Meadow Creek
Watershed Analysis

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INTRODUCTION

On October 20, 1993, the Regional Forester provided direction reflecting emphasis on ecosystem management and the health of riparian zones. The Wallowa-Whitman National Forest was asked to select high priority watersheds for analysis based upon several specific criteria. The Upper Grande Ronde Watershed was selected for analysis in 1994. The Federal Agency Guide for Pilot Watershed Analysis was used as a base model to complete the watershed analysis process. As part of the Governor's Demonstration Project within the Upper Grande Ronde Watershed, the Meadow Creek watershed was selected for a holistic analysis and accelerated restoration effort across all ownership boundaries. The need for an updated watershed analysis was identified in this area to analyze needs, opportunities, priorities, effects, and to measure success. Therefore, the Meadow Creek Watershed Analysis documents the completed update for the Upper Grande Ronde Watershed Analysis, 1994.

A. CONTEXT

The background for watershed analysis is rooted in several earlier efforts or initiatives that have occurred within the past four years in the Pacific Northwest. In order to understand the evolution of the concept of watershed analysis, it is important to understand the relationship between watershed analysis and earlier informational and decision making efforts.

1. PACFISH

In 1991, the USDA Forest Service and the USDI Bureau of Land Management (BLM) began analyzing a range of ecosystem-based interim management strategies designed to arrest degradation and begin restoration of aquatic habitat and riparian areas on lands administered by the Forest Service and BLM in Oregon, Idaho, Washington, and California. This comprehensive and coordinated strategy for restoring and protecting habitat of the affected species is commonly referred to as PACFISH.

The results of the analysis were documented in a March 1994 Environmental Assessment (EA) that specifically applies to watersheds outside the range of the northern spotted owl that provide habitat for Pacific salmon, steelhead, and sea-run cutthroat trout.

2. SAT AND FEMAT REPORTS

SAT Report --- On July 30, 1992, a Scientific Analysis Team (SAT) was commissioned by the Chief of the Forest Service to examine several issues related to the environmental impact statement (EIS) for management of the northern spotted owl in the National Forests. This was in response to a court directive to go beyond the northern spotted owl and evaluate additional species thought to be dependent on late-successional/old-growth forests. The SAT report was completed in March 1993.

The SAT Report contains a Fish Habitat Conservation Strategy that rests on four critical components with one of them being the requirement to implement watershed analyses as an explicit level of planning designed to evaluate geomorphic and ecologic processes operating in specific watersheds.

FEMAT Report --- In April 1993, President Clinton commissioned an interagency scientific team to develop a set of alternatives for management of forested ecosystems within the range of the northern spotted owl. This effort culminated in a report by the Forest Ecosystem Management Assessment Team (FEMAT) entitled, Forest Ecosystem Management: An Ecological, Economic, and Social Assessment, published in July 1993.

Due to accelerating concerns about declining fish resources, protection and improvement of aquatic and riparian ecosystems are key components of the FEMAT report. It presents a broad strategy for maintaining or restoring the distribution, diversity, and complexity of watershed and landscape-scale processes and characteristics under which aquatic species have evolved. Watershed analysis is one of four components of the Aquatic Conservation Strategy, and serves as a basis for planning further protection or management, including restoration measures.

Eventually, the SAT and FEMAT Reports had influence on Forests east of the Cascade Mountain crest. The Regional Forester made the decision to have a watershed analysis program throughout Region 6, including all non-owl Forests.

PACFISH, SAT, and FEMAT signal a new era in managing forest and rangeland. This has elevated watershed management and habitat conservation to a high level of importance and has compelled us to view large landscapes over longer periods of time. This is a key to developing and maintaining sustainable forest and range ecosystems which function to provide high quality habitat for all species. Watershed analysis will also help society determine future sustainable use in watersheds.

3. EASTSIDE FOREST ECOSYSTEM HEALTH ASSESSMENT

The Eastside Forest Ecosystem Health Assessment, developed April 1993, responded to the request by House Speaker Tom Foley and Oregon Senator Mark Hatfield for a scientific evaluation of the effects of Forest Service management practices on the sustainability of eastern Washington and Oregon forested ecosystems, and recommends a process and management practices that could restore stressed ecosystems to more sustainable conditions. The report documented several significant findings and the one specific to Aquatic Systems states, "Land management practices such as roading, stream channelization, grazing, and irrigation have simplified fish habitats and depreciated habitat quality by reducing the frequency and diversity of pools, changing stream bottom composition, decreasing the abundance of large woody debris, and reducing water quality".

The report made eleven general recommendations, with two being specific to inventory and analysis:

- Inventory and classify public lands and streams in eastern Oregon and Washington as the foundation for ecosystem management. Standardize land evaluation and classification procedures, data base structure, and GIS systems.

- Conduct planning, analysis, and management at all relevant biological, economic, and social scales.

4. ROADS ANALYSIS

In February 1999, Agriculture Secretary Dan Glickman, joined by Under Secretary for Natural Resources and Environment Jim Lyons and Forest Service Chief Mike Dombeck, announced an 18-month moratorium on new road construction in unroaded areas in most national forests, allowing for safe public access while protecting the environment.

During the 18-month suspension, the Forest Service was developing a long-term road policy for the National Forest Transportation System. The Policy was to minimize environmental damage, establish new policies to guide decisions on identifying unessential roads, recommending roads to be eliminated or maintained to reduce environmental damage, and assessing roads that need to be reconstructed and maintained so that they are safe and can sustain constant public use.

The shift in public use of national forests, changes in user expectations and the backlog of unfunded road maintenance led the Forest Service to conclude that it needed a new approach for the management, use and maintenance of the national forest road system.

The Roads Policy, which requires a Roads Analysis for any project that affects roads, was published in January 2001. Any NEPA decisions for projects that affect roads scheduled for signature after June 2001 will require a Roads Analysis to be completed before signing and implementation.

5. INTERIOR COLUMBIA BASIN ECOSYSTEM MANAGEMENT PROJECT (ICBEMP)

The U.S. Department of Agriculture, Forest Service, and the U.S. Department of the Interior, Bureau of Land Management, propose to develop and implement a coordinated, scientifically sound, broad scale, ecosystem-based management strategy for lands they administer across parts of Idaho, Oregon, Montana, and Washington. The ICBEMP FEIS represents 3 management alternatives. In December 2000 they released a Proposed Decision identifying Alternative S2 as the preferred alternative. However, this alternative has not been signed which would have formally revised the Wallowa-Whitman Forest Plan and made the direction within the FEIS mandatory for management on this Forest. However, information compiled and published within the Scientific Assessments by the Science Team were considered and incorporated into this watershed analysis.

B. INTENT

Watershed analysis is an ecosystem analysis at the watershed scale. The result is a scientifically based understanding of the ecological processes and interactions occurring within a watershed.

Watershed analysis is an intermediate step between land management planning and project planning. This scale of analysis will provide analytical information about ecosystem functions, structure, and flows in the watershed, including past and current conditions and trends. This analytical step will be used to support decision making at the provincial, basin, and project scales.

Watershed analysis is a dynamic process and information that is not available at the time of the initial analysis will be updated as additional information becomes available. Through the analysis, data gaps will be identified and documented.

Watershed analysis, as presented here, is not a decision process. It does not produce a formal decision notice or record of decision as required by the National Environmental Policy Act (NEPA).

1. PURPOSE OF WATERSHED ANALYSIS

The purpose of watershed analysis is to both identify issues or problems and identify approaches for resolution within an ecosystem context.

The following are watershed analysis objectives:

- Provide information to guide planning, management, restoration, and monitoring activities.
- Analyze cumulative effects.
- Describe the ecological and physical role of riparian zones in the watershed. Provide the information needed to determine how riparian reserves will be designed and mapped during site-specific project planning.
- Provide a common framework for evaluating and managing upland and riparian landscapes.
- Provide a common framework for multi-agency, multi-user interactions.

2. FOREST PLAN CONNECTION

Given the desired future conditions, goals and objectives, management area boundaries, and standards and guidelines from Forest Plans, watershed analysis is a tool to help in identifying and prioritizing Forest Plan implementation actions.

Information gained during watershed analysis may show that a Forest Plan amendment is necessary. If the Forest Supervisor decides to proceed with a plan amendment, watershed analysis will be used to support the NEPA analysis for the amendment.

3. PROJECT LEVEL PLANNING

Watershed analysis is a tool to help in identifying and prioritizing project opportunities. The watershed analysis will provide a framework for project development and will provide information regarding past and existing conditions, issues, and management concerns useful during subsequent project NEPA analysis. It will also help in addressing the cumulative effects of multiple activities within a watershed. The watershed analysis will be incorporated by reference into the project NEPA document, (Environmental Impact Statement or Environmental Assessment), and will become part of the project record.

C. CONNECTION WITH OTHER SCALES

1. HIERARCHICAL SCALE

A goal of ecosystem management is to promote sustainability by protecting the processes and functions within and across all spatial and temporal scales. The implementation of ecosystem planning and management requires multiple scales and hierarchical analyses. Within the hierarchy, each level operates as a distinct entity and as a part of the larger whole. This structure stresses the interaction between scales (see Table I-1).

Table I-1- Hierarchical Scale

Table I-1 – Hierarchical Scale

Scale	Description	Activity Area
Region	Broadest level of organization; size is normally issue driven	Region 6 and Eastside Ecosystem Management Project
Province	Watershed based delineations that relate the bio-physical landscape to socio-political values and structures	Blue Mountain Province
River Basin	Large, continuous land areas of hundreds to thousands of square miles and which have topographic or geologic integrity	Snake River Basin
Watershed	A subunit of the river basin; normally between 20 and 200 square miles	Meadow Creek Watershed Analysis
Site	A specific activity within a watershed	Project Level NEPA Analysis

The watershed analysis effort in the Upper Grande Ronde River (UGRR) drainage provided ecological information at the watershed scale, however, refinements in the process and new information indicated that an update for the Meadow Creek Watershed would facilitate future site specific project level planning within this area, as well as river basin, provincial, and regional efforts. Because ecosystem analysis and planning is a continuum at all scales, watershed analyses will provide information to river basin planning and receive information from site analyses. This hierarchical structure allows the definition of components of an ecosystem and the linkage between different scales of ecological organization.

The Interior Columbia Basin Ecosystem Management Project team has conducted a broad-scale assessment of the Columbia River Basin. The issues relating to the Columbia River Basin analysis are also relevant to the Meadow Creek Watershed analysis. The framework for ecosystem management is being developed so that information collected at the various scales may be aggregated to support ecosystem management decisions at different ecological scales.

D. METHODOLOGIES - ANALYSIS PROCESS

The draft Federal Watershed Analysis Guide for Pilot Analysis was used to guide the UGRR watershed analysis. This was an evolving document that allowed flexibility and as with the Meadow Creek effort, experience gained during the pilot program identified deficiencies and provided improved methods which were incorporated into this update. Modules, described in the Watershed Analysis guide and developed for the UGRR Analysis, were modified to fit the information available and to meet the specific needs of the Meadow Creek Watershed.

E. PUBLIC AND INTERAGENCY INVOLVEMENT

Watershed analysis does not generate a record of decision. Watershed analysis is an intermediate level of analysis which derives information from larger scale plans and provides information to smaller scale, site specific analyses. Both the large scale and smaller scale analyses are formal decision points under NEPA.

Watershed analysis should encompass the entire watershed, including all ownerships. Therefore, it is important that federal, state, county and tribal governments who administer land in the watershed work together and share information concerning the watershed.

The following is a partial listing of the agencies, local government and public interests that have been included in the watershed analysis effort; Bureau of Land Management, Soil Conservation Service, Oregon Department of Fish and Wildlife, Oregon Watershed Health team, Union County Court, Grande Ronde Model Watershed Board, Confederated Tribes of the Umatilla Indian Reservation and Union County Soil and Water Conservation District. A public presentation on watershed analysis was also given during a public meeting sponsored by the Forest Service.

F. ORGANIZATION FOR CONDUCTING WATERSHED ANALYSIS

The Core Team of resource specialists participating in this update was located at the La Grande Ranger District. Refer to the list of Interdisciplinary Specialists in the Appendix.

G. REPORT ORGANIZATION

The organization of the Meadow Creek watershed analysis report is influenced by the large area being analyzed and the need to look at the interactions between biological, social, and physical processes throughout the watershed.

Chapter I provides a brief description of the watershed. The issues and key questions specific to the Meadow Creek watershed are found in Chapter II. Throughout the report you will find common threads that relate the analysis to these issues and key questions.

Chapters III and IV outline past conditions, current conditions and condition trends, and desired conditions in the watershed. Chapter IV discusses the desired conditions and effects of land management actions as identified in the Forest plan. These chapters concentrate on the interdisciplinary aspects of the watershed's functions and processes.

Chapter V draws the common threads together and displays restoration and management opportunities in a form that may easily be used by land managers in developing restoration work, riparian reserves, and monitoring projects.

Chapter VI discusses landscape scale monitoring and will reveal types of data that will be useful for better understanding watershed processes, ecosystems, and impacts in the area.

Chapter VII lists some of the threshold analyses for the opportunities identified in Chapter V to assist in identifying scheduling, prioritizing, and future analysis of effects of implementation.

H. SUMMARY

Watershed analysis includes an evaluation of physical, biological and cultural qualities and processes. It provides a logical way to view ecosystem functions and will aid in making informed land use decisions.

Above all, watershed analysis is a vehicle for ecosystem management at the watershed level. It links riparian and aquatic habitats to a full suite of processes operating throughout the watershed, and it provides a common framework for evaluating and managing upland and riparian landscapes.

CHAPTER I

DESCRIPTION OF WATERSHED

A. LOCATION

The Meadow Creek watershed, a part of the Grande Ronde River Subbasin, is located on the La Grande Ranger District of the Wallowa-Whitman National Forest. It is located approximately 20 miles southwest of La Grande, Oregon in Union County. The Grande Ronde River Subbasin is part of the larger Snake River Basin, a tributary of the Columbia River basin.

The area being considered in this analysis consists of the Meadow Creek Watershed (#86). The Meadow Creek Watershed (#86) is bordered on the northeast by the Grande Ronde River/Hilgard Watershed (#87), on the southeast by the Upper Grande Ronde River Watershed (#85), on the southwest by the Upper Camas Creek Watershed (#97), on the northwest by the East Birch Creek Watershed (#98), and on the north by the McKay Creek Watershed (#99) (refer to the UGR River Watershed Assessment, 1994). The Meadow Creek NFS watershed has been further subdivided into subwatersheds to facilitate planning, implementation, and evaluation of forest management activities. For acreage totals, see Table 1-1.

Regional and Landscape Analysis

The Meadow Creek Watershed Assessment (MCWA) area encompasses approximately 115,852 acres. Chapter III of the MCWA identifies existing conditions and provides an analytical framework and integration of the conditions and processes of the ecosystem elements found in the watershed. The MCWA identifies ecosystem elements out of balance within the analysis area. Chapter IV of the MCWA identifies opportunities to return balance to the area subsequently pursued in this analysis.

One of the primary reasons the Interior Columbia Basin Ecosystem Management Project (ICBEMP) was initiated was to develop management strategies using a comprehensive, “big picture” approach, and disclose interrelated actions and cumulative effects using scientific methods. With completion and release of the Integrated Scientific Assessment and FEIS, new information became available which was considered during the development of this analysis.

The Meadow Creek Watershed Analysis area is a part of the Upper Grande Ronde River sub-basin, a part of the larger Grande Ronde River Basin. The preferred alternative in the FEIS for the Interior Columbia Basin Ecosystem Management Project (ICBEMP) identifies this as a High Restoration Priority subbasin for landscape, economic, tribal, and aquatic components.

The intent of landscape restoration is to re-pattern vegetation patches and succession/disturbance regimes and to restore watershed and streams to a condition more consistent with landform, climate, and biological and physical characteristics of the ecosystem. Restored ecosystems would be more resilient to disturbances, more predictable, and would provide the range of habitats needed by aquatic and terrestrial specials. Scarce habitats would be conserved in the short term while expanding these habitats through restoration in the long term.

Landscape restoration also includes Old Forest Habitat as a priority. The intent of restoration for these habitats is to focus on the vegetation cover types and structural stages that have declined substantially in geographic extent from the historical to the current period. Restoration would increase the geographic extent and connectivity of these source habitats and over time provide a framework for well-connected networks of source habitat for terrestrial species.

Aquatic restoration would reestablish watershed functions, processes, and structures, including natural diversity. The intent of management for watershed restoration would be to recognize the variability of natural systems while securing existing habitats that support the strongest populations of wide-ranging aquatic species and the highest native diversity and integrity, extend favorable conditions into adjacent watersheds to create a larger or more contiguous network of suitable and productive habitats, and restore hydrologic processes to ensure favorable water quality conditions for aquatic, riparian, and municipal uses.

The social-economic-tribal restoration component highlights areas where restoration activities directly influence human community, economic, social, and cultural needs. Design and implementation of restoration activities should promote workforce participation, serve demands for commodity production at various levels, encourage intergovernmental collaboration, and consider tribal needs and interests.

Watershed Level Analysis

The Meadow Creek Watershed (#86) has been subdivided into ten subwatersheds:

> **Lower Meadow Creek subwatershed (86A)** includes Meadow Creek from its confluence with the Grande Ronde River to a point just upstream from its confluence with Bear Creek. Bear, Campbell, and Battle Creeks also drain this subwatershed, which includes Starkey Flat and the area near Camp Elkanah.
>
> **Dark Canyon Creek subwatershed (86B)** includes the entire Dark Canyon Creek drainage from its confluence with the Grande Ronde River to its headwaters. Little Dark Canyon Creek is also located in this subwatershed. Dark Canyon Creek flows in a north to south direction and is paralleled by Road 2100410 for a majority of its length.
>
> **Lower McCoy Creek subwatershed (86C)** includes the portion of McCoy Creek from its confluence with Meadow Creek to approximately one mile upstream from its confluence with Syrup Creek. It also includes the McIntyre Creek and Syrup Creek drainages. Deer, Upper Syrup, Shady, Mann, Pothole, and Horseshoe Springs are also located in this subwatershed.
>
> **Upper McCoy Creek subwatershed (86D)** includes the portion of McCoy Creek from a point approximately 1 mile upstream from it confluence with Syrup Creek to its headwaters. This subwatershed also includes Ensign and Jennings Creeks. Wildhorse, McDonald, and Rock Springs are located in this subwatershed.
>
> **Marley Creek subwatershed (86E)** includes the entire Marley Creek drainage from its confluence with Meadow Creek near Camp Elkanah to its headwaters. Swan Creek is also located in this subwatershed and both streams flow in a south to north direction. McCarty and Pickle Springs can be found in this subwatershed.
>
> **Burnt Corral Creek subwatershed (86F)** includes the entire Burnt Corral Creek drainage from its confluence with Meadow Creek to its headwaters. Sullivan Gulch and Highway 244 are near the northwest boundary. Sullivan Spring, Portugese Spring, and Tybow Canyon are also located in this subwatershed.

Insert Project area map here

Insert Subwatershed Map here.

Bear Creek subwatershed (86G) includes the entire Bear Creek drainage from its confluence with Meadow Creek to its headwaters. Little Bear Creek and Tamarack, Bluff, Upper Bluff, and Bear Springs are located in this subwatershed.

Middle Meadow Creek (86H) includes the portion of Meadow Creek from its confluence with Bear Creek upstream to its confluence with Waucup Creek. Ray, Peet, and Smith Creeks also drain this subwatershed. Cougar Canyon, Halfmoon Spring, and Grouse Spring can also be found in this subwatershed.

Waucup Creek subwatershed (86I) is located at the west boundary of the Meadow Creek watershed and includes the entire Waucup Creek drainage.

Upper Meadow Creek subwatershed (86J) is also located at the west boundary of the Meadow Creek watershed and includes the portion of Meadow Creek from its confluence with Waucup Creek to its headwaters.

Table 1-1: Meadow Creek Subwatershed Acreages

Subwatershed Name	Number	FS Acres	Other Acres	Total Acres
Lower Meadow Creek	17060104-86A	4,708	8,149	12,857
Dark Canyon Creek	17060104-86B	9979	2035	12,014
Lower McCoy Creek	17060104-86C	7,032	11466	18,498
Upper McCoy Creek	17060104-86D	10,725	7,065	17,790
Marley Creek	17060104-86E	4707	821	5,528
Burnt Corral Creek	17060104-86F	8,723	61	8,784
Bear Creek	17060104-86G	7690	159	7,849
Middle Meadow Creek	17060104-86H	13,714	706	14,420
Waucup Creek	17060104-86I	8,629	744	9373
Upper Meadow Creek	17060104-86J	8256	483	8,739
TOTAL		84,163	31,689	115,852

B. CLIMATE

The Meadow Creek drainage is located in Northeastern Oregon. It is characterized by a marine climate, which is slightly modified as it moves up the Columbia River Basin. The area experiences a relatively cool, moist climate with a short growing season and little or no summer precipitation. Annual precipitation averages 20 inches per year and ranges from 15-30 inches, much of it falling as winter snow. Temperatures range from an average summer high of 80 degrees F to an average winter low of 17 degrees F. Summer temperatures fluctuate widely with hot days and cold nights. Portions of the drainage are located within summer lightning corridors and may experience localized brief, torrential rain events. At higher elevations, frost can occur almost any night of the year. Winter temperatures remain low for long periods with considerable snow accumulation.

C. GEOLOGY

As a smaller portion of the UGRR drainage, the Meadow Creek Watershed is within the Blue Mountain subprovince of the Columbia River Plateau physiographic province. This subprovince is characterized by broad rolling upland surfaces to the north and complex mountains and dissected volcanic plateaus to the south. There are a variety of rock types in the Upper Grande Ronde area, each with different weathering and erosion characteristics. The dominant rock type is Columbia River Basalt. This basalt flowed through fissures and dikes, flooding the area with many pulses forming a thick sequence of basalt. Other important rock types of the region include granitic rocks, Tertiary tuffs and tuffaceous sediments, quaternary alluvium and fanglomerate material found in the valleys, (Walker 1973).

D. TOPOGRAPHY

The 115,852 acre Meadow Creek drainage is composed of approximately 55 percent moderately steep to steep mountainous terrain (30 percent slope and above), approximately 20 percent moderately rolling terrain between the valley floor and the uplands, and approximately five percent of the terrain is relatively flat floodplains. Elevations within the Meadow Creek drainage range from approximately 3,400 feet at the mouth of Meadow Creek to 5,200 feet in the south end of the MCWA.

E. TERRESTRIAL ENVIRONMENT

Vegetation:

The Meadow Creek drainage contains a variety of vegetation types, with about one half of the coniferous forest on NFS land belonging to the grand fir series. Lodgepole pine, Douglas-fir, sub-alpine fir and ponderosa pine plant associations and community types make up the remainder of the forest area on public lands. Shrubland vegetation, grasslands, meadows and riparian communities add to the botanical and habitat diversity.

The plant associations for forested, non-forested and riparian areas are discussed in Chapter III of this document.

Soils:

Soils within the drainage developed over a variety of bedrock types. Most soils have a surface layer of volcanic ash, which was deposited as a result of eruptions, including Mt. Mazama (site of Crater lake). Ash surface soils are deposited over or mixed with residual bedrock derived soils. Surface soils are predominately fine to medium textured due to the presence of the ash while subsoils range from very fine to coarse textured, depending on bedrock type.

Wildlife:

Several Proposed, Endangered, Threatened, and Sensitive (PETS) wildlife species and their habitat have been documented in the drainage. Refer to Chapter III for a complete list of the species documented in the project area.

The wildlife management indicator species for the Wallowa-Whitman National Forest (Rocky Mountain elk, pileated woodpecker, pine marten, northern goshawk, and primary cavity excavators) occur across all or much of the Meadow Creek drainage. The Meadow Creek drainage comprises a large portion of the Oregon Department of Fish and Wildlife (ODFW) Starkey Big Game Management Unit.

F. AQUATIC ENVIRONMENT

On August 18, 1994, the National Marine Fisheries Service (NMFS) officially listed the Snake River spring/summer chinook salmon (Oncorhynchus tshawytscha) as an Endangered species under the Endangered Species Act. This August 1994 listing includes the spring chinook salmon found in the Grande Ronde River Subbasin on the La Grande Ranger District (LAG RD). Fall chinook salmon do not currently utilize habitat on the LAG RD, nor did they historically.

The Regional Forester for Region 6 of the Forest Service has added all wild and naturally producing anadromous fish occurring with Region 6 to the Regional Forester's Sensitive Species List. This includes Grande Ronde River Subbasin summer steelhead and spring chinook salmon. Bull trout and redband trout are also listed as sensitive species by the Regional Forester in Region 6 and are present within the UGRR Drainage.

G. PEOPLE

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) have reserved treaty rights to harvest fish, wildlife and plants at usual and accustomed places on lands ceded to the U.S. Government in the Treaty of 1855. In this case, the CTUIR reserved fishing and other rights to the Upper Grande Ronde River.

H. HUMAN USES

Consumptive uses:

Special Forest Products (SFP) are groups of raw material harvested for use as ornamentals, in landscaping, or by manufacturing into a wide variety of final consumer products including food and pharmaceuticals. Local interest has focused mostly on mushrooms, berries, fuelwood, post, poles, and other wood products. District-wide during the 2000 season there were 243 commercial mushroom harvesting permits issued, permits for 3,277 cords of personal firewood, 1,234 cords of commercial firewood permits, and 443 Christmas tree permits.

Timber Harvest:

A large proportion of the NFS land in the Meadow Creek drainage is allocated to the production of timber. Approximately 50 percent of the forested acres have had trees harvested in the last 30 years on the La Grande Ranger District. On private land, approximately 90 percent of the forested acres have received some timber harvest in the last 30 years (Rick Wagner, ODF, La Grande, OR pers. comm. 1993). These harvests were primarily in response to salvage of insect caused mortality into the early 80's.

Water Diversions:

There are currently no known water diversions in the drainage. Water diversions were utilized in the 1800's and early 1900's for mining, but these diversions are no longer active. There are no permitted water use allocated for irrigation in the drainage (Rick Lusk, Union county Water Master, Pers. Comm. 1993).

Fishing:

Recreational fishing for residential salmonids is common in the Meadow Creek and UGRR drainage as a whole in the summer months. The majority of the targeted fish are summer steelhead and hatchery rainbow trout.

Hunting:

The drainage is heavily utilized for hunting during the fall. Most of the use is associated with big-game hunting (elk and deer), which accounts for 11,000 recreation visitor days per year.

Mining:

Mineral exploration within the Meadow Creek drainage has been very limited over the last 150 years. Currently there are no valid mining claims or Operating Plans in the area.

Grazing:

Initially, there were seven allotments established for this watershed. Several of these allotments were once grazed by livestock, including horses, from the Umatilla Reservation. Livestock grazing was allowed at an approximate level of 8,122 Animal Unit Months (AUM's) during 2000 on 5 allotments on NFS lands within the watershed. Cattle grazing now accounts for 63 percent of the total livestock grazing level (based on AUM's) with sheep grazing accounting for 37 percent.

Transportation/Travel/Passage Routes:

The transportation system in the Upper Grande Ronde area began as roads, rather than trails, in the mid 1800's. By 1885, 114 miles existed. Road or railroad development continued slowly until about the 1950's. Most early development was located in draw bottoms where logs could be skidded down hill and road construction was easier than on hillsides. The need for more roads increased with demand for more Forest Products. Currently the Meadow Creek drainage and all of its tributaries are roaded right up to their headwalls. There are approximately 577 miles of open and closed roads on National Forest land located in the watershed 86 and about 137 miles of road on non-Wallowa-Whitman National Forest land within watershed 86.

Logging technology had the greatest influence on road location and road densities. Horse and tractor logging required logs to be skidded down hill. Short reach cable systems required roads to be built about 600 feet apart along the hillside and logs yarded up hill. Long reach systems capable of yarding up to 3000 feet required roads to be built near ridge tops. Until recently, roads and related structures were built but not obliterated when replaced by other roads. Many times this resulted in a drawbottom road, a hillside road and yet another road along the ridge top to access the same piece of ground. Mother nature was left to do road management and rehabilitation.

Special Uses:

The powerline, which is approximately 5 miles long, stretching from Hilgard to the Starkey Experimental Station is the only existing special use permit currently active within the Meadow Creek Watershed. The powerline is buried along the River and Highway 244 for most of its length. The Oregon Trail Electric Cooperative holds the permit.

Non-consumptive uses:

Recreation use.

Non-consumptive recreation uses in the area include camping, hiking, scenic driving, snowmobiling, mountain biking and all terrain vehicle (ATV) riding. Camping is primarily associated with the dispersed sites within the project area as no developed sites currently exist. Approximately 70 percent of the recreation use within the area is classified as day use only. There are no designated motorized vehicle trails or hiking trails in the Meadow Creek drainage.

I. VALUES

Non-consumptive values:

Visual Quality:

Meadow Creek Watershed is managed for Roaded Modified ROS opportunities on 10,880 acres with the remainder of the acres in the watershed managed for Roaded Natural. Visual corridors along Hwy 244, the entrance to Starkey Experimental Forest, and the viewshed from Frog Heaven Forest Camp should be managed for a Roaded Natural recreation setting.

Wildlife habitat:

The drainage contains a variety of habitat types, including substantial amounts of meadow, grassland/scabland, and riparian habitat. The majority of the watershed is coniferous forest, with grand fir and lodgepole pine plant associations comprising most of the watershed. Douglas-fir, subalpine fir, and ponderosa pine plant associations make up the remainder of the conifer forest types.

Vegetation habitat:

The flora of the drainage is characterized by plant species typically found in the Blue Mountains and contains nearly all elements of the native vegetation that are indigenous to the area (Strickler, 1980). Some species, more commonly found in the Great Basin are also present. Approximately 800 plant species have been identified and documented for this area, including five species from the (1991) Region-6 U.S. Forest Service Sensitive Plant List. (See Chapter III for more information regarding Threatened, Endangered and Sensitive (PETS) plant species.)

Cultural/Historical.

The early accounts of the Grande Ronde River Subbasin provide a picture of an area rich in fish and wildlife. Native Americans utilized the resources for thousands of years prior to the arrival of pioneer settlers.

CHAPTER II

ISSUES, KEY QUESTIONS, AND RELEVANT PROCESSES TO BE ANALYZED

A. PURPOSE

This chapter identifies the issues and key questions associated with the Meadow Creek Watershed. The issues identify the primary areas of concern in the watershed. Key questions focus the analysis of processes and functions directly related to the major issues. Key questions reflect the many facets of the issues and are questions this analysis will attempt to answer. They are viewed within the larger context of regional, basin, and provincial issues.

B. ISSUES AND KEY QUESTIONS

Issues and key questions focus watershed analysis on the important questions, so that efforts concentrate on the processes and functions directly related to desired conditions, values and uses of the watershed. The following issues and key questions are specific to the Meadow Creek watershed.

Issues

Key questions for this watershed are grouped under the Issue headings described below (Core Topics from The Federal Guide for Watershed Analysis - Version 2.2). Key Questions for each of these resource areas are listed under three major dimensions (Physical, Human, Biological).

Physical Dimension:
- Aquatic
- Roads Analysis
- Soils

Human Dimension:
- Roads Analysis – Human Factors
- Roads Analysis – Economic Factors

Biological Dimension:
- Old Growth and Structural Diversity
- Elk and Deer Habitat Effectiveness
- Roads Analysis – Biological Factors
- Riparian Habitat and Condition
- Threatened, Endangered, Sensitive Species
- Fire and Fuels
- Noxious Weeds
- Range
- Insect and Disease

Analysis

The Watershed Analysis Team developed measurement indicators for each of the key questions to aid in the desired condition descriptions and the opportunities section of this document. These issues have been identified to assist in focusing biological and physical conditions in the watershed to answer the following questions.

1. What are the needs for restoration within the watershed?

2. Where are these needs located?

3. What are the resource thresholds for the restoration needs and opportunities within the watershed?

4. Do the restoration needs identified in the analysis have timing restrictions or other needs based on the threshold analysis?

5. What are the priorities for restoration within the watershed?

6. What are the monitoring needs for this watershed?

The team decided to pursue the answers to these six questions to varying degrees, based on the data available for each resource area. The primary focus of the analysis is on those subwatersheds with a high percentage of National Forest System lands. The analysis will attempt to determine effects thresholds, restoration needs, and commodity output opportunities.

THE PHYSICAL DIMENSION

AQUATIC

1. Where and how have management activities affected riparian function?
   Measurements: Streamflow, width/depth ratio, equivalent clearcut area, riparian vegetation, acres of timber harvest within RHCAs, pieces of large woody debris per mile, streambank stability, miles per square mile of open roads, and miles per square mile of all roads (open and closed).

2. Where are water quality and habitat conditions NOT meeting the physical and biological requirements of TES fish species?
   Measurements: Pieces of large woody debris per mile, temperature, number of physical barriers to fish passage, number of pools/mile, pool quality, pool frequency, miles of roads within 100' of streams, miles per square mile of open/closed roads within subwatershed (SWS).

ROADS ANALYSIS – Physical Dimension Factors

1. **Aquatic -** How and where does the road system affect water quality?
   Measurements: Miles of open native surface drawbottom roads, miles of roads within 100' of drawbottoms.

2. **Aquatic -** How and where does the road system affect water quantity?
   Measurements: Miles of road within RHCAs, miles of drawbottom roads, numbers of culverts, number of culverts adequate to handle 100 year flood event.

3. **Hydrologic -** How and where does the road system affect stream channel dynamics?
   Measurements: Miles of roads within RHCAs, number of culverts adequate to handle 100 year flood event.

SOILS

1. What is the current level of detrimental soil compaction which affect vegetative site productivity and what are the restoration opportunities that are available to move the area toward the desired conditions?
   Measurements: Percent detrimental soil compaction within planning area.

THE HUMAN DIMENSION

ROADS ANALYSIS – Human Dimension Factors

1. **Resource Management and Administrative Use:** How does the road system affect access for resource management and Administrative Use? (Timber management, research & monitoring, fuels management, allotment management)
   Measurements: Open road densities (miles per square mile) for each Forest Plan Management area by SWS, acres of forest land without road access (open/gated roads).

2. **Other Ownership Access:** How does the road system connect large blocks of land in other ownership to public roads?
   Measurements: Number of access routes per individual private land inholding.

3. **Safety:** How does the road system address the safety of road users (including public, firefighters, and agency users)?
   Measurements: Number of roads and road numbers with maintenance levels too low for current use levels, number of roads and road numbers with maintenance levels too high for current use levels, roads without adequate turn arounds at the end or at closures.

4. **Heritage:** Which roads or areas hold cultural, symbolic, spiritual, sacred, traditional, or religious values for people (ethnic groups, subcultures, etc) that may be planned for road entry or road closure?
   Measurements: Areas, on and off public lands, tied to a map where heritage resources are located, areas tied to maps which are of cultural significance to the tribes. Map and list of roads with cultural significance to tribes or local users.

5. **Recreation – Roads & Access:** What is the appropriate level of open roads within the area to provide for people's access and recreation needs? Are maintenance levels adequate to meet the use levels the roads are currently experiencing and anticipated use levels into the future? Is there now or will there be in the future excess supply or excess demand for roaded recreation opportunities?
   Measurements: Number of access routes to existing dispersed recreation sites. Number of roads and road numbers with maintenance levels too low for current use levels, number of roads and road numbers with maintenance levels too high for current use levels.

6. **Recreation – OHV Management:** A significant percentage of recreationists use Off Highway Vehicles (OHVs) for cross country access, trail riding, and closed road access. There is little regulation of OHV use. Unregulated OHV use enhances some people's recreation experience and detracts from others. Is the use of OHVs properly distributed and managed?
   Measurements: Number of miles of OHV recreation available on roads, number of miles of OHV recreation available on trails, number of acres of closure areas, number of acres of cross country travel allowed, acres of high density use, and acres of low density use.

ROADS ANALYSIS – Economics

1. How does the road system affect the agency's direct costs and revenues? What, if any, changes in the road system will increase net revenue to the agency by reducing cost, increasing revenue, or both?
   Measurements: Deferred maintenance cost per road, Miles of deferred maintenance by maintenance level, Total decommissioning cost per road.

2. How is community social and economic health affected by road management (for example, lifestyles, businesses, tourism industry, infrastructure maintenance)?
   Measurements: Number of user days, number of hunter user days, miles of road maintenance by road and SWS, cost of road maintenance by road and SWS.

THE BIOLOGICAL DIMENSION

OLD GROWTH and STRUCTURAL DIVERSITY

1. What are the structural stage acres by biophysical group and what are their departures from historic range of variation (HRV)?
   Measurements: Acres of existing structural stages by biophysical environment. Acres of departure from HRVs.

ELK AND DEER HABITAT EFFECTIVENESS

1. What is the status of elk and deer habitat within the planning area?
   Measurements: Percent cover:forage by SWS, percent cover by SWS, road densities on National Forest Lands in mile/square mile by SWS. Departure from Forest Plan standards and guidelines.

ROADS ANALYSIS – Biological Dimension Factors

1. **Wildlife:** What are the road system effects on elk habitat?
   Measurements: Miles per square mile of roads by SWS by Forest Plan Management Area.

2. **Aquatics:** How and where do roads affect riparian vegetation?
   Measurements: Miles of roads in RHCAs.

RIPARIAN

1. What is the condition of riparian habitat as it relates to suitability for aquatic species, including species listed under ESA?
   Measurements: Acres of RHCA disturbance, miles of drawbottom roads, miles of open native surface drawbottom roads, stand density indices of RHCAs.

THREATENED, ENDANGERED, AND SENSITIVE SPECIES

1. What TE&S and candidate plant, animal, and fish species occur within the watershed and what activities and processes are influencing them?
   Measurements: List of TES and candidate species.

FIRE & FUELS

1. Where are the areas that display a departure from historical fire return intervals and what activities can move these areas toward a desired stand structure and adequate fire return interval?
   Measurements: Acres of Fire regimes by ecoclass by SWS, Acres of fire return interval departures by SWS, percent acres in Fire Regimes 1 and 3 within each SWS, Acres of moderate and High Fire return interval departures by SWS.

2. Where are fuel loadings representing a threat of damaging wildfire in the Watershed and what opportunities are available to alleviate that risk?
   Measurements: Total number of fires by cause, percent of fires by cause, acres of fires by cause, percent of acres by cause, total number of fires by size class, percent of fires by size class, fire occurrence rates per 1,000 acres, fire risk assessment acres by SWS.

3. What are the effects of prescribed fire vs. wildfire on air quality in the watershed and the adjacent sensitive airsheds?
   Measurements: Tons of PM10 for wildfire, tons of PM10 for prescribed fire, acres of mechanical fuels reduction, acres of prescribed fire fuel reduction.

NOXIOUS WEEDS

1. What noxious weed species occur in the watershed and what is their status?
   Measurements: Acres of noxious weed infestations, distribution, and species.

RANGE

1. Where are the specific areas or pastures where past management impacts related to grazing occur and what are the opportunities to restore them?
   Measurements*:* Utilization levels, streambank stability, appropriate watering locations, changes in ripariam vegetation from historic or desired grass/shrub systems, condition and age classes of shrubs.

INSECT & DISEASE

1. What were the historic levels of insect and disease and where are the potential risk areas?
   Measurements: Acres of low, moderate, and high risk areas for forest insects and diseases.

CHAPTER III

PAST AND CURRENT CONDITIONS

This chapter examines each of the key issues and some of the other key information relevant to those issues within the Meadow Creek Watershed. The current and past conditions are discussed primarily in terms of the measures identified in Chapter 2 for each Issue and will be used as a reference condition for determining how the current condition relates to the desired conditions described in Chapter 4.

THE PHYSICAL DIMENSION

AQUATIC

Where and how have management activities affected riparian function?

Riparian-wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to:

- dissipate stream energy associated with high flows, thereby reducing erosion and improving water quality;
- filter sediment, capture bedload, and aid in floodplain development;
- improve flood-water retention and groundwater recharge;
- develop root masses that stabilize streambanks against cutting action;
- develop diverse pounding and channel characteristics to provide habitat (water depth, duration, and temperature) necessary for fish production, and to support greater biodiversity (USDI BLM 1993).

The Wallowa-Whitman National Forest, La Grande Ranger District utilizes the Bureau of Land Management's process of Assessing Proper Functioning Condition for Riparian – Wetland Areas. This process assigns a Properly Functioning Condition (PFC) rating by dividing the function of a particular stream into three categories; hydrologic, vegetative, erosion/deposition. Management activities can affect each of these categories and, in turn, affect riparian function. To describe the effects of management activities on riparian function, the PFC components will be discussed as follows:

Hydrologic - *streamflow, width/depth ratio, equivalent clearcut area*
Vegetative - *riparian vegetation, timber harvest within RHCAs, large woody debris*
Erosion/Deposition - *streambank stability, road density*

Hydrologic

The ability of a channel to flood, (the floodplain being inundated in relatively frequent events), depends on geomorphological features of the channel such as sinuosity, width/depth ratio and gradient. These features must be in balance with the landscape setting and channel type in order to function properly.

Current Condition

***Streamflow*:** There are currently two La Grande Ranger District gauging stations within Watershed 86: Upper Meadow Creek, and Lower Meadow Creek (see Map 3-1 for location of gauging stations). Both gauging stations have been in operation for 9 years from 1992 to 2000. Hydrographs for each gage are displayed in Figure 3-1.

[insert Map 3-1 -- Gauging Stations Location here]

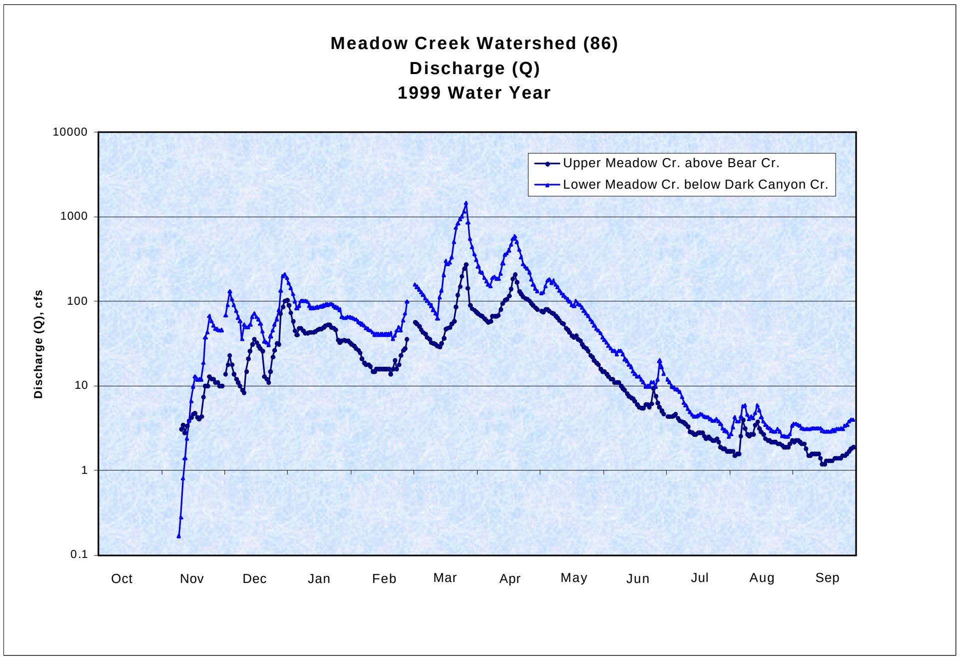


Figure 3-1. 1999 Water Year discharge (Q) for Watershed 86.

Table 3-1 displays the 1999 water year mean flow, total flow and drainage density for each of the two Meadow Creek Watershed gauging stations.

Table 3-1. 1999 water year mean flow, total flow and drainage density for Watershed 86 gauging stations.

Forest Service Gauging Stations	Mean Flow (cfs)	Total Flow (cfs)	Drainage Density (mi/mi^2)
Upper Meadow Creek (Above Bear Creek)	31.7	10,308.2	6.39
Lower Meadow Creek (Below Dark Canyon Creek)	97.6	31,812.3	6.93

Note**:** Lower Meadow Creek gauge includes flow that is measured at Upper Meadow Creek gauge.

Width/Depth Ratio**:** The width/depth ratio of a stream affects the ability of various discharges occurring within the channel to move sediment and aid in floodplain development. Width/depth ratio is a sensitive and positive indicator of trends in channel instability. Management activities can affect width/depth ratios through road building (constriction of the channel), riparian vegetation removal, and creation of erosional nick points. Figure 3-2 displays the bankfull width/depth ratio for all surveyed streams in Watershed 86.

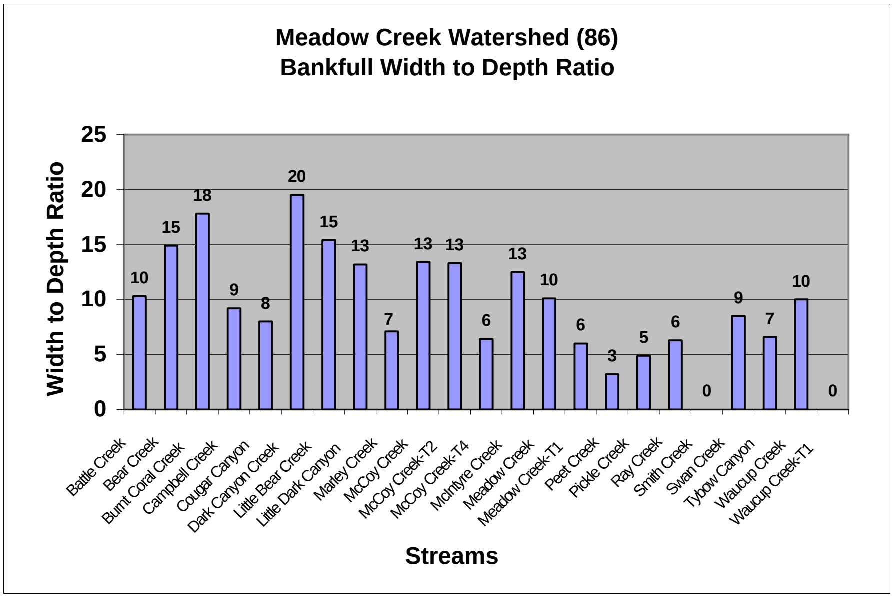


Figure 3.2. Bankfull width/depth ratios for surveyed streams in Watershed 86.

***Equivalent Clearcut Area*:** Timber harvest, prescribed and wild fire, and other activities, which create openings in the forested area, have the potential to contribute to changes in the magnitude and timing of peakflows. Peakflows are important mechanisms for channel and floodplain function. The Equivalent Clearcut Area (ECA) value was designed to give a general idea of the percent of a subwatershed in a harvested condition. This value was a measure of timber harvest and approximation of hydrologic recovery of a subwatershed following harvest. There are assumptions made in the ECA procedure, however, that are under scrutiny, and values for reference conditions are uncertain.

Because of the uncertainty of ECA values and assumptions, Historic Range of Variability (HRV) values were analyzed by the La Grande Ranger District to determine the percentage of forested National Forest System (NFS) lands within the Watershed that would typically be in an early aged forest or ECA-like condition. The Stand Initiation (SI) structural stage, one of seven stages within the historic range of variability, is equivalent to the ECA condition. Stands between 0 to 20 years of age are generally considered to be in the SI structural stage. At year 20, stands are considered hydrologically recovered. Table 3-2 displays the percent of forested acres in the SI structural stage per subwatershed in Watershed 86.

Table 3-2. Perent of forested NFS lands in the Stand Initiation (SI) Structural Stage per subwatershed (SWS) in Watershed 86.

SWS	Forested NFS Acres	Percent Forested NFS Acres in SI Structural Stage	SWS	Forested NFS Acres	Percent Forested NFS Acres in SI Structural Stage
86A	2,250	3	86F	5,909	17
86B	8,186	23	86G	5,276	12
86C	5,575	34	86H	9,803	22
86D	9,132	31	86I	4,992	43
86E	2,754	19	86J	6,845	42

SI structural stage acres are further adjusted based on the presence of roads (open, closed and obliterated). Acres estimated to be in the SI structural stage condition are calculated by multiplying total lengths of existing roads by road width. All roads are estimated to be 20 feet wide for simplicity. Obliterated roads are estimated to be hydrologically recovered at year 20. (Hydrologic recovery on obliterated roads is considered to be the same as that for forested stands.) All roads are considered to be on previously forested areas. Table 3-3 displays the total (roaded and forested) percent of forested NFS acres in the SI structural stage per subwatershed in Watershed 86.

Table 3-3. Total (roaded and forested) percent of forested NFS acres in the Stand Initiation (SI) Structural Stage per subwatershed (SWS) in Watershed 86.

SWS	Percent Roaded NFS Acres in SI Structual Stage	Percent Forested NFS Acres in SI Structual Stage	Total Percent NFS Acres in SI Structual Stage	SWS	Percent Roaded NFS Acres in SI Structual Stage	Percent Forested NFS Acres in SI Structual Stage	Total Percent NFS Acres in SI Structual Stage
86A	1.5	3	**4.5**	86F	2.2	17	**19.2**
86B	2.1	23	**25.1**	86G	1.8	12	**13.8**
86C	2.2	34	**36.2**	86H	1.5	22	**23.5**
86D	2.1	31	**33.1**	86I	1.9	43	**44.9**
86E	2.1	19	**21.1**	86J	1.9	42	**43.9**

Reference Conditions

Streamflow: Little information on streamflow exists prior to 1992 within Watershed 86, however, reference conditions can be derived from streamflow data analysis for the USGS Grande Ronde River gauging station at La Grande (#13319000). The La Grande gauge provides the most comprehensive streamflow record (1904-1989) in the area. The contributing area of the La Grande gauge is 433,920 acres; Watershed 86 comprises 27 percent (115,920 acres) of this area.

Streamflow at the La Grande gauge has characteristics of a typical snowmelt hydrograph. Late spring and fall rain events contribute to the flows. Peak flows usually occur in March and April with flows gradually decreasing to minimum discharges in August and September. For example, flow data for 1989 (the last year of gauge operation) shows that the Grande Ronde River at La Grande had a maximum discharge of 3800 cubic feet per second (cfs) in the spring, and a minimum discharge of 24 cfs in late summer (USDI GS 1989). The average annual discharge, using 81 years of data, was 389 cfs.

Rain-on-snow events, although relatively uncommon for the drainage, are highly influential on peak flows. Rain-on-snow events have been responsible for several of the highest flows on record, originating from mid-elevation ranges of 3,000 to 4,500 feet. From the 81 years of data collected at the La Grande gauge, the highest peakflow recorded (14,100 cfs) occurred on January 30, 1965 and was due to a rain-on-snow event.

***Width/Depth Ratio*:** The PACFISH recommendation for width/depth ratio is that all streams should have a ratio of less than 10 (USDA FS/USDI BLM 1995). However, this does not include consideration of different channel types. In accordance with Region 6 protocol for channel classification, width/depth ratio is directly related to channel type. The reference condition for width/depth ratio is the value that corresponds to a specific channel type as described in the Rosgen channel classification system (see Table 3-4).

Table 3-4. Rosgen channel classifications.

Rosgen Channel Type	Width/Depth Ratio	Description
A	< 12	steep, highly entrenched, step pool systems with high sediment transport potential. Riparian vegetation usually occurs only on the streambanks
B	> 12	gentle to moderately steep terrain, moderate gradient streams that are moderately entrenched , have low sinuosity and are riffle-dominated
C	> 12	low gradient, moderately high sinuosity, pool/riffle bedform with well-developed floodplains
E	<12	very low gradient, highly sinuous, with low width to depth ratios.
F	> 12	highly entrenched, high width to depth ratio streams

A majority of surveyed streams in Watershed 86 can be categorized as Rosgen A2 and B3 channel types, of which the numeric designation refers to channel material. Rosgen A2 streams have steep gradients (> 4%) with boulder substrates. Rosgen B3 streams have moderate gradients (2 – 4 %) with cobble/coarse gravel substrates. Table 3-5 displays channel gradient, bankfull width/depth ratio and channel type for surveyed streams in Watershed 86. Channel type (letter designation only) was determined from stream survey data and topographic maps.

Table 3-5. Channel gradient, bankfull width/depth ratio (W/D) and channel type for surveyed streams per subwatershed (SWS) in Watershed 86.

SWS	Stream	Gradient (%)	Bankfull W/D	Channel Type	SWS	Stream	Gradient (%)	Bankfull W/D	Channel Type
86A	Battle Cr.	2-4	10	B	86F	Burnt Corral Cr.	2-4	17	B
	Campbell Cr.	2-4	*	B		Tybow Cr.	>4	6	A
86B	Dark Canyon Cr.	2-4	20	B	86G	Bear Cr.	2-4	14	B
	Little Dark Canyon	2-4	13	B		Little Bear Cr.	2-4	15	B
86C	McIntyre Cr.	2-4	12	B	86H	Cougar Cr.	>4	8	A
86D	McCoy Cr.	2-4	13	B		Peet Cr.	2-4	*	B
	McCoy Cr-T2	2-4	13	B		Ray Cr.	>4	6	A
	McCoy Cr-T4	*	6	*		Smith Cr.	2-4	*	B
86E	Marlley Cr.	2-4	*	B	86I	Waucup Cr.	>4	10	A
	Pickle Cr.	2-4	*	B		Waucup Cr-T1	2-4	*	B
	Swan Cr.	2-4	*	B	86J	Meadow Cr.	>4	10	A
						Meadow Cr-T1	2-4	*	B

* = Inadequate information.

***Equivalent Clearcut Area*:** There is no specific reference condition for ECA. An unmanaged ECA value would reflect the influence of natural disturbances, such as fire, and insects and disease, on created openings. The National Marine Fisheries Service (NMFS) suggested that 15 percent ECA was a threshold that when reached more specific analysis needed to be conducted in order to proceed with additional management activities (NMFS Biological Opinion 1995). The cumulative effects risk analysis developed by the Forest Service Region 6 Office (1993) considers less than 15 percent to be in the low risk category. Neither value was referenced with methodologies, so 15 percent is an uncertain value. A surrogate reference condition is the HRV SI structural stage range of 5 to 15 percent. Historically 5 to 15 percent of the forested NFS lands in Watershed 86 were in the SI structural stage, or ECA-like condition.

Interpretation

***Streamflow*:** Streamflow discharge in Watershed 86 is characteristics of a snowmelt hydrograph, with late spring and fall rains contributing to the annual average flows. Peak flows usually occur in March and April with flows gradually decreasing to minimum discharges in August and September.

***Width/Depth Ratio*:** A width/depth ratio of 12 is the high end value for "A" channel types (usually <12) and the low end value for "B" channel types (usually >12). Width/depth ratios can occasionally vary by $\pm$ 2 units without necessarily indicating a change in stream type. All surveyed streams, with adequate data, have appropriate width/depth ratios for A and B channel types.

Data Gap - Stream type determinations should be field verified, and data should be collected for those channels with inadequate information.

***Equivalent Clearcut Area/SI Structural Stage*:** Of the 10 subwatersheds in Watershed 86, subwatershed 86G is within the HRV for SI structural stage (5 to 15 percent), and subwatershed 86A is below (Table 3-3). The remaining eight subwatersheds are above the range. The hydrologic response of Subwatersheds 86 B, C, D, E, F, H, I, and J, due to timber harvest and roads is expected to be outside the historic range. However, as discussed above under streamflow, discharge data from the two gauging stations with Watershed 86 are in line with discharge data from the USGS La Grande gauging station. Therefore, hydrologic response within Watershed 86 would appear to be within the historic range.

Data Gap – Information is needed on the success of treating compaction on obliterated roads, and on the affect of compaction on future stand conditions. Obliterated roads are considered "treated" for compaction, however, if compaction is not eliminated, stands develop shallower root systems and become more susceptible to windthrow and insects and disease.

Vegetative

A diverse composition of riparian plant species and age classes, combined with presence of those species that have root masses capable of withstanding high flow events is needed for proper riparian function. In addition, plant communities should provide an adequate source of large woody debris in forested riparian areas.

Current Condition

***Riparian Vegetation*:** There is limited information available to assess the condition of riparian vegetation in the Watershed. However, the condition of plant communities, or associations, developed from a combination of upland and riparian stand data, can be assessed by evaluating stand density using Stand Density Index (SDI). Stand Density Index is the relationship between tree size and number of trees in a stand. Indices are based on site productivity within a specific series of plant association. Each series is based on the climax species dominating the principal layer in the plant association.

Stand density indices are divided into three categories of stocking: overstocked, adequately stocked and understocked. Stands that are adequately stocked are growing at full potential. Adequately stocked stands provide sufficient canopy cover, root mass, evapotranspiration, and recruitment material for proper hydrologic functions. These stands are also less susceptible to risk of catastrophic fire and infestations of insects and disease. Table 3-6 displays the SDI's for stands within plant associations on the Wallowa-Whitman National Forest.

Table 3-6. SDI's for stands within plant associations on the Wallowa-Whitman National Forest.

Plant Association	Understocked SDI	Adequately Stocked SDI	Overstocked SDI
Douglas Fir (CD)	<92	92-133	133-279
Grand Fir (CW)	<177	177-265	265-419
Lodgepole Pine (LP)	<102	102-167	>167
Mountain Hemlock (CM)	<287	287-430	>430
Ponderosa Pine (CP)	<55	55-134	134-217
Subalpine Fir (CE)	<132	132-198	198-311

Table 3-7 displays acres of understocked, adequately stocked, and overstocked stands in each plant association on NFS lands within RHCAs in Watershed 86 by subwatershed. Stocking level acreages are based on the SDI for individual stands within a specific plant association series. (RHCAs are PACFISH Riparian Habitat Conservation Area stream buffers).

Table 3-7. Acres of under, adequately and over stocked stands per plant associations on NFS lands within RHCAs in Watershed 86 by Subwatershed (SWS).

SWS	Plant Association	Stocking Level		
		Understocked (acres)	Adequately Stocked (acres)	Overstocked (acres)
86A	CD	20	60	182
	CP	3	0	88
	CW	29	113	94
	Total	**52**	**173**	**364**
86B	CD	104	53	178
	CL	22	6	112
	CP	4	0	22
	CW	806	430	505
	Total	**936**	**489**	**817**
86C	CD	67	97	118
	CL	18	0	42
	CP	15	22	47
	CW	456	135	277
	Total	**556**	**254**	**484**
86D	CD	105	55	46
	CL	129	31	68
	CP	8	4	26
	CW	820	345	667
	Total	**1062**	**435**	**807**
86E	CD	**39**	13	93
	CL	6	5	24
	CP	19	17	21
	CW	103	98	195
	Total	**167**	**133**	**333**
86F	CD	79	133	230
	CE	3	0	50
	CL	9	**10**	46
	CP	22	4	103
	CW	236	127	326
	Total	**349**	**274**	**755**
86G	CD	31	50	157
	CL	14	0	29
	CP	6	4	18
	CW	351	288	297
	Total	**402**	**342**	**501**
86H	CD	11	37	203
	CL	132	122	160
	CP	5	3	38
	CW	500	303	773
	Total	**648**	**465**	**1174**
86I	CD	**32**	2	9
	CL	159	9	439
	CP	2	0	2
	CW	139	87	120
	Total	**332**	**98**	**570**
86J	CD	10	18	7
	CL	74	43	340
	CP	9	1	1
	CW	607	130	427
	Total	**700**	**192**	**775**

In addition to stocking levels per plant association within RHCAs, riparian vegetation can be evaluated by assessing the number of acres affected by timber harvest in RHCAs, and the amount of large woody debris present.

Timber Harvests within RHCAs*:* Timber harvest within RHCAs can reduce the amount of down wood available to slow sediment movement, remove shade producing trees, and remove potential in-channel recruitment. The degree of reduction is related to the type of harvest - partial or regeneration. Table 3-8 displays the acres and percent harvest within forested RHCAs on NFS lands by harvest type per subwatershed.

Table 3-8. Acres and percent timber harvest within forested RHCAs on NFS lands by harvest type (partial and regeneration) in Watershed 86 per subwatershed (SWS).

SWS	Forested RHCA (acres)	Partial Harvest (acres)	Regen Harvest (acres)	Total Harvest in RHCAs (acres)	Percent Partial Harvest in RHCAs	Percent Regen Harvest in RHCAs	Total Percent Harvest in RHCAs
86A	589	138	2	140	23	0	24
86B	2242	144	603	747	6	27	33
86C	1294	175	379	554	14	29	43
86D	2304	98	573	671	4	25	29
86E	633	59	74	133	9	12	21
86F	1378	92	216	308	7	16	22
86G	1245	344	103	447	28	8	36
86H	2287	564	407	971	25	18	42
86I	1000	162	283	445	16	28	45
86J	1667	164	624	788	10	37	47

The data displayed in Table 3-9 was analyzed from the Activities Database (ADB) on the La Grande Ranger District which contains timber harvest data from the mid 1970s to present. There is no data in ADB prior to the 1970s.

***Large Woody Debris*:** Large woody debris (LWD) is needed in the channel to store sediments, scour pools, and to create stream structure and fish habitat. Figure 3-3 displays the pieces of LWD per mile in surveyed streams within Watershed 86.

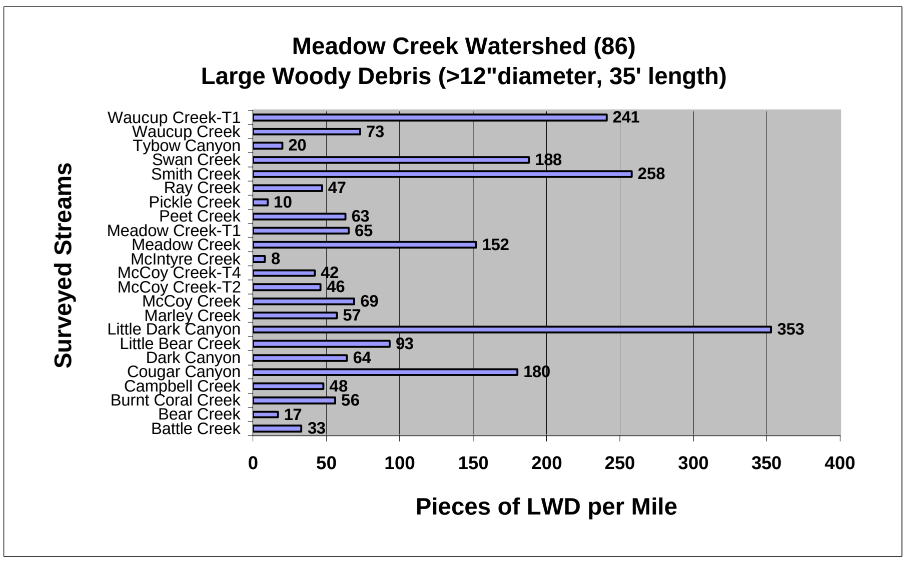


Figure 3-3. Pieces of LWD per mile of surveyed stream in Watershed 86.

Reference Condition

***Riparian Vegetation*:** The reference condition for riparian vegetation is 100% adequately stocked stands within riparian areas where factors of slope, soil, aspect, and moisture support this condition.

***Timber Harvest within RHCAs*:** There is no specific reference condition for timber harvest within RHCAs. However, an unmanaged RHCA would contain openings created from natural disturbances, such as fire, and insects and disease. Therefore the District's estimated Historic Range of Variability (HRV) for the stand initiation (SI) structural stage will be used as a surrogate reference condition for timber harvest in RHCAs. The HRV estimates approximately 5 to 15 percent of forested lands within Watershed 86 would be in an open to stand initiation stage like condition.

***Large Woody Debris*:** PACFISH recommends 20 pieces of large (>12" diameter, 35' length) woody debris (LWD) per mile of stream channel.

Interpretation

Riparian Vegetation: Overall, less than one third of the stands within riparian areas are adequately stocked. The vast majority of stands are about one third to one half understocked or overstocked. Table 3-9 shows the percent of acres that are understocked, adequately stocked and overstocked within each subwatershed. Subwatersheds 86B, C, D, and J have the highest amount (40 percent or greater) of understocked RHCA stands. Subwatersheds 86A, E, F, H, and I have the highest amount (50 percent or greater) of overstocked RHCA stands.

Table 3-9. Percent stocking level of under, adequately and over stocked acres within RHCAs in Watershed 86 by subwatershed (SWS).

SWS	Stocking Levels		
	Percent Understocked Acres	Percent Adequately Stocked Acres	Percent Overstocked Acres
86A	9	29	62
86B	42	22	36
86C	43	20	37
86D	46	19	35
86E	26	21	53
86F	25	20	55
86G	32	27	40
86H	28	20	51
86I	33	10	57
86J	42	12	46

***Timber Harvest within RHCAs*:** Timber harvest within RHCAs exceeds the HRV SI structural stage reference condition, of 5 to 15 percent, in all subwatersheds (see Table 3-8). The majority of timber harvest in subwatersheds 86B-F and I and J involved regeneration harvest. In subwatersheds 86A, G and H, the majority of timber harvest was partial harvest. The partial harvests involved salvage harvests of dead and dying materail after insect infestations, and were mapped as large areas of land in the GIS database, however not every acre of land received harvest. Most harvest activity, in all subwatersheds, occurred from 1981 to present, therefore a majority of forest regeneration is currently 1 to 20 years old.

***Large Woody Debris*:** All streams, displayed in Figure 3-3, meet or exceed the PACFISH Standard of 20 pieces of down woody material greater then 12" in diameter and 35' in length per mile, except Pickle, McIntyre and Bears Creeks. These three streams have only 10, 8 and 17 pieces of LWD per mile, respectively.

Data Gap - Information on availability of sources of woody debris for both long and short-term recruitment is needed for all surveyed streams.

Erosion/Deposition

Erosional and depositional forces allow a stream channel to transport and store natural sediment loads. When either the erosional or depositional forces are not in balance with channel characteristics, excessive erosion or deposition can occur.

Current Condition

***Streambank Stability*:** Streambank instability, above natural rates, can be an indicator of excessive erosion. Table 3-10 shows an estimate of streambank stability/condition for subwatersheds in Watershed 86 based on best professional judgement of the La Grande District Hydrologist and Fisheries Biologist using U. S. Fish and Wildlife Service (USFWS) standards.

Table 3-10. Estimated streambank stability/condition for subwatersheds in Watershed 86.

USFWS Diagnostic/Pathway	Properly Functioning (>80% of any stream reach has ≥90% stability)	Functioning at Risk (50 to 80% of any stream reach has ≥90% stability)	Not Properly Functioning (<50% of any stream reach has ≥90% stability)
Streambank condition		86A-J	

Roads: Excessive deposition, in the form of sediment, can be as detrimental to a channel as excessive erosion. Erosion must be occurring at some place within the watershed for deposition to occur. Although streambank erosion does cause subsequent deposition in areas, the highest contributor of sediment to stream channels is from roads.

The concentration and location of roads within a watershed are of concern not only as a source of sediment, but also because roads can intercept groundwater flow, increase the drainage network, and confine stream channels preventing natural lateral stream movement and storage of groundwater in floodplains.

Current information on road lengths, status and location was obtained through a query of the La Grande Ranger District GIS Transportation layer (Tables 3-11, 12 and 13). This database contains information for roads located on NFS and non-NFS lands within Watershed 86. Information on non-NFS roads was interpreted from 1994 ortho quadrangles. All non-NFS roads were considered to be open.

There are approximately 714 miles of road within the entire watershed. Approximately 470 miles are currently open to vehicle travel and 244 miles are closed. A closed road is usually blocked by earthen barricade, gate, or guardrail and usually receives no vehicle traffic. This equates to a total open and closed road density of 3.9 miles per square miles for the entire watershed (Table 3-11). Table 3-12 displays open road density on NFS lands only per the Wallowa-Whitman (W-W) National Forest Land and Resource Management Plan (LRMP) Standards and Guidelines (S&Gs) for Management Area (MA) allocations within each subwatershed. See each specific MA for total open road density on NFS lands.

Table 3-11. Drainage area, existing road lengths (miles) and densities (miles per square mile) of NFS & non-NFS open and closed roads for each subwatershed (SWS) within Watershed (WS) 86 and for the entire Watershed.

SWS	NFS & Non-NFS Area (mi^2)	All Roads (Open and Closed)				
		NFS Open Roads (miles)	NFS Closed Roads (miles)	Non-NFS Roads* (miles)	Total Roads (miles)	Total Road Density (mi/mi^2)
86A	20.1	20.4	5.8	26.3	52.4	2.6
86B	18.8	56.7	23.9	10.2	90.8	4.8
86C	28.9	43.7	11.2	47.0	101.8	3.5
86D	27.9	35.8	46.8	38.8	121.4	4.3
86E	8.6	14.8	5.1	3.8	23.7	2.7
86F	13.7	30.9	27.4	0.4	58.7	4.3
86G	12.3	26.5	24.8	0.2	51.4	4.2
86H	22.5	50.6	32.8	4.6	88.0	3.9
86I	14.5	26.4	33.6	5.0	65.0	4.4
86J	13.7	26.9	32.6	1.4	60.9	4.4
WS 86	**181.0**	**332.7**	**244.0**	**137.4**	**714.1**	**3.9**

* All Non-NFS roads are considered open

Table 3-12. Drainage area, existing road lengths (miles) and densities (miles per square mile) of NFS open roads for each Management Area per subwatershed (SWS) in Watershed 86.

SWS	LRMP Mngt Area	NFS Area (mi^2)	Open Roads Only		SWS	LRMP Mngt Area	NFS Area (mi^2)	Open Roads Only	
			Roads (miles)	Road Density (mi/mi^2)				Roads (miles)	Road Density (mi/mi^2)
86A	3	1.6	3.3	2.1	86E	15	0.3	0.1	0.3
	14	5.8	17.0	2.9	86F	1	1.3	2.5	1.9
86B	1	3.9	15.2	3.9		3	7.3	18.9	2.6
	1W	2.4	11.8	4.9		14	5.0	9.5	1.9
	3	8.3	27.0	3.2	86G	1	1.1	3.0	2.7
	15	0.9	1.8	2.0		14	10.8	23.2	2.1
	C4	0.1	1.0	10.0		15	0.1	0.3	3.0
86C	1	3.1	5.8	1.9	86H	1	8.9	26.8	3.0
	3	1.9	6.9	3.6		14	12.4	23.9	1.9
	12	0.3	0.0	0.0		15	0.1	0.0	0.0
	14	5.6	30.9	5.5		16	<0.1	0.0	0.0
	15	<0.1	0.0	0.0	86I	1	12.4	24.8	2.0
	C4	<0.1	0.0	0.0		15	0.2	<0.1	0.0
86D	1	13.2	27.9	2.1		16	<0.1	0.0	0.0
	3	2.0	4.2	2.1		E2	0.8	1.5	1.9
	14	0.1	0.1	1.0	86J	1	10.9	22.6	2.1
	15	0.5	0.0	0.0		15	1.2	0.2	0.2
	C4	0.8	3.7	4.4		C3	<0.1	0.1	1.0
	C5	<0.1	0.0	0.0		C4	0.8	4.0	5.0
86E	1	0.4	0.8	2.0		E2	0.0	0.0	0.0
	3	6.6	14.0	2.1	**Totals**		**131.1**	**332.8**	

Approximately 144 miles of open and closed roads are located within RHCAs throughout the entire watershed (Table 3-13).

Table 3-13. Miles of open and closed road within RHCAs by stream class on *NFS and non-NFS lands* per subwatershed within Watershed 86.

Subwatershed	Miles of Open and Closed Road per RHCA						
	Stream Class I		Stream Class III		Stream Class IV		Total
	Open	Closed	Open	Closed	Open	Closed	
86A	6.2	0.6	1.4	0.1	2.8	0.8	**11.9**
86B	3.2	1.5	1.5	1.0	9.1	4.5	**20.8**
86C	2.0	0.4	3.5	0.2	10.8	1.5	**18.4**
86D	6.5	1.4	3.0	0.2	6.9	8.4	**26.4**
86E	1.9	0.0	1.6	0.1	1.0	0.4	**5.0**
86F	5.4	0.5	4.4	0.6	2.5	2.6	**16.0**
86G	1.9	0.0	2.3	0.9	3.5	2.3	**10.9**
86H	3.4	2.3	3.4	2.9	2.1	2.2	**16.3**
86I	0.4	0.5	1.4	1.4	1.7	2.8	**8.2**
86J	0.4	0.7	0.9	2.1	2.4	3.4	**9.9**
Total	**31.3**	**7.9**	**23.4**	**9.5**	**42.8**	**28.9**	**143.8**

Reference Condition

***Streambank Stability*:** Streambank stability is a function of stream processes that maintain channel form through time. Integration of the vegetative component with soils and hydrology are inseparable in determining streambank stability. Riparian Management Objectives found in PACFISH call for >90 percent stable streambanks in non-forested systems, however, an objective for stable streambanks in forested systems was not identified. The La Grande Ranger District uses the best professional judgement of the Hydrologist and Fisheries Biologist to estimate streambank stability according the USFWS streambank condition values for Bull Trout. These values are divided into three categories: (1) properly functioning (>80% of any stream reach has $\geq$90% stability), (2) functioning at risk (50 to 80% of any stream reach has $\geq$90% stability), and (3) not properly functioning (<50% of any stream reach has $\geq$90% stability).

Roads: The reference condition for road density related to erosion is the natural condition of a watershed which is void of roads. However, information on erosion within the Watershed prior to roading is not available; therefore, the LRMP Standards and Guidelines (S&Gs) for open road densities will be used as a surrogate reference condition. The LRMP S&Gs require open road densities of 2.5 miles per square mile in Management Area (MA) 1 and 1.5 miles per square mile in MA1W and MA3.

The W-W National Forest administers a small portion of Umatilla National Forest lands within Watershed 86. Management Area allocations on these lands include C3, C4 and E2. The Umatilla LRMP S&Gs require open road densities that meet each allocation's management objectives. Management Area S&Gs, on both forests, are primarily related to road densities that would best meet the needs of wildlife species and are not necessarily related to water quality and fish needs.

A reference condition that best meets the needs of fish species which is closely related to water quality needs is the National Marine Fisheries Service's (NMFSs) recommended open and closed road density for summer steelhead. Watershed 86 contains summer steelhead habitat, but no occupied or potential bull trout habitat, therefore the USFWS open and closed road density for bull trout will not apply. The NMFS considers < 2 miles per square mile and no valley bottom roads as "properly functioning," 2-3 miles per square mile with some valley bottom roads as "functioning at risk," and > 3 miles per square mile with many valley bottom roads as "not properly functioning"

(NMFS 1996 Matrix of Pathways and Indicators in Making Endangered Species Act Determinations of Effect for Individual and/or Grouped Actions at the Watershed Scale). The NMFS did not define valley bottom roads in the1996 Matrix, so the meaning of the term is uncertain. For this analysis, valley bottom roads/road location was considered as open and closed roads within PACFISH Riparian Habitat Conservation Areas (RHCAs).

Both the Forests' and NMFS's reference conditions for road densities will be used as surrogate reference conditions to assess water quality and fish needs.

Interpretation

Streambank Stability: All subwatersheds rate as "Functioning at Risk" within Watershed 86. Degradation of streambank conditions is assumed to be a result of historic overgrazing, past harvest of trees in riparian areas, and increased sediment delivery from road construction.

Roads: All subwatersheds have an open and closed road density greater then the reference condition (NMFS's properly functioning condition recommendation for occupied summer steelhead of < 2 miles per square miles, no valley bottom roads) (Table 3-14).

Table 3-14. Existing (open and closed) road density, miles of (open and closed) road within RHCAs, on NFS and non-NFS lands, and proper functioning condition rating per subwatershed.

Subwatershed	Existing Road Density (mi/mi^2)	Existing Miles of Road in RHCAs	Condition Rating		
			PF	FAR	NPF
86A	2.6	11.9		X	
86B	4.8	20.8			X
86C	3.5	18.4			X
86D	4.3	26.4			X
86E	2.7	5.0		X	
86F	4.3	16.0			X
86G	4.2	10.9			X
86H	3.9	16.3			X
86I	4.4	8.2			X
86J	4.4	9.9			X

PR = Properly Functioning
FAR = Functioning at Risk
NPF = Not Properly Functioning

Table 3-14 shows eight (8) subwatersheds have road densities greater than 3.0 miles per square mile and "many" RHCA/valley bottoms roads, therefore Subwatersheds 86B-D, F-J are considered "not properly functioning." Subwatersheds 86A and E have 2-3 miles per square mile road densities, and "some" RHCA/valley bottom roads; therefore these two (2) subwatersheds are considered "functioning at risk."

Data Gap - Field surveys need to be conducted on both open and closed NFS roads to determine location and extent of any active erosion within the Watershed. In Subwatersheds 86B-D and H erosion is likely to be greater then in the other subwatersheds because of the higher miles of open road (see Table 3-12). Erosion on open native surface roads is greater then on closed roads due to higher surface disturbance. Closed roads need to be surveyed to determine effectiveness of road closures and whether further action needs to be taken to stop erosion activity. Information on sediment delivery following road obliteration is needed to determine a resource based threshold for amount of obliteration to implement per subwatershed per year.

Summary Interpretations for "Where and how have management activities affected riparian function?"

Properly Functioning Condition (PFC) is a basin-wide approach for determining the ability of riparian-wetland areas to function as a result of their interaction among geology, soil, water, and vegetation (USDI BLM 1993). It can be applied on several scales. As an absolute minimum it can be used as a preliminary survey and may lead the investigator to identify areas in need of monitoring at a more detailed level.

For this analysis, a cursory office PFC rating was given to each subwatershed. Table 3-15 displays the office PFC rating for each subwatershed and a summary of the riparian parameter conditions analyzed above.

Table 3-15. Summary of current riparian function parameter conditions, and overall Proper Functioning Condition rating for each subwatershed (SWS) in Watershed 86.

SWS	Stream Name	W/D Ratio	SI* (%)	Percent Adequately Stocked RHCA Acres*	Percent Total Harvest in RHCAs*	LWD (pieces /mile)	Stream-bank Condition*	Road Density/ Location *	Summary PFC Rating**
86A	Battle Creek	10	4.5	29	24	33	FAR	FAR	***FAR***
	Campbell Creek	---				48			
86B	Dark Canyon Creek	20	25.1	22	33	64	FAR	NPF	**NPF**
	Little Dark Canyon Creek	13				353			
86C	McIntyre Creek	12	36.2	20	43	8	FAR	NPF	**NPF**
86D	McCoy Creek	13	33.1	19	29	69	FAR	NPF	**NPF**
	McCoy Creek-T2	13				46			
	McCoy Creek-T4	6				42			
86E	Marley Creek	---	21.1	21	21	57	FAR	FAR	***FAR***
	Pickle Creek	---				10			
	Swan Creek	---				188			
86F	Burnt Corral Creek	17	19.2	20	22	56	FAR	NPF	**NPF**
	Tybow Canyon Creek	6				20			
86G	Bear Creek	14	13.8	27	36	17	FAR	NPF	**NPF**
	Little Bear Creek	15				93			
86H	Cougar Creek	8	23.5	20	42	180	FAR	NPF	**NPF**
	Peet Creek	---				63			
	Ray Creek	6				47			
	Smith Creek	---				258			
86I	Waucup Creek	10	44.9	10	45	73	FAR	NPF	**NPF**
	Waucup Creek-T1	---				241			
86J	Meadow Creek	10	43.9	12	47	152	FAR	NPF	**NPF**
	Meadow Creek-T1	---				65			

* - Values presented are related to the subwatershed and not necessarily the specific stream listed.
** - PFC ratings office assessment based on available data
--- = Inadequate information.
T1 = Tributary 1
FAR = Functioning at Risk
NPF = Not Properly Functioning

The above PFC ratings show that 8 of the 10 subwatersheds (86B, C, D, F, G, H, I, and J) are “Not Properly Functioning,” and 2 subwatersheds (86A, and E) are “Functioning-At-Risk” relative to riparian function. The primary influential factors for all subwatershed condition ratings are low percentages of adequately stocked RHCA stands, high percent harvest within RHCAs, high road densities, and high miles of road within RHCAs. All subwatershed PFC ratings need to be assessed in the field to verify this cursory office review and to determine monitoring/restoration needs for that subwatershed.

Data Gap - Stream reaches in Watershed 86 need to be field assessed using the PFC protocol.

Roads Analysis - How and where does the road system affect water quantity?

Roads directly affect water quantity by altering streamflow through interruption of hill-slope drainage patterns, which alters the timing and magnitude of peak flows and changes base stream discharge and sub-surface flows (Furniss and others 1991; Harr and others 1975; Megahan 1972). Due to a lack of streamflow discharge measurements prior to roading within the Meadow Creek Watershed and Upper Grande Ronde River Drainage (see Streamflow Reference Conditions), it is assumed that water quantity has been altered from pre-roaded conditions. Peak flows are likely earlier and of higher magnitudes during spring runoff, base flows likely occur earlier in the summer, and sub-surface flows are likely of lower magnitudes throughout the water year. However, current data suggests the amount that water quantity has been altered is insignificant. Nine years of current streamflow data from NFS gauging stations in the watershed are in line with long-term (81 years) streamflow data from a USGS gauging station on the Grande Ronde River.

Additionally, the La Grande Ranger District began closing and decommissioning roads throughout the District, including the Meadow Creek Watershed, approximately ten years ago to recover areas of degradation caused by the past 100 or so years of land use. Streamflows are likely recovering and will continue to recover from the impacts of roading as additional roads are closed and decommissioned through restoration activities, and due to the implementation and management of PACFISH Riparian Habitat Conservation Areas beginning in 1995. The Erosion/Depositional, Roads section of this analysis discusses and analyzes the affects of road density on water quantity.

Roads Analysis - How and where does the road system affect stream channel dynamics?

Roads directly affect stream channel dynamics by altering channel sinuosity through channel constriction, which alters sediment and stream discharge. Roads located adjacent to streambanks and within floodplains and riparian areas confine stream channels preventing natural lateral stream movement. Additionally, undersized culverts, at stream crossings, constrict channels preventing transport of sediment loads and high streamflows. As channels are confined and constricted, sinuosity decreases, flow velocity increases and the erosional and depositional forces change, which may lead to excessive erosion or deposition.

The Erosion/Depositional, Roads section of this analysis discusses and analyzes the affects of road location on channel dynamics.

A culvert inventory was completed in 2001 on the La Grande RD involving 73 culverts. The inventory consists of data on culverts assessed for fish passage through the Forest Fish Passage at Road Crossings Assessment program. Culverts that pass fish are also able to handle the 100-year flood event. Ten culverts were surveyed within Watershed 86. Seven of the ten culverts were identified as creating fish barriers. Of these seven, three were identified as high priority for fish passage/size improvement during the next two years - Dark Canyon Creek culvert on Forest Road (FR) 2100 Mile Post (MP) 31.5, East Burnt Corral Creek culvert on FR 2444120 MP 0.02 and Waucup Creek culvert on FR 2100 MP 11.1.

Roads Analysis – How and where do roads affect riparian vegetation?

Roads directly affect riparian vegetation by removing vegetation through road construction within riparian areas, or RHCAs. See Erosion/Deposition, Current Condition, Roads for an analysis of roads within RHCAs.

NATURAL FEATURES

The Meadow Creek watershed is subdivided or stratified according to ecological units that will respond to management or other disturbance in predictable ways. "Characterizations of historical variability, predictions of plant succession pathways, descriptions of natural disturbance regimes, and estimates of potential productivity are commonly stratified by ecological unit types: (Bailey et al. 1994). The Ecological Unit Inventory survey on the Wallowa-Whitman NF has been on going it incorporates inherent features such as landform, climate, geology and potential plant communities into the design of map units. Ecological units on the Wallowa-Whitman are designed with bedrock geology groups that weather in similar ways, groups of plant associations with similar climatic settings, and use landform groups with similar geomorphic processes.

This watershed analysis has developed a basic landscape stratification that incorporates these inherent features, which do not change substantially with management, with the more ephemeral qualities of successional stage and stand structural stage. The structural and successional stage is interpreted from the existing vegetation layer (E-Veg) of the GIS database reflecting stand exam and air photo interpreted data. The condition of the watershed will be quantified with this stratification as the basic database. Individual resource specialists can characterize a particular segment of the ecosystem based on this basic data or use it in combination with other data sets that are available. The following description of the watershed is oriented to the ecological unit inventory for inherent features and uses the E-Veg layer for more ephemeral characterization.

GEOLOGY

The Meadow Creek Watershed is within the Upper Grande Ronde (UGR) watershed within the Blue Mountain subprovince of the Columbia River Plateau physiographic province. Broad rolling upland surfaces to the north and complex mountains and dissected volcanic plateaus to the south characterize it. Due to uplift in the UGR the basalt, which covers parts of Washington, Oregon and Idaho, is thinned, locally exposing older pre-Tertiary rocks. Strong northwest trending faults, and northeast trending fold system influences drainage patterns. The creeks and streams draining the layered tertiary volcanic rocks (primarily the Columbia River Basalt Group) exhibit a trellis drainage pattern.

There is one rock type in the Meadow Creek drainage with different weathering and erosion characteristics (Table 3-16). The most abundant bedrock in the Meadow Creek area is the Columbia River basalt, which covers 97 percent of the watershed (see Map 3-1). They are mostly columnar jointed basalt flows 10 to 100 feet thick, with local interbeds of tuffaceous lucustrine sediments and minor fluvial gravels. Up to 400 flows erupted through fissures and dikes flooding the area with a massive basalt sequence that is very slowly permeable and produces loamy textured soil. Interlayer materials include paleosols and lakebed sediments that produce clayey textured soils, which can reduce, slope stability. Most Columbia River basalts weather to stable landscapes.

The most abundant surficial deposit is recent alluvium. This occurs on the present floodplains and low terraces of most drainages and tends to be dominated by clean sands and gravels in the basal channel deposits. The surface layers are usually silty floodplain deposits. Older terraces have a layer of volcanic ash. Ephemeral channels have more silts and clays throughout due to the lack of flows strong enough to produce clean sands. Pockets of Tertiary alluvium can be found in the watershed and are often associated with unstable clay-rich soils.

[Insert Map 3-1 here]

The geologic features most prone to change, and therefore the most easily influenced by management activities, are the surficial sediments. Alluvial sediments whose stability is often dependent on vegetative cover go through changes on a regular basis depending on the type of drainage system. Channels migrate laterally in low gradient streams unless riprap and other diversion structures are installed. Only 1.9 percent (2,227 acres) of the Upper Grande Ronde is alluvial sediments.

The Meadow Creek watershed has no active slides within the watershed analysis area; this is due to basalt bedrock dominance in the watershed.

Table 3-16: Geologic Groups from the Ecological Unit Inventory

Rock Type	***Geologic Group Information***	***UGRR Acres***	***Meadow Creek Acres/1***	***% Of Meadow Creek***
Basalts	Columbia River basalts	174,64	110,340	95%
Alluvial	Tertiary, Pleistocene and Recent	7,191	2,227	2%

1. This includes all lands within the analysis area both private and forest service. 3% of the lands consist of information gap acres where additional information is needed.

Two other major surficial sediments, which are the result of windborn sediments, occur throughout the watershed. These are the loess from glacial silts and volcanic ash from Mount Mazama. Loess is more common in the northern parts of the watershed, which is more directly downwind from glacial flood deposits of the Columbia Basin. There is at least a foot of weathered volcanic ash on forested slopes and 16 to 20 inches on broad ridges and benches. The ash has been eroded from steep slopes if an open canopy forest or grassland vegetation is present. This erosive setting is generally above and below the elevations where true firs grow. These eolian deposits are more fertile than most soils but have poor engineering quality. The relative absence of rock fragments means roads need to be surfaced to prevent rutting.

LANDFORM PROCESSES AND AGE

Some of the major landform processes are reflected in the surficial geology. The most common process is erosion by water. Dissection by streams through channel erosion is actively oversteepening some hillslopes by cutting away the base of the slopes. The most active area of the Meadow Creek watershed is in subwatershed (SWS) 86E where very steep (> 60%) slopes lie adjacent to stream channels. Much of the adjustment to downcutting is from dry ravel or mass failure but may also include sheet and rill erosion. These are some of the most sensitive lands because of the high sediment delivery potential (See Sediment Production and Delivery section). Overland flow is a more common form of the dissection and is associated with highly erosive settings (see Sheet and Rill Erosion section). This natural or background form of sheet and rill erosion is primarily associated with steep, sparsely vegetated slopes of lower elevations (see Sheet And Rill Erosion map on opposite page). Most of the watershed has had a forest canopy that prevents erosion but can become a source of sediment if the protective vegetation is removed.

A third major landform process is wind erosion and deposition. It can occur on all slopes but is most significant on gently sloping, sparsely vegetated slopes. They are primarily in the north end in tributaries of Meadow Creek. The distinctive mound/intermound topography of the basalt plateaus is associated primarily with the reworking of loess and ash by wind. Water erosion, frost heave and gopher activities are also involved in the process that builds mounded topography.

These natural erosion processes are self-perpetuating in this climatic setting where the thickness of the vegetative cover is dependent on the amount of soil available to hold water. A thick layer of soil can support a more protective vegetative cover so has the capability to capture more sediments and support more vegetation. Once the soil is lost and water holding capacity decreases, there is less vegetation to stop further erosion.

The stability of any of the surfaces created by geologic and geomorphic processes is indicated by the degree of weathering expressed in the soil (Birkland, 1964). The degree of weathering is also dependant on climatic considerations as discussed below. Most have strongly weathered soil because of the relative absence of surface erosion. This land is still undergoing a downcutting process that contributes minerals to streams. On these very stable surfaces, minerals are dissolved and carried into the groundwater some of which eventually is carried away in the stream system. This chemical denudation may equal or exceed erosional denudation on some stable forested slopes (Clayton and Megahan, 1986).

SOILS

Soil Genetic Processes

Soil genesis, or weathering, is the process that integrates geologic, geomorphic, climatic, biotic and temporal factors to determine soil properties (Jenny, 1947). These factors are the basis of ecological unit design. The process of soil genesis is one of mechanically reducing rocks in size to sand and silt and then chemically altering and leaching these fine mineral fragments. Biological processes that are active during formation result in the accumulation of organic matter, usually in the surface layer (A horizon) or as litter (O horizon).

Freeze thaw-cycles are the primary source of mechanical weathering on soil less than 30 percent slopes within the watershed analysis area. On the rest of the watershed this process works in conjunction with colluvial rolling down the slope under the forces of gravity. Soils are generally deeper on these moderately steep to steep (15 to 60%) slopes. Streams break down rocks in less than three percent of the area. Loess came from the Columbia basin area affects large areas of the Meadow Creek drainage.

Following mechanical breakdown, mineral bonds are chemically broken with the aid of organic acids from the litter layer to release nutrients and produce clays. After the more soluble nutrient ions are washed deep into the soil or into the groundwater, clays, which were created in the surface horizons, are translocated to the subsurface B-horizons. These clays as well as organic matter accumulation in the A horizons are the primary source of nutrient and water holding capacity.

Organic matter accumulation generally increases with elevation because temperatures are dropping and moisture is increasing (Stevenson, 1982). Grasslands and open canopy forests have more organic matter in the surface mineral horizon while closed canopy forests have more organic matter on the surface as litter.

Soil Inherent Properties

Fertility Related

The character of the soil can be inferred from the geologic and climatic groups of plant associations used in stratification of the watershed. Basalt derived soils are generally loamy with many rock fragments and good nutrient and water holding capacity (Table 3-17). If the groundwater is not close to the surface these can be droughty sites. Soils with loess nearly always have a mantle of ash, which results in a combination that provides to best water holding capacity. Cation exchange capacity (CEC) of ash and loess is not as high as the CEC of basalts, but relative to the amount of clay the CEC is high.

Table 3-17: Fertility Related Properties of Subsoils of Major Parent Materials						
	Cation Exchange Cap. (me/100g)		***Water Holding Cap. (in/in)***		***Available Phosphorus Percent (%)***	
Rock Type	***mean***	***range***	***mean***	***range***	***mean***	***range***
Basalts	38	30-45	0.09	.05 - .13	3	1-4
Weathered ash	12	10-15	0.28	.23 - .33	5	~~5-8~~
Loess	25	20-30	0.15	.14 - .17	2	1-3

The relative fertility of ash and other parent materials depends on the degree of weathering. Volcanic ash at low elevations with cool to warm and dry temperature/moisture groups is still as white as when it fell and does not have enough clay development to be able to hold nutrients. Volcanic ash in the cool to cold/moist settings has weathered enough to contain amorphous clays that have a high capacity to hold nutrients like phosphorus and water (Table 3-17). The degree of amorphous character is indicated by the amount of extractable aluminum and iron. Cooler and moister conditions at higher elevations have produced more amorphous clay but the soils are also more leached as indicated by the low base saturation (Table 3-18). The availability of nutrients in the ash soils and other forest soils is often controlled by microbes (Harvey etal, 1994). Therefore microbial activity may mean more to general fertility than the ability of a soil to hold nutrients.

Table 3-18: Fertility Related Properties of Ash in Major Temperature/Moisture Groups						
Temperature Moisture Group	***Phosphorous Retention (%)***		***Acid Oxalate Al & 1/2 Fe (%)***		***Base Saturation Percent (%)***	
	mean	***range***	***mean***	***range***	***mean***	***range***
G1 cold/moist	95	-	2.8	-	20	-
G2 cool/moist	55	40-70	1.9	1.1 - 2.6	53	40-75
G4 cool/dry	55	30-80	1.3	0.5 – 2.0	65	45-90
G5 cool/dry	25	10-40	0.6	0.1 – 1.1	84	40-100
G6 cool/dry	33	25-40	0.8	0.5 – 1.0	66	58-77
NF6 cool/dry	30	20-40	0.7	0.2 – 0.9	89	75-100
NF8 warm/dry	28	25-30	0.3	-	91	86-100

Organic matter amount and location is strongly correlated to temperature and moisture groups and cover type (Stevens, 1982). As the forest canopy closes there is less organic matter in the mineral soils but more, which occurs as the litter layer of the forest floor. The subalpine fir and grand fir plant associations in temperature/moisture groups G1, G3 and G4 are dominated by ochric (light) surface horizons and have organic matter dominantly occurring as litter. These make up about 30 percent (25,508 acres) of the watershed and are generally at higher elevations or north aspects of lower elevations. The Douglas-fir and ponderosa pine plant associations of temperature /moisture groups G5 and G6 have organic matter both as a surface litter layer and as a mollic horizon. These two groups make up about 32 percent of the watershed (26,877 acres). Due to the large amount of organic matter in the A horizon of these soils they are considered to respond differently to fire than soils of higher elevations. The impact of nutrient loess to volatilization is considered to be much less in this zone than in temperature/moisture groups G1, G3 and G4. The drier Douglas-fir and ponderosa pine plant associations of temperature /moisture groups G7 and G8 have organic matter both as a thin surface litter layer and as a mollic horizon. These two groups make up about 12 percent of the watershed (10,501 acres). Due to the large amount of organic matter in the A horizon of these soils they are considered to respond differently to fire than soils of higher elevations. The impact of nutrient loess to volatilization is considered to be much less in this zone than in temperature/moisture groups G1, G3 and G4. The third major organic matter condition is the nonforest area where nearly all of the nonphotosynthesizing organic matter is in the mineral soil. This group includes all of the nonforest temperature/moisture groups. The main exceptions are inclusions in the cold/moist and some cool/moist plant associations where peat accumulates on the surface in wet sites. The bulk of the nonforest groups in the Meadow Creek drainage are in the dry settings of low precipitation uplands and make up about 1 percent (1,017 acres) of the watershed. There is 25 percent (21,296 acres) that has not been mapped in Biophysical Environment Groups, this is mostly soils that have been assigned to a group within the watershed.

The organic matter on the forest floor becomes more important as a reservoir of nutrients in the cold/moist and cool/moist temperature/moisture groups at high elevations because few nutrients are held in the highly leached volcanic ash. Weathered ash and basalt soils have the capacity to store more nutrients mineralized by a fire than would naturally occur in the absence of fire. Slow recovery may be more related to nutrient availability due to alterations in microbial populations, which release nutrients from the litter on the forest floor. Microbial activity is affected by physical properties like porosity, soil temperature and moisture, which are discussed in the ephemeral soil properties.

Physical Properties

The low bulk density of ash-influenced soils contributes to their unique soil fertility. Relatively unweathered ash is light to start with but when weathered, as it is in most of the Meadow Creek watershed, it has bulk densities that average .66 to .81 g/cc (Geist and Strickler, 1978). Average soils without ash and soils buried by ash have bulk densities of 0.89 to 1.16 grams/cubic centimeter (g/cc).

PAST ACTIVITIES

The following information is based on an analysis of known activities from the district's activity database. There has been logging activities within the watershed in the past. These activities include site prep, tractor skidding, machine piling and burning. Based on the activities database approximately 29 percent show no activity; 53 percent show being impacted, once and 18 percent being impacted more than once. Based on this information we could say the 29 percent of the area is probably below the detrimental condition as stated in the forest plan. 53 percent of the area is at or near the forest plan standards, and 18 percent of the area has the possibility of exceeding the forest plan standards. These figures could be misleading as the activity database only goes back as far as the 1960's, not all activities have been recorded within the project area. For a better projection on the ground sampling would be needed.

Soils Ephemeral Properties

Many soil properties are capable of being altered by natural disturbances or management activity. Fire affects nutrient and moisture levels in the soil (Harvey etal, 1994). Soil structure, porosity, and nutrient levels and other fertility related properties are influenced by timber harvest activities (Harvey et al, 1994). While the extents of inherent soil properties are being more clearly mapped by the ecological unit inventory, the more ephemeral properties have only recently been defined and impacts quantified. Physical and chemical properties of the soil that are easily altered can have impacts that are long term and approach a change in the inherent capacity of the site.

Physical Properties

Physical properties of the soil, such as bulk density and porosity, are affected naturally by large ungulates like elk and deer. Grazers can compact soil particularly if the soil is moist (Meeuwig, 1965, Warren et al, 1986). Management activities have increased the magnitude and/or extent of this kind of disturbance through increasing stocking levels (Reed and Peterson, 1961, Rauzi and Hanson, 1966). Livestock grazing, fencing and herding has focused this impact in small areas while natural dispersal of game created a more widespread impact. Range condition in the Meadow Creek watershed is generally good or better so has not suggested large-scale changes in soil properties (see Range section). The level of inventory is not at the detail that could recognize localized compaction due to concentrations around watering areas or travel corridors.

Timber harvest techniques used in the late 1800's had a relatively light impact on the soil physical properties but as mechanical equipment became more available the intensity of impacts grew. Early horse logging concentrated on selecting specific trees and the percentage of the area disturbed was low. Extents of early tractor harvest techniques were small due to the predominance of select harvest techniques. By the 1960's and 1970's timber harvest activity affected a large proportion of a cutting unit (See Historical Activity). The yarding equipment was operated over larger areas when clear cutting became a common practice. An even greater impact on the soil was the practice of windrowing slash, which left little of the area undisturbed either as surface displacement or compaction. If equipment operated when the soils were moist, compaction could extend to depths of 12 inches (Froehlich, 1979, Wert and Thomas, 1981). Since almost 59 percent of the watershed is in the moist temperature/moisture groups G1, G3, G4, and G5 (49,808 acres) there is a high probability that compaction of these soils did occur. Most of the moist forest sites are also influenced by volcanic ash, which has greater increases in bulk density when compacted than nonash soils (Froehlich etal, 1985).

Amelioration of compaction can occur naturally if freeze-thaw and wet-dry cycles occur in the area. The cool to cold/moist temperature/moisture groups that cover nearly half of the watershed do not have a strong wet-dry cycle and in many years will not freeze in the winter due to the insulation of snow. Low clay soils like ash and granitic soils do not have the shrink-swell characteristics of soils with more clay so cannot respond to wet-dry cycles. This leaves small mammals and invertebrate activity and root growth as the main source of amelioration. Studies have shown natural amelioration to occur within 4.5 to 9 years to depths of 7.6 cm (approximately 3 in.) (Froehlich and McNabb, 1983, Froehlich etal, 1985). This may improve infiltration enough to prevent aggravated sheet and rill erosion but does not return water-holding capacity of lower layers to natural levels. Sheet and rill erosion models used in this analysis have incorporated the impacts of compaction on runoff potential. There has not been a comparable analysis of impacts on productive capacity. Compaction that occurred in the late 60's and early 70's could have an impact on fertility and productive capacity for many years due to low amelioration rates at depths. The use of mechanical treatments like subsoiling has been implemented in many harvest units. However, there has been no comprehensive inventory of compaction or any other physical disturbances related to management activities. In the future it is recommended that this type of data collection be made to determine the amount and extent of compaction or displacement and determine how significant this is to productivity or slope stability.

Disturbances that cause erosion and displacement can also have significant affects on soil fertility. Erosion rates associated with the inherent or historical range of variability can be accelerated if catastrophic fires occur which is outside that natural range. Timber harvest activity is also considered to increase soil loss to sheet and rill erosion. (See Current Erosion Section for Acreage Affected). This is often a short-term loss since revegetation occurs within 2 to 5 years (Dyrness, 1982). It may become long term if the site is marginal and a vegetation conversion occurs to a less protective cover. In both cases, it is the A horizon that is being lost to sheet and rill erosion and that is where most organic matter and nutrients occur (Meurisse etal, 1985). This loss of the A horizon to erosion has been enough to convert some alpine elk sedge communities to a forb type in the cold/dry temperature/moisture groups of the Elkhorn Mountains. Forested sites that lose litter to fire and the A horizon to erosion may take decades to recover the potential plant community in an area that would normally recover in less than 5 years (Swanson et al. 1989).

Chemical and Biological Properties

Nutrient availability may be more of a factor than nutrient loss in settings where microbial populations are essential to nutrient cycling. The temperature and moisture conditions needed to support microbes may be drastically changed by removing plants and the A-horizon.

Displacement, compaction and burning may all have similar impacts on regeneration due to impacts on the habitat of microbes. Displacement may bury an A horizon and remove it from the food, light, water and temperatures associated with the surface horizon. Compaction may limit movement and prevent vertical migration that occurs as microbes respond to daily and seasonal climatic fluctuations at the surface. Burning, if hot enough, can kill microbes with high temperatures and then prevent their reestablishment due to oxidation of their food and removal of the insulating qualities of the duff layer. These impacts on microbe habitat are expressed most where climatic extremes occur. Cold sites associated with the subalpine fir zone account for about 0.6 percent of the watershed while frost pockets in basins with the lodgepole pine members of the grand fir groups will add more to the sites where temperature is expected to have an influence on microbes.

Quantitative measurement of these types regarding how management disturbances affect fertility is only in the beginning stages. We can predict where some loss of fertility has probably occurred due to knowledge of where particular types of harvest systems and other management activities have occurred. It is recommended that these types of disturbances be inventoried to determine just where and how much of the inherent soil fertility has been changed.

SOCIAL ASSESSMENT-UNION COUNTY

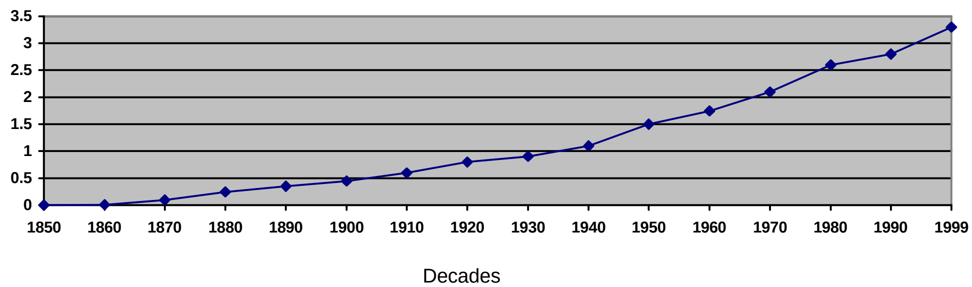
COUNTY POPULATION

COUNTY POPULATION

Historic (U.S. Census 1850-1990):

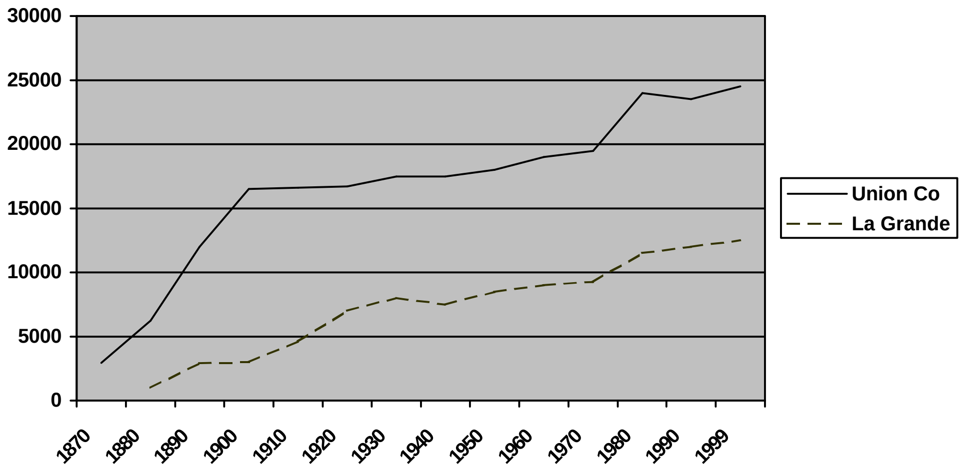
The total population of the State of Oregon has slowly grown since its inception as a state in 1859. From that time until just after the end of World War II, a period of approximately 100 years, the state grew from essentially zero to slightly more than 1.5 million. In the next forty years it surged to approximately 2.8 million, almost doubling (see Figure 3-3). Over time, the overall proportions of the population have steadily shifted from rural to urban. The metropolitan areas of Oregon now account for the bulk of the state's growth and this trend is expected to continue on into the future with an estimated eight or nine out of every 10 people living west of the Cascade Mountain range by the turn of the century.

Figure 3-3
Oregon State Population Growth
(in Millions/Decade)



Unlike the slow and steady growth pattern of the state-at-large, Union County had an explosive growth from the earliest period of its settlement until the turn of the century. This is an obvious reflection of the gold boom that occurred during this time. Then, for the next seventy years, the population slowly grew, growing from approximately 16,000 to 19,000, an almost ZPG (Zero Population Growth) pattern. This creep in the population number probably reflects the overall disinterest in the rural, lightly populated areas of the state by the dense Willamette Valley population clusters. Then, in the census of 1980, one can see a sudden burst in population growth in the county with the beginnings of an potential decline by the 1990 census. This decline may be a reflection of the several recessions that were felt in this part of the state during the 1980's. The city of La Grande, in contrast to the county, shows a rather steady growth curve (see Figure 3-4).

Figure 3-4
Population Growth – Union County and La Grande



The tendency toward urbanization so predominant on the west side of the Cascade Mountain range may also be seen in Union County. Through time, more and more of the county's total population has gravitated to La Grande with the result that, today, La Grande accounts for approximately 50% of the total population living in Union County.

The steady growth in Union County and the urbanization of the total county population seems to indicate that Union County, and especially the city of La Grande, is becoming a service center for the surrounding region of Eastern Oregon. This may be seen in Figures 3-5 and 3-6. Whether one looks at total labor force figures (Figure 3-5) or labor force as a percentage of the total labor force (Figure 3-3), one fact becomes rather apparent. The traditional economic base of the county, established during the early formative years of the county, 1860-1900, agriculture, forestry, and mining, are, based upon 1980 and 1990 Census data (2000 data is not yet available), minority factors in the overall labor force for the county. As can be seen, wholesale, retail, and services make up the bulk of the total labor force in the county, which tends to agree with the concept of the city of La Grande functioning as a service center for the larger region of Eastern Oregon. Adding these three sectors together we can see that in 1980 they accounted for 53.8% of the total labor force, growing to 55% in the 1990 census. By contrast, in 1940, farming activities generated 27% of the jobs. By 1990, it had dwindled to 6.3%.

Figure 3-5
Total Labor Force Employed
Union County – 1980 & 1990

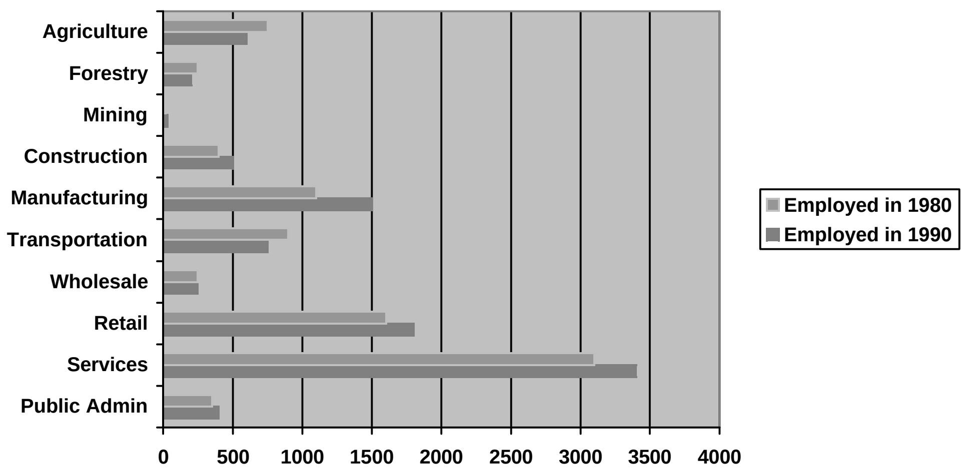
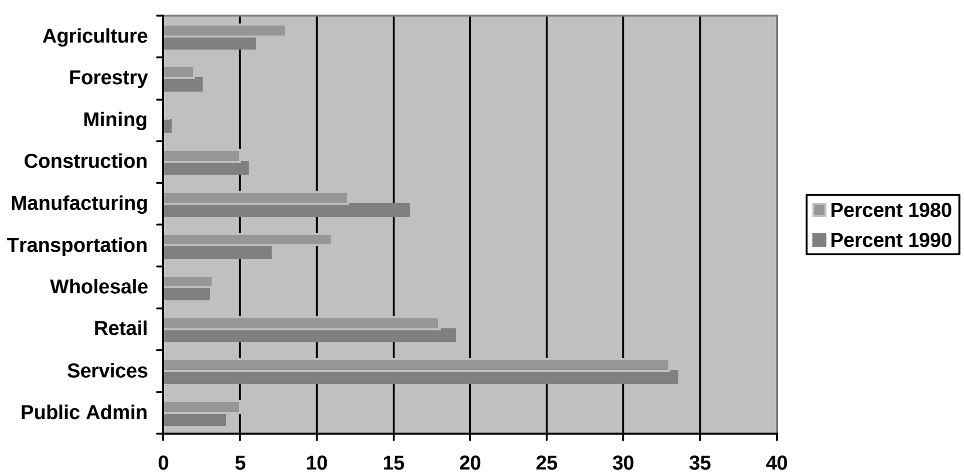


Figure 3-6
Percent Labor Force Employed
Union County – 1980 & 1990



Management Implications for the Upper Grande Ronde drainage:

With urbanization of the population, at both the state and county levels, the way the public lands are perceived changes. As the population becomes more and more engaged in economic activities further and further removed from the physical acts of agriculture, forestry, or mining, the attitude towards these activities shifts, from one of extraction to one of interaction. In terms of watershed management, future activity must take these probable value shifts into consideration. A heavy explanatory focus upon ancestral economic activities may well fall upon deafened ears and opinions that have a different focus as to what the "proper" direction for watershed management "ought" to be.

AGE DISTRIBUTION AND MEDIAN AGE

Historic (U.S. Census 1970-2000):

An inspection of the Census data for the years 1970 to 1990 for Union County raises an interesting demographic trend. In 1970, 51% of the population was female, in 1980, 50.2% female, in 2000, 51.3% female. Indicating a slight increase across the census periods. Of the entire Union County population in 1970, 32.1% were under 18 with 12.0% over 65. In 1980, 33.6% were under 18 years and 12.0% over 65. In 2000, 24.6% were under 18 and 25.0% over 65. This seems to indicate a shift in the direction of an increasingly older resident population relatively recently. The median age for the county population was 28.5 in 1970, 29.4 in 1980 and 37.7 in 2000. The State of Oregon median age in 1970 was 29.7, in 1980 30.9, and in 2000 was 36.3. While the state/county 2000 figure are fairly close, the previous years indicated that the county was slightly younger than the state-at-large. Thus, the median age shift from 1970 to 2000 for the county is rather dramatic, and shows a sharp increase toward an older overall population.

Management Implications for the Upper Grande Ronde drainage (including Meadow Creek):

A population that has a slightly older median age may well be one that is less likely to be interested in generic pronouncements and be somewhat more critical in their opinions and desires. As with the increasing urbanization, the increasing median age may well indicate that the kind of focus the population will bring to bear upon management activities in the watershed will be different than in the past.

ECONOMIC BASE

Historic (Dicken and Dicken 1979, 1982; Eastern Oregon Development Council 1975; Union County Overall Economic Development Program 1977):

Union County is a rural area that is, in microcosm, following the general trend of the greater United States in moving away from its rural roots in terms of development, occupation, and world view. As noted earlier, the labor force has become increasingly less directly involved in the original triumvirate: agriculture, forestry, and mining.

The areal distribution of logging operations in the state changed over time with a general increase in eastern Oregon and a slight decline in the west. In 1951 western Oregon had 85% and eastern Oregon 15% of the timber cut. By 1976, western Oregon dropped to 76% with the eastern counties increasing to 24%. In Union County commercial forest lands cover 57% of the county with only 35% of these lands being private. However, these private lands tend to be more productive due to a combination of low elevation and easier access. But it wasn't until 1960, in Oregon, that a greater percentage of the log production came from public lands rather than from the private lands. The average timber cut in Union County for the years 1951-1953 was 44 mmbf. By the time period 1971-1973, it had jumped to an average of 121 mmbf.

By 1975, it became apparent that harvesting in the west side of the state was becoming critical. It was estimated, that on industry lands, in 1975, the growth rate was 1.75 billion board feet per year, yet the harvest rate was 8.90 billion board feet a year. The jump in production figures for Union County suggest that this was a wide spread generalized approach on either side of the state.

Management Implications for the Upper Grande Ronde drainage (including Meadow Creek):

Past logging activities and approaches to those logging activities by public agencies may well be viewed in a negative light given the historical reality. Timber removal in the watershed will have to be carefully explained in order to overcome the negative emotional load from our immediate and not too distant past. As this watershed has had a large number of timber sales within its boundaries in the past, this will even become more and more necessary if we are to make a break between that past and the new ecosystem management approach.

TRANSPORTATION SYSTEM

Historic Activities

The transportation system in the Meadow Creek Watershed Analysis area began as roads, rather than trails, in the mid 1800's. By 1885, 114 miles existed. Road or railroad development continued slowly until about the 1950's. Most early road development was located in draw bottoms where logs could be skidded down hill and road construction was easier than on hillsides. Road locations progressed with technology and demand.

Initially the only road crossing, north to south, through the watershed area was the wagon track that ran from Umatilla Landing on the Columbia River to Granite, passing through the mining camp, Camp Carson, and called the Granite Creek Wagon Road on the 1882 GLO maps. This road was constructed in 1863, a precursor of several other road building projects through this area. In 1864 two other roads were built, both had junctions near the area where the Granite Creek Wagon Road crossed the Grande Ronde River.

One of these two roads, under military contract, was constructed down the Grande Ronde River to Hilgard where it connected with the Old Immigrant Road, after crossing the Grande Ronde River seventeen times. It was designed to redirect traffic around the reservation. The other road was a toll road, which headed south and east from this junction reconnecting with the Old Immigrant Road near where North Powder now stands. This was known as The Dealy Road. The Dealy Wagon Road Company advertised that this route was a full 25 miles shorter, which in those days probably meant at least saving one or more days travel.

The road pattern through this area remained essentially unchanged for at least 71 years as Metzer Maps for this same area, dated 1935, show the same roads with few additions.

However, by 1942, seven years later, a Forest Service map shows a proliferation of roads, especially true in the Meadow Creek Watershed (86). They appear to be mainly concentrated on private lands or lands that had been private but exchanged into the Forest Service holdings.

After the 1950's road construction increase proportionally with the increase of timber harvesting in watershed 86. The La Grande Ranger District harvested approximately 36 million board feet (MMBF) annually from the Upper Grande Ronde River and Meadow Creek watersheds (85 and 86 respectively), during the 1960's (Sater, personal communication). Throughout the 1980's, there was a major short term increase in harvested timber volume caused by the heavy taking of bug-killed salvage timber as well as the normal green tree harvest. Interestingly, the following annual volumes were reported for the mill at Perry during the splash dam era on the Grande Ronde River:

1898 -- 13 MMBF
1900 -- 18 MMBF
1901 -- 25 MMBF
1916 -- 50 MMBF.

The further development of roads in the area and on National Forests in general increased as the demand for forest products grew rapidly. Logging activities and technology has had the greatest influence on road construction, techniques, locations and densities. Initially use of horse and tractor logging required logs to be skidded down hill. Later use of short reach cable systems required roads to be built about 600 feet apart along the hillside and logs yarded up hill. Advancing technologies brought about long reach systems capable of yarding up to 3000 feet, this required roads to be built near ridge tops. Timber harvesting has been directly associated with road construction. In many manners roads can alter the timing, distribution and quality of water flow into streams and are believed to be a major contributor of human caused introduction of sediment into stream channels and or systems.

Until recently, road management practices did not address the removal (obliteration), of roads and associated infrastructure when replaced by other constructed roads. Many times this resulted in having drawbottom roads and repetitive hillside and ridge top roads leading to increased road densities and erosion potential. Abandoned roads were left to natural processes causing some areas of erosion and water quality degradation.

Erosion potential

Currently the Meadow Creek drainage and all of its tributaries are roaded right up to their headwalls. There are approximately 580 miles of open and closed roads on National Forest land located in the watershed 86 and about 140 miles of road on non-Wallowa-Whitman National Forest land within watershed 86 (See tables for detailed road information). Over 2000 miles of road have been inventoried on the La Grande District. From this inventory it was found that several items have a direct effect on erosion potential.

Location

Perhaps the key contributing cause of erosion and stream degradation is a road located in the drawbottom. Drawbottom roads were established early on due to ease of construction, poor equipment capabilities and construction techniques, and lack of understanding and forethought on stream systems. These roads were built in an earlier era, but remain today due to high quantities of these types of roads and the high costs of reconstruction. Mentioned earlier, these roads also remained due to the common practice of abandoning roads rather than rehabilitate them. The impacts on stream systems by these types of roads will be addressed in another part of this chapter.

Grades

Road grades of 0% to 4% had little erosion regardless of other conditions. Soft spots in the subgrade tend to rut or developed large chuckholes that hold water, but little soil leaves the road. Roads with grades of 5% -10% experience erosion dependant on a wide variety of factors. Road location, construction techniques, soil type, surface type and surface design all play an integral part in the level of erosion experienced by a road in this parameter. At the other extreme, road grades of 10% and greater showed sings of erosion regardless of soil type, surface type or condition, construction techniques and weather the road was closed to traffic or not.

The best means of controlling erosion on steeper grades in conjunction with surfacing is adequately spaced surface and ditch drainage structures such as culverts, rubber water diverters or waterbars, and when use allows, a heavy vegetative ground cover. Constructed road dips (reverse grade changes) can be effective reducing surface erosion, but like all techniques and practices require proper design, maintenance, and appropriate use. Of coursed controlling erosion on steeper road can also be accomplished by elimination of the road entirely.

Road inventories also demonstrated that soil types must be considered when designing seed mixes and rate of application to establish protective ground cover on fill and cut slopes and roadways and also determining spacing and type of drainage structures.

Surfacing

Surface type is a large factor in erosion potential ranging from native soils, the most erosive, to asphalt pavement, no surface erosion. Generally roads with surfacing tend to erode far less. The level varies widely, and can be directly correlated to the quality of surfacing. Paved surfacing has no surface erosion, but erosion can occur in ditches and on fill and cut slopes as with all surface types. Rock surfacing can be found in several forms and gradations that range from pit run to engineered crushed aggregate. Generally the less native soils and larger the particle size in road surface aggregate the less likelihood of erosion. That is why the crushed aggregate should be "engineered" to find an optimum mixture of crushed rock by size and distribution with existing sources. Proper surface design is a vital element in reducing erosion potential. The decision on when and how to surface a road is a complex function of project location, purpose, resources, and economics.

Contributing Activities

Any use of roads can contribute to erosion. The most detrimental time for use to occur is in the early spring, when soils are saturated by winter snows and spring rains. The road prisms are weak and very susceptible to rutting. This reduces the ability for crowns and other structures to function properly to eliminate long distances of uninterrupted surface runoff. Activities such as mushroom picking, wood–cutting, and general recreation traveling occur during this critical time frame. Through out the year normal traffic can case wear and tear on roads. Commercial timber harvesting also occurs through out the entire year, but this activity is administratively controlled to eliminate such damage. Commercial activities have declined and account for very little of current forest road traffic. Fall hunting seasons perhaps bring perhaps the largest influx of forest road traffic. This can also occur at a detrimental time frame due to fall rains and snow. Lower temperatures can be favorable although, causing the road prisms to freeze and cause less rutting and soil movement.

Road Maintenance and Management

Road maintenance performed routinely is by far one of the best practices to prevent surface erosion. This ensures that the road surface is repaired, aggregate is remixed and compacted, crowns re-established, and drainage structures are cleaned and functioning properly. Road maintenance was a required and essential part of all commercial logging activities. The commercial contracts provided for routine maintenance through deposits or actual performance. This allowed the Forest Service to maintain roads that were being used as part of commercial activities and continue maintenance by using deposits for force account or contracts. The declining commercial activities on National Forest lands forced a dramatic decrease in the need for roads while at the same time decreasing funding to provide for maintenance on roads that still are very much part of the forest landscape.

Road management plays a key role in reducing the negative effects that roads can cause. This may include road improvements when funding allows, weatherizing less used open roads, closing roads, weatherizing closed roads, seasonal use restrictions and lastly decommissioning of unneeded or problem roads. Past road management practices has been to protect wildlife, enhance the hunting experience. More recently road management practices on the La Grande Ranger District has been to reduce road densities through closure, decommissioning/obliteration or improve the existing long-term transportation network to reduce surface and other erosion.

Drainage inspection and maintenance is a vital part of every maintenance level. Virtually all monies received for level 1 maintenance is for drainage monitoring, maintenance and repair. Much of the money received for Level 2 is for the same thing. Surfacing maintenance on Level 2 roads is done when it is needed for drainage protection not for a smooth ride. Historically funding for Level 3, 4, and 5 roads has been inadequate and Level 1 and 2 funds have been used to make up the difference. One solution is to reduce the number of miles in the higher maintenance levels. This was attempted several years ago with the aid and support of the forest engineer. On the La Grande District it was determined no maintenance level should be reduced but there were roads that should be raised to a higher standard. The River Road (51) went from Level 4 to Level 5. The rest remained the same.

Decommissioning roads and taking them off the system eliminates all engineering funding and activities on that strip of ground. New construction funds would be required for the next entry.

Current situation

The past 140 years has see some 800 miles of road developed in the Meadow Creek watershed. Today, the development of roads has all but stopped, improvements come in the form of reconstruction, but the continued need for roads has remained. The need for road is still required for forest health management, whether it be harvesting, thinning or the multitude activities done for forest fuels reduction. Roads are also needed to maintain access for recreation users as well as protection. There is however a management conception that there is an over abundance of roads needed to carry out practices and allowing public and administrative access and that certain roads have a higher negative function rather than positive. Today road management is focused primarily upon deciding which roads need to remain open, level of maintenance or needed improvement, and which roads need to be eliminated and or relocated. In short most systems are managed under an interdisciplinary and multifunctional management plan which addresses all aspects of the transportation system.

Table 3-19 shows surface type, road miles designated as Open, Closed or Decommissioned, and location by Subwatershed. This table does not include state highways or county roads. These miles are located both on private and multiple federally owned lands.

<u>Maintenance Levels</u>

Maintenance Level 5 - High Degree of User Comfort – usually Asphalt surfacing
Maintenance Level 4 - Higher Degree of Maintenance than Maintenance Level 3, may include dust abatement, - surfacing can be Asphalt or Aggregate
Maintenance Level 3 - Suitable for Passenger Cars
Maintenance Level 2 - Suitable for high clearance vehicles
Maintenance Level 1 - Closed to vehicular traffic, minimum maintenance to protect resources/investment

<u>Surface Type</u>

"Asphalt" a surfacing composed of a combination of aggregates uniformly mixed and coated with asphalt cement.

"Aggregate" is crushed aggregate or gravel, also know as engineered crushed aggregate. This is imported processed material.

"Improved" is improved native material. This material may be imported material such as pit run or other select material.

"Native" is native material. This is the lack of any surfacing material. The running surface and sub-grade are of the same material.

<u>Other Status</u>

"Decommissioned" a road, which has been determined to no longer be needed in the National Forest Development Road System. Depending upon a variety of Treatment Levels, roads are returned to a more natural state and travel has been and will continue to be denied.

"Drawbottom" is a road that, for this report, is within 150 feet of the center line of a stream with a Stream Classification I-3. The miles represented are the accumulated miles of roads that fall within the buffer area, if it be continuous or intermittent.

Table 3-19 Meadow Creek Watershed Assessment and Road Analysis						
Surface Type Road Miles by Status and Subwatershed Only Forest Service Roads on National Forest land						
	All Existing Roads		**Decommissioned Miles**	**Drawbottom Roads**		**Decommissioned Drawbottom Miles**
Surface Type	**Open Miles**	**Closed miles**		**Open Miles**	**Closed miles**	
Subwatershed 86A						
Aggregate	2.61	-	-	.18	-	-
Improved	2.07	-	-	.15	-	-
Native	15.77	5.76	4.32	.72	.75	2.52
Subwatershed 86B						
Aggregate	11.79	1.43	-	.67	-	-
Improved	2.56	-	-	.14	-	-
Native	42.36	23.60	5.39	1.89	2.44	2.88
Subwatershed 86C						
Aggregate	3.15	-	-	-	-	-
Improved	12.53	.57	-	.28	-	-
Native	27.98	10.63	10.83	1.03	.62	5.30
Subwatershed 86D						
Aggregate	9.34	-	-	.37	-	-
Improved	7.49	-	-	2.23	-	-
Native	18.98	46.83	9.28	.74	1.62	1.52
Subwatershed 86E						
Aggregate	0.02	-	-	-	-	-
Improved	14.82	-	-	-	-	-
Native	-	5.13	20.89	.44	.1	3.5
Subwatershed 86F						
Aggregate	5.18			3.66	-	-
Improved	0.65	0.41	-	-	-	-
Native	19.68	27.03	22.11	2.34	1.05	6.4
Subwatershed 86G						
Aggregate	7.92	-	-	.26	-	-
Improved	9.76	-	-	2.01	-	-
Native	8.78	24.83	7.72	1.80	.88	3.62
Subwatershed 86H						
Aggregate	14.02	1.68	-	3.65	1.22	-
Improved	3.64	-	-	.29	-	-
Native	32.96	31.12	3.60	1.81	3.57	.09
Subwatershed 86I						
Aggregate	6.47	-	.19	.39	-	-
Improved	1.95	2.79	-	.37	.55	-
Native	17.98	30.84	8.97	.57	1.40	.54
Subwatershed 86J						
Aggregate	7.84	3.34	-	.67	.18	-
Improved	2.34	2.79	-	-	-	-
Native	16.74	26.42	6.08	.53	2.27	1.22
Watershed 86 Totals						
Aggregate	68.34	6.45	.19	9.85	1.40	-
Improved	57.81	6.56	-	5.47	.55	-
Native	201.23	232.19	99.19	11.87	14.70	27.59
Totals	327.38	245.20	99.38	27.19	16.65	27.59

Table 3-20 displays the open road densities in miles per square mile as they relate to the Forest Plan Management Areas and their density direction on a subwatershed level.

Table 3-20 Meadow Creek Watershed Assessment and Road Analysis

Subwatershed Road Densities by Management Area and Ownership Miles per Square Mile (mi/mi^2)

SWS	Management Area	Acres	Miles	Mi/Sq.Mi	Forest Plan Guidelines
86A	3	1,027	3.30	2.06	1.5
	14	3,681	16.96	2.95	Research
86B	1	2,461	15.16	3.94	2.5
	1W	1,547	11.83	4.90	1.5
	3	5,332	27.03	3.24	1.5
	15	561	1.77	2.02	None
	C4 (Umatilla)	78	0.96	7.93	1.5
86C	1	1,993	5.84	1.88	2.5
	3	1,229	6.94	3.61	1.5
	12	180	0	0	None
	14	3,581	30.85	5.51	Research
	15	1.2	.03	0	None
	C4 (Umatilla)	34	0	0	1.5
86D	1	8,454	27.83	2.11	2.5
	3	1,290	4.23	2.10	1.5
	14	63	.06	0.61	Research
	15	326	0	0	None
	C4 (Umatilla)	533	3.69	4.43	1.5
	C5 (Umatilla)	24	0	0	None
86E	1	265	.75	1.81	2.5
	3	4,236	14.04	2.12	1.5
	15	208	.05	0.15	None
86F	1	860	2.47	1.84	2.5
	3	4,645	18.94	2.61	1.5
	14	3,221	9.49	1.89	Research
86G	1	702	3.01	2.75	2.5
	14	6,897	23.18	2.15	Research
	15	52	.27	3.34	None
86H	1	5,710	26.76	3.0	2.5
	14	7,902	23.86	1.93	Research
	15	68	0	0	None
	16	33	0	0	Admin Site
86I	1	7,906	24.8	2.01	2.5
	15	132	.07	.34	None
	16	14	0	0	Admin Site
	E2 (Umatilla)	478	1.53	2.05	2.0
86J	1	6,964	22.64	2.08	2.5
	15	747	.16	0.14	None
	C3	5	.06	8.35	?
	C4	539	4.02	4.77	1.5
	E2	2	0.04	10.67	2.0

Many of the management areas do not appear to currently meet Forest Plan direction and the desired condition as displayed in the table above. This however, is not entirely true. Analysis of the figures used to arrive at these calculations indicates that while a subwatershed (1,000-5,000+ acre blocks) is an appropriate scale to look at open road densities, due to the dissected nature of the areas (due to ownership and subwatershed lines), many of the blocks analyzed are very small (less than 500 acres). The small size of these areas will skew the numbers to the high side and not give an adequate representation of the actual open road densities when considered at an appropriate scale. One main road that cannot be closed going through 25 acres of land will yield a very high open road density, when looked at on the landscape the area could be surrounded by very low densities. Therefore, site-specific project level open road density analyses must consider many factors and look at the broad landscape level. The table above, when appropriately analyzed, indicates that there are areas within the Meadow Creek watershed where there are opportunities for density reduction and designation of an appropriate long term access and travel management plan.

Table 3-21 shows subwatershed road densities in miles per square miles (mi/mi^2) by operating status and land ownership.

Table 3-21 Meadow Creek Watershed Assessment and Road Analysis

Subwatershed Road Densities by Status and Ownership
Miles per Square Mile (mi/mi^2)

	W-W National Forest Land			Private and Others	Densities On All Land in WS86	
SWS	Open	Closed	Total	P/O	Open	Total
86A	2.49	0.69	3.12	2.21	2.57	2.84
86B	2.80	1.23	4.03	3.20	2.85	3.92
86C	3.98	1.02	5.01	2.62	3.14	3.53
86D	2.40	3.15	5.56	3.44	2.85	4.65
86E	2.02	.70	2.72	2.93	2.15	2.75
86F	1.93	2.01	4.31	0.33	2.28	4.29
86G	2.21	2.07	4.28	0.48	2.17	4.19
86H	2.46	1.47	3.93	1.17	2.45	3.90
86I	1.92	2.45	4.64	4.31	2.17	4.48
86J	1.97	2.38	4.36	1.91	2.07	4.48
Total	2.57	1.87	4.43	2.67	2.60	3.95

Subwatershed 86A

Most roads within the sub watershed are either on private land or on the Starkey Experimental Forest. Roads shown closed may or may not be actually closed because of flat ground and the “Green Dot” closure system. Green Dot roads are closed to all users except researchers. If maximum use, which could be considered “non-use,” was agreed upon - say 1 vehicle per day, 2 vehicles per week, 5 vehicles per month or whatever is appropriate, then roads meeting that criteria could be considered close for calculating road densities. Otherwise, roads not physically closed should be calculated as open.

Subwatershed 86B

Sub Watershed 86B has received little road management attention in the past other than what it received through timber sale activities. Road closures by gates have met with considerable resistance from the public and some key holders. As an example, roads 2100410 and 2100530 were closed with gates but were found open every time they were checked. Most times these gates received varying degrees of vandalism but other times locks were left open hanging on the gate.

Roads 2100390 and 2100410 parallel both sides of Dark Canyon Creek. These are basically contour roads located well above the creek. It is tempting to consider them for road obliteration because they appear close together on a map and obliteration would reduce road densities. Fire and future logging access needs to be looked at closely before one or both of these roads are re-contoured.

Subwatershed 86C

Potential roadwork on National Forest lands is limited at the present time because most roads are on private property or in the Intensive Management Area of the Starkey Experimental Forest.

Subwatershed 86D

Considerable road management effort went into sub watershed 86D in the past. Timber sales and other activities may have changed what is shown on the transportation update map.

Subwatershed 86E and F

This sub watershed has received considerable road management attention over the years. It is important now to monitor what was accomplished and determine if additional work is needed. Like sub watershed 86E, 86F has had considerable road management activities but probably needs to be taken to the next level of rehabilitation.

Subwatershed 86G

Only a small area around Frog Heaven rock pit is outside the Starkey Experimental Forest elk fence. Road management is on going inside the fence.

Subwatershed 86H

Only the area within this sub watershed west of road 21 is being considered for additional road management at this time because everything east of road 21 is inside the elk study area.

Subwatershed 86I

Road 2114 was not developed from an overall transportation plan. From road 21 to 2114380 the road was built under the 1969 Waucup Timber Sale as a Long Term Maintenance Level 2. From there it grew in length by extensions into lodgepole units that were to be closed after use but weren't. Finally it tied into the old inadequate 2110220 that had never been successfully closed. Now a through route existed that had never been planned or designed for the type of traffic it was getting or the timing of that traffic.

Several attempts have been made to close 2114. They all failed. Gates were torn out, barricades removed, and by-pass roads built when barricades couldn't be removed by hand. Lands surrounding 2114 have been popular deer and elk hunting areas long before the first system road was built for logging. There is a section of private land in the middle of the area with access to 2114. It is used for a large hunting camp by the landowners.

Current Budgets

Current budgets allow these funds allocated each year for maintaining the Forest Service's Meadow Creek Transportation System.

Maintenance Levels	Annual Budget
All levels Operational Maintenance Level	$51,392 per year
All Levels Objective Maintenance	$44,194 per year

Deferred Maintenance Costs

In 2000 data was gathered to determine what the costs would be to maintain the Forest Service Roads system at the optimum level. This table reflects a much higher level of funding for maintenance than is currently available.

Maintenance Levels	Cost Per Mile
Maintenance Level 3	$23,087 per mile
Maintenance Level 2	$20,150 per mile
Maintenance Level 1	$2,869 per mile

After the system was brought to optimum levels the annual maintenance costs would be:

Maintenance Levels	Cost Per Mile	Number of Miles
Maintenance Level 3	$9,829 per mile	37.75
Maintenance Level 2	$3,453 per mile	289.5
Maintenance Level 1	$1,364 per mile	244
Decommissioned	$0	99.34

Current costs to decommission roads are as follows:

Closure: $350/mi
Wing Rip: $600/mi
Recontour: $2500/mi

RECREATION

ROS: Opportunities for recreation experiences can be described as the result of particular activities in particular settings. Settings refer to a combination of scenery, levels and types of other uses, recreation developments, roads, trails, and levels of regulation and risk. The Recreation Opportunity Spectrum (ROS) classifies settings on a spectrum from Primitive Recreation Opportunities to Urban Recreation Opportunities. Refer to FSM 2309 - ROS Handbook. Meadow Creek Watershed is managed for Roaded Modified ROS opportunities on 10,880 acre with the remainder of the acres in the watershed managed for Roaded Natural (ROS Map on file, La Grande Ranger District).

Visual corridors along Hwy 244, the entrance to Starkey Experimental Forest, and the viewshed from Frog Heaven Forest Camp should be managed for a Roaded Natural recreation setting. The La Grande Ranger District, the Wallowa-Whitman NF, and the National Forest has an over-abundance of Roaded Modified ROS opportunities. Supply of this recreation setting greatly exceeds demand. There is a shortage of Roaded Natural settings relative to supply on La Grande District.

Developed Sites

Frog Heaven Forest Camp is the only facility development in the watershed. It has minimally developed campsites with a single vault toilet.

Use

During late summer and fall the watershed is heavily used for hunting-related recreation. The use is dispersed throughout the watershed. At other times of the year, use levels are low. Dispersed camping, backcountry driving for pleasure, gathering forest products and scouting hunting camps are the primarily uses outside of hunting season.

Off Highway Vehicles are in the Meadow Creek watershed, particularly during hunting season. Except in areas with Area Closures, OHV riders are allowed to travel cross-country at will. They may use all roads closed to full sized vehicles. And they are allowed to create user-established trails from repeated use, so long as trees are not cut and soil is not excavated. A moderate level of OHV use is experienced during hunting season. Hunters use their machines to carry game, travel to remote locations, hunt, and herd game animals. During the spring and summer, OHV use is low. Most is associated with small game hunting, gathering plants, scouting firewood, accessing remote locations, driving cross country for pleasure, and trail riding on open and closed roads.

Most of Meadow Creek watershed is easily accessed from it's relatively high density of open and closed roads. It generally attracts a group of hunters that are not seeking a semi-primitive hunting experience. This group of hunters is less sensitive to management activities, roads and OHV noise, however minor conflicts between user groups have been recorded.

ADMINISTRATIVE SITES/FACILITIES

Starkey Experimental Forest and Range lies within Meadow Creek watershed. Interpretive opportunities associated with research projects are primarily available to pre-scheduled organized groups. The Experimental Forest is open to the public periodically for controlled hunts and dispersed recreation use.

THE BIOLOGICAL DIMENSION

OLD GROWTH and STRUCTURAL DIVERSITY

What are the structural stage acres by biophysical environment and how do they compare to the historic range of variability?

Reference Condition:

For the purpose of this watershed analysis, old growth habitat will be discussed in terms of Allocated Old Growth (Management Area 15) which is a land allocation in the Wallowa-Whitman LRMP, and late/old structure (multi-strata with large trees and single-strata with large trees) which are structural classifications used to implement direction in the Regional Forester's Forest Plan Amendment #2. Habitat meeting either definition should provide habitat for the old growth associated wildlife community (includes pileated woodpecker and marten), but the two terms have different administrative implications.

Late/Old Structural Habitat

To meet the direction of Forest Plan Amendment #2 concerning Historical Range of Variability (HRV), the amount of late and old structural habitat is analyzed and compared to an HRV standard established by the Forest for various biophysical environments (biogroups). Table 3-22 contains the biophysical groups used for the HRV analysis, and tables 3-23 and 24 show how the existing condition compares to the HRV for SSLT and MSLT structural stages.

Table 3-22: Acres by Biophysical Groups.

Biogroup	Acres	Definition
G1	541	Cold, Dry PIAL/TSME/ALBA2
G2	0	Cool Moist, Very Moist, Wet ABLA
G3	14,216	Cold, Dry ABGR
G4	10,752	Cool ABGR
G5	24,299	Warm ABGR
G6	2,578	Warm, Moist PSME
G7	6,539	Warm, Dry PSME, PIPO
G8	3,962	Hot, Dry Pipo
G9	1,017	Hot, Dry Juniper

Table 3-23: Multi-strata Large Trees Common Structure by Biophysical Group.
(The definition for multi-stratum with large trees common comes from "Recommended Definitions for New Structural Stages Per Amendment #2", 11/09/95)

Biophysical Group	Total Acres In Biogroup	MSLT (Existing)		HRV for MSLT	
		Acres	% of Biogroup	Range	Average
G1	541	75	14%	1-10%	10%
G2	0	0	0	5-25%	10%
G3	14,216	901	6%	30-60%	40%
G4	10,752	1018	9.5%	30-60%	40%
G5	24,299	2251	9.3%	5-25%	15%
G6	2,578	351	13.6%	10-30%	20%
G7	6,539	572	9%	5-25%	15%
G8	3,962	191	5%	2-20%	10%
G9	1,017	0	0	2-20%	15%

Table 3-24: Single-stratum, large trees common (SSLT).
(The definition of single-stratum with large trees common comes from "Recommended Definitions for New Structural Stages Per Amendment #2", 11/09/95)

Biophysical Group	Total Acres In Biogroup	SSLT (Existing)		HRV for SSLT	
		Acres	% of Biogroup	Range	Average
G1	541	0	0	1-10%	10%
G2	0	0	0	N/A	N/A
G3	14,216	0	0	N/A	N/A
G4	10,752	0	0	N/A	N/A
G5	24,299	0	0	15-55%	40%
G6	2,578	0	0	15-55%	25%
G7	6,539	0	0	15-55%	40%
G8	3,962	0	0	20-70%	55%
G9	1,017	0	0	20-70%	40%

Acreages in Tables 3-22, 3-23, and 3-24 are taken from the Meadow Creek Structural Stage GIS layer (EVEG data) through a query completed in April 2001. For the purpose of this analysis, late/old structure as defined by Charles Grier Johnson, Jr. (Blue Mts plant ecologist), is synonymous with Kevin O'Hara's single-stratum with large trees and multi-stratum with large trees structural stages. The following discussion on HRV is based on calculations from the entire watershed (forested acres), and is not divided by subwatershed or finer scales. The watershed is an appropriate scale to analyze HRV, and is meaningful in terms of landscape patterns as they relate to the distribution of wildlife habitat.

Approximately 8% of the forested area in this analysis area is in a late/old condition. The HRV for late/old habitat ranges from 1-70% depending on biophysical environment. Table 2 indicates deficiencies in MSLT structure in biogroups G3 and G4. Biogroups G5 – G8 are all within the lower end of the HRV for MSLT. Biogroup G1 appears to have a surplus of MSLT, but this group is poorly represented in the analysis area, and it would be of little utility to apply HRV standards to so few acres.

Table 3-24 shows that no SSLT exists in the watershed. However, the HRV for SSLT in biogroups G5 – G9 ranges from 15-70%.

The most abundant structural stages found in the analysis area are stand initiation and understory re-initiation. Understory re-initiation is typically comprised of a medium average diameter (approx. 12" dbh, smaller in lodgepole stands) overstory that is nearly occupying a site in terms of light, moisture and space. Small gaps in the canopy are allowing regeneration to establish, and shade tolerant species are coming in under the canopy. Development of this second layer is generally slow and susceptible to many insects, pathogens and disturbances since the trees are usually heavily stocked, and species that are more susceptible to insects and pathogens (eg. grand fir). These elements can lead to a stand structure that is not particularly diverse or capable of maintenance in the long term. However, understory re-initiation provides some valuable functions as wildlife habitat in the form of thermal and security cover for elk, hunting habitat for goshawk and other forest raptors, connective habitat between distant late/old patches, and habitat for some bird species that are common to the area (robin, flicker, nuthatches, junco, steller's jay, etc.). The majority of opportunities to move stands toward late/old structure exist in understory re-initiation stands.

Late/old structure stands occur in patches generally less than 50 acres in size. Late/old habitat is not well connected anywhere in the watershed, with many patches isolated by more than a mile from the next closest patch. The most abundant structural stage available to provide some level of connectivity between late/old patches is understory re-initiation. Due to the minor amounts of old growth and the small patch sizes, it is not practical to attempt to develop a connected network of old growth around the existing old growth component. A more meaningful approach would be to identify larger (400-600 acre minimum) patches of habitat and connective corridors that can be managed to provide these habitat values in the future.

Allocated Old Growth Areas (MA 15)- The Wallowa-Whitman LRMP allocates 36,750 acres of old-growth forest stands across the Forest to provide habitat for wildlife species that are dependent on old-growth habitat for all or part of their habitat requirements. Specific stands were identified under this direction (Old Growth Forest Stands Map, on file, La Grande Ranger District). These allocated old-growth stands were surveyed in 1993 and 1994 to determine their quality as old-growth wildlife habitat. A rating system was used to evaluate each stand for habitat suitability; the field ratings (Table 3-25) are expressed in terms of a percent of the maximum score possible (131 points) for each stand. For example, if a stand scored 80 points, the field rating in table 3-25 would be 61%. All the allocated stands within the Meadow Creek watershed have been surveyed. Some stands have substantial portions in natural openings (grass and rock), which are included in the acreage for each stand.

There are twelve allocated old growth areas within the Meadow Creek watershed totaling 2,077 acres. Surveys revealed a lack of quality old-growth habitat in these allocated stands. From general field observation, stands with a rating of greater than 70% appeared to provide suitable old-growth habitat. Only one of the 12 allocated stands in the Meadow Creek drainage was rated above 70%. Scores range from a low of 33.9% to a high of 71.9%. Seven stands rated less than 60%, and five stands rated less than 50%. Habitat components that are commonly lacking include: large live trees, large snags, and large logs.

Table 3-25: Field Ratings Of Forest Plan Allocated Old Growth Stands In the Meadow Creek Subwatersheds				
Stand Name	***Stand Number***	***Acres***	***SWS***	***Field Rating (%)***
Little Dark Canyon	109	547	86B	45.2
McCoy	108	324	86D	53.0
Pickle	126	208	86E	33.9
Frog Heaven 1	118	121	86G/H	62.0
Waucup 2	116	31	86I	42.4
Waucup 3	101	88	86I	47.5
McClellan 1	106	26	86J	42.7
McClellan 2	107	12	86J	62.9
Meadow Creek	103	184	86J	51.1
Meadow Creek 1	105	70	86J	65.0
Meadow Creek 2	104	199	86J	71.9
Meadow Creek 3	102	267	86J	63.9
Total		**2077**		

Some stands are too small to be considered quality old-growth habitat. The combination of small patch size and deficiencies in several habitat components result in marginal to poor habitat quality in these allocated old growth areas. Currently, five allocated old-growth stands are less than 75 acres; three stands are less than 40 acres. Another parameter that may be limiting the value of the allocated old-growth stands is edge-to-area ratio. Some of the stands are very linear in nature, which decreases the habitat suitability for some species that avoid or are adversely affected by edges.

In the recent past, many allocated old-growth stands have been affected by defoliating insects (spruce budworm and Douglas-fir tussock moth). This has resulted in varying levels of tree mortality. In some cases the overstory Douglas-fir and grand fir trees experienced heavy mortality. Although this would provide an abundance of large snags, the overall result is a lower rating because of the lack of large live trees.

Options for replacing these allocated old growth areas with more suitable stands elsewhere do not exist. Preparatory silvicultural treatments and time are required to develop an old growth network that meets the needs of the old growth associated wildlife community.

Interpretation

There is a deficit of old growth habitat relative to the HRV. Additionally, the existing old growth habitat occurs in small patch sizes and is severely fragmented in this watershed. The fragmentation is a result of natural land types and past logging. Much of the existing old growth habitat is also deficient in one or more important component (large snags, logs or green trees) which further contributes to marginal habitat conditions at the stand scale. This watershed is likely incapable of supporting or sustaining viable wildlife populations that depend on contiguous old growth habitat. These poor habitat conditions may lead to population instability or local extirpation of some species (eg. American marten, pileated woodpecker, white-headed woodpecker).

The Forest Plan indicates a management area size of at least 300 acres of old growth to meet the minimum requirements of old growth dependent species. Pileated woodpeckers (a management indicator species) require old growth; recent research indicates that 300 acres of old growth is not adequate to sustain breeding pairs of pileated woodpeckers (Bull and Holthausen 1993). Most of the allocated old-growth areas in this watershed do not meet the 300 acre criteria, thus are not providing habitat as assumed in the LRMP.

Small scale disturbances (wind events, small lightning caused fires, and insect outbreaks) are inherent to old growth habitat in this watershed when fire performs a maintenance function as it did before the fire suppression era. Theoretically, the HRV for old growth habitat could be achieved in approximately 100 years if nearly all the understory reinitiation stands were to develop into old growth, and all of the existing old growth is maintained. The effects of logging and insect epidemics preclude this area from attaining HRV for old growth sooner than 100 years. There are opportunities to accelerate development of stands to gain some older structural characteristics, and initiate an upward trend of old structural characteristics in the watershed.

Snags and Down Woody Habitat - Snags and down wood are important components of old growth habitat. Past harvest activities have reduced snag and large down wood levels. Conversely, the effect of defoliating insects has resulted in varying levels of tree mortality. In some stands, the majority of the overstory Douglas-fir and grand fir experienced heavy mortality. These stands may provide an abundance of snags in the short-term, but a shortage of live trees limits snag recruitment in the future. Snag and down wood estimates are based on cursory surveys of timber sale areas. Estimates indicate that snag levels in past timber sale units are below current standards that are intended to provide habitat at the 100% potential population level for primary cavity excavators.

Guidelines for logs and snags require that green trees of adequate size be retained in harvest units to provide replacements for snags and logs through time. Generally, green tree replacements (GTRs) need to be retained at a rate of 25 to 45 trees per acre, depending on biophysical environment. Stands exhibiting high levels of tree mortality may not contain 25 to 45 trees per acre to satisfy GTR requirements.

STRUCTURAL DIVERSITY

What is the departure from the historic range of variability within each biophysical group?

Historic/Current

Historic Range of Variation (HRV) refers to composition, structure, and dynamics of ecosystems before the influence of European settlers. The rationale for this approach is, in part, that species have adapted to habitat and disturbance conditions of previous millennia, and increased departure from those conditions is likely to result in increased risk of species loss and other undesirable ecological change (Swanson et al, 1994). Understanding the processes that helped form the composition and structure of the landscape can provide a basis for designing management prescriptions (Swanson et al, 1994). Prescriptions may deviate from HRV when society dictates that change or when questions of sustainability of uses override it. The Historic Range of Variability by structural stages table in the Structural Diversity section of the Biological Dimension shows the current acres and percentages for each structural stage by biophysical group.

Structural Stage breakdown by Watershed and Subwatersheds.

Historic Range of variation (HRV) analysis was used to assess landscape diversity. Within each biophysical group is a variation of structure reflecting stages of individual stand development. To evaluate existing and historic landscape diversity, plant associations are grouped along similar temperature/moisture and disturbance regimes termed as biophysical environments. The amount of area in each structural stage within each biophysical environment forms the basis for analysis of landscape diversity. The amount of area that historically occurred within each stage and within each group has been estimated for range and an average. The estimated historic ranges within each structural stage reflect normal fluctuations of vegetative patterns prior to fire exclusion and timber management. Forested stands were classified into the following structural stages based on the methodology in Regional Forester's Forest Plan Amendment No. 2. Large trees and whether or not their occurrence is “common” are defined by the Region Six Interim Old Growth Definitions, June 1993. Structural Stages are defined in the chart below.

HISTORIC RANGE

Historic Ranges of Variability by Structural Stages (H= % Historic C= % Current D= %Difference)

Biophysical Environment	Stand Initiation			SEOC			SECC			UR			MS w/o LT			MSLT			SSLT		
	H	C	D	H	C	D	H	C	D	H	C	D	H	C	D	H	C	D	H	C	D
G1-Cold & Cool/Dry (Average)	1-63 (5)	63	+58	0	0	0	5-25 (10)	0	-10	5-25 (15)	22	+7	50-70 (60)	0	-60	1-10 (5)	14	+9	1-10 (5)	0	-5
G2-Cool & Moist/Wet (Average)	1-10 (5)	0	0	0	0	0	5-25 (10)	0	0	5-25 (15)	0	0	50-70 (60)	0	0	5-25 (5)	0	0	0	0	0
G3- Cold, Dry (Average)	1-5 (5)	26	+25	0	0	0	5-25 (5)	0	-5	5-25 (15)	50	+35	20-50 (35)	7	-28	30-60 (40)	6	-34	0	0	0
G4-Cool & Dry/Moist/ Wet (Average)	1-10 (5)	37.5	+32	0	1.5	+1.5	5-25 (5)	0	-5	5-25 (20)	41	+21	20-50 (30)	9	-21	30-60 (40)	6	-34	0	0	0
G5-Warm & Dry/Moist (Average)	1-10 (10)	30.5	+19.5	5-20 (10)	1	-9	1-10 (5)	0	-5	1-10 (5)	51.1	46.1	5-25 (15)	4.5	-10.5	5-25 (15)	9.3	-5.7	15-55 (40)	0	-40
G6- Warm, Moist (Average)	1-15 (10)	1.6	-8	5-20 (10)	0	-10	1-10 (10)	0	-10	1-10 (5)	40.5	34.5	10-30 (20)	1.5	-18.5	10-30 (20)	13.6	-6.4	15-55 (25)	0	-25
G7- Warm, Dry (Average)	1-15 (10)	11	+1	5-20 (10)	0	-10	1-5 (5)	1	-4	1-10 (5)	65	+60	5-25 (15)	5	-10	5-25 (15)	9	-6	15-55 (40)	0	-40
G8- Hot & Dry/Moist (Average)	1-15 (15)	6	-9	5-25 (15)	1	-14	0	3	+3	0	42	+42	5-10 (5)	1	-4	2-15 (10)	5	-5	20-70 (55)	0	-55
G9- Hot Dry/Moist (Average)	5-15 (10)	5	-5	5-35 (25)	0	-25	0	0	0	0	0	0	5-20 (10)	0	-10	2-20 (15)	0	-15	20-70 (40)	0	-40

Biophysical Groups		Acres	Data Gap Acres
G1	Cold, Dry–Cool, Dry	541	8
G2	Cool, Moist-Cool, Wet	0	0
G3	Cold, Dry	14,216	1,476
G4	Cool, Dry-Cool, Moist-Cool, Wet	10,752	146
G5	Warm, Dry-Warm, Moist	24,299	770
G6	Warm, Moist	2,578	8
G7	Warm, Dry	6,359	574
G8	Hot, Dry-Hot, Moist	3,962	1,705
G9	Hot, Dry-Hot, Moist	1,017	968

Structural Codes	Structural Stage
SEOC	Stem Exclusion Open Canopy
SECC	Stem Exclusion Closed Canopy
UR	Understory Reinitiation
MS w/o LT	Multi-Stratum without Large Trees
MSLT	Multi-Stratum with Large Trees
SSLT	Single Stratum with Large Trees

Reference Stand Conditions and Definitions.

Stage	Definition
Stand Initiation	Growing space is reoccupied following a stand-replacing disturbance, typically by seral species.
Stem Exclusion Open Canopy	Occurrence of new stems is excluded (moisture limited). Crowns are open grown. Canopy is discontinuous. Frequent underburning or management can maintain this structure.
Stem Exclusion Closed Canopy	Occurrence of new stems is excluded (light or moisture limited). Crowns are closed and abrading .
Understory Reinitiation	A second cohort of trees is established under an older, typically seral species, overstory. Mortality in the overstory creates growing space for new trees in the understory. Large trees are uncommon.
Multistratum without large trees	Several cohorts of trees are established. Large trees are uncommon. Pole, small and medium sized trees dominate.
Multistratum with Large Trees Common	Several cohorts of trees are present. Large trees over 21" DBH are common.
Single stratum with Large Trees Common	A single stratum of large trees is present. Large trees are common. Young trees are absent or few in the understory. Park-like conditions may exist.

Measurements: Acres of departure within each structural stage is summarized below:

Structural Stage	Avg HRV acres	Existing Acres	Difference
Stand Initiation	5,314	16,629	+11,315
Stem Exclusion Open Canopy	4,190	476	-3,714
Stem Exclusion Closed Canopy	3,103	292	-2,811
Understory Reinitiation	6,034	30,939	+24,906
Multi stratum w/o large trees	13,968	3,446	-10,522
Multi stratum w/Large Trees common	15,732	5,360	-10,372
Single Stratum w/Large Trees common	15,621	0	-15,621

Interpretation

There is an obvious shortage of LOS stands due in large part to widespread insect epidemics (discussed in next section) and the Districts' Salvage Sale Program. The Single Stratum w/Large Trees structural stage is missing from the landscape due in large part to fire exclusion, fir encroachment, and past selective harvest. The stand initiation stage is far in excess of HRV due to the extent of regeneration cutting that took place between 1970 and 1992 (again primarily in response to insect epidemics). The Understory Reinitiation stage is far in excess of HRV due in large part to loss of large structure for reasons discussed above.

ELK AND DEER HABITAT EFFECTIVENESS

What is the quality of habitat for deer and elk?

Historic/Current

The Meadow Creek Watershed lies within the Starkey Game Management Unit (GMU), the units by which Oregon Department of Fish and Wildlife (ODFW) manage game animal populations. The Meadow Creek Watershed provides elk and mule deer habitat year round. The Forest Plan assumes that standards and guidelines for elk will suffice for deer as well. Studies at Starkey Experimental Forest and Range indicate that this assumption is invalid. The Watershed Assessment will only address elk habitat because appropriate standards and guidelines do not exist specifically for mule deer.

ODFW established the following management objectives (MOs) for elk in this GMU: 1) winter population of 5,300 and 2) bull:cow ratios of 10:100. The current population estimates meets the 5,300 MOs and bull:cow ratios have been slightly below MOs for the past several years. The latest estimate in 2000 was 8:100 (Leonard Erickson, ODFW, pers. comm. 2001). Although MOs are being met, poor distribution over available habitat, poor calf recruitment, and low-branched bull numbers are potential problems in the Starkey GMU. Distribution concerns can usually be addressed through access management. Causes of low calf recruitment are being investigated and management actions to increase calf recruitment are unknown at this time.

National Forest Lands in the watershed (approximately 83,000 acres) are primarily summer-transition range with the exception of approximately 20,000 acres of winter range located in the western portion (McCarty Winter Range and the Dark Canyon area and primarily lies within subwatersheds B, E, and F). The 25,000-acre Starkey Experimental Forest and Range lies within the Meadow Creek watershed and is enclosed by an elk-proof fence that does not allow movement of elk or deer into or out of the experimental area.

BIG GAME COVER

Cover was analyzed using the Interior Northwest Landscape Analysis System (INLAS), which utilized aerial photo interpretation (1997 photos). The purpose of INLAS is to provide a suite of analytical tools that can consistently assess current, and project future conditions at the mid-scale for watersheds and subbasins under varying management scenarios. Field verification of photo interpretation has not been done.

John Cook (National Council of the Paper Industry for Air and Stream Improvement) recently completed a study testing the hypothesis "that the sheltering effect of thermal cover is of sufficient magnitude to enhance condition of elk". This study refutes the thermal cover hypothesis on the basis that the benefit of thermal cover is too small to be physiologically relevant. This study does not dispute elk's preference for dense forest stands or the numerous studies that show elk using dense stands disproportionately to their availability. It does however indicate that the benefit of thermal cover in terms of body condition and growth is so small that it may be negated by other environmental or adaptive factors. This study does not negate the information gathered in numerous observational studies illustrating elk's preference for dense forest cover. Cook's study tested one hypothesis that has generally been accepted as fact. Dense conifer cover contributes to better distribution of elk across available habitat. Legal requirements to follow Forest Plan standards and guidelines still apply.

Cover:Forage

A cover:forage ratio is best used to display the relative amounts of cover to forage. The optimal ratio of cover to forage is 40:60 for summer range (Thomas 1979). The existing cover:forage ratio in all the Meadow Creek Subwatersheds is below the 40% cover and above the 60% forage (Table 3-26). Subwatersheds I and J have poor cover:forage ratios and are deficient in marginal and satisfactory cover due to timber harvest and affects of defoliating insects. Cover effectiveness is compromised by unrestricted motorized access.

Thermal Cover

Forested stands with relatively closed canopies are assumed to function as thermal cover, reducing the difference between an animal's body temperature and ambient air temperature. Forest Plan direction for MA-1 (transitional range) says to maintain at least 30% of the forest acres within a project area as cover. Subwatersheds B, C, D, F, G, and J do not meet the Forest Plan minimum cover standard according to information derived from INLAS (Table 3-26). Field verification of canopy cover is needed in all subwatersheds.

Table 3-26. Elk cover from INLAS based on 1997 aerial photo interpretation. Optimum cover to forage ratio is 40:60. Percent cover includes marginal and satisfactory cover and is calculated based on forested plant communities; Forest Plan standards are 30% thermal cover.

Meadow Creek Subwatershed	Cover: Forage	Percent Thermal Cover
A	26:74	50
B	21:79	26
C	20:80	27
D	23:77	27
E	19:81	31
F	21:79	29
G	18:82	26
H	23:77	32
I	27:73	36
J	20:80	22
Desired Condition	40:60	30

Road Densities

Excessive road densities have deleterious effects on habitat effectiveness by taking land out of production (1 mile = 4 acres of land), reducing the effectiveness of cover and increasing disturbance to elk. The Forest Plan states that open road densities in MA-1 should not exceed 2.5 mi/mi^2. In MA-1W and MA-3 goals for the open road densities during the critical winter range use periods are 1.5 mi/mi^2. While the winter range within SWS B currently exceeds Forest Plan standards, the Forest Plan indicates that the winter range objectives can be adequately achieved if the area is closed by snow during the critical use period. Therefore the winter range road density level is not necessarily a year round objective. The Meadow Creek Watershed has an open road density of 2.60 mi/mi^2 (Table 3-27). In some low-snow years, open road densities exceed Forest Plan standards in winter range (MA-3, 1W). Standards in transitional range (MA-1) in subwatersheds B, G, and H are currently being exceeded.

It is likely that the 1.5 mi/mi^2 standard is being met within the McCarty Winter Range area closure, which lies within subwatersheds E and F.

Unregulated use of off-highway vehicles (OHVs) continues to have a deleterious effect on elk distribution. OHVs currently have access on 441 miles of road (includes open and closed roads except 60 miles of Level 3 roads and 78 miles of obliterated roads). In addition, OHVs are allowed to travel cross-country; therefore, with the relatively open and flat terrain in the Meadow Creek Watershed, OHVs have access to most areas except the McCarty Winter Range from December 15 through March 31.

Table 3-27. Road densities on National Forest Land by winter range (MA-3, 1W; 1.5 mi/sq mi) and transitional range (MA-1; 2.5 mi/sq mi) in the Meadow Creek Watershed.

Meadow Creek Subwatershed	Forest Density MA-3;1w (mi/mi^2)	Forest Density MA-1 (mi/mi^2)	Forest Density Total (mi/mi^2)
A	2.06	NA	2.77
B	3.24; 4.90	3.94	3.64
C	3.61	1.88	3.98
D	2.10	2.11	2.14
E	2.12	1.81	2.02
F	2.61	1.84	2.27
G	NA	2.75	2.20
H	NA	3.00	2.36
I	NA	2.01	1.98
J	NA	2.08	2.09

Although the LRMP focuses on road densities as an important variable in habitat effectiveness for elk, a recent study at the Starkey Experimental Forest found that road density is a poor indicator of habitat effectiveness, and that managers should not use road density as a measure of habitat quality for elk (Rowland, 2000). A more meaningful method of assessing habitat effectiveness is through a distance band analysis that assigns a habitat value to concentric bands on either side of roads and routes open to motorized vehicles. Optimum habitat conditions or an HE roads value of 1.0 is reached beyond 1.8 km from an open road. This is an analysis that should be completed within the Meadow Creek Watershed in conjunction with project planning.

THREATENED, ENDANGERED, AND SENSITIVE TERRESTRIAL VERTEBRATE SPECIES

What Threatened, Endangered, and Sensitive Terrestrial Vertebrate species occur within the watershed and what activities and processes are influencing them?

Table 3-28 displays the US Fish and Wildlife Service updated federally listed species 1-4-01-SP-855, June 1, 2001 for the Wallowa-Whitman National Forest and the Regional Forester's sensitive species list November 28, 2000.

Table 3-28: Threatened, Endangered, and Sensitive terrestrial vertebrate species known or suspected to occur in La Grande Ranger District.

Status	Species (scientific name)		Common Name
	Birds		
T	*Haliaeetus leucocephalus*	*	Northern bald eagle
S	*Podiceps auritus*		horned grebe
S	*Buteo reglais*	*	ferruginous hawk
S	*Bucephala albeola*		bufflehead
S	*Tympanuchus phasianellus columbianus*		Columbia sharp-tailed grouse
S	*Bartramia longicauda*	*	upland sandpiper
S	*Agelaius tricolor*		tricolored blackbird
S	*Tringa melanoleuca*		greater yellowlegs
S	*Falco peregrinus anatum*		peregrine falcon
S	*Empidonax wrightii*		gray flycatcher
S	*Dolichornyx oryzivorus*		bobolink

Status	Species (scientific name)		Common Name
	Mammals		
T	*Felix lynx canadensis*		North American lynx
S	*Gulo gulo luteus*		California wolverine
S	*Ovis canadensis canadensis*		Rocky Mountain bighorn sheep
S	*Martes pennanti*		Pacific fisher
S	*Euderma maculatum*	*	Spotted bat
	Amphibians		
S	*Rana pipiens*		Northern leopard frog
S	*Rana luteiventris*	*	Columbia spotted frog

(T) = USF&WS "Threatened";(E) = USF&WS "Endangered"; (S) = Forest Service Region 6 "Sensitive". * **=** Habitat or species exist in the Meadow Creek Watershed

NORTHERN BALD EAGLE
(*Haliaeetus leucocephalus*)

Status: Threatened

Bald eagles inhabit forested areas primarily near larger bodies of water including lakes and rivers (Peterson 1986). Eagles are protected by the 1940 Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and the Endangered Species Act of 1973 as amended.

The bald eagle uses a wide range of food items ranging from fish, small mammals and waterfowl to available carrion. Several studies have indicated the staple of their diet is fish (Peterson 1986, Rees 1990, Bent 1937) and can comprise as much as 70 to 90 percent of their diet.

Bald eagles prefer to nest in large dominant trees where they build their nests on large branches or forks of trees (Peterson 1986). Most nest trees are located close to water. Eagles prefer to nest in mature or old growth trees with an average height of about 100 feet. Many times these birds will also have one or more alternate nests (Bent 1937). Perch trees and sites adjacent to the nest tree are also important since the adult male may spend much of his daytime hours perched.

Current: Bald eagles are found in the Meadow Creek Watershed during winter, along the Grande Ronde River. Surveys for bald eagles have been conducted during winter along the Upper Grande Ronde River and Meadow Creek since 1988. Occasional bald eagle sightings are reported during winter, but the only documented winter roosting area is near Spring Creek.

PEREGRINE FALCON
(*Falco peregrinus*)

Status: R-6 Sensitive.

Peregrine falcons are associated with high mountain areas with steep cliffs, usually near water (Bent, 1937). Investigations have shown that the preferred nest sites are shear cliffs 75 feet or more in height with a small cave or overhanging ledge large enough to contain 3 or 4 full grown nestlings. Undisturbed, falcons will use the same eyrie for many years. The peregrine falcon is particularly sensitive to disturbances near their nest sites during the breeding season, which may cause them to abandon the entire territory. Another critical period is just prior to the young fledging. The post-fledgling period may last up to 30 days, during which the newly fledged young will frequent the nest site vicinity.

The falcon is opportunistic and largely preys on birds, such as pigeons, ducks, quail, grouse, flickers, jays, starlings, etc. Pigeon sized birds probably constitute the bulk of their diet (Bent, 1937). Occasionally, small mammals and insects will also be taken. These prey items are taken aerially above the forest canopy, water, or open grasslands.

The decline of peregrine falcon populations was tied primarily to the use of toxic pesticides during the 1960's and 1970's; use of these pesticides has now been banned.

Current: There are neither known peregrine nest sites nor suitable nesting habitat within the Meadow Creek Watershed.

CANADA LYNX
(*Felix lynx Canadensis*)

Status: Threatened

Species and Habitat Description: Lynx are typically associated with large contiguous tracts of boreal or coniferous forest in Alaska and Canada. They are also found in isolated higher elevation spruce, subalpine fir, and lodgepole pine forests in the western United States (Koehler and Brittel 1990). Habitat selection is associated with the habitat requirements of its primary prey, the snowshoe hare (Quinn and Parker 1987). In general, mixed conifer stands are often preferred by hares for cover and forage. Lodgepole pine is often a major component of this habitat, especially within it's early to mid-succession stages. Historic fire patterns played an important role in maintaining the habitat components for snowshoe hare and lynx (McCord and Cordoza 1982).

Deep snow and extreme cold are often associated with lynx habitat. Lynx and hares thrive under these conditions due to their physical adaptations to low temperatures and deep snow. Other important habitat needs for lynx include mature forest for denning and resting, and thickets for hunting (Koehler 1990). Primary denning areas are often in large hollow logs, beneath windfall or upturned roots, or in brush piles in dense thickets.

Inventories and Surveys: Lynx surveys conducted in 1998 on the Deschutes, Willamette and Mt. Hood National Forests allegedly detected lynx at five locations. This suggests that the species currently exists in central Oregon. Past population numbers on the Wallowa-Whitman National Forest are unknown, but there are a several historical records of sightings and trapped/shot specimens from NE Oregon. The most compelling evidence of lynx prior existence in northeast Oregon is the County Bounty Records. Bounty was paid on 80 lynx in Union County between 1909 and 1922. Adjacent Umatilla Country records show twenty lynx turned in for bounty from 1910 through 1922. These numbers do not reflect lynx sold in the fur market, killed and disposed of, or killed and used for personal use. It is conceivable that the lynx population in the Blue Mountains was hunted and trapped to near extinction, and compounded by habitat changes, has been unable to recover in this portion of its range.
Winter track survey routes were conducted on the Wallowa-Whitman National Forest from 1991 through 1994. Tracks and sightings have been documented, but presence has not been confirmed with physical evidence. It is unknown if lynx currently exist on the Forest. Hair snares were used to survey for lynx on the Wallowa-Whitman National Forest during the summers of 1999 and 2000 according to two protocols, one developed by the U.S. Fish and Wildlife Service and another by the U.S. Forest Service. No lynx were detected by these surveys.

Current: A lynx habitat model was developed for the Wallowa-Whitman National Forest that identified lynx habitat as either denning, forage, or unsuitable habitat (potential lynx habitat) and all other areas were classified as non-habitat (refer to Lynx Conservation Assessment and Strategy for habitat definitions). The Meadow Creek Watershed is classified as non-habitat for lynx.

SPOTTED BAT
(Euderma maculatum)

Status: R-6 Sensitive

The spotted bat is found in western North America from southern British Columbia (north to Fraser River basin near Williams Lake) south through eastern Oregon, Idaho, south-central Montana, western Colorado, central Wyoming western Nevada, California (Pierson and Rainey 1998), southwestern Arizona, central New Mexico, western Texas, and central Mexico (Queretaro) (Verts and Carraway 1998). The winter range is not known for this species; probably some migrate south for winter. At least for lower elevation locations, it appears not to migrate (WESTEC Services 1981). The spotted bat possibly occupies coniferous stands in summer and migrates to lower elevations in late summer/early fall (Berna 1990, Barbour and Davis 1969) and is present in southern British Columbia from at least May though August (Leonard and Fenton 1983).

The spotted bat is very rare, at least in collections; from 1891-1965 only 35 specimens were reported in the literature. Since then, this bat has been more commonly captured (but very low numbers).

Because of the lack of sufficient information, only speculations can be made about threats. Habitat destruction, such as construction of dams that inundate high cliffs and canyon walls, possibly is a threat (Snow 1974). The two highest threats to spotted bats appear to be collection of specimens by humans, and the use of pesticides that the bats may accumulate through their diet and that kill their prey. The spotted bat is tolerant of non-destructive intrusion. Fenton et al. (1983) found spotted bats active in recreational areas with high human activity.

Not much management can be done until more ecological information is available. However, Snow (1974) recommended the following: 1) determine the presence of the spotted bat by surveying likely habitat 2) establish and maintain waterholes in likely spotted bat habitat (it is well known that the bat will fly for several miles to find water, and a water hole will benefit many species), 3) support and cooperate in studies to determine more about the impacts by humans.

The spotted bat is relatively solitary but may hibernate in small clusters (Whitaker 1980). In British Columbia, bats roosted solitarily during active season; appeared to maintain exclusive foraging areas (Leonard and Fenton 1983); foraged up to 6-10 km from day roost each night (Wai-Ping and Fenton 1989).

The spotted bat is found in various habitats from desert to montane coniferous stands, including open ponderosa pine, pinyon-juniper woodland, canyon bottoms, open pasture, and hayfields. Speculation has been made that captures outside coniferous forests reflect post-breeding wandering (Snow 1974). In British Columbia, spotted bats foraged mainly in fields near pines and over marshes (Wai-Ping and Fenton 1989). They are locally common in various habitats (pinyon-juniper woodland, riparian corridors, over river) in canyons in northwestern Colorado (Navo et al. 1992). These bats roost in caves and in cracks and crevices in cliffs and canyons and can crawl with ease on both horizontal and vertical surfaces (Snow 1974, van Zyll de Jong 1985); rests suspended by feet, with head down. In British Columbia, spotted bats used the same roost each night May-July, but not after early August (Wai-Ping and Fenton 1989). Their winter habits are poorly understood.

Handley (1959) found that spotted bats were found primarily on open or scrub country. Of 22 occurrences, 13 were around houses. He suggested that since most were found in strange situations, departures were made from normal habitat in response to a stimulus of rather frequent occurrence. Handley felt that an explanation for the paucity of collections in natural situations is due to the bat's narrow habitat tolerance (Snow 1974).

In Garfield County, Utah, Easterla captured a spotted bat in an area that was treeless and rolling for several miles around the site and also surrounded by mountainous terrain. The predominant plant species were sagebrush and rabbitbrush. In the mountainous terrain, the predominant plant was ponderosa pine. In Utah bats were captured over a waterhole near limestone cliffs with cracks (Snow 1974).

In the Big Bend National Park in Texas, the spotted bat was captured near the only water source (a permanent pool) in many square miles. It was found in a shallow, barren, hot, dry canyon with walls of angled, buckled pink and red limestone. The predominant plant species were creosote bush, candelilla, Hechtia, century plant, blind prickly pear, and ocotillo (Snow 1974).
Many bats in New Mexico were caught over waterholes near a sandstone cliff with numerous vertical cracks.

In Wyoming, bats are associated with canyons, cliffs, and nearby permanent water (Priday and Luce 1999).

The spotted bat is insectivorous and hunts alone, and at least sometimes appears to maintain an exclusive foraging area (Leonard 1983). Neighboring bats show evidence of mutual avoidance and have been observed to turn away when encountering one another near the boundaries of their hunting areas. This mutual avoidance has been interpreted as a mechanism to avoid competition. When the neighbor is absent, an individual may show no hesitation in flying into an area avoided earlier. It is believed that a combination of the bat's echolocation call and conspicuous color pattern are used to maintain the spacing between bats (van Zyll de Jong 1985).

Current: Surveys have not been conducted specifically for this species on La Grande Ranger District. However, no spotted bats were captured during general mist netting efforts to sample bat populations in the early 1990's.

It is difficult to determine whether habitat exists in the analysis area since so little is known about habitat use by this species. The mention of ponderosa pine forests, rock features and permanent water indicate that limited potential habitat exists within the Meadow Creek Watershed.

Ferruginous Hawk
(*Buteo regalis*)

Status: Region-6 Sensitive

This species is a prairie buteo and nests in isolated trees or shrubs in large xeric or mesic meadows, open ridges, and grasslands. Ferruginous hawk populations have been recorded north of Enterprise, Oregon in the Zumult Prairie area. Other records include the Grande Ronde and Baker Valleys.

Impacts to ferruginous hawks can be avoided by limiting project activities within suitable nesting habitat areas. Raptor surveys were conducted during spring 1998 and 2001. Although no ferruginous hawks were identified, suitable habitat occurs within the Meadow Creek Watershed.

Upland Sandpiper
(*Bartramia longicauda*)

Status: Region-6 Sensitive

The upland sandpiper is a ground nesting bird found in open grasslands nesting in depressions on the ground. Habitat conditions range from sandy, sparsely vegetated flats to grassy bogs and forest openings; not found near water. The upland sandpiper conceals the nest by surrounding dry vegetation and their food sources are mainly insects found in vegetation and seeds from plants.
Meadow to forest ratio that best suits sandpipers is 75:25, with 60% grass, 25% forbs and the remainder in shrubs and other plant forms. Habitat essential for nesting and feeding for the upland sandpiper have two important factors. Primary nesting sites have moist meadow features with the potential of new grass and forbs capable of growing up around the nest for hiding cover from predators. Feeding sites require a diverse grass and forb species mix as in blue bunch wheatgrass, Idaho fescue, arrowleaf balsam root, lomatiums and other meadow and forest plants that provide for insect development for the high protein needs of upland sandpipers (H. Akenson 1996 survey results, on file at La Grande Ranger District).

Current: Upland sandpipers occur in Northeast Oregon from early May to late August. It's estimated that fewer than 100 individuals nest and summer in Oregon. Upland sandpipers usually occur in large, flat, expanses of open grasslands that range from 3,400 to 5,200 feet elevation. Soils are deep relative to adjacent areas and percent rock cover is low (0-20%). Grasslands are usually dominated by rushes, blue camas, biscuitroot, mule's ears, American bistort, senecio, and Idaho fescue (Akenson 1991). Upland sandpipers are usually observed within 100 meters of forested edges, or edges created by changes in grassland structure. Upland sandpipers have been observed at Campbell Springs (Starkey Experimental Forest) and Marley Creek (survey information 1991-1995 on file at La Grande Ranger District).

Columbia Spotted Frog
(*Rana luteiventris*)

Status: Sensitive Region-6

The range of the Columbia Spotted Frog *Rana luteiventris* extends from the extreme southwestern Yukon, through the Alaska panhandle and most of British Columbia. It extends southeast, through eastern Washington, Idaho, western Montana, eastern Oregon, and northwestern Wyoming (Corkran and Thoms 1996). In Oregon, the Columbia Spotted Frog is found in parts of the Cascade Mountains, and throughout areas of eastern Oregon (Nussbaum et al. 1983, Leonard et al. 1993).

Columbia Spotted Frogs are highly aquatic, inhabiting marshes and marshy edges of ponds, streams, and lakes (Munger 1997). In dry habitats, these frogs also use deep pools within the main portions of watercourses. They usually occur in slow moving waters with abundant emergent vegetation and a thick layer of dead and decaying vegetation on the bottom. Thick algal growth in overflow pools and backwaters of eastern Oregon creeks are used in the same way (Nussbaum et al. 1983).

Columbia Spotted Frogs are active in lowland habitats from February through October and hibernate in muddy bottoms near their breeding sites in winter. They are known to use cut banks, beaver dams, and pond bottoms as hibernacula (Munger 1997). Courtship and breeding takes place in warm, shallow margins of ponds or rivers or in temporary pools. Breeding occurs between February and March at lower elevations, but may occur as late as May or June at higher elevations (Leonard et al. 1993).

Female Columbia Spotted Frogs deposit their eggs on or immediately next to other egg masses (McAllister et al. 1993). The rounded masses are not attached to vegetation, but rest on the bottom in shallow water (Nussbaum et al. 1983). Eggs are laid in water that is usually less than 12 in deep and are usually half-exposed to direct air. Columbia Spotted Frogs use the same locations for egg laying in successive years (Nussbaum 1983, Leonard et al. 1993).

Adult Columbia Spotted Frogs are opportunistic feeders and feed primarily on invertebrates (Nussbaum et al. 1983). Larval frogs feed on aquatic algae and vascular plants, and scavenged plant and animal materials (Morris and Tanner 1969).

Mortality of frog populations is associated with natural factors such as predation, winterkill, and disease. Human impacts include altering habitat, introducing non-native fishes and other aquatic vertebrates, and introducing toxic chemicals into aquatic systems (Nussbaum et al. 1983, Leonard et al. 1993, Corkran and Thoms 1996). Some management practices, such as fire suppression and fish stocking, may have negative impacts on amphibians (Fellers and Drost 1992). Activities that increase water level fluctuations are detrimental, since egg masses of the Columbia Spotted Frog are usually laid in the shallow margins of water bodies, where they are susceptible to freezing or desiccation (McAllister and Leonard 1997).

Current: Spotted frog surveys were conducted along Meadow Creek in 1997 by PNW Research Lab. Three breeding sites were located near road 2110 and 2.5 miles upstream. Spotted frogs are highly aquatic with breeding sites in permanent water with warm, shallow areas.

FISHERIES

Where are the water quality and habitat condition NOT meeting the physical and biological requirement of TES fish species?

Current and Historic Condition

Spring/summer chinook salmon, steelhead, and redband trout are all present in the Meadow Creek Watershed. Spring/summer chinook salmon and summer steelhead are listed as threatened species under the Endangered Species Act. Redband trout are listed on the Forest Service Region Six Regional Forester Sensitive Species List.

Bull trout, which are listed as a threatened species under the Endangered Species Act, are not known to spawn or rear in the Meadow Creek Watershed (discussed in more detail below), although they are present in the adjacent Upper Grande Ronde Watershed.

Spring/Summer Chinook Salmon

The historic and present distribution of spring/summer chinook salmon in the Watershed is presented in Table 3-29 below. It is estimated that spring/summer chinook salmon historically utilized 13.9 miles of stream habitat in the Watershed for spawning and rearing. Chinook salmon no longer spawn in the watershed and rear only in the lower reaches. An occasional spring chinook juvenile has been observed to use habitat up to 10 miles upstream from the mouth of Meadow Creek. This use is considered very limited. It is estimated that existing populations of spring chinook salmon utilize 13.9 miles of stream less than they did historically for spawning and no longer occupy 5.2 miles of formerly occupied habitat in the Watershed.

In 1999 Pacific Northwest Research Station (PNW) personnel found 25 juvenile chinook rearing in the first approximately 0.6 miles of stream upstream from the mouth of Burnt Corral Creek and 12 juvenile chinook in the approximately 0.6 miles of stream upstream from the Forest Boundary (approximately 2.5 miles upstream from the mouth) in Dark Canyon Creek. Subsequent PNW sampling in 2000 found no chinook rearing in Burnt Corral or Dark Canyon Creeks.

Table 3-29 - Spring/summer chinook salmon habitat (historic and existing) within Forest Service subwatersheds in the Watershed.

MILES OF SPRING/SUMMER CHINOOK SALMON HABITAT							
		HISTORIC HABITAT			EXISTING HABITAT		
SWS	Primary Stream	Spawn & Rear	Rear Only	Total	Spawn & Rear	Rear Only	Total
86A	Meadow Creek	10.0	0.0	10.0	0.0	10.0	0.0
86B	Dark Canyon	0.0	2.5	2.5	0.0	2.5	2.5
86C	McCoy Creek	0.0	6.7	6.7	0.0	6.7	6.7
86D	McCoy Creek	0.0	0.0	0.0	0.0	0.0	0.0
86E	Marley Creek	0.0	0.0	0.0	0.0	0.0	0.0
86F	Burnt Corral	0.0	0.6	0.6	0.0	0.6	0.6
86G	Bear Creek	0.0	0.0	0.0	0.0	0.0	0.0
86H	Meadow Creek	3.9	3.9	7.8	0.0	3.8	3.8
86I	Waucup Creek	0.0	0.0	0.0	0.0	0.0	0.0
86J	Meadow Creek	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	**Meadow Creek Watershed**	**13.9**	**14.9**	**28.8**	**0.0**	**23.1**	**23.6**

Steelhead/Redband Trout

All historic steelhead and redband trout spawning and rearing habitat in the Watershed is currently available and utilized. Steelhead distribution is presented in Table 3-30 below. Both species are pervasive in the Watershed, potentially occupying all 145.5 miles of fish-bearing stream habitat. Spawning areas are widespread throughout the Watershed, with most observed spawning occurring in smaller headwater tributaries.

Table 3-30 - Steelhead distribution data within each Forest Service Watershed and subwatershed in the Watershed

Subwatershed	Primary Stream	Spawn and Rear (miles)
86A	Meadow Creek	15.1
86B	Dark Canyon	12.1
86C	McCoy Creek	21.9
86D	McCoy Creek	25.2
86E	Marley Creek	9.2
86F	Burnt Corral	12.2
86G	Bear Creek	13.7
86H	Meadow Creek	17.5
86I	Waucup Creek	9.6
86J	Meadow Creek	9.0
TOTAL	**Meadow Creek Watershed**	**145.5**

Bull Trout

There is no known historic or current evidence of bull trout populations occurring in the Watershed. The lack of historic population data and the extensive recent sampling that has shown no populations of bull trout in the watershed combined with the relatively low elevation (3,200-5,200 feet) of and high stream temperatures in the Watershed have lead to the determination that the watershed did not historically support substantial bull trout populations. Given the migratory nature of bull trout, the species may have used the Watershed as overwintering and/or rearing habitat on a limited basis. This speculation is supported by the fact that one 205 mm, adult bull trout was captured in a PNW rotary screw trap on 4/25/99 in McCoy Creek near the McCoy Creek/Meadow Creek confluence and that one 111 mm juvenile bull trout was captured in a rotary screw trap in 2000 in Meadow Creek, approximately three miles upstream from the confluence of Meadow Creek and the Grande Ronde River.

Water Quality and Habitat

Reference Condition

Historic data is lacking throughout Watershed 86. Riparian Management Objectives (RMOs) as defined in the National Marine Fisheries Service (1996) and U.S. Fish and Wildlife Service (1998) matrices are summarized in Table 3-31 below. Only those indicators with adequate data and/or considered critical to this analysis are included in this analysis. These matrices were developed specifically for summer steelhead (NMFS) and bull trout (FWS). These are the RMOs against which Table 3-31 is rated.

Reference Condition

Table 3-31: - Riparian Management Objectives for the Watershed (from NMFS 1996 and USFWS 1998).

Pathway and Indicators	Properly Functioning/ Functioning Appropriately	Functioning At Risk	Not Properly Functioning/ Functioning at Unacceptable Risk
Water quality:			
Temperature -spawning (Steelhead, Chinook)	50-57 F	57-60 degrees F (spawning)	>60 degrees F (spawning)
Temperature-spawning (Bull Trout)	7 day avg. max. temperature in a reach during the following life history stages: Incubation: 36-41°F (2-5°C) Rearing: 39-54°F (4-12°C) Spawning: 39-48°F (4-9°C) In addition, temperatures do not exceed 59°F (15°C) in areas used by adults during migration (no thermal barriers).	7 day avg. max. temperature in a reach during the following life history stages: Incubation: <36 or 43°F (<2 or 6°C) Rearing:<39 or 55-59°F (<4 or 13-15°C) Spawning: <39 or 50°F (<4 or 10°C) In addition, temperatures in areas used by adults during migration sometimes exceed 59°F (15°C).	7 day avg. max. temperature in a reach during the following life history stages: Incubation: <34 or >43°F (<1 or >6°C) Rearing: >59 °F (>15°C) Spawning: <39 or 50°F (<4 or >10°C) In addition, temperatures in areas used by adults during migration regularly exceed 59°F (15°C) (thermal barriers present.
Sediment/Turbidity	<12% fines, turbidity low	12-20% fines, turbidity moderate	>20% fines, turbidity high
Habitat Access:			
Physical Barriers	barriers allow passage	barriers restrict passage at low flows	barriers restrict passage at a range of flows

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Pathway and Indicators	Properly Functioning/ Functioning Appropriately	Functioning At Risk	Not Properly Functioning/ Functioning at Unacceptable Risk
Habitat Elements:			
Substrate Embeddedness	gravel/cobble dominant or embeddedness <20%	gravel/cobble subdominant or if dominant, embeddedness 20-30%	bedrock, sand, silt dominant, or if gravel/ cobble dominant, embeddedness >30%
Large Woody Debris	>20 pieces/mile >12" diameter and adequate recruitment	meets quantity, but lacks future source of wood	does not meet quantity, and lacks future source of wood
Pool Frequency *(see Steelhead/Chinook table)*	meets pool frequency standard and LWD standard for PFC	meets pool frequency standard but lacks future source of wood	does not meet pool frequency standard
Pool Frequency *(see Bull Trout table)*	pool frequency in a reach closely approximates table listed below. Additionally, pools must have good cover and cool water, with only minor reductions of volume by fine sediment.	pool frequency is similar to values in "functioning appropriately," but pools have inadequate cover/temperature, and/or there has been a moderate reduction of pool volume by fine sediment.	pool frequency is considerably lower than values desired for "functioning appropriately," also cover/temperature is inadequate, and there has been a major reduction of pool volume by fine sediment.
Pool Quality/Large Pools	pools > 1 meter deep with good cover and cool water, minor reduction in pools by sediment	few deep pools or inadequate cover/temperature, moderate reduction in pools by sediment	no deep pools and inadequate cover/temperature, major reduction in pools by sediment
Channel Condition and Dynamics: Flow/Hydrology:			
Drainage Network	zero or minimal increases due to roads	moderate increases due to roads (~5%)	high increases due to roads (20-25%)

Pathway and Indicators **Watershed Conditions:**	Properly Functioning/ Functioning Appropriately	Functioning At Risk	Not Properly Functioning/ Functioning at Unacceptable Risk
Road Density/Location *(Chinook/ Steelhead)*	<2 mi/mi^2, no valley bottom roads	2-3 mi/mi^2, some valley bottom roads	>3 mi/mi^2, many valley bottom roads
Road Density/Location *(Bull Trout)*	<1 mi./sq. mi., no valley bottom roads.	1 – 2.4 mi./sq. mi., some valley bottom roads.	>2.4 mi./sq. mi., many valley bottom roads

Steelhead Pool frequency RMO:

Channel width	Pools/Mile	Channel width	Pools/Mile
5	184	20	56
10	96	25	47
15	70	50	26

Bull Trout Pool Frequency RMO:

Channel width	Pools/Mile	Channel width	Pools/Mile
0-5	39	5-10	60
10-15	48	15-20	39
20-30	23	30-35	18
35-40	10	40-65	9
65-100	4		

Existing Condition and Interpretation

Water quality and stream habitat conditions are important for the maintenance of aquatic species utilizing those stream systems. The Oregon Department of Environmental Quality (ODEQ) publishes a list of "Water Quality Limited Streams" every two years. This list is developed pursuant to direction from the Clean Water Act section 303(d). The 1998 303(d) lists streams in the Watershed as summarized in Table 3-32 below.

Table 3-32 - Stream reaches listed on the DEQ 303(d)(1) List of Water Quality Limited Water Bodies in the UGRR Drainage

SWS	Stream	Reach Listed	Parameters
86 A,H, J	Meadow Creek	Mouth to headwaters	HM, S, T(s)
86 B	Dark Canyon	Mouth to headwaters	HM, S, T(s)
86 C	McIntyre Creek	Mouth to headwaters	HM, S
86 C,D	McCoy Creek	Mouth to headwaters	HM, S, T(s)
86 F	Burnt Corral Creek	Mouth to headwaters	T(s)
86 G	Bear Creek	Mouth to headwaters	T(s)
86 I	Waucup Creek	Mouth to headwaters	T(s)

Key: HM – Habitat Modification; S – Sediment; T(s) - Summer Temperature

The National Marine Fisheries Service (NMFS) (1996) and the U.S. Fish and Wildlife Service (USFWS) (1998) developed matrices of pathways and indicators for use in determining an environmental baseline during consultation on fish species listed under the Endangered Species Act. These matrices have been combined in Table 3-33 to summarize the habitat and water quality condition of the Watershed. Several of the matrix indicators are not analyzed here, as there is inadequate quantifiable data. More discussion on all pathways and indicators may be found in the Upper Grande Ronde Assessment Area Biological Assessment for Bull Trout, Summer Steelhead, Spring/Summer Chinook Salmon (on file at La Grande Ranger District). Table 3-32 displays the values against which each subwatershed is rated. Since there are no Bull trout in Meadow Creek, where appropriate the NMFS values will be used (i.e. road density).

Table 3-33 - Multi-species matrix: Comparison of existing condition and Riparian Management Objectives (RMOs) for the Meadow Creek Watershed, by Forest Service subwatershed.

Diagnostic or Pathway	Properly Functioning/ Functioning Appropriately	Functioning At Risk	Not Properly Functioning/ Functioning At Unacceptable Risk	Data Source
Water Quality:				
Temperature (spawning) *Bull Trout*			N/A	
Temperature (spawning) *S/S Chinook, Steelhead*			All	Dataloggers, point sampling, BPJ
Sediment/Turbidity /Embeddedness			All	BPJ
Habitat Access:				
Physical Barriers	All			Stream survey database; ODFW
Habitat Elements:				
Large Woody Material	86H	86A, J	86B-G, I	Stream survey, BPJ
Pool Frequency *(NMFS Values)*			All	Stream survey database and BPJ
Pool Quality/Large Pools			All	Stream survey
Watershed Conditions:				
Road Density/ Location/Drainage Network *(NMFS Values)*		86A, E	86B–D, F-J	Transportation Management System

NOTES:
***Temperature requirements differ for summer steelhead (SS) and bull trout (BT)**
BPJ - Best professional judgement of LAG District personnel based on field observations

Water Quality:

Temperature: Temperature is an important attribute of habitat quality for fish and often is a limiting factor for fish survival and productivity. Water temperature has over various years, been continuously recorded at 11 locations on NFS lands in Watershed 86. Water temperature data for Watershed 86 is summarized in the form of maximum weekly average temperature by site and year in Table 3-34 below.

Table 3-34 - Maximum Weekly Average Temperature (MWAT) data for the Meadow Creek Watershed

SWS	Location	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
86A	Meadow Creek near McIntyre Rd.	80.49	82.65	DC							
86B	Dark Canyon Creek	69.30	75.86	67.29	67.78	NP	75.20	DC			
86C	Lower McCoy Creek	57.58	79.66	R	DC						
86D	Upper McCoy Creek						61.74	*	DC		
86F	Burnt Corral Creek	68.29	71.48	*	NP	NP	NP	NP	NP	NP	NP
86F	Burnt Corral Creek @ 2444040 Road		68.44	59.75	69.52	DC					
86G	Bear Creek	70.63	*	NP	NP	NP	73.13	*	NP	NP	72.71
86H	Meadow Cr. Upper Gauging Station	75.48	79.31	S	S	S	S	S	S	S	S
86H	Meadow Cr. Above smolt trap	72.93	76.87	*	76.40	DC					
86I	Waucup Creek @ 21 road		75.24	71.92	R	NP	NP	*	NP	NP	75.24
86J	Meadow Creek @ Waucup Creek			72.76	DC						

Legend: * = error in data resulting in unusable information
NP = Not Placed that year
S = Sampled but data unavailable in usable form until summarization in 2001;
R = Removed
DC = site Disconnected
Bold =

The water quality standard for temperature as stated by the Oregon Department of Environmental Quality (ODEQ) is based on a maximum 7-day average that is not to exceed 64 degrees Fahrenheit in surface waters that contain spring/summer chinook salmon and/or steelhead and not to exceed 55 degrees Fahrenheit during times of spawning and incubation for these species (OAR 340-41). The OARs regulations state that management activities cannot increase water temperatures that already exceed 64 degrees. Temperature of surface waters located on Forest Service lands within the Meadow Creek Watershed exceeds the standard of 64 degrees at every monitoring site in the Watershed (although not in every year). This is attributable to high levels of solar radiation, high air temperatures, high width to depth ratios, and possibly a reduction in meadow and floodplain function.

Water temperature can be a limiting factor for aquatic species. Each species of fauna has a specific temperature regime in which optimum growth occurs. The importance of stream temperatures in Watershed 86 is focused mainly on the needs of the salmonid inhabitants. Unsuitable temperatures for salmonids can lead to disease outbreaks, altered timing of migration for anadromous species, and changes in the rate of maturation (Bjornn and Reiser 1991). Juvenile spring chinook salmon have a zero net growth rate when stream temperatures exceed 66.4 F and reduced growth rates between 58.6° and 66.4° F (Armour 1991). Temperatures exceeding 79°F may be lethal to juvenile spring chinook salmon (Bjornn and Reiser 1991). Scott and Crossman (1973) found this upper lethal threshold to be 77.2° F. Upstream migration of adult salmon may be curtailed when stream temperatures reach 70° F (Salo and Cundy 1987). Temperatures exceeding 60° F are lethal to incubating spring chinook salmon eggs (Reiser and Bjornn 1979). Bell (1986) found temperatures exceeding 75° F to be lethal to steelhead and 50 to 55.4° F to be their preferred temperature range. As shown in Table 3-34, critical temperatures are approached and often exceeded in the Meadow Creek Watershed.

Given the level of disturbance, the poor health of riparian vegetation (see "Where and how have management activities affected riparian function?" portion of this watershed analysis.), and the poor quality of aquatic habitat in the Watershed, temperatures are likely altered from historic values in the NFS portion of the Watershed. Where temperatures have been altered, they are assumed to be on an improving trend as a result of the relatively recent implementation of no harvest stream buffers and improved grazing practices in the Watershed. The failure of streams in the watershed to meet relevant summer temperature standards and the reduction of chinook habitat combined with the fact that summer water temperatures typically exceed the preferred temperatures ranges and sometimes exceed lethal limits for the TES fish present in the Watershed indicate that temperature, is not currently meeting the biological requirements of the TES fish populations in the Watershed.

Sediment/Turbidity/Embeddedness*:* Salmonids avoid migrating in waters with high suspended sediment loads (Bjornn and Reiser 1991), which can change timing of fish migrations, causing shifts in fish arrival times at spawning grounds. It can also affect timing of juvenile fish migration to the ocean. High levels of suspended sediment can affect the health of individual fish, impact habitat, reduce egg and fry survival, and reduce the productivity of fish populations.

No reliable data exists to quantify sediment, turbidity, or emeddedness in the Watershed or on a reach scale. Therefore, classification of this habitat parameter was determined based on the best professional judgment of LAG RD Fisheries Biologists and/or Hydrologists, using road density (shown in Table 3-35 below), road location, pool frequency, and pool quality as indicators for sediment, along with personal observations.

Table 3-35- Existing road lengths (miles) and densities (miles per square mile) for each Forest Service Watershed and subwatershed within the UGRR Drainage

		All Roads (Open and Closed)				Open Roads Only			Obliterated
SWS*	Area (mi2)	FS Roads (miles)	Non-FS Roads (miles)	Total Roads (miles)	Road Density (mi/mi2)	FS Roads (miles)	Total Roads (miles)	Open Rd Density (mi/mi2)	FS Roads (miles)
86A	20.1	26.1	26.3	52.4	2.6	20.4	46.7	2.3	4.3
86B	18.7	80.6	10.3	90.9	4.9	56.7	66.9	3.6	5.4
86C	28.9	57.7	43.6	101.3	3.5	46.5	90.1	3.1	11.4
86D	28.0	82.9	39.0	121.9	4.9	35.8	74.7	2.7	9.4
86E	8.7	20.0	3.8	23.8	2.7	14.9	18.7	2.1	21.2
86F	13.7	58.4	0.4	58.8	4.3	30.9	31.3	2.3	22.9
86G	12.3	51.3	0.2	51.5	4.2	26.5	26.7	2.2	7.7
86H	22.5	83.4	4.6	88.0	3.9	50.6	55.2	2.5	3.6
86I	14.6	59.8	5.0	64.8	4.4	26.2	31.2	2.1	9.1
86J	13.7	59.8	1.4	61.2	4.5	26.6	27.0	2.0	6.5
WS 86	**181.2**	**580.0**	**134.6**	**714.6**	**3.9**	**335.1**	**468.5**	**2.0**	**100.7**

***SWS – Subwatershed**

Road densities in all subwatersheds except 86A (Lower Meadow Creek), 86C (Lower McCoy Creek), and 86E are in the Not Properly Functioning/Functioning at Unacceptable Risk (NMFS values; see Table 3-33). Road densities (shown in Table 3-35 above) are 3.9 miles per square mile for the Meadow Creek Watershed as a whole. These densities in conjunction with the associated increases in drainage network and 147 miles of drawbottom road (roads within 100 feet of stream channels; see Transportation portion of this watershed analysis) places the Meadow Creek Watershed in the Not Properly Functioning/Functioning at Unacceptable Risk category for road density/location. This determination was made using both the NMFS and USFWS values. Roads are the primary contributors of sediment for most subwatersheds and soil erosion rates are directly related to the amount of unprotected and/or compacted soils that are exposed to rainfall or runoff (Chamberlin et al., 1991). It is assumed that the elevated road densities in the Meadow Creek Watershed have increased sediment input to streams in the Watershed over historic levels. This assumption is further supported by personal observations as well as the large decreases in overall pool frequency and the reduction in large pools in the watershed from 1941 to 1991 reported by McIntosh (1992) discussed in detail below.

All subwatersheds in the Watershed are rated as Not Properly Functioning/Functioning at Unacceptable Risk with regard to Sediment/Turbidity/Embeddedness.

Habitat Access

Physical Barriers: There are no known barriers to fish migration in the Watershed. This matrix indicator is rated as Properly Functioning for all subwatersheds in the Meadow Creek Watershed.

Habitat Elements: Habitat condition requirements vary somewhat among different fish species. However, information is not available for all habitat requirements for each species. The matrices developed by the National Marine Fisheries Service and the U.S. Fish and Wildlife Service summarize the important habitat elements for salmonids. Several of the matrix indicators are not analyzed here as there is inadequate quantifiable data. Determinations were based largely on the stream survey data (on file at La Grande Ranger District) summarized below in Table 3-36.

Table 1-36: Stream Survey Summary Data, 1989-1999, Meadow Creek Watershed

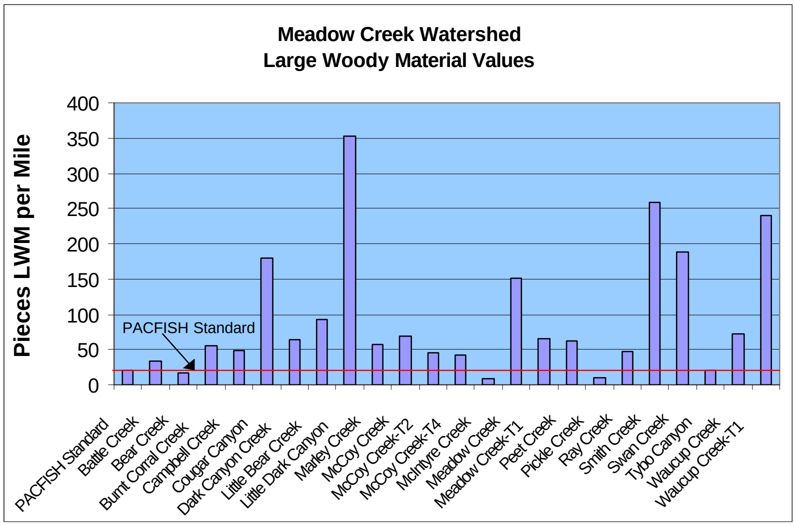
Stream Name	Surveyed Length (Miles)	Percent Area by Habitat Type			Pools/ Mile	Avg. Pool Depth (ft)	Mean Riffle Width (ft)	# Pieces of LWM
		Pool	Glide	Riffle				
Battle Creek	3.5	6	5	89	19	0.88	4.72	33
Bear Creek	5.4	20	0	80	51	0.68	7.45	17
Burnt Corral Creek	6.4	18	3	79	42	0.92	5.32	56
Campbell Creek	0.1	45	19	37	34	0.48	3.20	48
Cougar Canyon	1.6	13	11	76	31	0.74	4.10	180
Dark Canyon Creek	6.3	19	3	78	30	1.06	8.47	64
Little Bear Creek	2.4	6	0	94	12	0.90	4.97	93
Little Dark Canyon	4.9	7	10	83	17	1.04	6.93	353
Marley Creek	3.1	10	0	90	12	0.96	6.37	57
McCoy Creek	8.2	29	5	66	26	1.07	6.58	69
McCoy Creek-T2	1.9	9	5	86	25	0.74	3.62	46
McCoy Creek-T4	1.9	15	3	83	20	0.63	3.66	42
McIntyre Creek	2.9	6	0	94	14	0.92	4.17	8
Meadow Creek	7.2	27	51	21	19	1.74	7.36	152
Meadow Creek-T1	3.6	15	62	24	35	1.07	4.29	65
Peet Creek	0.4	10	59	31	9	1.48	1.91	63
Pickle Creek	1.2	20	0	80	25	0.93	2.10	10
Ray Creek	1.7	16	0	84	81	0.49	4.12	47
Smith Creek	0.8	32	2	66	74	0.70	3.67	258
Swan Creek	1.8	24	0	76	13	0.97	4.82	188
Tybo Canyon	4.4	7	0	93	15	0.88	6.51	20
Waucup Creek	6.6	8	39	53	16	1.36	8.69	73
Waucup Creek-T1	3.9	5	29	66	6	1.29	2.65	241

*Medium and large wood count as LWM toward RMOS.

Large Woody Material: All surveyed streams meet or exceed 20 pieces per mile, with the exceptions of Bear Creek, McIntyre Creek, and Pickle Creek. Personal experience has shown that a relatively pristine forested stream in the Blue Mountains typically has greater than 100 pieces of large wood per mile. Heavily disturbed forested streams in the Blue Mountains can often still meet the 20 piece per mile standard. Considering this, it appears that most fishbearing streams in the Meadow Creek Watershed are below potential for large woody material.

Future recruitment may be negatively affected due to past riparian harvests especially in subwatersheds 86B, 86D, and 86F where over 90% of the riparian areas have been harvested and 41-52% of this harvest was in the form of regeneration treatments (see Table 3-6). When analyzing RHCA stocking levels, it is apparent that future large woody material recruitment may be a problem due to the fact that less than one third of stands within RHCAs are adequately stocked in the watershed (values range from 10-29% by subwatershed) (see Table 3-7). Understocked stands may not produce enough trees, while overstocked stands may produce large numbers of trees that lack the size to adequately function from a hydrologic and/or fish habitat standpoint. Although it is estimated that future in-channel wood will meet the 20 pieces per mile standard over the long-term. Relatively recent implementation of no-harvest stream buffers on NFS lands (PACFISH) will serve to return move riparian areas toward historic conditions, which should in turn restore large woody material levels closer to potential in the watershed over the long-term.

Figure 3-7 – Summary of Large Woody Material Values for Surveyed Streams in the Meadow Creek Watershed



Pool Frequency: The number of pools per mile provides an indication of the quantity of habitat available for resting and feeding.

Portions of the Meadow Creek Watershed were surveyed in 1941 and resurveyed again in 1991 to assess changes in pool habitat and substrate conditions (McIntosh 1992). Survey results from McIntosh (1992) indicate that there has been a 52 percent decrease in total pools in Meadow Creek; and a 73 percent decrease in total pools in McCoy Creek. In addition to these documented decreases, it is believed that the pool habitat levels recorded in 1941 were already substantially reduced below natural levels due to historic activities that began in the early 1900's. These activities are related to the harvest of trees in riparian areas, increased sediment delivery from road construction, and long term effects of splash damming. This would indicate that Pool Frequency is Not Properly Functioning/Functioning at Unacceptable Risk for the entire Meadow Creek Watershed.

Table 3-37 displays the pool frequency values for the surveyed streams in the Watershed. None of the surveyed streams meet the matrix values for pool frequency. All subwatersheds in the Watershed are rated as Not Functioning Properly/Functioning at Unacceptable Risk for pool frequency.

Table 3-37 – Pool Frequency Values for Surveyed Streams in the Watershed

Stream	SWS*	Average Wetted Width (ft.)	Matrix Standard for Functioning Properly (Pools/Mile)	Surveyed Pools/Mile
Battle Creek	86A	4.72	184	19
Bear Creek	86G	7.45	96	51
Burnt Corral Creek	86F	5.32	96	42
Campbell Creek	86A	3.20	184	34
Cougar Canyon	86H	4.10	184	31
Dark Canyon Creek	86B	8.47	96	30
Little Bear Creek	86G	4.97	184	12
Little Dark Canyon	86B	6.93	96	17
Marley Creek	86E	6.37	96	12
McCoy Creek	86C, D	6.58	96	26
McCoy Creek-T2	86D	3.62	184	25
McCoy Creek-T4	86D	3.66	184	20
McIntyre Creek	86C	4.17	184	14
Meadow Creek	86A, J	7.36	96	19
Meadow Creek-T1	86J	4.29	184	35
Peet Creek	86H	1.91	184	9
Pickle Creek	86E	2.10	184	25
Ray Creek	86H	4.12	184	81
Smith Creek	86H	3.67	184	74
Swan Creek	86E	4.82	184	13
Tybow Canyon	86F	6.51	96	15
Waucup Creek	86I	8.69	96	16
Waucup Creek-T1	86I	2.65	184	6

*sws = subwatershed

Figure 3-8 – Pools per Mile for Surveyed Streams 0-5 Feet Wide in the Meadow Creek Watershed.

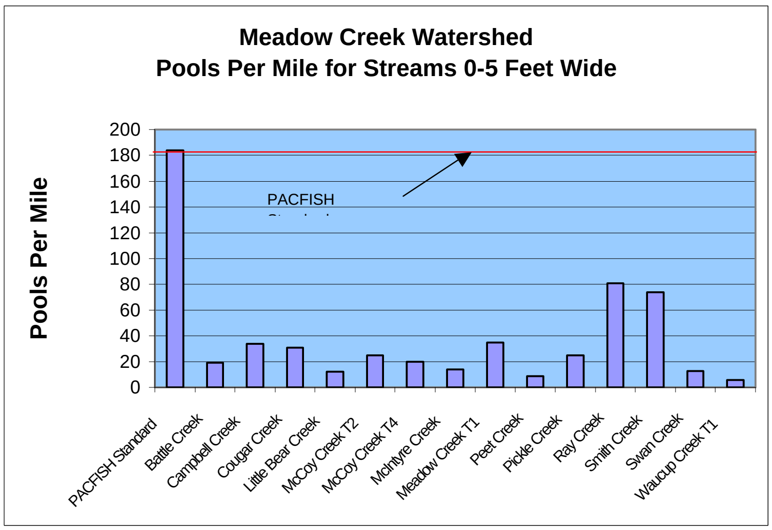
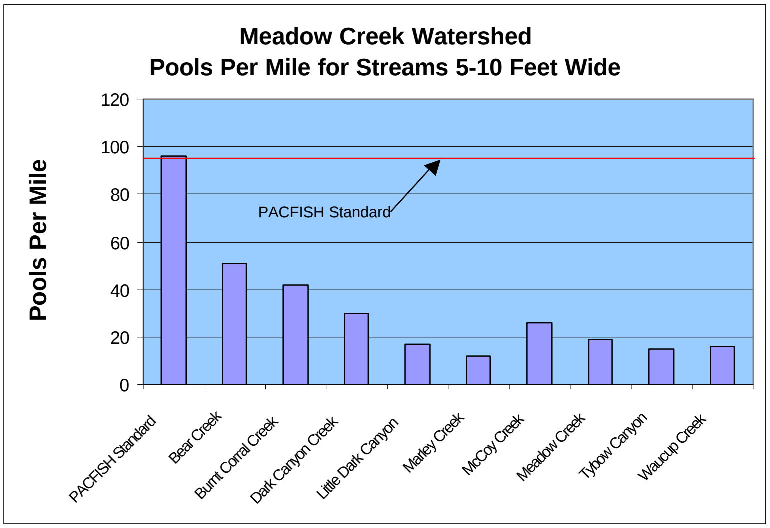


Figure 3-9 – Pools per Mile for Surveyed Streams 5-10 Feet Wide in the Meadow Creek Watershed.



Values presented in Table 3-37 for surveyed pool frequency were obtained through the Region Six Stream Survey protocol and were used to rate this indicator in Table 3-37. Pool frequency may be functioning better than shown in Table 3-37 due to the survey method employed. This method only counts pools if the length of the pool is greater than its width (with the exception of channel spanning plunge pools) if the pool spans the entire width of the channel. This method does not take into account any microhabitats that function as pool habitat. Although pool frequencies may not be as far from expected values as the matrix would lead one to believe, all subwatersheds are rated as Not Properly Functioning/Functioning at Unacceptable Risk for Pool Frequency based on McIntosh (1992), available data, and matrix values. (Note: the matrix value for this indicator needs to be adjusted for Blue Mountain streams).

Pool Quality: Streams in the Meadow Creek Watershed are lacking large pools. Survey results from McIntosh (1992) indicate that there has been a 20 percent decrease in large pools in Meadow Creek and an 82 percent decrease in large pools in McCoy Creek. Decreases in pool quality and large pools in the UGRAA are assumed to be a result of past harvest of trees in riparian areas, increased sediment delivery from road construction, and the long-term effects of splash damming.

Many of the streams in the Meadow Creek Watershed are narrow (<10 feet wide) with estimated average summer flows of 1-3 cfs. Even when large wood is abundant, pools of greater than 1 meter deep are not common in these small stream types. The larger streams in the Watershed also lack large pools and large woody material, leading to a rating of Not Properly Functioning/Functioning at Unacceptable Risk for all subwatersheds.

Where are the water quality and habitat conditions NOT meeting the physical and biological requirements of TES fish species?

Interpretation Summary

All subwatersheds within the Meadow Creek Watershed have matrix indicators ranging from Properly Functioning to Not Properly Functioning/Functioning at Unacceptable Risk (see Table 3-33). The overall determination of existing conditions for all streams and subwatersheds in the Meadow Creek Watershed is that they are **Functioning at Risk**.

The Meadow Creek Watershed was set on an accelerated recovery course almost 10 years ago. The determinations above are heavily influenced by the past 100 years of actions. Generally, field PFC ratings, all available data, and best professional judgment indicate that streams in the Meadow Creek Watershed are on an upward trend. These streams are recovering from past impacts such as extensive riparian timber harvests, instream debris clean-out, and roadbeds within floodplains. Vegetation recovery, in terms of mesic forbs and shrubs, is excellent. However, full recovery to a Properly Functioning Condition will likely take 20-50 years. Recovery in the last 10 years cannot overcome the past 100 years. The restoration activities described in Chapter 5 of this document will continue to advance the recovery of habitat for listed fish species.

How and where does the road system affect water quality?

See the sediment and temperature discussions under the “Where are the water quality and habitat condition NOT meeting the physical and biological requirement of TES fish species?” question above.

Because roads are the primary contributors of sediment for most subwatersheds and soil erosion rates are directly related to the amount of unprotected and/or compacted soils that are exposed to rainfall or runoff (Chamberlin et al., 1991). It is assumed that the elevated road densities in the Meadow Creek Watershed have increased sediment input to streams in the Watershed over historic levels (see sediment discussion under the “Where are the water quality and habitat condition NOT meeting the physical and biological requirement of TES fish species?” question above). Although no reliable data exists to quantify the amount of suspended sediment generated by roads in the Meadow Creek Watershed, it is assumed to be elevated over historic levels especially in subwatersheds 86C and 86D where there are over 35 total miles per subwatershed of drawbottom road. Of these miles, approximately 11.36 and 7.12 miles respectively of open, native surface drawbottom road are adjacent to fishbearing streams (see Transportation portion of this document). Sediment input to fishbearing streams in all subwatersheds in the Meadow Creek Watershed is likely elevated over historic levels given the fact that there are approximately 258 miles of drawbottom road throughout the Watershed. All subwatersheds in the Watershed also contain over two miles of open, native surface drawbottom roads adjacent to fishbearing streams.

The other primary way in which roads affect water quality is through the long-term removal of large shade-producing trees when roads are constructed in riparian areas and floodplains, which leads to elevated stream temperatures as a result of increased solar radiation. It is likely that roads are having the largest effects on stream temperature in areas where roads occur within 100 feet of perennial (class I and III) streams (see table 3-38). Roads in these areas reduce the critical shade-producing vegetation near water in the lowest flow, highest water temperature period of late summer. Table 3-38 shows that all subwatersheds have likely been affected by the loss of shade producing vegetation to roadways, as values range from 3.8 to 22.86 miles of drawbottom road adjacent to perennial streams per subwatershed.

Table 3-38 – Total Miles of Drawbottom Road by Subwatershed and Stream Class in the Meadow Creek Watershed

SWS	Class I	Class III	Class IV	TOTAL
86A	6.13	0.22	3.85	10.2
86B	21.57	1.29	14.95	37.81
86C	21.6	0.87	13.43	35.9
86D	19.4	0.49	20.68	40.57
86E	3.42	0.38	10.13	13.93
86F	18.49	3.02	10.7	32.21
86G	14.68	2.04	6.17	22.89
86H	19.63	4.03	4.72	28.38
86I	12.32	1.51	4.76	18.59
86J	10.46	1.74	6.05	18.25
TOTAL	147.7	15.59	95.44	258.73

SWS – Subwatershed

How and where do roads affect aquatic species?

See answer to "Where are the water quality and habitat condition NOT meeting the physical and biological requirement of TES fish species?" and "How and where does the road system affect water quality?" questions in this watershed analysis.

What is the condition of riparian habitat as it relates to suitability for aquatic species?

Riparian conditions in the Watershed have been degraded by past management activities as described in the "How and where have management activities affected riparian function?" and the "How and where does the road system affect water quality?" sections of this watershed analysis. Roading is one factor leading to the degraded instream conditions described in the "Where are the water quality and habitat condition NOT meeting the physical and biological requirement of TES fish species?" in the Watershed.

Properly functioning riparian areas are essential to the conservation of TES fish species because of riparian influence on stream channel morphology, stream temperature, and sediment. Rehabilitation of riparian vegetation can increase populations of desired fish (Platts 1991).

Reference Condition

It is estimated that historically, 100% of forested riparian stands in the watershed were adequately stocked and without roads, resulting in riparian habitat providing adequate shade and LWM to stream channels throughout the Watershed.

Current Condition

Less than 1/3 of the forested stands within RHCAs are adequately stocked. This has contributed to the elevated stream temperatures and decreased LWM levels discussed in the "Where are the water quality and habitat conditions NOT meeting the physical and biological requirement of TES fish species in the Watershed?" question in this Watershed Analysis.

The 258 miles of drawbottom roads in the Watershed (see Table 3-38 above) has reduced instream levels and future recruitment of LWM in the watershed.

Interpretation

There is a need to move RHCAs toward adequate stocking levels and to remove drawbottom roads throughout the watershed in order to improve stream temperatures, sediment delivery rates, and the drainage network in the Watershed.

What aquatic TE&S, candidate, or proposed species occur within the watershed and what activities and processes are influencing them?

See the “Where are the water quality and habitat conditions NOT meeting the physical and biological requirements of TES fish species?” in the Physical Dimension portion of this watershed analysis for the answer to the question posed above.

PLANT SPECIES of CONCERN

Sensitive Plant Species Known to occur in the Meadow Creek Drainage

The USDA Forest Service, in coordination with the Natural Heritage Programs in Oregon and Washington and the Conservation Biology Program of the Oregon Department of Agriculture, has developed the Region-6 Sensitive Plant List (April, 1999). Of the 68 species from this list which could occur on the Wallowa-Whitman National Forest, the following six sensitive species are documented for the Meadow Creek Watershed Analysis area (Table 3-39). None of the five threatened, endangered or proposed species which are known, or may possibly occur on the Wallowa-Whitman National Forest have been discovered within the Meadow Creek Watershed, or on the La Grande Ranger District (see Appendices for further information).

TABLE 3-39: Sensitive Plant Species Known To Occur Within the Meadow Creek Drainage, By Subwatershed (SWS)	
Species Name	***SWS***
Botrychium minganense Victorin (Mingan moonwort)	86 B 86 D 86 H 86 I
Botrychium montanum W.H. Wagner (Mountain moonwort)	86 B 86 D 86 I
Botrychium pinnatum St. John (Northern moonwort)	86 D
Calochortus longebarbatus var. *longebarbatus* S. Wats (Long-bearded mariposa lily)	86 C 86 D 86 G 86 H 86 I
Phlox multiflora A. Nels (Many-flowered phlox)	86 C 86 D 86 G 86 H 86 I
Trifolium douglasii House (Douglas' clover)	86 A 86 E 86 F 86 G 86 H 86 I 86 J

Information about sensitive plant species is limited in general, and historic abundance and distribution at a local level is particularly lacking. There are 128 sensitive plant occurrences within the Meadow Creek Watershed Analysis area. Specific locations are mapped and on file at the La Grande Ranger District (exempt from public disclosure). Biological response and implications of different disturbance regimes for each individual species is not well documented and species management guides for many species have yet to be developed.

Botrychium (Moonworts/grapeferns)

There are 13 different sensitive *Botrychium* species which occur on 12 of the 19 National Forests within Region 6. Moonworts are small plants with simple morphology. All but one (*Botrychium pumicola)* of these 13 species have been found on the Wallowa-Whitman National Forest, and seven different sensitive *Botrychium* species are documented for the La Grande Ranger District. Three of these (*Botrychium minganense, B. montanum* and *B. pinnatum*) occur within the Meadow Creek Watershed.

Habitat differences, as well as the plants' appearance, can be variable. Distinguishing features of *Botrychium* can be subtle and multiple species can be found growing together. "Because of the similarity among species, it has become difficult even for fern specialists to determine which of the many new forms recently reported are new species and which are simple morphological variants of known species. This situation needs to be resolved in order to establish management policies to protect the truly rare and threatened species" (Farrar, 1998).

The small size and low visibility of the plants makes them extremely difficult to locate and identify. Monitoring information suggests that individual plants do not necessarily come up each year (Wagner 1992).

Botrychium species are found in a variety of habitats. They occur in seeps, springs, along streams, and in meadows that are very wet in the spring with a tendency to gradually dry out over the summer. They can also occur along or in old skid roads of moist coniferous forests in association with Engelmann spruce, lodgepole pine, grand-fir and western larch.

Many sites are found in moist openings that occur in the forested canopy, or seasonally wet areas. Potential habitat for *Botrychium* species occurs within the Watershed. It is highly likely that additional populations and possibly additional species of *Botrychium* would be discovered, if intensive focused surveys were conducted. Protection of meadow and riparian areas from ground disturbing activities and grazing impacts should help protect these species.

***Botrychium** minganense*

Originally described in 1927, and only confidently recognized as a species in 1955, clarification of taxonomy for Mingan moonwort (*Botrychium minganense*) is still underway (Wagner 1992). Prior to 1991, there were no known sites for this species in the Meadow Creek watershed, although one site was documented in 1978 in Baker County, southeast of the analysis area. Also known as gray moonwort, this species is known to occur in small populations in the Wallowa, Blue and Ochoco Mountains, northern Cascades of Oregon and Washington and northeast Washington, according to (Wagner 1992). This species is documented for the Ochoco, Mt. Hood, Umatilla, Wallowa-Whitman and Willamette National Forests, and suspected to occur on the Umpqua National Forest.

Habitat for these plants within the Meadow Creek drainage includes forested seeps, mesic meadows and edges of stream courses. The dominant tree species surrounding the area include grand fir, subalpine fir, Engelmann spruce, and lodgepole pine.

One of the more commonly occurring sensitive *Botrychium* species, it has been found on the Eagle Cap, Baker, and Unity Ranger Districts and elsewhere on the La Grande Ranger District. *Botrychium minganense* is located at seven sites within four Meadow Creek Subwatersheds (86B, 86D, 86H and 86I) for a total of less than 3 acres.

***Botrychium** montanum*

Botrychium montanum, the smallest of the sensitive *Botrychium* can be easily confused with juvenile individuals of other species. Previously known from Cedar swamps of the Northern Oregon Cascades, south to Linn County, this species also occurs in Grant and Wallowa Counties (Wagner 1992).

Documented for the Ochoco, Mt. Hood, Umatilla, and Willamette National Forests, Mountain moonwort (*Botrychium montanum)* also occurs on the Eagle Cap, Baker and Unity Ranger Districts of the Wallowa-Whitman. There are five sites, on less than 2.5 acres within three of the Meadow Creek subwatersheds (86B, 86D and 86I). Additional locations for this species are known to occur on the La Grande Ranger District.

Montain moonwort sites include wet areas, from seeps, springs and bogs, to moist/wet meadows and streams. Moist mountain meadows in association with Engelmann spruce are also considered appropriate habitat.

Botrychium *pinnatum*
Considered rare and threatened in Oregon (Sidall 1979), Northern moonwort (*Botrychium pinnatum*) had previously been found only in moist alpine meadows of the Wallowa and Steens Mountains.

A fairly distinctive species, *Botrychium pinnatum* is now known from numerous locations on the Baker, Eagle Cap and La Grande Ranger Districts. It is also documented for the Gifford Pinchot, Malheur, Mt. Hood, Ochoco, Umatilla and Wenatche National Forests.

One site within subwatershed 86D is known for the Meadow Creek Watershed. The two other previously discussed sensitive *Botrychium* species (*minganense* and *montanum*) are also growing at this location. Moist sites in coniferous forests, and wet to moist meadows are considered potential habitat.

Calochortus *longebarbatus* var. *longebarbatus*
Prior to October 1979 this variety of *Calochortus longebarbatus* was known in Oregon only from 1880 collections near Hood River, the Warm Springs Indian Reservation (1961) and Sycan Marsh (1901) of South Central Oregon. According to a report by the Oregon Natural Area Preserves Advisory Committee (October, 1979) it was also listed in Washington and California; and considered a regional endemic and rare and endangered, if still extant in Oregon.

Kaye (1991) reported the species distribution as widespread, but infrequent over eastern Washington, Oregon and Northern California. Currently documented on the Fremont, Winema, Umatilla and Wallowa-Whitman National Forests it is also suspected to occur on the Deschutes, Gifford Pinchot, Ochoco and Mt. Hood National Forests.

Calochortus longebarbatus var. *longebarbatus* is found along stream courses, and in seasonally wet (moist to dry) meadow habitat. A weak association with *Danthonia californica* has been found (Ratliff and Denton 1994) and has been observed on the La Grande district. Drying of the meadow signals the lily to flower, thus affecting the time of year and whether or not the species will flower.

Twenty seven occurrences, totaling less than 170 acres have been located within five different subwatersheds (86C, 86D, 86G, 86H and 86 I) of the Meadow Creek Watershed.

Observations indicate that the long-bearded mariposa lily tends to grow in meadow areas that also contain the most palatable forage grasses and plants; and past seeding of exotic grasses may be a threat to the plants survival (Brooks/Croft 1994, memo). Late season grazing (after seed set and the meadows have dried) has been shown to cause much less damage to the plants and habitat than grazing earlier in the season (Brooks 1994, personal communication).

Phlox *multiflora*
Many-flowered phlox (*Phlox multiflora*) was first collected and observed in Oregon in 1977 (B. Meinke 1979) on state land along the Grande Ronde River within subwatershed 87F of the Spring Creek Watershed. This Union County location was the only known site outside the Rocky Mountains in the Pacific States, until 1991.

Of the 19 National Forests in the Region, this species is only documented for the La Grande Ranger District of the Wallowa-Whitman National Forest, although it is suspected to occur on the Umatilla National Forest.

Approximately 63 occurrences, supporting many thousands of *Phlox multiflora* plants, are scattered across the hillside, cliffs and rocky openings of approximately 280 acres of National Forest land within five subwatersheds (86C, 86D, 86G, 86H and 86 I) of this Meadow Creek Watershed.

Trifolium *douglasii*

Douglas's clover has a historic range from Spokane County, Washington to Baker County, Oregon and east to adjacent Idaho (Interior Columbia Basin Ecosystem Management Project Analysis of Vascular Plants, 1997). It was added to the Regional Forester's Sensitive Species list in the revision of 1999. Currently documented for only the Umatilla National Forest (Whitman County, Washington and Umatilla County, Oregon) and the La Grande Ranger District (Union County, Oregon) of the Wallowa-Whitman National Forest this regional endemic inhabits moist, temporarily flooded meadows, forested wetlands, and streambanks.

Often found growing in the same meadow systems as the *Calochortus longebarbatus* var. *longebarbatus*, conversion to agricultural uses and seeding of exotic grass species have negatively impacted habitat for *Trifolium douglasii*. Monitoring has shown that this rhizomatous clover can tolerate some grazing, but cannot withstand annual grazing.

Federally Listed or Proposed Plant Species which may occur in the Meadow Creek Drainage

Howellia aquatilis

Historically known to have occurred in California and the Willamette Valley of Oregon, *Howellia aquatilis* occurs in widely scattered populations, with two main centers of distribution within it's range. One is in Montana and the other is in the vicinity of Spokane, Washington (ICBEMP, 1997).

Documented on private land in northern Idaho and found in western Washington, this species is strictly aquatic. Although there is some potential that this species may occur on the Wallowa-Whitman National Forest or La Grande Ranger District, it is unlikely to occur within the Meadow Creek Watershed Analysis area.

Mirabilis macfarlanei

Mac Farlane's four-o'clock is listed as Threatened under the Federal Endangered Species Act (U.S. Fish and Wildlife Service, 1996). It grows in grassland habitats between 1,000 and 3,000 feet in elevation, in the Imnaha, Snake and Salmon River drainages of Oregon and Idaho. Populations have been found in many different plant associations, soil types, and on all aspects and slope angles. There are no known populations of this species in the Meadow Creek Watershed, and there is no potential habitat, since there is no low elevation canyon land.

Silene spauldingii

Spaulding's catchfly has been proposed for federal listing (12/99). This species is a long-lived perennial herb with four to seven pairs of lance-shaped leaves and small greenish-white flowers. The species has distinctive sticky glands all over the plant.

Spaulding's catchfly has been found at widely scattered sites throughout northeastern Oregon, western Idaho, eastern Washington, western Montana, and southern British Columbia. *Silene spauldingii* grows in remnant Palouse prairie and canyon grasslands. In northeastern Oregon, the species is typically found in grasslands dominated by Idaho fescue (*Festuca idahoensis*).

Documented for the Umatilla and Wallowa-Whitman National Forests, there is a slight possibility that potential habitat and undiscovered populations may exist on the La Grande Ranger District. However, there are no known sites or habitat within the Meadow Creek Watershed, and it is unlikely that it occurs there.

Spiranthes diluvialis

Ute's lady's tresses is listed as threatened under the Federal Endangered Species Act. This species of orchid grows in wet meadows, along perennial streams, and along the perimeter of lakes and ponds.

Spiranthes diluvialis has not been found in Oregon, but there is a slight chance that this species may possibly occur on the Wallowa-Whitman, La Grande Ranger District, and within the Meadow Creek Watershed Analysis area.

Thelypodium howellii ssp. ***Spectabilis***

A local endemic known from Union, Baker (Baker Valley), and Malheur Counties, Oregon, this species is associated with alkaline bottomlands, basins, flats and floodplains. Known sites are between 3,200 and 3,400 feet elevation and all known populations are on private land. A highly palatable species, spring and summer grazing is considered harmful.

There is no known habitat on La Grande Ranger District, or the Wallowa-Whitman National Forest. It is unlikely that this plant occurs within the Meadow Creek Watershed Analysis area.

Sensitive Plant Species Suspected to occur in the Meadow Creek Drainage

Several other species from the USDA Forest Service, Region-6, Sensitive Plant List (April, 1999) are suspected to occur within the Meadow Creek drainage. The following plants are believed to have the highest probability of being discovered within the Meadow Creek Watershed analysis area.

***Botrychium** ascendens*	W.H. Wagner
***Botrychium** campestre*	W.H. Wagner & Farrar
***Botrychium** crenulatum*	W.H. Wagner
***Botrychium** hesperium*	(Maxon & Claussen) W.H. Wagner & Farrar
***Botrychium** lanceolatum*	(Gmel.) Angstrom
***Botrychium** lineare*	W.H. Wagner
***Botrychium** lunaria*	(L.) Swartz
***Botrychium** paradoxum*	W.H. Wagner
***Botrychium** pedunculosum*	W.H. Wagner
***Carex** backii*	Boott
Carex *interior*	L. Bailey
***Carex** parryana*	Dewey
***Carex** stenophylla (= C. eleocharis)*	C.A. Mey
***Cypripedium** fasciculatum*	Kellog ex S. Wats
***Listera** borealis*	Morong
***Lycopodium** complamatum*	L.
***Mimulus** clivicola*	Greenm.
***Pellaea** bridgesii*	Hook.
***Phacelia** minutissima*	Henderson
***Plantanthera** obtusata*	Lindl.
***Rorippa** columbiae*	Suksdorf ex T.S. Howell

Although less likely, it is possible that the following species from the Region-6, Sensitive Plant List occur within the Meadow Creek drainage. Included are those plants which have been observed at other locations on the district or forest, or are suspected to occur and have not yet been discovered. Potential habitat for these species may possibly exist within the analysis area.

***Achnatherum** wallowensis* Maze & K.A. Robson
***Calochortus** macrocarpus* var. *maculosus* Douglas (A. Nels & J.F. Macbr.) A. Nels &…
***Calochortus** nitidus* Dougl.
***Carex** hystricina* Muhl. ex Willd.
***Carex** scirpoidea* var. *stenochlaena* Holm.
***Cicuta** bulbifera* L.
***Erigeron** disparipilus* Cronq.
***Erigeron** engelmannii* var. *davisii* A. Nels (Cronq.) Cronq.
***Kobresia** simpliciuscula* (Wahl.) Mkze.
***Lomatium** ravenii* Math. & Cronq.
***Pleuropogon** oregonus* Chase
***Primula** cusickiana* Gray
***Suksdorfia** violacea* Gray
***Thelypodium** eucosmum* B.L. Robins
***Trollius** laxus* var. *albiflorus* Salisb. Gray

Sensitive Plant Surveys

Surveys for sensitive, threatened and endangered plant species have been conducted for proposed forest service projects on the La Grande District. These surveys focused primarily on prescribed treatment areas, potential habitat likely to be affected, or probable habitat for certain sensitive species. Coverage of each subwatershed is variable with some surveys concentrated in a specific geographic area while others are widely scattered across the landscape. Survey routes on NFS lands are unavailable for query, and acres surveyed were estimated for each subwatershed.

Estimations show that surveys have been conducted on 15% of the National Forest land within the Meadow Creek Watershed (86). Records indicate that Dark Canyon (86B), Lower McCoy Creek (86C) and Upper McCoy Creek (86D) have significant botanical survey information available. Surveys within subwatersheds 86F, 86G, 86H and 86I have been conducted over only 8 to 12% of the NFS land. Subwatersheds having information on less than or equal to 5% of the NFS acreage include 86A, 86E and 86J.

Table 3-40: Estimate of Acreage and Percent of NFS Land Surveyed for Sensitive Plant Species, by Subwatershed (SWS) for the Meadow Creek Drainage

SWS Acres		*FS Acres in SWS*		
SWS	***Total***	***Total***	***Surveyed***	***Percentage***
86A	12,858	4,708	235	5 %
86B	12,015	9,978	2,495	25 %
86C	18,499	7,018	1,435	20 %
86D	16,882	10,690	5,345	50 %
86E	5,528	4,709	235	5 %
86F	8,784	8,727	690	8 %
86G	7,850	7,688	936	12 %
86H	14,420	13,712	1,587	12 %
86I	9,374	8,631	1,230	14 %
86J	8,739	8,258	253	3 %

Undiscovered populations of sensitive plants may yet exist within any of the subwatersheds since there is only a limited timeframe for locating many of the sensitive species, and areas cannot necessarily be surveyed for all possible species at once. All subwatersheds support at least one known sensitive plant species, with two subwatersheds (86D and 86I) known to support at least five different sensitive plant species (Table 3-40).

No Forest Service survey information is available for threatened, endangered or sensitive plant species on land outside the NFS system for the watershed. It is possible that sites for some species occur on land comprised of these other ownerships. Approximately 27% of the Meadow Creek Watershed is under other ownership. Acreage varies for each subwatershed (see Chapter I - Charts Meadow Creek Watershed acreages).

Other Species of Concern

Other plant species, although not listed as TES on the Region-6 Sensitive List, are of concern and exist within the analysis area. Some plant species (i.e. Aspen, bitterbrush and Mt. Mahogany) are important components of wildlife habitat and are in a degraded condition. Other species, including mosses, lichens, and fungi may be of conservation concern due to limited distribution or abundance within the watershed. No inventories or formal surveys have been done for many of these species and therefore constitutes a data gap.

Native Species/Species Diversity

The management of native grasses, forbs, shrubs, and deciduous trees is an emerging issue across the watershed and forest. The amount, distribution and condition of these species may be below the historic range due to past activities. Information is also lacking on distribution, diversity, and conservation status of mosses, liverworts, fungi and lichens.

There is concern that past activities have resulted in displacement of native species, caused changes in distribution of uncommon plant associations or impacts to unique habitat features, and an introduction and increase of noxious weeds. In addition to species diversity and structure, composition and function of plant community types need to be considered when planning for sustainability of ecosystems.

Healthy riparian hardwood communities are a significant component of stream ecosystems. Past impacts (long-term browsing effects, timber harvest, road construction and other mechanical disturbances) have led to removal of vegetation, degraded stream conditions and decreased abundance, recovery and sustainability of the shrub component. Other woody shrubs, important for wildlife species, have also been altered and may be lacking in structure, abundance or condition. Pacific Yew (*Taxus brevifolia*) is another example of a species which has been affected by past activities and needs to be considered in harvest and burning prescriptions.

Maintaining the native vegetative communities and associated flora across the forest is an important element of ecosystem management. Native plants are ecologically adapted to their habitats. Their use in revegetation and restoration projects is an important part of conserving the biodiversity, health, productivity and sustainable use of the forest, rangeland, and aquatic ecosystems.

The forest service has historically seeded roadsides, burns, riparian areas and meadows with non-native grasses. Some of these species have displaced native species and are now a permanent part of the ecosystem.

A plan was developed to provide a supply of genetically diverse, high-quality native seed or plant materials which are locally adapted and capable of producing healthy and vigorous growing stock for revegetation activities. The long-term goal is to use local native plant species as much as possible to meet management objectives. There are many opportunities within the Meadow Creek watershed to collect native plant materials (seed and cuttings) for propagation; and to use native plant species for revegetation projects (i.e. road obliteration, erosion control, and to provide shade and enhance streambank stability for riparian restoration projects).

Desired species and collection sites are in the process of being identified. These species can then be propagated and used for restoration projects.

SPECIAL FOREST PRODUCTS

Special Forest Products (SFP) are groups of raw materials harvested for use as ornamentals, in landscaping, or by manufacturing into a wide variety of final consumer products: food, herbs, medicinals, decoratives (including floral greenery and dyes) and specialty items (such as aromatic oils and value-added wood products). The awareness and interest in SFP is increasing as the public seeks alternative sources of income and economic diversification opportunities.

Special forest products incorporate a wide variety of plant species which play important, and often unknown roles in forest ecosystems in addition to providing products. Local interest has focused mostly on mushrooms, fuelwood, posts, poles and other wood products. However, there have been inquiries from the public regarding other activities including: collection of plants for pharmaceutical extraction, vegetation for landscaping and propagation, craft items, and food products.

The commercialization and accelerated harvest of mushrooms has heightened concerns about the effects of harvesting fungi from the forest. In addition to a lack of knowledge on the ecology, productivity, habitat requirements and effects of repeated harvest; there is a lack of information regarding potential demands on resources based on industries interest. In the Meadow Creek watershed, morel mushrooms (Morchella species) are the most significant non-tree special forest product.

In the past, the Wallowa-Whitman has issued commercial permits for mushrooms with few regulations on picking areas or quantities picked (refer to earlier discussion of miscellaneous forest products for district harvesting activity). There is very little information on what impacts actual harvest has on the mushroom resource. Additionally, effects of associated picking activities (off-road driving, littering, etc.) need to be monitored and addressed on a forest-wide level.

RESEARCH NATURAL AREAS

Research Natural Areas (RNAs) are established lands within the National Forest System that represent intact examples of terrestrial and aquatic ecosystems found in the Region. They are permanently protected for research, monitoring, education and maintenance of biological diversity and to preserve gene pools for typical and rare and endangered plants and animals (UGR Biological Assessment 1994).

Approximately 180 acres within Government Draw of Subwatershed 86H, had been recommended for designation as a Research Natural Area (RNA) in the Forest Plan (Management Area 12). Originally Proposed in 1971 for RNA status by Jerry Strickler, the Forest Plan has recently been amended to change the designation of Government Draw from a “proposed” RNA to an “established” RNA. Renamed as the “Gerald S. Strickler Research Natural Area”, this is the second established RNA on the La Grande Ranger District. The next step, development of a management plan, has not yet been accomplished.

FIRE and FUELS MANAGEMENT

Where are the areas that display a departure from the historical fire return intervals and what activities can move these places toward a desired stand structure and adequate fire return interval.

Reference (Historical) Condition

Under historical conditions there was a balance between fire, fuel, weather and topography. Within the historic fire regime there were many disturbance sub-cycles such as insects and disease. The effects of insects and disease have a direct relationship to fuel loading. Our perception of historic events is that of a smooth cycle. In reality, these historical patterns were comprised of many peaks and valleys, which are smoothed out when seen through the filter of time.

The presence of fire in Pacific Northwest forests can be traced back over thousands of years through analysis of pollen and charcoal deposits (Agee 1981b). A recent fire study done in the Blue Mountains (Maruoka 1994) found a fire return interval of 15 years in the ponderosa Pine areas, 60-80 years at mid elevation mixed conifer and lodgepole pine, and 120+ years in the grand fir/subalpine fir types. This study found fire frequencies starting to decrease in the early part of the century. This general idea is now being used as a tool to describe the characteristics of a Fire regime, which address similar fire return intervals.

The fire return interval can be used as a fire intensity gauge. The shorter the fire return interval, the less natural fuels will have accumulated, which results in lower fire intensity; as found in Ponderosa Pine types. Conversely, a long interval between fires allows time for accumulation of woody debris, which in turn results in high intensity fire; as found in grand fir stands. High intensity fires are characterized by tree mortality, consumption of large and small ground fuels, the duff layer, and soil degradation.

Fire intensity largely determines species composition, while fire frequency determines stand age. Historical fire patterns reveal a mosaic of burn patterns, which were dictated by fire intensities. The landscape of the Meadow Creek watershed includes stands of even aged lodgepole pine and western larch that regenerate after high intensity fire, within areas favoring these species compositions.

Current Condition

A. PRIMARY VEGETATION CONDITIONS

The Meadow Creek watershed is two-thirds forested with numerous small natural openings. The vegetative pattern consists of ponderosa pine at lower elevations, which ascend through mixed conifer at mid-ranges, and turn to fir dominated forest at higher elevations. Moisture regimes, local variation in topography, and fire occurrence influenced plant associations and associated historical fire regimes that existed within the Meadow Creek watershed. In 1937 the State of Oregon, Cover Type Map shows ponderosa pine found in approximately 45% of the watershed, primarily at the lower elevations. As you can see in the following tables, ponderosa pine (PP) is found in 15-25% of the watershed now.

Fire behavior and spread have shaped landscape composition and structure over time. Eastside forests are "hotspots" for lightning storms. Higher frequency lightning locations have shorter fire return intervals than locations with lower lightning potential (Agee 1994b).

North aspects area consist of mixed conifer types. Ridgetops and south aspects transition into ponderosa pine, Douglas-fir, and dry Grand fir types. Areas that have not had harvest activity or prescribed fire applied are generally overstocked or have true fir encroachment with heavy amounts of biomass accumulation. True fir establishment provided host species for many insects and diseases.

As a result riparian areas experienced high mortality, and many drier aspects are overstocked with a high risk of insects, disease (especially dwarf mistletoe), and wildfire damage.

The following table displays acres of current ecoclass groups and associated fire regimes found within the Meadow Creek watershed:

Table 3-41 Ecoclass and Fire Regimes by Subwatershed

			Sub-watershed											
Ecoclass Description	**Ecoclass**	**Fire Regime**	**86A**	**86B**	**86C**	**86D**	**86E**	**86F**	**86G**	**86H**	**86I**	**86J**	**Totals**	**% Ecoclass Group**
PP/DF Elk Sedge	CDG111	1	355	168	124	162	141	492	471	530	188	250	2881	4%
DF/Pinegrass	CDG112	1		11	111	328		11			15	11	487	1%
DF/Pinegrass	CDG121	1	298		86			12				7	403	1%
PP/Bluebunch Wheatgrass	CPG111	1	77	51	82	80	177	397	63	53	3	26	1009	1%
PP/Idaho Fescue	CPG112	1	293	68	96	155	449	751	313	334	91	16	2566	3%
PP/Idaho Fescue	CPG131	1		75	177						8		260	<1%
PP/Pinegrass	CPG221	1		26									26	<1%
TOTALS													**7632**	**10%**
Mixed Con/Pinegrass	CWG111	1	497	768	272	1376	538	825	1220	1146	459	855	7956	10%
Mixed Con/Pinegrass	CWG112	1	565	1149	916	1472	574	913	1462	2013	547	1136	10747	14%
GF/Pinegrass	CWG113	1		577	385	892		352	112	500	584	404	3806	5%
GF	CWG211	1		87	27		21						135	<1%
TOTALS													**22644**	**29%**
PP/Common Snowberry	CPS522	1		52						25			77	<1%
PP/Spirea	CPS523	1		33									33	<1%
PP/Common Snowberry	CPS524	1		46									46	<1%
TOTALS													**156**	**<1%**
Juniper	CJG111	2				56				62	181	640	**939**	**1%**
Bluebunch wheatgrass/Wyeth's Buckwheat	GB4111	2		32									32	<1%
Wheatgrass scab land	GB4911	2	1655	1350	1225	1289	1707	2249	1638	3228	901	419	20223	26%
Sandberg's Bluegrass/onespike oatgrass	GB9111	2	54	454	138	128		19	618	139	962	252	2764	4%
TOTALS													**23019**	**29%**
Dry Meadow	MD	2	610		17	21	13		74	97	76	33	**941**	**1%**
Mt Mahogany/Idaho Fescue-Bluebunch Wheatgrass	SD	2					20						**20**	**<1%**
PP/DF Snowberry-Oceanberry	CDS611	3	421	174	139	293		595	437	417			2476	3%
DF/Common Snowberry	CDS622	3			40	19							59	<1%
DF/Spirea	CDS634	3	350		510					36			896	1%
PP/DF/Ninebark	CDS711	3			53	12	436	711	59	233			1504	2%
DF/Big Huck	CDS812	3						42					42	<1%
TOTALS													**4977**	**6%**
Grand Fir/Big Huck	CWS211	3	37	699	100	561		35	84	489	114	1022	3141	4%
GF/Big Huck	CWS212	3				118	25			11		50	204	<1%
Grand Fir/Grouse Huck	CWS811	3	136	412	305	1404	322	677	414	1294	893	896	6753	9%
TOTALS													**10098**	**13%**
SA/Grouse Huck	CES411	4						66					66	<1%
GF/Twin flower/forb	CWF311	4		1086	508	746			401	1050	204	210	4205	5%
GF/Twin flower/forb	CWF312	4		526	697	223				208		7	1661	2%
GF/Spirea	CWS321	4		200	90					5			295	<1%

Table 3-41 Ecoclass and Fire Regimes by Subwatershed

			Sub-watershed											
Ecoclass Description	**Ecoclass**	**Fire Regime**	**86A**	**86B**	**86C**	**86D**	**86E**	**86F**	**86G**	**86H**	**86I**	**86J**	**Totals**	**% Ecoclass Group**
GF/Spirea	CWS322	4			172					5			177	<1%
TOTALS													**6404**	**8%**
LP/Twinflower	CLF211	4		84				136	23	133		33	409	1%
LP/Pinegrass/Grouse Huck	CLG211	4	590	50	920		359	328	96	948		1353	4644	6%
LP/Grouse Huck	CLS411	4						44		63	115	57	279	<1%
LP/Pinegrass	CLS416	4									995	148	1143	1%
LP/Big Huck	CLS511	4	304	40	41				12	162	103	153	815	1%
TOTALS													**7290**	**9%**
Orchards	AQ	5								33	14		47	<1%
Other Admin	AX	5	39		29	4		14	17	59			162	<1%
Buildings, Structures, roads	AB	5							7				7	<1%
TOTALS													**216**	**<1%**
GF/Rocky Mt Maple	CWS912	5		48									48	<1%
Meadow Moist	MM	5			15	49	13		4	93	83	26	283	<1%
Rigid Sage/Bluegrass scabland	SD9111	5		347	361	290			42		44		1084	1%
Meadow Wet	MW	5								132	102	43	277	<1%
TOTALS													**1692**	**2%**
Grand Totals			**5926** 8%	**8445** 11%	**7512** 10%	**9516** 12%	**4654** 6%	**8177** 10%	**7096** 9%	**12968** 17%	**6494** 8%	**7797** 10%	**78585** 100%	

B. FIRE REGIMES

A fire regime is described as the potential for fire over time in particular ecosystems. Five fire regime groups, having different combinations of fire frequency and severity, are used in the Pacific Northwest to describe different ecosystems, (Protecting People and Sustaining Resources in Fire-Adapted Ecosystems; A Cohesive Strategy). Fire regimes 1 and 3 consist of biophysical groups G5 – G8, (warm and dry forest types). Fire regime 4 consists of biophysical groups G1 – G4; (moist and cold forest types). Fire regime 5 consists of forest types that have greater than 200 year fire return intervals, or areas that do not burn at all.

Most of the Meadow creek area contains fire-adapted dry site species common to fire regime 1. These fire-adapted ecosystems are known for “short fire return intervals”, evolved from frequent, low-intensity fires that burned surface fuels. These type fires recycle nutrients, check the encroachment of competing vegetation, and maintain healthy stand conditions. The short fire intervals typically occurred on a 1 to 35 year basis and served to reduce growth of brush and other under story vegetation while generally leaving lager, older trees intact. The following table describes fire regime groups:

Table 3-42:	Fire Regimes Descriptions		
Fire Regime Group	**Vegetation Types**	**Frequency (Fire Return Interval)**	**Severity**
1	All ponderosa pine types; Dry-Douglas fir/ pine grass; and grand fir/grass.	0 – 35 years	Low severity. Large stand replacing fires can occur under certain weather conditions, but are very rare (200+ years).
2	True grasslands; juniper/grass; juniper/big sage; Mt big sage/grass; and Mt shrub/grass.	0 – 35 years ▪ True grasslands and savannahs with FRI (fire return intervals) of less than 10 years. ▪ Mesic sagebrush communities with FRI of 25 – 35 years and occasionally up to 50 years. ▪ Mountain shrub communities with FRI of 10 – 25 years.	Stand replacing.
3	 3a – Mixed conifer; dry grand fir. 3b – mesic grand fir. 3c – mesic grand fir and Douglas-fir.	35-100+ years 3a - < 50 years 3b – 50 – 100 years 3c – 100- 200 years	Mixed Severity 3a – Low severity tends to dominate. 3b – Mixed severity. 3c – High severity tends to dominate.
4	 4a - Lodgepole pine above ponderosa pine; aspen embedded in dry grand fir ; 4b - **Subalpine fir;** white bark pine above 45 degrees latitude; and mountain hemlock; 4c - Spruce-fir; western larch; western white pine.	35 – 100+ years 4a - 35 – 100+ years 4b - 100 + years 4c - 100 – 200 years	Stand replacing 4a - stand replacing 4b - stand replacing, patchy arrangement 4c - stand replacing
5	Vegetation classified as a non- burnable type.		

C. MANAGEMENT ACTIVITY

Vegetative composition, structure, and fuel accumulation within the watershed are a result of both natural and human disturbance. Since the turn of the century, human disturbance in the form of logging, domestic animal grazing, and aggressive fire suppression activities have replaced wildfire as a primary disturbance factor.

Timber Sales:

Over the past 30 years, harvest activities have occurred on approximately 43,642 acres in the Meadow Creek Watershed. Refer to Old Growth and Structural Diversity for acres of silvicultural treatment.

Prescribed Burning:

Records on post harvest underburning are not accurate prior to 1990. Since 1990, approximately 2,500 acres were underburned, with the majority of acres associated with French Bug (harvested 1990-1991) and Darkhorn (harvested 1997-1999) timber sales.

Natural fuels underburning, primarily for stand maintenance and forage enhancement, occurred on approximately 6,160 acres in 1990 - 2000.

Grazing:

The sheep and cattle grazing within the Meadow Creek Watershed have been actively managed and carefully monitored to prevent overgrazing conditions. Currently these practices have helped reduce fine fuel loadings that can contribute to fast rates of spread. A balance of proper stock rotation and vegetation recovery can help provide a less flammable fuel composition. Indications of less proactive management can be detected from more severe vegetative impacts. These situations occurred in the early 1900's when overgrazing in combination with intensive harvest practices scarified the soils leaving prime bare soil seedbeds. The results have been over stocked thickets with hundreds of suppressed trees that continue to provide lateral fuel arrangement threatening dominate overstory tree canopies, and increasing fire intensities due to the flashy nature of these "dog hair" thickets. Active range allotments include the following:

Table 3-43: Grazing Allotment In Acres

Allotment Name	Acres	Location
Dark Ensign	21,902	86B, 86C, 86D
* Cunningham	24,543	86D, 86G, 86H, 86I, 86J
Starkey	28,279	86A, 86C, 86F, 86G, 86H,
McCarty	7624	86A, 86E, 86F
Tin Trough	3010	86E, 86F

* Cunningham allotment is located on the Wallowa-Whitman NF but is administered by the Umatilla NF.

D. ECOLOGICAL RISK

In 1999 a system to prioritize areas for restoration was developed by the Wallowa-Whitman. This concept is called Watershed Restoration and Prioritization process (WRAPP). The ranking of watersheds are based on the following:

1. Fire Hazard Assessment – Their potential for loss or "damage" due to high intensity fires.
2. Ecological Risk – Current conditions and the magnitude of vegetative change that has occurred in relation to what historic conditions were for different fire regimes.

The intent of the Forest WRAPP, in regards to fire regimes, was to display where stand conditions have evolved to a density and complexities outside the historical range by biophysical group, high canopy closure, multiple layers of stand structure, and high numbers of trees within these layers. The fire regime ranking displays how far out of balance the fire return interval is compared to the historical range of variability (HRV). Each stand within each sub-watershed received a ranking of H (High Departure), M (Moderate Departure), L (disturbance pattern within historical range of variability; stand maintenance), and ND (not rated) an area not rated would include non-forested or private lands that rankings have not yet been established.

The ranking value is assigned based on the potential to burn outside of the historic fire regime and potential for loss or "damage" to ecosystem function. For example, a fire regime composed of a dry forest type with a high canopy closure, multiple layers of stand structure and high numbers of trees per acre is a high departure from historical range of variability and is not sustainable. Conversely, similar conditions in a subalpine fir or wet grand fir site is not far removed from the HRV.

The overall ranking for how far fire return intervals have departed from the historical range is considered a moderate level. The following tables display acres of high, moderate, low, and acres not rated by fire regime and subwatershed:

Table 3-44: Fire Return Interval Departures

Low Departures From Fire Return Intervals

SWS	Fire Regime Group 1	Fire Regime Group 2	Fire Regime Group 3	Fire Regime Group 4	Fire Regime Group 5	No Fire Group	TOTAL
86A			136				136
86B			587	966			1553
86C	22		328	733			1083
86D	4		1338	895			2237
86E	3		358	73			434
86F	51		610	338			999
86G			315	89			404
86H	30		984	1145			2159
86I	33		865	2122			3020
86J	51		1193	1078			2322
Totals	194	0	6714	7439	0	0	14347

Table 3-45: Fire Return Interval Departures

Moderate Departures From Fire Return Intervals

SWS	Fire Regime Group 1	Fire Regime Group 2	Fire Regime Group 3	Fire Regime Group 4	Fire Regime Group 5	No Fire Group	TOTAL
86A	734		154				888
86B	1782		694	1165			3641
86C	1316		311	489			2116
86D	2805		746	937			4488
86E	949		215	296			1460
86F	2500		569	332			3401
86G	1483		208	444			2135
86H	1983		746	1384			4113
86I	1347		142	1378			2867
86J	1909		634	846			3389
Totals	16808	0	4419	7271	0	0	28498

Table 3-46:	Fire Return Interval Departures						
High Departures From Fire Return Intervals							
SWS	Fire Regime Group 1	Fire Regime Group 2	Fire Regime Group 3	Fire Regime Group 4	Fire Regime Group 5	No Fire Group	TOTAL
86A	1053		303				1356
86B	1410		801	391			2602
86C	1052		775	190			2017
86D	1654		325	96			2075
86E	930		130				1060
86F	1201		794	49			2044
86G	2159		470				2629
86H	2589		761	139			3489
86I	516			34			550
86J	723		142	9			874
	13287	0	4501	908	0	0	18696

Table 3-47:	Fire Return Interval Departures						
Data Gaps - Not Ranked							
SWS	Fire Regime Group 1	Fire Regime Group 2	Fire Regime Group 3	Fire Regime Group 4	Fire Regime Group 5	No Fire Group	TOTAL
86A		1709	610			228	2547
86B		1834	339	5	3		2181
86C		1376	378		15	29	1798
86D	7	1479	288	33	49	6	1862
86E		1708	34		13		1755
86F		2268	17			46	2331
86G	38	2256	91	24	4	24	2437
86H		3388	278	30	93	720	4509
86I		1944	133		83	189	2349
86J	23	1311	67	5	26	448	1880
	68	19273	2235	97	286	1690	23649

Interpretation

Vegetation composition (common in dry forest types), and stand structure (primarily in stand developmental stages of Understory reinitiation and stand initiation) within the analysis area have departed from historical conditions. This departure represents an increase in stand densities and a multi-layer stand compositions characteristic of stand replacement fire events. Overall, the landscape has a significant deficit of MSLT, SSLT (Late and Old Structure resilient to fire and insects and disease), and MSLTU structure; and a large surplus of UR, and SI stand development, (reference Meadow Creek Watershed Assessment silvicultural report). These departures and conditions have been influenced by logging, grazing, insects and disease, and fire exclusion.

The following table displays the percentage of acres found in fire regime 1 and 3; dry forest type fire regimes with frequent fire return intervals. Fire regime 1 and 3 represent the most concern for fire managers to reintroduce fire into this biophysical structure, and to begin a more frequent fire return interval cycle :

Table 3-48:	% of Acres In Fire Regime 1 and 3 Within SWS		
SWS	**% of Acres in Fire Regime 1 (Historical FRI 0 – 35 Years)**	**% of Acres in Fire Regime 3 (Historical FRI < 50 Years)**	**Total % of SWS in Fire Regimes 1 and 3 (Frequent Historical Fire Return Intervals)**
86A	38%	26%	64%
86B	32%	24%	56%
86C	34%	25%	59%
86D	42%	25%	67%
86E	40%	16%	56%
86F	43%	23%	66%
86G	48%	14%	62%
86H	34%	20%	54%
86I	22%	13%	35%
86J	33%	25%	58%
Avg for Meadow Creek Watershed	**36%**	**21%**	**57%**

The following table displays the percentage of acres with moderate and high departures from historical fire return intervals. This displays the Moderate fire regime 3 and the high fire regime 1. The remaining 45% are low and not rated areas consisting of longer fire return intervals or non forested areas not capable of carrying fire:

Table 3-49:	Areas of Moderate and High Fire Return Intervals	
SWS	**% of Acres with Moderate Departures from Historical Fire Return Intervals**	**% of Acres with High Departures from Historical Fire Return Intervals**
86A	19%	29%
86B	37%	26%
86C	30%	29%
86D	42%	19%
86E	31%	23%
86F	39%	23%
86G	16%	34%
86H	30%	25%
86I	33%	6%
86J	41%	11%
Average for Entire Meadow Creek Watershed	**32%**	**23%**

Where are fuel loadings representing a threat of damaging wildfire in the watershed and what opportunities are available to alleviate that risk?

Reference Condition

Many of the wildland fire threats and ecosystem health issues that confront us today began over 100 years ago. In the late 1800s and early 1900s, “high grade” logging selectively removed the largest most valuable trees – often the fire-tolerant ponderosa.

In later years, fire exclusion from plantations of uniform trees of the same age class created conditions conducive to insect and disease infestation and subsequent fires. As time elapsed, logging and other management practices may have further compromised land health by removing overstory trees while leaving smaller trees, slash, and other highly flammable fine fuels behind.

In the Meadow Creek area, the notion of forest protection has historically been equated with fire exclusion. A primary function of the Forest Services mission has been fire suppression. These efforts have altered the vegetative compositions and changed historical fire return interval cycles. Although suppression will continue to be essential to prevent undesirable outcomes on the landscape, many steps are being taken to reduce heavy fuel loadings. Current fire management practices include mechanical and prescribed fire restoration for ecosystem health. To reintroduce a fire tolerant stand with less fuel loading and lateral fuel threat.

Current Condition

In the prolonged absence of periodic surface burning, low and moderate severity fire regimes in the analysis area have developed multi-layered tree densities and vegetation accumulation greater than that of historical fire regimes. Furthermore, heavy concentrations of dead standing and down trees exist within a number of riparian areas, and reserves that are managed to promote old growth characteristics.

Past harvest activities and scab ridges distributed throughout the analysis area created patches of diverse stand and fuel conditions. However, areas at risk are stands that contain large Ponderosa pine and Douglas fir trees with excessive amounts of biomass, most commonly found in riparian and MA 15 areas that contain heavy concentrations of dead standing and down trees. The same similarities can be wittnessed within Fire regime 1 and 3’s where fire return intervals are outside normal historical cycles. All of these areas containing unreasonable levels of fuels are susceptible to stand replacing fire events which could result in the loss of late and old structure, wildlife habitat cover, and consumption of large woody material and structure in riparians.

The fuel profile is an important component of the forest ecosystem. Woody fuel helps support forest diversity. There must be enough fuel to provide for wildlife habitat and soil nutrients; but, excessive fuel conditions result in disturbance from insects and/or wildfire. Soil is the primary structure for ensuring a healthy forest ecosystem. Healthy soil layers require 10-15 tons of woody residue to support soil development. The dryer pine sites are at the low end of this range, and the moister subalpine fir sites evolve at the upper end. The 10-15 ton range should be used as a sideboard for guaging fire hazard. Areas with fuel loading above these ranges should be evaluated for possible fuel treatments. The quantity and type of fuel also influences the damaging effects of wildfire. The fire intensity (damage) will rise as fuel loads increase outside their historical range.

A. Wildfire Analysis

The success of our initial attack action in suppressing wildfires has resulted in an increased fuel loading in some fuel types. Fuels that were historically consumed during periodic wildfires have increased. Today, in many areas fuel loading is above its historical range (Caraher-July, 1992). The fire hazard has increased. Another aspect of successful fire exclusion has been a shift towards more homogenous stand conditions in areas that have not had active forest management. This lack of diversity in patch size and age diversity increases the number of acres that can be at risk from a wildfire risk within a watershed due to the sameness of fuel and stand conditions.

Fire Occurrence:

The Wallowa-Whitman National Forest has one of the highest wildfire occurrence rates in Oregon and Washington. The Meadow Creek analysis area had 120 documented ignitions on National Forest lands from 1970 through 2000; 76 lightning caused, and 44 human caused. The area is heavily used by recreationsists; primarily hunting and ATV use.

The following tables display cause of fire data for the analysis area from **1970 - 2000**:

Table 3-50:

Cause of Fire		Total Number of Fires by Cause	% of Fires by Cause	Total Acres by Cause	Percent of Acres by Cause
Lightning	1	76	63 %	86.8	85%
Equipment	2	2	2 %	2.2	2%
Camp Fire	3	8	7 %	2.7	2%
Warming Fire	4	23	19 %	5	5%
Debri Burning	5	4	3 %	2.7	2%
Railroad	6	0	0 %	0	0%
Arson	7	2	2 %	.3	<1%
Children	8	1	1%	.1	<1%
Other	9	4	3 %	2.3	2%
TOTAL		120	100%	102.1	100%

The following table indicates the number of fires and size of fires since 1970 within the Meadow Creek watershed:

Table 3-51:		**Fire Size Class**	
Fire Size Class		**Total Fires by Fire Size class**	**Percent of Fires by Size Class**
A	Spot - .25 acres	98	81.7%
B	.26 - 9.9 acres	19	15.8%
C	10 – 99.9	3	2.5%
D	100 – 299.9	-	0 %
E	300 – 999.9	-	0 %
TOTAL		120	100%

Table 3-52: Fire Occurrence			
Fire Occurrence Rates per 1,000 Acres Based on Years 1970 – 2000 (30 Years)			
Area/SWS	**Total Fires**	**Avg Annual Fire Frequency**	**Fire Occurrence Rate per 1,000 Acres**
WWNF	4793	154.61	0.06
4th HUC (Upper Grande Ronde)	688	22.19	0.05
5th HUC (86 - Meadow Creek)	125	4.03	0.05
86A	3	0.10	0.02
86B	16	0.52	0.05
86C	17	0.55	0.08
86D	13	0.42	0.04
86E	3	0.10	0.02
86F	5	0.16	0.02
86G	12	0.39	0.05
86H	26	0.84	0.06
86I	14	0.45	0.05
86J	16	0.52	0.06

* The Fire Occurrence rate equals the number of fires per year per 1,000 acres. The rate is used to compare average fire occurrence per year on a relative basis. The Meadow Creek analysis area has a fire occurrence rate that is 10% lower than other watersheds on the forest.

Large Fires:

There have been no fires greater than 100 acres within the Meadow Creek Watershed within the last 40 years (**1960 to 2000)**. However, there have been 10 large fires within adjacent watersheds dating from 1960 – 2000. These fires burned at moderate and stand replacement severity. The following table displays large fire activity for the Upper Grande Ronde (4th HUC Waterhsed):

Table 3-53: Large Fire Description					
Fire Name	**Month**	**Year**	**Fire Size**	**Statistical Cause**	**Total Acres**
Squaw Butte	August	1987	E	Lightning	786
Railroad	August	1981	D	Railroad	130
Spring Creek	August	1986	E	Lightning	319
Ditch Creek	August	1987	E	Lightning	934
Three Cabin	August	1986	D	Lightning	105
Tanner Gulch	July	1989	F	Lightning	4,700
Bear/Frizzel	August	1986	D	Lightning	250
Grande Ronde River	July	1970	D	Lightning	180
Ma	October	1985	D	Lightning	293
Clear	August	1986	G	Lightning	6,411
Total Acres					14,108

B. FOREST RISK ASSESSMENT PROCESS (WRAPPS):

Earlier, the Forest WRAPPS process as it pertains to departures in fire return intervals and ecological risks was discussed. The second process addresses fire hazard – the potential for loss or “damage” due to a high intensity fire. Both of the methods attempt to address “risk” from a fire perspective. However, they are quite different processes designed to answer different questions.

The fire hazard assessment process used inputs such as elevation, slope, aspect, stand structure, fuel loading, and fire occurrence to predict potential fire behavior that could cause a stand replacing fire. Three variables were assigned to rank values that are at high medium, and low risk: Fire Occurrence x Hazard, Consequence = Risk.

- **Fire Occurrence** is a tally of fire starts over a set period (1970 through 2000). Each subwatershed (5^{th} field HUC) on the forest has been ranked as to fire occurrence within the watershed based on the number of recorded fire starts within the watershed. The ranking compares each watershed relative to all of the other to present a picture of how each compares with others across the 2.3 million acres of the Wallowa-Whitman. Given that this is a lightning prone landscape all watersheds will significant ignitions if the time period is long enough, but patterns do exists and certain watersheds and locales within some of these watersheds do exhibit higher values. Thus across the Forest watersheds can categorized as a high, med, low value (numeric) based on the total ignitions within each watershed. The size difference between watersheds is accounted for by considering them on a per thousand acre basis, this levels the process so all size watersheds can be compared.

- **Hazard** is a combined value derived from of the existing fuel model (modeled from EVG or PMR). The ranking value from the fuel model is based upon established default fire behavior parameters assigned to each model. Additional values are assigned to the following by establishing 3 primary categories for each value; percent slope, aspect, elevation, and stand structure. A summary numeric value is established that again establishes categories of high, medium, low.

- **Consequence** is the final variable in the calculation. This is a numeric value applied to identifiable resources or features within an area the following are resources or areas that could get the highest numeric value: mapped old growth, municipal watersheds, private lands, or any other key resource that is mapped and is of concern if exposed to high intensity fire. Wilderness, Backcountry, RNA's, wild and scenic river corridors are given the lowest value. All other lands would be in the middle or medium value.

- **Risk** is the summary value of the three inputs. Risk under this option could be defined as the potential for loss or "damage" due to high intensity fires as identified by occurrence and physiographic effects on fire behavior. This leads to potential for loss based on values assigned.

The following table displays acres by subwatershed for the Meadow Creek drainage that are at risk of loss or ”damage” should a high intensity fire occur.

Table 3-54:		Fire Risk Assessment By SWS			
Fire Hazard Acres by Subwatershed					
SWS	Low	Moderate	High	Not Rated	TOTAL
86A	3733	940		8185	12858
86B	7668	2252		2095	12015
86C	94	5839	1042	11523	18498
86D	7837	2801		7241	17879
86E	3694	1014		819	5527
86F	6154	2518		112	8784
86G	6184	1404		262	7850
86H	65	10756	2832	768	14421
86I	5991	2046		1236	9273
86J	72	5761	2102	804	8739
TOTAL	41492	35331	5976	33045	115844

Note: The **Not Rated** column of 33,045 is private property. When subtracted from the 115,844 total would represent a total of 82,799 Forest Service (FS) acres. These FS acres are most commonly used due to the data gap in private lands.

C. FIRE ACCESS

Though over-accumulation of vegetation resulting from fire exclusion has placed some areas at risk to severe wildfires, wildland fire protection programs are still essential to protect human lives, watersheds, species, and other resource objectives that are compromised during severe wildfire events.
The success of fire suppression tactics in recent years can be partially attributed to the development of a transportation system. The road system provides an important fire patrol network for wildfire detection and suppression access. The District Access Travel Management Plan was implemented during 1994 and completed in 1995. **See Access and Road Data located in Travel management portion.**

Initial attack response time is a key factor in modeling fire size. Time of initial attack has shifted from one hour to two hours due to the reduction in road mile density; which will result in a loss of time for initial attack as well as detection. Estimated fire size has been modeled in the BEHAVE fire program (Burgan and Rothermel, 1984). A two hour response time in Fuel Model 10 will result in a fire four times the size of a fire with one hour initial attack time. An additional component in the change relating to access also affects the type of resources that might be called to respond to an ignition. Reduced road access places a greater reliance on aerial delivered resources.

Interpretation

"A Cohesive Strategy for Protecting People and sustaining Resources in Fire-adapted Ecosystems" report is a response from Forest Service Management to Congressional direction to provide a strategic plan to reduce wildfire risk and restore forest health in the interior West. This strategy is intended to restore and maintain ecological integrity in fire-adapted ecosystems to:

- Improve health, resilience, and productivity of affected forests and grasslands at risk
- Conserve species and optimize biodiversity over the long-term
- Reduce wildfire costs, losses, and damages, and
- Better ensure public and firefighter safety.

The above national goals should influence management decisions in determining where to invest in the future for the greatest benefit to risk reduction. Considering this and the previously described Forest Risk Process the following priority areas in the Meadow Creek Watershed are:

In addition, reducing under growth (ladder fuels) and down material will provide beneficial long- term forest health and reduce wildfire effects within or adjacent to the analysis area. Treating places with dense stand conditions and heavy fuel loadings, and utilizing treated sites that exist throughout the planning area, will create defensible locations to prevent wildfires managed for resource benefits from spreading outside or into the Meadow Creek drainage.

Fire dependent ecosystems where fire- return intervals are furthest from their historical range of variability (Warm, Dry Types). Prescribed fire should be used:

- to reduce fuel accumulations and to promote balanced ecological plant associations in fire dependent ecosystems that existed historically.

- Acreage's that ranked high in the Forest Risk Process where species, public health and safety, and watersheds are at greatest risk of negative impacts of a severe wildfire.

The analysis area contains a mosaic of past harvest activities and warm dry site vegetative conditions, inadvertently fostered by aggressive fire suppression. Areas within these diverse stands and fuel compositions now contain excessive biomass accumulations. The protection and presence of large Ponderosa pine and Douglas-fir trees within riparian and MA 15 areas are at considerable risk. These areas could currently support intense, stand replacing fire events, which could result in the loss of late and old structure, wildlife habitat cover, and consumption of large woody material and structure in riparian areas.

Human influence, through fire suppression strategies, has prevented fire from playing its historical role in limiting stand density, clearing under growth and down material, and influencing species composition. Accumulations of vegetation and fuels that were historically consumed during periodic wildfires have increased primarily in areas that have not had forest management activities within the Watershed.

What are the effects of prescribed fire vs. wildfire on air quality within the watershed and the adjacent sensitive airsheds?

Reference Condition

Estimated amount of emissions released by burning:

There are three types of smoke generating activities on the La Grande Ranger District:

1. **Grass/forbs enhancement burns**: These will contribute less than 5 tons per acre of total emissions: 0.0375 tons (75 pounds) of PM10 per acre of grass burning.

2. **Landing piles**: Areas prescribed for LTA will have 10-35 % of the slash brought in to the landing. There will be an average of 10 tons of slash per acre that will be brought into the landing for piling and burning. The timber sale purchaser will be given salvage rights to the landing slash; if salvage is not taken then the piles will be burned: 0.125tons (250 pounds) of PM10 per acre of pile burning.

3. **Underburning**: Over the past 10 years pre and post burn monitoring plots have been established to record pre and post burn slash loadings. District fuel consumption averages have been established and these are used for estimating pre and post burn loadings: 0.225 tons (450 pounds) of PM10 per acre of prescribed burning.

The emissions released from a mild intensity spring burn are low. Consumption during spring burning is reduced due to high fuel and duff moistures. Spring underburning produces less particulate than summer burns and wildfires.

In 1994, prescribed burning of naturally occurring fuel was done on approximately 300 acres. The 1994 natural fuels burning monitoring showed that 41% of the woody fuel was consumed (36% >3" and 49% <3").

Current Condition

The Meadow Creek Watershed is located near the John Day Wilderness, a high visual quality area, and the Grande Ronde Valley. It includes the City of La Grande, which has been designated as a PM10 health sensitive area.

Air quality monitoring sites are located in two areas. The City of La Grande maintains equipment that is used for estimating PM10 levels for health purposes. Visual quality had been monitored from the Pt. Prominence fire lookout until 1998 where ODEQ maintained a camera visibility monitoring site (Boutcher, 1994). Current plans are to monitor visibility at an automated IMPROVE (Integrated Monitoring for Protected Visual Environments) site located within Starkey Experimental Forest. This is a joint project with EPA, UC Davis, Park Service, and US Forest Service.

Air quality "trade off limits" between wildfire and prescribed fire are documented in the Memorandum of Understanding between the DEQ, ODF, BLM and USFS (October 27, 1994). The four National Forests within the Blue Mountains of NE Oregon have agreed to the following baseline emission limits:

Wildfire target level = 2,500 **tons** PM10 per year
Prescribed Burning emission limit = 15,000 **tons** PM10 per year

Huff, Ottmar, et al (1995) found PM10 smoke production was twice as high for wildfires as for prescribed fire. This is because wildfires generally occur during drought periods in which there are low fuel moistures. Their research in the Grande Ronde River Basin found the following levels of PM10 smoke emissions:

Wildfire: 0.318 tons/635 pounds per acre
Prescribed burning: 0.167 tons/334 pounds per acre

Interjecting Ottmar's emission levels into the maximum PM10 tonnage levels shows an annual wildfire target of 8,000 acres per year and 90,000 acres of prescribed burning. The La Grande Ranger District comprises 452,000 acres (7.3%) of the 6.2 million acres found in four forests identified in the air quality Memorandum of Understanding. The La Grande Ranger District share of the annual smoke emissions budget level is:

Wildfire: 584 acres
Prescribed burning: 6,570 acres

The Meadow Creek Watershed is located 20 to 25 air miles west, southwest of the City of La Grande. The prevailing wind during fire season is out of the southwest. Under the Clean Air Amendments of 1990, La Grande was evaluated as a possible non-attainment area for PM10. From 1986 through 1994, air quality standards were violated ten days with a high of five violations in 1988. The last air quality violation was in 1991. None of ten violations were caused by smoke generated on the La Grande Ranger District, or other Forest Service activities. In December 1994, the Department of Environmental Quality declared that the City of La Grande had met Federal Clean Air guidelines for attaining air quality standards for fine particulate matter (PM10). La Grande is currently classified as a "non-restricted" air quality area; however, the District participates in a "voluntary" program for smoke and particulate monitoring to minimize smoke impacts (Oregon Smoke Management Annual Report for 1995). In 2000 modification to the particulate measurements changed from (PM10) to (PM2.5).

Nearby sensitive areas that may be affected by smoke generating events in the Meadow Creek Watershed are as follows:

I-84 in the Spring Creek area
Highway 244
Communities: La Grande, Union, Cove
North Fork John Day Wilderness Area (Class II)

For prescribed burning in logged areas the district average woody fuel consumption tonnages are used. These consumption averages are based on over 400 pre and post burn inventory plots that have been done between 1986 and 1993.

Table 3-55: Underburn Fuel Consumptions

	DUFF	0-1/4"	1/4-1"	1-3"	3"+	Total
Activity Slash						
PREBURN Tons/Acre	11.0	0.7	2.4	3.4	16	33.5
POSTBURN Tons/Acre	5.5	0.1	0.6	1.3	8	15.5
Average CONSUMPTION	5.5	0.6	1.8	2.1	8	18.0
Natural Fuels						
PREBURN Tons/Acre	--	0.45	6.0	11.3	1.7	35.5
POSTBURN Tons/Acre	--	0.31	3.0	7.2	10.5	21.0
Average CONSUMPTION	--	0.14	3.0	4.1	7.3	14.5

Ottmar (1992) compared fuel consumption, site severity, and smoke/PM10 production from logged units treated with prescribed fire and logged units left untreated and were burned during the Shady Beach Wildfire. This research, along with more recent studies, found an emissions range of 19 to 25 pounds of PM10 per ton of fuel consumed by prescribed fire.

The ACOST computer model was developed for predicting fuel consumption. ACOST uses on site information which is turned into the Oregon Smoke Management system to calculate the consumed tonnage for prescribed burns. This program slightly over predicts consumption. ACOST predicts 22 to 26 tons per acre consumed; compared to the District's measured consumption of 18 tons per acre.

Interpretation

Maintenance of air quality is the greatest challenge to a fuel reduction program. Regional direction places the highest priority on utilization of fiber. When prescribed burning is required for fire hazard reduction and/or ecosystem enhancement then the potential conflict with air quality becomes more critical.

Ottmar's research (1992) found that emissions released during a low intensity, spring prescribed burn are approximately half that released during a wildfire. Daily Smoke Management Forecasts assist in making decisions on whether or not to burn.

The protection of air quality in the class II John Day Wilderness can best be achieved by not impacting visual quality in this area during the peak recreational use period, which is defined as July 1 through September 15.

Prescribed burning opportunities may be limited at times due to the accumulative effects of multiple ignitions within the general La Grande area; coupled with wind direction and air stagnation patterns. Evening, down drainage winds may carry residual smoke from higher elevations into the Grande Ronde valley or into the North Fork John Day Wilderness. Fall time prescribed burning may also be effected by atmospheric inversions, which may trap smoke-laden air in the valley bottoms. Close smoke management coordination is necessary to maintain a prescribed burning program.

Smoke emissions produced during prescribed burning activities can be mitigated as follows:

1. **Burning Avoidance -** Maximizing utilization will greatly reduce the amount of emissions by converting from area underburning to sporadic landing pile burning.

2. **Smoke Dilution** - Cool/high fuel moisture prescription. Prescribed burning
   i. during cool, spring like conditions will reduce the amount of duff and large woody material (eg. > 3 inch diameter) fuel consumption. Underburns in areas with moderate to heavy fuel loading will generally be burned in the spring when fuel moisture content is higher and evening humidity recovery is best. This also reduces smoldering smoke emissions. Some fall burning may be needed to obtain desired results in units with lighter fuel loadings. Prescribed burns are accomplished during periods of favorable weather when there is high evening relative humidity recovery, moist soils, and high moisture in the larger woody fuel. These conditions aid in natural extinguishment and result in less mop-up and overall reduced smoke emissions.

3. **Smoke Dispersion** - Transport wind direction aid in determining if a sensitive area will be threatened by prescribed burning. Wind speed also assists in diluting smoke effects.

4. Conduct burning within the guidelines established by the Oregon Department of Forestry's Smoke Management Division (Salem). Daily smoke management advisories will provide forecasts for the La Grande area.

5. Landing piles may be partially covered with a paper product. This will keep the piles dry so that they can be burned in the fall during periods of favorable smoke dispersal.

6. Cull decks utilization.

7. Post burn mop up may be initiated if residual smoke is significantly impacting air quality.

NOXIOUS WEEDS/INVASIVE SPECIES

What noxious weed species occur in the watershed and what is their status?

Weed Species Known to occur within the Meadow Creek Drainage on NFS lands

The introduction of non-native plant species, especially noxious weeds is a potential threat to native biological diversity. Many of the weed infested sites occur in highly disturbed areas, where they can dominate and totally displace the native flora. Areas associated with fire, roads, timber harvest activities, and recreational use, have the potential to be invaded by weeds. Some weed species, including bull thistle (Cirsium vulgare), Canada thistle (Cirsium arvense), and Hounds tongue (Cynoglossum officinal) are certain to be in the watershed area, but their locations, other than sites where the species have become the dominant plant, have not been documented. These species are considered to be abundant countywide and the forest generally does not spend time treating ubiquitous weeds. Although these species can be fairly aggressive in early seral and disturbed sites, they will generally fade out of the ecosystem naturally as the tree canopy closes.

Techniques used to control and eradicate noxious weed species may involve any of the following: manual methods, cultural techniques, chemical treatments or biological control. Manual treatments may be effective in preventing the spread of certain species, but are not sufficient in most cases to eliminate weeds from the site. The La Grande Ranger District administers a comprehensive noxious weed control program which has been successful in identifying new sites, properly documenting, and developing a treatment regime to control and possibly eradicate the invading species from the site.

In addition to noxious broadleaf weeds, several invasive grasses, cheatgrass (Bromus tectorum) and Ventenata (Ventenata dubia) have been observed within the watershed which have the potential for alteration of the native plant community. These species favor disturbed sites where native grasses have been removed or weakened through past improper grazing, logging or road building activities.

Table 3-56 lists noxious weed species known to occur in the Watershed which are currently being monitored or are part of the District noxious weed treatment program.

Table 3-56: Noxious weed species acreage and location by subwatershed for WA 86

Species Name	Acres	SWS
Whitetop (Cardaria draba)	<1/10	86I
Musk thistle (Carduus nutans)	1	86B, 86D
Diffuse knapweed (Centaurea diffusa)	1.5	86B, 86C, 86D, 86G
Leafy spurge (Euphorbia esula)	6	86A, 86E
Tansy ragwort (Sececio jacobia)	Old sites None found during survey	86E, 86H
Canada thistle (Cirsium arvense)	30	86A, 86D, 86E, 86F, 86H
Bull thistle (Cirsium vulgare)	<1/10	86J
TOTAL NET ACRES	**38.7 est.**	**ALL 86 SWS**

Table 3-57: Site Specific Known Noxious Weed Locations

SITE ID	SITE ITEM	SPECIES	LOCATION	SWS	LEGAL DESCRIPTION
6-0003	070	EUES	Hwy.244	86A	T4S, R34E sec 13
6-0033	107	EUES	2120 730 rd	86A	T4S, R34E sec 12
6-0048	131	EUES	Battle Creek Tributaries	86A	T4S, R35E sec 7
6-0093	199	EUES	2120 725 RD	86A	T4S, R34E sec 11,12
6-0005	034	SEJA	Marley Creek Road.	86E	T5S, R35E sec 6
6-0004	030	EUES/CIAR	Tybo Canyon	86A,E	T4S, R35E sec 8,17,18
6-0007	014	CANU5	Little.Dark Canyon.	86B	T2S, R5E sec 14
6-0063	182	CEDI	2100-410	86B	T3S, R35E sec 14
6-0064	193	CEDI	Hwy. 244 410-536	86B	T3S, R36E sec 13
6-0031	a 096	CEDI	2100410 rd	86B	T3S, R35E sec 14
6-0070	188	CEDI	2137 400-385	86B,C	T3S, R35E sec 9
6-0006	006	CANU/CEDI	McCoy Creek	86D	T2S, R34E sec 34
6-0009	015	CEDI	McCoy Creek	86D	T3S, R34E sec 2, 4
6-0059	152	CEDI	21/21-140 Road Junction	86D	T3S, R34E sec 7,8
6-0009	275	CEDI	2125-358	86D	T3S, R35E sec 7
6-0106	201	CIAR	2100 rd	86D,H	T3S, R33E
6-0004	235	CIAR	2442	86E	T4S, R35E sec 20
6-0073	191	CIAR	Burnt Corral Road 2444	86F	T4S, R34E sec 1, 36
6-0068	186	CEDI	2110 Near Frog Heaven	86G	T4S, R34E sec 19
6-0031	e 100	CEDI	21/2110 Road Junction	86G	T4S, R34E sec 19

Complete inventory information is on file at the La Grande Ranger District.

Inventory information for private lands within the watershed is not available. It is known however that there are several large infestations (>50 acres) of leafy spurge on the private lands which have received some herbicide treatment in recent years. These locations are within SWS 86A, 86C, and 86F.

Cardaria draba (L.) Desv. (whitetop/hoary cress) CADR

Whitetop, a native to Europe, is common in disturbed soils but can invade croplands and and dry pastures as well. Common throughout most counties east of the Cascade Mountains, it is widespread in Baker County where treatment has been limited to only those sites which are new to the area. A highly competitive species, this species has the potential to become established in Union County as well.

Carduus nutans L. (musk thistle) CANU5

Musk thistle is a native to southern Europe and western Asia. Plants produce 50 - 100 seedheads which contain up to 1000 seeds. These seeds are mostly transported to new locations by vehicles birds and the wind, where they may remain viable in the soil for several years. Disturbances allow for invasion of this species, however it can also infest pastures, range and timberlands. An aggressive plant, this species can displace other, more desirable vegetation.

Centaurea diffusa Lam. (diffuse knapweed) CEDI

Diffuse knapweed is a native of southern Europe and the north central Ukraine. In addition to being a prolific seed producer, this species can spread rapidly, forming dense stands. Diffuse knapweed does not require disturbance to invade and tends to dry up, break off at the base, and spread seed like a tumbleweed. Additional sites for this species are also known outside the watershed. Plants are being treated with herbicide and hand-pulling on a site by site basis.

Cirsium arvense (Canada thistle) CIAR

Canada thistle is a colony forming perennial frpm deep and extensive horizontal roots. A naitve to southeastern Eurasia, Canada thistle was introduced in the late 18th century as a crop seed contaminent. The aggressive weed is difficult to control however treatment with herbicide is effective in reducing large colonies found in disturbed areas or along roadsides. On the La Grande Ranger District, only sites with large colonies are being inventoried for treatment.

Euphorbia esula L. (leafy spurge) EUES

Leafy spurge is native to Eurasia and was brought into the United States in 1827. This species propagates by rootstock and seed, which can remain viable in the soil for eight years. The extensive root system adds to the persistence of the species which has potential to damage riparian areas. There is a large infestation on several private land parcels adjacent to NFS lands near Marley Creek and Meadow Creek. Additional sites of leafy spurge are located just outside the watershed.

Senecio jacobaea L. (tansy ragwort) SEJA

Native to Europe, tansy ragwort was first reported in North America in the early 1900's. Seeds are dispersed by wind, water and animals, and can remain viable in the soil for three years. Tansy ragwort is known to exist at numerous sites within the UGRR drainage, two of which are within the Boundary Fire area. Additional sites are located in the adjacent, Beaver Creek Watershed (#16). Toxic to cattle and horses, tansy sites are actively being treated by the state of Oregon.

Where are the likely areas for noxious weed spread and what preventive measures may be pursued to prevent this spread? To what degree do the presence, type, and location of the roads increase the introduction and spread of exotic plant species? And what are the potential effects?

Weed species with potential to occur within the Meadow Creek drainage

Additional species, which occur just outside the watershed and may spread or be transported to areas within the Meadow Creek drainage include the following:

Centaurea maculosa Lam. (spotted knapweed)

Spotted knapweed is known to occur with subwatershed 87G of the adjacent Spring Creek watershed. Native to central Europe, it is believed to have been introduced to North America as a contaminant of alfalfa or clover seed. A prolific seed producer, seeds are dispersed by wind and may remain viable in the soil for eight years. This species does not require disturbance for invasion, and early spring growth allows it to competitively displace native vegetation.

Centaurea solstitialis L. (yellow starthistle)

> Yellow starthistle is documented within the Spring Creek Watershed (87G), although no sites are currently known within the Meadow Creek drainage. An introduced species from Europe, yellow starthistle is typically introduced on roadsides and disturbed areas such as campsites.

Kochia scoparia (L.) Schrad. (burning bush)

> Kochia, or burning bush, occurs at one location within subwatershed 87F of Spring Creek, but not within watersheds 85 and 86. Although it has some forage value for livestock (especially in the early stages) it can also be toxic due to high nitrate levels. Native to Asia and introduced from Europe, this species has escaped from cultivation as an ornamental and is rapidly spreading in many areas of the United States.

Linaria dalmatica (L.) Mill. (Dalmation toadflax)

> Dalmation toadflax is located along Interstate 84 within the Spring Creek Watershed (87E), adjacent to the analysis area. This perennial member of the snapdragon family, native to the Mediterranean region, is thought to be an escaped ornamental. Plants can produce 400,000 seeds per year, which may remain viable for up to 10 years. In addition to seed, it can also spread by lateral root extensions. Dalmation toadflax can dominate roadsides, rangelands and dry meadows, crowding out the preferred, native plant species.

Measures to reduce or prevent the introduction of these and other un-desirable non-native species are incorporated into all land management plans for projects on NFS lands. The use of state tested grass seed, equipment cleaning for logging and road construction, inspection of rock pits for presence of noxious weeds prior to use for road construction and maintenance projects, grazing by Forest Service grazing permittees on noxious weed free pasture prior to entry to NFS lands, and requiring noxious weed free feeds for pack and riding stock are all designed to reduce the spread or introduction of weed seed into previously un-infested areas.

Transportation systems within the watershed are vectors by which many noxious weeds are spread, however the road system is also the easiest to monitor for new infestations or the spread of existing ones. As roads are closed or decommissioned, the frequency of travel is reduced or eliminated thus reducing the opportunity for weed seed spread via vehicles. This also works against noxious weed detection in that decommissioned roads are more difficult to inspect and also provide a disturbed seedbed for establishment of noxious weeds. It is important to inspect these areas for several years following closure or decommissioning.

INSERT WEED LOCATION MAP WITH SPECIES LEGEND

Range allotment map insert here.

NON-FOREST VEGETATION

The Meadow Creek drainage provides a wide diversity of plant associations ranging from dense old growth timber stands to open grasslands and riparian meadows. Non-forest associations are capable of supporting a variety of herbaceous and shrubby vegetation.

Shrub communities found in the Meadow Creek drainage include curl-leaf mountain-mahogany and rigid sagebrush/Sandberg's bluegrass shrublands. Grassland associations found in the Meadow Creek drainage include Idaho fescue-bluebunch wheatgrass, bluebunch wheatgrass-Sandberg's bluegrass, and bluebunch wheatgrass-Sandberg's bluegrass-one-spike oatgrass.

Within the Meadow Creek drainage, many of the forest and non-forest associations are used as range allotments. Most upland range sites are in fair to good condition except for those few areas where the natural potential of the site has been altered in a way that makes recovery unlikely to occur. Although species composition in some riparian areas has been altered, herbaceous cover is essentially fully intact and capable of protecting the soil.

Most of the rangeland contained within the Watershed is believed to be in fair or good condition, with an overall upward trend. There are many healthy populations of Idaho fescue (<u>Festuca idahoensis</u>), Sandberg's bluegrass (<u>Poa sandbergii</u>) and bluebunch wheatgrass (<u>Agropyron spicatum</u>) present along the south facing slopes and ridge tops within the watershed. Pinegrass (<u>Calamagrostis rubescens</u>), Elk sedge (<u>Carex geyeri</u>), Columbia brome (Bromus vulgaris), and Mountain brome (<u>Bromus carinatus</u>) are found in many timbered areas and are the primary forage for livestock and wildlife here. These are all desirable native forage grasses.

There have been many other grass species introduced into this analysis area, for the most part by intentional seeding. Many of these are desirable forage species, widely used by domestic livestock and big game. These include: intermediate wheatgrass (<u>Agropyron intermedium</u>), western wheatgrass (<u>Agropyron smithii</u>), big bluegrass (<u>Poa ampla</u>), kentucky bluegrass (<u>Poa pretensis</u>), smooth brome (<u>Bromus inermis)</u>, and orchardgrass (<u>Dactylis glomerata</u>), among others. These species, although not native to the watershed, have become part of the potential natural community (PNC), and provide a wide diversity of habitat for both wildlife and big game alike.

The middle and high elevations vegetation consists mainly of mixed conifer, snowberry, spirea, elk sedge, and pinegrass. Meadows within the area are dominated by mountain brome, Kentucky bluegrass or tufted hairgrass (<u>Deschamsia cespitosa</u>). Riparian areas are dominated with a variety of species including Kentucky bluegrass, aquatic sedge (<u>Carex aquatilus</u>), and Nebraska sedge (<u>Carex nebraskaensis</u>), and smallfruit bulrush (<u>Scirpus microcarpus</u>).

<u>Grassland Condition and Trend</u>:

There are numerous Parker Three Step Transects (C&T's) throughout the Watershed, which have been established to assess the condition and trend of grass and forb communities within grazing allotments. Many of these C&T's were installed and initially read in the 1960's and have not been re-read for some time. The transects within the Dark-Ensign C&H allotments were re-read in 1992. Analysis of the information produced indicated that one percent of the acreage was in excellent condition, six percent was in good condition, 94 percent was in fair condition, and one percent was in poor or very poor range condition. The analysis of trend showed that overall, the allotment is in a stable or upward trend. The Forest Plan specified that range be in a fair condition with a stable trend as the minimum requirement. The Dark Ensign allotment had historically been very heavily used in the early part of the century and has been in a recovering mode since.

Overall, reductions in stocking and season of use, coupled with improved pasture management have allowed grasslands within NFS administered lands within the Watershed to improve in condition class and maintain an upward trend toward this improvement.

GRAZING/RANGE MANAGEMENT

Historic Activities

By the early 1880's the forests and prairies of the American West had been settled, with farmers beginning to move into the interior of the Pacific Northwest. The construction of railroads had ended the isolation of the area, made immigration easier and cheaper, and opened up new markets. The population of Washington Territory increased almost fivefold during this time.

Many of these immigrants entered the livestock business after pursuing other occupations, shifting from timber related activities, mining, cattle raising, fruit growing, and so on.

Many utilized The Homestead Act of 1862, which required the building of a home, five years' continuous residence, cultivation of a portion of the land, and a fifteen-dollar filing fee. An alternative was to reside for six months, make certain minimal improvements, and pay $1.25 an acre under the preemption aspect of this same law. The Timber Culture Act also enabled settlers to acquire an additional 160 acres by planting and maintaining ten acres of trees on the tract.

Sheep began moving into the Pacific Northwest during the westward migration along the Oregon Trail, with herds crossing the plains in 1844-1847, with first large sheep drive in 1848 (435 head). Between 1860 and the mid-1890's, the number of sheep in the western states and territories increased from less than 10 percent of the nation's flock to more than half. By 1890, four times more sheep than cattle were grazed on the Columbia Plateau, and during the next decade the numbers would exceed 1.1 million, more than eight times the size of the remaining cattle herds. Part of this change had to do with the economics of livestock raising.

Cattle required a larger initial investment than sheep and matured more slowly. Sheep could be raised cheaply on unclaimed range. One shepherd and his dogs could handle as many as three thousand sheep. In the spring, sheep could be grazed several days without water on the succulent range grasses enabling the herders to reach rangelands where cattle could not survive.

Some of the sheepmen began running their flocks into the Blue Mountains for summer range in 1868-72 (Strickler and Wade 1980).

By the 1880's the livestock grazers had altered themselves (in ways not realized). The rapid introduction of thousands of head of livestock affected the range land vegetation itself. The native perennial grasses, highly palatable to cattle, were overgrazed. The native cover was significantly reduced which allowed annual "weeds" (forbs) unwittingly introduced from Europe and Asia to spread. While these species were of marginal use as cattle feed, sheep however, preferred these succulent green annuals to dried grasses and used them to supplement their diet during the early spring months. As the native bunch grasses were replaced by these exotic, early maturing annual forbs, the ranges became less suitable for cattle grazing, but better for seasonal sheep use. Twenty years of heavy grazing had made plateau grasslands particularly suitable to sheep production.

Cheatgrass became the widespread plant species throughout the Columbia Plateau. Botanists had gathered a few samples in the 1890's, which probably came from contaminated wheat shipped into the region. A scientist at the Agricultural College in Pullman, Washington, grew a stand in 1897, as a part of research for a new grass for the depleted rangeland. Cheatgrass began to spread widely by 1905 and by the start of WW I it had become the most abundant "weed," particularly in those areas were the native bunchgrass had been closely grazed but it provided a lush, rank early spring foliage for sheep.

Sheep were kept in the sheltered lowlands during winter and spring months, and then after laming (March and April) and early summer (June), the sheep herds were trailed slowly to the higher elevations. The mountain forests were strictly seasonal pastures of late-maturing green grasses and shrubs, but were snowbound from late fall until spring.

The sheep best suited to this type of herding were the Spanish Merino and a derivative type, the Rambouillet, often called "French Merino." They were big, hardy animals, able to withstand drought and scanty food. The sheep were divided into bands of 1,500 to 3,500 animals, depending on the weather, topography and other conditions. The entire course of the American sheep industry between 1800 and 1900 was changed by the advent of the Merino. By 1900, all but five percent of the breeding flock were descended from the Merino stock.

The decline of the cattle business was hastened by a drop in market price. In the 1870's the price per head on local markets was $40, but in the 1880's the price dropped to $10. Cattle worth $9.35 per hundredweight in Chicago in 1882 sold at $1 per hundredweight in 1887.

By 1885, wool prices were good, flocks were rapidly growing in size, sheep production was booming. In the Far West stock number were up 400 percent in a decade to more than 18 million head. And it was during this period that relationships between cattle-raising homesteaders and sheepmen become strained.

Beyond strains across occupation lines were the strains placed on the sheep industry by the variable winter in the Columbia Plateau. The winter of 1886-87 was severe enough that numbers of sheepmen lost sizable portions of their stock (running out of hay). Shortly thereafter, the winter of 1889-90, following two years of abnormally light rainfall, killed large numbers of livestock, estimates ranged from 60 to as high as 90 percent mortality.

The national depression of 1893 (The Panic of 1893) brought to a halt the rapid economic growth in the area, with banks and stores closing, and the price of wool and mutton and wheat at their lowest point since the Civil War.

Coupled with this was the large number of acres being removed from open, unimproved range as farming expanded into these areas. In Whitman County, Washington, for example, the number of acres went from 1,300,000 in 1879 to 380,000 1899. By 1890, in the Columbia Plateau, more than 2 million acres had become "improved" farmland. And in spite of the heavy winter loses, there were 825,000 sheep and 189,000 cattle.

The shepherds from east of the Cascades began major drives eastward, headed for Kansas, Nebraska and the Dakotas. In the years 1888-1900 three to four hundred thousand sheep were on the road (Wentworth 1948).

It was about this time that it was recognized that the rapid exploitation of the unregulated natural resources had left the western rangeland in a chaotic state, massively overgrazed. During the 1890's as the creation of the national forest reserves began, sheep were either excluded or regulated.

Congress enacted a law that set aside millions of acres of land as forest reserves, later to be renamed national forests, in 1891. The Creative Act of 1891 authorized the president to set aside public lands as forest reserves. These lands were administered by the General Land Office. Sheepmen would no longer be allowed to have unlimited access to the lands inside the forest reserves. As restrictions came in, it became apparent to numbers of sheepmen that leasing and purchasing large amount of land would be required if they wished to remain in business, especially on the scale of earlier years.

The Organic Administration Act of 1897 specified the purposes for which the reserves might be established and provided for their protection and management. The first lengthy debate on grazing on federal holdings began in the late 1890's, pitting the naturalist John Muir on one side along with other conservationists, against folks like Giffort Pinchot. This argument opened a rift between what has been described as two schools of conservationism -- the commercial-utilitarian groups following the lead of Pinchot, and the aesthetic-utilitarian group that followed Muir (a debate familiar to today's debates). Muir pressed for a complete banning of sheep use due to damage to the vegetation leading to degradation of the watersheds. Pinchot felt that grazing land could be improved if grazing was brought under governmental management. The early fee system charged $5 per 1,000 head. Grazing was officially recognized on the forest reserves in 1902. The reserves having been transferred from the Department of the Interior to the Department of Agriculture by The Transfer Act of 1905. By 1907, permits for grazing included items limiting the length of the grazing season, a fee based on "per head," drives, trails and roads were set aside or constructed for flock movement, fences erected, pastures and corrals set aside, and water facilities developed. In November 1906, a meeting was held and each stock raiser with a prior history of grazing in the Blue Mountain was assigned an allotment with carefully designated boundaries (O'Neal 1989).

The forest system put in a series of regulations for grazing in 1900 which led to reductions in the number of sheep allowed to graze on the depleted ranges with several sheep companies going out of business in 1908-1910 as a direct result (McGregor 1982).

Initially, there were seven allotments established for this watershed. Several of these allotments were once grazed by livestock, including numbers of horses, from the Umatilla Reservation. A note on the back of a ca. 1932 allotment map suggests that unregulated horse usage was overgrazing the hill tops within the Dark Canyon area. Subsequent forage studies indicated that the hill tops had not recovered as of 1963. Originally the bulk of the land included inside these allotments were utilized for sheep, but over time they were mostly replaced by cattle.

Dark-Ensign Allotment -- This was the general area so heavily impacted by grazing from the Umatilla Reservation (previously mentioned). It was originally three allotments, the Flat Lake, Ensign, and Dark Canyon allotments, separately grazed by sheep and horses since the 1920's, then converted to cattle in 1953. The Flat Lake Allotment was changed to Dark Canyon Allotment and the Ensign allotment was added to the system in 1975 and has been grazed as a single allotment since.

Cunningham Allotment -- This large area was originally three allotments, Bowman, Peet Creek, and Rancheria Allotments. These allotments had been grazed by combinations of sheep and cattle starting in the 1920's. The allotments were combined and split several times and eventually combined into one allotment in 1975 and converted to sheep grazing.

Starkey Allotment -- This area was converted to the Starkey Experimental Range in 1940, then into the Starkey Experimental Forest and Range in 1946. Prior to these dates, 10-15 ranchers grazed sheep and cattle in the area beginning in 1906. The primary study purpose at this time in interactions between livestock and big game.

Tin Trough and McCarty Allotments – These allotments were grazed by settlers in the Starkey area beginning in the 1880's. This area was originally the Sullivan cattle and Umapine sheep allotments. The allotments were divided into the McCarty and Tin Trough allotments in 1954 and were grazed by sheep. In 1965, Tin Trough was converted to cattle use and has remained a cattle allotment since that time. McCarty has remained a sheep allotment.

In the early 1890's, nearly 500,000 Animal Unit Months (AUM) were present on the Wallowa-Whitman National Forest. Since then, the numbers have decreased substantially to 200,000 AUM by the 1950's and then to less than 140,000 AUMs by 2000. This tendency at the forest level was reflected at the district level (Barton, personal communication). The large decline is mainly attributed to the collapse of the sheep industry in Northeastern Oregon with cattle grazing now being over 90% of the total livestock usage. The early intensive livestock grazing impacted the riparian areas by reducing the riparian vegetation, collapsing stream banks, eliminating shade, and degrading water quality.

Current Situation

The locations of the grazing allotments established on NFS lands are shown on the map on page 105. Livestock grazing was allowed at an approximate level of 8,122 Animal Unit Months (AUM's) during 2000 on NFS lands within the watershed. This is a substantial decrease from historic levels. Livestock grazing levels in the watershed has remained fairly constant since the 1970's. Timber harvest from 1960 to the late 80's resulted in the creation of many acres of transitory range which in the past, had been unavailable for livestock use. This resulted in changes in livestock distribution within the watershed, allowing better use of areas where canopy closure had precluded production of useable forage. Elk and deer populations have increased since 1950 which has, to some degree, compensated for the decrease in livestock numbers in terms of animal impact of forage plants. Cattle grazing now accounts for 63 percent of the total livestock grazing level (based on AUM's) with sheep grazing accounting for 37 percent. Animal unit months are calculated as follows: one cow and nursing calf grazing for one month, or five sheep and their offspring (usually 1.5 lambs per ewe) grazing for one month. One animal unit month of use will remove approximately the same amount of forage regardless of animal type.

Specific information on the level of livestock use on private lands within the MCWA Drainage is unknown. Visual observations of private rangelands indicate that these areas receive higher utilization than adjacent NFS lands. Almost all (> 99 percent) of the non-NFS land in the MCWA Drainage is zoned to allow grazing use. Grazing activities on private land are not restricted and any recovery is based on the personal intent of the individual land owners.

Several of the private land managers have implemented large scale restoration and pasture management improvement projects in recent years. Much of the lower section of Meadow Creek and McCoy Creek have been integrated into riparian pastures where grazing by livestock can be better controlled. These more intensive pasture management systems in addition to development of upslope water for livestock use will result in more rapid improvement for riparian and upland vegetation conditions.

The main potential impacts due to domestic grazing are reductions in riparian vegetation, reduced streambank stability, and decreases in water quality due to suspended sediment and increased temperature. Streams particularly impacted by domestic livestock within the Meadow Creek drainage include the McIntyre Creek, Meadow Creek, and McCoy Creek.

Recent management changes (since 1992) within the NFS administered lands and restoration projects on the private lands have helped to begin the return to more near natural conditions. Completion of restoration activities within the McIntyre Creek riparian area will occur within the next 2 years (by 2003). Projects within this drainage include removal of the draw bottom road through re-contouring, placement of large woody material, planting of native shrubs and grasses, and continued rest from permitted livestock on the NFS lands.

Recent management changes (since 1992) within the NFS administered lands and restoration projects on the private lands have helped to begin the return to more near natural conditions. Completion of restoration activities within the McIntyre Creek riparian area will occur within the next two years (2003). Projects within this stream reach include removal of the drawbottom road through re-contouring, placement of large woody material, planting of native shrubs and grasses and continued rest from permitted livestock.

In the impacted areas located on private lands, shrubs and conifers are mostly absent or suppressed. These impacts are also apparent, to a lesser degree, on NFS lands where meadows are adjacent to the private land.

Past management changes and restoration projects on NFS lands within the watershed have been driven by listing under the Endangered Species Act of Spring Chinook Salmon (1992), summer steelhead (1997) and bull trout (1999). These changes in management were required through consultation with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) and through implementation of the Pac Fish Enclosure B guidelines for management of livestock grazing within watersheds affected by the listing of endangered fish species.

Within the Watershed, the following restoration/livestock management projects have been implemented that related to grazing management.

<u>Dark Ensign C&H</u>

1994	Dark Pasture Division Fences
	McIntyre Riparian Pasture
	McCoy Creek Riparian Exclosure (big game and cattle)
1999	Antler Springs Riparian Exclosure (cattle)

<u>Starkey C&H</u>

1995	Burnt Corral Riparian Exclosure (cattle)
	Campbell Creek Riparian Exclosure (cattle)
	Several new off-site water developments
2000	Meadow Creek Riparian Pasture (cattle)

Tin Trough C&H
1995 East Burnt Corral Riparian Pasture (cattle)

Summary of key indicators

Areas within the watershed where past management impacts related to grazing have been addressed as they are found, either through utilization monitoring, PFC assessments, stream surveys, or permittee recommendations. Re-construction and maintenance of off-site/upslope livestock water locations is currently the focus for much of the watershed. Changes in pasture management in addition to more restrictive utilization standards and increased awareness on behalf of the permittees has enabled the majority of impacted riparian areas to move more rapidly toward potential natural condition (PNC).

Specific areas where improvements in riparian area management have been identified are:

Starkey
Upper Bear Creek—reduction of trailing by livestock adjacent to Bear Creek. Road closure and control of use between two water developments is currently being analyzed.

Tin Trough
Upper Burnt Corral Creek—reduction of use within the riparian area in late season. May require temporary fencing. Determining factor: utilization level at or near minimum standards.

Dark Ensign
Upper North Dark Creek—reduction of use within the riparian area. May require placement of LWM and better management of livestock while in the pasture.

Current management on all allotments within the watershed

Cunningham Sheep Allotment

This allotment is administered by the Umatilla National Forest, North Fork John Day Ranger District. The portions of the Cunningham Sheep Allotment within the Meadow Creek Watershed are in the headwaters, upper, and middle portions of Meadow Creek; the headwaters and upper portion of McCoy Creek; the whole subwatershed of Waucup Creek; and the upper headwaters of the Bear Creek subwatershed. Elevation ranges from 4,000 feet at the lowest point to 4,980 feet. Grazing by sheep occurs primarily on open ridge type areas and transitory range created from past timber harvests. This allotment consists of one unit using a deferred rotation grazing system. Sheep are moved within the unit to 23 different sheep camps throughout the grazing season. Five of these camps are located on private land. The sheep routing schedule is reversed each year to provide early season rest of the turn-on areas.

The Cunningham allotment permits 1,825 ewe/lambs pairs that are split into two bands (east band and west band) from June 16 to September 30 for a total of 6,509 HMs. There are three designated crossing areas on Meadow Creek and one designated crossing on McCoy Creek. On Meadow Creek one crossing is located on a main road that crosses Meadow Creek. Another crossing is located in the upper portion of Meadow Creek where the stream channel is naturally wide and shallow. The third crossing is outside of the class four stream in the head waters of Meadow Creek. There are two designated watering/crossing sites on lower portion of Waucup Creek (sheep will not cross/water in any of the designated crossings/watering sites within the Meadow Creek Watershed until the middle of August to the first week in September when Steelhead smolts have left the gravels and moved into cooler reaches of the watershed). Sheep are primarily watered twice a day (morning and afternoon) and will only need to cross the designated crossing areas once during the grazing season. Herders have complete control of sheep and can move them very decisively into a crossing area. Developed ponds and springs are the primary water sources used by the sheep on the allotment. Sheep do not prefer moist streamside or wet meadow vegetation types. Sheep are only herded into these vegetation types to cross at the designated crossing and/or designated crossing/watering sites. There is one designated stream crossing on the upper headwaters of McCoy Creek. This crossing is located on an old road and will only be used once during the grazing season. Sheep will not cross the designated crossing site until after the first week in September.

In Cunningham Sheep Allotment, 53% (24,543 acres) is in Meadow Creek (WS 86), and 47% is in other watersheds.

Utilization (stubble height) monitoring has been conducted on the Cunningham Sheep Allotment within the UGRAA since 1993. There is an abundance of forage in the native uplands and in the transitory range vegetation types created by timber harvests. These areas are preferred by sheep and are used by the sheep with an occasional stream crossing to get to areas that are desirable for sheep grazing. There are four key areas that are monitored in the Grande Ronde River Watershed: two on Meadow Creek (SWS 86J) and one on both McCoy Creek (SWS 86J) and Waucup Creek (SWS 86I).

Dark Ensign Allotment

This allotment is managed on a three pasture deferred rotation system. There are 300 cow/calf pairs scheduled to graze this allotment from July 1 to September 30. A pasture division fence was completed in 1995 which divided the Dark pasture into two pastures (North Dark and South Dark) to help control livestock distribution. These two pastures are combined with the Ensign pasture and a three pasture rotation grazing system is utilized. There is a fourth pasture, McIntyre, that is being rested until riparian management objectives have been met. Each of the three active pastures are utilized for approximately four weeks and are rotated to be grazed during different seasons each year. Table 59 describes the pasture rotations through 2001.

The primary streams that flow through this allotment include Dark Canyon Creek, Little Dark Canyon Creek, McIntyre Creek, and McCoy Creek. There is no currently utilized habitat accessible to livestock within this allotment for spring/summer chinook or bull trout. There are 31.4 miles of habitat for steelhead within this allotment. Much of this habitat is inaccessible to livestock due to fencing and natural barriers.

There have been changes in management and distribution associated with protecting spawning areas from damage by livestock. Most of the McIntyre Creek subwatershed and 20% of the McCoy Creek riparian area were excluded from livestock use through the construction of riparian fencing in 1993. In addition, there is a full-time rider on this allotment who monitors cattle distribution and herds cattle away from riparian areas. Cattle turn on date is 7/1, after steelhead spawning.

McCarty Allotment

This sheep allotment uses a camp rotation grazing schedule to control livestock utilization. A total of 876 ewe/lamb groups will be allowed to graze from 6/1 through 9/30. The sheep herd will be moved to an established campsite, allowed to graze until partial utilization of forage is reached, then the herd will be moved to the next campsite. After all campsites have been grazed on one rotation, the herd will be rotated through the pattern again, this time utilizing forage to the level established in the LRMP. This allows for better control over livestock distribution and forage utilization. The camp rotation sequence will be reversed every year to allow forage plants to fully mature and to provide early rest on turn out sites.

The primary streams within this allotment include Fly Creek and Marley Creek. There are 1.1 miles of rearing only habitat for spring/summer chinook salmon. There are 17.9 miles of steelhead habitat within this allotment. There are 7.1 miles of migratory bull trout habitat within this allotment. However, only 0.2 mile of stream (total for all species) is considered accessible since there is a herder and designated crossings. The 0.2 miles of accessible stream habitat are located at designated stream crossings. There are water developments throughout the allotment which prevent the herds from needing to water at streams. There is a scheduled rotation of camps and water crossings. The watering sites are displayed on the allotment map. The crossing of Fly Creek is not used until after 1 July and there is a full-time herder with the sheep.

There have been changes in management and distribution associated with protecting spawning areas from damage by livestock. Upper hillslope watering ponds were constructed on this allotment in 1976-77, which allow sheep to be herded away from riparian areas, limiting the potential for livestock/riparian conflicts. In addition, the Fly Creek camp was eliminated to reduce impacts along riparian areas. There are no riparian fencing exclosures on this allotment. A restriction on the use of all riparian areas with perennial flow has been in place since 1992. The allotment was not grazed in 1995 and 1996. This non-use was for permittee personal convenience.

Starkey Allotment

This cattle allotment is primarily located within the Starkey Experimental Forest and Range. Eighty-three percent (28,690 acres) of the allotment is contained inside of an eight-foot high, big game proof fence that surrounds much of the Starkey Experimental Forest and Range. There are a total of 680 head of cattle that graze from June 15 to October 16. There is a complex system of division and boundary fences within this allotment, primarily to facilitate research on grazing systems and livestock/wildlife interactions. This system of fences allows for the implementation of a variety of grazing systems at any given time. The grazing system now in use involves three separate permittees. A herd of 500 cow/calf pair are rotated through the units within the game fence. Another herd of 141 pair is rotated through the units outside the game fence. A herd of 60 pair will be grazed on the Meadow Creek grazing study area from approximately June 19 to July 31.

A new study was initiated in 1999 in the exclosures on Meadow Creek (Management Strategies for Optimal Beef Cattle Distribution and Use of Mountain Riparian Meadows). The Phase 3 and Phase 4 exclosures on Meadow Creek are utilized to evaluate grazing strategies that potentially improve livestock distribution. The 200-hectare site was subdivided into two paddocks each containing riparian stream, meadow, and upslope vegetation types containing north slope forests and south slope grasslands. Two groups of 30 cow-calf pairs will be turned out from June 19 to July 31. Distribution is monitored with radio telemetry collars. Riparian vegetation greenline surveys, shrub utilization, hoof damage, and water quality are monitored. The current study includes four research hypotheses: (1) Timing of grazing (season of plant phenology) strongly influences livestock distribution relative to riparian areas, (2) Late season supplementation, and/or yearlings versus cow-calf pairs and/or electronic diversion are effective management tools for improved distribution, (3) Physical factors of a grazing area such as vegetation type, nutrient density of vegetation, shade/cover, slope, aspect, and distance from water strongly mediate beef cattle distribution, and (4) Physical impacts of livestock in a riparian area do not strongly influence riparian structure and function, water quality, and insect biodiversity when livestock distribution is managed. This study plan removed the internal fences and distribution of livestock in the Phase 3 and 4 exclosures on Meadow Creek, from 1998 designs and reduced pressure on the Meadow Creek riparian vegetation.

The primary streams within this allotment include Meadow Creek, Burnt Corral Creek, Syrup Creek, Bear Creek, and Campbell Creek. Bull trout do not utilize any of the streams in this allotment. There are 3.3 miles of rearing only habitat (also designated critical habitat) for spring/summer chinook salmon. There are 32.8 miles of steelhead habitat within the allotment, of which approximately 11.6 miles are accessible to livestock.

There have been changes in management and distribution associated with protecting spawning areas from damage by livestock. In an effort to protect critical habitat for spring/summer chinook salmon, exclosure fencing restricts livestock access along 5.0 miles of Meadow Creek, 0.5 miles of Waucup Creek, and 0.5 miles of Bear Creek within the allotment. These fences were constructed in 1992, 1982, and 1975, respectively. All of the 4.0 miles of Burnt Corral Creek are inaccessible to livestock due to the construction of an exclosure fence in 1995. A full time rider, combined with feed in the uplands generally keeps cattle out the riparian areas for the first two weeks following turn-out.

Tin Trough Allotment

This cattle allotment is divided into three pastures. The two primary pastures (East and West) are grazed using a two pasture deferred rotation system. Eighty cow/calf pairs will be turned onto the East pasture on June 16, then they are moved to the West pasture when full utilization has been reached (or by August 15 whichever comes first), then the livestock are removed when all allocated forage has been consumed, or by October 15 whichever comes first. This process is reversed in alternate years, with the cattle going onto the West pasture first. Table 59 displays the anticipated pasture rotation through 2001.

The primary streams within this allotment are Burnt Corral Creek and the East Fork of Burnt Corral Creek. There is no spring/summer chinook salmon or bull trout habitat within this allotment. There are 1.2 miles of habitat utilized by steelhead.

A cross fence was constructed in 1995 which sectioned off approximately 450 acres of the East pasture. This new pasture contains the lower 1.9-mile reach of the East Fork Burnt Corral Creek and is usually not scheduled for grazing, except for livestock gathering activities. During gathering activities, forage use occurs at a very low level. Due to the potential for occasional steelhead spawning in the lower portion of the East Fork of Burnt Corral Creek, livestock will not be allowed in the new pasture before July 1

Indian Lake/Johnson Ridge Allotments:

These allotments include approximately 305 acres of NFS land within the watershed. The allotments consists of two small isolated parcels of NFS land adjacent to land administered by the CTUIR, the State of Oregon, and privately owned lands. The boundary fence constructed for the Dark Ensign Allotment isolated these parcels of NFS land. The Indian Lake parcel was removed from grazing through the construction of a division fence on CTUIR lands. The Johnson Ridge parcel is currently within an active pasture, however use by livestock is very limited due to topographical features.

Range Management Planning

The Meadow Creek drainage has been divided into specific land areas designated as grazing allotments by the LRMP's for the WWNF and the UNF. There are currently seven allotments which are located completely or partially within the Meadow Creek drainage.

The Indian Lake and Johnson Ridge Allotments are currently managed by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). Livestock within these allotments are regulated through the CTUIR natural resources department.

The other allotments within the watershed are administered by the Umatilla and Wallowa-Whitman National Forests. Livestock use within these allotments is regulated by term permits and/or term private land grazing permits which authorize the class and number of livestock allowed to graze and determines the allowable season of use. The specific management of any given allotment is authorized in the Annual Operating Instructions (AOI).

The Multiple-Use Sustained-Yield Act of 1960 states "It is the policy of the Congress that the National Forests are established and shall be administered for outdoor recreation, range, timber, watershed, wildlife and fish purposes".

The LRMP states: "Range ecosystems are to be managed to ensure that the basic needs of the forage and soil resources are met. Forage production, above that needed for maintenance or improvement of the basic resources, is to be made available to wildlife and permitted domestic livestock under the standards and guidelines that will assure continued maintenance or improvement of the resource."

The allowable forage utilization levels, as established in the LRMP, were not immediately applied to all allotments with the issuance of the LRMP in 1990. A decision was made to allow for a "ramp down" period to lessen the impact of an immediate decrease in allowable use to the permittees. It was planned that forage utilization rates would be reduced each year and be in compliance with the LRMP levels by 1995.

In 1995 a set of Livestock Grazing Guidelines were developed following the environmental assessment for the Implementation of Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon, Washington, Idaho and portions of California (PACFISH). These guidelines hereafter referred to as PACFISH enclosure B, were developed to provide resource managers with consistent standards with which to measure impacts to riparian areas and to ensure that recovery of riparian ecosystems occurs at a rate as close to near natural rates as possible.

PACFISH enclosure B was amended into the Wallowa-Whitman LRMP and is currently used as the guideline for grazing management. The following are the Wallowa-Whitman interpretations of the guidelines and are used to determine management of the key areas on the allotments.

The initial PACFISH assessment did not specifically address management measures for grazing. A subsequent addition, titled Enclosure B was issued on July, 1995. This addendum provided more specific direction to be applied to livestock management. These recommended livestock guidelines are summarized as follows:

Late Seral Ecological Status Defined as status where percent similarity of riparian vegetation to potential natural community is >50%, and streambank/channel condition rating is good or better (or Proper Functioning Condition).

> Maintain or improve conditions, where criteria for “late seral” ecological status are not met or exceeded. Continue current grazing prescriptions, and ensure that at least 4-6 inches of residual herbaceous vegetation remains after the grazing season. Ensure that none of the Condition Thresholds (see below) are exceeded.

Mid-Seral Ecological Status Defined as status where percent similarity of riparian vegetation to potential natural community is 25-50% or better, and streambank/channel condition rating of at least fair (or Functional at Risk with Upward Trend).

> Adjust management practices for “mid-seral” ecological status with a downward or static trend, especially if it is the vegetative component of the ecological status that is responsible for the rating. Limit grazing to ensure that at least 6 inches of residual herbaceous vegetation remains after the grazing season. Ensure that none of the Condition Thresholds are exceeded. For moderate or low gradient channels (i.e., Rosgen type B or C channels), with substrates composed of medium to fine, easily eroded materials, also limit use to early season grazing to provide recovery of streambank/channel characteristics.

Early Seral Ecological Status Defined as status where percent similarity of riparian vegetation to potential natural community is less than 25% or, streambank/channel condition rating of poor (or Functional at Risk with Static/Downward Trend, or Non-Functional).

> Adjust management practices for “early seral ecological status with deteriorated streambank/channel conditions. For moderate or low gradient channels (i.e., Rosgen type B or C channels), with substrates composed of medium to fine, easily eroded materials, consider rest from grazing.

Grazing may be permitted in moderate to high gradient stream systems (i.e., Rosgen type A and B channels) with coarse substrate materials that provide inherent stability, and where the ecological status rating of early seral is tied entirely to vegetation characteristics, if the grazing is limited to early season use, at least 6 inches of residual herbaceous vegetation remains after the grazing season, and no Condition Thresholds are exceeded.

If early season grazing would result in adverse effects of is impractical, mid or late season grazing may be prescribed.

Influences of livestock grazing must result in riparian restoration at a minimum of "near natural" rates. Environmental effects are limited to those that do not carry through to the next year. Focus management efforts on providing for the health, form and function of riparian systems.

Appropriate Condition Thresholds will be monitored in all pastures/allotments and reported on an annual basis.

Condition Thresholds

1) New bank alteration Bank instability that becomes evident after the initiation of livestock grazing. Threshold of 5% of the lineal bank distance.

2) Riparian area alteration

    A) Riparian Islands (portion of riparian area higher and slightly drier than the rest, often dominated by Kentucky Bluegrass). Threshold of 25% visible trampled soils or a vegetation height of 2 inches whichever is reached first.

    B) Riparian sinks (portion of riparian area lower and more moist than the rest, often dominated by Carex species). Threshold of a vegetation height of 3 inches.

3) Woody vegetation utilization Threshold of 30% of the current year's growth, measured as incidence of use. Only need apply if mid-late season grazing and documented problem with woody vegetation over-utilization.

Stubble Height and Percent Utilization

The following example displays the relationship between percent use and stubble height for Kentucky bluegrass (Poa pratensis) and was derived from the Utilization Gauge (Rocky Mountain Experiment Station). Data from the Utilization Gauge is very closely correlated with similar data collected on the WWNF. Percent utilization is determined by creating a height/weight curve for the species of interest, then comparing the ungrazed height to the grazed, stubble height. A total percent utilized is then calculated. Stubble heights are directly related to percent utilization with one essentially being the inverse of the other.

Table 3-58: -Percent Utilization for *Poa pratensis* for Ungrazed Heights of 5 to 20 inches

Grazed Stubble Height	**6 inches**	**4 inches**	**3 inches**	**2 inches**
Ungrazed Height	**Percent Utilization**			
20 inches	28%	40%	52%	65%
15 inches	20%	32%	40%	57%
12 inches	12%	24%	34%	45%
10 inches	8%	18%	28%	40%
8 inches	2%	12%	18%	34%
5 inches	-	<2%	8%	17%

The amount of plant growth each season greatly influences the calculated percent utilization. Kentucky bluegrass will grow to different heights depending on the location of the site (i.e. taller in moist areas, shorter in perched terraces). In moist years, an average ungrazed height for Kentucky bluegrass and associated species is near 20 inches. Using the utilization table above, this would equate to a percent utilization of 65 – 40 percent for a stubble height of 2 to 4 inches (respectively). In a dryer year or on a less productive site (such as perched terraces), ungrazed height for Kentucky bluegrass and associated species may approximate an average of 12 inches which equates to a 45- 24 percent for a stubble height of 2 to 4 inches (respectively). Therefore, although using stubble height measurements solely can allow more utilization in wet (high precipitation) years, it will allow for less in the dry years when the risk of riparian damage is higher. The use of stubble height measurements will provide for the application of a more conservative use standard over time on less productive sites and in drier years through maintenance of a minimum standing residual herbaceous crop designed to meet site objectives.

Key areas have been established on each allotment where forage utilization rates are to be monitored. These key areas are located in suitable rangeland where excessive forage utilization first becomes evident, or areas where forage utilization may be causing resource conflicts (i.e., riparian areas). When utilization standards are met in these areas, the entire allotment is estimated to have met the standards. Small areas within the allotment that have unavoidable livestock concentration such as salt licks, water developments, gateways or corrals are not designated as key areas. Forage utilization outside of riparian areas will be limited to 55 percent of available forage for all allotments. Table 3-59 displays the maximum annual utilization standards. Included in the following table are the management guidelines for riparian areas following the original Wallowa-Whitman National Forest Plan guidelines.

Table 3-59: Maximum Annual Utilization of Available Forage in Riparian and Upland Areas.[1]

Management Level[3]	Grass and Grasslike Species[2]				Shrub Species[2]	
	Riparian		Upland		Riparian	
	[4] Sat. Condition	Unsat. Condition	Sat. Condition	Unsat. Condition	Sat. Condition	Unsat. Condition
Low	40%	0-30%	50%	0-30%	30%	0-25%
Moderate	45%	0-35%	55%	0-35%	40%	0-30%
High	50%	0-40%	60%	0-40%	50%	0-35%

*****Notes:**

1/ This is the cumulative annual utilization of forage by both big game and livestock.

2/ Percent utilization for grass and grasslike species is based on percent of annual production removed, by weight. Percent utilization for riparian shrub species is based on a measurement of twig length of the currently available leader growth.

3/ **Low** = Livestock use managed within current grazing capacity by riding, herding, and salting. Cost-effective improvements used only to maintain stewardship of range.
Moderate = Livestock managed to achieve full utilization of allocated forage. Management systems designed to obtain distribution and maintain plant vigor include fencing and water development.
High = Livestock managed to optimize forage production and utilization. Cost effectiveness culture practices improving forage supply, forage use, and livestock distribution may be combined with fencing and water development to implement complex grazing systems.

The Cunningham, Dark Ensign, McCarty, Starkey, and Tin Trough and Allotments are currently managed at the moderate level. The Warm Springs and Johnson Ridge Allotments are currently managed at the low level.

4/ Satisfactory/Unsatisfactory condition refers to rangeland condition which is determined through a combination of allotment classification and forage condition. Factors such as existing stream condition are also considered for this determination.

Table 3-60: Meadow Creek Watershed Allotment Overview

Allotment	SWS	AMP Date	Planned AMP revision date	Range Cond.	Range Trend	Stock Level	Type	Season of Use	Permitted Livestock (AUMs)	Total Acres
Cunningham[1]	86D, 86H, 86I, 86J	1998	2007	good	stable/ upward	1850	Sheep	6/16-9/30	1952	46,133
Dark Ensign[2]	86B,86C, 86D	1995[1,2]	2000	fair/ good	stable	300	Cattle	7/01-9/30	1,188	26,007
McCarty[2]	85B, 86E, 86F	1989[2]	2000	good	stable	1,000	Sheep	6/06-9/20	700	15,790
Starkey	86A,86C, 86F,86G, 86H	1985	2007	fair/ good	stable	708	Cattle	6/16-10/19	3,738	30,200
Tin Trough[2]	86E, 86F	1986[2]	2000	fair/ good	stable	80	Cattle	6/16-10/15	422	4,300
Indian Lake[3]	86D	none	none	unknown	unknown	0	Cattle	Non-use	0	265
Johnson Ridge	86D	none	none	unknown	unknown	10	Cattle	6/15-10/31	10	40

Notes:

/1 = Allotments administred by the Umatilla National Forest

/2 = Allotment included in the Upper Grande Ronde Allotment Management Plan Analysis. This analysis will form the base for development of current allotment management plans. Decision in 2001.

/3 = Allotment administered by CTUIR.

AMP Date = Date of latest revision to the Allotment Management Plan.
Range Cond. = Range determination of range condition based on plant health, determined with vegetation transects, information or professional judgment.
Range Trend = Range determination of the trend of plant health over time.
Stream Cond. = General rating of stream habitat condition as related to potential impacts from rangeland management, based on stream survey data and field reconnaissance.
Stock Level = Number of cow/calf pairs, or five ewe/lamb pairs.
Type = Indicates the type of livestock grazed on the allotment.
Meadow Creek Acres = The portion of the allotment acres that are within the Meadow Creek Drainage.

INSECTS AND DISEASE

Historic/Current

Endemic levels of insect and disease provide diversity to forest stands and the landscape, however, many mixed conifer stands in the Blue Mountains have been damaged by a variety of insects and diseases, compounded by protracted draught, overstocking, and inappropriate past management (Schmitt and Scott, 1993).

Many factors affect tree and stand susceptibility to insects and diseases. Both inherited and environmental factors play a role in predisposition to insects and diseases. The availability of growing space available in a stand is an important factor governing tree and stand vigor (Cochran, et al, 1994).

Outbreaks of insects have become more widespread and damaging since 1950 (Gast et al, 1991). Major outbreaks that have affected stands in the watershed are western spruce budworm during the 1980's through 1992, followed by a severe outbreak of Douglas-fir bark beetles. Mature lodgepole pine communities are limited within the watershed due to a major epidemic of mountain pine beetle during the 1970's and early 1980's. Nearly all mature lodgepole pine stands within the watershed were attacked and these stands are not yet again susceptible to beetles. Meadow Creek watershed was severely defoliated by Douglas-fir Tussock moths during the early 1970's outbreak.

Tree diseases that may be on an increase due to conditions that have allowed shade tolerant, susceptible species to increase in numbers include: laminated root rot, armillaria root disease and annosus root disease. In addition, both western dwarf mistletoe and Douglas-fir dwarf mistletoe have increased due to exclusion of fire and an increase in stocking levels.

Interpretation

Risk Analysis

Risk relates to the potential or expected levels of mortality to trees from insects and diseases. There are three levels of risk identified: low, moderate, and high. A composite rating to the risk of insect and disease is calculated for the watershed for each category (see complete Analysis of Insect and Disease Risks for the Meadow Creek Watershed in Appendix Veg.III BMPMSC-01-09 completed April 3, 2001). Risk analyses help to locate those portions of the watershed that have a greater chance of insect and disease incidence. The reference condition is to manage landscapes at density levels and species composition that reduces the risk of epidemic conditions of insects and diseases.

Insect or disease risks are determined using several published risk-rating or hazard-rating models, and/or other risk rating methodology built into the UPEST risk rating calculator, a computer program include in UTOOLS software (Ager et al. 1995aa, 1995b). The classification of "risk" in regard to forest insects and diseases within a specified period of time, that interferes with management of resources associated with forested landscapes (adapted by Gast et al. 1991, and Shore and Safranyik 1992). UPEST analysis should be viewed in the context of relative likelihood of risk of occurrence and severity, rather than actual on the ground situations.

Since various risk-rating models calculate risk indices in differing formats, the following results have been standardized to report risk ratings for each insect and disease calculated by the UPEST program. Three levels have been identified: low, medium, and high. These should be viewed in relative terms. That is, the demarcation between high and medium, and medium and low is artificial, and there is only a relative likelihood of a given insect or disease being more active in the higher risk rating. However, since these ratings do identify risk, most attention should be given to those stands that are identified as having high and medium ratings for multiple insects and diseases.

The composite rating below for insects and diseases in the UPEST analysis is a weighted summation score. Insects and diseases which readily cause mortality are given a higher weight than those which result in growth loss of defect. The importance of these weightings would differ between different management allocations or management objectives, while the composite score is standard across the watershed of the sake of simplicity. The complete UPEST analysis including maps is included in the Appendix.

Table 3-61: UPEST Results for Meadow Creek Watershed				
Insect or Disease	**Low Risk Acres**	**Medium Risk Acres**	**High Risk Acres**	**Data Gap Acres**
W. Dwarf Mistletoe	31,516	10,328	7,197	13,315
W. Larch Dwarf Mistletoe	25,893	18,795	4,353	13,315
Indian Paint Fungus	34,913	14,008	119	13,315
Tomentosa root and butt rot	76,814	1,067	160	13,315
Spruce Beetle	47,489	1,552	0	13,315
Schweinitzii root and butt rot	2,064	27,132	19,844	13,315
Doug-fir Dwarf Mistletoe	17,907	14,860	16,273	13,315
Doug-fir Beetle	9,613	10,766	28,661	13,315
Western Spruce Budworm	3,193	5,957	39,105	13,315
Fir Engraver Beetle	24,415	194	8,534	13,315
Doug-fir Tussock Moth	12,332	25,859	10,850	13,315
Mtn Pine Beetle (lodgepole)	47,677	668	695	13,315
Mtn Pine Beetle (ponderosa)	28,299	1,938	18,803	13,315
Blister Rust	49,040	0	0	13,315
Composite Risk	11,088	20,199	17,906	13,161

Preventative work needs to be done to correct the underlying imbalances that set the stage for such large increases in insect activity. Effective prevention needs to include landscape level silvicultural treatments to restore healthy stand conditions. Planting a mix heavy to non-host and resistant species and thinning of overstocked stands, leaving larger trees room to grow are the keys (Schmidt, 1994).

Due to the extent of thinning in the watershed the threat of a future Mountain Pine Beetle epidemic developing throughout the lodgepole stands has been reduced. None of these stands are of an age and stocking level to sustain an epidemic at this time.

The most damaging group of tree diseases are root rots. Ratings are currently not available. This part of the analysis will be updated when the root disease model is working correctly.

Continued restoration work, balanced by knowledge of pest dynamics is recommended. Chapter 4 of this watershed assessment outlines some opportunities for treatments through use of prescribed fire or timber harvest to reduce insect and disease related damage.

CHAPTER IV

DESIRED CONDITIONS and TRENDS

Currently, the Forest Land and Resource Management Plan (Wallowa-Whitman National Forest, April 1990), provides overall guidance for management activities occurring within the Meadow Creek Watershed. Over the years, this management direction has been refined on many levels and incorporated into the Plan as amendments. Efforts to conserve and manage threatened and endangered species, and to implement ecosystem management, will continue to affect future land management options within this watershed as the Blue Mountain Province moves toward revising their Forest Plans in the next 5+ years.

A. FOREST PLAN MANAGEMENT AREAS

The Wallowa-Whitman National Forest Land and Resource Management Plan contains descriptions of management goals, direction, and desired future condition for a number of management areas or land allocations on the National Forest. It also contains standards and guidelines for the management of specific resources. National Forest System lands within the Meadow Creek Watershed (86) contain seven of the management areas described in the Forest Land and Resource Management Plan. The following is a listing of NFS land allocations within the analysis watershed and their acreages.

Wallowa-Whitman National Forest:

MA1	Timber Production Emphasis	37,167 acres	44 percent
MA1W	Timber Production Emphasis	1,547 acres	2 percent
MA3	Wildlife/Timber Emphasis	18,511 acres	22 percent
MA12	Research Natural Areas	180 acres	<1 percent
MA14	Starkey Experimental Forest	25,415 acres	30 percent
MA15	Old Growth Forest	2,094 acres	2 percent
MA16	Administrative/Recreation Sites	47 acres	<1 percent
		84,961 acres	

There are approximately 13,315 acres of other ownership within the analysis watershed including Umatilla National Forest (1,694 acres), State, private, tribal, and Bureau of Land Management. Total area within the analysis watershed is 115,852 acres.

The following are summaries of the direction for the major management areas within the Upper Grande Ronde River Watershed:

Management Area 1 and 1W (Timber Production Emphasis)

Management emphasizes wood fiber production on suitable forest land while providing relatively high levels of forage and recreational opportunities. Temporary forage increases are expected as a result of silvicultural activities. Timber is to be managed according to Forest-wide standards and guidelines.

Timber management generally will provide a mixture of even-aged stands up to 40 acres in size. These stands are to be managed at intensities promoting vigorous, healthy trees commensurate with the productive potential of the sites on which they are growing. Regeneration harvest units will be separated by uncut stands containing one or more logical logging units. This mixture of stand ages and sizes provides a degree of diversity for big game and other wildlife species and a high level of wood fiber and forage production. Open road density is generally limited to 2.5 miles of road per square mile. In that portion of Management Area 1 within identified elk winter range (MA1W), open road density is limited to 1.5 miles per square mile. This Management Area contributes to the Forest's allowable sale quantity.

Management Area 3 (Wildlife/Timber Emphasis)

This management area is intended to provide a broad array of Forest uses and outputs with emphasis on timber production. However, timber management and other silvicultural activities are designed to provide near-optimum cover and forage conditions on big game winter range (MA3).

When in a managed condition, timbered areas are generally a mosaic of even-aged stands that are 40 acres or less in size. These stands are to be dispersed in order to provide a mixture of forage areas, satisfactory cover, and marginal cover. Regenerated stands must contain trees that are at least 10 feet tall before adjacent stands can be harvested. Special restrictions apply to any harvest activity that reduces cover. This is done in order to achieve optimum distribution of cover for elk. Open public road access is generally limited to not more than 1.5 miles per square mile during the time areas are being used by big game. On winter ranges, adequate road closure will result from snowfall. Improved forage and cover distribution will help to maintain or improve herd productivity. Road access will remain at a level low enough to maintain habitat quality and recreation values. Availability of big game escape opportunities, along with a low level of road access on summer ranges will provide big game hunting opportunities not found in MA1. This Management Area contributes to the Forest's allowable sale quantity.

Management Area 14 (Starkey Experimental Forest and Range)

This Management Area includes the Starkey Experimental Forest and Range, which is generally located at the heart of the Meadow Creek Watershed. The area is allocated for research use and is managed to protect existing research projects and to provide for future research needs. In addition, the experimental forest is expected to provide a variety of other benefits including timber and livestock forage when compatible with research uses. This management area does not contribute to the Forest's allowable sale quantity.

Management Area 15 (Old Growth Forest Preservation)

These areas are intended to maintain habitat diversity, preserve aesthetic values, and to provide old growth habitat for wildlife. Old growth stands contain mature and over-mature trees in the overstory, have a multi-layered canopy, and contain trees of several age classes. Standing dead trees and downed woody material are present. Evidence of human activity may be present but does not significantly alter other stand characteristics.

Twenty animal species have been identified on the Wallowa-Whitman National Forest which exhibit definite preference for mature or old growth forest. Management indicators for old growth forest include: pine marten, pileated woodpecker, northern three-toed woodpecker, black-backed three-toed woodpecker, and goshawk. Old growth forest provides the best habitat for these species. It is unknown whether other habitats are sufficient to maintain viable populations of these species without an available reservoir of old growth. This Management Area exists as stands ranging widely in elevation and aspect and occurring in a variety of plant communities. It is intended that these stands will continue to provide the quality habitat needed by those species dependent on mature and old growth timber.

Management Areas 12 and 16

The other two Management Areas found in the Upper Grande Ronde River Watershed include MA12 - Research Natural Area and MA16 - Administrative and Recreation Sites. In total, these two management areas make up less than one percent of the total land area within the watershed and they do not contribute to the Forest's allowable sale quantity.

B. DESIRED CONDITIONS MEASURES AND TRENDS

The following are discussions of the desired conditions and condition for resources included under each of the major issues identified in Chapter 2.

THE PHYSICAL DIMENSION

1. AQUATICS

Desired conditions for aquatic and riparian-wetland areas within Meadow Creek Watershed would be dynamic, resilient, and consistent with local climate, geology, soils, land-forming processes, and potential natural vegetation. Aquatic and riparian-wetland habitat would be characterized by high-quality water and complex, well-distributed physical attributes that lead to high quality fish habitat and properly functioning stream channels.

High-quality water and fish habitat and properly functioning stream channels are attained when adequate vegetation, landform, or large woody debris is present to:

- Dissipate stream energy associated with high flows, thereby reducing erosion and improving water quality;
- Filter sediment, capture bedload, and aid in floodplain development;
- Improve flood-water retention and groundwater recharge;
- Develop root masses that stabilize streambanks against cutting action;
- Develop diverse pounding and channel characteristics to provide habitat (water depth, duration, and temperature) necessary for fish production, and to support greater biodiversity (USDI BLM 1993).

Elements necessary for fish habitat/production:

- 57 or less degree F maximum weekly average temperatures throughout a Watershed;
- Streambed substrate of less than 12% fines, and cobble of less than 20 percent embedded;
- Stream turbidity low;
- There are no physical barriers to fish migration;
- There are over 100 pieces of large wood (12” diameter and 35” long) per mile;
- Pool frequencies meet standards shown in Pool frequency table below;
- Pools over one meter deep are increased by approximately 200% throughout Meadow Creek and its major fishbearing tributaries;
- Roads increase drainage network of watershed by less than 5%;
- Road density throughout the watershed is less than 2 miles per square mile and no valley bottom roads exist.

Trends

Past land management activities on NFS lands within the Meadow Creek Watershed have led to adverse effects on aquatic and riparian-wetlands resources. Eight of 10 subwatersheds are “not properly functioning” and two are “functioning at risk.” The primary influential factors for all subwatersheds are: low percentages of adequately stocked RHCAs, high percent of past harvest within RHCA, and high road densities outside of and within RHCAs. The trend of adverse effects has been reversed however within the last 5-10 years with implementation of new management direction, laws and polices (i.e. PACFISH).

AQUATIC DESIRED CONDITION MEASURES:

The following measures will be used to assess attainment of desired aquatic and riparian-wetland conditions:

A. Stream flow - Late spring and fall rain events contribute to the flows. Peak flows usually occur in March and April with flows gradually decreasing to minimum discharges in August and September.
B. Stream width/depth ratio - Width/depth ratios should follow the descriptions used in the Rosgen (1996) channel classification as displayed in the following table and correspond to channel types.

Rosgen channel classifications.

Rosgen Channel Type	Width/ Depth Ratio	Description
A	< 12	steep, highly entrenched, step pool systems with high sediment transport potential. Riparian vegetation usually occurs only on the streambanks
B	> 12	gentle to moderately steep terrain, moderate gradient streams that are moderately entrenched , have low sinuosity and are riffle-dominated
C	> 12	low gradient, moderately high sinuosity, pool/riffle bedform with well-developed floodplains
E	<12	very low gradient, highly sinuous, with low width to depth ratios.
F	> 12	highly entrenched, high width to depth ratio streams

C. SI Structural Stage (ECA) - The reference condition for the HRV SI structural stage is 5 to 15 percent. Historically 5 to 15 percent of the forested NFS lands in Watershed 86 were in the SI structural stage (or ECA-like condition).
D. Riparian Vegetation - 100% adequately stocked stands within riparian areas where factors of slope, soil, aspect, and moisture support this condition.
E. Acres of RHCA affected by timber harvest - Approximately 5 to 15 percent of forested lands within Watershed 86 would be in an open to stand initiation stage like condition including the RHCAs.
F. Large woody debris - 20 pieces of large (>12” diameter, 35’ length) woody debris (LWD) per mile of stream channel.
G. Streambank Stability - >80% of any stream reach has ≥90% stability.
H. Road densities - Road density (open and closed) of <2.0 miles per square mile, with no valley bottom roads, in occupied summer steelhead and bull trout habitat (spawning and rearing).

The following measures will be used to assess attainment of desired fish habitat conditions:

A. Temperature – Steelhead/Chinook Spawning Temps - 50-57^{0} F
   Bull Trout - 7 day avg. max. temperature in a reach during the following life history stages:
      Incubation: 36-41°F (2-5°C)
      Rearing: 39-54°F (4-12°C)
      Spawning: 39-48°F (4-9°C)
      In addition, temperatures do not exceed 59°F (15°C) in areas used by adults during migration (no thermal barriers).
B. Sediment/turbidity - <12% fines, turbidity low
C. Habitat Access - barriers allow passage

D. Substrate embeddedness - gravel/cobble dominant or embeddedness <20%
E. Large woody debris - >20 pieces/mile >12" diameter and adequate recruitment
F. Pool frequency –

Species	Channel Width (feet)	Pools/Mile
Steelhead	5	184
	10	96
	15	70
	20	56
	25	47
	50	26
Bull Trout	0-5	39
	5-10	60
	10-15	48
	15-20	39
	20-30	23
	30-35	18
	35-40	10
	40-65	9
	65-100	4

G. Pool quality - pools > 1 meter deep with good cover and cool water, minor reduction in pools by sediment
H. Drainage network - zero or minimal increases due to roads
I. Road density – Chinook/Steelhead = <2 mi/mi^2, no valley bottom roads; Bull Trout = <1 mi./sq. mi., no valley bottom roads. ***(Also relates to Roads Analysis – Biological Dimension)***

2. ROADS ANALYSIS – Physical Dimension Factor Measures

The desired condition within the watershed is to provide an adequate, safe, and appropriate transportation system which will meet the needs of administrative and a wide variety of recreational users while protecting/balancing the physical needs of all other resource areas.

Water quality - ***(Also relates to Roads Analysis – Biological Dimension)***

A. Miles of open native surface drawbottom roads – no valley bottom roads
B. Miles of roads within 100' of drawbottoms – no valley bottom roads

Water Quantity - ***(Also relates to Roads Analysis – Biological Dimension)***

A. Miles of road within RHCAs – no valley bottom roads
B. Miles of drawbottom roads – no valley bottom roads
C. Number of culverts adequate to handle 100 year flood event - All culverts would be adequate to handle 100 year flood events.

Hydrologic - ***(Also relates to Roads Analysis – Biological Dimension)***

A. Miles of drawbottom roads - – no valley bottom roads
B. Number of culverts adequate to handle 100 year flood event – All culverts would be adequate to handle 100 year flood events.

3. SOILS

Desired conditions for soils are primarily related to maintaining and enhancing soil productivity. To accomplish this goal detrimental soil conditions (compaction, puddling, displacement, and severe burning) must be minimized during management activities. Scablands and other areas with shallow soils are given special consideration for the fragile nature of the soils involved in order to protect them and the species that thrive in this habitat.

SOILS DESIRED CONDITION MEASURES

A. Percent detrimental soil compaction within each SWS - A <u>minimum</u> of 80 percent of an activity area will be in a non-compacted, non-puddled, and/or non-displaced condition."

THE HUMAN DIMENSION

1. ROADS ANALYSIS – Human Dimension Factors

In 1998, Forest Service Chief Mike Dombeck directed the Forest Service to develop a long-term road policy for the National Forest Transportation System. The Roads Policy, which requires a Roads Analysis for any project that affects roads, was published in the Federal Register in January 2001. Any NEPA decisions for projects that affect roads and are scheduled for signature after June 2001 will require a Road Analysis to be completed before signing and implementation.

The shift in public use of national forests, changes in user expectations and the backlog of unfunded road maintenance led the Forest Service to conclude that it needed a new approach for the management, use and maintenance of the national forest road system.

The District management goal for the transportation system is to provide safe and efficient access for all anticipated users including administrative, commercial, and recreational traffic. Roads are to be operated and maintained to minimize impacts to resource values. Principal access roads would be paved or graveled while other roads would be of lower standard. Many roads would be available for use, but some would be closed to standard vehicles. All areas would remain open to all terrain vehicles unless specifically closed by the District Access and Travel Management Plan.

For a majority of the analysis watershed, the transportation system has been designed, built, and maintained primarily for management of the timber resource, but considered all intended uses. The Roads Analysis will produce a plan, which will minimize environmental damage, establish policies to guide decisions on identifying unessential roads, recommend roads to be eliminated or maintained to reduce environmental damage, and assess roads that need to be reconstructed and maintained so that they are safe and can sustain constant public use.

Trends:

Currently there are 714 miles of roads both open and closed within the Meadow Creek Watershed. Of these miles, 577 miles are located on National Forest System lands and 137 miles are located on private, State, tribal, and Bureau of Land Management lands.

On National Forest System lands, 333 miles of road are open to vehicle traffic. There are 244 miles of closed roads. A closed road is usually blocked by an earthen barricade or guardrail and receives little to no vehicle traffic. Roads on NFS lands are either paved, surfaced with crushed gravel or pit run rock, or are native surfaced and spot rocked.

There are approximately 144 miles of drawbottom roads in the analysis watershed. These roads are located parallel and adjacent to stream channels. They channelize the stream, reduce interaction between the stream and its floodplain, reduce riparian vegetation, and can greatly increase sediment yield.

Open road density currently ranges from 1.0 – 5.5 miles per square mile over the entire Meadow Creek Watershed.

ROADS ANALYSIS – Human Dimension Factors Measures

Resource Management and Administrative Use

A. Open road densities (miles per square mile) for each Forest Plan Management area

Management Areas	Direction (Miles/Sq. Mile)
1	2.5
3, 3A, 1W	1.5
6	Road densities to remain essentially unchanged from 1985 levels.
12	Minimum necessary to provide for research and education.
14	Research dictates road densities as needed.
15	Avoid new road construction
16	Access construction allowed as needed to serve sites or facilitate their use.

B. Acres of forest land without road access – provide reasonable and appropriate access to forested lands allocated to management activities within forest plan standards above.

Other Ownership Access

A. Number of access routes to private land inholdings – Provide reasonable access to private land inholdings.

Safety

A. Maintenance levels reflect current use levels and are adequate to provide safe access to designated user groups as designated in the Access and Travel Management Plan (ATM Plan). Adequate turnouts are provided in roads which are designated to remain on the long term ATM Plan as well as turn arounds for those roads scheduled for closure.

Heritage

Access plans will recognize, protect, preserve, enhance, and provide opportunities to interpret when appropriate, prehistoric and historic sites, buildings, objects, and antiquities of local, regional, or National significance. The goal will be to preserve their historical, cultural, and scientific values for the benefit of the public.

Recreation – Roads & Access

Dispersed Recreation - Dispersed recreation patterns are provided for and maintained through time. Dispersed camping sites are characterized by the presence of large healthy trees and low fuel loadings immediately adjacent to the sites. Access to dispersed sites on open roads is considered and maintained during all project planning and in the District ATM Plan. Future road closures are in locations that provide additional attractive dispersed camps, leave adequate space for camping and vehicle turn-around when possible.

Motorized Recreation - An appropriate mix of motorized and non-motorized recreation opportunities are provided to best meet the demands of all recreation users in the watershed. The appropriate mix will be determined at the District/Forest/Province level based on customer demand for motorized and non-motorized opportunities, and the special characteristics which Meadow Creek watershed offers. OHV opportunities will be a mix of trails, closed roads open to OHVs, open roads, and areas where cross-country use will be allowed. Non-motorized opportunities may take the form of road and area closures.

ROADS ANALYSIS – Economic Measures

Road maintenance levels on forest roads within the watershed are appropriate for the level of use and type of use received. Each road is maintained adequately to provide safe access at an appropriate level for the primary uses it was designed for. If the road is no longer needed or is causing resource damage it is removed and an alternative route designed if appropriate to meet the combined needs of the area. Tourism and lifestyle expectations are supported by the amount and type of access provided.

A. Deferred maintenance cost and miles of maintenance by maintenance level

Maintenance Levels	Cost Per Mile	Number of Miles
Maintenance Level 3	$9,829 per mile	37.75
Maintenance Level 2	$3,453 per mile	289.5
Maintenance Level 1	$1,364 per mile	244
Decommissioned	$0	99.34

B. Total decommissioning cost per road – use most cost effective method to meet closure and resource objectives (see above).

THE BIOLOGICAL DIMENSION

1. OLD-GROWTH/STRUCTURAL DIVERSITY

Old Growth/Structural Diversity

Over the 20 year planning horizon, the desired condition is to trend toward a mosaic of structural stages across the Meadow Creek Watershed landscape that reflect HRV, emphasizing development of MSLT and SSLT structural stages.

In approximately 100 years forested stands will be within the upper half of the historical range of variability. The amounts, patch sizes, and interspersion of structural stages will provide high quality habitat for the old growth associated wildlife community. Larger patches of old growth will be represented, generally larger than 400 to 600 acres, to provide for wildlife species that require or prefer interior (away from the influence of edges) old growth habitat. Landtypes and disturbance regimes will largely determine patch sizes of old growth habitat. Portions of the watershed are characterized by non-forested habitats and narrow timbered stringers, precluding development of interior conditions and large patch sizes. The rationale for a minimum patch size criteria of 400 to 600 acres is based on the following:

- Northern goshawk post-fledgling areas are approximately 400 acres (Reynolds et al. 1991; McGrath and DeStafano 1995).
- A desired future condition of the forest in Fifty years, identified in the 1990 Land and Resource Management Plan refers to “old growth groves”, “ranging in size from 30* to 600 acres within management areas 1, 3 and 18 (LRMP pg 4-15 1990).
- American marten were found to have home ranges ranging from 3,500 acres for females to 7,089 acres for males, almost completely comprised of old growth habitat, and marten were absent from areas with significantly less old growth habitat (Bull 1997).
- Pileated woodpeckers occupy home ranges in NE Oregon of approximately 1,000 acres, of which nearly 60% (600 acres) was in an old growth condition (Bull pers com 2002).
- The Land and Resource Management Plan indicates that pileated woodpeckers require 300 acres of nesting habitat adjacent to 300 acres of feeding habitat, therefore 600 acres of habitat was assumed adequate for a breeding pair of pileateds (LRMP pg M-17 1990).

No scientific basis could be found for advocating old growth patch sizes as small as 30 acres. Thirty acres was likely derived from a typical sized harvest unit rather than a biological requirement. This is not to imply that smaller old growth patches do not contribute to the habitat value of surrounding forests, but small patch size is not a meaningful basis for a long-term, old growth reserve networks.

Distances between larger old growth patches will generally be no more than two miles to facilitate dispersal of most old growth associated species found in this area (LRMP pg M-14,15 1990). Connective corridors between old growth patches will be an unnecessary management approach since the forest matrix between old growth patches will provide abundant options for travel by all wildlife species from the most mobile to sedentary permanent residents.

Large diameter (greater than 20 inches) down logs and snags will be well dispersed and in numbers capable of supporting 100% potential populations of primary cavity excavators. The following tables display the levels of snags and logs estimated to meet the 100% potential population objective.

Recommended Snag Levels
(La Grande Ranger District Snag Management Policy, 1997)

General Group	Bio. Environments	Snags/Acre	Size Criteria
Dry	G5-G8	2-4	≥12” dbh, ≥20’ tall
Moist	G4, some G5s	4-6	≥12” dbh, ≥20’ tall
Cold	G1-G3	6-8	≥10” dbh

Down Log Guidelines

General Groups	Bio Environments	Logs/Acre	Size Criteria	Comments
Dry, Ponderosa Pine	G5 – G8	6	Average >10” diameter	>25% of these >20” average diameter
Moist, Mixed Conifer	G4 and some G5s	33	Average >15” diameter, average 35’ long	40% should be >20” diameter
Cold, Lodgepole Pine	G1-G3	20	Average >10” diameter, average 30’long	Largest logs available should be left

(The ICBEMP Draft EIS, Alternative 4 (preferred), Standard HA-S8 (Chapter 3, page 152) states that in the absence of "locally developed standards", the above shall be provided:)

Coarse Woody Debris/Soil Coarse Woody Debris Requirements		
Habitat Types	**Cover Type**	**Desired Tons/Ac**
AF/LIBO	AF/LP/ES	12-25
AF/VASC	AF/LP/ES	12-15
AF/VAME	AF/ES/LP	9-14
GF/SPBE	GF/DF/PP	7-14
DF/PHMA	DF/PP/WL/LP	7-13
DF/CARU	DF	12-24
PP/FEID	PP	6-13

Trend: The area is trending toward a more seral mixture of species with more representation of the later structural stages. Silvicultural treatments have and continue to accelerate the development of larger diameter overstory trees. Other benefits realized by current treatments include reduction of fire risks to overstory trees, restoration of seral species compositions, and greater stand resilience. The trend in HRV is a reduction in SI and UR as they grow into subsequent structural stages.

OLD GROWTH and STRUCTURAL DIVERSITY DESIRED CONDITION MEASURES

A. Average Historic Range of Variation, Existing acres and distribution of structural stages by biophysical environment (except MS and SSLT). Acres and percent difference from HRV and Existing.

Structural Stage	Avg HRV Acres	Avg HRV %	Existing Acres	Existing %	Difference Acres	Difference %
Stand Initiation	5,314	8	16,629	29	+11,315	+21
Stem Exclusion Open Canopy (SEOC)	4,190	6	476	1	-3,714	- 5
Stem Exclusion Closed Canopy (SECC)	3,103	5	292	1	-2,811	- 4
Understory Reinitiation	6,034	12	30,939	54	+24,906	+42

Historic Range of Variation for SSLT and MSLT forest structures.

Biophysical Group	Total Acres In Biogroup	HRV for SSLT		HRV for MSLT	
		Range	**Average**	**Range**	**Average**
G1	541	1-10%	10%	1-10%	10%
G2	0	N/A	N/A	5-25%	10%
G3	14,216	N/A	N/A	30-60%	40%
G4	10,752	N/A	N/A	30-60%	40%
G5	24,299	15-55%	40%	5-25%	15%
G6	2,578	15-55%	25%	10-30%	20%
G7	6,539	15-55%	40%	5-25%	15%
G8	3,962	20-70%	55%	2-20%	10%
G9	1,017	20-70%	40%	2-20%	15%

2. ELK HABITAT EFFECTIVENESS

The forage:cover ratio will be near 60:40. The concept of managing "thermal cover" will have been replaced with a security cover approach. At least 30% of the forested area will be in a security cover condition. Security cover will be provided by a combination of conifer cover that at least meets the definition of hiding cover, and low levels of motorized access.

Road density will no longer be used to assess elk habitat effectiveness. Elk habitat effectiveness relative to roads will be analyzed in terms of the amount of habitat in concentric distance bands out from open motorized routes. At least 50% of the watershed will be more than 1km from an open motorized route (road or trail), and motorized access will be limited to designated roads and routes for all classes of motorized vehicles. Optimum conditions can exist in habitat that is greater than 1.8km from open motorized routes (Rowland, 2001).

Trend: Forested stands that experienced high mortality from insects in the early 1990's are being restored through fuels reduction, and promotion of a new green tree layer. Much of the hiding cover has been pre-commercially thinned within the past five years, and will recover to a hiding cover condition within the next decade. Drier biophysical environments are being restored to more open, single layered conditions. Understory reinitiation is being prepped to develop larger diameter overstory trees, and be more resistant to insects and pathogens. Given time, these UR stands that are being treated now will provide the highest quality cover and old growth habitat in the long-term. Non forested habitats are being rejuvenated with prescribed fire, providing higher quality forage for deer and elk, later into the summer months.

ELK HABITAT EFFECTIVENESS DESIRED CONDITION MEASURES

Assuming current LRMP standards and guidelines remain unchanged, which is highly unlikely, the following measures would apply.

A. Acres and distribution of elk cover and forage - 40% cover to 60% forage for summer range, at least 30% of the forested land is cover in MA-1 transitional range.
B. Open Road Densities – *(Also relates to Roads Analysis – Biological Dimension)*

Management Areas	Direction (Miles/Sq. Mile)
1	2.5
3, 3A, 1W	1.5
6	Road densities to remain essentially unchanged from 1985 levels.
12	Minimum necessary to provide for research and education.
14	Research dictates road densities as needed.
15	Avoid new road construction
16	Access construction allowed as needed to serve sites or facilitate their use.

If standards and guidelines are updated to reflect recent research, the following measures may apply.

A. Habitat effectiveness for a security cover variable on winter ranges – 40% of the forested acres meets the security cover definition of at least meeting hiding cover conditions (vegetation capable of hiding an adult elk at 90 meters), and greater than 1km from an open motorized route.

B. Habitat effectiveness for a security cover variable on summer ranges – 30% of the forested acres in security cover.

C. Habitat effectiveness for a roads variable – >50% of the total area is greater than 1km from an open motorized route on summer ranges. >75% of the total area is at least 1km from an open motorized route on winter ranges.

3. ROADS ANALYSIS – Transportation System

ROADS ANALYSIS – Biological Dimension Factors Measures

Aquatics

A. Miles of roads in RHCAs – no roads (open or closed) within RHCAs.

4. RIPARIAN CONDITION

Desired conditions for aquatic and riparian-wetland areas within Meadow Creek Watershed would be dynamic, resilient, and consistent with local climate, geology, soils, land-forming processes, and potential natural vegetation. Aquatic and riparian-wetland habitat would be characterized by high-quality water and complex, well-distributed physical attributes that lead to high quality fish habitat and properly functioning stream channels.

High-quality water and fish habitat, and properly functioning stream channels are attained when adequate vegetation, landform, or large woody debris is present to:

- Dissipate stream energy associated with high flows, thereby reducing erosion and improving water quality;
- Filter sediment, capture bedload, and aid in floodplain development;
- Improve flood-water retention and groundwater recharge;
- Develop root masses that stabilize streambanks against cutting action;
- Develop diverse pounding and channel characteristics to provide habitat (water depth, duration, and temperature) necessary for fish production, and to support greater biodiversity (USDI BLM 1993).

Elements necessary for fish habitat/production:

- 57 or less degree F maximum weekly average temperatures throughout a Watershed;
- Streambed substrate of less than 12% fines, and cobble of less than 20 percent embedded;
- Stream turbidity low;
- There are no physical barriers to fish migration;
- There are over 100 pieces of large wood (12" diameter and 35" long) per mile;
- Pool frequencies described in this chpater.
- Pools over one meter deep are increased by approximately 200% throughout Meadow Creek and its major fishbearing tributaries;
- Roads increase drainage network of watershed by less than 5%;
- Road density throughout the watershed is less than 2 miles per square mile and no valley bottom roads exist.

Trends: Past land management activities on NFS lands within the Meadow Creek Watershed have led to adverse effects on aquatic and riparian-wetlands resources. Eight of 10 subwatersheds are "not properly functioning" and two are "functioning at risk." The primary influential factors for all subwatersheds are: low percentages of adequately stocked RHCAs, high percentages of timber harvest within RHCAs, and high road densities outside of and within RHCAs. The trend of adverse effects has been reversed however within the last 5-10 years with implementation of new management direction, laws and polices (i.e. PACFISH).

RIPARIAN DESIRED CONDITION MEASURES

A. Acres of RHCA disturbance – 5-15% of the forested lands (including RHCAs) will be in stand initiation structural stage (HRV value for LGRD). Riparian Management Objectives found in PACFISH call for >80% of any stream reach has $\geq$90% stability).
B. Miles of drawbottom roads – no valley bottom roads
C. Miles of open native surface drawbottom roads - no valley bottom roads
D. Stand Density indices for RHCAs – 100% adequately stocked stands within riparian areas where factors of slope, soil, aspect, and moisture support this condition.

5. THREATENED, ENDANGERED, AND SENSITIVE SPECIES

A Forest goal is to maintain native and desirable introduced or historic plant and animal species and communities. Provide for all seral stages of terrestrial and aquatic plant associations in a distribution and abundance to accomplish this goal. Maintain or enhance ecosystem function to provide long-term integrity and productivity of biological communities.

A District management goal is to protect and manage for the perpetuation and recovery of plants and animals that are listed as threatened, endangered, or sensitive.

Another District goal is to assure that management activities do not jeopardize the continued existence of sensitive species or result in adverse modification of their essential habitat.

Trend: The Meadow Creek watershed is currently in a predominantly managed condition due to past management activities and salvage of insect caused mortality. The area is out of balance with the historic range of variation in all structural stages, fully roaded, and lacking in large snags and down woody debris.

Should this trend continue, species sensitive to these conditions within the analysis watershed would be compromised. Populations of management indicator species, particularly goshawk, pine martin, pileated woodpecker, and other cavity excavators, would continue to decline or lose viability. However, as habitat conditions are moved toward the landscape envisioned in the Forest Plan, as amended, conditions should continue to improve within the project area and long term habitat will meet the needs of all species within the project area.

TE&S DESIRED CONDITION MEASURES

A. Maintain and enhance viable populations of all native and desirable introduced or historic plant and animal species and communities.

6. FIRE/FUELS

A District management goal for fire and fuels is to maintain a diverse fuel profile, return fire intervals to historic occurrence levels, and reduce hazardous fuel accumulations across the landscape to reduce the risk of damage and resource/habitat loss to catastrophic fire. Reintroduction of appropriate fire intervals based on a fire regimes and biophysical characteristics will assist in creating a landscape more closely resembling that of pre-fire suppression conditions allowing fire to resume its natural role in the ecosystem.

Forests with reduced fire risk would be healthy, resilient, and productive. All forest species would be conserved and biodiversity optimized over the long-term. Public and firefighter safety would be optimized and the cost of wildfires in terms of suppression and resources lost would be minimized over time.

The Forest goal is to maintain air quality at a level that is adequate for the protection and use of National Forest resources, and that meets or exceeds applicable Federal and State standards and regulations. Currently, the Federal Clean Air Act and State of Oregon Air Quality Implementation Plan are the primary legislative mandates that guide management activities.

Trend: Effective fire suppression has resulted in increased natural fuel loadings and a vegetative shift from fire tolerant species to fire intolerant species. Forest cover in the analysis watershed has increased above historical levels. This has resulted in overstocking of stands with fire sensitive species. The amount of available fuel is greater than the historic range of variability.

There has been a significant increase in fuel loading because of insect and disease activity and an aggressive fire suppression policy. The risk of crown fire has risen because of increased fuel loadings and the greater continuity of the vegetative and fuel layers.

The eastern boundary of the Meadow Creek watershed is located 13 miles west of the City of La Grande. La Grande has been designated as a PM10 smoke particulate non-attainment air quality area by the Oregon Department of Environmental Quality. The eastern part of the planning area is within the 20 mile Special Protection Zone that surrounds the City of La Grande.

Wood stove smoke is the primary concern. However, the Special Protection Zone is an area of particular smoke sensitivity. Prescribed burning must be coordinated with the Salem Office of the Oregon Department of Forestry. Slash burning has been identified as one of the sources of PM10 within La Grande. La Grande is currently in a voluntary smoke management program. The voluntary smoke management program has been successful in not exceeding air quality within the past three years. Any prescribed burning must be carefully controlled to prevent smoke intrusions into the City of La Grande.

FIRE/FUELS DESIRED CONDITION MEASURES

Historical fire return intervals:

A. Fire return intervals (FRI) by fire regime groups (refer to Chapter 3 for specifics). Fire regime 1 and 3 represent the high and moderate departures from historical fire return intervals. The fire regimes that have missed multiple return intervals are subject to dramatic changes in fire size, intensity, severity, and landscape patterns.

Fire Regime Group	Frequency (Fire Return Interval) FRI
I	0-35 year FRI
II	0-35 year FRI
III	35-100 +year FRI
IV	35-100 +year FRI
V	>200 year FRI

B. Acres and percentage of departure within fire regimes 1 & 3 by SWS

SWS	High FRI Departures Acres	Hi FRI Percent	Mod FRI Departures Acres	Mod FRI Percent	DFC/HRV Acres	DFC Percent
86A	1356	7	888	3	2244	5
86B	2602	14	3641	13	6243	13
86C	2017	11	2116	7	4133	9
86D	2075	11	4488	16	6563	14
86E	1060	5	1460	6	2520	5
86F	2044	11	3401	12	5445	12
86G	2629	14	2135	7	4764	10
86H	3489	19	4113	14	7602	16
86I	550	3	2867	10	3417	7
86J	874	5	3389	12	4263	9
Total	18,696	-	28,498	-	47,194	-

C. Acres of Moderate and High Fire return interval departures by SWS - In 20 years it is possible to move about half of the total high and moderate departures from fire return intervals (25% per decade) to a maintenance level. High departure rankings represent a higher relative risk of fire caused losses to natural resources and other key ecosystem functions. The higher departures should obtain the most attention. To obtain even a 50% balance in acres at risk 23,597 acres would need to be targeted over 20 years. An annual treatment rate of 2,360 would result in reducing the existing condition by 5% a year.

High risk fuel loadings

A. Number and percent of fires by size class - Fire size and numbers within those larger size classes continue to be reduced over time as hazard fuel loadings are reduced and isolated which will reduce the potential for extensive resource damage as a result of a large wildfire.
B. Fire occurrence rates per 1,000 acres – No desired condition as this is primarily based on weather patterns and seasonal conditions.
C. Fire risk acres by SWS – Reduce high fire risk fuel arrangements to moderate or low risk ratings. Reduce moderate risk fuels 30-70% across the watershed. Reduce or geographically isolate higher risk fuel loadings 75-100%. Low risk areas will be maintained at low level with treatments periodic treatments over time.
D. Fire intervals (see chart and statements in section above) and the fuel profiles reflect historic ranges which result in conditions consistent with historical fire regimes.

Air Quality

A. Tons of PM10 for wildfire – no more than 2,500 tons of PM10 per year
B. Tons of PM10 for prescribed fire – No more than 15,000 tons of PM10 per year.

7. NOXIOUS WEEDS

The District management goal for noxious weeds is to pursue effective noxious weed management techniques, including education and prevention, which are also cost effective to contain or eradicate existing populations of these species and prevent the spread of any new infestations. Noxious weed control and management will stretch across all ownerships in a coordinated manner. Revegetation with desirable plant species as a means of restoration will be one of the final goal of noxious weed management.

Trend: Present distributions of many exotic plants, including noxious weeds, are increasing rapidly and in some cases exponentially. This rapid rate of expansion has overwhelmed the ability to curtail the expansion. Uncoordinated weed control efforts throughout the project area have been ineffective against noxious weeds and other exotic plants.

The rapid expansion of these species is one of the greatest threats to healthy native plant and animal communities. Noxious weeds are contributing to a decline in the quality of all habitats, reductions in forage and grazing, increasing runoff, sediment, and erosion, reducing biodiversity, and escalating the cost to control these species.

NOXIOUS WEEDS DESIRED CONDITION MEASURES

A. Acres of noxious weed infestations (private and public) distribution and species – Eradicate new introductions, contain and control existing large populations, prevent new infestations, and revegetate with desired species.

8. RANGE

District goals are for rangelands that reflect a mosaic of multiple-aged shrubs, forbs, and native grasses with management emphasis on maintaining a diverse native plant community. Conifers do not dominate on rangelands. Rangelands have the necessary structure and composition, ecological processes, and ecosystem function to meet most needs of federal and state listed and sensitive rangeland-dependent wildlife species. The distribution of different amounts and ages of shrubs, grassland, and woodland, are approaching desired levels in a mosaic pattern. Vegetation is appropriate for the site with multiple age classes of shrubs and grasses being common.

Riparian vegetation: a) provides an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems; b) provides adequate summer and winter thermal regulation; c) helps achieve rates of surface erosion, bank erosion, and channel migration characteristic of those under which the communities developed.

All riparian areas will be in late seral or potential natural community ecological vegetative conditions (that is 60 to 100 percent of potential natural community species composition). All streams on the allotment will meet state water quality standards on those portions administered by the Forest Service. Watershed and fisheries habitat conditions in all streams will be maintained and/or improved to fair and good conditions.

Trends: Initially, there were seven allotments established for this watershed. Several of these allotments were once grazed by livestock, including horses from the Umatilla Reservation. A note on the back of a ca. 1932 allotment map suggests that unregulated horse usage was overgrazing the hill tops within the Dark Canyon area. Subsequent forage studies indicated that the hilltops had not recovered as of 1963. Originally the bulk of the land included inside these allotments were utilized for sheep, but over time they were mostly replaced by cattle.

In the early 1890's, high numbers of Animal Unit Months (AUM) were grazed on the Wallowa-Whitman National Forest. Since the very high 1890 levels, livestock numbers have decreased substantially over time. The large decline is mainly attributed to the collapse of the sheep industry in Northeastern Oregon with cattle grazing now being over 90% of the total livestock usage. The early intensive livestock grazing impacted the riparian areas by reducing the riparian vegetation, collapsing stream banks, eliminating shade, and degrading water quality.

Recent management changes (since 1992) within the NFS administered lands and restoration projects on the private lands have helped to begin the return to more near natural conditions. Completion of restoration activities within the McIntyre Creek riparian area will occur within the next two years (2003). Projects within this stream reach include removal of the drawbottom road through re-contouring, placement of large woody material, planting of native shrubs and grasses and continued rest from permitted livestock.

RANGE DESIRED CONDITION MEASURES

A. Utilization levels from the Forest Plan

Maximum Annual Utilization of Available Forage in Riparian and Upland Areas						
Management Level	**Grass and Grasslike Species**				**Shrub Species**	
	Riparian		**Upland**		**Riparian**	
	Sat. Condition	**Unsat. Condition**	**Sat. Condition**	**Unsat. Condition**	**Sat. Condition**	**Unsat. Condition**
Low	40%	0-30%	50%	0-30%	30%	0-25%
Moderate	45%	0-35%	55%	0-35%	40%	0-30%
High	50%	0-40%	60%	0-40%	50%	0-35%

***Notes:** Refer to specifics under Chapter 3 – Rangeland Existing Condition

B. Streambank stability - - Riparian Management Objectives found in PACFISH call for >80% of any stream reach has ≥90% stability`).
C. Appropriate watering locations - Watering sites will be located out of riparian areas and adequately spread throughout the allotment to facilitate movement of animals. They will be located in areas to promote utilization in underutilized areas and as a management technique to move livestock out of undesirable areas and into desirable areas for resource protection.
D. Changes in riparian vegetation from historic or desired grass/shrub systems - Riparian areas in Proper Functioning Condition are managed to maintain at least that condition with no downward trends, and there is an annual increase in the number of areas functioning at risk that show an upward trend. Riparian areas are covered by protective vegetation. Sediment and hydrologic regimes are appropriate to geoclimatic setting. Native and desired non-native plant communities in riparian areas are diverse and productive.
E. Condition and age classes of shrubs - Within the Cool Shrub Potential Vegetation Group, 60-80 percent of the area is dominated by native grasses and shrubs with an overstory layer of shrubs; 15-40 percent of the area contains mixtures of perennial grasses and shrubs. Closed canopy sagebrush and conifers dominate the remaining area.

   Within the Dry Shrub Potential Vegetation Group, 50-70 percent of the area is dominated by native grasses and forbs with an overstory layer of shrubs. Native grass and forb communities dominate Ten to 25 percent of the area. The remaining area is dominated by closed shrub communities with declining herbaceous layers, by seeding of exotic and native grasses and other plants, and in small areas, by annual grasses and noxious weeds.

   Within the Dry Grass Potential Vegetation Group, 60-80 percent of the area is dominated by native grasses and forbs without conifer and shrub encroachment.

9. INSECTS AND DISEASE

Tree stocking levels and species composition are the result of applied integrated pest management techniques that prevent catastrophic insect and disease outbreaks. Stocking levels compatible with site productivity promote vigorous stand conditions resilient to insect and disease epidemics. Increased early seral tree species composition (such as Ponderosa pine and western larch) reduces the potential for major defoliating insects that have caused major damage in the watershed over the last 30 years. Sanitation harvest and reintroduction of fire reduce Dwarf mistletoe incidence to levels present prior to fire suppression. All acres with past harvest regeneration are fully stocked with a mixture of desirable early seral tree species.

INSECT DESIRED CONDITION MEASURES

A. More specific Management Recommendations for each of the major and minor pests in the Watershed are found in the "Analysis of Insect and Disease Risks for the Meadow Creek Watershed, Wallow-Whitman National Forest." (BMPMSC-01-09, April 3, 2001-MCWA Appendix).

CHAPTER V

MANAGEMENT OPPORTUNITIES

This chapter is comprised of a series of Tables which list potential projects, based on the analysis completed in Chapters 3 and 4, that would promote the desired trends in the watershed. The results of discussions in previous chapters are brought to conclusion by:

1. Recommending management activities that are responsive to the issues in Chapter 2 and to the interpretation(s) in Chapters 3 and 4 between existing and desired conditions and are designed to move the system towards reference conditions;
2. Summarizing Data Gaps, information needs and limitations of this analysis;
3. Identifying monitoring and research activities that are responsive to the issues and data gaps;
4. Prioritization based on Forest and District stressors and indicators.

The potential projects listed are minimally detailed. Actual project level planning and design will be done through a NEPA process which will frequently be dependent upon further ground/field survey and analysis.

Forest WRAPPS Process:

In 1999, the Wallowa-Whitman Forest Leadership Team established a watershed restoration strategy with the overall goal to maintain or improve the baseline condition, or health of all watersheds across the forest. The watershed restoration strategy was developed to assist in prioritization of restoration needs, aide in cumulative effects analyses, and display how projects are to improve or maintain baseline conditions over time.

The Watershed Restoration and Prioritization Process (WRAPP) is based upon the concept of "stressors and indicators."

> **Stressors** are effectors that push the ecosystem to the outer limits of the Historical Range of Variability (HRV). Ecosystems with high stressor values are more likely to experience large-scale re-adjustments from catastrophic events or disturbances.
>
> **Indicators** are values that provide an indication of relative ecosystem function or health. Low indicator values are often associated with a system that is under stress.

Four stressors were selected to represent the primary effectors on watersheds. The stressors selected are fire risk, forest insect and disease, noxious weed invasion, and roads. Three indicators were selected to evaluate ecosystem heath. These are aquatic (fish habitat), vegetation (HRV and structural stage departure), and Lynx (denning and forage habitat mix). Further analysis indicated that the Meadow Creek Watershed area does not have the capability to produce the habitat features needed to support lynx and is therefore not within a Lynx Analysis Unit negating lynx as an appropriate indicator for this watershed.

The Meadow Creek Watershed Rankings for NFS lands are as follows:

Stressors	***Indicators***
Fire – Moderate	**Aquatics** – High
Insects and disease – High	**Vegetation** – Moderate
Roads – High	
Noxious weeds - High	

The Meadow Creek Watershed Rankings for Private lands are as follows*:

Stressors	***Indicators***
Fire – High	**Aquatics** – High
Insects and disease – High	**Vegetation** – High
Roads – High	
Noxious weeds - Moderate	

*Based on FY2001 Blue Mountain Demonstration Project WRAPPS

Analysis of the combined Forest Service and Private land ratings resulted in an overall priority rating of High for restoration work within the Meadow Creek Watershed.

RECOMMENDATIONS

POTENTIAL PROJECTS FOR ECOSYSTEM MANAGMENT AND RESTORATION

This section is presented in the three main dimensions (physical, human, and biological). Under each dimension, **potential projects** are organized and displayed by narrative or in a series of tables **under their related key question resource area**. These recommended projects have the objective of creating a movement or trend towards desired conditions in the watershed. This will also provide a stronger link with Watershed Assessments and District NEPA documents answering the questions:

1) How does this project fit within the identified priorities of the entire Watershed? Answers the question of “Why here, why now?”.
2) How does it move the area toward the desired conditions?
3) How does this project fit within the thresholds that this watershed can withstand?

The potential projects listed vary in detail. The information from this analysis was used to guide development for Dark Meadow, McMeadow, and Burnt Pickle Restoration projects. Site specific information summaries from these analyses will be included in the attached tables and referenced appendices. Other information outside either the scope or area of those proposed projects will not be as specific in detail. Additional project level planning and design will be done through NEPA and selection will require further field survey and analysis.

Table 5-1: General – Survey and Monitoring Needs						
Number	***Project***	***Location***	***Purpose***	***Acres***	***Time Frame***	***Priority***
G-1	Stocking Surveys	Regeneration units in all subwatersheds in Wshed 86	To determine seedlings per acre and ensure adequate stocking.	2,460 currently	Within next 5 years	Low. Part of ongoing program.
G-2	Water Quality Monitoring	All SWS	Continue existing monitoring program at all gaging stations, stream temperatures sites, and precipitation sites.			Moderate
G-3	Road Surveys	All SWS	Build on existing information and culvert inventories to update ATM Plan and Roads Analysis.			Moderate-High
G-4	Stream Surveys	All SWS	Continue existing stream survey program across entire SWS			Moderate-High
G-5	PETS Surveys	All SWS	Continue existing survey program for fish, plants and wildlife Proposed, Endangered, and Threatened species.			Moderate-High

THE PHYSICAL DIMENSION

AQUATIC

Table 5-2: Aquatic Projects

Number	***Project***	***Location***	***Purpose***	***Acres***	***Time Frame***	***Priority (Hi to Low)***
P-1	Stand Initiation (SI) Creation	SWS 86A and G	Create SI structural stage (0 to 20 year old trees) to mimic the natural opening processes.	86A – treat up to 338 acres. 86G – treat up to 63 acres.	Within 5-10 years	
P-2	SI Maintenance	SWS 86B-F, H-J	Maintain 5-15% of forested acres in SI. Thin remaining SI acres to accelerate stand development and hydrologic recovery.	86B: up to 819 ac. 86C: up to 1171 ac 86D: up to 1644 ac. 86E: up to 165 ac. 86F: up to 236 ac. 86H: up to 882 ac. 86I: up to 1497 ac. 86J: up to 1985 ac.	Within 5-10 years	SWS: J,D,I, C,H,B,F,E
P-3	RHCA Planting	SWS 86A-J	Interplant understocked RHCAs in all subwatersheds to accelerate development of canopy cover, root mass, and recruitment material.	86A: 52 ac. 86B: 936 ac. 86C: 556 ac. 86D: 1,062 ac. 86E: 167 ac. 86F: 349 ac. 86G: 402 ac. 86H: 648 ac. 86I: 332 ac. 86J: 700 ac.	Within 5-10 years	SWS: D,C,B,J,I,G,H,E,F,A

Table 5-3: Aquatic Projects						
Number	***Project***	***Location***	***Purpose***	***Acres/Miles***	***Time Frame***	***Priority (Hi to Low)***
P-4	RHCA Thinning	SWS 86A-J	Thin overstocked and suppressed RHCAs in all SWS to acclerate development of recruitment of LWD materials.	86A: 364 ac. 86B: 817 ac. 86C: 484 ac. 86D: 807 ac. 86E: 333 ac. 86F: 755 ac. 86G: 501 ac. 86H: 1,174 ac. 86I: 570 ac. 86J: 775 ac.	Within 5-10 years	SWS: A,I,F,E,H,J,G,C,B,D
P-5	Stream Channel LWD Additions	SWS 86C, E, G	Increase LWD in Pickle Creek (86E), McIntyre Creek (86C), and Bear Creek (86G) to enhance instream structure.	Pickle Creek – 1.2 miles McIntyre Creek – 2.9 miles Bear Creek – 5.5 miles	Within 5-10 years	SWS: C, E, G 1. McIntyre 2. Pickle 3. Bear
P-6	Road Obliteration	SWS 86A-J *for specific roads refer to the Roads Analysis Section	Reduce overall road densities and roads within RHCAs. Restore SWS to total road density PFC by road obliteration.	86A: 12.4 mi. 86B: 24 mi. 86C: 24 mi. 86D: 24 mi. 86E: 7 mi. 86F: 24 mi. 86G: 24 mi. 86H: 24 mi. 86I: 24 mi. 86J: 24 mi.	Within 5-10 years	SWS: B,D,F,J,I,G,H,C,A,E
P-7	Meadow Creek Large Pool Development	SWS 86A & H	Create large pools to improve habitat conditions for threatened summer steelhead.		By 2004	High
P-8	McCoy Creek Large Pool Development	SWS 86C & D	Create large pools to improve habitat conditions for threatened summer steelhead.		By 2004	High

Table 5-4: Aquatic Projects						
Number	***Project***	***Location***	***Purpose***	***Acres/Miles***	***Time Frame***	***Priority (Hi to Low)***
P-10	McIntyre Road Channel Reconstruction and Rehabilitation	McIntyre Creek SWS 86C	Increase fish habitat, reduce sediment, restore floodplain and stream channel, restore native vegetation.		By 2004	High
P-11	Culvert Replacement	Dk Canyon(86B)	Restore fish passage throughout watershed for all fish species and life stages.		w/in 5 yr	Low
		Waucup (86J)			2002-4	High
		E Brnt Corral • Rd 2440040 • Rd 2440120			2002-4	High
		Meadow (86J)			w/in 5 yr	High
		Peet (86H)			w/in 5 yr	Low
		Unknown (86D)			w/in 5 yr	Low
		McIntyre (86C) • Rd2100 MP20			w/in 5 yr	High
		Battle (86A)			w/in 5 yr	Low
		L.Dk Canyon (86B)			w/in 5 yr	Low
P-12	Drainage Culvert Installation	All Subwatersheds	Reduce sediment input to 303(d) listed streams containing federally listed fish.		Within next 5-10 years	Moderate - High

THE HUMAN DIMENSION

RECREATION and ROADS ANALYSIS

Table 5-5: Human Dimension – Recreation						
Number	***Project***	***Location***	***Purpose***	***Acres***	***Time Frame***	***Priority***
H-1	OHV Management Plan	All Subwatersheds	Provide for appropriate OHV management within the watershed that meets recreation needs while protecting resources.		Within 5 years	High
H-2	Access and Travel Management Plan	All Subwatersheds *Refer to specific Roads Analysis recommendations below	Establish a long term management system for access and travel across the watershed ensuring all access needs are met while resources.		Within 5 years	High

Subwatershed 86A

Right-of-way needs to be obtained for road 2120750 and 2120755. This will allow for re-contouring road 2120750 from about 2120756 to State Highway 244 and clean up of an old rock pit being used as a dump in sub watershed 86F.

Road Management Recommendations

1. Road 5100035 is isolated. The roads south end tied into the old Fly Creek Road which was abandoned in the '70's, stream crossings removed in the '80's, and wing ripped in the '90's. A log stringer bridge once crossed the Grande Ronde River at the forest boundary tying the Fly Creek Road and road 5100035 to road 5100. It was removed in the late '60's. After checking with the Union County Road Department, it was determined that access from the north is over a private road which ties into the McIntyre County Road near the old town site of Starkey.
2. Recommend re-contouring road 5100035.
3. Re-contour road 5156880.
4. Road 5156820. Check and refurbish drainage structures. This road was originally planned for a CFR closure but proved too isolated for effective administration.
5. Check 2120950 for possible re-contouring.
6. Road 2120 from Hwy 244 to 2105 and road 2120731 is being dust abated annually and should be considered maintenance level 4, which includes dust abatement.

Subwatershed 86B

Roads 2100390 and 2100410 parallel both sides of Dark Canyon Creek. These are basically contour roads located well above the creek. It is tempting to consider them for road obliteration because they appear close together on a map and obliteration would reduce road densities. Fire and future logging access needs to be looked at closely before one or both of these roads are re-contoured. Decommissioning by removing existing culverts, adding large water bars, many barricades, wing ripping, and seeding would stop traffic and minimize erosion. Road 2100410 is located for long reach logging systems. If the road is re-contoured, a new one will be built in the same location.

Road Management Recommendations

1. Decommission road 2100425 by scattering boulders and slash over the existing wheel tracks and ripping where it will do some good.
2. Treat 2100427 and 2100428 the same as 2100425.
3. Re-contour road 2100536 from the forest boundary to where it breaks out of the draw or approximately 0.60 miles.
4. Roads 2135090, 2135100 and 2100102 appear to have accessed harvested lodge pole stands. If so, these roads could be decommissioned until the next generation of lodge pole is ready to harvest. At a minimum they should be closed.
5. Decommission road 2135530 from 2135532 to 2135. Use road 2135700 from 2135530 to 2135 as access, when needed, to the remaining portion of 2135530. Renumber 2135530 and 2135700 from 2135530 to 2135400.
6. Decommission road 2135700 from end of decommissioned section to 2135530.
7. Decommission road 2135702.
8. Close road 2135709.
9. Decommission roads 2100372, 373 and 374.
10. Road 2100380 is a good candidate for obliteration. It parallels a large branch of Dark Canyon Creek and is located just across the draw from 2135. Changing logging systems and broken ground may allow the tributary area to be logged from 2135 and landings stubbed in

from 2100500 thus eliminating a long road adjacent to the stream. This would need to be check out before the road was re-contoured. Re-contour 2100381 at the same time.

11. Close road 2100385 from 2100391 to end.
12. Decommission road 2100391.
13. Decommission road 2100393 from 2100385 to 2100394. Construct logging access when needed from 2100355 to the present junction of 2100393 and 2100394.
14. Close road 2100355. Road was closed but is shown open on Transportation Map dated 10/03/01.
15. Close roads 2100347 and 349. Road located on flat terrain and if they were used to access lodge pole stands, decommission.
16. Decommission road 2100343.
17. Decommission road 2100607 and 608. These roads are presently closed and grassed in.
18. Close road 2138390
19. Close road 2138395.
20. Decommission last 0.40 miles of 2138420.
21. Close road 2138422 and 426
22. Close road 2138400 from saddle in section 14 to forest boundary. Barriers will be required at the forest boundary to prevent access from private property. Additional barriers will be required to prevent cross-country access from open roads.
23. Close road 2138415.

Sub watershed 86C

Potential road work on National Forest lands is limited at the present time because most roads are on private property or in the Intensive Management Area of the Starkey Experimental Forest.

Road Management Recommendations

1. Decommissioning of road 2137is to be completed FY 2002. Road 2100325 was wing ripped several years ago and should be inspected for additional needed work.
2. Decommission 2137380 from 2137 to where relocation of 2137380 starts.
3. Decommission 2137385 from 2137 to where relocation of 2137385 starts.
4. Decommission 0.30 mile of 2125350 from the west side of the draw to road 2125. This will help keep the upper gate from being vandalized and left open.
5. Decommissioning of road 2137378 from 2137379 to 2137 completed.
6. Close road 2100305 and 306.
7. Close road 2100307.
8. Decommission road 2125323 and re-contour old rock pit.
9. A Share Cost Agreement has been requested by Dick Snow on roads 2125354 and 2125350 from 2125354 to newly reconstructed County Road 1. This request was made and agreed to during right-of-way discussions between Dick Snow, Shauna Mosgrove, and the Forest Service.
10. Road 2125356 is shown open on the Meadow Creek Transportation Update map dated 10/03/01. It should be closed from a couple of hundred feet west of the allotment fence north to 2125350.
11. Check 2120436 in the field to verify location, length, etc.

Construction/Reconstruction Needs

With obliteration of road 2137 planned, some construction type work will be necessary to funnel traffic away from road 2137 and the McIntyre Creek draw bottom to roads presently located on ridges above McIntyre Creek.

1. Construct approximately 0.30 mile connection from 2137380 to 2137385. Construction starts approximately 1000 feet south of 2137 and 2137380 junction traversing north and climbing to junction with 2137385. This will be a one way junction with limited access to the south. Tag line and survey completed in FY 2000.
2. Construct approximately 0.55 mile connection from 2137385 to 2100335 (2138000). Construction starts approximately 1200 feet south of 2137 and 2137385 junction and

traverses north and east to junction with 2100335(2138000). Tag line and survey completed in FY 2000.
3. Construct connection from north termini of road 2137378 to road 2100.
4. Junction of roads 2125365 and 2125 is a one way junction towards 2137. Reconstruction will be required to allow traffic flow towards County Road 1.

Subwatershed 86D

Road Management Recommendations

1. Close road 2115245.
2. Re-contour 2123111.
3. Re-contour road 2123128.
4. Re-contour last 0.30 miles of road 2123129.
5. Re-contour road 2123131.
6. Several draw bottom roads grown in with reproduction were wing ripped and heavily grass seeded. They were constructed on the flood plain and little opportunity existed for re-contouring. Further disturbance is not recommended. These are roads 2125350 from 2125361 to its northern termini, 2125359, 2125234, 2125236, 2125250 and 2125265.
7. Road 2125361 is a wheel track road traversing the nose of a rocky ridge. It was barricaded, ripped, water barred and grass seeded but if someone wants to drive along this route from 2125 to the creek they will. Check and refurbish drainage.
8. Re-contour roads 2125120, 2125230, and 2125142.
9. Decommission road 2120237.
10. Decommission road 2120238.
11. Close road 2120230 from 2120100 to 2120212.
12. Decommission road 2120190 approximately 0.20 miles starting at 2120195 and running south.
13. Decommission road 2120192.
14. Decommission road 2120195.
15. Close road 5427220.
16. Re-contour 5427235 from 5427236 to end.
17. Re-contour road 5427314.
18. Close road 5427320 from 5427361 to end.
19. Close road 5427364 from 5427367 to end.
20. Road 2100 from east boundary of section 36, T.2 S., R.34 E., to beginning of existing crushed road just south of junction 2100 and 2123125 should be changed from maintenance level 2 to maintenance level 3 to provide a maintainable running surface, reduce surface runoff, and provide travel continuity.

Construction/Reconstruction Needs

Areas of concerns are roads located adjacent to McCoy Creek or its tributaries. Road 2100 from 2100275 to 2100230 and 2125 from 2100 to 2125140 as well as other sections of 2125 fit these criteria. Road 2100 has a weighted average grade of 6.25% with pitches of 9 and 10%. The first 1.44 miles of 2125 is constructed on the edge of the McCoy Creek flood plain with a weighted average grade of 3% and short pitches of 6 and 7%. Both road 2100 and 2125 are not surfaced allowing sub grade erosion and heavy summer dusting to enter the stream.

Road 2125 was constructed in the early 1960's as the main road serving forest service resource needs in an area defined by McIntyre Creek on the east, McCoy Creek on the west, private land on the south, and Umatilla Indian Reservation on the north. Road 2100 is the main route for any produces hauled from the area to Pilot Rock.

Relocation of 2100 from the McCoy Creek Bridge to approximately road 2100275 and re-contouring abandoned sections is one alternative. Right-of-way is needed for this alternative and normally requires two years to obtain. Performing deferred maintenance, installing additional drainage and surfacing road 2125 is another alternative. Costs for the two alternatives are similar so the questions will be is there money available and what alternative will give the biggest environmental improvement for the dollars spent.

A brief analysis containing route maps, descriptions, and rough costs was submitted in FY 2000.

1. Recommend road 2125 receive a minimum of 4" lift of course graded crushed rock from road 21 to 2125140.
2. Recommend road 21 be surfaced from the McCoy Creek to the beginning of the crushed rock to the west.
3. Recommend building the relocation of road 21 as proposed and re-contouring abandoned portions of 2100. Surface 21 from 2100275 to county road.
4. Work with Union County on improving the running surface of road 21(also Union County Road 1) from the east section line of section 36 to the county line.

Subwatershed 86E

Road Management Recommendations

1. Re-contour 5156880.
2. Re-contour 2442150. First priority is from 2442 to 2442153.
3. Monitor conditions on 2442153 and determine additional work if any. This is a ridge road probably getting traffic even with the effort that went into closing it.
4. Re-contour 2442 from 2442150 to 2444310.
5. Check roads 2442172, 2442250, and 2442300 for resource damage. These roads were closed and seeded in the mid '70's and have had no traffic. At last inspection they were grown in with grass and brush.
6. Road 2442069 has been closed for many years and grown in with brush and grass. There are areas that could be re-contoured if the road is not to be used again.

Subwatershed 86F

Road Management Recommendations

1. Roads 2442020, 2442030, 2442035, and 2442040 were wing ripped but should be re-contoured.
2. Re-contour road 2440600.
3. Re-contour road 2440605.
4. Re-contour last 0.51 mile of 5160900. This is a mid slope road located above Sullivan Gulch. If logging is restricted below the road, it could be re-contoured but road 5160950 and its tributary area would be left without access. If access can be found for 5160950, re-contour 5160900.
5. A fence was built in 2444060. Re-contour portions without the fence.
6. Re-contour 2444072.
7. Re-contour 2444200.
8. Re-contour 2444367.
9. Road 5160930 was closed. This is a ridge top road with considerable hunting pressure. Additional closure effort may be needed.
10. Roads 2442 and 2444 have been the primary access into the Marley Creek and Burnt Corral Creek area for almost 50 years. All major roads tributary to these two collector roads have been closed, wing ripped, and now recommended for re-contouring. These are roads like 2442020, 030, 069, 150, 250, 300, and half of 2442 itself. The 2444 system has roads like 2444040, 060, 070 and others being planned for re-contouring. Remaining open roads in this area are tributary to 5155 and 5160. Re-contour 2442 from Hwy 244 to 2442060. Re-contour 2444 from Hwy 244 to 2444070

Construction/Reconstruction Needs

1. Add surfacing and drainage to road 2444 from 5155 to 2444070.
2. Reconstruct 2442070 to a minimum standard with surfacing, turnouts and adequate drainage.

Subwatershed 86G

Construction/Reconstruction Needs

Some ditching and additional drainage structures are needed on road 2105 and other roads on the Starkey Experimental Forest. Sections of 2105 that do not have crushed rock, should be rocked. A separate construction and road management plan should be developed with the scientist providing input about their concerns and needs.

Subwatershed 86H

Only the area within this sub watershed west of road 21 is being considered for additional road management at this time because everything east of road 21 is inside the elk study area.

Road Management Recommendations

1. Close road 2100110. Road can be accessed across country from road 21. Install several barricades along 2100110's length to prevent wheel track roads access being developed from road 21.
2. Re-contour road 2100130.
3. Re-contour road 2100131.
4. Re-contour road 2100132.
5. Re-contour road 2100137.
6. Re- contour road 2100145.
7. Re-contour road 2110659.

Construction/Reconstruction Needs

1. Construct tie spur from end of 2100153 to 2100139 if ever needed for vegetation management.

Subwatershed 86I

Road Management Recommendations

1. Re-contour road 2100145.
2. Re-contour road 2100150 from 2100152 to end.
3. Re-contour road 2114137. This road runs straight up and down the slope and offers open access to roads in the 2114135 system and therefore a large portion of the Waucup Creek drainage. Road 2114135 is closed by a gate that receives considerable vandalism. Because of administrative access needs, road 2114135 and its tributary roads have received little closure effort other than the one gate. Recommend additional closure effort on 2114135 and tributaries. If closure of 2114137 is breached, there will be no place to go.
4. Re-contour 2114135 from 2114160 to end.
5. Barricade 2114135 north of 2114160 junction and also north of 2114150 junction.
6. Re-contour road 2114138.
7. If possible, re-contour 2114265.
8. Re contour road 2114145.
9. Re-contour road 2110710 starting 0.35 mile from section 36 and running to section 36.
10. Roads like 2110013, 230, 232, 236, 250 ,260, 2114451, 551, and 559 are flat land roads shown on the Transportation Update map as obliterated that were built to access lodge pole stands . These should be checked for obliteration success and additional effort applied if necessary.
11. Re-contour road 2110360.
12. Re-contour road 2110362.
13. Obliterate road 2110040.
14. Obliterate road 2110041.
15. Obliterate road 2110012.

Construction/Reconstruction Needs

1. Construct tie through spur from 2110804 to 2110240 when needed for vegetation management.

2. Recommendation is to reconstruct 2114 for 2.53 miles from 2114380 to 2110220, relocate and reconstruct 2110220 to 2110 for approximately 2.00 miles. This would be a low standard road similar to 2110 - 14' sub grade, 1000' turnout spacing, course graded crushed rock, (pit run if found) and drainage as necessary.

3. Reconstruct 0.17 miles of road 2110 from 2110360 to 2110359 adding ditch and culverts. Short term high volume runoff area above the road causing heavy road surface riling into an annual stream.

Sub Watershed 86J

Road Management Recommendations

1. Re-contour last 0.30 miles of road 2114175.
2. Re-contour road 2114280 from 2114283 to end.
3. Re-contour road 2114283.
4. Re-contour road 2114286.
5. Re-contour last 0.40 miles of 5427091.
6. Re-contour last 0.36 miles of 5427093.
7. Close road 2115245.

(If the elk fence is ever removed, recommend road 2120 from ½ miles west of 2120100 to Meadow Creek be re-contoured and remove the Upper Meadow Creek Bridge.)

Construction/Reconstruction Needs

1. Improving the 2100 crossing of Waucup Creek already has a project proposal. Part of that proposal should include ditching and installing culverts from 2115200 to Meadow Creek. Considerable surfacing from this section of road is washed on to the flood plain of Meadow Creek.
2. The road inventory for road 2115 indicates there are "ford dip" in intermittent streams that are washing - some badly. Recommend an inventory be made of the culvert/ford dip situation and ford dips be replaced with culverts where needed.
3. Reconstruct portions of road 2114 within this watershed to a minimum rocked standard.

THE BIOLOGICAL DIMENSION

Table 5-6: Biological Dimension – Diversity, Old Growth, I&D						
Number	***Project***	***Location***	***Purpose***	***Acres***	***Time Frame***	***Priority***
B-1	Identify and Manage Old Growth Patches	Patches enclose allocated and existing old growth; approximately one patch per subwatershed (usually no more than 2 miles apart)	Maintain existing and manage for future old growth habitat; identify potential old growth habitat patches, generally larger than 400 acres. (smaller stands of old growth will exist outside the larger patches to meet HRV)	1000-6000 acres/SWS	100 years	High
B-2	Identify and Manage Connective Corridors	See B-1	Provide connective corridors to facilitate wildlife movement between old growth patches.		Ongoing	Moderate
B-3	Identify and Manage Big Game Cover Areas	Intermediate stand treatments will accelerate the development of cover of biophysical groups 1-4 (see B10-B12)	Provide cover to influence the distribution of elk across available habitat.	See B10-12	Ongoing	Moderate
B-4	OHV Management	Refer to Tri-Forest OHV Plan	Enhance wildlife security habitat	Watershed 86	5 years	High
B-5	Road obliteration	All Subwatersheds *Refer to specific roads in the Road Analysis section above.	Return un-needed road beds to productivity, and reduce motorized disturbance to wildlife	See specific roads in Roads Analysis Section	5 years	High

Table 5-7: Biological Dimension – Diversity, Old Growth, I&D						
Number	***Project***	***Location***	***Purpose***	***Acres***	***Time Frame***	***Priority***
B-6	Sign Old Growth Areas	Little Dark Canyon McCoy Pickle Frog Heaven Waucup 2,3 McClellan 1,2 Meadow Ck, 1,2, 3	Post signs to protect snags and old growth values from wood cutting.	12 MA 15 areas	5 years	Low
B-7	Reduce fuel loadings in Allocated Old Growth Areas	Little Dark Canyon McCoy Pickle Frog Heaven	Reduce the risk of wildfire in allocated SSLT old growth areas with high fuel loadings.	547 ac 324 ac 208 ac 121 ac	10 years	Moderate
B-8	Forage Enhancement Burning	All subwatersheds	Burn grassland and dry plant communities to enhance forage and grass cover for big game and nesting birds.	14,096 ac (biophysical group G6-9) nonforested =23,980 ac TOTAL=62,056	10% per year by sws	Moderate

Table 5-8: Biological Dimension – Diversity, Old Growth, I&D						
Number	***Project***	***Location***	***Purpose***	***Acres***	***Time Frame***	***Priority***
B-9	Reduce stocking levels in overstocked stands	86A: 2,240 ac. 86B: 4,680 ac. 86C: 3,215 ac. 86D: 4,885 ac. 86E: 2,340 ac. 86F: 4,500 ac. 86G: 3,815 ac. 86H: 6,460 ac. 86I: 3,700 ac. 86J: 3,660 ac.	Thinning to reduce densities in overstocked stands to promote stand growth and vigor.	39,490ac	32% per decade	High Silv-1
B-10	Promote development of LOS	All Subwatersheds	Thin from below to increase growth to facilitate development of late and old structure (LOS) across the landscape to meet HRVs.	24,900ac (included in 39,490 total above)	50% of U.R. per decade (12,460ac)	High Silv-2
B-11	Remove Insect and Disease Damaged Trees	All Subwatersheds	Remove insect or diseased trees in severely damaged stands at or below recommended stocking levels.	Estimated to be 20% of the total acres listed above	2,492 acres of the total 12,460 acres.	Moderate Silv-3
B-12	Precommercial Thinning	All Subwatersheds	Thinning of stem exclusion closed canopy stands to promote vigor and growth.	17,000 ac	Within next 20 yrs.	Moderate Silv-4
B-13	Stocking and Plantation Protection	All Subwatersheds	Ensure disturbed areas are adequately stocked and plantations are protected.	2,640 acres currently	Within next 5 years	Low Silv-5

THE BIOLOGICAL DIMENSION

Table 5-9: Biological Dimension – Fire & Fuels

Number	***Project***	***Location***	***Purpose***	***Acres***	***Time Frame***	***Priority***
B-14	Reduction of High Fire Risks	86C: 1,040 ac. 86H: 2,832 ac. 86J: 2,102 ac	Reduce fuel loadings using mechanical and prescribed fire in areas identified as having a high fire risk.	90-100% of these acres will receive a mechanical pretreat. Burning will be limited to 10% of the available forage/ year within the watershed.	Within 10 years on a rotation basis	High Fire-1 Hi to Lo= 86J, H, C
B-15	Reduction of Moderate Fire Risks	86A: 940 ac. 86B: 2.250 ac. 86C: 5,840 ac. 86D: 2,800 ac. 86E: 1,015 ac. 86F: 2,520 ac. 86G: 1,405 ac. 86H: 10,755 ac. 86I: 2,045 ac. 86J: 5,760 ac.	Reduce fuel loadings using mechanical and prescribed fire in areas identified as having a moderate fire risk.	15% of these acres will receive a mechanical pretreat. Burning will be limited to 10% of the available forage/ year within the watershed.	Within 10 years on a rotation basis	High Fire-2 Hi to Lo= 86J,H,C,F,D, I,B,E,A,G

Table 5-10: Biological Dimension – Fire & Fuels						
Number	***Project***	***Location***	***Purpose***	***Acres***	***Time Frame***	***Priority***
B-16	Reduction of Low Fire Risks	86A: 3,735 ac. 86B: 7,670 ac. 86C: 95 ac. 86D: 7,835 ac. 86E: 3,695 ac. 86F: 6,155 ac. 86G: 6,185 ac. 86H: 65 ac. 86I: 5,990 ac. 86J: 70 ac.	Reduce fuel loadings using mechanical and prescribed fire in areas identified as having a low fire risk.	15% of these acres will receive a mechanical pretreat. Burning will be limited to 10% of the available forage/ year within the watershed.	Within 10 years on a rotation basis	Low Fire-4 Hi to Lo= 86J,H,C,F,D, I,B,E,A,G
B-17	Reintroduction of Fire in High Departure Areas	86A: 1,355 ac. 86B: 2,210 ac. 86C: 1,825 ac. 86D: 1,980 ac. 86E: 1,060 ac. 86F: 1,995 ac. 86G: 2,630 ac. 86H: 3,350 ac. 86I: 516 ac. 86J: 865 ac.	Return fire to areas in Fire Regimes 1 and 3 (hot/warm dry sites) to restore fire as a disturbance, reduce fuel loadings, and manage for historic species mixes and structures.	15% of these acres will receive a mechanical pretreat. Burning will be limited to 10% of the available forage/ year within the watershed.	Within 10 years on a rotation basis	High Fire-3 Hi to Lo= 86H,G,B,D,F C,A,E,J,I
B-18	Reintroduction of Fire in Moderate Departure Areas	86B: 390 ac. 86C: 190 ac. 86D: 95 ac. 86F: 50 ac.. 86H: 140 ac. 86I: 35 ac. 86J: 10 ac.	Return fire to areas in Fire Regime 4 (cool/moist sites) to restore fire as a disturbance, reduce fuel loadings, and manage for historic species mixes and structures.	15% of these acres will receive a mechanical pretreat. Burning will be limited to 10% of the available forage/ year within the watershed.	Within 10 years on a rotation basis	Low Fire-5 Hi to Lo= 86H,G,B,D,F C,A,E,J,I

THE BIOLOGICAL DIMENSION

RANGE and NOXIOUS WEEDS

Table 5-11: Biological Dimension – Range & Noxious Weeds

Number	***Project***	***Location***	***Purpose***	***Acres***	***Time Frame***	***Priority***
B-19	Treatment of Leafy Spurge, Musk Thistle, Diffuse Knapweed, White Top Noxious Weed Sites	1. T4S, R34E, S13 2. T4S, R34E, S12 3. T4S, R35E, S7 4. T4S, R34E, S11-12 5. T4S, R35E, S8,17-18 6. T2S, R35E, S14 7. T3S, R35E,S14 8. T3S, R36E, S13 9. T3S, R35E, S14 10. T3S, R35E, S9 11. T2S, R34E, S34 12. T3S, R34E, S2-4 13. T3S, R34E, S7-8 14. T3S, R35E, S7 15. T4S, R34E, S19 16. T4S, R34E, S19 17. T3S, R34E, S35 18. T3S, R33.5E, S24 19. T3S, R33.5E, S24 20. T3S, R33E, S14	Appropriately treat populations of the identified noxious weed species to eventually eradicate these species from this area.	1. .25 2. .25 3. .10 4. 3 5. 1 6. 0 7. .25 8. .25 9. .10 10. .10 11. .25 12. .10 13. .50 14. .10 15. .10 16. 0 17. .10 18. 2 19. .10 20. .10	Within a 5 year period (2006)	High
B-20	Treatment of Canada Thistle and Bull Thistle	T3S, R33E T4S, R35E, S20 T4-5S, R35E, S36,1 T4S, R33.5E, S19 T3S, R33E, S12 T3S, R33E, S12	Appropriately treat populations of the identified noxious weed species to eventually eradicate these species from this area.	1. 1 2. .50 3. 2 4. 2 5. .50 6. .50	Within a 5 year period (2006)	Moderate

Table 5-12: Biological Dimension – Range & Noxious Weeds						
Number	***Project***	***Location***	***Purpose***	***Acres***	***Time Frame***	***Priority***
B-21	Monitoring of Tansy Ragwort Sites	T5S, R35E, S6 T3S, R34E, S34	These areas were treated previously. Annual effectivenes monitoring is needed to ensure treatment success and minimize potential for regrowth.		Yearly for 5 years	Low
B-22	Bear Creek/Little Bear Creek LWM Placement	SWS 86G Starkey Allotment	Placement of large woody material along stock trails and riparian areas to protect streambanks and increase riparian complexity.	Bear Creek = 4mi. L.Bear Crk= 2mi.	Within 5 years (2007)	Moderate
B-23	Bear Creek/Little Bear Creek Off-site Water Development	SWS 86G Starkey Allotment	Develop additional off-site water sites to provide for better livestock distribution and utilization.	Bear Creek = 4mi. L.Bear Crk= 2mi.	Within 5 years (2007)	Moderate
B-24	Campbell Creek Riparian Exclosure and Water Development	SWS 86A Starkey Allotment	Reconstruct Campbell Creek riparian exclosure and redevelop the Campbell water development to better protect the stream.	¾ mile Campbell Creek	Within 5 years (2007)	Moderate
B-25	Upper Dark Canyon LWM Placement	SWS 86B Dark Ensign Allotment	Development of stock trails, placement of LWM, construct additional off-site water developments, change salting locations to better manage livestock use.	1.5 miles of Dark Canyon Creek	Within 5 years (2007)	Moderate

Table 5-13: Biological Dimension – Range & Noxious Weeds						
Number	***Project***	***Location***	***Purpose***	***Acres***	***Time Frame***	***Priority***
B-26	Antler Springs LWM Placement	SWS 86B Dark Ensign Allotment	Placement of additional LWM and repositioning of existing LWM to prevent livestock from trailing adjacent to the stream.	½ Mile	Within 5 years (2007)	Moderate
B-27	E. Fk. Burnt Corral Spring Development	SWS 86F Tin Trough Allotment	Placement of LWM, construct additional off-site water developments to better manage livestock use.	½ Mile	Within 5 years (2007)	Moderate

Table 5-14:						
Number	***Project***	***Location***	***Purpose***	***Acres***	***Time Frame***	***Priority***

CHAPTER VI

LANDSCAPE SCALE MONITORING WORKPLAN

A. INTRODUCTION:

This workplan is being proposed as a work-tool methodology to determine what landscape scale monitoring will be recommended by a watershed analysis team for inclusion in a specific watershed analysis report. Upon completion, a workplan for a watershed will provide the basic text and data to complete the watershed analysis report chapter that covers landscape scale monitoring.

Background

Federal agencies have a mandate to monitor environmental change, including monitoring to ascertain whether or not State water quality standards are being met. Appropriate monitoring parameters and locations vary according to the type of site, the type of land use, the type of concerns, and the type of impact mechanisms active in the area. To provide useful results, monitoring plans must be tailored for the particular setting in which they are to be carried out.

Watershed Analysis provides the information needed to design appropriate monitoring strategies. In addition, the process of Watershed Analysis will reveal types of data that would be useful for better understanding watershed processes, ecosystems, and impacts in the area.

Monitoring allows us to make decisions based on site specific information. Also, monitoring results will provide information for updates and revisions to both watershed analysis, and project planning and design. With a smaller federal work force, successful monitoring will depend on a cooperative efforts by research stations, universities, other agencies, community groups and volunteers.

Appropriate monitoring variables are those that are likely to change significantly and quickly if the impacts of concern are occurring. Similarly, monitoring location should be chosen that are likely to show significant changes early on. Both the processes driving the change and the response of the resource of concern can be monitored, but the driving processes will exhibit the least lag and so provide the greatest warning of impending impacts. By the time channel morphology changes at a sensitive site, for example, the processes that caused the change are usually too far advanced to do anything about. However, an understanding of process mechanisms is required if appropriate driving processes are to be singled out for monitoring.

Appropriate monitoring parameters and locations are best described for different management related monitoring goals. In addition, the basic data needs for understanding watershed processes and ecosystems are prioritized and their applications described. Research needs may be identified in this section.

B. FOREST LAND MANAGEMENT PLAN MONITORING

To avoid overlap and duplication of effort, and to assure that different monitoring programs are coordinated and compliment each other, it is important that Forest Plan Monitoring is reviewed before Watershed Analysis Teams recommend landscape scale monitoring proposals.

The following table identifies some of the measurements that are already identified for collection in Forest Plan Monitoring Plans in the Blue Mountain area.

Table 6-1: MONITORING MEASUREMENTS ADDRESSED (in one or more of the Forest Plan Monitoring Plans)	
DFC Ecological Elements	***Monitoring Elements***
Air Quality	Air quality in level one air sheds, amount of fuels consumed by prescribed fire, total emissions from prescribed fire, meeting regional S&Gs for smoke emissions, meeting the state smoke management plan.
Water Quality	Are S&Gs and BMPs implemented? Are they effective in meeting water quality objectives, trend in water quality, and cumulative effects of management activities and natural events?
Hydrology	Effects of management on peak flows, low flows and timing of flow if channel forming processes are operating to result in DFC for fish habitat.
Fish/Aquatic Systems	See water quality. If meeting habitat improvement objectives, if fish habitat capability is improving, if fish productivity is improving, are relationships between habitat parameters and fish production as predicted.
Geomorphic Processes	no measurements identified
Fire/Fuels Regime/Risks	Area where fire has been re-introduced, area burned by wildfire, area of high intensity burn, ecological effects of prescribed fire, consideration of use of prescribed fire to meet management objectives.
Corridors	Amount and changes in Wilderness, Wild and Scenic River system, RNAs, Botanical Areas, old-growth allocations, and back country allocations. If Visual Quality Objectives (and associated large tree habitat in Fg) are met.
Travel Linkages	As above for corridors, amount and condition of riparian areas.
TES Viability	Identification and protection of identified and potential habitat for the bald eagle, peregrine falcon and MacFarlanes 4 o-clock. Identification of habitat, habitat protection needs, for sensitive species, adequacy of the protection measures to prevent listing of a species.
Fragmentation	Amount, size and spacing of old-growth, rate of conversion of non-allocated old-growth, harvest unit size and dispersal, maintenance of natural edge during timber management.
Habitat Relations	Habitat use by MIS, population baseline and trends for MIS, biological validity of the elk HEI model, habitat relationships between fish and fish habitat parameters.
Nutrient Cycling Longterm Soil Productivity	Are we meeting soil protection guidelines? Are the guidelines effective in meeting productivity goals? the level of accelerated erosion due to burns, erosion rates.
Grazing Regime	Forage utilization, primary and secondary condition and trend, Riparian condition and trend.
Insect Disease & Noxious Weeds	Effectiveness of Integrated Pest Management, current status of insect and disease, loss due to insect and disease, noxious weed locations, population levels and trends of noxious weeds, level of success for noxious weed eradication projects.

Table 6-1: MONITORING MEASUREMENTS ADDRESSED (Continued)	
DFC Ecological Elements	***Succession Community Structure/Composition***
Forest	old-growth area, quality, size and spacing, replacement old growth location and trend, area affected by timber sales by species group, management area and harvest type, area thinned or otherwise meeting stocking criteria, size and dispersal of harvest units, range and average size of harvest units, area of natural and planted reforestation, area reforested with superior genetic stock, area forested with pine, stocking levels and time frames for reforestation, lands suitable for timber production, area meeting VQOs (and associated habitat for Fg), amount size and spacing of elk cover, level of protection of elk calving areas, and probably some measurement of forest structure for snow melt modeling.
Riparian	Riparian vegetation condition and trend, channel health, shade
Range	Primary and secondary range condition and trend, forage utilization, riparian vegetation condition and trend, forage condition for elk habitat, forage use on elk winter range.
Other	Snag habitat levels, dead down tree habitat levels, mix of deterioration classes for dead tree habitat, snag habitat replacement tree levels, level of protection of unique habitat, location of raptor nest sites, protection and improvement of habitat for raptors.

The following table shows the appropriate scale of analysis for these various monitoring items:

Table 6-2: SCALE OF ANALYSIS						
Ecologically Sustainable Conditions	***Physio. Region***	***Physio. Zone***	***River Basin***	***SWS***	***Stand/ Reach***	***Individ.***
Air Quality	**X**	**X**	**X**	**X**	**X**	
Water Quality	**X**	**X**	**X**	**X**	**X**	
Hydrology	**X**	**X**	**X**	**X**	**X**	
Fish/Aquatic Systems	**X**	**X**	**X**	**X**	**X**	**X**
Geomorphic Processes	**X**	**X**	**X**	**X**	**X**	
Fire/Fuels-Regime/Risks	**X**	**X**	**X**	**X**	**X**	
Corridors	**X**	**X**	**X**	**X**	**X**	
Travel Linkages						
TES Viability	**X**	**X**	**X**	**X**	**X**	**X**
Fragment.	**X**	**X**	**X**	**X**		
Habitat Relations	**X**	**X**	**X**	**X**	**X**	
Nutrient Cycling/ Longterm Soil Product		**X**	**X**	**X**	**X**	**X**
Grazing Regime		**X**	**X**	**X**		
Succession Community Structure/Composition		**X**	**X**	**X**	**X**	

The Wallowa-Whitman Forest Land Management Plan provides overall guidance for implementation and monitoring of the Plan itself and for individual projects designed to accomplish Plan goals. Those goals and the Monitoring Plan are organized around various management areas that are distributed across the Forest.

Forest Plan Monitoring covers a total of 47 monitoring items. Types of monitoring include IMPLEMENTATION, EFFECTIVENESS, AND VALIDATION.

Monitoring items that include only IMPLEMENTATION type monitoring are:
Precommercial Thinning, Suitable Lands Verification, Range Outputs, Allotment Management Planning, Budget,

Monitoring items that include only EFFECTIVENESS type monitoring are:
Insect and Disease Control, Harvest Units, Sensitive Species, Minerals, Wilderness, Wild and Scenic Rivers, ORV Use,

Monitoring items that include only VALIDATION type monitoring are: Costs and Values, Community Effects, Adjacent Lands.

Monitoring items that include both IMPLEMENTATION AND EFFECTIVENESS type monitoring are: Compliance with NEPA, Timber Offered for Sale, Reforestation, Transportation System, Range Vegetation Conditions, Range Improvements, Noxious Weeds, McFarlane's Four O'Clock, Visual Resource Objectives, Cultural and Historic Site Protection, Rehabilitation, and Interpretation.

Monitoring items that include both IMPLEMENTATION AND VALIDATION monitoring are: Timber Harvest

Monitoring items that include both EFFECTIVENESS AND VALIDATION type monitoring are: Forage Utilization, Watershed Management Standards and Guidelines, Riparian Area Cumulative Effects, Low Flows/Peak Flows, Soil Productivity, Dead and Defective Tree Habitat and Primary Cavity Excavators, Pileated Woodpecker, Goshawk Populations, Pine Marten Populations, Recreation Setting.

Monitoring items that include all three types (IMPLEMENTATION, EFFECTIVENESS AND VALIDATION) are: Old Growth, Elk Habitat, Bald Eagles, Peregrine Falcons, Fisheries,

C. COORDINATED MONITORING FOR ECOSYSTEM SUSTAINABILITY

The Blue Mountain Forest Planners group began efforts in 1992 to initiate a coordinated monitoring approach for ecosystem sustainability in the Blue Mountains. The following table shows the scale of analysis planned for 10 units of ecologically sustainable conditions:

ESC - Ecologically Sustainable Conditions

Table 6-3: SCALE OF ANALYSIS							
Ecologically Sustainable Conditions	***Physio. Region***	***Physio. Zone***	***River Basin***	***Watershed***	***SWS***	***Stand/ Reach***	***Individ.***
Air:							
TSP (tons)	**X**	**X**	**X**	**X**			
Class I Violations (days)	**X**	**X**	**X**	**X**			
Water		**X**	**X**	**X**	**X**	**X**	
Hydrology	**X**	**X**	**X**	**X**	**X**	**X**	
Fish/Aquatic		**X**	**X**	**X**	**X**	**X**	
Geomorphic		**X**	**X**	**X**	**X**		
Fire/Fuels:							
Fire Regime		**X**	**X**	**X**	**X**		
Wildfire Risks (acres)		**X**	**X**	**X**	**X**	**X**	
Standing Dead and Down (tons)		**X**	**X**	**X**	**X**	**X**	
Habitat:							
Wildlife (acres)	**X**	**X**	**X**	**X**	**X**	**X**	
Connective (miles)	**X**	**X**	**X**	**X**	**X**		
TES (acres)	**X**	**X**	**X**	**X**	**X**		
Fragmentation (miles)	**X**	**X**	**X**	**X**	**X**		
Soil Productivity:							
Soil Erosion (tons/ac)		**X**	**X**	**X**	**X**	**X**	
Compaction (acres)		**X**	**X**	**X**	**X**	**X**	
Displacement (tons/acre)		**X**	**X**	**X**	**X**	**X**	
Range Condition:							
Trends (acres)		**X**	**X**	**X**	**X**		
Utilization Levels (acres)		**X**	**X**	**X**	**X**	**X**	
Plant Community:							
Forested:							
Late Seral Park (acres)		**X**	**X**	**X**	**X**	**X**	
Structure		**X**	**X**	**X**	**X**	**X**	
Compostion (species)		**X**	**X**	**X**	**X**	**X**	
Succession (acres)		**X**	**X**	**X**	**X**		
Stand size (acres)		**X**	**X**	**X**	**X**	**X**	
Nonforested:							

It is important the note that when monitoring occurs over a broad range of analysis scales the index base line often changes. For example, see the following table to see how an index baseline "natural range of variability" changes at the various analysis scales:

T

BROAD-TO-NARROW GEOGRAPHIC SCALE	LIMITING FACTORS AFFECTING CAPABILITY	NATURAL RANGE OF VARIABILITY (acres)
Mixed Physiographic Zone (3,000,000 acres)	1) 70% of acres are within the fir climax forest and can support old growth. 2) natural fire frequencies burn and set-back acres. 3) 400,000 acres are currently in old growth condition (13%)	**30%+/-2%**
Middle Fk John Day Basin (300,000 acres)	1) 80% of acres are within the fir climax forest and can support old growth. 2) randomness of fire events becomes more pronounced at this smaller scale. 3) 60,000 acres are currently in old growth condition (20%)	**20 - 40%**
Lower Camp Creek subwatershed (12,862 acres)	1) 90% of acres are within the fir climax forest and can support old growth in this densely-forested area. 2) fire patterns become more pronounced, as landscape becomes more variable w/in subwatershed, given same event probabilities. 3) 2,500 acres are currently in old growth condition (25%)	**10 - 70%**
Old Growth unit #212 (304 acres)	1) Ponderosa pine is late seral condition on fir climax site. 2) With fire exclusion, stand will become less open over time, and eventually cease to be park-like in appearance. 3) Stand is currently in old growth condition, hence 304 acres meet old growth (100%)	**0 - 100%**

D. WATERSHED SCALE MONITORING

Hopefully, the above displayed sections on Background Information, Forest Plan Monitoring, and Coordinated Monitoring for Ecosystem Sustainability provide a solid basis upon which to proceed into recommended monitoring at the landscape scale that will be included in the Watershed Analysis Report.

Monitoring in the Meadow Creek watershed should be focused on the main issues brought forth in the watershed analysis. Exact details of monitoring plans need to be tailored to the specific issues affected by a particular project or management direction. It is important that these monitoring plans for individual projects form an integrated group of actions that complement each other to make efficient use of limited monitoring resources (dollars and personnel). As additional projects are implemented and monitored, our collective understanding of processes and key conditions of ecological health should grow. It is also important, as well as as a major challenge, to devise strategies from some of the monitoring that address linkages among physical and biological entities, rather than single disciplines. Therefore, it is imperative that monitoring be an interdisciplinary team effort in development and execution.

Candidate Proposals for Watershed Scale Monitoring:

A review of the watershed analysis results indicates the following factors are relevant in designing a monitoring program for the Meadow Creek watershed:

1. **Resources and impacts of most concern** (draw from Issues, Key Questions, and Relevant Processes listed in Chapter II, also check against Human Uses and Values in Chapter I):

2. **Conditions most susceptible to environmental change** (draw from Chapters III and IV that discuss Past and Current Conditions and Conditions Trends):

3. **Types of changes likely to occur** (draw from Chapters III and IV that discuss Past and Current Conditions and Conditions Trends):

4. **Locations most susceptible to environmental change** (draw from Analysis Maps, Data Tables, and Chapters III and IV that discuss Past and Current Conditions and Conditions Trends):

5. Driving variables or indicators most closely associated with the changes of concern, sorted by costs, time frames for response, and reliability of monitoring each variable or indicator.

6.**Data needs for better understanding processes and ecosystems in the watershed** (draw from Data Gaps summarized in the Appendix):

Prioritization:

Prioritize the above candidate monitoring proposals by a Risk or Cost of Error analysis:

RISK X ENVIRONMENTAL COST OF RISK = RATING VALUE

OR,

LEVEL OF ASSUMPTION X ENVIRONMENTAL COST IF ASSUMPTION IS WRONG = RATING

Cost of error may be biological, economic or political and will be rated 1,2, or 3. Likelihood of error may be related to level of knowledge of the resource, pressure on the resource, or amount of resource available and will be rated 1,2, or 3. The highest possible rating value of 9 would be be given a rating of HIGH.

Tentative Recommendation of Items for Watershed Scale Monitoring:

Based on the above prioritization, recommend what rating values and associated candidate monitoring proposals should tentatively occur in the watershed.

E. SCREENING OF RECOMMENDATIONS BY FOREST PLAN MONITORING COORDINATOR:

Monitoring Questions:

If any of the Tentative Recommendations turn out to be EFFECTIVENESS or VALIDATION type monitoring items, first check with the Forest Plan Monitoring Coordinator to see if the recommendations fit into the overall monitoring plans that are coordinated at the Forest and Regional levels, respectively. After this check is a made, list the monitoring items that are included in the final coordinated recommendation:

For each final recommended monitoring item, answer the following monitoring questions:

1. What is the management objective?

2. What is the Ecological Model? (identify assumptions versus data/facts)

3. What is the Monitoring Objective?

4. What is the Sample Design?

Location:

Frequency:

Project
Duration:

5. What is the Variability Threshold?

Limits of Watershed Analysis Monitoring Recommendations:

Since Watershed Analysis is a non-decisional process, the monitoring recommendations will not be fully developed beyond the information provided above. Once a Line Officer decides to follow the recommendations, and move into implementation, there will be a few more monitoring planning items his/her staff will need to develop. The followup should include:

Data Collection Methods:
- Methods
- References
- Limitations and Assumptions (State Hypothesis to be Tested)
- Data Forms Needed
- Personnel Needed
- Collection Time
- Equipment Needed
- Costs

Data Management and Analysis:
- Data Documentation and Reduction
- Data Analysis (Tie to Goals)
- Report Format and Schedule

The following table summarizes the monitoring that would provide information on the condition, maintenance, or recovery of issue topics associated with the watershed. Completed copies of this table will also be set up in a PARADOX database program so the various Wallowa-Whitman watersheds can be sorted and queried to make Forest-wide summaries of proposed monitoring actions.

Issue	***Topic***	***Monitoring Project***	***Monitoring Type***	***Priority Ranking***	***Hi Priority Locations***	***Monitoring Results Utilization Level***

Table with Example Data

Issue	***Topic***	***Monitoring Project***	***Monitoring Type***	***Priority Ranking***	***Hi Priority Locations***	***Monitoring Results Utilization Level***
Vegetation Health	Structural Stage Percentage Compared to HRV	Veg structure stage acres by Plant Association	Implementation	1	Entire Watershed	Project and Provincial
Water Quality	Warm water temperatures	Guaging Station with temperature measurement equipment	Effectiveness	2	Mouth of China Creek	Project and Forest Plan
Wildlife Habitat	Habitat Effectiveness Index	HEI Model Validation	Validation	3	SWS 83B	Forest Plan and Regional

Fire/Fuels – specific monitoring requirements.

LEVEL I IMPLEMENTATION MONITORING

Implementation monitoring collects information to determine if plans, projects, prescriptions, and activities are completed as designed. The basic question to be answered is, "Is the plan being implemented as intended?"

The following form will be included in each burn plan and is to be completed for every burn. It is intened that the form will be completed on the burn day. The Burn Boss, or other qualified representative, will use the form to record site conditions, effects, and observations that can help in determining if the correct prescription was assigned. It is intended to be be a written record that can be referenced at a later date, and as supplemental information during Level II and III monitoring. This level of monitoring responds to the prescribed fire documentation requirements for post-burn evaluations found in the Wildland and Prescribed Fire Management Policy Reference Guide (pg.70). The level of primary responsibility is the Prescribed Fire Manager/FMO.

Prescribed Burning Monitoring Report Form

Date: ____________________ **Unit Acres:** ____________________
Start Time: ____________________ **Unit Name / Number:** ____________________
End Time: ____________________ **Burn Boss:** ____________________
Acres Completed: ____________________ **Ignition Method:** ____________________

1. Burn Day Conditions

A. RH min ______ max ______
B. Temp min ______ max ______
C. Wind Direction ______ Avg speed ______

D. Spot Weather Forecast Satisfactory? Y / N (circle one)

If not, why? ____________________

____

____

2. Fire Behavior / Intensity

(Discuss flame length, intensity, torching, areas of interest or concern, objectives)

____

____

____

3. Smoke Dispersal

A. Direction ______
B. Height ______

C. Comments: ____________________

____

____

4. **Fire Effects; Results**

(Describe burn day objectives and results, may include stand mortality, consumption, anticipated results, unit specific objectives, etc.)

LEVEL II. EFFECTIVENESS MONITORING

Effectiveness monitoring collects the information to determine if plans, projects, prescriptions, and activities are effective in meeting the intent of the management direction. The basic question to be answered is, "Are the onsite results within the range of desired and predicted outcomes. A review of the planning documents (NEPA, and any related documentation), and implementation document (Burn Plan) would be done to review the intended objectives". Did the project accomplish the set goals were the identified parameters satisfactory in meeting the landscape goals.

The monitoring process for the Fire Zones on the Wallowa Whitman National Forest are to:

1. Annually visit a sample of the units from previous years burn projects with the line officer, ID team members, or specialists (minimum level is 2 burn projects - 1 spring, 1 fall). The object of these reviews are to see if the objectives in the EA's, and burn plans were met and to tie together the Level I and Level II monitoring. These burns should be selected by the Ranger and staff and provide the opportunity to review any of the following critical issues - RCA's, improvements, private land coordination/cooperation, habitat, scenic integrity, or other significant issues related to hazard fuel reduction. During these site visits it may be appropriate to look immeditately outside the burn block, if it provides a good preburn surrogate for the treated area, so that a better understanding of the area is possible. .

2. Older burns, three or more years past the implementation year, should be considered for review so that delayed ecological responses can be observed. This should provide a wider range of age classes in which to evaluate the burning program on a temporal scale.

3. Document and compile results of Level I & II monitoring to see what issues are created from burning, if objectives and mitigations were met, if changes need to be made in the program, and to develop out year monitoring locations.

4. The level of primary responsibility is the District Ranger.

LEVEL III. VALIDATION MONITORING

Validation monitoring collects the information to determine whether initial data and assumptions are correct or if there is a better way to meet regulations or objectives. The basic question to be answered is, "Are the results resolving planning issues, concerns, and opportunities?"

Three percent of the prescribed burning acres on the Wallowa Whitman National Forest will be monitored each year. These units will be inventoried prior to burning and again two weeks after burning. Additionally, these same units will be inventoried once again at one, three, and five year intervals. The same individuals that conduct the pre-burn inventories should be used to do the initial post-burn survey which is to be accomplished within two weeks of the burn.

The level of primary responsibility is the Forest Supervisor.

PLOT ESTABLISHMENT AND MEASUREMENT

This monitoring is done on a sample basis. One or more permanent plots are established in each predominant vegetation type within the project area. The plot center is marked by a steel post with a reference tag Attached. One or more trees are tagged with reference tags indicating the direction and distance to the plot center. The plot locations can also be recorded using a Global Position system (GPS) device to aid in relocation. Each monitoring plot has 5 permanent photo plot (PP) points (see item #5 below). The PP's are located at the plot center and radiate in the following cardinal directions (0, 90, 180, 270 degrees) at 37.2 feet from plot center (1/10 acre). Each of the four quadrant PP's are marked with painted rod iron.

The following information is collected from each monitoring plot location: Read entire instructions prior to establishing a plot if unfamilar with the process.

1. Fixed plot information will include: slope, aspect, elevation, fuel loading, duff depth, fuel height, mineral soil, number of seedling to 4.9 inch DBH trees, and photos

2. Two fuel transects are performed at 0 and 90 degrees from plot center. Planar Intercept or photo series may be used for fuel loading, duff depth, and fuel height. Planar Intercept measures fuel loading by size class as well as fuel bed depth, and duff depth. Photo series measurements compare a set of compiled fuels photos and their accompanying fuel profiles with the observed conditions at the site, estimates of fuel loading and depths are generated. Representative fuel profiles may be pulled from different photo sets to assess the Fuel sizes to be measured are 0-.24, .25-.99, 1-2.99, 3-8.99, 9-20, and 20 inch plus.

3. Seedling to 4.9 inch DBH trees: measure the fixed radius plot (37.2 feet) and record the sample trees 5 inches or less. Begin at 0 degrees and proceed with the talley in a clockwise direction. Tree species and size will be recorded for live and dead trees within the plot. Trees may be tagged with metal tags to help identify post burn mortality.

4. A meter square vegetation plot is established at each plot center location. <u>This needs to be done as an initial step in plot establishment to avoid any vegetation disturbance as the complete plot is laid out and information gathered.</u> These meter square plots will photographed before implementation and there after at each monitoring interval.
   ?
5. General area photos are taken of each photo point. Each quadrant photograph (0, 90, 180, 270 degrees) is taken from plot center with a meter stick at the end of the 37.2 transcect as the focal point. Center the meter pole in the image. Another photo is taken of the meter square vegetation plot which will be located along the 270/90 degree plot line with the 0 degree line bisecting the middle of the meter plot (see figure 1 for illustration of the vegetation plot location).

6. A few selected monitoring plots may be photographed as the fire is passing. This information can be used to correlate fire behavior with effects as well as environmental conditions.

7. Comments should be made on anything else that may be of interest within the plot.

8. Variable radius plot information will be gathered from the plot center using a 10 BAF prism. Record tree class, species, DBH, live or dead of all 5 inch and greater DBH trees and tag them with metal tags and identification numbers. Start from 0 degrees and move clockwise.

Most of the information collected from these surveys can be entered into Super Stand a PC based software program that is available on most districts. This program can then calculate many different items including trees per acre and statistical summaries as to the accuracy of the samples taken.

The same information and plots would be used for the two week post burn, 1, 3, and 5 year monitoring surveys.

Silviculture – specific monitoring requirements

The following monitoring needs are recommended for the Meadow Creek Watershed specific to the silvicultural and structural DFCs within the watershed.

1. Ongoing stocking surveys to ensure adequate stocking is maintained. Plantation protection measures, if needed, will be determined from these regularly scheduled surveys.
2. Continued updating of stand structure information into the District Vegetation Data base. This likely to be done by ongoing stand diagnosis and stand exams (funding dependent).
3. Monitoring of insect and disease conditions via annual Insect and Disease Condition aerial reconnaissance. Evaluation by District Silviculturist and Zone Entomologist and Zone Pathologist.
4. Continued Post Treatment Monitoring of Harvest units and precommercial thinning to ensure objectives were attained.

Fisheries and Watershed – specific monitoring requirements

This plan addresses monitoring for water quality and listed fish habitat in the Meadow Creek Watershed. In addition to monitoring fish habitat conditions and trends, a number of short-term monitoring items will occur, which will aid monitoring in Meadow Creek Watershed such as site-specific monitoring related to individual projects, Forest Plan monitoring as amended or modified by PACFISH, terms and conditions monitoring in biological opinions, and site-specific monitoring now being conducted on active and ongoing projects.

I. PURPOSE

Monitoring and research are an integral component to successful implementation of a restoration effort for listed fish species. They provide the feedback loop necessary to carry out adaptive management and a means of determining rates of recovery. Monitoring provides the mechanism to evaluate whether activities are meeting objectives. Monitoring provides the basic information needed to adjust future activities if objectives are not being met, or improving trends cannot be shown. Monitoring also provides a mechanism for gaining scientific knowledge of physical processes and biological functions.

The purpose of this monitoring plan is to:

1. Inventory existing conditions of riparian and instream habitat, water quality and salmonid populations in the Meadow Creek Watershed;

2. Compare existing conditions with the set of habitat, water quality and landscape variables described in the Matrix of Pathways and Indicators; and

3. Determine if management activities are resulting in a trend toward pathways and indicators (Desired Future Conditions), meeting Desired Future Conditions (DFC's), or are not successful in moving toward DFC's. In addition, determine the rate of change occurring from implementation of management activities.

II. OBJECTIVES

This monitoring plan has four objectives related to the recovery of freshwater habitat for spring chinook salmon, summer steelhead, and redband trout.

The objectives are to:

1. Document existing conditions for fish habitat and water quality parameters. Existing conditions will determine the baseline conditions for DFC assessment and recovery efforts for the Meadow Creek Watershed.

2. Assess the baseline condition against DFC values to determine needed protection, mitigation and conservation measures. This assessment will also set trend analysis points for monitoring improving trends toward DFC's.

3. Relate water quantity and fish habitat parameters to the future recovery plans for both listed fish species (spring/summer chinook salmon and summer steelhead); and

4. Develop technology transfer opportunities ties for utilization of monitoring results by other Columbia River Basin and Snake River Basin administrative units.

III. METHODS AND DISCUSSION

Methods utilized in this monitoring plan are presented below. Each section describes the methodology and equipment to be used for measurement of each parameter (including references where appropriate), and a discussion presenting the rationale associated with each monitoring effort.

A. Water Quality and Quantity

1. Stream Flow

Streamflow (discharge) is the basic mechanism by which stream channels are formed and maintained. It is also the mechanism used to determine the capacity of a stream to carry sediment, maintain cool temperatures, sort substrate, and form fish and related aquatic habitats. Runoff patterns vary by regional and climatic descriptors such as vegetation, storm events, snow pack, geology, and seasonal climatic conditions (drought). Runoff patterns also influence migration patterns of anadromous salmonid adults and smolts (Bjornn and Reiser 1991).

Many management activities affect the natural streamflow response from a watershed. For example, timber harvests can alter the rate that water, in the form of snowmelt or rainfall, moves from side slopes to channels (Chamberlin et al. 1991). Impacts of this alteration can include changes in the magnitude and timing of streamflow. Activities related to timber harvest (i.e. road building, yarding and burning) can also alter the water balance. The resulting effect varies with the severity of the management action and the ecosystem involved (Chamberlin et al. 1991). Therefore, monitoring streamflow is an important component of a comprehensive monitoring plan.

Gauging stations are established at two sites to provide a continuous record of surface water elevations. These stations were installed in 1992 by the U. S. Forest Service (USFS) in the Meadow Creek Watershed at lower Meadow Creek at the mouth and on Upper Meadow Creek above Bear Creek (see Table 1). The stations are Sutron Accubar Nitrogen Gauge Pressure Sensor gauges housed in a 48 inch corrugated metal pipe on the streambank.

The base data collected at these stations consists of records of stage and measurements of discharge. Observation of factors affecting the stage-discharge relationship, weather records, and other information are used to supplement base data that determine daily discharge. Measurements of discharge are made with a current meter using standard methods (Stednick 1991).

These stations are being monitored and the record developed by the Union County Water Master with cooperation and funding provided by the USFS, Bureau of Reclamation (BOR), and Grande Ronde Model Watershed Program. The record is developed using United States Geological Survey (USGS) specifications based on the period of October 1 to September 30 (Water Year). The gauging stations have low maintenance requirements and have the advantage of continuous recording so individual storm runoff events can be gauged.

In addition, one permanent flow transect has been installed on Meadow Creek to provide streamflow data for the summer (June - September) (site 95, see Table 1). This station utilizes a UNIDATA 64K data logger (planned to be updated to 128K as funding becomes available) linked to a capacitive water depth probe (model 6621) that provides a continuous record of surface water elevation. Measurements of discharge are made with a current meter (Marsh-McBirney Model 201 D) using standard methods (Stednick 1991).

Permanent flow transects provide additional data during the summer months. The summer period include both low flows and summer rainstorm events. This data will be indexed to the gauging stations and will provide further information for streamflow analyses.

The gauging stations are permanent sites that are designed to continuously measure streamflow. The data will characterize the hydrograph for long-term monitoring of the potential effects of management activities on streamflow and the effectiveness of restoration activities directed at meeting DFC's. Streamflow data will be used to correlate monitoring parameters such as suspended sediment, temperature, smolt migration, and evaluate yearly variation in instream habitat parameters.

These data, in conjunction with historical records (period 1903-1959) of streamflow for the Grande Ronde River located at La Grande, Oregon (USGS gauge 13319000), and Catherine Creek will provide for long term, comprehensive characterization of streamflow for the Meadow Creek Watershed.

The following table displays the water quality and quantity monitoring sites for the Meadow Creek Watershed Monitoring Plan and the parameter(s) measured at each site. There are fourteen sites in all.

Meadow Creek Watershed Water Quality and Quantity Monitoring Sites

Site #	SWS	Location	Type of Site	Parameter(s)
12	86A	Meadow Creek near McIntyre Rd	Temperature Site	Stream Temperature (S)
89	86A	Lower Meadow Creek	Gauging Station Temperature Site Weather Station	Flow & Stage (Y) Stream Temperature (Y) Air Temperature, Relative Humidity & Solar Radiation (S)
10	86B	Dark Canyon Creek	Temperature Site	Stream Temperature (S)
11	86C	McCoy Creek	Temperature Site	Stream Temperature (S)
81	86D	McCoy Creek	Temperature Site	Stream Temperature (S)
13	86F	Burnt Corral Creek	Temperature Site	Stream Temperature (S)
46	86F	Burnt Corral Cr. @ 2444040 Rd	Temperature Site	Stream Temperature (S)
14	86G	Bear Creek	Temperature Site	Stream Temperature (S)
15	86H	Upper Meadow Creek	Gauging Station Temperature Site Weather Station	Flow & Stage (Y) Stream Temperature (Y) Air Temperature, Relative Humidity & Solar Radiation (S)
16	86H	Meadow Creek above smolt trap	Temperature Site	Stream Temperature (S)
85	86H	Meadow Creek	Rain Gauge Weather Station	Precipitation (S) Air Temperature, Relative Humidity& Solar Radiation (S)
51	86I	Waucup Creek @ 21 Rd	Temperature Site	Stream Temperature (S)
95	86I	Meadow Creek above 21 Rd	Flow Transect Temperature Site Weather Station	Flow & Stage (S) Stream Temperature (S) Air Temperature, Relative Humidity & Solar Radiation (S)
60	86J	Meadow Creek @ Waucup Creek	Temperature Site	Stream Temperature (S)

SWS = Subwatershed
(S) = Summer, June through October, measurements
(Y) = Year-round measurements

2. Stream Temperature

The primary effect of management activities on stream temperature is through removal or manipulation of streamside vegetation. Vegetation within the streamside zone provides a thermal insulating layer during extreme temperature periods in the summer and winter months. Instantaneous maximum stream temperatures and their duration are the main concern.

Deviations from natural stream temperature ranges can negatively affect salmonid survival (Meehen 1991). Stream temperatures regulate the behavior, metabolism, and mortality of fish. Temperatures above optimum can cause altered timing of migration, accelerated or retarded maturation, and disease outbreak in migrating and spawning fish. In addition, juvenile fish growth rates are reduced in stream temperature that exceed optimal, but are lower than lethal limits (Bjornn and Reiser 1991).

Stream temperature measuring equipment is designed to identify reaches where stream temperatures may be adversely affecting fish and other aquatic organisms. The current problem of elevated stream temperatures is documented from existing monitoring stations.

Stream temperature monitoring stations are established at thirteen locations within the Meadow Creek Watershed. These stations utilize a UNIDATA 64K data logger (planned for update to 128K when funding becomes available) or Hobo Tempmeter linked to a thermistor (Model 6607A). Hourly maximum, minimum and average stream temperatures are continuously recorded for the summer period (June to October). Two temperature stations (located at the gauging stations) are recording year-round. However, icing conditions and equipment failure due to extreme cold make winter sampling difficult.

The effectiveness of management practices to reduce temperatures will be evaluated with these data stations.

3. Climatic Variables

Climatic conditions have a direct influence on hydrologic processes through influences on temperate regimes as well as peak flow and runoff timing and magnitude. Climate data such as ambient air temperature, relative humidity, global radiation, and precipitation are necessary to evaluate annual stream temperature and flow characteristics.

Precipitation monitoring provides rainfall and snow pack data to correlate with streamflow. There are several natural factors that influence the amount of rainfall that will reach a stream channel as runoff. These factors include the type, extent and condition of vegetation, and soil type (Brooks *et al*. 1991). Interception, transpiration, evaporation and infiltration affect rainfall runoff patterns. Management activities can change the natural relationship between rainfall and streamflow through the manipulation of vegetation, road building, and/or livestock grazing. The amount of rainfall that reaches the stream channel as runoff can be can estimated through correlation of streamflow and precipitation measurements.

Monitoring stations for ambient air temperature, relative humidity, and solar radiation are established at four locations: the two gauging stations (sites 89 & 15), one precipitation site (site 85), and one flow transect site (site 95). These stations utilize a UNIDATA 64K (planned for update to 128K) data logger linked to a weather instrument (Model 6501 DU). This data is recorded for the summer period (June to September), except for the gauging station sites, which record year-around.

A monitoring station for precipitation (rain) is established at one location (site 85) based on methods described by Corbett (1955) (site 85). This station utilizes a UNIDATA 64K data logger (scheduled to be updated to 128K) linked to a tipping bucket rainfall gauge (Model 6506A). This data will be recorded hourly for those periods not influenced by the accumulation of snow. Tipping bucket gauges are not functional during periods of snow accumulation.

Snow pack and additional climatic data will be retrieved from a USFS Remote Automated Weather Station (RAWS), a long-term monitoring site located at the Starkey Experimented Forest and Range Headquarters.

4. Sediment/Substrate

The relationship between increases in fine sediments and salmonid production is not conclusive. Most studies on salmonids have been concerned with the effects of sedimentation on egg and fry survival; however, Everest *et al*. (1967) emphasizes that little effort has been made to relate sediment as a limiting factor to salmonid populations. Laboratory studies have investigated the effects of fine sediments out of context with natural aquatic ecosystems (Chapman 1956, Everest *et al*. 1967). None of these studies can assist managers in determining if sediment is limiting natural populations of salmonids (Everest *et al*.1967). What can be inferred about controlled laboratory studies is that at some specific life stages salmonids are vulnerable to deposited and suspended inorganic sediment (Chapman 1966).

The favored approach is one that relies on quantifiable and repeatable measurements of elements such as large woody debris, stream bank stability, stream bank angle, width to depth ratio, and pool frequency. These elements, when described in terms of DFC's, will act as surrogates for sediment. It is speculated that if all of these elements are within the threshold for the established DFC's, then fine sediment is estimated to not be an impact to egg survival or winter habitat. Therefore, we will not intensely sample fine sediments for developing relationships for egg to emergence survival. This contention is supported by scientists that developed the PACFISH, SAT and FEMAT reports (Dr. Fred Everest, Fisheries Research Scientist, PNW Research Station, Juneau, Alaska and Dr. James Sedell, Aquatic Research Scientist, PNW Research Station, Corvallis, Oregon, Personal Communication).

Meadow Creek and major tributaries are proposed to be monitored visually and potentially through water column grab samples, twice, during the spring runoff period, during periods of unseasonal warming, and/or following large storm events by foot and/or by helicopter to assess water color/clarity and isolate point sources of sedimentation.

Substrate conditions will be monitored throughout the Meadow Creek Watershed through the utilization of Wolman (1954) pebble counts conducted during stream habitat surveys. All fishbearing streams in the Watershed have been surveyed, although pebble counts are a relatively new part of the survey and have not been a part of most past surveys. All fishbearing streams are scheduled to be re-surveyed in the Meadow Creek Watershed over the next 5 years. Streams are typically re-surveyed every 5-10 years to monitor trends in fish habitat condition, including substrate. These surveys, including Wolman pebble counts, will provide baseline data and eventually trend data and an index of substrate conditions. Monitoring requires revisiting the same transects and plots as previously established. At each transect, the exact location of the previously sampled plots must be relocated.

In addition, surface fines will be measured visually as a percent of wetted channel surface area. This will be collected simultaneously with the stream habitat survey on all fish bearing streams every five to 10 years.

B. <u>Instream and Riparian Habitat</u>

Physical habitat characteristics have been documented with stream and riparian surveys. Use of repeated surveys of streams approximately every five to 10 years will provide documentation of trends in habitat.

Key elements that will be monitored include large woody debris, pool frequency and depth, bank stability, width to depth ratio, and bank angle for meadow reaches. All watersheds will be monitored for physical elements and will be correlated to direct or indirect fish habitat and water quality impacts and the other monitoring parameters. Research projects in the Meadow Creek Watershed conducted by Pacific Northwest Research Station (PNW), Oregon Department of Fish and Wildlife (ODFW), and Oregon State University (OSU) will be correlated to these elements in order to validate findings.

The Hankin and Reeves (1988) methodology as modified by the Pacific Northwest Region of the USFS (R6 Stream Inventory) has been used to conduct surveys on approximately 80 miles of streams containing existing or potential fish habitat. The R6 Stream Inventory and the ODFW Aquatic Inventory are compatible, and both have been and would continue to be utilized. Resurvey and reevaluation of the stream reaches containing existing or potential fish habitat would be conducted on every five to 10 years.

Riparian canopy closure measurements taken will be site specific and more detailed than those with the R6 Stream Inventory. The objectives of canopy closure monitoring are to 1) determine level and occurrence of destructive forest pests and their corresponding threat to attainment of canopy closure DFC's, and 2) determine if species composition and stocking are sufficient to meet canopy closure DFC's.

Riparian canopy monitoring would be accomplished through 1) annual aerial observations of insect and disease conditions, 2) analysis of acres of tree thinning used to reduce insect epidemics, 3) track and model forest pest occurrences using Geographic information System (GIS) or other appropriate methods, and 4) measure crown density at year 3, 5, 10, and 20 in thinned stands.

If more detailed data is needed on specific reaches, the same parameters as mentioned above can be collected within a defined primary riparian zone using measured line transects. These transects are site-specific, project driven, and time consuming and would be used only where the data from the riparian/aquatic inventory indicates a need for more detailed information to aid in the site-specific decision process.

Reference reaches for quantifying and qualitatively describing DFC's for forested reaches have been established at Limber Jim Creek and Lookout Creek, and at one location on Beaver Creek (Cove Creek) (Case and Kaufmann 1993). These represent the best quality stream segments for forested reaches at higher elevations thereby ensuring that data is collected, which allow reasonable approximation of DFC values. Although these reaches are located in the Upper Grande Ronde Watershed (85), they are representative of forested reaches in the Meadow Creek Watershed. A study of habitat elements in reference reaches in the Upper Grande area is integral to refining and revising DFC's and monitoring strategies for instream and riparian habitats.

Reference reaches for quantifying and qualitatively describing DFC's for meadow and transition reaches have been established on Meadow Creek and McCoy Creek in the Meadow Creek Watershed and on Limber Jim Creek in the Upper Grande Ronde Watershed (85). These reaches are designed to exclude one or more users of riparian area resources (such as livestock, big game, recreationalists, roads, etc.). These exclosures provide information regarding rate of recovery, successional progression toward site potential, effectiveness of restoration measures, and ultimately information for the refinement and revision of DFC's and monitoring strategies.

Permanent photo points would be established within selected reference reaches as well as within other key areas. These camera points would be designed to record changes within riparian areas occurring to the vegetative composition, cover, etc. A minimum of one camera point is established for each reference reach. Key area camera points would also be established outside these reference reaches, as appropriate, to monitor changes induced by management activities.

C. Salmonid Habitat Utilization

Historical and current distribution on spring chinook salmon, summer steelhead, and bull trout, for all freshwater life history stages, has been documented. Data on file with ODFW, PNW, Confederated Tribes of the Umatilla Indian Reservation (CTUIR), and USFS has been reviewed and discussed in Chapter III of this Watershed Analysis. Data used to determine distribution includes historical information and over 10 years of extensive data collection throughout the watershed. This effort helped to determine baseline conditions and describe fish community structure throughout the year with observational relationships determined where possible.

Fish habitat utilization monitoring will continue, as potential habitat is made accessible to fish through replacement of existing culverts acting as barriers to upstream habitat. Streams within the Meadow Creek Watershed with culverts identified as fish passage barriers and planned for repair in the next two years are Dark Canyon Creek, East Burnt Corral Creek and Waucup Creek. Approximately 13 miles of potential habitat would be made accessible upon replacement of these culverts. The effectiveness of culvert replacements to remove fish passage barriers and make habitat accessible will be evaluated on these streams.

The documentation of distribution has been used to correlate use and abundance to habitat parameters. Water quality and fish habitat parameters have been used in conjunction with life history data to refine the DFC and assess recovery. This information has been used to develop high priority protection and/or restoration projects that benefit both adults and juveniles. The correlation of fish use, habitat condition, and water quality will all guide future project proposals.

D. <u>Research</u>

Research is an integral part of any monitoring effort. Research provides scientifically credible linkages between monitoring data and restoration activities. Research can also assist in identification and refinement of DFC's and monitoring strategies. The following list of research activities are provided to show that monitoring activities described here and in conjunction with each section of Chapter III are being validated

Meadow Creek Riparian Recovery Study -This study is designed to assess the long-term effects of grazing strategies on riparian vegetation. The study tests 1) the long-term management of riparian vegetation and 2) riparian vegetation recovery and acceleration of recovery. OSU Department of Rangeland Resources, PNW Research Station and Wallowa-Whitman National Forest are conducting the study, which was begun in 1987 by PNW Research Station. The Meadow Creek Study will aid in the development of riparian vegetation restoration plans and projects. The study would facilitate refinement and revision of DFC's, RMO's, and matrix elements. PNW Research Station will conduct further research through aerial photo analysis. This rate of recovery is essential to determine if and when DFC's for riparian plant communities are achieved.

Meadow Creek Instream Restoration Study - This project was conducted by PNW in Corvallis with cooperation from Wallowa-Whitman National Forest (WWNF). It began in 1987and continued for ten years. The purpose of the study was to evaluate the effectiveness of instream structures for increasing steelhead smolt production and determination of steelhead life history strategies in tributary ecosystems. The study was initiated to examine large woody debris placements. Analysis of the data will be conducted as funds become available.

Syrup Creek Sediment Delivery Study - This project was conducted by the Department of Forest Engineering at OSU in cooperation with PNW in Corvallis and the WWNF. This project began in 1990 and continued for eight years. The purpose of the study was to validate a sediment delivery model for ash soils related to road construction and timber harvest. This study will assist in understanding sediment contribution to stream channels from management activities. Analysis of the data is scheduled for 2002.

Meadow Hydrology Study - This project is being conducted by the Department of Forest Engineering, Fisheries, and Wildlife at OSU in cooperation with PNW in Corvallis and the WWNF. This project began in 1992 and is continuing. The purpose of the study is to assess the hydrologic nature of two meadow ecosystems, Squaw Creek and West Chicken Creek. This study will assist in the understanding of meadow ecosystems and help refine DFC's for those systems.

Meadow Vegetation Study - This project is being conducted by the Department of Fisheries and Wildlife at OSU in cooperation with PNW in Corvallis and the WWNF. This project began in 1993 and is continuing. The purpose of the study is to characterize the vegetative component in relation to the hydrologic regime and soils characterized in the Meadow Hydrology Study (above).

Juvenile Life History Study - This project is a cooperative effort between PNW, ODFW and WWNF. This project partially began in 1993 and concluded in 2000. The purpose of the study was to characterize the life history characteristics of spring chinook salmon and summer steelhead in relationship to their habitat in the Upper Grande Ronde and Catherine Creek.

Stream Temperature Characterization Study - This project was conducted by the Department of Forest Engineering at OSU in cooperation with PNW in Corvallis and WWNF. This project began in 1990 and completed in 1993. The purpose was to describe the summer stream temperature regime in the Upper Grande Ronde River and validate a temperature prediction model, TEMP86. The La Grande Ranger District is now using the initial temperature stations as long-term temperature data stations.

Additional research needs are being developed as current research and monitoring efforts continue. Research is an ongoing effort, necessary to evaluate the effectiveness of restoration activities and refine DFC's and monitoring strategies.

E. Technology Transfer

The La Grande Ranger District will prepare annual reports by April 1 of each year. Reports will clearly present baseline data and evaluate each additional year's collection to the baseline condition.

Review of the annual report may indicate the need to refine or revise data collection procedures. This would incorporate elements related to the following: the monitoring strategy, monitoring locations, new techniques to better address data needs, trend data, changes in standards for habitat elements, restoration plans, and management guidelines.

Production of General Technical Notes on the monitoring results will be completed in cooperation with PNW and Fish Habitat Relations programs. Research results will be presented in thesis or dissertation documents and in journal articles. This documentation will be available for use on other Snake and Columbia River Basin administrative units.

IV. CONCLUSION

The monitoring plan relies on correlation of water quality, instream and riparian habitat and fish population monitoring to determine whether the objectives are being met for the Meadow Creek Watershed. Each section of the monitoring plan is directly or indirectly related to parameters that will, in the short or long term, verify whether an improving trend in water quality and fish habitat is being achieved.

Data will be synthesized and reported in an annual monitoring report. When the annual report is reviewed, a refinement or revision of the data collection may ensue. This would incorporate elements relating to the following: the monitoring strategy, monitoring locations, new techniques incorporated to better address data needs, trend data, changes in standards for habitat elements, restoration plans, and management guidelines.

CHAPTER VII

MANAGEMENT THRESHOLDS

As described in the existing condition section of this Watershed Analysis update, desired conditions have not been achieved in many of the resource areas under each Dimension. In order to facilitate movement of the landscape toward the desired conditions, a list of Management Opportunities was developed and prioritized in Chapter V. It is neither appropriate nor desired to accomplish all of these opportunities at one time on the landscape as each has potential direct, indirect, and cumulative effects on the physical, biological, and human dimensions within the area. Therefore, the team of resource specialists compiling this watershed analysis update reviewed the list of proposed Management Opportunities to identify resource areas where full implementation of the Management Opportunities within the next 10-15 years may exceed resource thresholds.

Thresholds are defined as management direction contained in the Forest Plan, as amended, Endangered Species Act direction, or other existing decisions from other plans or policies. Thresholds are also those existing conditions on the ground as a result of past and present management actions on public and private ground that can limit future management actions. The following threshold assessment is based on the consideration of past and present management actions and whether the potential exists to exceed existing thresholds with full implementation of the Management Opportunities within the next 10-15 years. The intent of these thresholds are to help guide future management in the Meadow Creek Watershed related to timing, scale, and level of permissible disturbance/activity.

THE PHYSICAL DIMENSION

1. AQUATICS: Since the early 1990's there has been an increased emphasis on restoration of the Meadow Creek watershed, both on public and private lands. The intent of the Management Opportunities are to facilitate moving the watershed towards its desired conditions. Full implementation of the Management Opportunities should lead towards improvements in baseline conditions (temperature, sediment, instream habitat, upland conditions). Timing and location of project implementation would be critical to ensure thresholds are not exceeded. There are no known management thresholds beyond those listed in the Forest Plan and Biological Opinions. Analysis of how site-specific projects would improve baseline conditions would be disclosed in environmental documents, with mitigation as warranted.

2. ROADS: The Management Opportunities are restorative in nature that will lead to achieving desired road management objectives. Implementation of management opportunities within the next 10-15 years would improve conditions for aquatics, soils, big game cover. There are no known management thresholds beyond those listed in the Forest Plan and Biological Opinions. Analysis of how site-specific projects would improve baseline conditions would be disclosed in environmental documents, with mitigation as warranted.

3. SOILS: Many of the Management Opportunities are restorative in nature and would benefit soils resources if implemented within management direction. Those Management Opportunties that have the potential to have site-specific effects that could exceed thresholds would be analyzed and disclosed in an environmental document with mitigations where warranted. There are no know management thresholds beyond those listed in the Forest Plan.

THE HUMAN DIMENSION

1. ROADS – Human Dimension Factors, as addressed in Chapter 4, Current Trends and Desired Conditions, there are many elements to consider relative to the human dimension. Accessibility, safety, dispersed recreation, motorized recreation, and economics are key elements that factor into maintaining a safe and efficient transportation system. Experience has shown that whether building a road or closing/obliterating a road benefits some forest users and displaces others. The primary drivers in managing a safe and efficient transportation system are other resource objectives, such as aquatics and big game management. Undeniably, the Management Opportunities listed (road obliteration, OHV Management Plan, and Access and Travel Management Plan) will reduce motorized opportunities within the watershed. These opportunities would lead to improvements from baseline conditions for many resources. Thus, there are no known management thresholds beyond those listed in the Forest Plan and Biological Opinions. Analysis of how site-specific projects would improve baseline conditions would be disclosed in environmental documents, with mitigation as warranted.

THE BIOLOGICAL DIMENSION

1. OLD-GROWTH/STRUCTURAL DIVERSITY

Old-Growth

Refer to direction from Wallowa-Whitman National Forest Plan as amended and Endangered Species Act direction for this resource.
Data Gap: Number of Structural acres.

Old Growth and Connective Corridors

Late and old structural stages fall below the HRV identified for the Meadow Creek Watershed for both the multistratum with large trees and single stratum with large tree structural stages.

The Forest Plan states that connectivity between old growth stands will be maintained and enhanced by at least 2 different directions. Connective corridors are comprised of trees ≥9" dbh and canopy closure of >50% (or within the top 1/3 percent of site potential). Stand widths should be at least 400 ft. wide. In the Meadow Creek Watershed late and old structural stages occur in patches generally less than 50 acres and are not well connected and generally not functioning as habitat for old growth dependant species. Many of these patches are isolated by more than a mile. The most abundant structural stage available to provide some level of connectivity between late and old structure patches is understory reinitiation. Due to the minor amounts of old growth and the small patch sizes, it is not practical to attempt to develop a connected network of old growth around existing old growth. A long-term approach to developing late and old structure is to identify larger (400-600 acre) patches of habitat and connective corridors with the highest potential to develop over the long term and managed to provide old growth habitat values in the future.

The Old Growth and Connective Corridor issue guides implementation of the management opportunities (particularly vegetative treatments) by emphasizing silvicultural prescriptions e.g.

thinning from below to the Upper Mgt Zone. The likely results will facilitate attainment of Late and Old Structural characteristics by maintaining large structure, increasing diameter growth and reducing the chances of loss of large trees to insects, diseases or fire. Implementation of Silvicultural prescriptions (Harvest Regeneration cutting e.g. clearcuts, seed trees or Shelterwoods) would not maintain structure or cover at desired levels. Thinning from below would maintain structure, however (depending upon the plant association) would likely reduce cover in the short term below recommendations for connective corridors.

A balance between short and long-term goals includes retaining existing old growth and connective corridors in the short term and manage for this structure, considering patch size and distribution in the long term.

Upland Vegetation and Structural Diversity

The emphasis areas for Silvicultural needs for the Meadow Creek Watershed are:

1. Thinning from below (low thinning) in overstocked stands to reduce stand susceptibility to insects, diseases, parasites and other harmful agents and to promote stand growth and vigor;
2. Thinning from below to increase growth to facilitate development of late and old structural (LOS) characteristics in a landscape that is far below the historic range of variability for LOS.
3. Sanitation/Salvage to remove insect or diseased damaged trees in high damage incidence stands that are at or below recommended stocking levels.
4. Precommercial (non commercial) thinning of stands in the stem exclusion closed canopy structural stage to promote stand growth and vigor, and to reduce future stand susceptibility to insect, disease and parasite caused damage.
5. Ensure that all disturbed areas are adequately stocked and that plantations are monitored and protected from damage.

In general, thresholds for accomplishing these activities would be related to direction from Wallowa-Whitman National Forest Plan as amended, Biological Opinions, and Endangered Species Act direction. In addition, short term and long-term cover would be a threshold for the thinning called for in 1, 2, and 4 above. Refer to the following section for mechanical thinning thresholds.

2. WILDLIFE HABITAT EFFECTIVENESS

This threshold assessment addresses guidelines to reduce disturbance to wildlife and provide wildlife habitat within the Meadow Creek Watershed. Disturbance factors include:

- Distance of habitat from motorized access
- Motor vehicle access - Forest Plan direction
- Timing
- Location of project activities.

Cover

Distribution of cover is addressed by applying the standard at the planning area scale (LRMP). The intent of managing for 30% cover is to ensure an adequate amount of cover at any point in time (LRMP). Cumulatively the watershed is above the 30% objective in the forest plan. 6 subwatersheds exceed that objective. Many of the Management Opportunities are restorative in nature and would benefit cover, such as limiting motorized vehicle access and stand structure development from vegetative treatments. Vegetative treatment has the greatest potential to reduce existing marginal and satisfactory cover in the short term. The timing and location of these management Opportunities will guide project level planning to ensure that cover objectives at the subwatershed scale will be met. Private landowners typically do not manage for wildlife cover and generally, restoration activities on private lands promote tree farming objectives and reduced fire risks. Private lands can't be depended on for wildlife cover.

Down Wood

Based on local studies with the PNW Research Lab (Bull et al. 1995, 1999) Forest Plan down wood standards are inadequate to meet wildlife habitat needs. The ICBEMP Draft EIS, Alternative 4 (preferred) recommends higher log densities than those required in the Forest Plan. Standard HA-S8 (Chapter 3, page 152) states that in the absence of "locally developed standards", the following shall be provided:

- Dry Forest, ponderosa pine, 6 logs/acre >10 in. average diameter, +25% of these >20 in. average diameter;
- Moist Forest, mixed conifer, 33 logs/acre >15 in. average diameter with an average length of 35 ft. Of these, 40% should be >20 in.;
- Cold Forest, lodgepole pine, 20 logs/acre >10 in. average diameter with an average length of 30 ft. Largest logs available should be left.

Vegetative treatments implemented would meet the above recommendations, thus thresholds for down wood would not be exceeded.

3. RIPARIAN CONDITION

Management opportunities are restorative in nature or focused on acceleration of recovery of riparian vegetation. Treatment of riparian area vegetation should not exceed 10% of the total acres in a subwatershed in any single year.

If vegetation treatments are limited to the 10% threshold per year no measurable impacts would occur to stream temperature, reduction of large wood debris levels or sediment delivery to stream channels. The 10% threshold would allow acceleration of riparian vegetation characteristics which would lead to meeting the desired condition for aquatics in the Meadow Creek Watershed.

4. FIRE/FUELS

Use prescribed fire to work towards the historical range of variability levels for the analysis area. Management of grasslands using prescribed fire can create some deficiencies for big game and domestic livestock if it is not scheduled throughout the decade. One of the objectives in burning grasslands is to enhance forage production while achieving a mosaic pattern of vegetation within any subwatershed and within the Meadow Creek watershed. Prescribed fire is a management tool that can facilitate the distribution of big game, reintroduce fire frequency to the ecosystem and minimize impacts on domestic livestock operations. To ensure that prescribed fire is meeting big game and domestic livestock objectives no more than 10% of the available forage per year should be burned.

OTHER RESOURCES:

1. ROADS – Biological Dimension – reference the Aquatic and Wildlife Habitat Effectiveness above. There are no know management thresholds beyond those listed in the Forest Plan.
2. THREATENED, ENDANGERED, SENSITIVE SPECIES – Although the management opportunities are restorative in nature, the potential exists, based on the timing and location of projects, to retard recovery of TE&S species. Section 7 consultation under the ESA with NMFS

and USFWS will ensure that any management thresholds associated with those species won't be exceeded and would facilitate the recovery of the species and/or their habitat.

3. NOXIOUS WEEDS – Management opps are preventative and restorative in nature. As an example, implementing an Access and Travel Management Plan would further limit motorized access within the watershed, providing preventative measures. The primary goal stated in The Weed Prevention Best Management Practices (draft 1999) includes stopping the spread of existing weeds and preventing the establishment of new weeds. Prevention and Control Measures are identified in the National Policy: FSM 2080. Analysis of how site-specific projects would improve baseline conditions would be disclosed in environmental documents, with mitigation as warranted.
4. RANGE – Management opportunities are restorative in nature. In conjunction with ongoing operations of the Allotment Management Plan, management opportunities such as prescribed fire, water developments, and fencing will move the grasslands towards desired conditions. As noted under Fire/Fuels above, the timing and location of prescribed fire needs to consider potential impacts on annual forage production and utilization for any given pasture. Thus the management threshold of no more than 10% of the available forage per year should be burned. There are no other management thresholds beyond those listed in the Forest plan.
5. INSECT AND DISEASE - A primary objective of the vegetation treatment opportunities is to manage forest stands to maintain or improve resilisency from instect, disease, wildfire, or windthrow events. Vegetation treatments are designed to improve structural composition of the stands, facilitating late-old structure, which is generally resilent to natural disturbance factors. Excessive treatment, particularly if it is poorly implemented can lead to an increased risk of insect and disease. So long as Forest Plan management direction is followed and potential risk are assessed in the environmental document then implementation of the management opportunites should not exceed management thresholds.

Appendices

- **Maps**
- **Botany TES Plant List**
- **Literature Cited**
- **List of Preparers**

Maps:

1. Meadow Creek Structural Stages
2. Meadow Creek Water Quality Monitoring Sites
3. Meadow Creek Historic Disturbance Sites
4. Meadow Creek Fish Distribution
5. Meadow Creek Stream Classes
6. Meadow Creek Road Status
7. Meadow Creek Weathered Rock Types
8. Meadow Creek Gully Erosion Hazard Ratings – Current Condition
9. Meadow Creek Landslide Hazard Areas

List of Preparers

The following is a list of the interdisciplinary planning team members and primary support personnel. Provided are their qualifications and responsibilities in preparation of the Watershed Analysis.

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Recreation Forester, La Grande Ranger District, Wallowa-Whitman NF
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Fisheries and Watershed Staff, La Grande Ranger District, Wallowa-Whitman NF
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