affect it?

How can BLM tie into their strategic plans?

b. Recreation Access

Are the present levels of recreation impacting user experience?

What are the access needs, if any, in the watershed?

How does this watershed agree with the 126 Corridor/Cascades regarding recreation?

What do recreationists want from the watershed?

How can recreational use (mainly from outside interests) best fit with local interests?

c. Economy - The discussion will focus on how this watershed contributes to the local economy through commodity production, fisheries, and recreation use.

What actions in the future may affect the local economy?

Commodity Production

What can BLM expect to be harvested from the watershed?

What type of Special Forest Products are harvested?

What areas provides Special Forest Products? What is the demand? Can BLM meet the demand? Regulation needed?

What type of learning opportunities does BLM have regarding vegetation management, density management?

Recreation

What is the economic contribution of recreation use to the watershed?

Fisheries

What is the economic and sociological contribution of fisheries in the watershed?

2. Water Quality and Sediment Delivery

- Water quality is an important issue for the entire McKenzie River watershed. This analysis will focus on the potential for sediment delivery in the analysis and BLM's affects on water quality.

a. Water Quality

What water quality concerns are there in the analysis area?

What beneficial uses of water exist in the analysis area? What beneficial uses occur on BLM lands or are most affected by activities that take place on BLM lands? Which water quality parameters are critical to these uses?

What are the conditions and trends of beneficial uses and associated water quality parameters, and how do they compare to the historical or reference water quality characteristics of the watershed?

What natural and human activities have resulted in a difference between current and historical (desired) water quality conditions in the watershed? (or . . . What are the natural and human causes of change between historical and current water quality conditions?)

What beneficial uses occurring on or downstream of BLM lands are not being supported by current water quality conditions? What actions on BLM lands are contributing to identified water quality problems?

What are the influences and relationships between water quality and other ecosystem processes in the watershed (mass wasting, fish habitat, stream reach vulnerability)?

b. Erosion Processes

What erosion processes are dominant within the watershed (hillslope erosion, road-related surface erosion, mass movement), and where is there evidence of, or potential for, these processes to occur?

What are the conditions and trends of the dominant erosion processes within the watershed, and how do they differ from historical erosion processes? What are the natural and human causes of changes between historical and current erosion processes in the watershed?

Where in the watershed, and on BLM lands in particular, do erosion processes have the greatest potential to deliver sediment to stream channels or other water resources?

Is the amount of sediment transported to streams and other water resources sufficient to cause a change in channel conditions, habitat conditions, or beneficial use?

What are the influences and relationships between erosion processes and other ecosystem processes (i.e., vegetation, woody debris recruitment)?

c. Hydrology

What are the dominant hydrologic (flow) characteristics in the watershed (i.e., peak flows, minimum flows, total discharge), for the McKenzie River and its tributaries?

What are the conditions and trends of the dominant hydrologic processes, and how do they compare to the historical or desired hydrologic characteristics? What natural processes or human activities have resulted in a change between historical and current hydrologic conditions? What is the relative importance of management on BLM lands to the hydrologic conditions of the McKenzie River? . . . the tributaries to the McKenzie?

What water quantity concerns exist in the analysis area?

How have changes in hydrology (flow) impacted beneficial uses of water? Are these changes occurring on BLM lands or as a result of management activities on BLM lands (consider both negative and positive impacts)?

What are the relationships between hydrologic processes and other ecosystem processes (i.e., sediment delivery to streams, fish migration)?

3. Habitat Diversity - Terrestrial

- The amount of Federal lands (15%) and the distribution of Federal lands presents a challenge for providing forest diversity and species habitat. This issue will focus on species' requirements and landscape design based on RMP and Pacific Northwest Forest Plan standards and guidelines and land allocations.

a. Management of Islands of Federal Lands Under the Umbrella of the RMP and the Pacific Northwest Forest Plan

- Fifteen percent of the watershed is in Federal ownership; 65 percent of the watershed is in private industrial forest use.

How well are the species/habitats that we can manage effectively doing and/or progressing through time (due to management)?

Bald Eagle Habitats

How should BLM manage Bald Eagle Habitat Areas for existing nesting habitat, for potential nesting habitat, and for future replacement nesting habitat?

Where and how can BLM manage for bald eagle foraging habitat?

Spotted Owl Habitats

How much land (acres) occur in spotted owl critical habitat and how shall BLM manage these areas?

How should BLM manage spotted owl core areas for existing habitat and future nesting replacement habitat? How can BLM manage these areas for long-term viability?

How can BLM arrange the timber management program to provide optimal dispersal opportunities for spotted owls across the landscape and over time?

How can BLM manage Riparian Reserves to best serve spotted owl habitat needs?

Big Game Habitats

How can BLM arrange the timber management program to provide thermal and hiding cover across the landscape and over time?

How can BLM manage the land to assist ODFW in managing elk populations?

Forest Fragmentation

Given the current fragmentation, how can BLM place future harvest units to have the least impact?

What are the effects of roads on wildlife use in the watershed?

Mature and Old Growth Forest Habitat

How many acres of 80-year old and over exist? How much of the 80+ forest is in small patches?

b. Providing Refugia/Inoculum

What nonmobile species such as plants and snails are restricted to a specific seral stage that may need refugia provided?

Most Survey and Manage species have low mobility and will require site by site management actions. These species will need to be surveyed prior to any ground disturbing action, mitigation, and/or alternatives are taken to lessen impacts.

Red Tree Voles

Which sub-basins within the watershed need to be surveyed?

Great Gray Owls

Areas above 3,000 feet in elevation would require surveys. What acreage and how much is above

3,000 feet?

Aster vialis and Cimicifuga elata

Where is it likely to occur?

c. Vegetation

In relation to the 15 percent rule, what area should be set aside?

Given the outs for threatened and endangered species, Riparian Reserves, and the 15 percent rule, how many acres (volume) are available for harvest?

4. Aquatic Habitat

- The discussion will focus on the ability of streams to provide habitat and examine the habitat situation. It will also address the quality of species' habitat, species distribution, and present and critical areas.

a. Stream Channel

Materials processing capability

Where are source/transport/response reaches?

Where are stream channels degraded?

What are the causes?

Where are potential bottlenecks/trouble spots?

What is the distribution of potentially fully functional stream channels? (i.e., is plane bed-should be pool/riffle)

Habitat formation

What are the dominant habitat forming processes/elements? Where are these functioning together effectively? (e.g., LWD, s-t-r)

How and where have management activities affected channel complexity? Sediment loading?

b. Fish

Habitat

Is present habitat adequate for fish requirements at all life stages? (habitat condition/miles)

What are the limiting factors for fish?

What is the potential distribution of habitat?

Where are priority restoration areas?

Populations

What species are present?

What is their distribution?

Where are barriers to fish?

Where are critical areas for fish?
((spawning/rearing/overwintering)

c. Riparian Reserves

What, where, and in what priority does restoration or enhancement of habitat for wildlife, plants, and fisheries need to be done?

5. Central Cascade Adaptive Management Area (CCAMA) - The existence of the CCAMA provides an opportunity to manage Federal lands, to experiment and learn, to contribute to the local economy, and to provide commodities.

CCAMA Key Questions/Hypotheses

What learning opportunities do the CCAMA lands offer to the local economy, resource managers, and research?

CHAPTER 4
Social

Prehistory and Culture

The McKenzie River drainage between river mile 21 (mouth of Camp Creek) and river mile 41, including Gate Creek drainage, has not been as thoroughly inventoried and the prehistory is not as well known as is the case for that segment of the McKenzie drainage located immediately downstream of river mile 21. A cultural resource survey limited to the lower portions of the Gate Creek drainage was conducted by personnel from the Oregon State Museum of Anthropology in the Fall of 1967. This survey resulted in the discovery and recordation of a single prehistoric site.

Beginning in 1975 Bureau of Land Management personnel conducted cultural resource surveys on BLM administered lands in advance of potential surface disturbing activities. Beginning in 1977 a program of post-harvest cultural resource survey was begun. Between 1975 and the present 4,920 acres (46%) of Bureau administered land within the watershed has been surveyed for cultural resources prior to timber harvest. Post-harvest surveys have reexamined 920 acres (18%) of the final harvest acreage within the watershed. Approximately 3,800 acres located in the northeastern corner of the watershed are administered by the USDA Forest Service, Blue River Ranger District. The Forest Service surveyed 109 acres (2.8%) for cultural values in advance of potential surface disturbing projects between 1981 and 1987. No cultural resource surveys were conducted on these lands between 1988 and the present (E.O. Bergland, personal communication). Employees of a private consulting firm and personnel from the State Museum of Anthropology have surveyed limited acreage along power transmission lines, canals, and the highway rights-of-way along the river corridor.

In total these efforts have resulted in the discovery and recordation of 13 prehistoric archaeological sites. Of the sites 5 are located on BLM lands and the remainder are located on private property. Also found on Bureau administered lands within the watershed boundary were 17 isolated artifacts. A single isolated artifact location has been recorded on Forest Service administered lands within the watershed.

A Class I literature review and synopsis of existing data for lands within the Eugene District, including those within the Vida/McKenzie Watershed Analysis Unit (WAU), was conducted by Heritage Research Associates during 1980 and 1981. The results were published in the University of Oregon Anthropological Papers series (Beckham, S.D., R. Minor and K.A. Toepel 1981). Those interested in detailed understanding of the cultural sequence of the use of the Willamette Basin, aboriginal settlement patterns of the area, or information concerning the ethnographic life styles of the aboriginal inhabitants should consult this work.

Limited test excavations have been conducted at 3 sites within the WAU. Hatchery Tributary site (35LA469) consists of a small lithic scatter situated adjacent to a small spring-fed tributary of Hatchery Creek at an elevation of 2,100 feet. Artifactual material recovered from the test excavations included biface and uniface tools, culturally modified flakes, and obsidian and cryptocrystalline silicate debitage. Recovery of both narrow-necked projectile point forms and a shouldered lanceolate point were interpreted as evidence that the site contained elements of both Late Archaic and Early Archaic components (Southard 1991:63-86).

An additional site, 35LA951, is a small lithic scatter located on an alluvial terrace on the north side of the McKenzie River near Walterville. Cultural material recovered from the site included 7 formed tools and 94 pieces of debitage including obsidian, cryptocrystalline silicate, and basalt flakes. The site was determined to be a single component assigned to the Late Archaic period based on the recovery of a single narrow-necked projectile point (Toepel and Bland 1991).

The Walterville Overlook site (35LA654) is a lithic scatter located on the ridge line north of the McKenzie River above the community of Walterville at an elevation of 1,300 feet. The site has been assigned to the Early Archaic period on the basis of 2 lanceolate projectile points recovered from the surface of the site (Southard, in progress).

The occasional isolated discovery of fluted lanceolate points from surface contexts in western Oregon raises the possibility that the prehistoric period in this part of the State may span 10,000 or more years. Archaeological deposits in the western hemisphere greater than 10,000 years old are assigned to the Paleo-Indian period. No cultural remains attributable to the Paleo-Indian period have been discovered in the Vida Landscape Analysis Unit (LAU); however, a single Clovis point was discovered in the adjacent Mohawk drainage. Elsewhere in the western United States the Paleo-Indian period is associated with the hunting of extinct megafauna. The Early Archaic Period covers the period between 10,000 and 6,000 BP. This period is viewed as the period of human adaptation to the Holocene environment in western Oregon. The subsistence economy of the Early Archaic appears to have been based on a generalized hunting and gathering way of life with more emphasis placed on hunting. The hallmark of the Early Archaic in western Oregon is the leaf-shaped Cascade point. The Middle Archaic Period covers the period between 6,000 and 2,000 BP. This is viewed as the period when the inhabitants of the Willamette Valley were fully adapted to exploitation of the local environment. The use of plant food resources assumed greater importance during this period as illustrated by the presence of mortars and pestles at a large number of low elevation sites. Leaf-shaped points were gradually supplanted by a variety of broad-necked stemmed points.

The Late Archaic Period (2,000 - 250 BP) marks the culmination of the development of native cultures in the Willamette Valley. Late Archaic sites, in part, incorporate the tangible remains of the laughs of Willamette Valley natives as captured in the ethnographic record. However, the ethnographic record for the Willamette Valley is somewhat impoverished because the native population was decimated by introduced diseases at an early date and no attempt at ethnographic documentation was carried out until the third decade of the present century. Thus, native informants were either very young when their people were removed to the reservation or were relating second-hand information. In addition, the informants were relating information about a time of cultural crisis following the loss of many people with a concomitant loss of cultural content. Hallmarks of the Late Archaic are a variety of narrow-necked stemmed projectile points, which served as armature for arrows. Mortars and pestles continued in use during this period and coupled with archaeobotanical materials recovered from a number of sites serve to point out the importance of plant foods in the subsistence economy.

The Historic Period marks the brief time between the earliest introduction of Euro-American trade goods around A.D. 1750 and the removal of the native population of western Oregon to the Grand Ronde and Coast reservations in 1856. The Vida/McKenzie WAU has no recorded sites assigned to the Historic Period. At the time of Euro-American contact the boundary between the territories of the Mohawk band of the Kalapuya and the Upper Santiam band of the Molala was located near the present town of Vida (Beckham 1976). However, relationships between the Molala and their Kalapuya neighbors were purportedly amicable so the boundary was not firm. Thus, Late Archaic and Historic Period archaeological sites located toward the eastern end of this watershed area could be attributable to the ancestors of modern-day Molala or Kalapuya peoples. All of the recorded sites appear to be small lithic scatters associated with resource extractive activities. None of the sites have produced the large and varied inventory of tool forms associated with base camps or winter residence sites, nor have the test excavations (albeit limited) conducted at 3 of the sites resulted in the discovery of features associated with sites occupied for extended time periods. None of the recorded prehistoric sites located in the Vida/McKenzie WAU have been found eligible for listing on the National Register of Historic Places.

Euro-American Settlement

Although the McKenzie River is named after Donald Mckenzie, a partner in Jacob Astor's Pacific Fur Company who later worked for the North West Fur Company following the sale of the Pacific Fur Company, there is no concrete evidence that he or any other trapper/trader explored the McKenzie watershed during the fur trade era between 1811 and 1846. Exploration of the lower portion of the McKenzie Valley probably proceeded apace with the settlement of this area.

The best lands along the north side of the river as far upstream as Walterville were claimed under the Donation Land Claim Act by settlers who had arrived in Oregon too late to file on lands in the Willamette Valley. Most of the filers on the lower McKenzie staked their claims between 1853 and 1855 although many did not patent their claims until 10 to 20 years later in order to avoid paying taxes on the land. These early settlers fenced small parcels on which to grow a few acres of grain, planted small orchards and large gardens, and pastured their cattle on the prairies and oak openings in a largely self-sufficient subsistence lifestyle. Less desirable tracts located on the south side of the river (very limited access to the wagon road on the north side) and tracts located on the upland flanks of the valley were claimed by Homestead Entry and Cash Entry between 1870 and 1905. At least some of the latter were probably claimed for their timber value rather than with any serious intent of farming or stock raising.

Lands to the east of Walterville filled slowly between 1872 and 1939. Homestead Entry and Cash Entry were the 2 methods used to claim lands in the eastern portion of the WAU. As was the case in the western portion of the watershed, the bottomland on the north bank of the river was the earliest to be settled while upland tracts and tracts on the south side of the river were settled later. A number of upland locations were claimed by Homestead Entry and Cash Entry avenues between 1890 and 1910. Some claims were filed on tracts burned in the recent past and probably represent legitimate attempts at stock raising on the burned over lands. Some of these claims may have been filed primarily for the value of the timber on the claim. However, the pattern of an extensive number of entries filed between 1907 and 1910, marking the fraudulent claims associated with the O&C timber fraud as seen in the Mohawk drainage, is not apparent in the Vida/McKenzie WAU (Bureau of Land Management, n.d.).

There are 3 townsites located within the V/M watershed boundaries: Walterville, Leaburg, and Vida. These towns lie along the route of the McKenzie Wagon Road, approximately the same route now followed by State Highway 126, which was completed as far east as the lava fields near the summit of the Cascades by 1864. All 3 towns began as the locations of rural post offices during the decade of the 1870s, although Vida post office was originally named Gate Creek (McArthur 1992). Each location developed into a small village with a school, church, and small store to serve the needs of the local population (Toepel and Beckham 1991).

Cultural Resources

Logging and Lumbering - Logging did not play a major role in the economy of the McKenzie watershed until after 1910 when timber harvested in the lower portions of the watershed was floated by river to mills in Springfield and Coburg. The river was the only means of moving logs to the mills in the McKenzie watershed until Booth-Kelly extended its logging railroad into the headwaters basins of Lane and Johnson creeks during the 1930s. Booth Kelly began truck logging on the south side of the McKenzie River during the same decade (Polley 1984). During the 1930s and 1940s timber harvesting shifted from private to public lands for a source of timber (U.S. Forest Service, Willamette National 1995).

From the 1950s through the 1970s timber harvest on BLM lands increased, reaching a peak during the late 1960s and early 1970s. Since that time timber harvest on BLM and all forest lands declined in Lane County (BLM and Oregon Department of Forestry data). By 1990 Federal timber harvests had declined with more timber being harvested on private lands (see Figure 1).

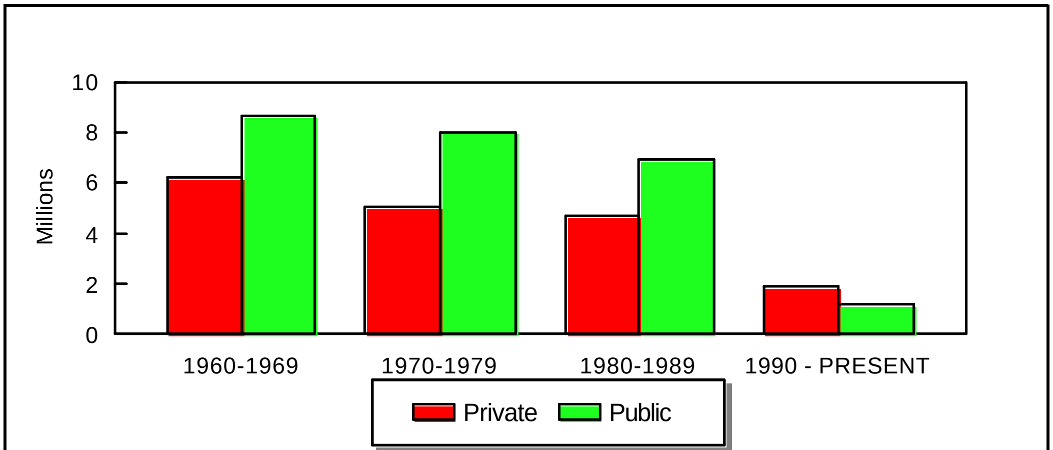


Figure 7: Log Production from Lane County (1960-1990)

Figure 1 - Timber Harvest on Private/Public Lands from 1960 to Present

Figure 2 shows the trends on BLM lands of timber harvest within the McKenzie River watershed since 1910. In the 1940s an increase in timber harvesting occurred because of the need for forest products during World War II. In the 1980s an increase in timber harvest occurred in the watershed because harvesting laws increased in this watershed as timber harvesting was being deferred on stands used heavily by the northern spotted owl in adjacent watersheds.

Figure 2 - Timber Harvest on BLM Lands in the Watershed

Special Forest Products - In comparison to other areas on the Eugene District the WAU is not heavily used for the harvest of special forest products. It is primarily used for firewood collection with most of those permits being sold to residents of the Eugene/Springfield area rather than local residents.

Table So-1 - Number of Special Forest Products Permits Sold
BLM, Eugene District, McKenzie Resource Area WAU (1986-1994)

Year	Number of Permits	Number to Local Residents	Number to Eugene/Springfield Residents	Number to Residents Outside Area
1986	13	3 (23%)	10 (77%)	0
1987	0	0	0	0
1988	0	0	0	0
1989	4	0	4 (100%)	0
1990	2	0	2 (100%)	0
1991	4	0	2 (50%)	2 (50%)
1992	32	1 (3%)	28 (88%)	3 (9%)
1993	62	5 (8%)	39 (64%)	18 (29%)
1994	35	2 (6%)	25 (71%)	8 (23%)

(USDI, Bureau of Land Management, 1995)

This information indicates that there are more permits being sold for firewood since 1992 than in previous years and that more permittees are coming from outside the local or Eugene/ Springfield area than in previous years. Based on this information we can conclude that the need for the Eugene BLM to provide firewood cutting opportunities for local residents is limited. Special Forest Products collected in the WAU include firewood, moss, sawtimber, boughs, wildings, burls, mushrooms, vine maple, Oregon grape, rails, posts, cascara bark, salal, yew wood, incense cedar, ferns, bolts and shakes, Christmas trees, and quarry rock.

It has been suggested that the opportunity to provide firewood on the public lands will decrease in the future (Hegg 1989). It is also anticipated that increases in permits for greenery, florals, mushrooms, and herbs will occur in the future due to a rapidly growing international market for these products.

Many groups and individuals are exploring the opportunity to establish a business where special forest products such as the greenery, boughs, florals, mushrooms, and burls could be sold in Linn or Lane County. If such a business were established in the nearby area it would most likely encourage increase harvesting of these products on Federal lands.

Mining - Although there is no record of mining within the boundary of the Vida/McKenzie WAU the discovery of gold around 1887 in the Blue River drainage near Gold Hill resulted in the construction of a wagon road from the community of Gate Creek (later Vida) to the mining district (Minor and Pecor 1977). The Blue River mining district is located in the SW corner of T. 15 S., R. 4 E. and the NW corner of T. 16 S., R. 4 E. The Blue River mining district was originally accessed by a trail system beginning east of Brownsville and running along the divide between the Calapooya and McKenzie drainages. By 1891 this trail was replaced by a water grade trail along the course of the Calapooya River (Sharp 1891). C.M. Collier, who surveyed the subdivisions in the north portion of T. 16 S., R. 2 E. during 1892, noted the "projected line of the Gold Hill and Gate Creek Wagon Road" on the plat map completed in 1892 (C.M. Collier 1892). The route presumably followed a water level route up Gate Creek as far as the confluence of the North and South forks. At that point the projected route climbed the ridge between the North and South forks and followed the summit of the ridge line northeasterly to join the old trail along the divide between the Calapooya and the McKenzie rivers. A plat of T. 16 S., R. 3 E. drawn following the survey of the subdivisions of the township in 1908/1909 shows a completed wagon road (Henry 1909). At the same time, a wagon road was constructed along Quartz Creek to the mines in the east end of the Blue River mining district (Mensch 1907). The wagon roads have long since been incorporated into the network of logging roads serving the area.

Power Generation - Two diversions and one dam for power generation are located within the WAU. The diversions were constructed by the Eugene Water and Electric Board (EWEB) in 1910 and 1911 in Leaburg and Walterville, respectively. The dam was built by EWEB in 1929, also in Leaburg.

Recreation - The McKenzie River corridor is regionally known for its scenic, recreational, and wildlife/fisheries resources. It draws visitors from the Eugene/Springfield metropolitan area as well as out-of-area visitors, particularly in the summer months.

A 1991 recreational survey found fishing as the predominant recreational activity pursued in the river corridor, then boating, followed by picnicking (USDI, Bureau of Land Management 1994). Of the survey respondents who indicated they were fishing, 58 percent fished from shore, 44 percent from a boat, and 13 percent while wading in the river (USDI, Bureau of Land Management 1994). Of the survey respondents who indicated they were boating, 58 percent used drift boats, 25 percent used rafts, and 8 percent used canoes and kayaks (USDI, Bureau of Land Management 1994). Only 12 percent of the boaters who responded to the survey used commercial guides (USDI, Bureau of Land Management 1994). These results are consistent with those derived from a 1990 McKenzie River User Survey, which found 90 percent of the boaters were private operators.

Dispersed recreation has always been a popular activity within the WAU and is expected to increase in the future. Most formal recreation activity occurs in the Upper McKenzie because of the greater recreation development in that area and greater amount of Federal forest lands in that area. Most of the dispersed use in the Lower McKenzie includes: fishing, nonmotorized boating, driving for pleasure, water play, picnicking, hiking/walking/running, and wildlife viewing (USDI, Bureau of Land Management 1994). Dispersed recreation use in the area is focused on public lands because most in the Lower McKenzie are privately owned (USDI, Bureau of Land Management 1994). However, private landowners have increasingly gated their roads due to problems with people dumping garbage and hazardous materials, thus limiting public access to public forest land within the WAU and dispersed recreation opportunities.

Hendricks Park, which is a State-run developed facility within the WAU, receives an average of 150,000 visitors a year. Over 70 percent of these visitors are picnickers and hikers, and 30 percent are boating and fishing (Anderson, pers. communication 1995).

A January 1995 report titled "Initial Social Assessment of Proximate Communities for the Central Cascades Adaptive Management Area," by Bruce Schindler and Peter List of Oregon State University after they surveyed residents of the Eugene-Springfield area and in the communities along the McKenzie River corridor and found the following levels of interest in using forested lands (see Table So-2).

Table So-2 - Recreational Uses
People in Eugene/Springfield and the McKenzie River Drainage

Visit the Forest for Any Reason	Eugene/ Springfield	McKenzie
Never	1%	1%
Occasionally	57%	65%
Frequently	42%	34%
Use the Forest to	**Eugene/ Springfield**	**McKenzie**
Day Hiking	70%	81%
Camping in developed sites	77%	74%
View/Photo Wildlife	73%	68%
Fishing	52%	64%
Hunting	28%	45%
Mushroom/Berry Picking	33%	43%
Overnight Backpacking	40%	32%
Bicycling	44%	40%
Power Boating	27%	30%
Woodcutting	21%	39%
River Rafting	37%	34%
Downhill Skiing	36%	25%
Cross country skiing	29%	16%
Motorcycling/ATV	14%	18%
Horseback Riding	15%	11%
Snowmobiling	6%	9%

(Schindler et al. 1995)

The most significant differences in the use of the forest appear to be in hunting, day hiking, mushroom and berry picking, and woodcutting where local residents tend to do more of these activities than the visitors from the metropolitan communities. The metropolitan communities tend to use the forest for recreation uses such as backpacking and downhill and cross-country skiing.

Fishing - The McKenzie is one of Oregon's most popular rivers for trout fishing. Wild and hatchery trout contribute to angler catch. Since the late 1940s the Oregon Department of Fish and Wildlife (ODFW) has stocked the river annually with about 120,000 legal sized rainbow trout (Oregon Department of Fish and Wildlife 1983). Important recreational fisheries for spring chinook salmon and summer steelhead also exist on the river (Oregon Department of Fish and Wildlife 1983). Hatchery-reared juvenile spring chinook salmon have been stocked periodically in the McKenzie since the early 1900s to supplement the wild population (Oregon Department of Fish and Wildlife 1983). Since 1968 an introduced run of summer steelhead has been maintained by an annual release of hatchery-reared smolts (Oregon Department of Fish and Wildlife 1983).

Angler surveys were conducted on the McKenzie River in the early 1950s (Jensen 1947-1952) and in 1973-1974 (Moring 1976), and allow comparison of hatchery:wild composition of the trout catch and average catch per unit effort (see Table So-3). The proportion of wild fish in the trout catch, which dropped from 47 percent in 1951 to 11 percent in 1974, was still 11 percent in 1983 (Oregon Department of Fish and Wildlife 1983) (see Table So-4).

Table So-3 - Comparison of Hatchery and Wild Composition Trout Catch and Average Catch Per Unit Effort During Survey Years 1946 to 1983

Year	Legal-sized Rainbow Trout Stocked	Wild Trout (% of catch)	Hatchery (% of catch)
1946	0	100	0
1950	144,226	46	54
1951	123,331	47	53
1974	126,041	11	89
1983	123,089	11	89

(Oregon Department of Fish and Wildlife 1983)

Table So-4 - Estimated Angler Effort and Catch in the McKenzie River, 1983 Trout Season

Category	Lower Section	Middle Section (Below Leaburg Dam)	Sections Combined
Total Anglers	29,857	23,855	53,712
Total Fish Caught	28,502	25,234	53,736
Total Angler Hours	87,688	76,590	164,278
Fish per Hour	0.33	0.33	0.33
Percent Stocked Fish Caught	**Lower Section**	**Middle Section (Below Leaburg Dam)**	**Sections Combined**
Hatchery Rainbow Trout	47.7	29.7	37.1 (average)
Summer Steelhead Smolt	3.4	9.4	5.9 (average)
Spring Chinook Salmon Smolts	0.9	0.1	0.4 (average)

(Oregon Department of Fish and Wildlife, 1983)

The data in these 2 tables is the most recent available for the analysis area from the Oregon Department of Fish and Wildlife (Ziller, ODFW, pers. communication 1995). Though the information is dated it does indicate that the fishery resources on the Lower McKenzie River depend heavily upon hatchery fish and is a major recreation activity within the WAU.

The recreational angling occurring in the Lower McKenzie contributes to the economy of the area. A June 1991 study by the Research Group for the Oregon Department of Fish and Wildlife, "Oregon Angler Survey and Economic Study," considered what the economic contribution of an angler/day is to the local economy in several regions in Oregon. The analysis area is included in the Willamette Region. This study estimated that residents of the region contribute $24.35 per angler/day to the local economy (Willamette Region). This includes equipment, gas, food, and other minor expenses. Nonresidents were estimated to contribute $14.45 to the local economy. The lower nonresident costs are due to having assumed their main equipment purchases were outside the Willamette region. The total economic impact of fishing in the Willamette Region was $44.3 million in 1991.

As sales for angling activity work through the economy a total of $.78 of personal income is generated from each $1.00 of increased sales (Oregon Department of Fish and Wildlife 1991). The total personal income generated by annual expenditures by Oregon residents for the angling experience are $1,366 per angler (Oregon Department of Fish and Wildlife 1991).

In general in Oregon most anglers are male, between the ages of 45 to 65, and have a moderate income (Oregon Department of Fish and Wildlife 1991. They have fished for over 11 years and, when they take a trip (average of 10 trips/year), it is primarily for fishing rather than other outdoor activities (Oregon Department of Fish and Wildlife 1991.

River Rafting - In addition to the angler use of the river it was estimated that 36,208 nonangler recreational boaters floated the river between Armitage Park and Blue river during the 1983 trout season. This probably represented over 80 percent of the total number of such boaters using the entire river during all of 1983 (Oregon Department of Fish and Wildlife 1983). In July, August, and September these river users outnumbered all anglers (Oregon Department of Fish and Wildlife 1983). Heaviest nonangler boating generally took place above Leaburg Dam and was associated with sunny days, weekends and holidays (Oregon Department of Fish and Wildlife 1983).

Existing BLM and Forest Service Recreation Opportunities

Taylor Creek Day-use Boat Launch Site (T. 17 S., R. 1 E., Section 19) - This area, particularly the portion north of Deerhorn Road, is considered desirable for recreational use by the public as indicated by the regular visitation it receives from boaters and anglers. It represents the closest parcel of public land to the Eugene/Springfield metropolitan area that is administered by BLM. BLM has not actively managed the site for recreational use and it is sustaining visible and growing negative resource impacts (USDI Bureau of Land Management 1994). Users are denuding the vegetation by creating nondesignated parking areas and continue to use the riparian area without benefit of sanitation facilities (e.g., toilet, trash receptacles) (USDI Bureau of Land Management 1994).

Under a Proposed Recreation Area Management Plan (PRAMP) (USDI Bureau of Land Management 1994) the boat launch site would be "hardened" and some development would be done. The goals of the development would be to reduce bank erosion, littering, and improper waste disposal.

During 1994 there were 381 visits to the boat launch site. Of these visits 80 percent were for nonmotorized boating, 30 percent were for fishing, and a few additional visits were for hiking, hunting and walking activities (USDI Bureau of Land Management 1995).

Highbanks Site - The Highbanks site is accessed from Goodpasture Road. It contains a gravel stockpile, and appears to be mainly used as a dumping site for garbage, partying, and shooting. It is about 100 yards away from a high, heavily vegetated bank overlooking the river. Fishing access is possible, but is difficult. Though the site is on the river, it does not really provide access to the river.

North Fork Gate Creek Site - This site was carried over from the previous Management Framework Plan (1983). It appears to have little potential due to topography and access. The access road to the site is controlled by Weyerhaeuser. There is no evidence of recreational use of the site. It has limited potential for fishing, wading, and hunting. The reservation for the recreation site includes 70 acres, of which 21 were identified to be developed. The streambanks are high and steep (approximately 6 to 12 feet). The overstory is mostly a maturing second growth stand of Douglas-fir and a few remnant old growth Douglas-fir and hemlock. The understory is alder and maple with ferns in the flatter areas.

Downstream from the North Fork site is Weyerhaeuser's Gate Creek campground and picnic area. Vehicle access to this area has been blocked and the remaining picnic tables are not receiving maintenance. There is a graveled parking area, but no services are apparent. The site had once been popular for camping and picnicking. More recently it has became a management problem for Weyerhaeuser as it was being heavily used by a transient population so Weyerhaeuser decided to close it to all access.

Forest Service lands located in the northwestern portion of the WAU have no developed recreation facilities and receive very little recreation activity. According to the Blue River Ranger District recreation specialist these areas are not as popular as the nearby lakes and rivers and developed facilities farther upriver, which are located in a more natural setting (pers. communication 1996).

Developed campgrounds are absent within the WAU; however, observation by BLM personnel confirms that dispersed camping occurs within the WAU, predominantly on the south side of the McKenzie River on lands administered by BLM along Deerhorn Road (USDI Bureau of Land Management 1994).

Transportation - Between 1984 and 1993 daily vehicle traffic in the Lower McKenzie increased from 2,793 vehicles to 3,446 vehicles daily. The highest volume of traffic occurs in June, July, August and September. The use of the bus system has continuously increased over the decade between 1985 - 1995. Beginning in the fall of 1995 the Lane Transit District began offering 2 trips on Sunday due to ridership interest (see Table So-5).

Table So-5 - Lane Transit District (LTD) Average Ridership (1985-1995)

Year	Weekday Average Number of Riders (4 trips)	Saturday Average Number of Riders (2 trips)
1995	145	75
1990	104	58
1985	65 (3 trips a day)	0 (no trips offered)

(Viggiano, pers. communication 1995)

Population, Employment, and Income Levels

Population - In 1980 approximately 3,700 people lived in the WAU (1980 Census); in 1990, 3,376 individuals were residents (1990 Census). This indicates a 9 percent decline in population in the area over the decade. Also in 1980, 14 percent of the labor force was unemployed while in 1990 only 7 percent was unemployed (1980 and 1990 Census). This might indicate people leaving the area due to lack of work in timber or timber related industries due to the decline in timber harvesting in the area or may indicate individuals finding work in other industries within the growing metropolitan area of Eugene/Springfield. In a 1995 survey 3 percent of the community indicated that they were unemployed (Schindler et al. 1995). This decline in the number indicating they were unemployed may not indicate an actual decrease in unemployment, but rather may be that employed people are more likely to respond to surveys.

Between the 1980 and the 1990 census there was only a 1 percent change in individuals not in the labor force (1980 and 1990 Census). This minimal change may question the assumption that a large number of retirees recently moved to the Lower McKenzie Valley; however, in a 1995 survey over 38 percent of the individuals in the communities stated that they were retired (Schindler et al. 1995).

Employment - In 1980 72 percent of those in the labor force were private wage and salary workers, but by 1990 that number had declined to 66 percent (1980 and 1990 Census). In 1980 16 percent were government employees and by 1990 that number increased to 18 percent (1980 and 1990 Census). In 1980 12 percent were self-employed, and by 1990 that number had increased to 16 percent (1980 and 1990 Census). Overall, in the work force between 1980 and 1990 the largest increase in the types of employment of individuals in the Lower McKenzie Valley was in executive, administrative or managerial positions, service professionals, and machine operators (see Table So-6). The largest declines were seen as follows: professional specialists; administrative support specialists; farming, forestry, or fish occupations; and precision production, which would include millworkers (see Table So-6 - 1980 and 1990 Census).

Table So-6 -The 1990 and 1980 Census Occupations and Levels

Occupation	Level in 1980 (%)	Level in 1990 (%)	% Change
Executive, Administrative, or Managerial	11.3	15.4	+4.1
Professional Specialty	15.3	9.5	-5.8
Technicians	0.9	4.0	+3.1
Sales	10.3	8.8	-1.5
Administrative Support	13.8	10.5	-3.3
Private Household	1.1	0	-1.1
Protective Service	0	1.2	+1.2
Other Service	7.9	11.8	+3.9
Farming, Forestry or Fishing	8.8	6.3	-2.5
Precision Production	17.4	14.7	-2.7
Machine Operators	3.7	6.8	+3.1
Transportation and Materials Movement	5.2	6.1	-0.9
Handlers, Helpers, Laborers	3.7	4.2	-0.5

The greatest increase of individuals employed in specific industries was in finance, insurance, and real estate;

personal services, entertainment, and recreation; and educational services. The largest decrease was in retail trade, manufacturing (durable), and transportation (see Table So-7).

Table So-7 - 1980 and 1990 Industry Employment Levels

Occupations	1980 (%)	1990 (%)	% Change
Agriculture, Forestry, Fisheries, and Mining	7.1	7.5	+0.4
Construction	9.1	8.6	-0.5
Manufacturing (nondurable)	2.3	2.4	+0.1
Manufacturing (durable)	17.8	15.3	-2.5
Transportation	5.6	3.6	-2.0
Communication	4.7	5.0	+0.3
Wholesale Trade	4.0	3.4	-0.6
Retail Trade	14.9	11.8	-3.1
Finance, Insurance, and Real Estate	4.9	8.4	+3.5
Business and Repair Services	4.2	4.8	+0.6
Personal Services, Entertainment, and Recreation	1.5	4.2	+2.7
Health Services	5.8	5.9	+0.1
Educational Services	9.4	10.6	+1.2
Other Professional and Related Services	4.9	5.2	+0.3
Public Administration	2.9	2.7	-0.2

(1980 and 1990 Census)

In a 1995 report it was shown that Lane County's employment has grown rapidly over the last 10 years despite severe cutbacks in the local wood products industry (Oregon Employment Department 1995). In 1994 the unemployment rate in Lane County dropped to its lowest level in 25 years (Oregon Employment Department 1995). From 1985 to 1994 Lane County's economy underwent extensive change with more jobs being created in the nonmanufacturing sector, particularly services (Oregon Employment Department 1995). However, within the manufacturing sector there has been increased diversity, moving away from the traditional base of wood products manufacturers (Oregon Employment Department 1995).

It is anticipated by the State of Oregon's employment department that lumber and wood product manufacturing employment will decline in the years between 1995 - 2005 at the rate of -13.2 percent in the Eugene/Springfield area (Oregon Employment Department 1995). It is also anticipated that there will be a 10 percent decrease in Federal government employment in that same period (Oregon Employment Department 1995).

In both 1980 and 1990 the majority of people working had a 30-minute or 20-mile commute to their place of employment with most work outside the McKenzie corridor and with the majority working in the Eugene/Springfield area (1980 and 1990 Census). It appears that a general increase in household income occurred during the decade (see Table So-8).

Table So-8 - Income Levels

Income	Households in 1990 (%)	Households in 1980 (%)	% Change in Households (1980 to 1990)
Less than $5000	3.5	6.8	-3.3
$5,000 to $9,999	4.0	13.6	-9.6
$10,000 to $14,999	11.8	13.8	-2.0
$15,000 to $24,999	14.5	34.6	-20.1
$25,000 to $34,999	14.7	13.4	+1.3
$35,000 to $49,999	26.3	9.2	+17.1
$50,000 to $74,999	17.4	5.4	+12.0
$75,000 or more	7.3	2.9	+4.4

In 1980 the median income of the area was $19,615 (1980 Census). In 1990 the median income of the area was $33,821 while the median income for Lane County in 1990 was $19,481. This indicates that overall the WAU has households with significantly higher incomes in comparison to the surrounding area.

Economy - The communities of Vida, Walterville, and Blue River have all been recognized as timber-dependent communities and, due to this status, have been able to receive some Federal grants. These are the only unincorporated communities that were recognized by the State as timber-dependent.

Between January 1980 and July 1995, 73 building permits were filed for new commercial developments, 22 permits for commercial additions, 353 for mobile homes, and 347 for single family dwellings. This appears to indicate that new individuals moving into the area is not closely related to commercial development.

Community Values - A survey of residents conducted in the summer of 1995 indicates that community members in the WAU value the rural character of the area, preservation of local history, the fishing resource, safety, and the recreation the McKenzie River provides (University of Oregon 1994).

According to the report, *Initial Social Assessment of Communities for the Central Cascades Adaptive Management Area*, which surveyed residents of the area during 1994,

> "Given the length of time people have resided in these communities, many have probably developed strong attachments to specific places and these feelings are likely to carry a high level of expectation that their preferred recreation sites will be protected. Community members also probably have a strong sense of the landscape around them and an interest in forest management activities. However, most were unaware of the BLM and its management activities in the area (Schindler et al. 1995)."

On a more informal basis, others have indicated that the McKenzie River may be different than other rivers in the region because of the strong loyalty residents and recreationists have to the area.

Community and Interest Groups - The following are some of the major organizations and groups that individuals mentioned in conversations in 1995 about the WAU and that were included in informational materials about the area.

McKenzie Chamber of Commerce - ". . . actively supports the promotion of commercial, industrial, civic, and recreational growth of the McKenzie River Valley; the preservation of the scenic beauty of the McKenzie River and Valley; the preservation and further development of natural resources, fish and wildlife; and to make the McKenzie River Valley a better place to live."

McKenzie Watershed Council - Formed in 1993 to coordinate and integrate resource planning for the entire McKenzie basin. Its purpose is ". . . to help address watershed management issues in the McKenzie River watershed and provide a framework for coordination and cooperation among key interests in the development and implementation of a watershed action program." The Council is intended to be an advisory group to establish decision-making bodies and communities of interest and, in a consensus building framework, . . . makes recommendations concerning the protection, restoration, and enhancement of the quality of the McKenzie River Watershed.

Other Groups - Rural Fire Protection League, McKenzie Residents Association, The McKenzie River Trust, McKenzie River Garden Club, McKenzie Neighborhood Watch, McKenzie Schools PTA, McKenzie School Board, McKenzie River Guides Association, McKenzie River Guides and Packers Association, McKenzie River Paddlers, McKenzie School Boosters and Walterville Elementary Boosters, Welcome Rebekah Lodge #211, McKenzie Late Bloomer Garden Club, Whitewater Masonic Lodge, McKenzie River Lions, McKenzie RFPD Booster, and McKenzie River Artist Guild.

Stream Flow Conditions

The Vida/McKenzie Watershed has changed fairly significantly from historic conditions. The most obvious change is the regulation of flow on the McKenzie River; the timing and magnitude of flows have been altered from what would be expected under natural conditions

Statistical estimates for flow events with return intervals of 2, 5, 10, 25, 50, and 100 years were made by USGS for this station using data representing the preregulated stream. A storm with a recurrence interval of 2 years or more has been reached only once (water year 1965) during the time period 1963-1993 on the McKenzie River. This time period correlates to the regulated flow (post dam construction) on the McKenzie River. A storm event with a recurrence interval of 2 years or more has also just recently occurred (1996) on the McKenzie River. A 2-year storm event is generally correlated with bank full stream conditions. This variability has been somewhat stifled since the regulation of flow of the river.

On Gate Creek, which is an unregulated tributary in the watershed, numerous flow events greater then the 2-year event were recorded during a comparable period (after 1963). Several flow events of magnitude greater then or equal to a 5-year event were recorded during this same period. A comparison between the Gate Creek and McKenzie River points out the differences between regulated and unregulated flow over the same period. The effect is particularly noticeable for low and moderate peak flow events. Gate Creek has more 2-year events and 5-year events. The McKenzie River only had 5-year (or greater events) in the floods of 1964 and 1996. The range in peak flows were narrower on the regulated McKenzie River in comparison to Gate Creek (see Appendix B).

Figure 1 shows the changes in timing of flows on the regulated main stem from reference (pre-dam) conditions. The differences are not dramatic but do indicate the seasonal changes to flow because of the reservoirs. Flows in the late summer and early fall are higher then under natural conditions because of the release of water from the reservoirs. Flows in the late winter and early spring are lower then under natural conditions because of the filling of the reservoirs.

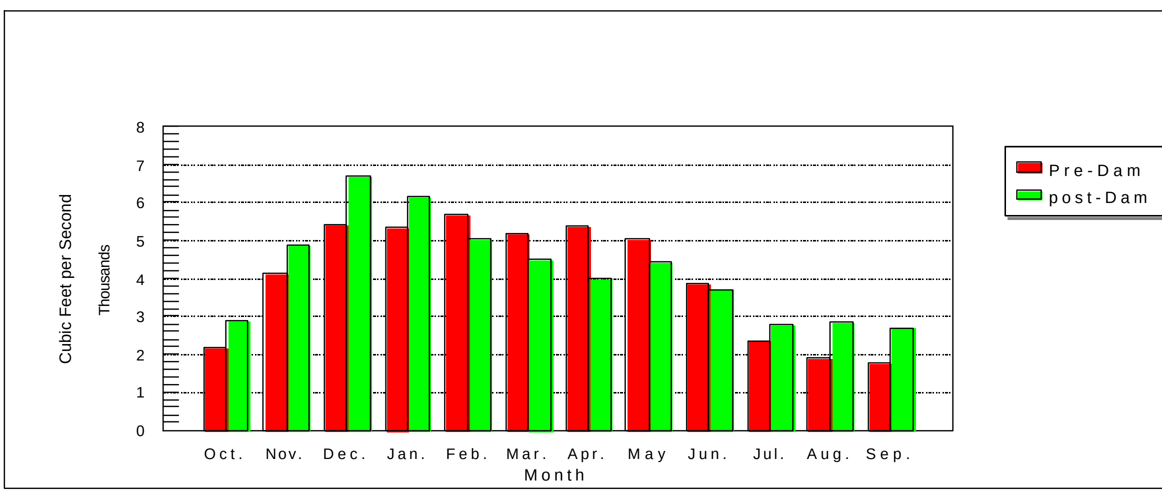


Figure 1: Monthly Mean Flows - McKenzie River at Vida

The influence of the power canal diversions (Walterville and Leaburg) can be seen in Table H-1 for the Total Yield and Average Flow data. The USGS stations at Leaburg and Walterville are below the canal diversions. Average Flow and Total yield for these stations are both considerably lower then for the USGS station on the McKenzie at Vida (upstream). The stations at Walterville and Leaburg would normally be expected to have much greater Average flow and total yield then the Vida station in the reference condition of no diversions. The much lower flow and yield at these stations illustrates the large amount of flow that is being diverted through the canals. In addition, now there are tributaries in the watershed that flow directly into the canals instead of directly into the McKenzie River.

Table H-1 - Vida/McKenzie Watershed Total Yield; Maximum, Minimum, and Average Recorded Flow. Peak Flows for the McKenzie River and Gate Creek for Various USGS Stations

	McKenzie River				**Gate Creek**
	at Vida USGS Station #14162500	**at Coburg USGS Station #14165500**	**at Leaburg USGS Station #14163150**	**Walterville USGS Station #14163900**	**at Vida USGS STATION #14163000**
Total Yield	2,935,000 Acre-ft/yr	4,286,000 Acre-ft/yr	1,557,000 Acre-ft/yr	1,645,000 Acre-ft/yr	153,600 Acre-ft/yr
Maximum Recorded Flow	64,000 (CFS)	88,200 (CFS)	29,300 (CFS)	23,600 (CFS)	7,140 (CFS)
Minimum Recorded Flow	1,260 (CFS)	1,080 (CFS)	457 (CFS)	420 (CFS)	12 (CFS)
Average Recorded Flow	4,051 (CFS) (1925-1987)	5,916 (CFS) (1944-1972)	2,149 (CFS) (1989-1993)	2,271 (CFS) (1989-1993)	212 (CFS) (1952-1957)(1967-1987)
Peak Flows from USGS Equations for Recurrence Intervals (RI) 1.25,2,5,10,25,50, and 100 Years (Exceedance Probabilities of 80%, 50%, 20%, 10%, 4%, 2%, and 1%)					
Recurrence Interval/ Exceedance Prob.	McKenzie River at Vida (1923 -1962)	McKenzie River at Coburg (1945-1963)	McKenzie River at Leaburg and at Walterville (1989 to Present)		Gate Creek at Vida (1952-1987)
1.25 Yrs/80% E.P.	20,300 (CFS)	36,300 (CFS)	Not Applicable - Period of Record is not long enough for statistical validity.		1,970 (CFS)
2 Years/50% E.P.	29,200 (CFS)	49,500 (CFS)			2,890 (CFS)
5 Years/20% E.P.	41,500 (CFS)	68,600 (CFS)			4,280 (CFS)
10 Years/10% E.P.	49,500 (CFS)	81,900 (CFS)			5,280 (CFS)
25 Years/4% E.P.	59,500 (CFS)	99,400 (CFS)			6,630 (CFS)
50 Years/2% E.P.	66,800 (CFS)	---			7,700 (CFS)
100 Years/1% E.P.	74,100 (CFS)	---			8,810 (CFS)

An increase in peak flows and total yield from historic conditions has also likely occurred in the unregulated tributaries in this watershed. The primary causes of this are an increase in compacted area (roads, forest and agricultural activities; man-made structures; human development, etc.); an "extension" of the stream network due to the direct routing of water from roads to streams; and an increase in snow accumulation and snow melt (rain-on-snow events) due to clear cut forest harvesting.

The increase in peak flows from rain-on-snow affects has been analyzed and quantified in considerable detail by the Weyerhaeuser Company (WEYCO) in their Watershed Analyses of the Lower McKenzie. Estimates were made in these analysis using the Washington Forest Practices Methodology with localized data. Table H-2 is a summary of the WEYCO analyses findings for rain-on-snow impacts. This table shows the estimated percent increase in rain-on-snow peak flows from a fully forested condition to the current condition by sub-watersheds. It also shows the predicted increase from a fully forested condition to scenarios in which entire subwatersheds are in a hydrologically immature condition (recently cutover). Changes in rain-on-snow peak flows were estimated using average and unusual storm conditions. The increases are represented for 2-year, 10-year, and 100-year storm events.

Table H-2 - Percent Increase in Rain on Snow Peak Flows Estimated for Forest Conditions and Hydrologically Immature Forest Cover Conditions for "Average" and "Unusual" Storms Vida/McKenzie Watershed.

Analysis Unit	Average Storm						Unusual Storm					
	Current Cond.			Immature Cond.			Current Cond.			Immature Cond.		
	2 yr.	10 yr.	100 year	2 yr.	10 yr.	100 year	2 yr.	10 yr.	100 year	2 yr.	10 yr.	10 yr.
Osborn	11	6	4	23	14	9	17	11	7	45	28	19
Boulder	4	3	2	25	15	10	8	5	3	38	25	17
Taylor**	8	5	3	19	11	7	15	10	7	34	22	15
Alder	4	2	1	21	12	8	9	6	4	28	18	13
Spring*	9	6	4	20	12	8	16	10	7	39	25	17
Hagen	7	4	3	20	12	8	22	14	10	43	27	18
Ritchie*	5	3	2	22	15	9	10	7	5	37	25	17
Goose	4	2	1	14	8	5	20	13	9	40	26	18
Trout	10	6	4	22	15	9	18	12	8	39	26	18
Toms	8	5	3	17	11	7	11	8	5	36	25	17
Gate	1	1	1	25	16	10	-	-	-	-	-	-
SF/Gate	2	1	1	25	16	10	-	-	-	-	-	-
NF/NF/ Gate**	0	0	0	26	16	11	-	-	-	-	-	-
Indian	2	1	1	24	15	9	-	-	-	-	-	-
NF/Gate	-	-	-	-	-	-	-	-	-	-	-	-
Finn	-	-	-	-	-	-	-	-	-	-	-	-
Cogswell	-	-	-	-	-	-	-	-	-	-	-	-
Johnson	-	-	-	-	-	-	-	-	-	-	-	-
Holden*	-	-	-	-	-	-	-	-	-	-	-	-
Lane	-	-	-	-	-	-	-	-	-	-	-	-
McKenzie	-	-	-	-	-	-	-	-	-	-	-	-
Rawhide	-	-	-	-	-	-	-	-	-	-	-	-
79th Street	-	-	-	-	-	-	-	-	-	-	-	-

* - No BLM Ownership ** - Very small Percentage of BLM ownership

Information obtained from the Hydrology Assessment Reports completed by Ken Carlson (Beak Consultants Incorporated) and Maryanne Reiter (Weyerhaeuser Company) for the North and South Side Lower McKenzie Watershed Analysis (Weyerhaeuser Company).

The WEYCO Analysis used flow events from the Gate Creek Gaging Station and local storm data to show that the average storm condition is the more representative condition in this analysis area. The unusual storm condition represents a worst case scenario. Two of the sub-watersheds in this analysis area were not in the WEYCO Lower McKenzie Watershed Analyses area. The peak rain-on-snow model has not been run for these sub-watersheds but these areas are predicted to be on the lower end of the spectrum for increases in peak flow from rain-on-snow events. These sub-watersheds are on the western boundary of the watershed and are predominately in the lowland and rain dominated precipitation classes. Rain-on-snow events are very unlikely in these sub-watersheds.

A 10 percent or less increase in peak flows from natural conditions is generally accepted as having little or no adverse impact (Washington Forest Practices Board 1993). Peak flow increases greater then 10 percent have the potential for adverse impacts. The WEYCO model indicates that conditions under average rain-on-storm situations would not result in significant increases in peak flows. Significant increases in peak flows are possible under unusual rain-on-snow conditions for conditions, particularly for 2-year events. Significant increases in peak flows are also predicted if entire sub-watersheds are cutover to an immature condition for both average and unusual storms. The most dramatic impacts are predicted for the 2-year and (to a lesser extent) 10-year events.

The WEYCO model does not include the changes to the timing and magnitude of peak flows from the influence of road drainage and compacted surfaces. Impacts to peak flows due to these influences have not been quantified. Road density is fairly high for many of the sub-watersheds in the Vida Watershed (see Table H-3). Road densities for the sampled sub-watersheds vary from a low of 1.72 miles/square mile to 8.5 miles/square mile (Weyerhaeuser Watershed Analyses for the Lower McKenzie River 1993 & 1995).

Streams within the watershed have been effectively "extended" from reference conditions because of the direct routing of water from roads to stream crossings. Numerous subwatersheds were sampled in the WEYCO Watershed Analyses for the Lower McKenzie (north and south) to determine the percent of road length that potentially routes water to streams. The findings vary considerably by sub-watershed (see Table H-3). The percent deliverable varies from a low of 6 percent to a high of 35 percent. The subwatersheds that have the highest levels in deliverable percent include: Indian, Lane, Holden, Johnson, and Boulder creeks, and the majority of the Gate Creek sub-watersheds. The largest impacts to timing and magnitude of peak flows from the influence of road drainage are anticipated to occur in these subwatersheds.

The overall influence of roads, compacted area, changes in snow accumulation/snow melt (rain-on-snow) from forest harvesting, regulation of the McKenzie (dams and diversions) on flow cannot be easily quantified. Much more work will need to be done to get a clearer picture of this. Certainly, some of the influences from road and harvest activity have altered the timing and magnitude of flow from the reference conditions, particularly in the sub-watersheds. These influences have been somewhat overshadowed in the main stem by regulation of flow for power and flood control purposes. The influence on flow from activities on public lands is likely to be low because of the minimal amount of public lands and roads within the watershed. It is important to note that these activities can add to the cumulative impacts to flow within the entire watershed.

Table H-3 - Vida/McKenzie Watershed Road length, Road Density, and Percent Deliverable by Subwatershed

Hydrologic Analysis Unit	Road Length (miles)	Deliverable Road Length (miles)	Percent Deliverable	Road Density (miles/sq. miles)
Osborn	23.6	2.12	9%	7.20
Boulder	17.3	3.98	23%	5.00
Taylor**	21.1	3.38	16%	6.70
Alder	12.5	1.38	11%	7.10
Spring*	12.5	1.38	11%	7.50
Hagen	42.3	5.50	13%	6.60
Ritchie*	54.5	9.27	17%	6.00
Goose	23.5	2.35	10%	8.50
Trout	23.3	1.63	7%	6.20
Toms	24.3	1.94	8%	3.70
Gate	7.0	0.45	6%	3.30
SF/Gate	69.0	21.39	31%	3.58
NF/NF/Gate**	55.0	19.31	35%	5.34
Indian	23.0	6.53	28%	3.53
NF/Gate	71.0	23.97	34%	4.39
Finn	26.0	4.07	16%	4.02
Cogswell	19.0	4.24	22%	3.74
Johnson	13.0	2.96	23%	1.72
Holden*	23.0	5.58	24%	5.02
Lane	9.0	2.13	24%	1.57
McKenzie	-	-	-	-
Rawhide	-	-	-	-
-	-	-	-	-
79th Street	-	-	-	-

*- No BLM Ownership

**- Very Small Percentage of BLM Ownership.

Information obtained from Surface Erosion Assessments for the North and South Side, Lower McKenzie Watershed Analysis (Weyerhaeuser Company).

Productivity and Resiliency

Maintenance of soil productivity is essential to ecosystem health. Most forest uses ultimately depend on a productive soil resource. In addition to serving as a medium for plant growth and biological activity, soils also function in the storage and movement of water through a landscape. Long-term soil productivity is the capability of the soil to sustain the inherent, natural growth potential of plants and plant communities over time. Just as soils in a landscape differ in their natural productivity, they also behave differently with various land use practices. Soils in the Vida-McKenzie Watershed Analysis Unit (WAU) were analyzed in terms of their productivity and sensitivity to natural and human caused disturbance using the Resiliency Unit concept.

The Resiliency unit concept is a stratification of soils into Low, Moderate, or High resiliency categories across the landscape according to physical properties and processes that have evolved over time in response to climate, geology, geomorphology, and the biotic community (Appendix B- Soils). Resiliency units for the Vida/McKenzie Watershed were created by combining soil map units listed by SCS in the Soil Survey for Lane County, Oregon. Each Resiliency Unit has soils with similar properties. Resiliency Units are based on such factors as soil temperature and moisture regimes, soil drainage, soil depth, soil coarse fragment content, texture, water holding capacity, organic matter content, nutrient capital and permeability.

Soils in the high resiliency category are generally the most productive areas. They can sustain substantial manipulation and still maintain nutrient capital, inherent physical and chemical capabilities, hydrologic function, and natural rates of erosion. Soils in the Low resiliency category are the least productive. In general, they require protection and offer minimal opportunities for manipulating the surface vegetation without impairing inherent properties and processes, and accelerating the frequency and magnitude of erosional events. See Soil Resiliency Units Map that shows the locations of the soil resiliency categories in the Vida/McKenzie analysis area (see Table 4 below for a summary of the resiliency categories for this area).

Table 4 - Soil Resiliency Unit Summary For Vida/McKenzie Watershed

Unit Number	Resiliency Category	Acres	% Watershed Analysis Area
Unit 1	N/A	1,086	1
Unit 2	LOW	395	<1
Unit 3	LOW	813	1
Unit 4	LOW	2,267	2
Unit 5	MODERATE	4,945	5
Unit 6	MODERATE	21,260	22
Unit 7	MODERATE	4,296	4
Unit 8	HIGH	5,733	6
Unit 9	HIGH	54,312	56
Unit 10	N/A	513	<1

The Vida/McKenzie WAU landscape is dominated by soils in the high and moderate resiliency categories (93% of the watershed). Soils in the high resiliency categories, Units 8 and 9, represent the most productive areas and occupy 62 percent of the watershed. These soils occur on gentle to steep topography, are deep (>40 inches), well-drained and highly permeable dark brown clay loams and dark reddish-brown silty clay loams. They also have high nutrient levels, organic matter content, and plant available water. The highly productive and resilient nature of the soils in turn result in a high potential for successful vegetative restoration of these areas.

Soils in the moderate resiliency categories, Units 5, 6, and 7, occupy 31 percent of the watershed. In comparison, these soils are less productive because they are moderately-deep (20-40 inches) and/or have a higher coarse fragment content. In addition, this category includes soils occupying the drier (xeric) low elevation sites, and the cooler, higher elevation sites where the growing season is shorter.

Soils in the low resiliency categories, Units 2, 3, and 4, occupy less than 4 percent of the watershed area. These areas generally occur on steep slopes and have shallow (<20 Inches), rocky soils associated with scattered rock outcroppings. For soils in this category, nutrients and water are limiting factors, they are drought prone and, therefore, the least productive areas.

Alterations of the soils and associated vegetative cover have occurred from historic conditions. Land use in the landscape has been dominated by forest management activities in the uplands and conversion of lands to agricultural, urban, or domestic use in the McKenzie River Valley. These land use practices have affected the soils resource in several ways. Timber harvesting and broadcast burning have changed the amount of organic matter added to the system and how this material is cycled. Urban and road developments have resulted in soil removal and displacement and higher levels of compaction than under naturally occurring conditions. Roads and compacted areas have also influenced water storage and movement and the ability of the soil to support vegetation and biological activities.

Erosional Processes and Sediment Delivery

Mass Wasting Assessment

Mass wasting is the downslope movement of soil and rock material through a variety of landslide movement mechanisms. It is a natural process in the analysis area due to the presence of weak rock overlying more competent rock on steep slopes. Therefore, under natural conditions creeks in the analysis area have had pulses of sediment and wood delivered over relatively short periods. The material generated by mass wasting events can have beneficial effects downstream by supplying structural components such as gravels, cobbles, and woody debris to stream channels. But acceleration of landslide delivery frequency can adversely affect channels and fish habitat. Of particular concern are management activities that increase the natural frequencies and magnitudes of mass wasting events and overwhelm the system's natural ability to process sediment.

The mass wasting potential assessment for the Vida/McKenzie Watershed Analysis Unit is based on the results of Weyerhaeuser Company's Lower McKenzie Watershed Analysis (1994), and Lower McKenzie, North Side Watershed Analysis (1995). The methods used in the Weyerhaeuser (WEYCO) analyses are those described in the Watershed Analysis Manual, Version 2.0 (Washington Forest Practices Board, 1993). Aerial photography flights were used as sources for the landslide inventory and for measurement of the area and, in turn, volume of the landslides. The Lower McKenzie (south side) aerial photo period was 1945 to 1993, and the Lower McKenzie (north side) aerial photo period was 1955 to 1994. The years 1945 and 1955 are considered the reference for early management conditions. Field visits of the analysis area were conducted in order to verify the location and description of photo identified landslides, to locate landslides not identified on the photos, and to collect landslide and scour measurements. Mass wasting map units were generated, where landslide prone areas were placed into groups with similar landforms, dominant landslide type, and probability of mass wasting and sediment delivery (see the Weyerhaeuser Co. Lower McKenzie Watershed Analyses reports). Those areas in the Vida/McKenzie WAU west of Lane Creek and west of Osborn Creek were not included in the mass wasting analysis.

The mass wasting units generated in the Lower McKenzie Analyses were used to develop a mass wasting potential map of the Vida/McKenzie WAU (see Mass Wasting Potential Map). The Mass Wasting Potential Map indicates 21 percent has a high potential for mass wasting potential and delivery (see Table 5). Most of the high potential areas are located east of Indian Creek, where the topography is steepest (see Slope Class Map). Shallow, rapid landslides and debris torrents were the most common landslide type identified. In the Indian, Minnie, and North Fork North Fork subbasins, landslide prone areas were found in steep stream inner gorges in dormant or ancient landslide topography, and steep, regular concave slopes over 50 percent in dormant landslide topography. For the rest of the Gate Creek subbasin, landslide prone areas were identified on steep, regular, and concave slopes over 60 percent, and slope breaks and benches with significant changes in material properties. Channels prone to dam break floods are another area with a high potential for mass wasting, and almost all the main tributary channels north of the McKenzie River have the potential for this type of mass wasting.

Table 5 - Mass Wasting Potential

Mass Wasting Potential	Acres	Percent of Watershed
Low	63, 317	75
Moderate	3,188	4
High	17,495	21

Areas with a moderate potential for mass wasting occupy 4 percent of the WAU, and are predominantly located south of the McKenzie River. These mass wasting areas include stabilized mid and toe slopes of old slump areas, slopes >60 percent underlain by tuffaceous breccia, volcanic ash, and some igneous rock (i.e., weak rock), and areas in Alder Creek and Taylor Creek, on slopes <50 percent underlain by igneous rocks with small areas of tuffaceous rocks. Over 50 percent of the landslides identified in these areas were road related failures, and were triggered either by the removal of stabilizing mid and toe slopes, or overburdening slopes with sidecast material and subsequent saturation of this material as a result of poor road drainage.

The results of the Lower McKenzie, North Side analysis indicate management activities have increased mass wasting and sediment delivery rates above natural background levels. Road related failures accounted for 49 percent of all landslides during the 1955 to 1994 aerial photo years, and 72 percent of these landslides delivered sediment to streams. Road related failures were primarily associated with sidecast road construction on steep, midslope locations, a common feature in the area east of Indian Creek (see Table 6). Road failures were also associated with cutbank failures, stream crossing failures, headwall crossing failures, and poor road drainage. Although it is difficult to determine the exact amount of sediment volume from landslides, any fine sediment delivered to streams as a result of road related landslides are above background level. In the North Side Lower McKenzie Analysis, road related failures were determined to increase the sediment inputs 50 percent to 100 percent above natural background volumes. Guidelines in the Watershed Manual state management induced increases of fine sediment delivery that are 50 percent to 100 percent of natural background levels may be chronically present in the stream system, potentially impacting aquatic habitat conditions.

Table 6 - Road Related Landslide Distribution, Lower McKenzie, North Side, Watershed Analysis

Year	Sidecast Fill	Cutbank	Stream Crossing	Headwall Crossing	Landing	Tota l	Total Delivered
1955	6	1	5	1	0	13	8
1965/67	5	2	10	1	1	19	19
1979	28	13	16	4	1	62	44
1993/94	38	22	11	1	8	80	54
TOTAL	77	38	42	7	10	174	125

When considering only those subbasins located in the Vida/McKenzie WAU, the results of Weyerhaeuser's Lower McKenzie, South Side, analysis indicate an increase in landslides with management, although not as dramatic an increase as that found in the North Side analysis. Table 7 shows the number of landslides by subbasin and photo year for those subbasins south of the McKenzie River. In general, the increase in the number of landslides is coincidental with an increase in management, particularly road construction. Only one landslide was identified for the 1968 photo period, when previous to this time, logging had taken place only in the Ritchie and Haagen creeks subbasins. In addition, the Wasting Potential map supports the lower level of landslide activity in this area, with most of this region mapped as having a low or moderate mass wasting and sediment delivery potential.

Table 7 - Number of Landslides by Subbasin and Photo Year for Subbasins South of the McKenzie River

	1945		1955		1968		1984		1993		
WATERSHED	**RR**	**NRR**	**RR**	**NRR**	**RR**	**NRR**	**RR**	**NRR**	**RR**	**NRR**	**TOTAL**
Alder			1								1
Boulder			1								1
Osborn			1					1			2
Taylor			1								1
Haagen			1						2		3
Ritchie			1	2	1		5		2		11
Trout							2	6	1	3	12
Toms							1	1		1	3
TOTAL			6	2	1		8	8	5	4	34

(RR = Road Related; NRR = Non-Road Related) (From "Lower McKenzie Watershed Analysis, Weyerhaeuser Co. 1994")

In both Lower McKenzie Watershed Analyses, nonroad related or in-unit landslides were found to most often occur in stands less than 20 years old. In the South Side analysis, 75 percent of the in-unit landslides occurred in harvested areas less than 20 years old, and located within the peak rain-on-snow zone. These results indicate increased landslide activity in harvest areas may be associated with a reduction in root strength and an increase in snow accumulation following harvest. However, both analyses note the difficulty in seeing landslides in mature stands when using aerial photos. It is, therefore, difficult to determine the increase in the volume of fine sediment delivered to streams as a result of in-unit, harvest related landslides.

Hillslope Erosion Assessment

Hillslope erosion occurs on slopes where detachable soils on moderate to steep slopes are exposed to rainfall and overland or surface flow. Sediments generated by surface erosion processes can affect water quality and aquatic habitat. The occurrence of overland flow can be increased by human activities that remove the protective duff layer and expose bare mineral soil to weather and activities resulting in soil compaction. Factors determining the susceptibility of soil to erosion include type and amount of vegetation, topography, climate, and soil properties such as cohesiveness, infiltration rates, and texture.

The relative potential of hillslope related surface erosion for the Vida/McKenzie WAU was analyzed by developing a soil erosion potential map. The factors used in the GIS analysis were topography (slope steepness) and soil erodibility (soil K-factor). The K-factor is a relative measure of the erodibility of bare, freshly tilled soils. The assumption is certain, easily detachable soils (low soil strength) occurring on steep slopes are most susceptible to surface erosion and overland flow. Vegetative cover and climate were not included in the analysis.

The location of Soil Strength Classes (Strong, Moderate, and Weak), are depicted in Soil Strength Classes Map and information on the acreage and percent of the analysis area are summarized in Table 8. Less than 1 percent of the watershed was predicted to have weak soils with a high potential for detachability. The low strength soils in this class are represented by soils classified as wet, and riverwash areas that, due to their proximity to moving water, are very weak and highly susceptible to detachment. The results indicate the vast majority of the analysis area, 77.9 percent, is occupied by soils with strong soil strength.

Table 8 - Soil K-Factor Categories

Soil K-Factor Category	Acres	Percent of Watershed
Weak (K<.25)	337	0.4
Moderate (K=.25-.4)	20,729	21.5
Strong (K>.40)	75,096	77.9

Slope Classes Map indicates the location of each topographic class (Gentle, Moderate, Steep) in the analysis area. Approximately 8 percent of the analysis area is in the steep slope class (>60% slopes) (Table 9). Much of the steeper slopes can be found in the far northeastern portion of the analysis area. Fifty-nine percent of the analysis area is in the gentle slope class (<30%), and 33 percent in the moderate slope class (30-65%).

Table 9 - Slope Class Summary

Slope Class	Acres	Percent of Watershed
Gentle (<30%)	56,975	59.1
Moderate (30-65%)	31,815	33.0
Steep (>65%)	7,598	7.9

The distribution of Hillslope Erosion Risk Classes of Low, Moderate, and High derived from the information from the Soil K-factor and Slope Class maps is shown in the Hillside Erosion Potential Map. Less than 1 percent of the watershed analysis area is in the High Erosion Potential Class (Table 10). Most of the sites in this class are river wash that is susceptible to erosion due to its proximity to strong water flows. Other notable locations are rocky sites on steep slopes. Eleven percent of the soils in the analysis area are in the Moderate Erosion risk category. Moderate risk sites are predominantly located east of Indian Creek, where there are high strength soils on very steep slopes.

Table 10 - Hillslope Erosion Potential Class

Soil Erosion Potential	Acres	Percent of Watershed
Low	84,934	88.1
Moderate	10,826	11.2
High	479	0.5

Eighty-eight percent of the analysis area is in the Low Hillslope Erosion class. This is consistent with observations in the field where surface erosion and overland flow are found to be uncommon in this landscape because the soils are strong and resist detachment, even under bare soil conditions. In addition, the presence of surface organic layers in the forest landscape provides a protective layer that minimizes the opportunity for soil particle detachment and overland flow. When soil is exposed and eroded, it is rarely delivered to the stream system due to the high permeability of the soils and the discontinuous nature of the exposed soil patches. Changes in harvesting methods from ground based to cable yarding systems probably has reduced the potential for harvesting activities on steeper soil types to result in erosion. Yarding trails in recently harvested units are generally compacted and may show indications of overland flow. However, in Weyerhaeuser's Lower McKenzie Watershed Analyses, few yarding trails were found to deliver sediment to streams, which is consistent with field observations by BLM personnel.

The soil K-factor values were developed for agricultural conditions and have not been adapted for forest environments. Also, the K-factor values are for bare, tilled soil, a level of disturbance atypical for the forest environments of the analysis area. The erosion potential map can, therefore, be seen as a "worst case" scenario. From past experience, it was decided that the use of aerial photographs would not be helpful in determining sites with existing surface erosion (i.e., gullies). Field visits were conducted for the 3 erosion potential categories to determine presence (and degree) or absence of erosion.

Road Related Erosion and Sediment Assessment

Erosion and sediment delivery to streams from roads can significantly impact aquatic habitats and other water resources. Whereas cutslopes and fillslopes will eventually revegetate following initial road construction, thereby reducing erosion from these sources, the road running surface remains unvegetated and can continue to erode and provide sediment to streams for as long as the road is in use. Sediment from road surfaces is routed from the road prism to streams by flowing water in culverts, roadside ditches and, where road drainage failure has occurred, as overland flow. Although all roads can generate erosion, only some portions of roads have the potential to deliver sediment directly to streams. Important factors influencing delivery of sediment to streams are the amount and condition of the road prism that drains directly into streams, the level of log truck traffic a road is receiving, and the type of road surfacing present.

Road related erosion and sediment production for the Vida/McKenzie WAU are based on the results of Weyerhaeuser Company's Lower McKenzie (1994) and Lower McKenzie, North Side (1995) Watershed Analyses. The road related surface erosion assessments in the Lower McKenzie Watershed Analyses were conducted using the method described in the Watershed Analysis Manual, Version 2.0 (1993, Washington Department of Natural Resources). In this assessment, an estimate of sediment production is determined by sampling roads for characteristics such as road prism, drainage system density, and traffic level in relation to how they influence sediment delivery to the stream system. Other factors included in the analysis are differing conditions of the road surface (i.e., dirt, native gravel, pit run gravel, crushed rock, and asphalt), cut and fill slope vegetative cover, parent material, and age of the road. The roads in the subbasins located west of Lane Creek and west of Osborn Creek were not included in the road erosion inventory and analysis.

Lower McKenzie, South Side road erosion results are based on a road inventory that samples approximately 28 percent of the total roads in the analysis area. Length of road surfacing types and road densities are shown in Table 11. Ninety-three percent of the roads are surfaced, with 55 percent pit run gravel, 36 percent crushed rock, and 2 percent paved. Road densities ranged from a low of 3.7 mi./sq.mi. in Toms Creek and a high of 8.5 mi./sq.mi. in Goose Creek.

Table 11 - Length of Road Surfacing and Road Densities For Subbasins South of the McKenzie River

Subbasin	Dirt (miles)	Native Gravel (miles)	Pit Run Gravel (miles)	Crushed Rock (miles)	Asphalt (miles)	Total (miles)	Road Density (mi/mi2)
Osborn	2.8	0	10.3	10.1	0.4	23.6	7.2
Boulder	2.5	0	8.9	5.0	1.0	17.3	5.0
Taylor	2.2	0	12.4	6.3	0.2	21.1	6.7
Alder	0.7	0	10.1	1.7	0	12.5	7.1
Forest	0.3	0	6.1	6.1	0	12.5	7.5
Haagen	4.6	0	14.4	19.7	3.7	42.3	6.6
Ritchie	3.6	0	35.1	15.8	0	54.5	6.0
Goose	0	0	16.6	6.8	0	23.5	8.5
Trout	0.4	0	12.5	10.3	0	23.3	6.2
Toms	0.7	0	14.8	8.7	0.1	24.3	3.7
TOTAL	17.8	0	141.2	90.5	5.4	254.9	

An important factor in this assessment is the traffic levels used. For this analysis, road erosion and sediment yield calculations were based on the assumption that 15 percent of the roads would receive heavy logging truck traffic use, and the other 85 percent would receive light traffic.

Results of the analysis indicate road erosion is delivering fine sediment to streams at a rate less than that of natural background levels. (Natural background levels for the North and South Side Analyses were derived using the method described in the Watershed Analysis Manual, and are based on soil creep rates.) Figure 1 (page 32) shows estimated annual fine sediment yields of roads and background levels by subbasin. For the subbasins considered in the Vida/McKenzie WAU, road sediment delivery rates are all less than 50 percent. The Watershed Manual guidelines indicate delivery rates that are less than 50 percent of background levels will probably not be detectable in the channel system. The highest estimated road erosion fine sediment yields is occurring in Boulder Creek at 43 percent of background levels. Osborn, Alder, Haagen, and Ritchie creeks are delivering road sediments at 20 to 30 percent of background levels. Other subbasins are contributing at levels less than 10 percent of background.

Lower McKenzie, North Side - A total of 314.5 miles of road were inventoried for this analysis, and included 100 percent of the roads on BLM, Giustina, and Weyerhaeuser lands. Roads located on small private lands in the uplands, and private lands located along Highway 126 were not included in the analysis. Table 12 lists the lengths of road, deliverable lengths, area, and road density by subbasin. Of the 314.5 miles inventoried, 90.63 miles, or 29 percent of the total road miles were determined to have the potential to contribute sediment to streams. Road densities are considerably lower than those in the South Side analysis, ranging from a low of 1.57 mi/sq.mi. in the Lane Creek subbasin, to a high of 5.34 mi/sq.mi. in the North Fork North Fork of Gate Creek subbasin.

Table 12 - Lengths of Road, Deliverable Lengths, Area, and Road Density
Subbasins North of the McKenzie River

Subbasin	Road Length (miles)	Deliverable Length (miles)	Area of Subbasin (sq.mi.)	Road Density (mi./sq.mi.)
Lane	9	2.13	5.44	1.57
Holden	23	5.58	4.48	5.02
Johnson	13	2.96	7.49	1.72
Cogswell	19	4.24	5.12	3.74
Finn	26	4.07	6.40	4.02
Indian	23	6.53	6.51	3.53
North FK North FK	55	19.3	10.25	5.34
North Fk Gate	71	23.97	16.27	4.39
South Fk Gate	69	21.39	19.30	3.58
Gate	7	0.45	2.20	3.30
TOTAL	315	90.63		

Table 13 shows totals of road use mile lengths, road position, and sediment yield. Total sediment yield from roads in the analysis area was estimated to be 981 tons/yr. Mainline roads contribute the most tons/mi/yr toward sediment yield, and is due to the heavy log traffic use these roads generally receive. The 45 miles of mainline roads are located mainly in the Holden, North Fork (Gate Creek), North Fork North Fork (Gate Creek), and South Fork (Gate Creek) subbasins. Thirty miles of the 45 miles of mainline road are located in the South Fork subbasin. Most of the roads in the analysis area are midslope roads, and consequently midslope roads contribute the highest proportion of the estimated road sediment yield. Figure 2 (page 32) indicates the average tons/mi/yr per subbasin using an active traffic scenario. It can be seen that the Holden Creek, South Fork Gate and Gate Creek subbasins contribute more fine sediment in tons/mi/yr than the other subbasins. This is explained in part by the presence in these subbasins of a large amount of mainline roads and/or the presence of midslope roads with high cutslope delivery rates (i.e., 81% cutslope delivery on 19 miles of midslope road in Holden Creek, 63% cutslope delivery on 59 miles of midslope roads in South Fork (Gate Creek), and an 87 percent cutslope delivery rate on 2.6 miles of midslope road in the Gate Creek subbasin).

Table 13 - Miles by Road Use, Road Position, and Sediment Delivery
Subbasins North of the McKenzie River

Road Use	Miles	Tons/Year
Mainline	**45**	**354**
Primary	**47**	**108**
Secondary	**158**	**397**
Spur	**64**	**122**
Estimated Total	**314**	**981**
Road Position *	**Miles**	**Tons/Year**
Streamside	19	152
Midslope	260	810
Ridge top	35	19
Estimated Total	34	981

* Streamside = roads parallel to streams within 200 feet; Ridge top = road segments at least 2,000 feet long that occur on or near the ridge top; and Midslope = all other roads

Figure 2 (page 32) shows the result of estimated road sediment yield calculations in comparison to natural background levels, per subbasin, under a moderate traffic use level, which was determined to be a more accurate representation of the traffic use in the watershed. This Figure shows that under moderate haul levels, the South Fork (Gate Creek), North Fork (Gate Creek), North Fork North Fork (Gate Creek), Indian, and Holden Creek subbasins were estimated to deliver road related fine sediment to streams at a rate 50 to 100 percent of background levels. According to the guidelines in the Watershed Analysis Manual, this level of sediment yield may be chronically detectable in the streams in these subbasins. The large amount of mainline roads and/or presence of midslope roads with high cutslope delivery rates are 2 of the reasons why these subbasins have relatively high road sediment delivery rates. In addition, Weyerhaeuser's road inventory showed that many midslope and ridge top roads in these subbasins lack cutslope ditches, resulting in the creation of gullies in the road tread that deliver sediment laden runoff directly to streams crossing. Sections of midslope and ridge top roads in these areas were also found to lack vegetation on cutslopes, resulting in sheet wash and increased sediment inputs during rainy periods. Outsloping of roads is also absent and has resulted in concentration of runoff and subsequent development of gullies routing sediment directly to streams. All of these factors result in high sediment delivery rates.

Conclusions

There are few BLM managed lands in the those portions of the analysis area with the highest potential for excessive road-related sediment delivery. Although the potential effects of road erosion from roads on BLM managed lands may be small, the impacts of fine sediment delivery to streams are cumulative, and can be locally significant to aquatic habitat conditions and private water supplies. The subbasins of greatest concern for the BLM appear to be the Indian Creek and Minney Creek subbasins. Management efforts to reduce sediment from roads in these areas should focus on the use of outsloping or crossdrains to reduce the 100 percent delivery of cutslope ditchlines, and the establishment of vegetation on cutslopes. The BLM may also work cooperatively with private landoners to correct road-related sediment delivery problems such as in Finn Creek where high cutslope delivery rates may exist on roads on private lands. In addition, this analysis focused on estimating sediment production from the road surface (and cutslopes). Failing stream crossing can also be a significant source of sediment to streams, but no method is available for assessing sediment production from these sources. An inventory of stream crossing on BLM managed roads would aid assessment of this type of problem.

Comparison of Sediment Sources and Sediment Delivery

Sediment yield or the processing, storage, and transporting of weathered material through a watershed influences channel morphology, aquatic habitat, domestic water supplies, and other uses of water. Of particular concern are forest management and other human activities that change input rates especially of fine-grained sediments, which influence sediment routing throughout the watershed, and potentially affect the suitability of streams for fish habitat and water quality.

The purpose of this assessment is to identify areas in the watershed with the potential to produce increases in fine sediment affecting water resource values. Previous discussions on the importance of hillslope, mass wasting, and road related erosional processes can be used to develop an understanding of the relative increase in fine sediment yield, as a result of management activities, in comparison to natural background sediment yields.

As discussed above, in Weyerhaeuser's Lower McKenzie River and Lower McKenzie North Side Watershed Analyses management related road and hillslope sediment yields were compared to a natural background sediment yield. The major source of sediment for background yield for this comparison is assumed to be soil creep, and is determined as described in the Watershed Analysis Manual. The background fine sediment yield was determined to be 1,436 tons/year for the North Side analysis area, and 2,815 tons/year for the subbasins south of the McKenzie River occurring in the Vida/McKenzie WAU.

For the Lower McKenzie (South Side) Analysis, hillslope erosion and road related erosion were determined to contribute fine sediment to streams at a rate of 25 to 20 percent of natural background levels. According to the guidelines in the Watershed Analysis Manual, increases in sediment yield that are less than 50 percent of background levels will probably not be detectable or significantly impact water resources. This is consistent with the limited channel survey information available for the area, indicating excess sediment is not a widespread problem, and seems to occur more as a local problem. Data was unavailable to compare sediment yield form natural, background landslides to management related landslides in these subbasins.

In the Lower McKenzie, North Side, analysis sediment yield from hillslope erosion was again found to be far less than background soil creep levels (see Figure 3, page 33). Figure 4 indicates that when considering all the subbasins in the North Side, sediment yield from roads is 50 percent or more of background creep fine sediment yield, a level that may be chronically present in streams. The subbasins where road related erosion may be a concern are the South Fork (Gate Creek), North Fork (Gate Creek), North Fork North Fork (Gate Creek), Indian and Holden creeks subbasins. As shown in Figure 3, mass wasting from landslides is the major contributor to sediment yield in the analysis area. As discussed earlier, road related landslides have increased sediment yields 50 to 100 percent of background landslide levels.

Figure 4 (page 33) is a comparison of sediment yield sources in the Lower McKenzie, North Side, analysis area by subbasin. When considering all sediment sources, it can be seen the subbasins of concern are Johnson, Indian, North Fork North Fork (Gate Creek), and South Fork (Gate Creek) subbasins. Limited channel information does not indicate excessive fine sediment yield as a widespread problem in these subbasins. This is consistent with the results of the Channel Assessment describing the Vida/McKenzie WAU as dominated by moderately confined transport reaches, resulting in the watershed having a high capacity for transport of materials through and out of the watershed. There is some indication excess fine sediment may have been a problem in some of the Gate Creek and Toms' creek subbasins in the recent past, and is further discussed in the Aquatic Habitat and Channel Assessment sections of this chapter.

Introduction

The dominant forest series found within the Vida/McKenzie Watershed is western hemlock. A forest series (or vegetation zone) is the area within which a particular tree species is dominant in the climax plant community. The Douglas-fir forest series can be found on some of the drier southern aspects and lower elevations at the west end of the watershed, but represents a much smaller proportion of the area.

The western hemlock forest series represents warm, moist conditions, and lies between the lower, drier Douglas-fir and the higher Pacific silver fir series. The western hemlock series makes up the bulk of the Vida/McKenzie Watershed Analysis Unit (WAU). Precipitation varies from 50 to 80 inches annually, with temperatures slightly below freezing in the winter to 90 to 100 degrees in summer.

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

Plant associations (or communities) are classified within forest series, and are defined as generally discrete, recurring collections of plant species that maintain stable populations over a long period. Plant association describes the potential, or climax plant communities; the vegetation that would eventually occupy a site in the absence of disturbance. For more information and descriptions of the plant associations, refer to the *Willamette National Forest Plant Association and Management Guide* (Hemstrom et al. 1993).

Historic - Based on the stand year of origin, the last major fire events in the Vida/McKenzie Watershed occurred between 1850 and 1900. The fires were predominately mid-sized stand replacement fires. They show varied patterns, ranging from many residual trees remaining to very few left. Most of the mature stands lack structural components of snags and downed logs. A probable scenario is that a stand replacement type fire burned through an area creating snags and over time large amounts of fuel accumulated on the forest floor. Several years or decades later, a second fire came through the area and consumed snags, downed wood, and the duff layer more thoroughly than the first fire.

Florisitic Diversity Within the Watershed (Botany)

Plant community information is lacking on this watershed. This type of information is critical in being able to describe, track, and compare the diversity of plant communities that occur in and between watersheds and in being able to assess the distribution and abundance of plants, fungi, and animals that depend on these plant associations.

It has been documented that the low elevation old growth forest adjacent to the Willamette Valley is rare. As plant communities below 3,000 feet have not been adequately described, it is probable that these low elevation climate plant communities are rare within the watershed. The rarity of these plant communities (and species within them) is further complicated as these plant communities were probably maintained by past anthropogenic fire regimes.

A total of 382 species have been documented occurring on BLM lands in this watershed. The number of nonnative (or exotic) species documented totals 67. This list will become more complete as botanical inventories continue in this watershed. Little information This liis available on fungal and bryophyte species.

ferns and fern allies		15
forbs		257
grasses		35
sedges and rushes		8
trees and shrubs		67
Bryophytes and fungi	(no information documented)	
introduced species		62
noxious weeds		5

Some species of interest have been identified on BLM lands (*Montia diffusa, Aster oregana*). These species are of ecological interest because they have either/or scattered distributions; are locally rare; are found at geographical extremes of their range; or are in a disjunct area for the species. Populations may have unique genotypic characteristics important for long-term species viability.

Special Status Plants (SSP)

Special Status Plant Species identified in the Vida Watershed include species classified as Federal Candidate for listing as Threatened or Endangered, State Candidate for listing as Threatened or Endangered, and BLM tracking species. In addition to those species classified, there are other uncommon plants within the watershed that are being reviewed by the Eugene District Botany Program and/or the Lane County (Emerald) Chapter of the Native Plant Society.

As of January 1996, 1,184 acres (9% of BLM holdings within the watershed or 1% of the total watershed area) of BLM lands have been inventoried in the Vida Watershed for Special Status Plant species. These surveys were primarily botanical clearances in support of other resource programs such as timber management, wildlife and fisheries enhancement, recreation, etc. Some species specific inventories for *Aster vialis* and *Cimicifuga elata* have been done under Challenge Cost share Projects in cooperation with the Oregon Department of Agriculture.

Aster vialis (wayside aster) occurs primarily in the remnant oak forests that fringe the Willamette Valley. This habitat was once maintained as open oak savannah by native burning. Fire suppression, urbanization, and farming has resulted in a reduction of suitable habitat for *Aster vialis*. Poor levels of cross-pollination resulting from habitat fragmentation and continued habitat disturbance are the major threats to this species. The species is now restricted to scattered refugia, usually south facing grassy balds. The majority of this species is located at the southern end of the Willamette Valley. The lower elevation portion of the watershed bordering on Springfield and Jasper contain forest that was once probably oak savannah that has grown in. Openings in this forest are potential habitat for *Aster vialis*. As little of this area has been surveyed, more Aster or its habitat may be found. Areas identified as potential habitat could be identified for reintroduction of this species. Little is known about the response of this species to stand management. In one case, individual plants were initially seen to increase in size and flowering following clear cutting, but over time it now appears as though they are being outcompeted by weedy species also increased by the cutting.

Cimicifuga elata (tall bugbane) is a regional northwest endemic forest species. In the Western Cascades it occurs mostly in mixed Douglas-fir/hemlock/bigleaf maple stands. The sites are always mesic throughout the dry season and frequently steep and rocky. This species is not restricted to a particular stand age. Plants growing in stands with an open canopy have a higher rate of reproduction (Kaye and Kirkland 1994). Potential habitat for *Cimicifuga elata* exists throughout the watershed. Response of this species to stand management is mixed, having low survival in clear cuts; populations adjacent to clear cuts and in thinnings survive, if not directly impacted.

Land Use Allocations for Special Status Plants - Land use allocations for Federal Candidate 2 species *Cimicifuga elata* and *Aster vialis* were made in the Eugene District's Record of Decision and Resource Management Plan (ROD/RMP) June 1995. Botanical reserve areas have been established in the Vida Watershed for the protection and a management of these species; 42 acres have been reserved for *Aster vialis*, (2 sites), and 35 acres for *Cimicifuga elata* (2 sites). All actions proposed within these areas must be consistent with the protection and management of these species.

SEIS Survey and Manage Species - Under the District's ROD/RMP, implementation of the standards and guidelines for Survey and Manage species (Appendix B) will be required. Under this requirement there are 4 provisions to be implemented: (1) Management of known sites; (2) Survey for these species prior to ground disturbing activities; (3) Extensive surveys for these species; and (4) General regional surveys for these species. The only Survey and Manage species known to occur within the watershed is *Aster vialis*, which falls into component 1 of the FSEIS/ROD Standards and Guidelines. Survey for this species is done as part of botanical inventories on the District.

Survey and Manage Species Suspected in the Watershed - The lack of information about of many of the Survey and Manage species makes it difficult to predict the potential occurrence in the watershed. *Allotropa virgata* (candystick plant) is one of the species that can be predicted as likely to occur in this watershed. It has been seen on ridges with thin soil, evidence of past fires (charcoal in the soils), and may be correlated with the fungi species *Armillariella ponderosa* (matsutake), conditions that may exist at higher elevations in this watershed.

Noxious Weeds Within the Vida/McKenzie Watershed - Noxious weeds are defined in *Noxious Weed Strategy for Oregon and Washington* (BLM/OR/WA Pt-94+4220.9) as "Plant species designated by federal or state law as generally possessing one or more of the characteristics of being aggressive and difficult to manage, parasitic, a carrier of host of serious insects or disease, and being nonnative, new or not common to the United States."

<u>BLM Manual 9200</u> provides guidance for implementing integrated pest management on lands administered by the BLM. The objective is to ensure optimal pest management with respect to environmental concerns, biological effectiveness, and economic efficiency while achieving resource objectives.

Cysistus scoparius (Scotch broom), *Senecio jacobea* (tansy ragwort), *Hypericum perforatum* (St. John's wort), *Cirsium arvense* (Canada thistle) and *Cirsium vulgare* (bull thistle) are all known to occur in this watershed. An inventory is needed to delineate area occupied by these and other noxious weed species.

Vegetation Conditions 1995

In the Vida/McKenzie Watershed 32 percent is in a early and young seral condition including recent clear cuts (as of 1993); 24 percent is in a mid seral condition; and 17 percent is in a late seral condition (Table V-1). Approximately 56 percent of the watershed has been harvested since intensive harvesting began in the 1940s, primarily by clear cutting. Salvage harvest along roads has occurred in many of the remaining older stands.

Table V-1 - Seral Stages - All Lands - Vida/McKenzie Watershed

Seral Stage	Age - (BLM defined)	Acres	Area Percent
Recent and Early Seral	Recent (0-9 years) Early (10-30 years)	30,519	31.7
Mid Seral	31-50 years	23,207	24.1
Late Seral	51+ years	16,526	17.2
Other forest	Hardwoods, all ages	10,439	10.8
Nonforest	Agriculture, urban, rock, etc.	15,324	15.9
Water		317	0.3
Total		96,332	100

This seral stage data is a combination of BLM FOI data on BLM lands and 1988 Landsat TM Imagery with recent clear cuts updated to 1993.

The early seral stands in this WAU were created almost entirely by clear cutting. The young seral stands include both older managed stands and some areas where mid-size stand replacement fires occurred in the early 1900s. The mature seral stands were created from a series of stand replacement fires throughout the late 1800s. Most of the late seral conditions originated before 1800.

Stand Structure - Early seral conditions in Vida/McKenzie WAU are mainly the result of clear cutting harvest practice, as mentioned above. Clear cutting simplified the structure of these stands. Past logging utilization practices, fuel management, and safety regulations governed the amounts of downed logs and standing snags retained in plantations. Generally, these managed stands have a lower level of downed logs and standing snags than would be present under natural conditions. Clear cuts within the last 5 years have increasing levels of downed logs, standing green trees, and snags due to BLM's agreement to comply with the Oregon Forest Practices Act (September 1991), and the Eugene District's Record of Decision and Resource Management Plan (June 1995).

Young and mature seral conditions show a varying level of stand structure. Older managed plantations in the young seral conditions have similar levels of structure mentioned above. Native stands represented in the young and mature seral condition were created from stand replacement fires in the mid 1800s and early 1900s. The frequency and intensity of these fires determined the existing amounts of downed logs and standing snags in these stands. Stands on northern slopes and along riparian areas generally have higher levels of structure. Many mature stands (120 years old) in this watershed exhibit low levels of structure. These conditions may have been a result of a high intensity fire and/or reburns of the area during the late 1800s. Portions of stands that originated after fires in the early 1900s were salvage logged, which reduced the structural components of these stands.

The late seral conditions generally have the associated moderate to high levels of downed logs and standing snags. Fire suppression during this century has contributed to the accumulation of these structures. The timber salvage program has reduced the amounts of downed logs and snags in late seral stands adjacent to road systems.

Forest structure within the watershed is defined as a combination of young, mature, and late seral stand conditions, representing the small and large sawtimber structural classes. Small sawtimber stands have an average diameter of 11 to 21 inches. Tree height ranges from about 50 feet to > 100 feet. The canopy is generally a single layer with cover ranges from 60 to 100 percent closure. It is often open enough to allow some development of an understory, although not usually as rich and diverse as mid and late seral conditions. Large sawtimber stands have an average stand diameter of >21" and trees are usually >100' tall. The canopy frequently has openings allowing development of diverse understory and multi-layers. Varying amounts of snags and downed logs may be present. Although this watershed is quite fragmented, the forest structure is still the most connected forest type.

Immature forest patches are composed of early seral conditions and include the following structural classes: grass/forb/shrub, open sapling/pole, and closed sapling/pole. Most of these stands are managed plantations created from a history of clear cut harvesting.

Federal Ownership - The Federal ownership in the watershed totals 14,507 acres and makes up 15 percent of the analysis area. The Federal acres are BLM and Forest Service lands combined; the BLM ownership is 10,625 acres and the Forest Service owns 3,882 acres. The seral stages for the federal lands are shown in Table V-2.

Table V-2 - Seral Stages - Federal Land
Vida/McKenzie Watershed

Seral Stage *	Age	Acres	Watershed Area Percent (96,332 A)	Federal Land Percent (14,507 A)
Recent and Early	Recent (0-9) Early (10-30)	3,397	3.5	23.4
Mid	40-50	3,834	4.0	26.4
Late	51+	7,216	7.5	49.7
Nonforest	Withdrawn	60	0.06	0.4
TOTAL		14,507	15.06	99.9

* see Appendix for a description of the Seral Stage process

Land Use Allocations

There are 5 different Land Use Allocations (LUA) within the Vida/McKenzie watershed: Adaptive Management Area (AMA); Matrix, i.e., General Forest Management Area (GFMA); Late-Successional-Reserves (LSR); District Designated Reserves (DDR); and a small portion of Connectivity (CON) as described in the Eugene District's Resource Management Plan (ROD/RMP June 1995) See Table V-3 "Land Use Allocations for Federal Lands" and Vida/McKenzie LUA MAP.

Table V-3 - Land Use Allocations for Federal Lands
Vida/McKenzie Watershed

LUA	AREA ACRES	PERCENT of WATERSHED
AMA - Adaptive Management Area	5,624	38.8
MATRIX, GFMA - General Forest Management Area	3,989	27.5
LSR - Late-Successional Reserve (USFS)	3,882	26.8
DDR - District Designated Reserve	1,012	6.9
CON - Connectivity	0.2	0.00
TOTAL	**14,507**	**100.00**

Adaptive Management Area (AMA) - This is part of the Central Cascade Adaptive Management Area (CCAMA), which is 38.8 percent (5,624 acres) of the BLM managed land within the watershed. Adaptive Management Areas are landscape units designated to encourage the development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives (C-21).

Standards and guidelines need to be considered during planning and implementation of activities within AMA, and they may be modified in AMA plans based on site-specific analysis (C-3). Management activities in the AMA will be conducted to achieve the objectives described in the NW Forest Plan. Flexibility is provided to meet objectives for Riparian Reserves and Key Watersheds. Standards and guidelines for LSRs must be followed in AMAs (C-22).

AMAs less than 15 percent of fifth field watershed in late-successional forest should be considered as a threshold for analysis rather than a strict standard and guideline, and the role of late-successional forests must be fully considered in watershed analysis before they can be modified (D-11).

MATRIX - General Forest Management Area (GFMA) - This is 27.5 percent (3,989 acres) of BLM lands in the watershed. The GFMA use consists of lands designated for timber management and associated silviculture activities that will emphasize a regeneration cycle of 60-110 years using the SEIS/ROD Standards and Guidelines.

Connectivity (CON) - This is in the Matrix land use allocation but will be managed differently from both LSRs and GFMA in that the best 25 percent of habitat for late-successional dependant species is reserved from timber harvest. This watershed has less than 1 acre within the boundary. This partial acre is associated with a larger land use block in an adjoining watershed and will be managed within that connectivity block.

Late-Successional-Reserves (LSR) - These lands will be managed for old forest characteristics and late-successional species. The LSR is 26.8 percent (3,882 acres) of the watershed. The Forest Service land comprises the Late-Successional Reserves (LSR) land block in the watershed.

District Designated Reserves (DDR) - These are administratively withdrawn areas that include special resource values such as Bald Eagle Habitat Areas and Relic Forest Islands. DDR includes 6.9 percent of the watershed and totals 1,012 acres. In the SEIS/ ROD the DDR are called "Administratively Withdrawn Areas." These areas (DDR) are opportunities where management emphasis precludes scheduled timber harvest and are not included in calculations of Probable Sale Quantity (PSQ).

Riparian Reserves (RR) - Riparian Reserves are lands adjacent to streams where the riparian dependent resources receive the primary emphasis in the specific standards and guidelines from the SEIS/ROD. Riparian Reserves include that part of the watershed directly coupled to streams and rivers and that part of the watershed required for maintenance of hydrologic, geomorphic, and ecological processes affecting the standing and flowing waters. The SEIS sets interim widths for Riparian Reserves based upon 5 categories of streams and waterbodies. The Vida/McKenzie watershed has 3 categories: fish bearing streams; permanently flowing, nonfish bearing steams; and seasonally flowing intermittent streams, wetlands less than 1 acre, and unstable and potentially unstable areas. These reserve widths apply across all LUAs. According to Table V-4 there are 9,734 acres within the watershed identified as potential Riparian Reserves. This is based upon the standards and guidelines in the SEIS/ROD for Federal ownership and the Oregon Forest Practices Act (January 1995) requirements apply to private forest lands. The acreage for Federal lands is based upon using a site-potential tree height of 210 feet for the Riparian Reserve width. This site-potential tree height has been established by the Eugene BLM rather than the lesser distances specified in the ROD because the site tree height is greater. The Oregon State Forest Practices Act utilizes a 25-foot streamside protection buffer. Although Riparian Reserve boundaries on permanently flowing streams may be adjusted, they are considered to be the approximate widths necessary for attaining Aquatic Conservation Strategy objectives (see Riparian Reserves Map for a representation of the Riparian Reserve).

The following table summarizes the amount of Riparian Reserve by each of the major LUAs, including other lands subject to the provisions of the Oregon Forest Practices Act requirements. The acres shown in Table V-4 reflect the "best case" scenario. This is because the hydrology layer used to develop this has not been fully field verified. It may also include streams that are predicted to occur based upon drainage area but do not actually occur on the ground. Site-specific analysis will be necessary prior to establishing Riparian Reserves for any management activity.

Table V-4 - Riparian Reserves by LUA - All Lands
Vida/McKenzie Watershed

Land Use Allocation	Acres in LUA	Acres Riparian Reserves	Percent Riparian Reserves in Land Use
AMA	5,624	2,861	50.87
GFMA-MATRIX	3,989	1,596	40.01
LSR	3,882	1,587	40.88
DDR	1,012	420	41.50
CON - MATRIX	0.2	N/A	0
Private (lands subject to Oregon Forest Practices provisions)	66,184	3,270 *25 ft. buffer each side	4.9
TOTAL	80,691.2 acres	9,734 acres	12.06%

Riparian Reserves on Federal lands are designated for the protection and enhancement of the aquatic ecosystem and adjacent upland areas that directly affect it. Interdisciplinary team projects will adhere to Best Management Practices in the attainment of the Aquatic Conservation Strategy (ACS). Table V-5 shows an age class break to illustrate the amount of acres where potential future riparian enhancement projects may occur. It also shows the amount of acres of older age classes.

Table V-5 - Riparian Reserve Acres, Federal Lands
Vida/McKenzie Watershed

Stand Age Years	Acres	Riparian Reserve Acres	Percent Riparian Reserves	Acres Outside Riparian Reserves
0 - 5	1,819	760	42	2,579
6 - 15	704	196	28	508
16 - 45	2,306	830	36	1,476
46 - 80	3,173	1,162	37	2,011
81+	6,505	3,078	47	3,427
TOTAL	14,507	6,026	42	8,481

The MATRIX land use allocation will be managed for timber products; it has a land base for which future harvest actions will be planned. This management is outlined by the District ROD/RMP. Table V-6 shows the Matrix (GFMA) acres that are in each management stage and acres in Riparian Reserves.

Table V-6 - Management Acres IN MATRIX-GFMA
Vida/McKenzie Watershed

Potential Harvest Type	Age Class, Years	Total Acres in GFMA	Percent Acres in GFMA	Available Acres in Age Class	Percent Available in GFMA
None	0-10	549	13.77	389	9.76
None	20-30	500	12.54	318	7.98
Thinning	40-50	2,632	66.03	1,562	39.19
Regeneration Young	60-80	77	1.93	39	0.98
Regeneration Mid	90-150	143	3.59	59	1.48
Regeneration Old	160+	39	0.98	3	0.08
Withdrawn	N/A	46	1.15	0	0
TOTAL		3,986	100%	2,370	59.46

The **Adaptive Management Area** includes lands that are to be used to develop and test new management approaches to achieve the desired ecological, economic, and other social objectives toward the goal of improved forest management. Table V-7 shows the acres in each management stage and acres in Riparian Reserves within this land allocation.

Table V-7 - Management Acres in AMA
Vida/McKenzie Watershed

Potential Harvest Type	Age Class Years	Total Acres in AMA	Percent Acres in AMA	Available Acres in Age Class	Percent Available in AMA
None	0-10	2020	35.92	1043	18.55
None	20-30	192	3.41	90	1.60
Thinning	40-50	969	17.23	549	9.76
Regeneration Young	60-80	389	6.92	240	4.27
Regeneration Mid	90-150	2007	35.69	819	14.56
Regeneration Old	160+	32	0.57	12	0.21
Withdrawn	N/A	14	0.25	0	0
Total		5623	100%	2753	48.96

Management to favor **Late-Successional** species and qualities is planned for the Late-Successional Reserves (LSR) and Designated District Reserves (DDR). These management actions will be reviewed by a District **I**interdisciplinary Team. Tables V-8 and V-9 illustrate the age classes and Riparian Reserves in the LSR and DDR land use allocations.

Table V-8 - Late-Successional Reserves (LSR), Riparian Reserve Acres, and Upland Acres
Willamette National Forest, Vida/McKenzie Watershed

Age Class (Year	Total Acres in LSR	Riparian Reserve Acres	% Riparian Reserves	Acres Outside Riparian Reserves	% Acres Outside Riparian Reserves
80-100	3,882	1,587	40.88	2,295	59.12

Table V-9 - District Designated Reserves (DDR), Riparian Reserve Acres, and Upland Acres Vida/McKenzie Watershed

Ages (Year Class)	Total Acres in DDR	Riparian Reserves Acres	% Riparian Reserves	Acres Outside Riparian Reserves	% Acres Outside Riparian Reserves
0-10	18	4	22.22	14	77.78
20-30	114	51	44.74	63	55.26
40-50	233	111	47.64	122	52.36
60-80	306	135	44.12	171	55.88
90-150	139	49	35.25	90	64.75
160+	202	70	34.65	132	65.35
WIithdrawn Lands	0	0	0	0	0
TOTAL	1,012	420	41.50	592	58.50

Retention of Old Growth Fragments - The distribution of old growth stands throughout the landscape is an important component of ecosystem diversity and plays a significant role in providing for biological and structural diversity across the landscape. Isolated remnant old growth patches are ecologically significant in functioning as refugia for a host of old growth associated species, particularly those with limited dispersal capabilities that are not able to migrate across large landscapes of younger stands. Isolated patches will function as refugia where old growth associated species are able to persist until conditions become suitable for their dispersal to adjacent lands. This will ensure future options for management and enhancement of diversity within adjacent developing stands.

The standards and guidelines are designed to identify these old growth stands and reserve the most intact or essential 15 percent for refugia within the watershed. Table V-10 includes all land use allocations in the watershed that have an identified stand age of 80+ years. The table separates these allocations in order to identify the reserve areas. Protection of these stands could be modified in the future when other portions of the watershed have recovered to the point where they could replace the ecological roles of these stands.

Table V-10 - Forested Acres 80+ Years on Federal Land Vida/McKenzie Watershed

Land Use Allocation	**Location**	**Acres**	**Percent on Federal Land (14,507 acres)**
MATRIX	Outside Riparian Reserves	62	0.4
MATRIX	Inside Riparian Reserves	120	0.8
AMA	Outside Riparian Reserves	831	5.7
AMA	Inside Riparian Reserves	1,208	8.3
LSR (reserved)	All Lands	3,882	26.8
DDR (reserved)	All Lands	341	2.4
TOTAL		6,444	44.4

Fisheries

Stream Channel Morphology and Fish Habitat

Reference Conditions

Because pools are a critical component of fish habitat at all life stages they can be used as indicators of overall habitat quantity and quality. Pools may be created by geomorphic processes such as bedrock faulting/landslides, or they may be "forced" into existence by pieces of Large Woody Debris (LWD) or boulders in the stream channel. Most forced pools in the Western Cascades are formed when large conifers fall into the stream. This material enables the stream to slow the flow of water, scour out pools of various shapes and sizes, and provide cover for fish. LWD also creates a variety of water patterns and velocities that effectively sort substrates according to size. Well sorted gravels are important primarily for fish spawning. Fish select gravel bars composed of similar size stones, generally no larger than the fish's tail, to dig their redds. Mixed sizes (unsorted) of gravel can prevent fish from spawning. A healthy riparian area with numerous large conifers of different ages will supply the stream with the needed long-term recruitment of LWD.

The PACFISH Guidelines (USFS/USDI-BLM 1995) have established a desired condition of 80 pieces of LWD (>2'x50') per mile for all streams, and a certain number of pools per mile based upon wetted channel width. These parameters are focused on salmon streams, which are generally larger and lower gradient than many of those used by resident trout and other fishes. In small streams proportionally smaller pieces of wood would function as well. Because there are no published guidelines for wood size and amount for these streams, only the PACFISH standards will be addressed in this report. There are several definitions of "pools" being used in inventory methods in Western Oregon. The BLM inventories were done using a definition compatible with PACFISH guidelines, so no adjustment needs to be made to pool comparisons.

Information on historical habitat conditions is rare. However, fish were apparently abundant until at least the turn of the century, especially salmon. It is generally accepted that impacts from management activities, primarily harvest of riparian conifers, roading, and agricultural development, have altered historical conditions. Considerably less LWD is entering stream channels. This results in faster water, fewer pools, and altered substrate recruitment and deposition patterns from what we would expect under pristine conditions. In contrast to the Mohawk/McGowan Watershed, none of the streams in this Watershed Analysis Unit (WAU) were splash dam logged but all have been affected by mass wasting events of one sort or another.

Current Conditions

Fish Species Habitat Overview - Limiting Factors

Rainbow Trout - The species is widely dispersed, probably as far upstream as existing streamflow and gradient would permit. There is no shortage of habitat; what is lacking is habitat quality. The principal shortcoming is that the channels lack complexity, particularly the pools. Much of Fish Zone 2 (Potential Fish Habitat Map) is dominated by plane bed reaches that should, based upon gradient, be pool/riffle. The addition of wood or large boulders would enhance these reaches. Deeper pools and increased complexity would allow larger fish to inhabit the streams within the WAU. At present, it is likely that some resident rainbow trout, especially redsides, outgrow their natal stream and migrate towards the McKenzie River (Danhey 1995).

Cutthroat Trout - There are 2 areas of sensitivity associated with cutthroat trout: the stream size they inhabit, and pool complexity. Recent fish surveys by the Oregon Department of Fish & Wildlife (ODFW) suggest that cutthroat trout may inhabit headwater tributaries with drainages smaller than acknowledged and, since most surveys are conducted during the summer, the range could expand even farther during the winter months. These channels at the edge of the habitat distribution are the most sensitive to any disturbance, but are often the ones most subjected to it. Lower in the WAU, the species faces the same limitations as the rainbow. There is a lack of quality pools, particularly with cover. Pools with cover are an important feature of high quality cutthroat habitat in areas where it co-occurs with rainbow. This pool characteristic is critical for cutthroat to be successful. South Side tributaries support very fragmented populations of cutthroat trout due to the many waterfalls in the area. Isolated populations of cutthroat trout are found in Boulder Creek, Ritchie Creek, and Indian Creek. Status of other populations has not been determined. ODFW has designated Hatchery, Cogswell, Indian, Minney, and Tom's creeks as wild fish special management areas for cutthroat trout.

Spring Chinook - Much of the McKenzie River run is now comprised of fish bound for the McKenzie Hatchery near Cogswell Creek. Of the wild fish, most spawn in the upper part of the McKenzie basin, above Leaburg dam, and in the main stem McKenzie River (Hooton et al. 1988). Chinook production in the Vida WAU tributaries is limited primarily by stream size. Gate Creek is the most suitable tributary for chinook and is used by them. However, the wide valley floor, combined with a generally variable flow regime is not conducive to holding LWD and other habitat creating elements. Historically this area was probably loaded with very large fallen trees, and perhaps a large beaver population. These elements would slow water in high flows and create ample habitat in low flows. As it is, Gate Creek may be used more in years with a rainy fall spawning period. However, even in those years spawning would probably be limited by a shortage of well-sorted gravels and juvenile rearing habitat and may not be conducive to supporting a run (Danehy 1995).

All salmon and steelhead (ocean going rainbow trout) smolts in the McKenzie basin are potentially at the mercy of the Eugene Water & Electric Board's (EWEB) Walterville Power Plant. As fish migrate out to sea many enter the power canal, which is not screened to prevent fish from entering. Most of these young fish go through the turbines and are either killed outright, damaged seriously, or at best severely stunned. EWEB plans to install a fish screen in 1997 if their operating license is renewed by Federal Energy Regulatory Commission (FERC). The canal at Leaburg Dam is already screened.

1987-88 BLM Habitat & Present Condition

Of the 655 stream miles in the watershed, 272 are potentially fish bearing (33 miles/12% on BLM land) and 198 miles (17 BLM miles) of these are above barriers, mostly waterfalls (Potential Fish Habitat Map). Almost half of the stream channels in this WAU (47%) function in a materials transport capacity. Almost as many channels (42%) are sources of material, much of this in the Gate Creek basin. Only 11 percent of the stream channels (exclusive of the McKenzie River itself) function as response areas, and most of these are in Gate Creek also (Stream Transport and Response Reaches Map).

The majority of in-channel wood comes from within 100 feet of the stream channel. This WAU has been extensively logged and in many cases buffer widths are less than 100 feet, thus limiting the amount of LWD that may be delivered to the stream. Riparian areas have also been impacted by debris flows. Streamside overstory vegetation type was classified for streams 3rd order and larger using aerial photos. Of the 318 stream miles assessed, 80 (25%) are forested. Streamside vegetation along these is primarily hardwood/conifer mix (32%), followed by hardwood (26%) and young conifer (24%). There is also some mature conifer (18%), mostly on BLM managed lands (Streamside Vegetation Map). ROD Riparian Reserve widths will improve short-term and long-term LWD recruitment potential. Much of the reserve vegetation is conifer and 58 percent is in stands aged >46 years on at least one side of the stream (Riparian Reserve Stand Ages Map). These reserve areas will provide short and long-term LWD. Finn Creek, however, has been impacted by recent harvest on both sides and has little short-term LWD potential for much of its length on BLM managed lands. Upper Indian Creek will be impacted by a sold/awarded but not cut timber sale (Moria). Buffer widths for this sale are in conformance with old forest practices rules and may not provide any short-term LWD. Riparian areas dominated by mature conifer have the highest potential for short and long-term LWD recruitment. Although conifer debris is generally more stable than hardwood debris, bigleaf maple debris can also be relatively stable, especially if it is in-channel and still living. Riparian areas dominated by alder offer poor recruitment potential. Areas now in a young hardwood condition may require long periods (>150 years) to begin to have a conifer component that can contribute more stable large woody debris (Reiter 1995). Some riparian conversion may be beneficial in these areas. Riparian thinning may be beneficial in areas where a plantation stand is now part of the Riparian Reserve. Trees thinned may be used for instream structure and down wood.

Leaburg Tributaries - There are 10 streams (1st to 4th order) in the WAU on the north side of the McKenzie River west of Gate Creek. For most of their length these streams are high gradient channels (8-20%) flowing through hummocky and moderately steep terrain. Most channel beds are cascade/colluvial, confined, and function in a transport/source capacity (Turner 1995). Because they flow across ancient landslide deposits, there are local areas of lower gradient and less confinement that may function as response areas. These areas should be priorities for restoration where possible.

Six of these streams, flow through at least 1/2 section of BLM managed lands (East Fork Rawhide, Johnson, Cogswell, Hatchery, Finn, and Indian creeks). Of these, all but East Fork Rawhide Creek support populations of both cutthroat and rainbow trout. The Leaburg tributaries provide 89 miles of fish habitat, 17 miles (19%) of this is on BLM managed land. Johnson Creek flows into the Leaburg Canal. Cogswell Creek also flows to the canal, but is diverted to provide a water supply for the McKenzie Salmon Hatchery. Finn and Indian creeks flow into the reservoir behind Leaburg Dam and should be priority restoration streams (Armantrout 1992).

The BLM portions of these Leaburg tributaries are mostly of plane-bed morphology and function primarily in a transport capacity, moving materials from the headwaters to the McKenzie River flood plain (Source Transport and Response Reaches Map). Because of the canal and the lake and agricultural use, transported materials cannot function to create quality habitat on the flood plain. There are fish in both the lake and the canal but there is little quality habitat for them. Therefore, instream tributary habitat (particularly lower gradient areas) may be especially important for fish in this reach. Small side tributaries are apparently critical refugia from frequent slide events. After the Johnson Creek slide in 1986, rainbow trout from a side tributary were again found in the main stem within a week of the event (Armantrout 1992).

Fish habitat inventories were conducted by BLM on portions of Cogswell, Finn, and Indian Creeks during 1987-88. A total of 4.4 stream miles was covered. The Leaburg tributaries (BLM) averaged 8 pc/mi LWD, only 10 percent of the PACFISH recommended amount (Table F-1). There were also 39 percent fewer pools than recommended by PACFISH (Table F-1). Most pools were relatively small, shallow (Table F-2), and lacking cover (Table F-1) - overall not good adult habitat. Likewise juvenile rearing habitat is seriously lacking in the stream segments sampled (Table F-1). Here again the small side tributaries may be important for young fish rearing. A variety of substrate types are present but, because of the lack of LWD, they are generally not well sorted (Table F-3). There are a number of waterfalls in these streams, and many of these are barriers to fish, especially at low water (Potential Fish Habitat Map). Several side channel culverts are also fish passage barriers, but exact locations are not known.

Gate Creek - The Gate Creek basin includes Minney Creek, North Fork Gate Creek, North Fork of the North Fork (Gate Creek), and South Fork Gate Creek and is the most important drainage for fish in this WAU besides the McKenzie River itself. This largest drainage in the WAU varies geomorphically in different sub-drainages. Minnie Creek shares most characteristics with the Leaburg tributaries, except in the headwaters. These, along with upper Indian Creek to the west and the upper North Fork of the North Fork (Gate Creek), make up an area having high gradient channels, and variable channel types. Inner gorge failures are common. Woody debris loadings are generally high and often create large steps/debris dams that trap sediment (Turner 1995).

The North Fork (Gate Creek), South Fork (Gate Creek), and the very headwaters of Johnson Creek are also in high gradient areas and have confined channels with variable channel types. The main stems of the Gate Creek forks (including BLM managed areas) are relatively low gradient pool/riffle response reaches that support fish. However, there are many small tributaries to the forks that exceed 20 percent slope. Transport capacity is high in these and landslide materials can rapidly be delivered to downstream reaches. The South Fork has very high background sediment levels because the hillslope materials are relatively unconsolidated, and the potential for habitat damage (particularly infilling of spawning gravels) is high. Evidence of imbedded fines below the surface substrate was found by Weyerhaeuser Company (WEYCO) geomorphologist, Ted Turner. This could affect macroinvertebrate production and, therefore, be limiting to fish indirectly.

The Gate Creek main stem (below the forks) is moderately confined but, because of its low gradient, has a relatively low transport capacity and functions as a response reach (Source Transport and Response Reaches Map). The channel is wide and does not hold large wood easily. Therefore, this area is subject to both sediment deposition (pool/gravel infilling) and severe scour in high flow events. The channel type is primarily pool-riffle with some plane-bed. This indicates that overall the channel is more or less functioning properly but pools are relatively shallow, and the area has more potential for quality fish habitat than is there at present.

Gate Creek offers 94 miles of fish bearing stream, but only 4 miles (4%) is in BLM managed lands, mostly on Minney Creek. Rainbow trout habitat is abundant in Gate Creek (Potential Fish Habitat Map), and rainbows (including steelhead juveniles) were the most numerous salmonid found when sampled in 1992 (ODFW). Because of the long valley and low gradient, these fish persist far up both forks of Gate Creek. BLM found spring chinook spawning on in the South Fork (Gate Creek) in 1989 (Armantrout 1992). Two chinook redds were found by WEYCO researchers in 1995 in the Gate Creek main stem below the forks. Gate Creek is probably an important rearing area for fry.

Inventories of BLM managed lands were conducted in 1987-88. There were an average of 13 pc/mi of LWD, 16 percent of PACFISH recommendations (Table F-1). There were also 54 percent fewer pools than recommended by PACFISH, but on the South Fork pool frequency met PACFISH guidelines (Table F-1). The majority of substrates were gravels (Table F-3). Much of this material was captured by a large log jam near the upper end of the BLM managed lands on the South Fork (Gate Creek) and was well sorted, providing excellent spawning habitat (Armantrout 1992). However, little juvenile habitat in the way of alcove or side channel pools was found, and only 11 percent of any habitats surveyed had cover elements (Table F-1). Gate Creek is the only stream in the WAU that has many large pools. A few are deep enough to hold oversummering anadromous fish, but most are relatively shallow (Table F-2). BLM manages most of the suitable fish habitat in Minney Creek. The channel is stable and functions well, although the addition of LWD would create more pools for rainbow, cutthroat, and potentially, steelhead and McKenzie redside trout.

South Side Tributaries - Ten streams (1st to 4th order) flow northward into the McKenzie River west of Marten/Gale creeks. Streams on this side of the river are similar to the Leaburg Tributaries geomorphically except that here the streams are more stairstep due to a more benchy topography (Peacock 1994).

BLM manages lands of >1/2 section along 4 of these creeks - Osborn, Boulder, Trout, and Tom's Creeks. These streams provide approximately 89 miles of potential fish habitat, 12 miles (13%) of which is on BLM land. All 4 BLM streams function by transporting material, although Tom's and Trout creeks are fairly low gradient for much of their length and may have some response areas (Source Transport and Response Reaches Map). These features make them especially suitable for rainbow trout (including steelhead and McKenzie redsides). Cutthroat trout are generally the most abundant fish in these south side tributaries (Potential Fish Habitat Map). The mouths of all fish bearing streams in the area are accessible to migrating fish; however, most are blocked by waterfalls close to the mouth. Trout and Tom's creeks offer the most habitat for migrating fish from the river, but Tom's Creek is the only one that offers potential spawning habitat for spring chinook. These 2 streams offer the best opportunities for restoration activities on the south side (Armantrout 1992). Holding pools and adequate gravels are limiting throughout. Spawning is also limited by fine sediment deposition. Rearing is limited by lack of cover and suitable pool habitats (Herger 1994).

Fish habitat inventories were conducted on BLM managed stream segments during 1987-88. South side streams had a shortage of LWD, 12 pc/mi vs 80 pc/mi PACFISH (Table F-1). This in turn has contributed to a corresponding shortage of pools, 36 percent less than recommended by PACFISH (Table F-1). Most pools are small and 95 percent are in fair to poor condition (Table F-2). There is very little juvenile rearing habitat (5%) and only 20 percent of all habitats surveyed on the south side had any cover elements (Table F-1). There is a diversity of substrate types but, due to the lack of large wood, these are generally not well sorted (Table F-3). There are several waterfalls and culverts on south side streams that are barriers to fish (Potential Fish Habitat Map).

McKenzie River - The river is naturally unconfined in this WAU. However, residential and agricultural development limit meander and flood plain connectivity. In addition, most of the WAU is influenced by Leaburg Dam. The dam stores sediments that would otherwise be available for channel development, including spawning gravel bars. Because the water has lost its bedload, it becomes "hungry" downstream of the dam and uses the energy it had expended in sediment transport above the dam to scour the channel below the dam until bedload transport capacity is reached. Thus, the river in the WAU, instead of functioning as a response area, is still in a transport mode, resulting in decreased fish habitat potential. It should be noted, however, that because of the wide valley below the dam, the river in this WAU has much more flexibility and habitat is less impacted than below dams farther upriver (Blue River, Cougar, Trailbridge) that are located in higher gradient confined topography. In this WAU, the McKenzie River is the primary spawning area for spring chinook salmon. Much of the spawning takes place on the south side of the river where there is an abundance of gravel bars. The lower reaches of tributaries on the south side are probably important for juvenile salmon rearing.

Table F-1 - Comparison of Cover, Juvenile Rearing Habitat, Large Woody Debris (LWD), and Pools per Mile McKenzie River Tributaries Surveyed During 1987-88 (BLM Lands Only). Juvenile Rearing Habitat Includes Side Channel, Backwater, Alcove, and Slough Pools.

				# Pools per Mile	
Stream	% Habitat with Cover	% Rearing Habitat	LWD -PC/MI (>2' x 50')	PACFISH	Existing
Cogswell	13	3	3	96	67
Finn	5	6	4	154	95
Indian	28	2	20	96	49
Leaburg	12*	4*	8	346	212
Minney	10	1	15	125	55
NFK Gate	5	13	14	31	26
SFK Gate	17	11	8	53	52
Gate	11*	5*	13	209	133
Osborn	7	0	0	183	110
Trout	23	5	10	91	66
Tom's	19	5	16	91	59
South side	20*	5*	12	365	235
Total	14*	5*	10	920	582

* Mean Percentage

Table F-2 - Pool Habitat Comparison - McKenzie River Tributaries Surveyed During 1987-88. Values are Percent Pools in Listed Condition (BLM Lands Only)

Streams	Width: Depth Ratio				Pool Size (Sq. ft.)			
	Excel (<3:1)	Good (3:1 - 5:1)	Fair (5:1 - 10:1)	Poor (>10:1)	0 - 300	300 - 600	600 - 5,000	> 5,000
Cogswell	1	9	31	59	90	10	0	0
Finn	1	9	50	40	98	2	0	0
Indian	7	15	47	31	97	3	0	0
Leaburg (mean)	2	10	45	43	96	4	0	0
Minney	4	15	37	35	98	2	0	0
NFK Gate	0	8	23	69	31	23	46	0
SFK Gate	12	18	35	44	54	27	19	0
Gate (mean)	5	15	35	45	76	12	12	0
Osborn	0	0	55	45	100	0	0	0
Trout	0	2	36	62	92	6	2	0
Tom's	0	8	41	51	93	7	0	0
South side (mean)	0	5	40	55	93	6	1	0
Total (mean)	2	10	42	46	92	6	2	0

Table F-3 - Substrate Composition - McKenzie River Tributaries Surveyed During 1987-88. Percentages are Given (BLM Lands Only).

Stream	Bedrock	Large Boulder	Small Boulder	Cobble	Rubble	Large Gravel	Small Gravel	Sand	Silt	Organic
Cogswell	7	6	11	15	12	11	11	16	10	2
Finn	5	8	20	18	15	9	5	9	6	0
Indian	5	7	16	18	17	13	10	10	4	1
Leaburg (mean)	6	7	16	17	15	11	9	12	7	1
Minney	12	6	10	6	16	13	11	10	6	0
NFK Gate	11	10	14	20	18	11	9	7	1	0
SFK Gate	4	2	4	11	12	22	25	11	10	1
Gate (mean)	9	6	9	15	16	15	15	9	6	0
Osborn	1	5	10	18	19	14	12	17	5	0
Trout	11	8	13	15	12	10	9	15	7	1
Tom's	4	4	13	18	19	15	12	14	3	0
South side (mean)	5	6	12	17	17	13	11	15	5	0
Total	7	6	12	15	16	13	12	12	6	0

Wildlife

Introduction

In the Vida/McKenzie Watershed Analysis Unit (WAU) habitat conditions are the prime determinants of wildlife abundance both in the number of species and the number of individuals and their distribution. The abundance of most wildlife species is directly dependent upon the condition of available habitat, whether used for breeding, feeding, or resting (Shelter USDA, 1985).

Although few wildlife surveys have been conducted, a wide variety of species are known or suspected to inhabit this watershed. Of the species known or suspected to occur, there are 2 threatened species; 30 candidate species (16 vertebrates and 14 invertebrates); and 31 species identified as Bureau Sensitive, Bureau Assessment, or Bureau Tracking. There are 5 species, which may occur in this watershed, that are species protected through the Standards and Guidelines outlined in the *Standards and Guidelines for Management of Habitat for Late-Successional and Old Growth Forest Related Species Within the Range of the Northern Spotted Owl* (April 1994), and the Eugene District ROD/RMP (June 1995). In addition, this subbasin supports a number of recreational important species such as Roosevelt elk, black-tailed deer, mountain lion, and black bear. The scope of this analysis cannot cover all of these species so only those of significant concern (T&E) or high profile (big game) are included (see Appendix E).

Conifer forests contain the most abundant habitat types in the Vida/McKenzie WAU. Forests in western Oregon were dominated by large interconnected blocks of mature and older conifer forests prior to European settlement. Forest habitats within this landscape were both structurally and vegetatively very complex.

Early seral habitats now dominate the landscape interspersed with small, isolated patches of older forest, which are often fragmented by roads and young conifer plantations. Nearly all habitats have been simplified both vegetatively and structurally. Forest practices and land ownership patterns have created sharp habitat boundaries, providing conspicuous contrast between adjacent habitats. These habitat alterations have substantially reduced the populations of many wildlife species associated with riparian and old growth forest habitats. Streams, riparian areas, ponds and associated wetlands are probably the second most available habitats and the most heavily used areas by wildlife.

Special Status Species

Northern Spotted Owl

There are 6 known spotted owl sites located within the Vida/McKenzie WAU, and 4 sites that are outside the boundary with home ranges extending into the watershed. These owl sites are distributed evenly across the landscape; most sites are associated with BLM and Forest Service administered lands. Of the 6 owl sites in the watershed, 2 are occupied by pairs, 2 are unoccupied but have been recently active, and 2 are historic sites that have not been recently occupied. All 6 sites within the boundary are in a "take" situation (too little habitat available which threatens their survival). When you consider only active owl sites the species becomes less distributed in the watershed, and becomes more concentrated in the northeastern portion.

Suitable spotted owl habitat consists of stands that exhibit moderate to high canopy closure (60-80%); a multi-layered, multi-species canopy dominated by large overstory trees (>30 inches DBH); a high incidence of large trees with various deformities (e.g., large cavities, broken tops, dwarf mistletoe infections, and other evidence of decay); numerous large snags; large accumulations of fallen trees and other woody debris on the ground; and sufficient open space below the canopy for owls to fly (ISC 1990). Dispersal habitat includes stands that have at least an 11-inch DBH average tree diameter and at least 40 percent canopy closure (ISC 1990).

On Federal lands 96 percent, 14,233 acres (10564-BLM, 3669 USFS), is considered suitable for spotted owl dispersal habitat. This habitat allows young owls to disperse safely across the landscape with protection against predation and inclement weather. There are 3 quarter-townships in the watershed (out of 21) that do not meet the 50-11-40 rule, and an additional 2 that are approaching the 50 percent level (this is for federal lands only). The 50-11-40 rule gives an indication of how well dispersal habitat is distributed across the landscape. There are 9,101 acres (5432-BLM, 3669-USFS) or 61 percent of suitable spotted owl habitat (for nesting, roosting and foraging) on Federal lands within the WAU. The main opportunity for spotted owl habitat management is to provide dispersal habitat across the landscape. The Mt. Hagan Block and adjacent lands, however, are contained within LSR RO217 and are capable of providing suitable nesting, foraging, and roosting habitat.

Spotted owls are relatively mobile, travelling moderate distances (9 to 30 miles) during dispersal (USFW - April 1992). Spotted owls require forested cover for moving safely across the landscape, however, they can and do move across open country (Thrailkill, personal communication 1996). Spotted owl movements can be restricted by land management practices.

While spotted owl habitat is fairly well distributed on BLM and Forest Service administered lands, throughout the watershed there is a greater concentration of blocked habitat located in the northeastern portion. Dispersal habitat exists on 96 percent of Federal lands and, therefore, is well distributed. Most available suitable spotted owl habitat occurs on Federal lands and, due to management activities on private lands, this will probably continue into the future. Similarly, private lands provide limited dispersal habitat, and where dispersal habitat occurs there should be plans for harvest soon since this is the approximate stand rotation age.

Trends - Past forest management practices have resulted in fragmentation and conversion of late-successional forests to young, even-aged forests, and they have been put onto a short harvest rotation. These practices have reduced the amount of suitable spotted owl habitat available, and reduced the amount of habitat that would otherwise return to suitable habitat over time after a similar 'natural' disturbance.

The amount and quality of habitat on public lands is increasing over time. Within 10 to 30 years approximately 3,236 acres will potentially become suitable habitat. However, almost 64 percent (2,074 acres) of this habitat will be managed mainly for timber production. Thirty nine percent of all Bureau administered lands are in Riparian Reserves and will be managed for late-successional species. Of the Riparian Reserves 28 percent are suitable owl habitat, and 27 percent are suitable dispersal habitat and will potentially be suitable nesting habitat within 10 to 30 years. The Bureau manages 302 acres for spotted owls located in 3 different core areas. Ninety-seven percent of these acres meet suitable (nesting, roosting and foraging) habitat conditions. Most of the Forest Service lands (mainly in the Mt. Hagan Block) occur in an Late-Successional Reserve (LSR) and will be managed for late-successional forests; this equates to approximately 4 percent of total ownership or 26 percent of Federal lands in the watershed. These lands are just becoming suitable habitat so over time the habitat in the Mt. Hagan area should improve. Since most (85%) of the lands in this watershed are private, this watershed (mainly federally administered lands) will only be able to function as dispersal habitat and/or allow temporary occupancy of spotted owls (with exception of the Mt. Hagan block).

The Vida/McKenzie WAU is within the Western Cascades province, which is considered to be the core of the spotted owl range because it appears to be in the best condition relative to other provinces in the owl's range (Draft OR St. Review, USFWS). Populations remain moderately high. The north-south distribution is adequate, with the exception of the Santiam Pass area that has been identified as an area of concern for intra-provincial movement. With some exceptions, the overall quality and quantity of habitat is relatively high on Federal lands. Connectivity between provinces through suitable and dispersal habitat is sufficient, excepting the Santiam area of concern.

FSEIS/ROD Standard and Guidelines ensure the continued viability of this species on the landscape. The USFWS has recommended that "take" be avoided if possible in the Matrix while the LSRs recover habitat and begin to fully function.

One Late-Successional Reserve (LSR RO217) is partially encompassed within the Vida Watershed. This small LSR encompassing 7,320 acres, has 6,960 acres of suitable spotted owl habitat. However, only 3,905 acres (53%) of this LSR and a small portion of the home range of one owl site fall within the Vida/McKenzie WAU. Another LSR (RO219) is located 6 miles to the southeast.

RO217 is a fairly small LSR that acts as a steppingstone between the 2 larger LSRs to the north and south. This LSR contains a Research Natural Area (RNA), fairly steep ground, and relatively contiguous forest stands. Most of this LSR has fire history second growth and spotted owl foraging habitat, although there are inclusions of old growth. There are 4 known activity centers within this LSR, 2 of which are pair locations. The goal for this smaller steppingstone LSR is 5 pairs. None of the 4 activity centers within LSR RO217 fall below the take threshold. This LSR does not contain large expanses of old growth nesting habitat; habitat quality is judged fair. It has adequate suitable habitat and numbers of owl pairs to maintain stable owl populations in the short term, facilitate owl movements, and prevent local extirpation.

There is a portion of one Critical Habitat Unit (CHU, OR-16) for spotted owls located within the Vida/McKenzie WAU. There are approximately 4,170 acres of Federal lands within this CHU, of which 3,908 acres (94%) are considered suitable. The Bureau manages 265 acres of these lands of which 122 acres are suitable habitat.

Historic - Based on the amount and distribution of mature forests (Vegetation Pattern Map 1854-1909), spotted owls were probably fairly abundant and well distributed throughout the watershed. In Oregon spacing of spotted owl pairs has been documented to be about 1.5 miles apart, depending on habitat suitability (USFS PNW, 1985). This equates to 4,660 acres per owl site and the VIda/McKenzie WAU could support approximately 13 owl pairs.

According to the Circa 1854-1909 data, mature forests were well distributed across the watershed. While quality or "condition" of the forest cannot be fully known it is believed that, through natural succession, these forests provided suitable nesting, foraging, and roosting habitat.

Bald Eagle

There is one pair of nesting bald eagles located in the southern portion of the watershed. Bald eagles inhabit the forests of western Oregon during both the wintering and nesting seasons. This watershed does not receive any significant increase in use by bald eagles during the winter, but the nesting pair is probably resident year round.

Bald eagles require large, dominant nest trees that are close to lakes, reservoirs, and rivers containing abundant fish populations. Nest sites usually command a view of the forage area and must be relatively secure from human disturbances (Anthony and Isaac 1987). Federally administered lands in the Vida/McKenzie WAU mainly provide nesting and foraging habitats. Anthony and Isaac (1988) found that trees used for nesting by bald eagles were larger and older than those produced under an 80-100 year harvest rotation system. Bald eagle nest, roost, and perch trees usually are situated in the stand where visual access to adjacent habitat is possible. Trees emerging above the canopy or on edges of clearings are selected (USFS PNW 1985). Adequate forage sources are perhaps the most critical components of bald eagle breeding and wintering habitat. Foraging areas in the watershed are mainly associated with the McKenzie River where fish and waterfowl are their main prey.

Land management practices near aquatic environments can adversely affect bald eagle foraging habitat (Brown et al. 1985). Management objectives should include provisions to allow eagles to feed without interference from human activity. Excessive human activity at or around potential feeding sites may force eagles to winter in marginal habitat where food is less abundant (Stalmaster and Newman 1978). Braun et al. (1975) have identified habitat alteration, especially along shorelines, as one of the primary factors contributing to declines in bald eagle populations.

Bald eagles are highly mobile and their ability to distribute in the watershed would not be affected by land management actions. However human disturbance can cause changes in use and/or availability of habitat. There are approximately 292 acres of potentially suitable nesting habitat (forest stands greater than 200 years old) for bald eagles on BLM administered lands that are fairly well distributed throughout the watershed. The Bureau has 1,608 acres of forested lands designated for bald eagle management area within this watershed; these lands are to be managed for 2 nest sites, alternative nest sites, and for future replacement nest sites. Of the 1,608 acres designated for eagle habitat management approximately 224 acres are considered old growth and suitable for nesting, 58 acres are mature and should be suitable for nesting relatively soon (10 to 110 years), and 1,326 acres are at early seral stages and will not be suitable approximately 120 to 180 years. The Bald Eagle Management Areas (BEMA) are fairly well distributed in the watershed, but they mainly occur in the southwest two thirds of the watershed. The Mt. Hagan Block, however, occurs in the northeast portion of the watershed and mostly contains mature forests that typically are not suitable nesting habitat for bald eagle. There are some remnant old growth trees in the Mt Hagan Block that may provide some nesting opportunities. There is very little federally administered lands along the McKenzie River that would provide management opportunities for foraging habitats. Most foraging habitats are under private ownership, and a significant portion of riparian habitats are being impacted by human development for homes. There are several islands along the McKenzie River that contain mainly hardwoods, with limited nesting or perch trees.

Trends - Past forest management practices have resulted in fragmentation and conversion of late-successional forests to young, even-aged forests, and these practices have reduced the amount of suitable nesting habitat. On public lands (BLM and Forest Service) there should be an increase in amount and quality of nesting habitat over time. There are approximately 292 acres of suitable habitat, but there are another 6,014 acres (2,345 BLM and 3,669 USFS) of mature forests that will develop relatively soon (10 to 110 years) into suitable nesting habitat. Some of these lands are reserved for wildlife habitats (including bald eagles) and should ensure the continued existence of suitable nesting habitat for bald eagles.

Land management practices on private lands in the watershed are directed toward intensive tree farming. As a result, forested habitat suitable for bald eagles is probably very limited on private lands and will continue to be that way in the future. Foraging habitat mainly occurs along the river corridor where private ownership dominates. This riparian habitat is being developed into home sites at a relatively high rate.

According to the Recovery Plan for the Pacific Bald Eagle (USFWS 1986), 2 nesting pairs is the goal for recovery in Zone 12 (McKenzie River). In Contract No. 910-PH5-435, "Evaluating Potential Bald Eagle Nesting Habitat" along the McKenzie River, Isaac and Anthony (1987) reported sufficient habitat resources to support 3 nesting pairs of bald eagles of which 2 are located in the Vida/McKenzie WAU and the third is upriver in the Bear/Marten Watershed. In their report they divided the river into 3 Eagle Consideration Areas (ECA) - Walterville, Leaburg Dam, and Eagle Rock. The Walterville and Leaburg Dam ECAs occur in the Vida WAU; the Walterville ECA has been occupied with a nesting pair since 1990, and Leaburg Dam has never been occupied.

Historic - There is no information on historic abundance and distribution of bald eagles in this watershed. Isaac and Anthony (1987) compared the distribution of bald eagles on the Umpqua River, downstream from Roseburg, to the McKenzie River and determined (based on amount of space) that 2 pairs of nesting eagles could inhabit the watershed.

Historically (Vegetation Pattern Map 1854-1909) there was a significant amount of bald eagle nesting habitat well distributed throughout the watershed. If nesting habitat were the limiting factor affecting population and distribution, then historic forest conditions would have provided adequate amounts for optimum numbers of eagles to occupy this area.

Other Species

Great Gray Owl

Only one historic sighting of great gray owls exists for this watershed and occurred in the Mt. Hagan Block. According to Marshall (1992) there are historic records (1930s or earlier) for the Willamette Basin, but there is no information on abundance or distribution of great gray owls in this watershed. No surveys are known to have occurred. Great gray owls are relatively mobile and have been known to exhibit irruptive flights far south of northern range due to food shortages (Terres,1991).

This species can be found in a wide variety of habitat types including one or more of the following: ponderosa pine, lodgepole pine, tamarack, Douglas-fir, grand fir, and aspen or other deciduous tree types. Most nests are located near (985 ft.) natural meadows or human-made openings (>10 acres); located between 3,100 ft. and 4,080 ft. elevation; occur in mature and remnant old growth conifer forests or forests with remnants of older trees or snags; and the nest stand typically has >60 percent canopy closure with an open understory and an abundance of dead and down material for prey. Elevations of occupied sites within the range of the northern spotted owl are not well known but Bull and Henjum (1990) found them occurring from 4,500 to 4,900 feet in eastern Oregon. Locations of great gray owls on the Willamette National Forest ranged from 3,100 to 4,080 feet (Platt and Goggins 1991). In general, they can be found in deciduous or coniferous forests up to 9,200 ft. in elevation (Bull and Duncan 1993). Elevations within these ranges appear to be less of a concern as long as key habitat components are present (Behan 1995).

If one considers potential habitat is restricted to occur above 3,000 feet elevation (as proposed in the 1995 REIC survey protocol) then only 7 percent could exist in the Vida WAU (all ownerships), and Federal lands amount to only 1/2 percent of the total acreage. All lands that occur above 3,000 feet occur along the watershed boundaries mainly in the eastern half. For the north portion most lands above 3,000 feet are located in Indian, Divide, North Gate, and North Fork Gate creeks' subwatersheds. In the southern portion of the watershed most lands above 3,000 feet occur in Hagan, Trout, and Toms creeks' subwatersheds. For the eastern range of the watershed, lands above 3,000 feet occur in the South Fork Gates Creek subwatershed.

Trends - With very little land above 3,000 feet and few acres (550 acres) under Federal management, determining trends is not very applicable. But the areas where habitat occurs is located on the uplands and along ridges where most forest management and road construction will occur. With these types of activities occurring on BLM lands and intensive timber management on private lands, suitable habitat for great gray owls will always be extremely limited. This watershed mainly occurs at lower elevations and on the western edge of the great gray owl range so this watershed plays a minor role in the conservation of this species.

Historic - there is no information pertaining to the Vida/McKenzie WAU. Areas that would meet the elevation criteria (potential habitat) are not very well distributed and are restricted to the outer edges of the watershed boundaries. Except for the elevation criteria there was probably a fair amount of suitable habitat for great gray owls that would have been fairly well distributed. This based on the amount and distribution of wildlife, naturally occurring meadows, and prairie lands in the lower valley.

Red Tree Vole

There is no information on abundance or distribution of the red tree vole in the WAU, and population ecology of this species is not well understood (FSEIS Appendix J2, 1994). Melotti (personal comm. 1995) documented red tree voles in the McKenzie Resource Area (through analysis of spotted owl pellets) at owl sites 12 miles to the north and 9 and 11 miles to the south. Corn and Bury (1988) captured red tree voles 7 miles east of the watershed in the H.J. Andrews Experimental Forest. Because they are small and live almost exclusively in the canopy of conifers, they may have limited dispersal capabilities (FSEIS Appendix J2 1994), and early seral stage forests may be a barrier (Carey 1989). Red tree voles may be vulnerable to loss or fragmentation of old growth Douglas-fir forests (Huff et al. 1992). However, red tree voles have been known to disperse through younger forests (Behan 1995).

The red tree vole is restricted to coniferous forests west of the crest of the Cascade Range in Oregon and northern California (Johnson and George 1991; Maser 1965a). Red tree voles are most frequently found in forests dominated by Douglas-fir, but also occur in stands of grand fir, Sitka spruce, and western hemlock; they occur at elevations of sea level to 1,300 m (Huff et al. 1992). The red tree vole is more abundant in late-successional forest than young forest, and appears to be closely associated with older forests (FSEIS Appendix J2 1994).

Potential red tree vole habitat (>30 years) is very well distributed on Federal lands in the watershed (exists on 96% of these lands). These stands are at least 50 years in age or older of federally administered lands, 39 percent (2,262 acres of BLM and 3500 acres Forest Service) are 100 years old or older and are considered suitable habitat. This equates to approximately 6 percent of all ownerships in the watershed. The suitable habitat that is available is fairly well distributed in the watershed, but is concentrated in Indian Creek and Trout Creek subwatersheds and a few adjacent watersheds. Additionally there is a concentration of suitable habitat in the Mt. Hagan Block (Forest Service). While areas closer to Springfield have plenty of young potential habitat there is less older (> 100 years) suitable habitats nearby to function as a refuge.

Trends - Past forest management practices have resulted in fragmentation and conversion of late-successional forests to young, even-aged forests, and these practices are believed to have reduced numbers of red tree voles (FSEIS Appendix J2, 1994). Each LSR may support large populations of red tree voles, but each of these populations might be isolated from other such populations. Connectivity of LSRs by blocks or corridors of older forests may be necessary to provide small breeding colonies between large reserves to facilitate gene flow from one reserve to another (FSEIS Appendix J2, 1994). By implementing Riparian Reserves, managing known breeding colonies in the Matrix, meeting the 50-11-40 rule, reserving the oldest and largest green trees in prescription for green tree retention, and protecting additional old growth and late-successional forest, BLM should be able to provide some connectivity between LSRs and other reserves (FSEIS Appendix J2, 1994). With the private lands managed with only 25 foot riparian buffers there is a strong likelihood this will block connectivity.

With intensive forest management practices on private lands (85%) these lands may not provide much (if any) suitable habitat for voles. They will, however, provide potential habitat (30 to 99 years old) for a short time until the stands reach their rotation age (approximately 40 to 80 years old). During this time vole populations that may exist as refugia on BLM and Forest Service administered lands may emigrate onto private lands. During this time private lands may serve as temporary dispersal corridors linking subpopulations together.

Riparian Reserves and deferred old growth ecosystem areas may provide connectivity of LSRs through corridors and by providing small breeding colonies between large LSRs to facilitate gene flow from one LSR to another.

Historic - There is no information on abundance or distribution of red tree voles in this watershed. No surveys are known to have occurred.

Historically there was a fair amount (64% of mature timber) of suitable habitat in the watershed. According to the 1854-1909 Map the available habitat would have been very well distributed. There was a large (approximately 12,480 acres) burn that divided the watershed in half. Additionally, there was a fair amount (15,240 acres) of bottom land, scattered timber, prairie, and agricultural lands that were arranged in the valley in a way that could have possibly fragmented the existing habitat more, making dispersal difficult .

Evening Field Slug

There are no records for this species either in the Vida/McKenzie Watershed or in the Eugene District of BLM. Literature records indicate this slug inhabits Washington and Oregon west of the crest of the Cascade Range. There is a reasonable possibility of finding this species in the Eugene District. If it is present in this District, then what little is known about it suggests there is a reasonable possibility of finding it in the Vida/McKenzie Watershed (pers. comm. Applegarth 1996).

An immature example of the genus *Deroceras* was found in the west Eugene wetlands by one of the mollusk experts earlier this year, but it could be either *D. hesperium* or an exotic species belonging to that genus. More information on this species is needed and hopefully will be available soon because of its status as a survey and manage species. Until a survey protocol becomes available, searches for this slug species should be a part of any surveys for native (survey-and-manage) slugs.

All slugs have relatively poor mobility, and this one is small (1-2 cm long) and apparently rare, so its ability to recolonize potential habitat is likely to be especially poor. Colonization is likely to require either a continuous avenue of suitable conditions, or being transported, deliberately or accidentally, to a new and inhabitable location.

The Evening Field Slug is said to prefer a lot of thermal cover in the form of loose objects, such as woody debris and rocks, and the cooling effect of a relatively closed tree canopy. It is thought to favor old growth conditions but able to survive in second growth areas because they are small and can retreat into the ground and become dormant in order to escape from unfavorable weather conditions. Favorable conditions for all native slugs include damp (skunk cabbage) swales, shady flood plains, the base of rocky and north-facing slopes, and areas with some hardwoods and large woody debris, especially near seeps, springs, and small streams (but above the zone that is seasonally flooded).

All literature records are from relatively low elevations. Two historic sites on the Olympic Peninsula are at 8 and 610 meters (25 and 2,000 feet) elevation. No exact records for this species are in the present version of the survey and manage database. Based on the forest condition and the network of streams on BLM lands, potential habitat for this species should be well distributed. The scarcity of ecological information prevents estimating the extent of potential habitat.

Trends - As part of the FEMAT process, regional experts considered this species as an old growth and riparian associate that was threatened by habitat loss. Most of the watershed is managed intensively for timber, which provides very little habitat protection for the evening field slug, and most of the potentially available habitat will continue to be impacted. However, on public lands the implementation of the FSEIS creates Riparian Reserve networks and other administrative outs, so a significant portion of potential habitat should fall under management favorable to this species

Because there are some questions about the identity of this species, and because there are no recent (since 1950) records for Oregon, this species is unlikely to be found in this watershed and in this District. Survey protocols are likely to include this species with searches for the other native slugs (no separate search is likely). Therefore, the possible presence of this species should affect land management decisions.

Historic -The apparent decline of this species on the Olympic Peninsula and the historic alteration of the environment of the Vida/McKenzie Watershed suggest that, if this species was present in prehistoric times, it may have declined or disappeared during historic times. There are no records for this species either in the Vida/McKenzie Watershed or in the Eugene District.

Historically there would have been a fair amount and well distributed suitable habitat. This determination is based on the amount of mature forests (64%) available and the network of streams in the watershed.

Oregon megomphix

There are no records for this small land snail in the Vida/McKenzie Watershed. During 1995-1996 this snail was found at 5 locations in the Eugene District. One location is about 5 km north of the Vida/McKenzie Watershed and another is about 24 km to the south, so there is a strong possibility this species is present in this watershed. Where this snail has been found, it is scarce and a minor member of local snail communities. It is rare in museum collections and known from widely scattered locations in the western parts of Washington and Oregon. The first site and type locality is Olympia, Washington. It was found at 12 sites on the Olympic Peninsula. In addition to the 4 new locations in the Eugene District (Mill Creek, Mill Valley Creek, Lost Creek, Timber Ridge, and Big Canyon -- details are available), this snail has been found at 4 other locations in Oregon. There are old records for Marshfield (the old name for Coos Bay) and Riverdale (southern suburb of Portland), and new (1994 and 1995) records for the North Umpqua Trail (BLM land near Idleyld Park in Douglas County) and Oswald West State Park (northwest Tillamook County).

All land snails have relatively poor mobility, and this one is small (about 12 mm or 1/2 inch wide), secretive, and scarce where it occurs, so its ability to recolonize potential habitat is likely to be poor. Among mollusks, this species probably has low mobility. Colonization is likely to require a continuous avenue of suitable conditions, or transport, deliberate or accidental.

This snail is a secretive species of reliably cool, damp situations. It occurs near streams and upslope, close to the ridge top, under late-successional and younger forests with large rotten logs from prior stands. Typically, bigleaf maple trees are present and may be a necessary component for this snail (pure conifer duff may be too acidic, or the absence of hardwoods could reflect a seasonality to subsurface moisture). On slopes, an impermeable bedrock covered by a thin mantle of rock rubble may provide reliably damp subsurface refugia. North-facing slopes are less affected by seasonal drought, and the bottoms of slopes may have conditions favorably moderated by riparian hardwoods. Live snails have been found in Douglas-fir bark heaps, and shells have been found under bigleaf maple leaf litter.

This snail could be on virtually any slope within this watershed. Except for higher terraces next to hill slopes, this snail is not likely to be found on flood plains. Available records are from relatively low elevations. Although the highest elevation in this watershed is 4,445 feet (Elk Mountain, T. 16 S, R. 3 E, section 12), most lands are under 3,000 feet and probably within the elevation range of this species.

Trends - As part of the FEMAT process, regional experts speculated that habitat conditions were deteriorating throughout the range of this species. Other than the regional trend of a growing human population and a reduction of acres of late-successional forest, no habitat trend information is available. Possibly this snail also survives in some special situations where they are not dependent on forest stand age.

It is anticipated that searches for and, if found, management for this species will become a regular part of land management decisions for this watershed (the survey protocol and management guidelines are in preparation by the mollusk subgroup of the survey and manage team). Surveys for this Survey and Manage Species should be easy, but protocols are not yet available. Affects on forest management are expected to be minimal.

Historic - The local historic condition of this species is not known. Fire, both prehistoric and historic, may have contributed to its present apparently patchy distribution. The apparent decline of this species on the Olympic Peninsula and the historic alteration of the environment of this watershed suggest that, if this species was present in prehistoric times, it may have declined or disappeared during historic times.

The historic condition and distribution of potential habitat are also unknown. Prehistoric fires, natural and anthropogenic, may have restricted this species to the more mesic areas -- north-facing slopes and riparian areas near springs and along small streams.

Blue-gray Tail-dropper

There is no information on abundance or distribution of the blue-gray slug in the Vida/McKenzie Watershed. The range of this species includes the forested mountains of western Washington and Oregon. In eastern Lane County this slug has been found at 2 locations (T. 24 S, R. 5 E, sections 21 and 35) at moderately high elevations, 3,660 and 4,500 feet, but elsewhere it has been found as low as 1,000 feet, so it could potentially occur at any elevation within the Vida/McKenzie Watershed. Most records for this species are from intermediate and higher elevations in both the Coast and Cascade ranges. There are few museum and literature records for this species, and experts consider it an endangered species, but this apparent rarity may be biased by a local scarcity of experts and survey efforts.

All land slugs have relatively poor mobility and, among mollusks, this species probably has low mobility. Colonization is likely to require a continuous avenue of suitable conditions, or transport, deliberate or accidental.

Slugs in this species and this genus are said to be favored by cool, moist conditions found in minimally disturbed coniferous forests. These slugs browse on mushrooms and decaying plants and are often found in association with skunk cabbage, hardwood trees, rotten logs, ferns, and mosses. Slugs, especially the small-bodied species, are vulnerable to desiccation. The environmental alterations from logging and fire seem to make all native tail-dropper slugs locally rare or absent. Some of the available observations for this species indicate that areas with deep rock rubble, such as the volcanic soils of higher elevations in the Cascade Range, can also provide reliably damp conditions.

This slug could occur in any forested part of this watershed, but the most likely places would be on north-facing slopes, in skunk-cabbage swales, and the riparian zones of relatively stable streams. An apparent intolerance to logging and fire suggests it will be rare or absent because most of this watershed was logged or burned in the last 100 years.

Trends - Other than the regional trend of a growing human population and a reduction of acres of late-successional forest, no habitat trend information is available. Possibly this slug is gone or reduced to a few special situations where it is not dependent on old forest conditions.

Surveys for this "survey and manage" ROD species should be fairly easy, but the protocol is not yet available. Affects on forest management are expected to be minimal.

Historic - Because this species has not been identified by experts as occurring in the Vida/McKenzie Watershed, there is no information about its historic abundance and distribution.

The historic condition and distribution of potential habitat are also unknown. Prehistoric fires, natural and anthropogenic, may have restricted this species to the more mesic areas -- north-facing slopes and riparian areas near springs and along small streams.

Papillose Tail-Dropper

There are no records for this dark purplish-gray slug in the Vida/McKenzie Watershed. This is a rare species that has been found at widely scattered locations in the forested parts of the Pacific Northwest, from the vicinity of Puget Sound in Washington to Trinity County in northern California. This slug has been reported for only one location in Lane County, Alderwood Wayside (T. 16 S, R. 6 W, section 28) with an elevation of about 600 feet. Elsewhere it has been found as high as 1,500 feet in Lewis County, Washington, and this species could probably occur at most if not all elevations within the Vida/McKenzie Watershed. The few records for this species are generally from low elevations in both the Coast and Cascade ranges. Experts consider this an endangered species, but its apparent rarity may be biased by a local scarcity of experts and survey efforts.

Among mollusks, this species probably has low mobility. Colonization is likely to require a continuous avenue of suitable conditions, or transport, deliberate or accidental.

Slugs in this species and this genus are said to be favored by cool, moist conditions found in minimally disturbed coniferous forests. These slugs browse on mushrooms and decaying plants and are often associated with skunk cabbage, hardwood trees, rotten logs, ferns, and mosses. Slugs, especially the small-bodied species, are vulnerable to desiccation. The environmental alterations from logging and fire seem to make all native tail-dropper slugs locally rare or absent. The northern California observation for this species indicates that deep rock rubble can also provide suitably damp conditions.

This slug could occur in any forested part of this watershed, but the most likely places would be on north-facing slopes, in skunk-cabbage swales, and the riparian zones of relatively stable streams. An apparent intolerance to logging and fire suggests it will be rare or absent because most of this watershed was logged or burned in the last 100 years.

Trends - Other than the regional trend of a growing human population and a reduction of acres of late-successional forest, no habitat trend information is available. Possibly this slug is gone or reduced to a few special situations where it is not dependent on old forest conditions.

Surveys for this "survey and manage" ROD species should be fairly easy, but the protocol is not yet available. Impacts on forestry are expected to be minimal.

Historic - Because this species has not been identified by experts as occurring in the Vida/McKenzie Watershed, there is no information about its historic abundance and distribution.

The historic condition and distribution of potential habitat are also unknown. Prehistoric fires, natural and anthropogenic, may have restricted this species to the more mesic areas -- north-facing slopes and riparian areas near springs and along small streams.

Oregon Slender Salamander

There are no records for the occurrence of this forest-dwelling amphibian within the Vida/McKenzie Watershed. This salamander was known from 9 locations in eastern Lane County (Willamette National Forest), including a relatively large population (that seems to have recently declined) in the vicinity of Hidden Lake (T. 18 S., R. 5 E, NW¼ of section 8, about 3,350 feet elevation). The potential for occurrence in the Vida/McKenzie Watershed was illustrated by the unexpected discovery in 1995 of this species at relatively low elevation at the north end of the Coburg Hills (on the north side of George's Knob, T. 15 S., R. 1 W, NW¼SE¼ section 3, at 1,320 feet elevation).

Relative to other amphibians, this salamander has exceptionally low mobility. Most movements are subsurface vertical migrations (down to avoid seasonal cold and drought, and up to forage under fallen bark and in rotten logs). Unless corridors are already inhabited, they are not likely to be used for dispersal, and finding populations large enough to withstand removal of individuals for reintroduction efforts elsewhere seems questionable.

This salamander is a terrestrial species (it lays its eggs on land and stays away from streams). Large rotten logs (decay classes 2-4), deep rock rubble, or a combination of both seem to be required, and local survival seems to be favored by a relatively closed conifer canopy and the presence of snags and partly down Douglas-fir and hemlock that are shedding their bark (the bark heap is the desired feature). Reliable subsurface dampness seems to be critical, and this salamander is scarce or absent in thinned and clear cut units near Hidden Lake, indicating a need for a relatively closed canopy. The greatest potential for finding this species (if habitat is defined by presence of the species), will be on the north-facing slopes that have abundant large rotten logs (not destroyed by fires or gross yarded away). Slopes and mid-slope terraces are most likely to be inhabited, while flood plains and ridge tops are the least likely to be inhabited.

Potential habitat could be fairly well distributed based on the existence and distribution of old growth (> 196 years old) stands in the watershed. The number and size of these old growth stands is extremely limited, however. The LSR (RO 217) in the eastern part of the watershed does not contain good quality habitat conditions due to it being fire regenerated and the age of the forests.

Trends - Overall there has been a reduction of potentially suitable areas and a progressive fragmentation of the distribution of this amphibian (this fragmentation may have existed to some extent in prehistoric times as a result of fires). Since this salamander uses upland habitats and is not strongly tied to riparian habitats, forest management on BLM administered lands, outside of the Riparian Reserves, will significantly reduce (61%) the amount of potential future habitat. However, approximately 39 percent of BLM administered lands fall within Riparian Reserves, and will be managed for late-successional forests, which should aid in the conservation of some habitats for this species. Additionally, within this watershed there are administrative reserves for bald eagles, spotted owls, and sensitive plant species that provide protection to other areas that may be suitable habitat or be managed for suitable habitat (late-successional forests). With LSR RO217 to be managed for Late-Successional Reserves (LSR) there should be a recruitment of potential Oregon slender salamander habitat in the future.

This is Oregon's only endemic amphibian (found here and nowhere else), and in most locations it seems to be scarce (intensive searches usually find few if any individuals). Although only a Bureau Sensitive species, biologically it is a threatened species, and every effort should be made to protect known populations by management for old growth conditions within habitat reserves of at least 180 meters radius around known sites.

Historic - Because no occurrences of this species have ever been reported for the Vida/McKenzie Watershed, there is no information about its historic abundance and distribution.

The historic condition and distribution of potential habitat are also unknown. Natural and anthropogenic fires may have fragmented the distribution of this species. With 64 percent of the watershed existing in mature forests historically, there would have been plenty of potential habitat available.

Roosevelt Elk

Analysis of population trend over the past several years indicates a population of about 4,500 elk. The McKenzie Unit is productive with a healthy elk population; elk continue to expand their range within the unit and are increasing in numbers in many areas. Elk surveys indicate a long-term increased trend in population numbers. Survey data, however, are from counts on winter range located on Forest Service land; this is the area where elk first became reestablished. Much of the western portion of the unit (where Vida/McKenzie Watershed lies) has not been surveyed. However, elk appear to be rapidly expanding within the western portion of the unit. In this there is significant use of BLM lands in the Finn Creek, Indian Creek, and Hatchery Creek subwatersheds, where they may be providing important travel corridors to adjacent watersheds.
Elk are relatively mobile, but their movements can be affected by cover and open road densities. While elk are well known for their migrations, most herds of Roosevelt elk in Washington, Oregon, and California do not demonstrate definite migration, although they do make seasonal movements in response to forage conditions (Thomas and Toweill 1982).

The McKenzie Unit is approximately 2,800 square miles and about 59 percent public land. Within the McKenzie Unit elk typically do not have distinct summer and winter ranges and they are resident year round; elk may show a shift in preference in aspect and/or elevation during inclement weather.

Elk have been described as grazers feeding mainly on grasses and forbs, but in western Oregon browse comprises about 70 percent of the food for Roosevelt elk in spring and summer, and drops to about 50 percent during autumn and winter. Forbs are most important in autumn and winter, when they constitute about 30 percent of the diet. Autumn use drops to about 15 percent during spring and summer. Grass consumption ranges from 12 to 15 percent during all seasons, except during winter when it climbs to approximately 20 percent (Thomas and Toweill 1982). Elk habitat consists of forage and cover; the interspersion of forage and cover areas in time and space, their relative quality, and the effects of human disturbance from roads open to motorized vehicles are the major factors affecting elk use (Wisdom 1985). There are 4 habitat variables that affect the availability (or effectiveness) of these habitats to elk. These variables consist of sizing and spacing of forage and cover areas; the density of roads open to motorized vehicles; cover quality; and forage quality. In the Vida/McKenzie Watershed there are approximately 681 miles of road, which equates to a road density of 4.9 mi/mi^2. This figure requires that an average of 3.4 miles of road per square mile be closed to bring the density to the RMP and ODFW maintenance target levels of 1.5 miles per square mile. It has been suggested that road closures be widespread, not concentrating the closures in any one given area. This would promote a less concentrated use of any one area by hunters, and enhance a road closure program. The road system in this watershed is mainly controlled by private landowners at a few key locations. Road access is typically closed to the general public year round except during the deer and elk hunting seasons when most roads are open to the public on weekends.

Most of the BLM and Forest Service lands are in forested conditions providing relatively good thermal and hiding cover for elk. Adjacent private lands are in many different seral stages. The varying conditions (stand ages, canopy closures, stocking levels) of private lands are providing a mosaic of different habitat types in a fairly well distributed fashion. With the relatively well distributed public lands providing cover, and the intermixed private lands providing a variety of forage, and thermal and hiding cover, elk habitat is fairly well distributed across the landscape. There are occurrences of relatively large (100+ acres) clear cuts adjacent to each other with only a few years difference in age between them, which then actually becomes an enlarged cut-over area. These enlarged cut-over areas can be obstacles for elk dispersal and distribution, and makes some forage unavailable.

Trends - With short rotations and fast growing conditions, private lands will provide mostly hiding cover and some thermal cover. Forage will also be available but, with the large sizes of some of the harvest units (120 acres), much of this forage will not be available due to lack of hiding cover. The mosaic of seral stages on private land, in general, should provide a continuous supply of forage and cover across the landscape. This continuous supply of food and cover will undoubtedly move about the watershed as forest stands grow, reach their rotation age, are cut and then burned and replanted. On Federal administered lands there are 2 scenarios. First is the management for late-successional forests in LSR RO217 where optimal hiding and thermal cover should be achieved in the near future; forage, however, will be limited in the LSR. The second situation occurs on BLM lands and the management of the General Forest Management Area (GFMA) with the associated network of Riparian Reserves and District Designated Reserves (DDR). With 39 percent of BLM lands occurring in Riparian Reserves (which are well distributed throughout the watershed on BLM lands) there will be some long-term hiding and thermal cover for elk. Meanwhile in the GFMA lands, outside of Riparian Reserves, intensive timber management will occur and provide a variety of habitat types in a similar fashion to private lands (i.e., regeneration areas will provide good forage opportunities for 8 to 10 years where it then becomes hiding cover, then grows into thermal cover, is thinned, grows back into thermal cover, and then the stand is regenerated). Suitable habitat conditions for elk will continue to exist into the future, but not at optimal levels. Whether or not optimal conditions, under the present management scenarios, will be achieved depends on the ability to plan and accommodate elk needs, and coordinate efforts with private landowners.

This watershed is located within one elk management unit (McKenzie) identified by the Oregon Department of Fish and Wildlife (ODFW). In the McKenzie Unit, the management objective is 5,200 elk.

Historic - The McKenzie Unit elk population was nearly eliminated in the late 1800s. Present populations were achieved as a result of protection from hunting through the 1940s, and an active ODFW transplant program in the 1960s and 1970s.

According to the 1854-1909 historic vegetation data, 18 percent of the watershed was recently burned. While the burned areas mainly occurred in one large area, there were a number of smaller burns scattered throughout the watershed. These burned areas, and approximately 2 percent more lands occurring in natural prairies, would have provided high quality forage. Sixty four percent of the watershed was in mature timber that would have provided excellent thermal and hiding cover with some foraging opportunities. Approximately 14 percent of the watershed had a mixture of bottomland timber, scattered fir, and scattered fir and oak, which would have provided a variety of forage and hiding cover with maybe some thermal protection. Historically there was a mosaic of vegetative types dispersed across the landscape providing good quality habitat for elk.

Miscellaneous Species - Bats are recognized as an important component of forest ecosystems. They are a main predator of nocturnally active adult forms of many forest insect pests. At least 2 species are dependent on trees for roosts that are primarily present in old growth stands. Many other bat species rely on old growth trees for roost sites when other structures are absent (cliffs, caves, mines, buildings). Little is known of the distribution and species diversity in forests primarily managed for timber fiber. Distribution of individual bats and bat species in forests is nonrandom and the overlying factor appears to be roost limitation (Perkins & Peterson 1992). There are 5 species of bats that are Federal Candidates (category 2) and have the potential to inhabit the Vida/McKenzie Watershed (Hayes, unpublished report).

Old Growth Habitat

Mature and older forests dominated the Vida/McKenzie Watershed during the mid-1800s and early 1900s. Based on survey notes and plats, the 1854-1909 Vegetation Pattern Map classified approximately 64 percent of the watershed as heavily timbered that, after review of the 1936 Vegetation Pattern Map, it appears to have been primarily mature and old forest habitats. The 1914 Historic Vegetation Map classified 54 percent of the watershed as merchantable timber, which again corresponds to the mature and old forest habitats of the 1936 type map. These forest conditions were generally uniform across the watershed aside from the valley bottom portion, which was composed of a prairie habitat type mixed with bottomland timber habitat component and scattered fir and oak. This prairie habitat is reclassified as agriculture land today. Additionally, there was one large burn and a few small, irregular shaped burns within the conifer forest landscape in the 1800s and early 1900s. These burns composed approximately 18 percent of the watershed. Therefore, the watershed was characterized as a relatively large block of dense, contiguous old forest interspersed with relatively few patches of young forest, shrub lands, and openings. By 1936 the watershed contained approximately 42 percent of old forest habitat and by 1993 the watershed was highly fragmented, with only 17 percent (1993 LCOG data) of the landscape remaining in mature and old forest condition. The majority of the watershed today is composed of plantations and young forests that are predominately private timberlands.

The increase in the amount of old forest habitat influenced by edge is one of the major effects of fragmentation. Microclimate changes along patch edges alter the conditions for interior plant and animal species (Lehmkuhl and Ruggiero 1991), reducing the amount of interior old forest habitat. Along these edges, the habitat usually becomes drier and receives much more light, increasing the abundance and vigor of early seral vegetation and the probability of their establishment with patch interiors (Lehmkuhl and Ruggiero 1991). Estimates in Pacific Northwest forests by Lehmkuhl and Ruggiero suggest that microclimatic effects extend up to approximately 525 feet in from the patch edge. Based on these estimates, patches of old forest 25 acres or smaller are effectively all edge and have lost the essential attributes of the old growth condition (Lehmkuhl and Ruggiero). Within the Vida/McKenzie Watershed there are 72 patches of mature (81-195 years) and 9 patches of old growth (196+) forests. Thirty six of the mature and 3 of the old growth patches (>25 acres) may still maintain functions of mature and old growth forests. The role of the smaller patches to some of the plants and less mobile animals and invertebrates is not completely known. Management practices have not only increased the amount of habitat affected by edge, but also changed the character of edges and patch shapes. In unmanaged forests, natural disturbance processes such as fire, disease, and wind create irregularly shaped patches. The location of patch borders in natural landscapes is strongly influenced by aspect and topography, with openings occurring primarily on the ridge tops and gradually changing into the more dense forests, which remain along the streams. Clear cut logging practices have substantially altered this pattern. Within the Vida/McKenzie Watershed, these patterns are typically geometrically shaped with linear boundaries following ridge lines or property boundaries.

Nearly all vegetation is removed within these boundaries, creating a landscape with very narrow, sharp patch edges and dramatic contrast between adjacent habitats.

Wildlife populations are impacted by forest fragmentation in many ways. The quantitative loss of habitat is the most obvious effect. Of the 61,753 acres of mature and old forest habitat present in the Vida/McKenzie Watershed in the mid-1800s to early 1900s, approximately 6,306 acres (2,637 BLM, 3,669 USFS) remain in small patches scattered throughout a heavily fragmented landscape. The species most directly affected by habitat loss through fragmentation include those with large home range requirements, very specific micro-habitat requirements, and poor dispersal abilities (Faaborg et al. 1993). Although species with small home range requirements may be able to survive and reproduce, population size will be limited by the available habitat, increasing the chance of local extinction for populations in small isolated forest remnants (Saunders et al. 1991). Species such as the fisher and American marten, which historically may have occurred throughout the watershed, are now strongly believed to be restricted to the Mt. Hagen Block as a result of habitat loss and fragmentation.

Forest fragmentation has also reduced the ability of mature and old forest associated wildlife species to maintain genetic interchange and colonize forest developing late seral characteristics. Narrow bands of unsuitable habitat may serve as a barrier to movement between forest patches for species with limited dispersal capabilities, such as salamanders and rodents. However, species with small home range requirements are often capable of persisting in small refugia for extended periods of time, allowing them to colonize surrounding habitats if future conditions become suitable at a later time (Lehmkuhl and Ruggiero 1991).

Movement and dispersal of species associated with mature and older forests were much easier in the natural forests of the watershed that occurred in the 1800s and early 1900s than in the present landscape. When catastrophic events such as fire transformed a portion of mature forest displacing the resident wildlife, large environmental conditions again became favorable. In contrast, the small isolated patches of old forest habitat in a heavily fragmented landscape support much smaller and less resilient wildlife populations (Faaborg et al. 1993). Forest management practices of the past 3 decades have also reduced the structural and vegetative complexity of early seral habitats (Spies and Franklin 1991), eliminating many habitat components such as down logs and snags, which facilitate the dispersal of wildlife species.

Increased intra-specific competition from edge associated and generalist species that benefit from increased forest fragmentation provide additional complications to wildlife species dependent on interior habitat conditions (Lehmkuhl and Ruggiero 1991; Saunders et al. 1991). Road corridors often function as edge or young forest habitats that support populations of edge associated wildlife species within the core of larger old forest patches, increasing the proportion of old forest species affected by intra-specific competition. Additionally, many edge associated and generalist species are nest parasites or predators, capable of affecting the survival and reproductive success far inside habitat patches (Faaborg et al. 1993).

The fragments of remaining old forests provide key habitats for many wildlife species. They serve as refugia where small populations of older forest species may persist, and are a source for recolonizing nearby habitats following disturbance or local extinctions. However, these small isolated populations are extremely vulnerable to local extinction (Lehmkuhl and Ruggiero 1991), making it important to maintain as many of the existing refugia as possible, and manage the surrounding landscape to minimize the external influences on these remaining patches (Saunders et al. 1991). In the short-term, forest management practices in the watershed should center on maintaining the integrity of refugia by minimizing edge effects through avoidance of further fragmentation, maintaining existing forest buffers around habitat patches, and promoting the rapid revegetation of adjacent early seral habitats, including unnecessary roads.

In addition to maintaining the integrity of refugia, it is important to provide for genetic exchange between these habitats by facilitating the opportunities for successful movement and dispersal of wildlife species between habitat patches. The Riparian Reserves established, based on the FEMAT (1993) recommendations, may serve as an important link providing part of the connectivity between habitat patches, especially for wildlife species closely associated with aquatic and riparian needs.

Dead and down wood materials are important components of wildlife habitats in western forests that furnish cover and serve as sites for feeding, reproduction, and resting for many wildlife species. The fire and timber harvest histories within the watershed have resulted in a landscape generally deficient in large snag habitat necessary for such cavity nesting birds as the Western bluebird and pileated woodpecker. Also missing in many stands is the large down wood in various stages of decay necessary as habitat for such species as the Oregon slender salamander.

Habitat Components

Snags are an important structural component in forest communities. Species of wildlife that frequently use snags for foraging, nesting, or perching are selective as to size, decomposition state, and abundance of snags (Brown et al. 1985). Nearly 100 species of wildlife, including at least 53 species (39 birds and 14 mammals) are cavity-dependent. Brown et al. has defined a snag as . . . any dead, partially-dead, or defective (cull) tree at least 10 inches in diameter at breast height (dbh) and at least 6 feet tall.

Snags are also used by wildlife as loafing sites, dens, lookout posts, overwintering sites, plucking posts, communication sites, and food caches. On the Eugene District, at least 36 species require standing dead trees for one or more life needs (Eugene District RMP, 1995[65]). The absence of suitable snags can be the major limiting factor for some snag-dependent wildlife populations. From the 1940s through the early 1960s the Oregon Conservation Act of 1942 (repealed) inadvertently provided snags on managed young forests. This act required the replanting of harvested sites or the retention of seed trees. These old seed trees, many now dead or dying, often became snags (Brown et al. 1985). The number of snags in all sizes in Douglas-fir stands in western Oregon and western Washington is about 70/acre in young stands (30-80 yrs.), 50/acre in mature stands (80-200 yrs.), and 24/acre in old growth stands (>200 yrs.). When only large snags (20" dbh and 16' tall) are considered, then there are 6/acre in old growth stands, 4/acre in young stands, and 3/acre in mature stands (Maser et al. 1988). The use of snags by wildlife is also influenced by the snag's stage of deterioration. Soft and rotten snags are generally used by cavity-nesting wildlife; however, woodpeckers in western Oregon often select "hard-remnant snags" for nesting while the chestnut-backed chickadee use "soft-remnant snags." The importance in managing for the requirements of all snag-dependant species is incumbent in the management of all snag deterioration stages.

Over 90 percent of the forested lands in the Vida/McKenzie Watershed have been harvested with the majority of the stands being managed on a second rotation and some being managed for a third rotation. Recent timber harvest units (final regeneration or commercial thinned stands) during the past 20-30 year have retained few if any snags and very few green trees were retained to serve as future snag recruitment. During the fall of 1994, 50 snags were created on the uplands of the Rawhide Creek drainage in timber stands that have been commercially thinned within the past 5 years and are 50 to 70 years of age. There were very few natural snags in these areas prior to project initiation. Of the 50 green trees treated for snag development in 1994, all but 2 trees were 19 inches or greater in diameter.

The following table from Maser et al. shows the estimated age for various snag stage deterioration. (Please refer to Appendix for explanation of snag deterioration stages.)

Estimated age snags reach a given stage of deterioration	Stage of Deterioration				
	1	2	3	4	5
1-18" dbh	0-4 yrs	5-8 yrs	9-17 yrs	>17 yrs	Fallen
8-19" dbh	0-5 yrs	6-13 yrs	14-29 yrs	30-60 yrs	>60 yrs
>19" dbh	0-6 yrs	7-18 yrs	19-50 yrs	51-125 yrs	>125 yrs

Marcot et al. developed a model to estimate densities of snags by decay class and size classes over time based on desired population levels of primary cavity nesters (i.e., woodpeckers). These criteria indicated that 11 inches dbh is the minimum size class used as nesting habitat by cavity nesters.

Snags - Existing Condition - At least 36 wildlife species require standing dead trees for one or more life needs in the Eugene District (Eugene District PRMP 1994). The Eugene District Resource Management Plan (ROD/RMP June 1995) requires that snags and green trees, 15 inches dbh or greater, be retained at levels sufficient to support species of cavity nesting birds at 40 percent of potential population levels.

Table W-1 shows the primary cavity-nesting birds that occur in the Vida/McKenzie Watershed. This table assumes 40 percent population levels. Numbers of snags per 100 acres are shown in parentheses. Snag densities shown here refer to densities through time. (Adapted from Brown et al. 1985).

Table W-1 - Snag Requirements for Nesting Woodpeckers Found in the Vida/McKenzie Watershed

Snag Diameter Class (inches dbh)	Snag Decay Stage		Total Snags by Diameter Class
	Hard 2-3	Soft 4-5	
11+	Downy Woodpecker (3)	Downy Woodpecker (3)	(6)
15+	Red-breasted Sapsucker (18)	Hairy Woodpecker (77)	(95)
17+	Northern Flicker (9.5) Red-breasted Nuthatch (31)	Northern Flicker (9.5)	(50)
25+	Pileated Woodpecker (2)	N/A	(2)
Total Snags by Decay Class	(63.5)	(89.5)	(153)

In an effort to document existing conditions for snags and down logs Bureau personnel conducted a small inventory for use in watershed analysis. Within the Vida Watershed habitat data was gathered from 25 inventory plots distributed randomly across all ownerships and seral stages to document existing snag and down log conditions. Each inventory plot was one-half acre in size and all dead standing and down logs were measured. See Appendix E for the results of this inventory.

The number of snags found in the study suggest that the watershed contains fewer snags than you would find in fire regenerated stands for the <80 age class, but contains more for the 81-199 age class. There were no stands in the owl study area that were over 200 years of age. From the habitat analysis inventory for the Vida/McKenzie Watershed of the 232 total snags measured in the watershed, only 12 percent were larger than 15 inches. Looking at the snags in the >15", 0 percent of the snags are in the 1st decay class; 0 percent are in the 2nd decay class; 11 percent are in the 3rd decay class; 0 percent in the 4th decay class; and 89 percent in the 5th decay class. None of the inventory plots were located in stands 200 years old and older.

As mentioned above, some woodpecker species are dependent upon the later decay stages (4-5) to meet their biological needs. Safety issues and logging activities could eliminate most of these snags in a stand. This potentially would include all snags in the 3rd decay class and later. Shorter snags (<= 50 ft tall), however, pose less of a hazard and in most circumstances can be safely worked around, (Hovland, 1996, pers. comm)

It takes anywhere between 19-50 years for a snag (>19" dbh) to reach the 3rd decay class and 51-125 years for a snag (>19" dbh) to reach the 4th decay class, and over 125 years for this same snag to reach the 5th decay class. It seems highly unlikely this snag condition will be maintained sufficiently or persist for any length of time across the Matrix landscape given the short rotation age for the forest landscape unless intensive planning and effort goes into their management. Therefore, the best opportunity to maintain snags in the later decay class may fall upon the Riparian Reserves and some of the few administrative outs scattered throughout the watershed. New methods for the development of cavity nesting habitat are available and have recently been used in an applied research project in the Mohawk/McGowan Watershed.

Coarse Woody Debris

- Coarse Woody Debris (CWD) is important in many ecological and physical processes in forest and stream ecosystems. The amount, structure, and dynamics of CWD in forests can influence species composition, nutrient cycling, productivity, and geomorphology for centuries and millennia (Spies et al. 1988). Large logs typically persist for very long periods - up to several centuries for some species, such as Douglas-fir and western red cedar (Ruggiero et al. 1991). Down logs represent major long-term sources of energy and nutrients as well as sites for nitrogen fixation. Down logs provide essential habitat for many plants and animal species. There are 150 terrestrial wildlife species known to use dead and down woody materials in the forests west of the Cascade crest in Oregon/Washington. This habitat component provides cover and serve as sites for feeding, reproducing, and resting for many wildlife species.

When a fallen tree decomposes, unique habitats are created within its body as the outer and inner bark, sapwood, and heartwood decompose at different rates (Maser et al. 1988). Tree size influences both internal and external habitats. Habitats provided by the death of young trees in a young forest are short lived and rapidly changing. In contrast, the less frequent more irregular mortality of large trees in old forests creates long lived, stable habitats. Just as snags can be a limiting factor for some wildlife populations in western forests, so too can down woody material be a limiting factor (Brown et al. 1985).

Large quantities of down logs are an important component of many streams. The most productive habitats for salmonid fish are small streams associated with mature and old growth coniferous forests where large organic debris and fallen trees greatly influence the physical and biological characteristics of such streams (Maser et al. 1988). Large amounts of woody debris, regardless of the bed material, were contained in the channels of both high-and low-gradient rivers. Down woody debris influences the form and structure of a channel by affecting the profile of a stream, pool formation, and channel pattern and position (FSEIS). This debris also affects the formation and distribution of habitat, provides cover and complexity, and acts as a substrate for biological activity. Down woody debris in streams comes directly from the adjacent riparian area, from tributaries that may not be inhabited by fish, and from hillslopes (FSEIS).

In 1st and 2nd order streams, large woody debris is common and covers as much as 50 percent of the channel. Large woody debris usually covers less than 25 percent of the channel in 3rd and 4th order streams; 1st and 2nd order streams feed 3rd and 4th order streams, the amount of which becomes progressively smaller as stream order increases. Small streams derive much food for invertebrates (Maser et al. 1988).

Existing Condition

- None of the 25 plots (80%) measured within the Vida/McKenzie Watershed contained enough down logs to meet the RMP requirements of trees >20" dbh, 20 feet long and 240 linear feet/acre, and were in the 1 and 2 decay classes (Table W-2). Of these logs 60 percent were in decay class 5, 23 percent in decay class 4 and 17% in decay class 3.

Table W-2 - Down Logs Meeting RMP Requirements for Size but not Decay Class by Forest Age Class

Age Class/Number of sites; Plots/Age Class	Number of Logs Measured	Avg. Log Diameter (inches)	Linear ft./Acre
21-40 years 8	21	33	344
41-80 years 12	30	33	297
81-150 years 2	3	35	121
>151 years 3	4	33	108

In the Vida/McKenzie Watershed where over approximately 75 percent of the forest lands have been converted to managed forests and agricultural fields, habitat complexity has been significantly reduced, which has impacted many species of wildlife, especially those associated with old growth forests. Approximately 83 percent of these lands are privately owned and will continue to be managed primarily for commercial production of agricultural and forest commodities. These lands will provide only simplified, early seral habitats with limited value to a variety of wildlife, particularly those wildlife species associated with older, more complex habitats. As a result, to meet the objective of maintaining long-term ecosystem health outlined by FEMAT (1993), management of the 14,770 acres (10,981- BLM, 3789 - USFS) of Federally administered lands should focus on emulating the complex vegetative and structural conditions present in natural forests. Given that this watershed is to be managed primarily for timber production, the value of riparian buffers and some administrative withdrawn areas becomes increasingly important to wildlife species associated with older forest habitats. Habitat management practices in these areas should be targeted at developing the patchy, complex canopies typical of natural forests instead of plantations with uniform tree size, height, and spacing. These practices should be consistent with strategies identified in the ROD/RMP for these areas. Management prescriptions should protect existing snag and down log habitat and provide mechanisms for future recruitment to ensure adequate numbers, sizes, and conditions of these structures are continually available and well distributed throughout the landscape. The effectiveness of Riparian Reserve widths should be evaluated as to their effectiveness in maintaining habitat for older forest dependent species occurring in the watershed, and their ability to provide connectivity across the landscape.

Conclusion

Since these areas do not contain any logs that meet RMP criteria, standing live trees will need to be used during each sale. Since some wildlife species use and need the existing down logs in the older decay classes they need to be retained and protected during harvests.

The data (see Appendix E) indicated adequate numbers and sizes of snags and that none occur in early decay classes (1 and 2), but most (89%) occur in the oldest (5) decay class. This supports the need to manage for hard snags during each timber sale.

Even though the data indicates the average height of existing snags are typically 50 ft. tall or less, which have a better chance of being retained during harvests (Hovland 1996, pers. comm)), BLM would still lose a large proportion of these snags because of hazards or operations. Additionally, with no snags in the younger (1 and 2) decay classes there would be a lack of recruitment of soft snags and no habitat for primary cavity nesters in the hard snags.

Hence, management should assume there are no snags available and retain green trees to meet RMP standards. During snag creation in timber sale units one should consider creating snags less than 50 feet in height. This would decrease their hazardous condition and increase the certainty of continued maintenance through several harvest entries. This could also be done after commercial thinning where the Bureau typically does not create snags because of safety concerns. Another reason snags are not created during commercial thinnings is because tree diameters do not usually meet RMP snag standards. But with the development of inoculating live trees with heart rot fungus smaller trees would continue to grow to adequate size before they died. Additionally, the inoculation point could be located below 50 feet where the tree would probably break first and result in a relatively short safe snag.

Water Quality

INTRODUCTION

Water quality is an important issue in the Vida/McKenzie Watershed Analysis Unit (WAU) especially in terms of how it supports some of the scenic and social values associated with the McKenzie River Valley. The McKenzie River Corridor, linking the Eugene-Springfield metropolitan area to the High Cascades, is an important scenic feature within the Vida/McKenzie WAU. The McKenzie River Corridor "Vision 2010" Statement refers to "People traveling through the corridor see the clear, clean, cascading waters of the McKenzie River connecting a number of small, attractive, prosperous, and safe rural communities" (McKenzie River Futures, Vol. 3, Oct. 1995).

Survey information gathered by the McKenzie River Council and the Central Cascade Adaptive Management Area (CCAMA), indicates both user groups and residents of the area have a high interest in the quality of the water in the McKenzie River. Recognizing the local concern for the integrity of the river and its tributaries, the McKenzie River Watershed Council selected water quality as one of the 4 major issues they will work on over the next 2 years. The Council's goal is to work with users and residents of the area to maintain and enhance the existing high water quality of the McKenzie River, its tributaries and underlying groundwater, for all uses. Uses of particular concern to the Council are drinking water, fish and wildlife habitat, water contact recreation, industry, and aesthetics.

Beneficial Uses of Water in the McKenzie River and Its Tributaries

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

The beneficial uses of water for the McKenzie River are:

- Water Supply - Public, Private, and Industrial
- Irrigation and Livestock Watering
- Anadromous Fish Passage, Spawning, and Rearing
- Resident Fish, Aquatic Life, and Wildlife
- Hunting and Fishing
- Boating and Water Contact Recreation
- Aesthetic Quality
- Hydro Power

With the exception of boating hydro power, these beneficial uses are also associated with the tributaries of the Mckenzie River lying within the Vida/McKenzie WAU.

The water quality parameters monitored and the associated beneficial use they protect are as follows:

!	Dissolved Oxygen	(Fisheries & Aquatic Life)
!	Bacteria	(Water Contact Recreation)
!	Ph	(Fisheries & Aquatic Life)
!	Temperature	(Fisheries & Aquatic Life)
!	Turbidity	(Fisheries & Aquatic Life)

- ! Total Dissolved Solids (Drinking Water)
- ! Toxic Compounds (Drinking Water, Fisheries & Aquatic Life)
- ! Total Phosphorus (Aesthetics)
- ! Chlorophyll a (Aesthetics)

The primary beneficial uses of water considered by the DEQ for the McKenzie River are aesthetics, aquatic life, and water contact recreation; the primary parameters evaluated are dissolved oxygen, bacteria, Ph, chlorophyll a, toxic compounds, turbidity, and total phosphorus. DEQ began continuous monitoring of water temperature on the McKenzie River for the first time in 1995.

Once standards for parameters are set, Oregon tracks its progress toward protecting beneficial uses and meeting the requirements of the Clean Water Act in its "Water Quality Status Assessment Reports" (305(b) report), submitted to the EPA every two years. The report provides a summary of data collected during the 2 year period, describes advances, and discusses water quality problems that need work. When water quality standards are not being met and beneficial uses are not protected, a water body may be designated as "water quality limited" (303(d) list). With this designation, DEQ is required to develop a management strategy and Total Maximum Daily Load (TMDL) limitations, the maximum amount of pollutants that may enter the water body without violating numeric water quality standards, for high priority waters in the State (those needing immediate attention). The McKenzie River is not considered to be a high priority water body.

Conditions Of Beneficial Uses And Associated Parameters

As part of its efforts to assess the water quality and health of the McKenzie River, the McKenzie River Watershed council asked a task group to review available water quality data for the McKenzie River for use in assessing the health of the watershed (Laenen and Bennett 1995). They determined adequate information was available to describe historical and current status of flow in the McKenzie and, to a lesser extent, information was available to describe water temperature trends in portions of the watershed. Information for other water quality parameters was incomplete and/or sampling methods were questionable.

Given the small and scattered nature of the BLM managed lands within the analysis area, it is unlikely that BLM activities will have significant impacts on the beneficial uses of water in the main stem McKenzie River. However, BLM management activities may affect beneficial uses of water in the tributaries to the McKenzie River. Beneficial uses with the greatest potential of being affected by BLM activities are aquatic life and fisheries, and private water supplies, due to their proximity to BLM managed lands. Unfortunately, data collected to assess the condition of water quality parameters for tributaries to the McKenzie River is almost nonexistent. Therefore, the discussion of conditions and trends of beneficial uses and associated water quality parameters primarily covers information gathered on the main stem of the McKenzie River.

There are 294 surface water rights within the analysis area, 124 of which are for using water directly from the McKenzie River, and the remaining 170 are for using water from streams or springs in the tributaries of the river. Of the 124 water rights for the McKenzie River, 99 are for irrigation purposes, 9 for domestic water use, and the remaining for hydroelectric power, manufacturing, fisheries, livestock watering, and recreation. Of the 170 water rights in the tributaries to the river, 88 are for irrigation purposes, 52 for domestic water use, 17 for fisheries, 6 for livestock watering, 5 for hydroelectric power, and 2 for recreation purposes. Of the tributary streams, Gate Creek has the largest number of water rights with 19, followed by Toms Creek (15), the Walterville area (14), Finn Creek (13), and Holden Creek (13). There are 6 domestic water rights located on BLM lands: 3 in the 79th St. area, 2 in the Cedar Flats Area, and 1 in the Toms Creek drainage. There is 1 irrigation water right located on BLM lands in the Gate Creek drainage.

The following is a summary of conditions and trends for beneficial uses and associated water quality parameters:

Public, Private, and Industrial Water Supply - DEQ monitors toxic compounds to determine if the drinking water beneficial use is being protected. The draft 303 (d) list (Dec. 1995) lists the McKenzie River, from the mouth of the River to the South Fork McKenzie River, as a water quality limited water body due to exceedence of the toxic compound criteria, specifically arsenic. Even though the McKenzie River is known to have naturally elevated levels of arsenic, once levels exceeding the numeric criteria are detected, EPA guidance to States is to list the water body unless the natural levels can be proven. DEQ is currently investigating new data on arsenic levels in the lower McKenzie River which may change the water quality limited designation (Andy Schaedel, DEQ, Personal Communication).

The 1994 305(b) report lists the McKenzie River as a water body of concern due to levels of cadmium, copper, lead, zinc, PCB's, and Phenol that are less than criteria guidance values, but above background levels. This designation requires additional data collection to determine beneficial use impacts or standards violations.

In the Water Supply Assessment portion of Weyerhaeuser's Lower McKenzie (1994), and Lower McKenzie, North Side (1995) watershed analyses, interviews with personnel at the Leaburg and McKenzie Fish Hatcheries, the Walterville and Leaburg Hydroelectric Plants, and the Hayden Bridge Filtration Plants determined these water supply diversions had "Low" vulnerability ratings to the following input variables: fine and coarse sediments, stream flow changes, temperature increase, and nutrient inputs. In other words, these facilities have not experienced problems with excessive sediment or nutrient levels that inhibit fish growth or plant operations.

No monitoring data is available addressing the quality of water in tributary streams for private domestic water uses.

Irrigation and Livestock Watering - Monitoring of chlorophyll levels (i.e. to detect algae) and toxic compounds in the McKenzie River by DEQ has determined these numerical standards are being met.

Anadromous Fish Passage, Spawning and Rearing, Resident Fish and Aquatic Life - DEQ monitors turbidity (sedimentation); temperature parameters; dissolved oxygen; and pH levels to assess the protection of fisheries and aquatic habitat resources. Monitoring of pH and turbidity levels of the McKenzie River by DEQ has determined the aquatic life beneficial use is fully supported by these standards. These parameters are not monitored by DEQ in the tributaries. However, the Eugene BLM office has received calls from the public and the ODF regarding concerns with high turbidity conditions in Finn Creek while log truck traffic is occurring on Road No. 16-2E-29. The accelerated sediment delivery to Finn Creek may be due to the lack of relief drainage on approximately 1 mile of the lower end of this road. This portion is under private ownership and, therefore, represents an opportunity for the BLM to work cooperatively with private landowners on watershed restoration.

Oregon's 1994 305(b) report listed the dissolved oxygen standard as only partially supporting the aquatic life and fisheries beneficial uses. A partial support designation technically means further monitoring is needed, with the potential of designating the River as water quality limited. Further investigation determined that, even though the report shows a partial support rating, dissolved oxygen values were only slightly below standard (Greg Pettit, DEQ, Personal Communication). In addition, the dissolved oxygen standard as currently used is difficult to meet and highly dependent upon temperature and, therefore, an inaccurate and unreliable measure of oxygen levels. These problems have led the DEQ to change the standard from percent saturation to a mg/liter value. As a result of the new standards, the dissolved oxygen parameter for the McKenzie River will be removed from the final 303(d) list. Monitoring of dissolved oxygen levels, temperature, pH and turbidity by the fish hatcheries, including the old

ORAQUA hatchery, determined these parameters were generally at appropriate levels (Weyerhaeuser Lower McKenzie Watershed Analyses, 1994 & 1995, and Michael McKay, Personal communication).

The draft 1994/1996 303 (d) list includes the McKenzie River (mouth to S. Fork McKenzie) as water quality limited due to summer temperatures which exceed the new temperature standard, 50 F, for waters that support Oregon Bull Trout. The Oregon Bull Trout is a candidate species for federally threatened and endangered. This standard would not apply to any of the tributaries to the McKenzie River lying within the Vida/McKenzie analysis area, since they do not have Oregon Bull Trout habitat. DEQ is currently working with available data on Bull Trout to try and refine this standard so it is specific to life stages (Andy Schaedel, DEQ, Personal Communication). Once the new standards are in effect (July 1, 1996), DEQ will begin developing a temperature management plan aimed at reducing the anthropogenic causes of increases in temperature in the lower McKenzie, such as changes in stream shading, condition of riparian areas, channel morphology changes, and dam operations to name a few.

In Weyerhaeuser's Lower McKenzie watershed analyses, the stream temperature assessments determined shading along the tributaries was high, and mean maximum stream temperatures were highly correlated with stream shading. Nevertheless, several streams, namely Potter, Gate Creek, South Forks of Gate Creek, Deer, and Taylor Creeks exceeded the proposed State temperature standard (64E F.) during July 1995. Insufficient data is available to determine if this was the historical temperature condition for the tributaries in the analysis area.

In addition to numerical water quality standards, fish habitat and aquatic life have been impacted by human activities within the analysis area. These impacts are in the form of decreased flows as a result of diversions, lack of appropriate fish screens at the Walterville Hydroelectric Plant, loss of large woody debris and associated habitat in the tributaries to the McKenzie River, and road related barriers to fish passage in the tributaries.

Hunting and Fishing - Not addressed.

Boating and Water Contact Recreation - DEQ monitors bacteria levels to determine protection of water contact recreation beneficial uses. Their monitoring has found bacteria levels are within appropriate levels for full support of this beneficial use.

Aesthetic Quality - DEQ monitoring has found full support of this beneficial use in their program monitoring chlorophyll a and pH levels in the river.

Conclusions

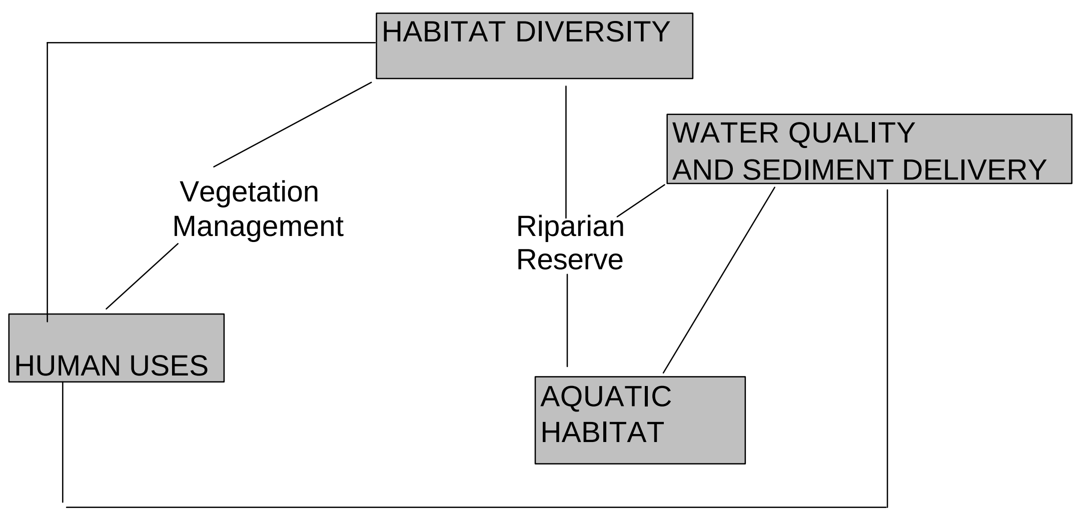
Human activities have impacted the aquatic life and fish habitat uses more than any other beneficial use. Within the lower McKenzie River, the biggest impact has come from the diversion of water from the river resulting in decreased flows, and channelizing of the river, urban growth, and associated inputs of sediment and toxic compounds. However, there is much cooperation and support by users of the River and, as a result, plans are already underway to improve conditions in the McKenzie River. For instance, as part of their project relicensing, EWEB prepared a water quality report for the DEQ, which included modifications in their operation that will benefit fish habitat and fish migration by decreasing the amount of water diverted from the river, and placing appropriate fish screens in the Walterville plant. In addition, the McKenzie River Watershed Council recently approved a long-term water monitoring strategy for the McKenzie River Watershed. As a result, the Council has helped fund 2 new monitoring stations on the river, in cooperation with DEQ, and there are plans for more sites.

In the tributaries or uplands, changes in water quality conditions have been associated primarily with harvesting and road building activities that result in acceleration of landslides and debris torrents, road related sediment delivery, road related barriers to fish, and elimination of large wood and large wood recruitment potential as a result of harvesting activities. Riparian Reserves required by the ROD Standards and Guidelines, will adequately protect the temperature standard in the tributaries on BLM managed lands. Aquatic life and fish habitat beneficial uses on BLM managed lands are most likely impacted by road-related barriers to fish migration, and road-related erosion accelerating the delivery of sediment to streams, as discussed in the "Erosional Processes and Sediment Delivery" section. Although neither problem appears to be widespread in the analysis area, given the high concern for water quality in this watershed, it would be prudent to determine where problems lie and take action to correct them.

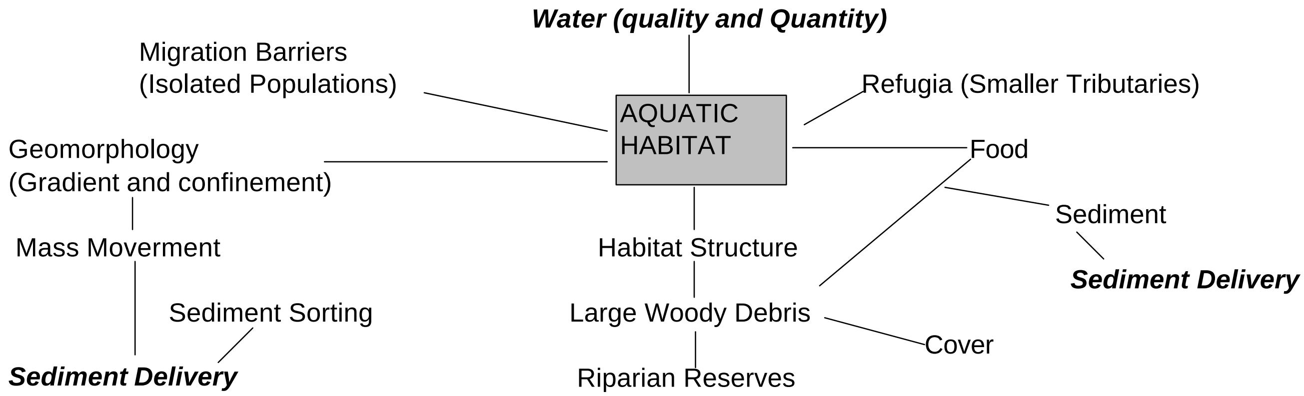
CHAPTER 5
Synthesis

Synthesis is examining the different resources and discussing how they are interrelated. In Chapter 4, the current condition and reference chapter, how resources are interrelated were part of the discussion. The synthesis chapter will contain highlights from the Chapter 4 discussion. The synthesis chapter has 3 elements to it. They are as follows: 1) diagrams, 2) highlights and 3) general recommendations. The diagrams show how the values/issues are related to each other and other resources. The highlights bring forth important information regarding synthesis from chapter 4. The general recommendations were based on the highlights and the diagrams. Chapter 6 will use the general recommendations to develop more specific recommendations were appropriate.

The diagram below shows how the values/issues are related to each other. The major connections are drawn, see the specific resource diagrams in this chapter to see all the connections. The values/issues are placed in the boxes.



AQUATIC HABITAT



Highlights

- Lack of large woody debris (LWD)
- Lack of side channel habitat/pools/spawning gravel
- Within 50 feet of the stream 58 percent of the trees are hardwoods
- From 50 feet to the edge of the riparian reserves over half of the trees are conifers >46 years
- Side tributaries serve as refugia
- Sediment delivery can be a local problem
- Lower gradient unconfined/moderately confined transport reaches serve as response areas.

Recommendations

Criteria for selection of restoration opportunities

- Adequate BLM ownership
- High habitat potential
- Availability of on site materials due to lack of access
- Presence/potential of anadromous fish or ODFW special management fish
- Cooperation with other landowners

Priority Locations (not in order of priority)

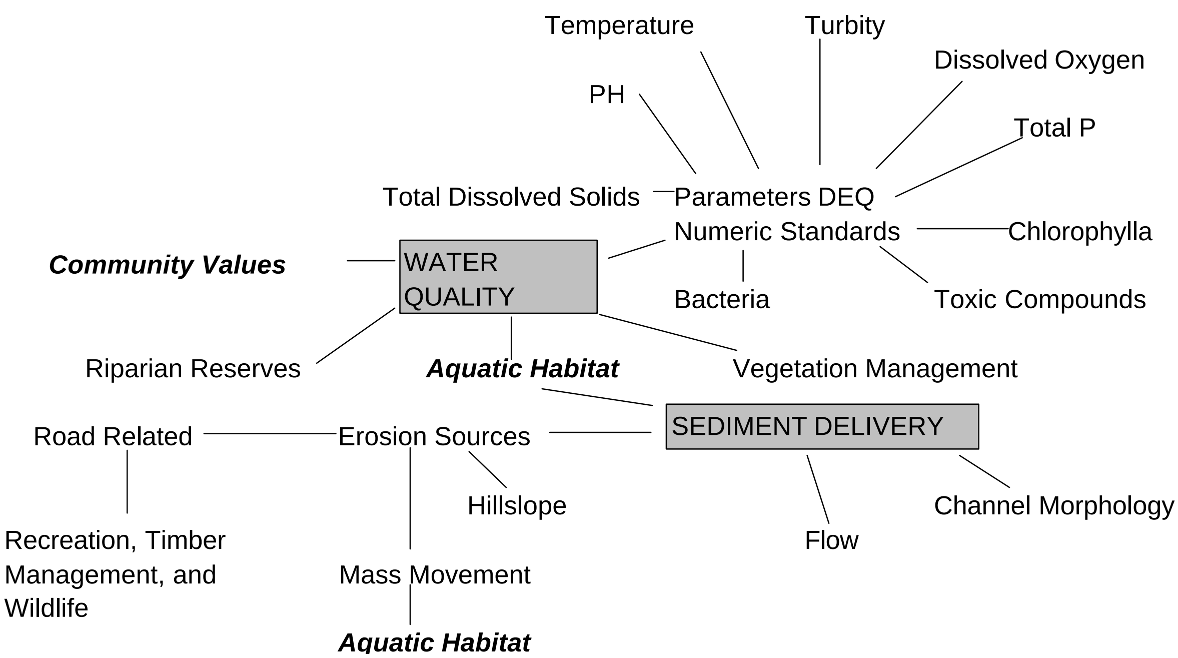
All projects will incorporate riparian treatments as needed to improve riparian condition/function and at the same time provide a source of material for the stream channel. Specific locales and treatments will be determined on the ground. Within the project area identify areas for vegetation and read management.

- Finn Creek (sec. 19) - Create pools and side channel rearing habitat to benefit cutthroat trout (ODFW special management stream).
- Indian Creek (sec. 17/20) - Riparian restoration and pool enhancement/creation to benefit cutthroat trout (ODFW special management stream).
- Trout Creek (sec. 5) - Create spawning and rearing habitat to benefit Chinook salmon, steelhead/ redsides, rainbow trout, cutthroat trout.
- Toms Creek (sec. 3) - Riparian restoration, pool enhancement, spawning gravel sorting to benefit Chinook salmon and steelhead/redsides (potential), rainbow trout, cutthroat trout (ODFW special management stream).
- Minney Creek(sec.23) - Provide instream structure and cover to benefit rainbow trout, cutthroat trout, possible steelhead/redsides. It is a Gate Creek Partnership stream.

- North Fork Gate Creek.(sec. 23/24) - Provide instream structure/pool enhancement and cover to benefit Chinook salmon, steelhead/redsides, rainbow trout, cutthroat trout. It is a Gate Creek Partnership stream.

Other streams in this WAU are also in need of restoration (with the exception of Hatchery and Johnson Creeks) but are of lower priority. Hatchery Creek may provide an opportunity for an interpretive trail in conjunction with the old Hatchery visitor center project (see Aquatic HMP draft 1992). Johnson Creek has been the subject of an OSU study since the debris torrent in 1986. Landowners have been asked not to interfere with the natural recovery process.

WATER QUALITY AND SEDIMENT DELIVERY



Highlights

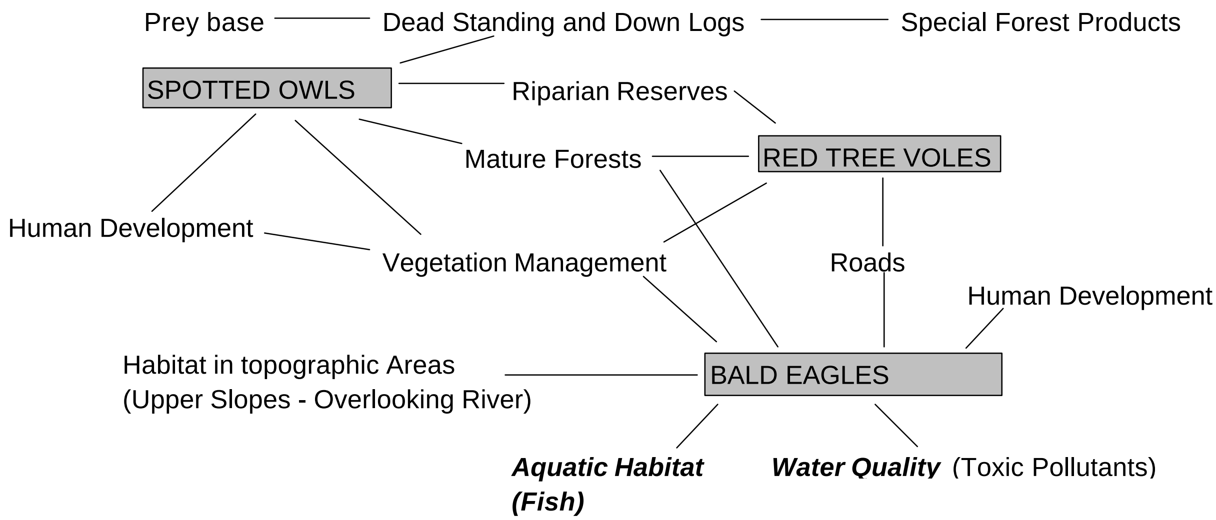
- Indian and Minney Creeks, for the BLM, are the subbasins of the greatest concerns for accelerated sediment delivery as a result of road-related landslides and road erosion.

Recommendations

- Roads in the area should use outsloping or crossdrains to reduce the ability of cutslope ditchlines to deliver sediment directly to streams. (The lack of relief drainage on privately managed sections of road 16-2E-29 in the Finn Creek drainage represents an opportunity for the BLM to work cooperatively with private landowners to correct road erosion problems.)
- Establish vegetation on cutslopes where necessary.
- Inventory culverts and other stream crossings to identify potential erosion and sediment problems, fish passage problems, and undersized or log culverts in high mass movement potential areas.

HABITAT DIVERSITY

LATE-SUCCESSIONAL HABITAT



Spotted Owls

Highlights

- Three core areas should be considered in management decisions.
- 96 percent of Federal lands are suitable for owl dispersal; therefore, there should be opportunity for arrangement of sales over time.
- Six known spotted owl sites - two active pairs

Recommendations

- Johnson Creek is the most important site with a pair. The adjacent BLM lands (T16S, R01E,section 33) should be either harvested later in the decade and/or do small density management thins.
- Four quarter townships (T17S, R01W,NW SE; T16S,R01E,NE; T16S,R2E,NE) do not meet 50-11-40 rule (locate on map) and should be entered last for timber harvesting if possible.
- Two quarter townships (T17S, R01W,SW; T17S,R02E,NW) approach 50 percent level and should be entered later if possible. Meeting 50-11-40 rule helps distribute and maintain dispersal habitat throughout the landscape, but is no longer a legal requirement (50-11-40 means that 50 percent of BLM lands will consist of forested stands with an average dbh of 11 inches or larger, and 40 percent canopy closure).

Red Tree Voles

Highlights

- No existing information specific to the Vida/McKenzie watersheds
- 96 percent of Federal lands in the area are considered to contain potential habitat and 6 percent to contain suitable habitat. These areas will need to be surveyed for timber sales.

Recommendations

- C Survey and manage according to guidance criteria.
- C Manage Riparian Reserves for late-successional forests that would provide dispersal and refugia opportunities.

Bald Eagles

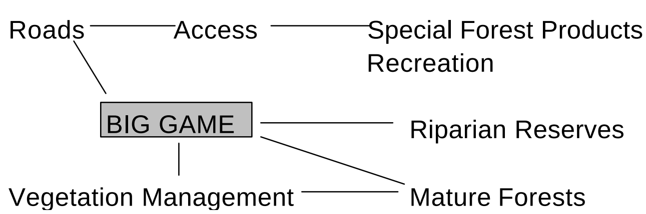
Highlights

- C 1,608 acres are in designated Bald Eagle Habitat Areas, of which 224 acres are suitable nesting habitat, and 1,326 acres are in early seral stages. Current and future habitat conditions could be enhanced.
- C Foraging/Mckenzie River riparian BLM administered lands are extremely limited and private riparian is being developed.

Recommendations

- C Develop a habitat management plan with interdisciplinary support and potentially inter agency and public participation.
- C Conduct no management actions in these areas without habitat management plan.
- C Provide structural and vegetation complexity in early seral stage habitats.
- C Develop harvest units with irregular shaped patches and edges, and use natural topographic and ecological features
- C Manage selected sites for species dependent on oak forest and grassland ecosystems

BIG GAME HABITAT



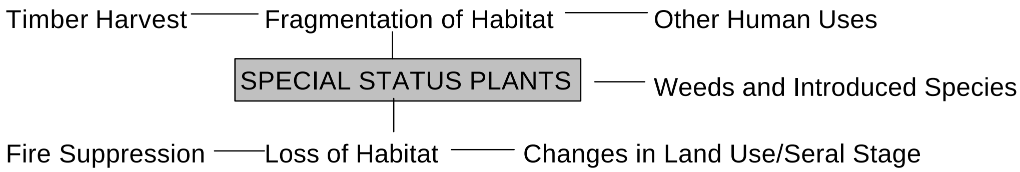
Highlights

- C Density of roads open to motorized use (4.9 miles of roads/mi^2) is above the RMP management goal of 1.5 miles/mi^2.
- C While habitats are fairly well distributed across the landscape forest management (large clearcuts) can negatively impact elk movements and habitat availability.
- C Elk use of habitat conditions in Indian, Finn and Hatchery creeks subwatersheds is important link to adjacent watersheds.

Recommendations

- C During timber sale planning identify unnecessary roads for decommissioning and temporary closures.
- C Arrange timber sales such that they are not eliminating all thermal and hiding cover in an area, which will limit elk distribution. Use Riparian Reserve network to aid in providing hiding and thermal cover across the landscape.

SPECIAL STATUS PLANTS HABITAT



Highlights

C 9 percent of BLM lands have been surveyed for all special status plants.

Aster vialis (Federal Candidate 2; Survey and mange species)

- *Aster vialis* is a valley fringe endemic, primarily restricted to oak savannah or at the edge of forests that were once oak savannah.
- Fire suppression, urbanization and farming reduce *Aster via/is* habitat
- Habitat fragmentation impacts cross-pollination, reducing vigor of isolated populations.
- At present, 42 acres are reserved for *Aster vialis,* at the eastern edge of its range.
- This species can be outcompeted by weedy species where habitats are altered.
- Canopy closure at *Aster vialis* sites can reduce vigor and decrease reproduction of plants.

Cimicifuga elata (Federal Candidate 2)
- Forest species that occurs generally on north slopes and requires a moist site.
- Populations adjacent to clear cuts and in thinnings may survive if not directly impacted and habitat around plants is maintained.
- At present 35 acres are reserved in two sites.

AIlotropa virgata (survey and manage species) is likely to occur in the watershed.

Recommendations

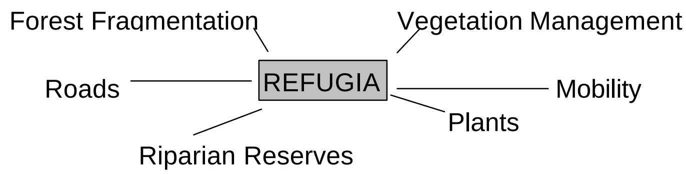
C An inventory is needed to delineate noxious weed species location

C Manage forest to provide a variety of seral stages.

C Reduce the spread of noxious weeds and introduced species to maintain diversity of plant communities. Actions that can be taken are inventory to identify infested areas, put to bed unneeded roads, remove infestations, clean equipment and vehicles as they pass from infested to uninfested areas, use certified seed for revegetation projects, and do not move soil or gravel from infested areas to uninfested areas.

C Maintain habitat links between special status plant populations to maintain or increase gene flow. Manage known sites of special status plants to increase and improve available habitat; where appropriate, reintroduce fire, disturbance, or other natural processes. Remove weeds to reduce competition. Consider reintroduction of special status species into habitat in historical range.

REFUGIA



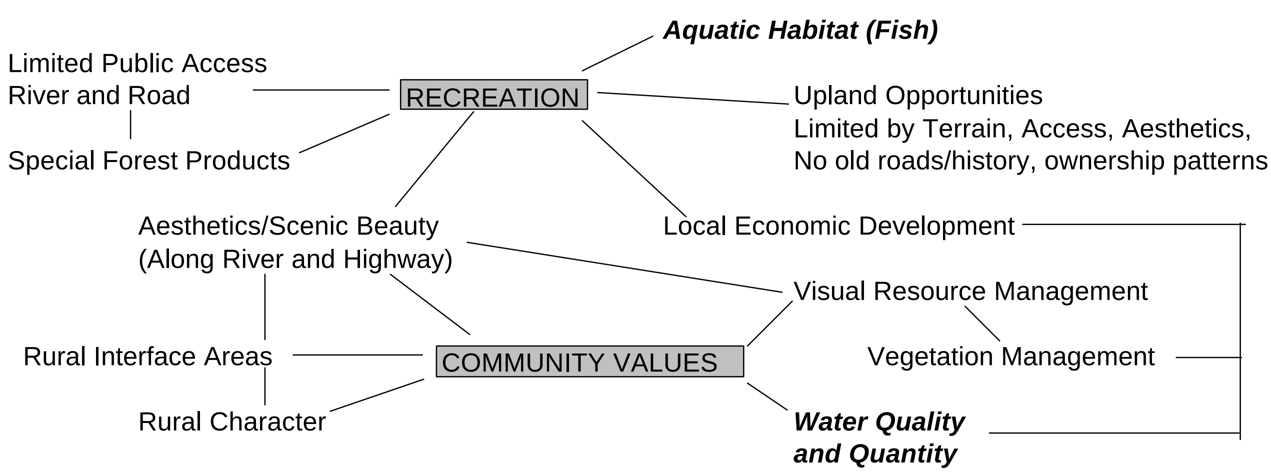
Highlights

- C 36 of 72 of mature forest patches (80-195 years) are nonfunctional (less than 25 acres in size and effectively are all edge). Additionally, six of nine old growth (195 years and older) patches are non-functional. Manage for larger continuous patches.
- C Increased inter-specific competition from edge associated and generalists species from forest fragmentation can decrease the effectiveness of maintaining mature and old growth patches for wildlife and plant communities.
- C Recruitment and maintenance of dead standing and down logs is important because current supplies are in older decay classes, and a distribution in all decay classes is needed.

Recommendations

- C Select oldest and largest patches for meeting the 15 percent rule, and tie these areas into other forest reserves. Do not discount smaller patches for refugia.
- C Manage mature forests that are uniform to provide structural diversity and dead standing and down logs in a variety of decay classes over time.
- C Remove and rehabilitate unnecessary roads.
- C Maintain integrity of refugia by arranging through time to maintain forested conditions on a few sides of late seral blocks
- C Maintain integrity of refugia by minimizing edge effects
- C Provide structural and vegetation complexity in early seral stage habitat
- C Limit forest fragmentation of mature forest

HUMAN USES



Highlights

- 9 percent decline in population since 1980
- 9 percent unemployment in 1990 down from 14 percent in 1980. This may indicate people finding employment or, based on the decline in population, may indicate people moving from the area.
- 38 percent retired in 1995. In 1990 43 percent of the population indicated they were out of the labor force.
- 2.5 percent drop in occupation in farming, forestry, or fishing from 1980 to 1990.
- 4.1 percent increased in occupations in executive, administrative, or managerial positions from 1980 to 1990.
- Majority of people in watershed commute to work
- Watershed median income $33,821; Lane County median income $19,481 in 1990. In 1980 the median income was slightly higher than the rest of Lane County, but by 1990 there is a significant difference. This indicates that individuals moving to the area over the last 10 years are not dependent upon the local economy or the declining timber industry for their income. It is suggested that these individuals are either retired individuals or commuters to the Eugene/Springfield area. However, as you move closer to Vida, the median income is significantly lower than the rest of Lane County. This may indicate that individuals living in this area may be more dependent on the local economy than those lower down in the watershed.
- Dispersed recreation visits on BLM lands in the watershed are increasing.
- Taylor Creek day-use boat launch site is sustaining visible and growing negative resource impacts and has no sanitation facilities
- Dispersed camping predominately on south side of McKenzie River
- Watershed not heavily used for special forest products harvesting
- Visual Resources are mostly Class 4 with some Class 2. Community has a high value placed on scenic views.

Recommendations

- Develop a recreation plan for the area. Specifically, consider Taylor Creek for improvements. Inventory special forest products. Ask special forest product harvesters for input on the access issue.
- Do a transportation plan for the area.
- Consider views from highway and river when doing timber harvesting.

CHAPTER 6
Recommendations

Introduction

A list of recommendations was created by the Interdisciplinary Team (ID Team) using the information from the synthesis chapter and management direction. The recommendations are suggestions or guidelines as to the possible locations for projects based on the information that is available. Through further investigation on the ground or by new information, suggested projects may not occur or new ones may be added.

These recommendations are not decisions. Further site-specific field work and analysis is needed before the Resource Area decides to initiate a project. Besides more field work and analysis, an Environmental Assessment (EA) will be prepared where appropriate to adhere to the National Environmental Policy Act of 1969 (NEPA).

Criteria were developed to determine where projects could be located, such as timber sales and restoration activities. This chapter is arranged into 3 sections - Potential Upland Projects, Potential Riparian Reserve Projects, and Transportation Management.

Potential Upland Projects

Criteria

The ID Team used the following criteria to recommend potential location and sequence of timber harvesting, snag creation projects, down woody creation, and other projects. This criteria would be used in the future to add additional timber harvesting areas to the recommendation list.

1. **Learning Opportunities -** The CCAMA is about 64 percent of the watershed. Within the CCAMA, there are opportunities to learn about forest management that can be applied to General Forest Management Areas (GFMA) throughout the Resource Area. Areas outside of the CCAMA also offer opportunities to learn about forest management. The team suggested timber harvesting areas in 1997 and 1998 to gain knowledge that can be applied on General Forest Management Area (GFMA) lands.

2. **Refugia -** The amount of stands over 80 years old located in the Late-Successional Reserves (LSR), Riparian Reserves (RR), District Designated Reserves (DDR), and other administrative out exceeds the 15 percent rule. This means that in stands already removed from programmed timber harvest, the 15 percent rule is met. The team identified areas that are over 196 years old that have a potential for being harvested. These areas are small in size, totaling 13 acres; the largest stand is 9.4 acres. These areas were not considered for harvest at this time. They were considered as potential refugia in the uplands.

3. **Transportation Management -** Areas that had an existing road system were selected as potential harvesting areas for the 1997 fiscal year. Areas that did not have an existing road system were considered for potential timber harvesting in fiscal years 1998-2003. The potential harvest units were scattered through the next couple of years to limit the amount of units that needed transportation needs assessment in one year.

4. **Politics, Public Involvement, Rural Interface Areas (RIA), and Scenic Visual Resource Management (VRM) Considerations** - Activities such as harvesting and transportation planning in the Indian Creek drainage may potentially have a high public interest so they were scheduled to allow time to adequately involve the public.

5. **Review Youngest Stands First** - Thinning stands that were at the younger end of the range of thinning age were considered first. This was to obtain the greatest benefit from the investment in thinning; also, in the 80+ age category, harvesting the youngest first was considered.

6. **Northern Spotted Owls** - When considering where to plan timber sales, the team looked at the following concerns:
   - Where owl sites were located.
   - Where the active owl sites are located.
   - Where there is adequate dispersal habitat.

   For the one active owl site, the team discussed the issue of thinning near an owl site versus regeneration. The discussion was whether it would be preferable to have a thinning impact on the owls sooner or wait until the stand reaches the age for regeneration, prolonging the harvesting impact to the stand. The wildlife biologist will discuss with the U.S. Fish and Wildlife Service (FWS) the management options for this potential timber sale area which is in a GFMA.

   To define adequate spotted owl dispersal habitat, the 50-11-40 measurement tool was used. Areas that have less than 50 percent of the 1/4 township not providing dispersal habitat were identified. Areas that are above 50 percent, but have the potential of becoming less than 50 percent if harvesting occurred, were identified. The team did not recommend timber sales in areas identified as being below 50 percent or susceptible of being less than 50 percent if harvesting occurred.

7. **Space Units Benefitting Wildlife Within a 10-Year Period** - As much as possible, units were scattered to minimize the impact to big game. Some stands were not considered for harvesting if adjacent sections or drainages contained potential harvest units.

Adaptive Management Area (AMA) Recommendation - Hypotheses -

Timber sales offer the opportunity for applying different techniques in yarding trees, creating snags, and involving the public. The Indian Creek drainage also offers an opportunity to explore alternatives in transportation planning. These timber harvests were selected based on the criteria stated above.

The timber harvest proposed will provide learning opportunities in stands available for commercial thinning and regeneration harvest. The following are assumptions that can be tested as hypotheses through timber sales.

1. Regeneration harvests and density management in the AMA can be used to test various yarding techniques, produce different types and volume of Large Woody Debris (LWD), test irregular cutting patterns for wildlife needs, and help produce high demand forest products while meeting the Aquatic Conservation Strategy.

2. Regeneration harvests and density management in the AMA can be used to test economic feasibility of different harvesting techniques (i.e., helicopter logging).

3. Site preparation techniques can enhance wildlife opportunities and still meet new seedling planting objectives.

4. Snags can be produced, based on the Northwest Forest Plan and the District RMP levels in several decay classes through a couple of rotations without causing safety problems to crews on the ground.

5. Methods and techniques are available to expedite the recruitment of cavity nesting wildlife trees (snags) into young/mature forest stands that are below the Eugene ROD/RMP thresholds.

6. Involving local land and business owners and interested publics in the development of proposed projects, such as those proposed in the Indian Creek drainage, will lead to greater community satisfaction and interest in the area and will give the agencies a more accurate understanding of the local public's concerns about Federal land management and more successful implementation of those projects. The BLM goal in testing this hypothesis is to design more effective local public involvement strategies.

7. Various native forbs and grass species can be utilized throughout different elevation zones for revegetation effects.

   Table 1 on the following page lists potential location of timber sales and other projects. The decision to harvest any of the potential units will not occur until the NEPA process is started at a site-specific level. To help suggest potential locations of timber sales the harvest potential map was used. See also the potential project area map to see were some of the suggested projects are located.

Table 1 - Potential Projects in the Uplands

POTENTIAL PROJECTS	LOCATION	LUA	Estimated Acres	Potential Sequence	COMMENTS
Create snags and down woody material	in conjunction with timber sales	GFMA, AMA, RR		Annually	Field inventory is needed to determine additional locations.
Manage Sensitive Plant Sites	where they occur			Annually	
Prepare a bald eagle habitat plan				FY 96	
Experiment with ways to address the noxious weed problem					
Potential Commercial Thinning harvest	T.16E. R.1E. sec 25; Hatchery drainage	AMA	50	FY 97	Recommended - there is an established road system.
Potential Regeneration harvest	T.17S. R.1E. sec 1; Potter Creek drainage	GFMA	63	FY 97	Recommended - there is an established road system.
Potential Regeneration harvest	T.17S. R.1W. sec 11; Rawhide and Potter creeks drainage	GFMA	184	FY 97	Recommended - there is an established road system.
Potential Regeneration & Thinning harvesting units; harvest no more than a total of 137 acres in 1998 and 2003 combined	T.16S. R.2E. sec 17, 21; Indian Creek drainage, total acres available for harvesting is 273 acres; 120 regeneration and 153 thinning acres	AMA	137	FY 98 & 2003	Selected because of the learning opportunities; no existing road system. Possible helicopter logging opportunity; opportunity to learn about helicopter logging in thinning units; potential high public involvement opportunity, need, and interest.
Density management, thinning unit	T.16S. R.1E. Johnson Creek drainage	GFMA	86	FY 98	Selected because of the opportunity to thin SW quarter of the section; stay out of the rest of the area; leave as one of the last areas to do a regeneration harvest; F&WS will be contacted for input on managing this stand.
Regeneration harvest; 3 potential units	T.16S. R.2E. sec 33, Good Pasture area	AMA	61, 6, 50	FY 2002	Selected because there is an established road system and to scatter the impacts throughout the watershed. Potential Rural interface Area concerns; harvest one of the 2 larger units.
Commercial thinning harvesting; 2 potential units	T.16S. R.2E. sec 23, Minney Creek drainage	AMA	32, 24	FY 2001	Selected because of the thinning opportunity and to scatter impacts. Hold off regeneration in this drainage for 5 years; harvest one of the 2 units.
Commercial Thinning	T.18S. R.1W. sec 5; Cedar Flats	GFMA	405	FY 99	Selected because it is one of the younger thinning opportunities and potential road decommissioning and upgrades opportunity. ID team needs to consider if smaller units would be more appropriate and if vegetation management is needed in the Riparian Reserve.
Commercial Thinning	T.18S. R.1W. sec 9; Starks Creek drainage	GFMA	132	FY 2000	Selected because it is one of the younger thinning opportunities.

Potential Riparian Reserves Projects

A. **Instream Restoration Projects** were recommended based on the following criteria. Instream projects were not prioritized because they all have the same level of importance. All the streams in the watershed are in need of some restoration work. The instream restoration projects were recommended before the flood of February 1996. After flood damage has been assessed, the recommendations for restoration may change.

1. **Ownership** - Streams where BLM administered lands consist of a significant portion of the land adjacent to the stream.

2. **Anadromous fish** - Streams that have the potential to provide habitat for anadromous fish

3. **Log Source** - Streams that have large trees nearby for stream structures.

4. **ODFW Special Management Designation** - Streams designated by ODFW for special management for cutthroat trout.

5. **Opportunities to Work with Adjacent Private Landowners** - Streams located in the Gate Creek Partnership drainage or mixed ownership were considered.

B. **Vegetation Management Projects** were considered where restoration projects are occurring. Areas within 200 feet of stream of restoration projects would be examined for opportunities for vegetation management. Where commercial thinning opportunities are occurring upland, the Riparian Reserves would be field checked to determine if vegetation management is needed. Large thinning units may not allow for vegetation management in the Riparian Reserves. Riparian would be needed to provide hiding cover for big game and dispersal habitat for wildlife since thinned units may not provide hiding cover for 5 to 10 years. Vegetation management in Riparian Reserves should consider what is occurring in the uplands and maintain the connectivity characteristic of the Riparian Reserves. Vegetation management priorities are (1) thinning young stands to create large trees for fish and wildlife and (2) replacing some hardwood stands with conifers. A secondary priority is to create snags and down woody material outside of areas selected for vegetation management.

C. **Transportation Management Inventory** would be concentrated in the drainage receiving a restoration project. The road inventory work would include examining culverts for adequate size, examining drainage structures, looking for fish passage problems near culvert erosion, and examining upper road drainage problems to determine where they originate. Transportation Management inventory needs to occur during the planning of the restoration projects.

Regarding Riparian Reserve management, the ID Team will consider mitigation measures, such as placing logs in streams, when crossing streams with corridors and roads or for vegetation management.

Table 2 - Potential Riparian Reserve Projects

POTENTIAL PROJECTS	LOCATION	COMMENTS
Trout Creek	T.17S. R.2E. sec. 5	Anadromous fish potentially present
Finn Creek	T.16S. R.2E. sec. 19	ODFW special management stream for cutthroat trout.
Minney Creek	T.16S. R.2E. sec. 23	Gate Creek Partnership includes this stream; opportunity to work with private landowners.
Toms Creek	T.17S. R.2E. sec. 3	Anadromous fish potentially present; ODFW special management stream for cutthroat trout.
North Fork Gate Creek	T.16S. R.2E. sec. 23, & 24	Anadromous fish potentially present; Gate Creek partnership stream.
Indian Creek	T.16S. R.2E. sec. 17 & 20	ODFW special management stream for cutthroat trout.
Taylor Creek	T.17S., R.1E. sec 19	Confirm boat launch site; reduce bank erosion, littering, and improper waste disposal; manage for low intensity recreation use to minimize impacts to bald eagles.
Create snags and down woody material		Additional locations outside of instream restoration areas would be identified by wildlife biologists through additional analysis.
Vegetation Management	200 feet on either side of creeks selected for instream restoration	Additional field inventory is needed to identify opportunities in drainages not identified for instream restoration.

Adaptive Management Area (AMA) Recommendation - hypotheses -

The following are assumptions that can be tested as hypotheses in the Riparian Reserves. Vegetation management in the Riparian Reserves offer opportunity for applying different techniques in creating snags in different age classes, accelerating young stands to a late-successional seral stage and involving the public.

1. Vegetation manipulation in the Riparian Reserves can meet Aquatic Conservation Strategy objectives and benefit Riparian Reserves.

2. Specific silvicultural treatments in young stands (40 to 60 years) can accelerate the development towards late-successional seral stage.

3. Snags can be produced, based on the NW Forest Plan and the District RMP level, in several decay classes through a couple of rotations without causing safety problems to crews on the ground.

4. Methods and techniques are available to expedite the recruitment of cavity nesting wildlife trees (snags) into young/mature forest stands that are below the Eugene ROD/RMP thresholds.

5. Involvement of the local landowners in the scoping and discussion of project proposals would prove beneficial to agencies and the successful planning and implementation of projects.

6. The instream restoration projects offer an opportunity to use other methods besides large machinery. Lessons learned from not using large equipment can be applied elsewhere. The instream restoration projects also offer an opportunity to combine riparian enhancement with instream structure.

7. Involving local land and business owners and interested publics in the development of proposed projects,

such as those proposed in the Indian Creek drainage, will lead to greater community satisfaction and interest in the area and will give the agencies a more accurate understanding of the local concerns about Federal land management and more successful implementation of those projects. The BLM goal in testing this hypothesis is to design more effective local public involvement strategies.

8. Various native forbs and grass species can be utilized throughout different elevation zones for vegetation efforts.

Transportation Management Opportunities

- This section discusses opportunity for decommissioning or closing roads. In Appendix A there is a discussion on new and existing roads and building roads through the Riparian Reserves. This discussion was placed in the appendix because it gives general information regarding site-specific projects.

Road Decommissioning

- In identifying potential roads for decommissioning, focus was placed on those areas or sections with existing high densities of roads. Consideration was then given to what road-related resource concerns might exist in the area (i.e., wildlife and access, known sediment delivery concerns), and what the short-term and long-term future management and access needs might be. Short-term needs are defined as 10 years or less and long-term needs are defined as more than 10 years. Consideration was also given to where potential future timber sales and high road density exist in the same drainage. Reducing road density could be addressed through the timber sale process. It was assumed the main access roads would be needed both for future BLM management, and for the access they provide to private timber lands. Therefore, most of the recommendations are for elimination of spur roads or dirt surface roads.

The recommendations use the following terminology for road closure as defined in the Western Oregon Transportation Management Plan (draft 3/96):

Temporary/Seasonal - These are generally local roads, temporarily closed with a gate or similar barrier. The road will be closed to the general public but may be open to all during BLM/Permittee commercial activities. The road may or may not be closed to BLM administrative uses on a seasonal basis depending upon impacts to resources. Drainage structures will be left in place.

Decommissioning - These will be based on resource protection needs identified in watershed analysis and the RMP directives. The road segment would be closed to vehicles on a long-term basis, but may be used again in the future. Prior to closure, the road will be prepared to avoid future maintenance needs; the road will be left in an "erosion-resistant" condition by establishing cross drains, removing fill in stream channels, and potentially unstable fill areas. Exposed soils will be treated to reduce sedimentation. The road will be closed with a device similar to an earthen barrier (tank trap) or equivalent.

Full Decommissioning (hydrologic obliteration) - Roads determined through an interdisciplinary process to have no future need will be subsoiled (or tilled), seeded, mulched, and planted to reestablish vegetation. Cross drains, fills in stream channels, and potentially unstable fill areas will be removed to restore natural hydrologic flow. The road will be closed with a device similar to an earthen barrier or equivalent. The road will not require future maintenance. Roads receiving this treatment will be removed from all inventories.

Obliteration/Full Site Restoration - These roads will have all drainage structures removed. Fill material used in the original road construction will be excavated and placed on the subgrade in an attempt to reestablish the original ground line (recontoured). Exposed soil will be revegetated with trees or other native species. This is generally the recommended treatment for roads in sensitive or unstable areas where potential for damage to the watershed is high. Roads receiving this level of treatment will not be used at any time in the future and will be removed from all inventories.

Potential Road Restoration Opportunities

1. **16 S., 2 E., Sec. 33 (Goodpasture) (AMA)** - This area has a relatively high road density and there are wildlife concerns due to the existing level of access. A regeneration harvest is suggested for FY 99.

   Recommendation - In conjunction with the regeneration harvest, analyze future road needs. Fully decommission or obliterate roads not needed in short-term (i.e., 10 years), after the regeneration harvest. The focus will probably be on spur roads.

2. **16 S., 1 E., Sec. 25 (Hatchery Creek) (AMA)** - This area has a relatively high road density and no gate, so access and disturbance of wildlife is a concern. A commercial thinning/riparian enhancement are scheduled in the area for FY 97. There are some potential road sediment delivery concerns in the area (i.e., 16-1E-35.1 and 16-1E-25.2). There are also 2 dirt roads in section 35 in the Riparian Reserve area of Hatchery Creek (-35.2 and -35.3). These roads should be checked to confirm they are overgrown and not delivering sediment into streams.

   Recommendations

   a. Confirm whether there is a functioning gate at this location. Consider temporary/seasonal closure of section for wildlife needs (check Escape Hatch EA).

   b. Future harvesting will take place in the east half of this section (west half is too young). Analyze future needs, and consider fully decommissioning or obliterating spur roads in the west half of the section. Do the same for the roads in the east half of the section once operational needs are clarified.

3. **17 S., 1 W., Sec. 15 (Rawhide Creek)** - Area has relatively high road density and there are wildlife concerns (i.e., no gate) related to the existing level of access. Given the age of the stands in the section, the assumption was made that the stands will be regeneration harvested in the next 10 years.

   Recommendations

   a. Consider temporary/seasonal closure of section (gate).

   b. Fully decommissioning or obliterating excess roads/spurs following regeneration harvest.

   These actions should include 17-1W-9 (Camp Creek), another section with high road density, and where operational activities are complete.

4. **16 S., 2 E., Sec. 19 (Finn Creek)**

   Recommendation - Consider fully decommissioning or obliterating excess spur roads and old dirt road. Include road restoration opportunities for Road Nos. 16-2E-19.1, 19.5 - inventory showed these have high sediment delivery potential.

5. **18 S., 1 W., Sec. 5 (Cedar Flats)** - Commercial thinning is planned in this section beginning FY 99. There are several existing dirt surface roads. The condition of these roads relative to erosion and sediment delivery are unknown. Some of these roads may be used during the timber operations. The area is know to have high Off Highway Vehicle (OHV) use.

   Recommendations - After assessing road conditions and locations, and future road needs, consider the following:

   a. Surface or otherwise upgrade erosion control measures for those roads with future use.

b. Fully decommission or obliterate roads with no future use. Consider accomplishing under the thinning operation.

c. Replace or relocate road for future use, i.e., regeneration harvest. Consider accomplishing this under the thinning operation.

6. **18, 2 W., Sec. 1 (and 17-1W-31) (79th Street)** - There are existing dirt surface roads in the area whose condition is unknown. There are 2 botanical sites present in the area.

   <u>Recommendation</u> - Consider recommendations listed above for No. 5.

Data Gaps

Data gaps that were identified through the watershed analysis process are the following. (For some of the data gaps assumptions were made.)

Great Gray Owl - These owls potentially exist above an elevation of 3,000 feet; 0.5 percent of Federal lands in the Vida/McKenzie watershed is above 3,000 feet. Therefore, the impact of the lack information was minimized because very little potential great gray owl habitat exists on Federal lands. Potential habitat will be surveyed before any timber harvesting occurs. Without survey and monitoring information BLM will have to make broad assumptions (i.e., they occur in this watershed) and survey accordingly. If BLM had information on their abundance, distribution, and habitat needs for this area the Bureau could plan and manage with their needs in mind and potentially not have to survey prior to ground disturbing activities.

Red Tree Vole - Potential red tree vole habitat exists on 96 percent of Federal lands and is well distributed. Red tree voles will be surveyed prior to any timber harvesting. This will aid in gathering information on the species. Without survey and monitoring information BLM will have to make broad assumptions (i.e., they occur in this watershed) and survey accordingly. If the Bureau had information on their abundance, distribution, and habitat needs for this area BLM could plan and manage with their needs in mind and potentially not have to survey prior to ground disturbing activities.

Evening Field Slug, Oregon Megomphix, Blue-gray Tail-dropper, Papillose Tail-dropper, bats - The habitat for these species exists in the watershed. An assumption is that the Riparian Reserves, the LSR, and other areas removed from timber harvesting would continue to provide habitat and that the habitat would remain well distributed. The lack of data indicates that exact location of species are unknown.

Habitat Information for Elk Modeling - To make adjustments for not having habitat information, the elements that make up the elk modeling were discussed. This strategy allows examination of the components of the elk model. If all necessary information were available for using the elk model BLM would be able to better analyze the affects of timber management and associated road management on the elk population. This information would allow BLM to improve the layouts of timber sales.

Road Inventory Work - The implications for management is that problem areas are not known. Therefore, there is no way to make recommendations of whether or not restoration work is needed. It is also impossible to prioritze work. Stream crossings and channel conditions will be examined as restoration projects are implemented.

Survey Channel conditions

- Obtain temperature data on tributaries
- Survey stream crossings (condition, location, fish passage, and culverts)
- Complete road information for BLM south of the McKenzie River

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APPENDICES

APPENDIX A
Project Guidelines - ID Team

The Interdisciplinary Team will consider the following regarding timber sales:

- Develop harvest units with irregular shaped patches, edges, and use natural topographic and ecological features.

- Arrange timber sales in a manner that does not eliminate all thermal and hiding cover in an area so as to limit elk distribution. Use the Riparian Reserve network to aid in providing hiding and thermal cover across the landscape. Specifically consider doing this for Indian Creek drainage.

ROAD MANAGEMENT

As noted in Chapter 5 - Synthesis, road management is connected to a variety of resources in the watershed analysis area. Whereas roads provide a variety of beneficial uses like access for forest management activities, hunting, and recreation, they are sometimes in conflict with other resources such as wildlife, aquatic habitat, and water quality. In addition, in recent years funding for road maintenance has been below the level required to maintain the existing road system, and will continue to be below standard for the near future. Therefore, the BLM is at risk of having roads open it cannot maintain, which may result in road degradation potentially impacting other resources. The focus of the following sections is to provide guidance to assist ID Teams to keep to a minimum the number of new, permanent road miles, and to close or decommission any existing roads identified as having no short-term need.

The team examined the issue of road management under 3 conditions: existing roads, new roads, and roads in the Riparian Reserves. Most of what is discussed in this section are guidelines for ID teams when they are at the site-specific project level.

A. Guidelines For New Roads And Existing Roads

A checklist was developed using the Western Oregon Transportation Management Plan and information gathered through this analysis. The checklist should be used to help determine if additional roads should be constructed and whether or not the roads should be permanent or temporary. For information regarding the checklist, review the Western Oregon Transportation Management Plan. The checklist is as follows:

1. What are the wildlife concerns?

   Big Game concerns exist in the following drainages because of the amount of road density.
   - Cogswell
   - Hatchery
   - *Finn
   - *Good Pasture
   - *Minny
   - Rawhide
   - T.18 S., R.1 W., Section 5

   * gated

The drainages containing a gated road system are of less concern. However, there is an uncertainty on the level of closure provided by the gates. For instance, are the gates open during hunting season? Further investigation is needed.

2. What are the number of stream crossings occurring, and will the hydrology be changed by making a new crossing?

3. Will there be any impacts to water quality?

4. Are the roads causing sediment to be delivered to the stream?

At the site-specific project level, the ID team should use this list as a guide to determine if they are in an area where roads are a high concern. When project activities are occurring within the road systems, the ID team should look at the road system for possibilities to reduce road density.

For roads listed when planning timber sales consider high cut slope sediment for improvement.

5. Will fish habitat be effected?

6. Is the road needed as access for management activities such as wildlife protection?

7. Does this road have noxious vegetation on it that may be transported elsewhere?

8. Is this a road that the public use? if so to what level?

9. Given the reduced funding for road maintenance, is it cost-effective to build or keep this road?

10. What is the minimum standard that this road could be constructed to?

B. Roads, Corridors, and Tailhold Trees in the Riparian Reserve

As a general rule, management actions/direction for Riparian Reserves prohibit or regulate activities that retard or prevent attainment of Aquatic Conservation Strategy (ACS) objectives (Eugene District ROD/RMP p. 7). This will be the overriding criteria for activities in the Riparian Reserves. The following are additional considerations for roads, corridors, and tailhold trees in the Riparian Reserve.

1. Entering the Riparian Reserves but not Crossing Stream with a Road

! Conditions of the vegetation
  Stand age
  Stand type
  Microclimate/riparian function
! Are there any special status plants or wildlife present?
! How would constructing the road affect wildlife corridors?
! Would the road impact desired habitat such as LWD, DWD, or snags?
! Will this be a temp. or permanent road system?
! Are there any mitigation opportunities?
! Consider the road system - what roads can be removed? What can be built to neutralize the effect of the road system? Look at the road system and well as the individual road.

2. Crossing Streams with Roads

- What is the channel condition?
- Where are you in the channel?
- What is the number of existing crossings?
- Is the stream fish bearing?
- Are there any special status fish known to use the creek?
- How much would the stream hydrology be changed?
- What is the sediment delivery potential?
- What is the mass wasting potential?
- Are there any mitigation opportunities?
- Are any snags or LWD affected by crossing the stream with a road?

3. Logging Corridors through/in the Riparian Reserves

- What type of suspension? Full suspension?
  Will there be ground disturbance? vegetation disturbance?
- What is the age of the affected trees and, if mature (80+), how much of the area has mature trees?
- What is the stand condition?
- Are there any benefits to wildlife?
- Are there any mitigation potentials?
- What will be the spacing of the crossing?
- Consider all options - A crossing may be better than building additional roads and vice versa.

4. Tailholds and Guidelines in Riparian Reserves

- Amount of large wood on the ground
- Number of mature trees
- Number of snags in the area
- What are the trade-offs of not doing it?
- What is the value of the trees to wildlife?

APPENDIX B
Hydrology

Figure B-1 - Instantaneous Peak Flows - McKenzie, Vida Gaging Station (1925-1993)

Figure B-2 - Instantaneous Peak Flow - Gate Creek (1952-1989)

APPENDIX C
Vegetation

Forest Succession and Seral Stage Development - Oregon Western Cascades

Successional Stages - Succession is the replacement of vegetative communities following events that change or alter the original community. Eventually the original community is restored and remains reasonably stable and constant until the next disturbance event. In the Pacific Northwest, the dominant species are so long-lived that the probability of succession restoring the original community before another disturbance event happens is low.

The following is a general description of the various successional stages. The ages are somewhat different than those utilized in the vegetation class and patch type descriptions, but the overall stand level dynamics and interactions are well documented.

Early Seral Stage - This seral stage occurs from the time of disturbance that exposes bare ground to the time when the site is revegetated with conifer or hardwood saplings. Domination of the site with hardwood and/or conifer saplings typically occurs before 15 years after disturbance. The first 2 to 5 years are usually dominated by grass, forbs, and herbaceous vegetation followed by a dominance of shrubs and/or hardwoods. Species diversity is highest in this seral stage and biomass is relatively low, but increases rapidly throughout this stage. The conifers develop slowly at first but gradually become dominant. Once conifer dominance occurs and the crowns close to fully occupy the site, then the early seral stage is concluded. These descriptions assume that all stands currently in this sera] stage have developed as a result of man-caused disturbance (forest management) and there are no stands in this seral stage that have resulted from natural disturbances.

There are 3 separate stand conditions that exist during the early seral stage: grass-forb, shrub, and open sapling-pole.

1. Grass-Forb Stand Condition - This stand condition usually lasts 2 to 5 years and occasionally as long as 10 years. After timber harvest or disturbance, the area is usually devoid of vegetation for the first growing season. Resident herbs and new plants quickly dominate the site. Some shrubs and sprouting hardwoods may be present, but not yet dominant. This stage can be bypassed if residual overstory tree cover does not create openings, e.g., a shelterwood harvest.

   This stage can be defined as shrubs less than 40 percent crown cover and less than 5 feet tall; areas may range from mainly devoid of vegetation to dominance by herbaceous species (grasses and forbs); tree regeneration generally is less then 5 feet tall and 40 percent crown cover. Stands in the grass-forb stand condition are classified as clear cut patch types for this analysis.

2. Shrub Stand Condition - The shrub condition typically lasts from 3 to 10 years, but can remain for 20 or more years if tree regeneration fails or is delayed. Shrubs become the dominant vegetation and provide some habitat for wildlife that is different from the grass-forb condition. Tree regeneration is common, but the trees are generally less then 10 feet tall and provide less then 30 percent of the crown cover.
   This stage can be defined as: Shrubs greater than 40 percent crown canopy; they can be any height; trees less than 40 percent crown canopy and less than 1 inch dbh. When trees exceed 1 inch dbh for the stand average, they should be classified in the "open sapling" or "closed sapling" category. Stands in the shrub stand condition are classified as clear cut patch types for this analysis.

3. Open Sapling - Pole Stand Condition - This stand condition exists when the trees reach 10 feet in height, but still have less then 60 percent crown cover. The trees generally average less then 1 inch in dbh. A dominant shrub understory is common and generally consist of vine maple, hazel, oceanspray, thimbleberry, salal, and Oregon grape. This stage may be bypassed if initial stocking densities exceed 400 to 500 trees per acre. This stage can also be reinitiated or prolonged through precommercial thinning. This stage may last from 8 to 20 years depending upon tree crown closure and subsequent stand treatments.

   This stand condition is defined as: Average stand diameter greater than 1 inch dbh and tree crown canopy less than 60 percent. Saplings are 1 to 4 inches in dbh; poles 4 to 9 inches. Stands in the open sapling pole condition are classified into the sapling-pole patch type for this analysis.

Mid Seral Stage - This stage is characterized by dominance of conifers (from the time of crown closure to the time of first merchantability). This stand condition can also be called closed sapling-pole sawtimber or "stem exclusion stage". These sites are characterized by a dense conifer stand, a closed canopy with crown cover ranging from 60 to 100 percent, and a relatively low occurrence of understory vegetation. Stands typically exhibit these characteristics between 16 and 45 years of age.

The overstory trees are growing very rapidly and begin to lose the lower, deeply shaded foliage and branches. Stem growth slows down and the stem form becomes more tapered. As individual trees within the stand differ in growth rates and occupy different amounts of growing space, some trees gain a competitive advantage. Since the overstory is growing very rapidly, the larger more dominant trees begin to overtake the growing space of the smaller less competitive individuals. This process is called stand differentiation and is generally manifested first in diameter differences, and then later in height differences. Stand differentiation creates a stand with individual trees of different crown sizes and positions, as well as different heights and diameters. This allows for a classification of individual trees by canopy position or crown class - dominants, codominants, intermediates, and overtopped or suppressed.

Species diversity decreases in most cases. These stands can change to large sawtimber and eventually old growth if thinning treatments and long rotations are used. The size and number of snags and coarse woody debris is dependent upon the stand origin. Managed stands created by forest management during the past decades tend to be devoid of large snags and downed logs. However a large number of small snags are present. These snags are created by stand differentiation and competition mortality; which tends to be the smaller sized trees in the intermediate and overtopped crown classes. Natural stands may have a greater number of snags and large downed logs that are legacies from the original forest as well as the high amounts of small snags and downed logs created by competition mortality. These existing natural stands tend to be limited in the number of large snags as a result of past fire management policies, but still have some levels of downed logs. These snags and downed logs currently present tend to be in the more advanced decay classes; classes 3 and 4, and this stand condition can be defined as: average stand diameters between 1 and 21 inches in dbh and crown cover exceeding 60 percent. The average stand diameter range used can overlap into the late seral stage, depending upon stand management treatments applied and the site productivity. Stands in the mid seral stage are classed in the pole-young patch type for this analysis.

Late Seral Stage - This stage typically is characterized by openings in the canopy with a corresponding increase in forbs and shrubs or the understory reinitiation stage. Species diversity, although minimal, is once again beginning to increase but at a slower rate than what occurred in the early seral stage. For conifer growth, it is the time of first merchantability to the time of culmination of mean annual increment (CMAI). During this period, stand diversity is low but increasing. Stands generally exhibit these characteristics between 46 and 80 years. Stands in the late seral stage are classified as pole-young patch types.

These stands typically have large numbers of small diameter snags and downed logs resulting from stand density and competition related mortality. The large diameter snags and downed logs, legacies from the previous forest, tend to be few in number, limited in distribution, and those present are typically in the more advanced decay classes. The number of legacy and small diameter snags and downed logs tends to be greater in naturally regenerated stands. Past management activities and silvicultural treatments like precommercial and commercial thinning tend to decrease the number of small snags and downed logs present in these stands.

Mature Seral Stage - This stage typically occurs between ages 81 and 195. Stand diversity is gradually increasing response to openings in the canopy created by windthrow, disease, insects, and stand mortality. Biomass is increasing but at a relatively slow rate. For conifers it is the time from CMAI to an old growth state.

This stage could also be called the "large sawtimber stand" condition that is characterized by trees with an average dbh of 21 inches or larger. The conifers usually exceed 100 feet in height with crown cover generally less than 100 percent, permitting the development of ground vegetation. Stands in the mature seral stage generally have a more open canopy than the mid seral aged stands. These stands create different wildlife habitat than smaller sized stands. Natural stands in this condition can have nearly as much standing and downed woody material as old growth stands. Stands that have had silvicultural treatments are generally lacking in standing and downed woody material. These stands also tend to lack the more tolerant, successional understory species required for the old growth stage. For this analysis the stands in the late seral stage are classified as mature or mature over young if a 2-storied stand condition is present.

Old Growth Seral Stage - This stage typically occurs after 195 years and represents climax and subclimax plant communities. The subclimax condition may persist for centuries depending on the frequency of natural disturbances. Whether in the climax or subclimax condition, old growth is characterized by 2 or more tree species with a wide range of size and age including long-lived seral dominants, decadence of the long lived dominants, a deep, multi-layered canopy, significant amounts of snags and downed logs, and openings or gaps in the canopy. More tolerant conifers (western hemlock and western red cedar) and/or shrub species occur in the understory or in the gaps and openings caused by windthrow or other disturbance. Old growth stands are optimal habitat for saprophytic plants, lichens, mosses, and liverworts. Biomass reaches a maximum and species diversity approaches the level found in the early seral stages. Forest stands in the old growth seral stage are classed as old forest or old over young if a 2-storied stand condition exists.

APPENDIX D
Soils

Purpose, Assumptions, Methodology

Soil Productivity & Resiliency Assessment

Purpose/Key Questions - This assessment will identify the areas with similar soils and natural, inherent productivity. The following Key question will be addressed:

What is the inherent, natural range of soils and site productivity, and has it been affected by man?

Assumptions - Soils with similar properties and characteristics have similar inherent productivity and resiliency and behave similarly.

! Data from SCS soil surveys combined with professional knowledge and experience of soil characteristics and behavior can be used to develop mapping units that identify soil capability and resiliency.

! Soil characteristics, including moisture and temperature regimes, have some correlation to vegetation communities.

Methodology - Resiliency units for the Vida/McKenzie Watershed analysis area were created by combining soil mapping units listed by Soil Conservation Service in the *Soil Survey of Lane County, Oregon* (1987. Each resiliency unit has soils with similar properties. Resiliency units are based on such factors as soil temperature and moisture regime, soil drainage and permeability, soil depth, coarse fragment content, texture, water holding capacity, and nutrient capital. Eleven resiliency units were created to cover soils in the Eugene District. These units cover xeric and udic moisture regimes, mesic and cryic temperature regimes, and wetland type soils.

Hillslope Erosion Assessment

Purpose & Key Questions - The purpose of this assessment is to identify the existing and potential hillslope related surface erosion areas that contribute sediment to stream channels. The following key question will be addressed by this assessment:

What is the hillslope erosion potential, i.e., what areas are sensitive?

Assumptions

! Sheet erosion of hillslopes is influenced primarily by soil type, hillslope gradient, protective cover, precipitation intensity, and human activity.

! Certain soils (easily detachable) and slope conditions (steeper) are conducive to surface erosion.

! On potentially erodible soils, the primary factors determining whether surface erosion occurs are exposure and compaction of mineral soil and topography. Surface erosion tends to increase as these 3 characteristics increase.

- Certain management practices can expose and/or compact surface mineral soil and significantly increase surface erosion. Practices that do not expose or disrupt the surface mineral soil are unlikely to increase surface erosion.

- Surface erosion may be delivered anywhere in the stream system by dry ravel or overland flow, but is fairly easily disrupted by a buffer of slash, duff, and other protective soil cover. Therefore, sediment is generally not delivered to the stream system if adequate buffers exist on the hillslopes.

- Dry ravel is primarily a function of slope gradient, hillslope storage potential, surface cover, and soil erodibility.

- Most surface erosion occurs within 5 years of a contributing activity.

Methodology - Soil erosion potential maps (Mass Wasting Potential and Hillside Erosion Potential) were made using Geographic Information System (GIS) with topography (slope steepness) and soils (USDA Soil Conservation Service, K-factors) themes. Three categories of relative potential for erosion of exposed mineral soil were mapped using the following criteria:

High	Slopes > 65%, K > .25 Slopes > 30%, K > .40
Moderate	Slopes > 65%, K < .25 Slopes 30-65%, K .25 - .40 Slopes < 30%, K > .40
Low	Slopes < 30%, K .25 - .40 Slopes < 65%, K < .25

APPENDIX E
Wildlife

Table E-1 - Wildlife Species in the Vida/McKenzie Watershed

Species (common name)	Scientific Name	Status	Presence	Inventory
Bald eagle	Haliaeetus leucocephalus	FT	K	3
Northern spotted owl	Strix occidentalis caurina	FT	K	4
Red tree vole	Phenacomys longicaudus	SM	S	N
Great gray owl	Strix nebulosa	SM	U	N
evening field slug	Deroceras hesperium	SM	U	N
Oregon megomphix	Megomphix hemphilli	SM&BS	S	N
Blue-gray tail-dropper	Prophysaon coeruleum	SM&BS	S	N
Papillose tail-dropper	Prophysaon dubium	SM&BS	S	N
Roosevelt elk	Cervus elaphus roosevelt	Game	K	N
Bats	miscellaneous species	C2	K	2
Oregon slender salamander	Batrachoseps attenuatus	BS	S	N

KEY

Status:
A = Assessment species
BS = Bureau Sensitive species
C1 = Federal Candidate species in category 1 (per Portland Field Office)
C2 = Federal Candidate species in category 2
K = known to be present
p = a reasonable possibility of presence
S = suspected to be present
s = special concern species (rare or vulnerable)
SM = Survey and Manage species (strategy 2)
t = Tracking species
x = exotic species (potentially harmful)
PB = Protection buffer species of the Northwest Forest Plan

Presence:
K = Known
S =Suspected
U = Uncertain

Inventory:
N = No surveys done
1 = Casual, unstructured surveys
2 = Structured spot surveys
3 = Structured surveys not to protocol
4 = Surveys to protocol

SNAGS

Table W-2 lists the averages for the various forest age classes as they pertain to the RMP requirement of retaining snags at least 15 inches in diameter for future timber management activities. This data representS conditions on all lands in the Vida/McKenzie Watershed and not just BLM. Consequently, only 4 inventory plots fell randomly on BLM administered lands. In comparing this data with the District's RMP standards 3 variables need to be assessed for snags. These variables include the number of snags per acre, the snag's diameter class, and their decay class. In comparison with the RMP requirements (40% cavity nesters), the Vida random plots indicate that there are sufficient numbers of snags in adequate diameter classes (Table W-2), but they mostly occur (87%) in the older (softer) decay classes (Table W-5), which do not meet the RMP requirement (42% in hard decay classes). Also field observations for other project work tend to suggest an overall lack of early decay class snags occurring on public lands and other private land throughout the watershed. While the smallest snag size used by woodpeckers for nesting in the watershed is 11 inches, smaller snags are important to woodpeckers as foraging habitat.

Table W-2 - Averages of Snag Data by Forest Age Class

Age Class (years)	Snags/Acre (No. of plots)		Average DBH (inches)		Average Height (feet)	
	<15"	>15"	<15"	>15"	<15"	>15"
21-40	28.9 (8)	1.5	6.1	47.0	46.4	26.2
41-80	37.8 (12)	3.0	6.5	41.1	38.5	25.9
81-150	34.4 (2)	10.1	7.5	44.7	52.7	69.6
150+	25.6 (3)	13.5	7.0	32.3	30.7	12.8

Tables W-3 and W-4 reveal how the number of snags found in the Vida habitat inventory compares with the spotted owl habitat analysis study, and to research done in 1988 by Spies and others on snags found in Douglas-fir stands that originated after wildfire in the Oregon Cascade Range (Spies et al. 1988). The comparisons were made relative to 20 inches DBH since that is how Spies et al. displayed their data.

Table W-3 - Comparisons of Snag Density, DBH, and Height for Snags SMALLER THAN 20" DBH

Age Class (years)	Snags/Acre - <20"			Average DBH - (inches)		
	Spies et al.	Vida Watershed	Entire Study Area (No. of plots)	Spies et al.	Vida Watershed	Entire Study Area
<80	71	34.2 (20)	28.7 (168)	13	6.4	6.1
81-199	38	29.6 (5)	14.5 (84)	13	7.5	8.9
>200	14	N/A (0)	8.1 (1)	-	N/A	5.1

Table W-4 - Comparisons of Snag Density, DBH, and Height for Snags GREATER THAN 20" DBH

Age Class (years)	Snags/Acre - >20"			Average DBH - (inches)		
	Spies et al.	Vida Watershed	Entire Study Area	Spies et al.	Vida Watershed	Entire Study Area
<80	11	2.4	2.9	-	42.6	40.5
81-199	6	11.3	9.1	-	37.7	36.6
>200	11	N/A	36.4	22	N/A	49.5

The number of snags found in the study suggest that the watershed contains fewer snags than found in fire regenerated stands for the <80 age class, but contains more for the 81-199 age class. There were no stands in the owl study area that were over 200 years of age.

Table W-5 presents the snag decay class for snags measured in the habitat analysis inventory for the Vida/McKenzie Watershed. Of the 232 total snags measured in the watershed, only 12 percent were larger than 15 inches. Looking at these snags in the >15" heading in Table W-5, 0 percent of the snags are in the 1st decay class; 0 percent are in the 2nd decay class; 11 percent are in the 3rd decay class; 0 percent in the 4th decay class; and 89 percent in the 5th decay class. None of the inventory plots were located in stands 200 years old and older.

Table W-5 - Decay Class Information for Actual Snags Inventoried in the Vida Watershed

Age Class (years)	<15"					>15"				
	1	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
21-40	13	30	13	1	0	0	0	0	0	3
41-80	8	40	59	3	2	0	0	1	0	8
81-150	0	5	11	1	0	0	0	2	0	3
150+	0	5	10	0	4	0	0	0	0	10
Totals	**21**	**80**	**93**	**5**	**6**	**0**	**0**	**3**	**0**	**24**

As mentioned above, some woodpecker species are dependent upon the later decay stages (4-5) to meet their biological needs. Safety issues and logging activities could eliminate most of these snags in a stand. This potentially would include all snags in the 3rd decay class and later.

It takes anywhere between 19-50 years for a snag (>19" dbh) to reach the 3rd decay class and 51-125 years for a snag (>19" dbh) to reach the 4th decay class, and over 125 years for this same snag to reach the 5th decay class. It seems highly unlikely this snag condition will be maintained sufficiently or persist for any length of time across the Matrix landscape given the short rotation age for the forest landscape unless intensive planning and effort goes into their management. Therefore, the best opportunity to maintain snags in the later decay class will fall upon the Riparian Reserves and some of the few administrative outs scattered throughout the watershed. New methods for the development of cavity nesting habitat are available and have recently been used in an applied research project in the Mohawk/McGowan Watershed.