RIVER BASIN ASSESSMENT

UPPER/MIDDLE GRANDE RONDE RIVER & CATHERINE CREEK

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Errors or omissions in this document are the responsibility of the authors, alone.

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INTRODUCTION

BACKGROUND

During the 1993–1995 state biennium, watershed protection and restoration activities were planned and implemented in the Grande Ronde, South Coast, and Rogue River Basins through the Oregon Watershed Health Program. The program recognized the need for basin assessments to help determine priority areas and restoration needs. The limited time available for program implementation, along with the lack of protocols and mechanisms for accomplishing basin assessment, led to a decision to select a subset of these basins for completion of assessments.

Currently, federal agencies are in the process of developing watershed analyses for watersheds ranging in scale from 20 to 200 sq. miles. The assessment process developed and utilized by the Oregon Watershed Health Program focuses on the river basin scale, areas of hundreds to thousands of square miles. At this scale, the assessment identifies the key resource issues and values, evaluates the physical, biological and ecological processes affecting them and identifies concerns and opportunities. Analysis at this scale is much broader in scope, and contains significantly less site specific data than a watershed analysis (FEMAT, 1993). Through this pilot effort, we hope to develop a protocol for river basin assessments that will link with and complement federal agency protocols for watershed analysis.

PURPOSE

The goals of a river basin assessment include (FEMAT, 1993):

- Identifying key resource issues and concerns,
- Delineating land-use and ownership patterns,
- Describing the general spatial distribution of key physical processes, and
- Providing a general description of physical and biological conditions within the river basin.

The information developed in the river basin assessment can be used to:

- Prioritize areas for more detailed watershed analysis,
- Evaluate broad-scale cumulative effects.
- Identify areas requiring protection and restoration, and
- Help focus the type, location and extent of restoration needs.

ANALYSIS AREA

The assessment covers the area draining to the Grande Ronde River upstream of the confluence with the Wallowa River at Rondowa, and is referred to here as the Upper Grande Ronde Subbasin. It includes the upper and middle segments of the Grande Ronde Riv-

er, and Catherine Creek (Map 1). A detailed discussion on how this subbasin is delineated is provided here to prevent confusion related to different applications of the term "Upper Grande Ronde". The USGS system for delineating hydrologic units is used in this assessment. The USGS system is a hierarchical characterization of drainages which are identified by a numbering system (Seaber et al., 1987). Each layer of the hierarchy consists of two digits of an eight-digit numeric code. Each two digits is known as a "field", resulting in four levels, or fields, of delineation. Subbasins delineated by the eight-digit code are often referred to as HUCs for Hydrologic Unit Code. The HUCs are currently available as a Geographical Information System (GIS) map layer for the State of Oregon. The analysis area covered in this document is the Upper Grande Ronde River Subbasin, HUC number 17060104. Table 1-1 shows the classification: (see McCammon, 1994 for a discussion of watershed terminology).

ASSESSMENT APPROACH

The assessment is a ridgetop-to-ridgetop approach evaluating upland, riparian and in-channel components of the ecosystem. The focus is on delineating the type and location of key resource issues and values. Resources at risk are linked to the natural processes and management activities that can impact them. The assessment uses a process based approach, identifying key physical and biological processes, their spatial distribution and their importance to the resource values. Temporal distribution of processes is also considered where possible. Due to limited information and specialist expertise, this assessment addresses only a portion of the many processes and functions occurring in the ecosystem. Focus is on aquatic resources, with limited discussion of terrestrial ecosystem values, processes and functions. For upland areas, runoff and erosion are the predominant physical processes considered in this analysis. Biological processes and functions considered include plant succession, habitat abundance, distribution and connectivity, and species migration. For riparian areas, the input, storage and transport of water, wood and sediment are the predominant processes and functions considered in this analysis.

River basins and subbasins are quite large, and often contain multiple ownerships. Because of this, information may be quite detailed for some areas of the basin, and limited or non-existent for others. For this assessment, the selection of data is based on both resolution and consistency; the highest resolution data that are available for all, or most of the basin, is used in the analysis. No new data were collected for this assessment. More detailed assessments using higher resolution data are reserved for analysis conducted at the watershed scale. The majority of the data are managed and analyzed using a Geographical Information System, Arc-Info (Environmental Systems Research Institute, Redlands, CA.). In GIS, data are managed as themes, or coverages. Some information was already available as GIS themes, while other data were added to GIS to create new themes. These new coverages, along with many existing coverages, are available at the State Service Center for GIS (Oregon Department of Administrative Services).

Table 1-1: USGS Hierarchical Classification for The Upper Grande Ronde River Subbasin

Number	17	06	01	04
USGS Term	Region	Subregion	Accounting Unit	Cataloging Unit
Name	Pacific Northwest Region	Grande Ronde Subregion	Grande Ronde River Basin	Upper Grande Ronde Subbasin

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WATERSHED DESCRIPTION AND LANDSCAPE CHARACTERISTICS

GENERAL LOCATION

The Upper Grande Ronde Subbasin forms the upper portion of the Grande Ronde River Basin, which is located in northeastern Oregon and southeastern Washington. The entire Grande Ronde Basin covers an area of 5,300 sq. miles. The Grande Ronde River is a major tributary to the Snake River, and extends 212 miles from headwaters to the mouth. The Upper Grande Ronde Subbasin covers the area draining to the Grande Ronde River upstream of Rondowa, approximately 1,640 sq. miles (Map 1). The subbasin is divided into three major subdivisions, the Upper Grande Ronde River, Middle Grande Ronde River and Catherine Creek (Map 1). Area of these subdivisions is given in Table 2-1. The area shown as Catherine Creek is based on its confluence with the Grande Ronde River prior to construction of the State Ditch.

CLIMATE AND TOPOGRAPHY

The Upper Grande Ronde Subbasin is located within the Blue Mountain ecoregion (Omernick, 1987; Clarke et al., 1991) and is characterized by a semi-arid climate. The Subbasin is bordered by the Blue Mountains to the west and northwest, the Elkhorn range to the southwest and the Wallowa mountains to the east and southeast. The subbasin is characterized by rugged mountains in the headwater areas which give way to the 360 sq. mile Grande Ronde Valley in the lower elevations. Temperature and precipitation in the Upper Grande Ronde vary with elevation, which ranges from approximately 2,300 feet to 7,800 feet (Map 2).

Table 2-1: General Information for The Three Major Subdivisions in The Upper Grande Ronde River Subbasin

SUBDIVISION	AREA (SQ. MILES)	STREAM LENGTH* (MILES)	DRAINAGE DENSITY (MILES/SQ. MILE)
Upper Grande Ronde	695	1,002	1.44
Middle Grande Ronde	612	725	1.18
Catherine Creek	333	419	1.26

* 1:1000,000 Scale

In the lower elevations, generally below 3,000 feet, average annual precipitation ranges from 12 to 25

inches. Precipitation occurs predominantly as rain or rapidly melting snow. Prevailing winds blow from the southwest, causing lower precipitation along the south part of the Grande Ronde Valley and higher precipitation along the north end. Temperatures are characterized by warm dry summers and cold, moist winters. At elevations greater than 5,000 feet, average annual precipitation is greater than 50 inches, and occurs mostly as snow. Highest precipitation occurs in the headwaters of Catherine Creek, which originates in the Wallowa mountains. At mid-elevations (3,000–5,000 feet) average annual precipitation ranges from 20 to 50 inches and occurs as a mixture of rain and snow. Rainfall over existing snowpack can lead to large runoff events in this elevation band, which can increase peak flows and sediment inputs to streams. Management activities in this zone are of particular concern due to the potential for runoff and sediment producing precipitation events.

Slopes vary throughout the subbasin with the valley generally characterized by gentle slopes, and the upper parts of the watershed characterized by steeper slopes. Slopes as high as 90 percent are found in some areas of the watershed. The headwaters of many streams in the subbasin form deeply entrenched canyons.

SOCIAL AND ECONOMIC CONSIDERATIONS

Land ownership in the Upper Grande Ronde Subbasin is about equally divided between federal management and private ownership, with small amounts of state, county and tribal land (Map 1 and Figure 2-1). The federal land is predominantly managed by the USDA Forest Service (USFS) as two different national forests, the Wallowa-Whitman and the Umatilla. This land is located along the headwaters of streams in timbered, mountainous terrain. Private ownership occurs predominantly along the valley bottoms and mouths of streams, with predominant land uses of agriculture and livestock management.

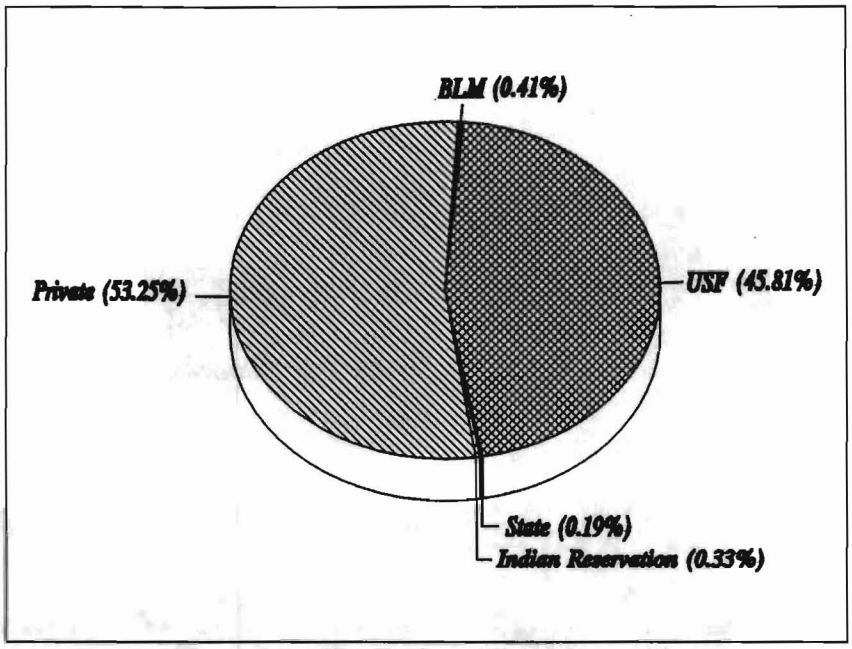


Figure 2-1: Distribution of Land Ownership

Until the mid-1800's, the Grande Ronde Basin was utilized solely by the Cayuse, Umatilla, Walla Walla and Nez Perce Indians (James, 1984). After this time, European settlers moved into the area and significant timber harvest, livestock grazing and agricultural production began. Initially the Oregon Trail, which crosses the Upper Grande Ronde, brought settlers to the area, and subsequent building of the railroad mainline through the Grande Ronde Valley led to more rapid development. A description of the land use history of the Upper Grande Ronde can be found in McIntosh (1992).

The Upper Grande Ronde Subbasin is located almost entirely within Union County, with small amounts of the western and northern edges falling in Umatilla County and a small portion of the southern edge falling in Baker County. The population of Union County is currently 24,000, with major population centers of La Grande/Island City (12,660), Union (1,880) and Elgin (1,600) (The *Oregon Blue Book*, 1993–1994). With the exception of a small part of the headwaters of Catherine Creek, which lies in the Eagle Cap Wilderness, the national forests are managed for multiple use, primarily timber production, livestock grazing and recreation. Seasonal forest recreation use, including big game hunting and mushroom harvest, is also of economic significance. In addition, the Confederated Tribes of the Umatilla Indian Reservation and the Nez Perce Tribe have reserved treaty rights to harvest fish, wildlife and plants at usual and accustomed places on lands ceded to the U.S. Govern-

ment in the Treaty of 1855. Along with federal forest land, approximately 209,000 acres of Union County are in non-federal forest land, which includes a mixture of industrial and non-industrial owners. Agriculture and livestock management are the predominant land uses within the Grande Ronde Valley. Agricultural products include small grains and livestock forage. Approximately 144,000 acres of the valley are designated as cropland; approximately 49,000 acres are designated as irrigated land, with approximately 42,000 acres in irrigated crops (U.S. Department of Commerce, Bureau of Census, 1992) such as wheat, grass seed, mint and alfalfa.

GEOLOGY

Geology of the Upper Grande Ronde Subbasin is composed of 300-100 million year old deformed metamorphic rocks and granites, overlain by younger volcanic rocks including Columbia River basalts. Map 3 shows geology of the subbasin from the 1:500,000 State Geology Map (Walker and McLeod, 1991). Table 2-2 provides a legend which describes the watershed related properties of the geologic units.

The oldest rocks in the subbasin were laid down approximately 210 to 260 million years ago during the late Permian/early Triassic period (Units TRP_{sv} and TR_{sv}). These are a combination of metamorphosed volcanic flows and marine sediments which crop out in Catherine Creek and the headwaters of the Grande Ronde River. They are hard rock units which are generally not susceptible to erosion and mass wasting. During the late Jurassic and early Cretaceous periods (120 to 160 million years ago), the area was intruded by diorite and granite igneous masses such as the Bald Mountain Batholith (Unit KJi). This unit resists weathering and forms steep slopes that are resistant to erosion and mass wasting.

During the Oligocene epoch of the Tertiary period, approximately 20 to 35 million years ago (Tas through Tvm), the area was uplifted forming highlands ancestral to the Blue and Wallowa mountains, and extensive erosion created an irregular surface. Downcutting formed river channels with subsequent deposits of fluviatile conglomerate. These deposits are highly susceptible to weathering and erosion and present a significant mass wasting potential. The conglomerate was in turn overlain by tuff breccias, andesitic lava flows and volcanoclastic deposits which erupted from vents (Units Tas and Tsfj). These form gentle to moderate slopes and are subject to significant erosion potential. The combination of substitute sediments overlain by lava flows has created areas of local instability; nearly all of the small landslides found in the Upper Grande Ronde Subbasin occur where Tertiary sedimentary rocks are overlain by lava flows.

In the late Miocene epoch of the Tertiary period, the large basalt lava flows of the Columbia River Group (Tcg) were erupted from fissures throughout much of northeast Oregon, southeast Washington and western Idaho. These occurred as multiple layers of flows (Units Tcs through Tci), which now total 1,000 to 4,000 feet thickness in the Grande Ronde Basin. The ages of rocks related to the Columbia River Group range from 5 to 17 million years, with the bulk of the eruptions occurring between 15 and 16 million years ago. The gray rocks which rim the Grande Ronde Valley and occupy most of the Catherine Creek watershed are andesites, 13 to 5 million years in age. These andesites are broadly considered part of the Columbia River Group. The layered Columbia River flood basalts form the dominant rock type found in the uplands and plateaus of the Upper Grande Ronde River Subbasin. Many of the rock units have been folded and faulted. The basalts are resistant to weathering and mass wasting but where they overlie sediments they may form significant landslides.

Faulting during the Miocene through Pleistocene formed down-dropped blocks (grabens) such as the Grande Ronde and Elgin Valleys, and uplifted surrounding mountains. Vertical offset on faults along the north side of the Wallowa Mountains total about 7,000 feet. Faulting that created the Grande Ronde Valley produced vertical offsets of about 5,000 feet between the rocks buried beneath the sedimentary fill in the Grande Ronde Valley and the equivalent rocks at the top of Mount Emily on the west side of the valley. Faulting has significantly affected the topography and morphology throughout the subbasin.

Glaciation sculpted the Wallowa and Elkhorn Mountains. Glacial sediments provided significant fill for the Grande Ronde Valley and other low-lying areas. Alluvial fans of the Grande Ronde River, Catherine Creek, Ladd Creek, Mill Creek and others are major repositories of glacial and more recent sediments. The youngest rocks in the subbasin are the Quaternary deposits (Qal through Qs) composed of sands, alluvium and other unsorted gravels and boulders generally occurring in the valley areas. These rocks erode easily.

Table 2-2: Watershed Related Properties of The Geologic Units in The Upper Grande Ronde Subbasin

Qal	–	Alluvial deposits, floodplain soils. Muds, sands and gravels. Easily eroded by streams. Forms gentle slopes. Soil rich in organic material. Hazards include flooding, and rapid erosion and deposition within the floodplain and streams. High groundwater potential.
Qls	–	Landslide and debris-flow deposits. Mixture of rock fragments and unstratified soils. Erodes to mud and sand. Forms gentle to moderate slopes. Variable rock and engineering conditions with extreme behavioral variation in artificial cuts.
Qf	–	Randomly sized mixture of mud, silt and basalt. Alluvial fan deposits; poorly sorted; poorly stratified. Weathering forms gentle slopes. Erodes to mud and is easily eroded by streams.
Qg	–	Unsorted boulders, gravels, sands and fine grained ground up rock. Glacial deposits; moraines. Weathers easily; erodes to sand and mud. Forms gentle slopes. Groundwater potential locally.
Qs	–	Lacustrine and fluvial sedimentary rocks. Unconsolidated clay, silt, sand, and gravel. Weathers easily; erodes to mud and sand. Susceptible to landslides. Erosion occurs on steep slopes and stream banks.
Qgs	–	Glaciofluvial, lacustrine, and pediment sedimentary deposits. Unconsolidated poorly sorted silt, sand and gravel.
Ts	–	Sedimentary rocks and tuff. Semi-consolidated to well-consolidated sandstone, siltstone, mudstone, tuffs and breccias.
Tvm	–	Volcanic material: basalt and glass. Weathers to a gentle slope. Slowly erodes to mud.
Tlf	–	Lacustrine and fluvial deposits. Muds, sands, and volcanic glass partially cemented together. Poorly · moderately consolidated. Forms gentle slopes. Rapidly erodes to fine sands and muds on steep or artificial slopes.
Tc	–	Columbia River basalt and volcanic debris. Weathering forms moderate slopes. Very slow erosion. Variable to high groundwater potential.
Tim	–	Resistant to erosion; erodes to mud. Forms moderate to steep slopes. Intrusive rocks; mafic.
Tcs	–	Basalt. Resists weathering. Forms gentle slopes and canyon walls when cut by streams. Erodes to mud. Resistant to landslides. Groundwater potential.
Tcw	–	Medium grained basalt. Resists weathering. Forms gentle slopes and canyon walls. Erodes to mud. Resistant to landslides. Groundwater potential.
Tcg	–	Grande Ronde Basalt. Fine grained. Resists weathering. Forms gentle to steep slopes, and canyon walls due to river cuts. Erodes to mud. Resistant to landslides. Good groundwater potential locally.
Tcp	–	Picture gorge basalt.
Tci	–	Imnaha basalt. Coarse grained. Resists weathering. Forms moderate slopes. Resistant to landslides. Low groundwater potential.
Tsfj	–	Lava flows, ash flows, clays. Fine-grained easily erodible sediment. Forms gentle to moderate slopes. Subject to gullying and massive landslides beneath rim rock. Very low groundwater potential.
Tas	–	Highly variable andesite and sedimentary rocks; lava flows breccia and clays. May be prone to landslides, especially on steep slopes.
KJi	–	Intrusive rock; batholiths. Resists weathering. Forms moderate to steep slopes. Resistant to erosion. No groundwater potential.
TR_{sv}	–	Undifferentiated marine sedimentary and volcanic rocks. Forms steep slopes and canyon walls. Resistant to landslides.
TRP_{sv}	–	Structurally deformed sedimentary and volcanic rocks. Complexly folded. Forms canyon walls and steep slopes. Erodes to sand and mud. Resistant to landslides.

Groundwater potential occurs in localized areas primarily associated with the basalt lava flows and recent Quaternary deposits. Major control of groundwater movement may be provided by basin structure, especially by the location and activity of faults, and by possible deformation of deeply buried sediments. Groundwater movement is also constrained by the complicated and poorly understood stratigraphy of the deep sediments in the Grande Ronde Valley, most of which are alluvial in origin. The Tcs, Tcg and Tcw units are all well-developed basalts which may have locally high groundwater potential. The Qg and Qal Quaternary units consist of unconsolidated sands, gravels, boulders and other fine-grained rock that have generally high groundwater potential. The combination of shallow groundwater and highly permeable materials makes these areas highly sensitive to potential groundwater pollution.

SOILS

• General Description

Soils in the Upper Grande Ronde Subbasin vary depending on topography and bedrock geology. The Union County Soil Survey (USDA–Soil Conservation Service, 1985) delineates four main groups of soils for broad classification purposes. Soils which formed in alluvial and lacustrine deposits are found on the floodplain, terraces and fans of the Grande Ronde and tributary valleys. These soils form on gentle slopes and are well suited for cultivated crops and pasture. Soils which formed in a combination of alluvium, eolian and lacustrine deposits mixed with residuum and colluvium from basalt and volcanic tuff are found in higher terraces and alluvial fans of the Grande Ronde Valley. Slopes vary considerably, ranging from less than 5 percent up to 45 percent. These soils are also used for irrigated crops and pasture, as well as rangeland. Soils derived exclusively from colluvium and residuum from basalt and volcanic tuff are found on the dry foothills above the Grande Ronde Valley and below the timbered areas. Slopes vary from less than 5 percent to as much as 70 percent. Areas with steeper slopes tend to have high erosion hazard. These soils are mainly used for rangeland and wildlife habitat. Soils which formed in colluvium and residuum from basalt and volcanic tuff and recent volcanic ash are found in the forested uplands of the watershed. Slopes vary from less than 5 percent to greater than 70 percent, and have variable erosion hazard. Predominant land use is timber production, wildlife habitat and woodland grazing.

• Processes

In order to quantify the physical processes occurring in the watershed, soils are classified based on their susceptibility to runoff and erosion. Using GIS, this classification is combined with other landscape and land use information to help determine the impacts of physical processes on resource values. The Union County soil survey is in the process of being digitized into a GIS coverage, but it was not available at the time of the analysis. However, a coarser scale soils database called STATSGO (USDA–Soil Conservation Service, 1991) is currently available on GIS. STATSGO soil maps were developed by generalizing more detailed soil survey maps and were designed to be used for regional, state and riverbasin planning. In STATSGO, each map unit contains up to 21 soil components (generally soil types) for which there is information on soil properties, but no distinction as to the location of each component within the map unit. Consequently, STATSGO information is usually reported as percentage of the map unit that meets the criteria.

For susceptibility to runoff, the soil properties of surface permeability, soil depth and slope were used to delineate areas of high, moderate and low runoff potential (Huddleston and Brett, personal communication). Table 2-3a shows the matrix used to calculate runoff potential. In the analysis, each soil type is classified as high, moderate or low, and the results displayed in map form as the percentage of the map unit defined as one of these categories. For susceptibility to erosion, the calculation was based on runoff potential and surface "k", or soil erodibility factor (Table 2-3b). The "k" factor is a measure of the inherent erodibility of the soil, and depends on properties such as texture, structure, organic matter and permeability. Map 4 shows the proportion of map units with high and very high runoff potential. Similar maps exist for moderate and low runoff potential, as well as high, moderate and low erosion potential.

VEGETATION

• General Description

The Upper Grande Ronde Subbasin is primarily dominated by forest at moderate and high elevations (>3,000 feet), and range and pastures on the foothills and valley bottoms (1,000–3,000 feet). The Oregon gap analysis (Kagan and Caicco, 1992) mapped 16 vegetation complexes in the subbasin based on satellite imagery from

Table 2-3a: Matrix for Runoff Potential

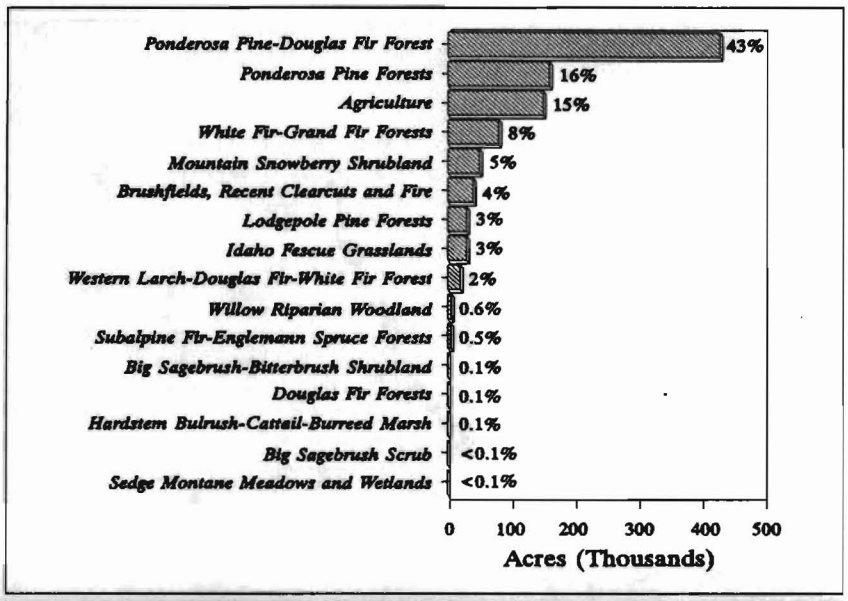
Surface Permeability (in/hr)	Soil Depth (in)	Slope			
		Less than or = 5%	5 – 16%	16 – 30%	Greater than 30%
Very Slow (Less than 0.06)	< 20	High	Very High	Very High	Very High
	20–40	High	Very High	Very High	Very High
	> 40	High	Very High	Very High	Very High
Slow (0.06 – 0.60)	< 20	Moderate	High	Very High	Very High
	20–40	Low	Moderate	High	Very High
	> 40	Low	Moderate	High	High
Moderate (0.60 – 6.00)	< 20	Low	Moderate	High	Very High
	20–40	Low	Moderate	Moderate	High
	> 40	Very Low	Low	Moderate	High
Rapid (Greater than 6.00)	< 20	Low	Moderate	High	High
	20–40	Very Low	Low	Low	Low
	> 40	Very Low	Very Low	Very Low	Very Low

Table 2-3b: Matrix for Erosion Potential

Runoff Potential	Surface "k" Factor		
	Low 0.02 – 0.20	Moderate 0.20 – 0.40	High 0.40 – 0.69
Very Low	Very Low	Very Low	Low
Low	Very Low	Low	Moderate
Moderate	Low	Moderate	High
High	Moderate	High	Very High
Very High	High	High	Very High

1988, with a minimum mapping unit of 320 acres (Map 5). Although only large-scale vegetation patterns are documented, the gap analysis provides the only basin-wide coverage of vegetation in the Upper Grande Ronde Subbasin available at this time. The vegetation complexes (groups of vegetation types) are listed in Figure 2-2 with their total acreage and relative abundance in the basin. The most abundant forest types are Ponderosa Pine-Douglas-fir (43% of the subbasin) and Ponderosa Pine (16%), which are widely distributed throughout the subbasin. Lesser amounts of White Fir-Grand Fir (8%) are found in large stands north and south of La Grande and scattered elsewhere. Lodgepole Pine Forests (3%) are scattered around the upper elevation perimeter of the subbasin, where it is often associated with Subalpine Fir-Engelmann Spruce Forests (0.5%). The higher elevations east of Imbler and Alicel have some of the only stands of Western Larch-Douglas-fir-White Fir (2%) in the drainage. Other forest types make up less than 1 percent of the remaining land area in the drainage. Typical forest understory species include ninebark, oceanspray, snowberry, and spiraea. Scattered throughout the subbasin, mainly above 3,500 feet, are Brushfields from recent clearcuts and fires (covering 4% of the subbasin).

Agricultural vegetation (i.e., cropland and pasture) covers about 15 percent of the subbasin and is abundant in the valley bottoms around La Grande and other communities. Mountain Snowberry Shrublands (5%) are found in a belt around the southern foothills of the main valley centered around Union. Idaho Fescue Grasslands (3%) occur in a fairly narrow north-south band along the eastern



Source: Oregon Gap Analysis, ***Manual of Oregon Actual Vegetation*** **(Kagan and Caicco — 1992)**

Figure 2-2: Vegetation Classes from Oregon GAP Analysis

margin of the valley from Cove to Elgin. Other vegetation types, such as Willow Riparian Woodland, Big Sagebrush-Bitterbrush Shrubland, Big Sagebrush Scrub, Marsh, and Montane Meadows cover <1 percent of the land area of the subbasin.

Exposed stream banks at lower elevations are often dominated by Douglas-fir, hackberry, and occasional Ponderosa pine, especially in canyons. Understory shrubs are typically represented by native chokecherry and bittercherry (USDI-Bureau of Land Management, et al., 1993). Historical overgrazing and other ground-disturbing activities have allowed introduced annual weeds to invade and dominate the flatter, more accessible sites. Knapweed continues to invade the subbasin. Cheatgrass (*Bromus tectorum*) currently dominates most uncultivated stream-side terraces, as well as the understory of most Douglas-fir/hackberry associations. Along stream-sides and where surface water is available, white alder and associations of box elder and water birch are common. Introduced tree species dominate portions of the stream-side near old homesteads, and some species, such as black locust, are expanding their range in the drainage.

• Processes and Functions

Vegetation provides several important functions for the Upper Grande Ronde subbasin. Plant growth is the base of the food chain, providing sustenance to all other organisms in the area. Both wildlife and livestock depend on the productivity of the basin's vegetation. Runoff and soil erosion during and after precipitation events is ameliorated by healthy vegetative cover, which retains moisture and helps water penetrate the soil. Wetland vegetation acts as an important natural filter to trap and remove particulates and some nutrients from surface waters. Riparian vegetation provides cooling shade for waterways, and provides structure to streams in the form of logs, overhanging roots, and other woody debris. In addition, healthy vegetative plant communities are habitat for many species of plants and animals, some of which are considered rare, and are discussed in Section 3. Little spatially-organized information is available to assess the condition of the existing vegetation in the Upper Grande Ronde subbasin. In general, the highest quality data has restricted geographic coverage (such as U.S. Forest Service land only), and is therefore of limited use for assessing the condition of the subbasin as a whole. Information on forest fragmentation (as assessed from high-elevation aerial photography) is available basin-wide through the gap coverage, and will be discussed in Section 5.

STREAMS AND STREAMFLOW

Map 1 shows the stream network for the Upper Grande Ronde at a scale of 1:100,000. The Grande Ronde originates in the Blue Mountains, and flows 212 miles to its confluence with the Snake River. Catherine Creek, which is 33 miles long, originates in the Wallowa Mountains and is a major tributary to the Grande Ronde. Other main tributaries include Meadow Creek, approximately 22 miles in length; Beaver Creek, 19 miles; Fly Creek, 16 miles, Sheep Creek, 12 miles; Indian Creek, 15 miles; and Lookingglass Creek, 15 miles. Total stream lengths and drainage densities for the three subdivisions of the subbasin are shown in Table 2-1.

Streams in the subbasin vary in gradient, with relatively steep gradients in the headwaters and gentle gradients along the lower reaches. Examples of longitudinal

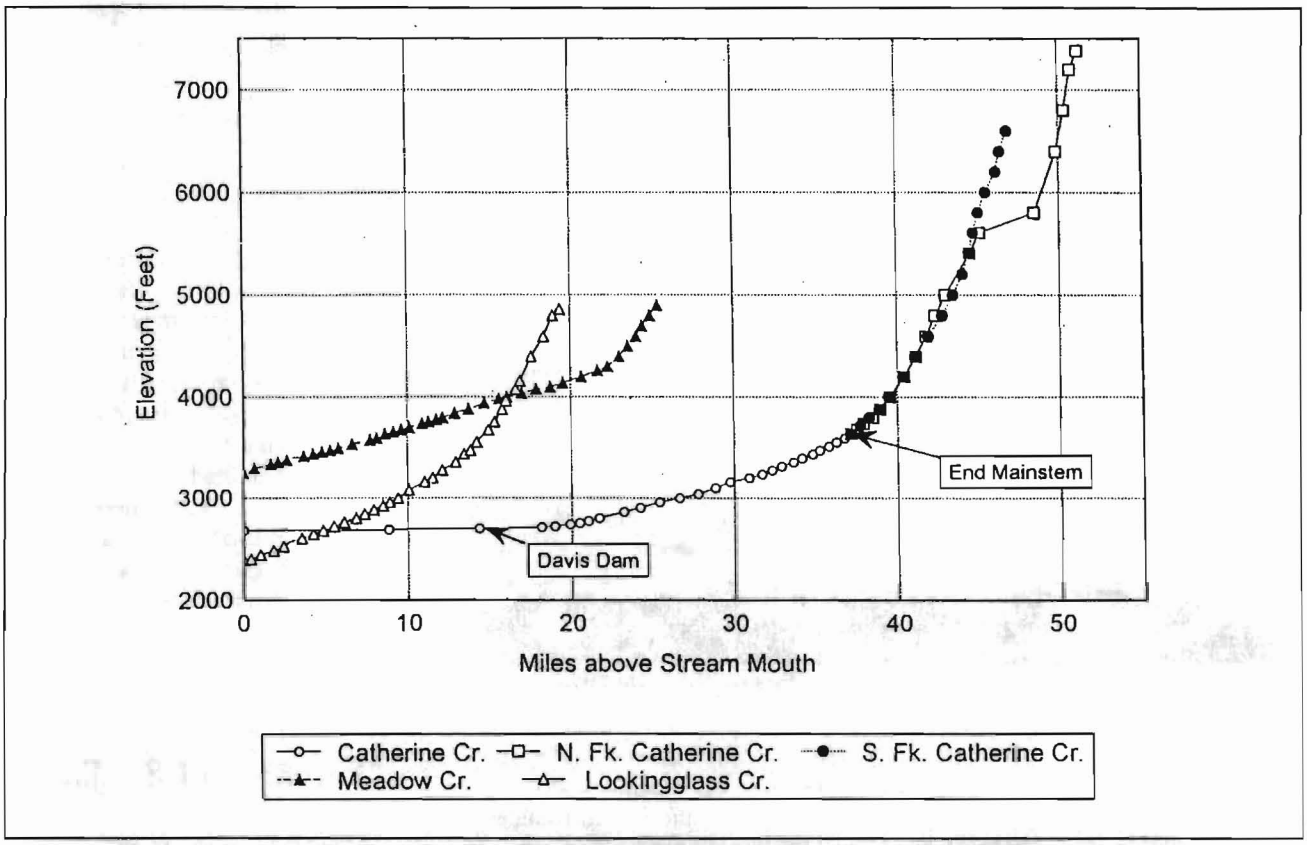


Figure 2-3: Longitudinal Profiles for Several Streams in The Upper Grande Ronde Subbasin

profiles of several streams are shown in Figures 2-3 and 2-4. Within the Grande Ronde Valley, the mainstem of the Grande Ronde River is channelized into the State Ditch. Flow within the original channel is limited to discharge from Catherine Creek, and is quite low during the summer months. This effectively converts about 33 miles of unconstrained, complex stream into a 4.4 mile long simplified reach, and has reduced much of the fish habitat available in this portion of the valley.

Figure 2-5 shows mean monthly stream discharge over the period of record for four stations along the Grande Ronde River, and for Catherine Creek near the city of Union. Discharge in the Grande Ronde at Rondowa includes flow from the Wallowa River. The

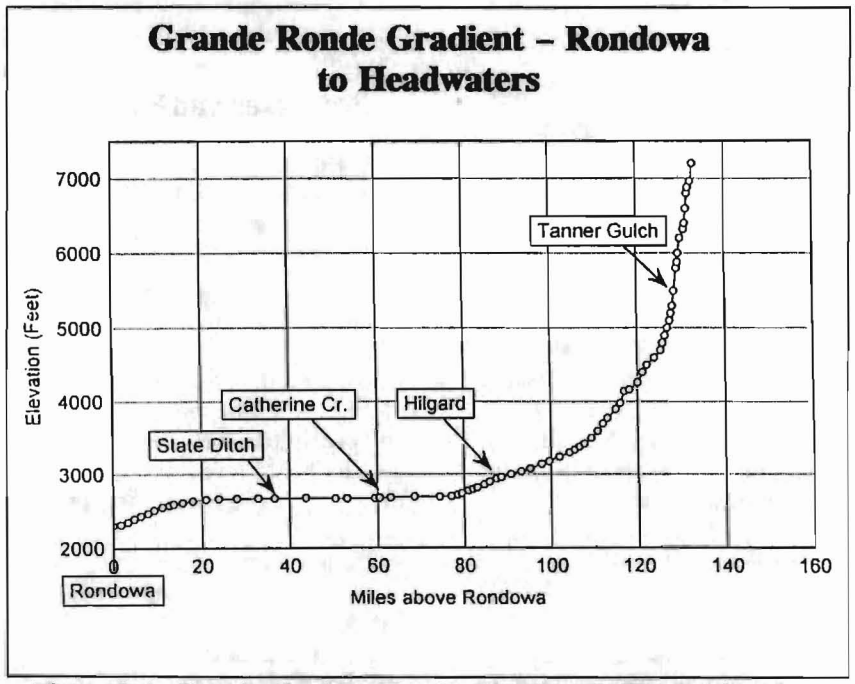


Figure 2-4: Longitudinal Profiles for The Grande Ronde River from Rondowa to The Headwaters

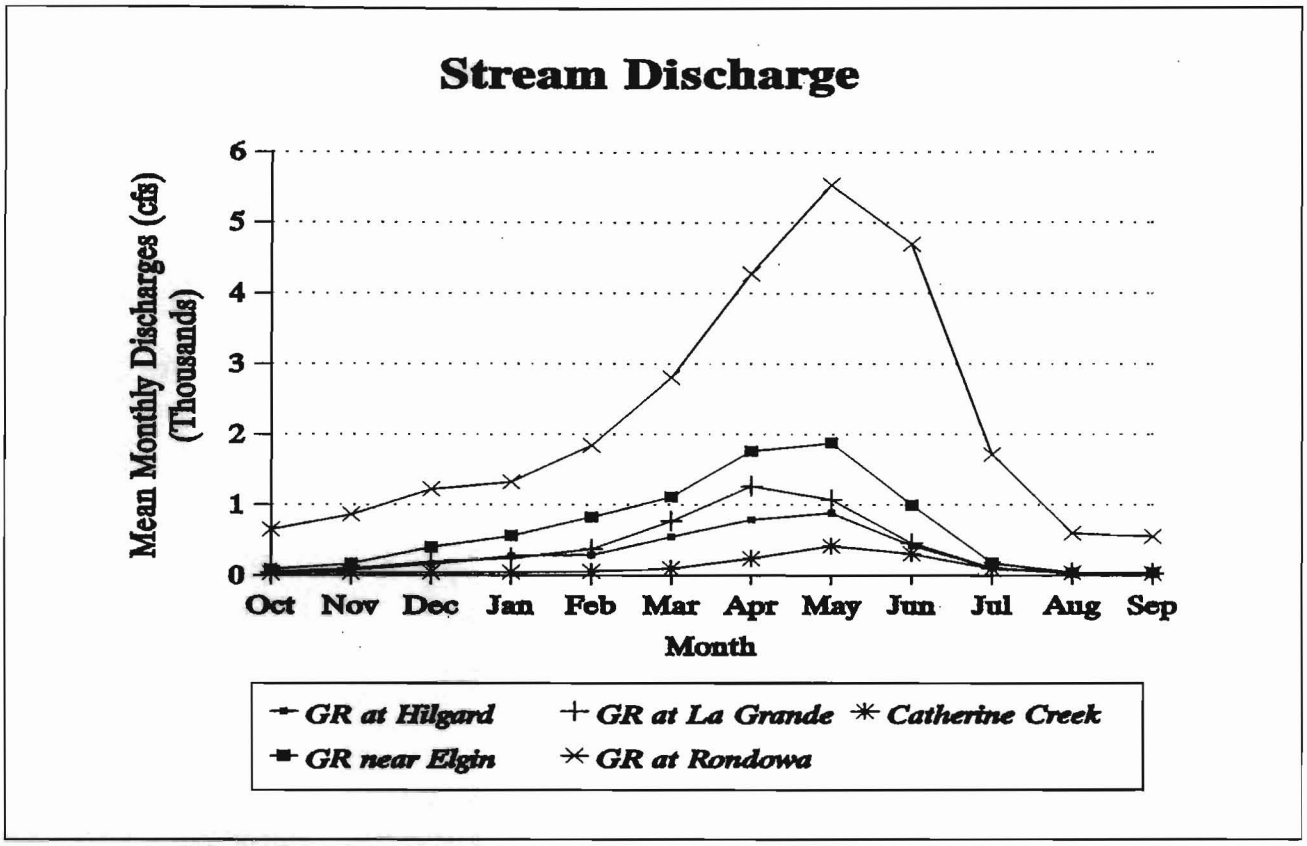


Figure 2-5: Stream Discharge in The Grande Ronde River and Catherine Creek

period of record varies for each of these stations: Grande Ronde River at Rondowa, 1926–1987; Grande Ronde River at Elgin, 1955–1981; Grande Ronde River at La Grande 1918–1987; Grande Ronde River at Hilgard, 1966–1982; Catherine Creek, 1911–1987. Runoff in the watershed is primarily derived from snowmelt, with peaks typically occurring in spring. As little precipitation occurs from June through October, streamflows are generally low in the summer through early fall. Water shortages for irrigation or instream flows often occur during this period. A combination of natural conditions and water withdrawals causes some of the smaller streams in the basin to go dry for part of the summer period.

3

WATERSHED ISSUES AND RESOURCE VALUES

SALMONIDS

Salmonid species of concern in the Upper Grande Ronde include anadromous populations of spring/summer chinook salmon (*Oncorhynchus tshawytscha*) and summer steelhead (*Oncorhynchus mykiss*), and resident populations of bull trout (*Salvelinus confluentus*). Also present in the basin are populations of resident rainbow trout (*Oncorhynchus mykiss*) and brook trout (*Salvelinus fontinalis*). The National Marine Fisheries Service (NMFS) listed the Snake River spring/summer chinook salmon as a threatened species under the *Endangered Species Act* in May 1992, and upgraded the listing to endangered in August 1994. Bull Trout were reviewed for listing by the U.S. Fish and Wildlife Service. In June 1994, the status was determined to be "warranted but precluded", which was changed to "warranted" in February 1995.

In addition, Snake River spring/summer chinook are listed under the state *Endangered Species Act*. Bull trout are on the Oregon state sensitive species list. Summer steelhead (Snake River) are currently classified as a stock of concern by the Oregon Department of Fish and Wildlife, sensitive by the U.S. Forest Service, and are currently part of a Pacific Northwest regionwide review of steelhead stocks for potential listing under the *Endangered Species Act* by NMFS.

In 1993, a watershed classification subcommittee of the Oregon chapter of the American Fisheries Society compiled a database of "critical watersheds" throughout Oregon (Henjum et al., 1994). These watersheds, known as Aquatic Diversity Areas (ADAs) were delineated in an effort to:

- Help conserve the diversity of watersheds, habitats and indigenous aquatic fauna of Oregon,
- Establish refugia of native aquatic assemblages and corridors of migration, and
- Designate "reference watersheds" that could serve as a benchmark for evaluating effects of human disturbance.

The five ADAs in the Upper Grande Ronde River Subbasin are shown in Map 6, and are listed, along with their criteria for selection, in Table 3-1. These ADAs represent important areas for protection and restoration in the Upper Grande Ronde River Subbasin.

• Spring/Summer Chinook

The Grande Ronde Basin historically produced large runs of native spring chinook salmon. Since the early 1970's, the runs have declined substantially. Spawning ground surveys conducted on index streams throughout the basin document the decline (ODFW, et al.,

Table 3-1: AFS Aquatic Diversity Areas

Aquatic Diversity Area	Ecological Criteria	Description
North Fork Catherine Creek	GR	Important spawning area for the Catherine Creek population of spring chinook.
		Provides a significant amount of high quality, intact habitat for a viable population (multiple age classes observed) of bull trout.
		Supports a wild steelhead population.
Upper Grande Ronde River Complex	HS	Extreme vulnerability (highly erodible soils) in critical habitat for spring chinook.
		Several disjunct populations of bull trout limited to headwaters of smaller drainages.
		Several FS roadless areas in the upper area.
		Habitat is critical and should be restored and/or protected.
Beaver Creek	EF	Upper end is intact and habitat has been protected as the city watershed; provides good quality habitat and water.
Five Points Creek	EF	Relatively intact habitat; impacts to the system have been low.
Indian Creek	EF	Fairly large portion of the upper watershed is unroaded, in good shape, and has good water quality.
	GR	Disjunct population of bull trout in the very upper Indian and Camp Creeks.
		Provides spawning and rearing for spring chinook.
Lookingglass Creek	GR	Bull trout population has intact habitat.
		Provides habitat for chinook salmon.

LEGEND:

GR = Genetic Reserve HS = Highly Sensitive EF = Ecological Function

1990). Since 1975, Grande Ronde spring chinook must pass a total of four Snake River and four Columbia River dams during their migration. These dams are Bonneville (year in service, 1938), The Dalles (1957), John Day (1968) and McNary (1953) on the Columbia and Ice Harbor (1961), Lower Monumental (1969), Little Goose (1970) and Lower Granite (1975) on the Snake River. In addition to passage problems at the dams, riparian and instream habitat degradation within the Grande Ronde Basin have also contributed to the decline in chinook abundance.

Current distribution of spring chinook is shown in Map 6. The distributions shown on this map are general estimates based on surveys and professional knowledge (Jeff Zakel, Oregon Department of Fish and Wildlife (ODFW), personal communication). The information was gathered from biologists, and digitized into GIS at a scale of 1:100,000. These maps are part of an ongoing effort at ODFW to develop fisheries distributions at 1:100,000. Distributions of threatened and endangered salmonids are currently available for the state; distributions of other species will be available in the future (Milton Hill, ODFW, personal communication). Map 6 shows that spawning generally occurs along parts of the mainstem of the Grande Ronde River, Catherine Creek, Sheep Creek, Indian Creek and Lookingglass Creek. Summer rearing occurs in these streams as well as parts of Clear, Meadow, Fly, Milk and Lick creeks. For the distributions shown in Map 6, confidence in spawning and summer rearing locations is high, but knowledge of winter rearing locations is somewhat limited. Chinook trapping experiments conducted by ODFW suggest that winter rearing takes place along the mainstem of the Grande Ronde between Starkey and Elgin. Low winter temperatures in higher streams may be limiting winter rearing.

Anecdotal information indicates that historic spawning distributions may have included the lower part of Meadow Creek, the mainstem of the Grande Ronde as far downstream as La Grande, the lower part of Indian Creek, and parts of Five Points and Beaver Creeks (Jeff Zakel, ODFW, personal communication).

Most Grande Ronde spring chi-

nook enter the Columbia Basin in April and May (ODFW et al., 1990). By June or July, the adults are holding in the Grande Ronde Basin. Spawning usually occurs in August and September. Eggs incubate in the gravel over the winter and fry emerge between January and March. Most juveniles rear in the basin for one year before migrating to the ocean as smolts between March and May.

• Summer Steelhead

The Grande Ronde Drainage also historically produced large runs of native summer steelhead (ODFW et al., 1990). Spawning ground surveys conducted annually since 1964 indicate that summer steelhead returns declined dramatically through the 1970's and early 1980's, and increased again in the late 1980's (ODFW et al., 1990). Declines again occurred for the 1993-1994 and 1994-1995 runs (Jeff Zakel, ODFW, personal communication). As with chinook salmon, declines are related to passage problems at the dams as well as within-basin habitat degradation.

Current distribution of summer steelhead is shown in Map 7. Steelhead can spawn in smaller streams and use a larger variety of habitat than chinook; therefore, their distribution is more extensive. Upstream distribution of steelhead is limited by natural and constructed barriers in Limber Jim, Jarboe, Mottet, Little and Beaver Creeks. Spawning occurs throughout the basin, but rearing is somewhat limited in lower tributaries and the lower mainstem due to habitat conditions (ODFW, et al., 1990). Several streams are used for rearing only, including the mainstem from Catherine Creek to Dry Creek (which includes the historic Grande Ronde channel), the State Ditch, and Catherine Creek from the mouth to Union.

Steelhead have a highly variable life history. Most summer steelhead enter the Columbia basin from July through October (ODFW, et al., 1990). Most adults enter the Grande Ronde between September through March. Spawning occurs from March through the end of May, with peak spawning in April and May. Fry emerge from mid-June through July. Limited data indicate that most summer steelhead rear for two years in the Grande Ronde River. Most smolt migration occurs from April through June.

• Bull Trout

Historical information indicates that bull trout once used a large portion of the Upper Grande Ronde area (USDA-Forest Service, 1994b). Habitat degradation and introduction of non-native species has likely contributed to a decline in bull trout populations throughout the Upper Grande Ronde. Current known distributions are shown in Map 8. Spawning generally occurs in the upper headwaters of the Grande Ronde River, Catherine Creek, Limber Jim Creek, Clear Creek, Chicken Creek, Indian Creek and Lookingglass Creek. Rearing occurs in these areas, as well as throughout the mainstem of the Grande Ronde and Catherine Creek. Bull trout are extremely sensitive to elevated water temperatures and stream sedimentation.

• Habitat Requirements

In general, salmon and steelhead need a sufficient amount of cool, clean water in which to spawn and rear. Spawning requirements include sufficient minimum flows, abundance of spawning gravel, and temperatures generally below 55°F for chinook and steelhead (Smith, 1975) and below 50°F for Bull Trout (Philip Howell, USFS, personal communication). Size of spawning gravel varies by species, ranging from less than 1 inch up to 6 inches. Chinook generally use larger gravel than steelhead, while resident trout use smaller sizes (Smith, 1975). Spawning beds must be relatively free of fine sediment, and not be highly compacted. Excessive fine sediment can result in a decreased supply of dissolved oxygen for incubating eggs, and reduce fry emergence. Juvenile rearing requirements include abundance of large woody material and pools for shelter, high dissolved oxygen levels, and temperatures generally below 59°F for chinook and steelhead (Rhodes et al. 1994) and below 50°F for bull trout (Philip Howell, USFS, personal communication. Available rearing area is influenced by water flow and temperature. Elevated summer water temperatures, caused in part by a lack of shade from riparian areas, coupled with low streamflows, can greatly reduce the area of available rearing habitat. Adequate flows are also required for anadromous fish migration, both upstream migration of adult fish and downstream migration of juveniles. More detailed information on habitat requirements is provided in Section 4. An excellent literature review of habitat requirements for salmonids and impacts of habitat degradation can be found in Rhodes et al., 1994.

SPECIAL STATUS TERRESTRIAL SPECIES

The Upper Grande Ronde Subbasin

is home to 34 rare animal and plant species. Many of these are listed as threatened or endangered with the U.S. Fish and Wildlife Service, Oregon Department of Fish and Wildlife (animals only), and Oregon Department of Agriculture (plants), which gives them protected status on state and federal lands. ***State endangered species laws do not provide protection for these species on private lands, and federal law has jurisdiction on private land for listed animals only***. In addition to listed species, several other species are candidates for listing or are considered rare by other groups, such as the *Oregon Natural Heritage Program*. The special status and jeopardy of some of these species make them high-priority resource values to target for conservation and restoration. The Upper Grande Ronde Subbasin contains 150 of the 549 reported occurrences of these species in the Grande Ronde Basin as a whole.

• Animals

A total of 20 rare animal species occur in the Upper Grande Ronde Subbasin. Three are considered threatened or endangered by state or federal agencies (bald eagle, california wolverine and american peregrine falcon), eight are considered sensitive by the state, and the remaining nine are considered rare by the *Oregon Natural Heritage Program*. These species are represented by 95 sightings in the subbasin (this total includes both historic and current reports). Table 3-2 lists these animals, their abundance in the drainage, and their legal status (*Oregon Natural Heritage Program*, 1993). The distribution of these species is shown in Map 6. There is a high probability that there are undiscovered sites for some of these species.

Protected Species — Bald Eagles use old growth habitat close to major fishery resources. The area from Vey Meadow to Fly Creek along the Grande Ronde River corridor is identified as a potential nest site by the Bald Eagle Recovery Plan and high quality nesting habitat occurs on adjacent private holdings, specifically the uplands surrounding the Vey Meadow area. The locations of roads and campgrounds create high potential for disturbance of bald eagles along the Grande Ronde River between Vey Meadows and Fly Creek (USDA–Forest Service, 1994b). The lower reaches of Fly Creek, including the area around its confluence with the Grande Ronde River, have been identified as a potential bald eagle winter roost site.

Wolverines prefer mature or intermediate-aged timber stands at elevations around 5,000 feet to near timberline. They are scavengers, relying largely on large ungulate herds, and their range appears to cover large distances. Declining habitat due to timber harvesting is impacting this species. The Peregrine falcon, listed as endangered under both state and federal programs, has been predominantly impacted by environmental contaminants, especially DDT. The Oregon Department of Fish and Wildlife has been involved in a reintroduction program throughout Oregon over the past 10 years. The success of this program may lead to down-listing in the near future (Mark Henjum, ODFW, personal communication).

Sensitive Species — Several of the species listed as sensitive by the state have only one known population in the Upper Grande Ronde Subbasin. These include the yellow-billed cuckoo, upland sandpiper, Lewis's woodpecker and pacific fisher. The yellow-billed cuckoo relies on large riparian forests for habitat; loss of riparian areas due to urbanization, agriculture, grazing and timber harvest have likely impacted this species. Upland sandpipers use grassy fields and prairies during migration, and nest around wet areas, often near open-canopy forested edges. Breeding habitat is composed of high elevation meadows that have a mosaic of grasses, sedges and herbaceous plants. Lewis's woodpecker occurs primarily in riparian areas that have large cottonwoods, or burned over ponderosa pine forests. The pacific fisher is a medium-sized furbearer generally found in conifer forests with high canopy cover. Fishers appear to prefer dense mature and old-growth forests.

Low numbers of populations are also reported for the painted turtle, three-toed woodpecker and pacific western big-eared bat. Painted turtles require slow moving or still, shallow waters with soft bottoms. Drainage, water diversions and grazing are land use activities of concern. The pacific western big-eared bat has experienced widespread declines throughout Oregon. Impact on habitat, mainly due to human disturbance through recreational use of caves and vandalism, has eliminated or reduced use at many historical sites. The three-toed woodpecker is generally found in mature or old-growth lodgepole pine or mixed grand fir-lodgepole pine. Since feeding occurs on dead and dying trees, removal of insect-infested timber through salvage operations, and conversion of mature and old-growth forests to young stands has likely impacted this species.

The Northern Goshawk also occurs predominantly in mature and old-growth forests. It requires dense

Table 3-2: Special Status Animals and Plants Found in The Upper Grande Ronde Subbasin

The number of populations is the number of reported sightings of each species as of April 1994.

Upper Grande Ronde Subbasin (Hydrologic Unit Code 17060104)	Status		No. Sightings
	Fed	State	
Animals			
Bald eagle (*Haliaeetus leucocephalus*)	E	E	10
California wolverine (*Gulo gulo luteus*)	C2	T	4
American peregrine falcon (*Falco peregrinus anatum*)	E	E	8
Yellow-billed cuckoo (*Coccyzus americanus*)	3B	SC	1
Painted turtle (*Chrysemys picta*)	–	SC	2
Upland sandpiper (*Bartramia longicauda*)	–	SC	1
Three-toed woodpecker (*Picoides tridactylus*)	–	SC	5
Pacific western big-eared bat (*Plecotus townsendii townsendii*)	C2	SC	3
Lewis woodpecker (*Melanerpes lewis*)	–	SC	1
Northern goshawk (*Accipiter gentilis*)	C2	SC	27
Pacific fisher (*Martes pennanti pacifica*)	C2	SC	1
Boreal owl (*Aegolius funereus*)	–	–	3
Ring-necked duck (*Aythya collaris*)	–	–	1
Swainson's hawk (*Buteo swainsoni*)	3C	SV	17
Bobolink (*Dolichonyx oryzivorus*)	–	SV	4
Common loon (*Gavia immer*)	–	–	1
Greater sandhill crane (*Grus canadensis*)	–	SV	1
Harlequin duck (*Histrionicus histrionicus*)	C2	SP	2
Long-billed curlew (*Numenius americanus*)	3C	–	2
Columbian sharp-tailed grouse (*Tympanichus phasianellus columbianus*)	C2	–	1
Total	**—**	**—**	**95**
Plants			
Oregon semaphoregrass (*Pleuropogon oregonus*)	E	E	3
Crenulate moonwort (*Botrychium crenulatum*)	C2	C	1
Meadow lomatium (*Lomatium pastoralis*)	–	–	1
Blue Mountain lupine (*Lupinus burkei* ssp. *caeruleomontanus*)	–	–	4
Sabine's lupine (*Lupinus sabinii*)	–	–	9
Many-flowered phlox (*Phlox multiflora*)	–	–	1
Sierra onion (*Allium campanulatum*)	–	–	1
Swamp onion (*Allium madidum*)	–	–	3
Long-bearded mariposa lily (*Calochortus longebarbatus* var. *longebarbatus*)	3C	–	4
Lance-leaved grape-fern (*Botrychium lanceolatum*)	–	–	1
Moonwort (*Botrychium lunaria*)	–	–	3
Gray moonwort (*Botrychium minganense*)	–	–	6
Mountain grape-fern (*Botrychium montanum*)	–	–	12
Male fern (*Dryopteris filix-mas*)	–	–	5
Ground cedar (*Lycopodium complanatum*)	–	–	1
Total	**—**	**—**	**55**
Upper Grande Ronde HUC Total	**—**	**—**	**150**
Grande Ronde River Basin Total Animals (for comparison)	**—**	**—**	**309**
Grande Ronde River Basin Total Plants (for comparison)			**341**

LEGEND:

Federal: E=Endangered; T=Threatened; C2=more information necessary to list; 3B=taxonomic problem; 3C=too common or no threats.

State: E=Endangered; T=Threatened; SC=critical, listing imminent; SV=vulnerable, listing not imminent if populations managed; SP=peripheral, Oregon populations are at edge of species' range; C=candidate.

Other: Not listed by state or federal agencies, but considered by the *Oregon Natural Heritage Program* to be threatened or endangered in Oregon, more information necessary, or considered rare but stable.

Source: *Oregon Natural Heritage Program* **Database**

overhead foliage and a high degree of canopy cover. The Goshawk is an indicator species for mature and old-growth forests on the Wallowa-Whitman National Forest. Other species of concern in the Upper Grande Ronde Subbasin that rely on mature and old-growth forest or dead and dying trees include the pigmy nuthatch, flammulated owl, white-headed woodpecker, black-backed woodpecker, american marten and pileated wood pecker. The american marten and pileated woodpecker are also indicator species for old-growth on both the Wallowa-Whitman and Umatilla National Forests. Reduction in amount and size of old growth stands, removal of diseased trees and snags, and forest fragmentation have greatly impacted these species.

More detailed information on the above species, as well as many others, can be found in Marshall (1992a,b) and Henjum et al. (1994).

• Plants

A total of 15 rare plant species currently occur in the Upper Grande Ronde Subbasin. One (Oregon semaphoregrass) is considered endangered by the U.S. Fish and Wildlife Service and Oregon Department of Agriculture, two (crenulate moonwort and long-bearded mariposa lily) are candidates for listing, and the remaining 12 are considered rare by the *Oregon Natural Heritage Program*. Very little information is available regarding the pre-settlement distribution and abundance of these plants. These species are represented by 55 sightings in the basin (this total includes both historic and current reports). In the case of plant species, each sighting is considered a population. Table 3-2 lists these plants, their abundance in the basin, and their legal status. The distribution of these species is shown in Map 6. Approximately one third of all U.S. Forest Service lands in the drainage have been surveyed for special status plants, and there is a high probability that additional undiscovered sites are present (USDA–Forest Service, 1994b).

Protected Species — Oregon semaphoregrass is listed by federal and state agencies as endangered. The known *global* distribution of the species includes three small patches in the Upper Grande Ronde Subbasin near Ladd Canyon, as well as a small population in Lake County, Oregon. In the Upper Grande Ronde Subbasin, all of the known plants are on private land, although one is currently protected by an easement with The Nature Conservancy. The species occurs in wet meadows, especially around seeps and springs. Extensive surveys for this species have been conducted on public lands, but additional sites may occur on private holdings, especially in wet places in rangelands (and possibly forest openings) from La Grande south to the foothills above Union.

Candidate Species — Only one population of crenulate moonwort is known in the Upper Grande Ronde Subbasin. This species occurs in moist or very moist meadows within forests at moderate to high elevations. Surrounding forests are typically dominated by Engelmann spruce and lodgepole pine. Most of the crenulate moonwort populations in the region are in the Wallowa Mountains, but additional undiscovered populations may yet be found at higher elevations of the Upper Grande Ronde Subbasin.

Four populations of long-bearded mariposa lily are known, all in the western-most lobe of the subbasin. The populations occur in meadows and drainage swales that are wet in winter and spring, usually in forest openings surrounded by Ponderosa Pine-Douglas-fir forests. The Upper Grande Ronde populations represent the eastern-most occurrences of the species in Oregon. This species has a patchy distribution from eastern Washington to northern California. Thus, the Upper Grande Ronde represents a relatively small and peripheral portion of the species' range.

Other Rare Species — Twelve special status plant species that are neither candidates nor listed as threatened or endangered at this time are discussed below as functional groups. Nearly all of the grapeferns and moonworts (*Botrychium* spp.), for example, occur in moist to very moist meadows at moderate or high elevations in the basin. Often two or more species occur at the same site. The highest concentration of these species in the subbasin, including crenulate moonwort, gray moonwort, lance-leaved grapefern, mountain grapefern, and pinnate grapefern, is in forest openings due east of Imbler and Alicel near the headwaters of Clark and Indian Creeks. Moonwort also occurs in two populations near the headwaters of Catherine Creek, and mountain grapefern occurs at one additional site on upper Fly Creek and two near the headwaters of the Grande Ronde River. Male fern and ground cedar are found in wet areas in forests, such as seeps and riparian zones. There are five populations of male fern in the subbasin, scattered widely across National Forest land. The only known population of ground cedar in the subbasin occurs near the headwaters of the Grande Ronde River, also on National Forest

land. Sierra onion and swamp onion, both of which are uncommon in the Upper Grande Ronde subbasin, but more common elsewhere in the state, are found in openings and meadows in forests that are wet in winter and spring and dry in summer. Blue Mountain lupine and Sabine's lupine are species found in Ponderosa pine forests at moderate to higher elevations in the northern parts of the basin, especially up Lookingglass and Gordon Creeks.

Habitat conservation is the most effective way to protect populations of threatened and endangered species. In some cases, this may only be accomplished by making the habitat off-limits to disturbance, either through fencing to exclude cattle, withdrawal from consideration for timber harvest or mining, or other means. In other cases, disturbances may be permitted at certain times of year, such as during the season when the species are not present (e.g., migratory animals), or are not active (e.g., plants that are dormant in winter).

ECOSYSTEM FUNCTION

Diversity of vegetation and wildlife is an important part of Oregon's biological value. The Oregon Natural Heritage Plan (prepared by the Natural Heritage Advisory Council to the State Land Board) lists terrestrial and aquatic ecosystems that represent Oregon's diversity. Important natural areas are identified as ecosystem 'cells' in the Plan, and partnerships are formed with state and local agencies and private land owners to 'register' these sites for protection. Representative ecosystems on federal lands are recognized as Research Natural Areas (RNAs) and Areas of Critical Environmental Concern (ACEC), but are not registered with the state. Recognition and protection of areas representative of each ecosystem can help maintain examples of Oregon's biota for future generations.

In the Upper Grande Ronde Subbasin, only one area has been registered under the Oregon Natural Heritage Plan. Ladd Marsh (managed by Oregon Department of Fish and Wildlife) contains significant examples of aquatic ecosystems in Oregon, and was registered in 1988. Several other important ecosystems that have not been registered occur in the Upper Grande Ronde, and these are listed in Table 3-3. Priority for protection of these ecosystems is high.

"Diversity of vegetation and wildlife is an important part of Oregon's biological value."

The primary threats to the ecosystems identified in the Oregon Natural Heritage Plan (Natural Heritage Advisory Council, 1993) are land development, cattle and sheep grazing, logging, mining, road building, and other activities that alter the hydrology or vegetation of the habitat. Often the ecosystems can sustain limited resource use if the disturbance is timed to avoid critical seasons or extremely sensitive areas. In addition, some ecosystems require a form of disturbance, such as periodic fires, for long-term survival. Compatibility of ecosystems with resource use will vary on a case by case basis, and cannot be adequately covered here. Complete basinwide information on the condition of Upper Grande Ronde ecosystems is not available at this time.

HUMAN USES

Municipal drinking water supply systems are located at the cities of La Grande, Union and Elgin. Water supply for all three sites is currently obtained completely from groundwater. A backup supply for the City of La Grande is available from the reservoir on Beaver Creek. Requirements for drinking water include low dissolved solids and low chemical and bacterial concentrations.

Recreation activities include swimming, boating and fishing, all of which require sufficient quantity and quality of water. There are several state parks and numerous campgrounds within the Subbasin, as well as several local and municipal parks around the La Grande area. Additionally, portions of the river experience very heavy recreation use. Map 8 shows the location of major water contact recreation areas within the basin. General requirements for recreation include moderated stream temperatures, low levels of turbidity, and low chemical and bacterial concentrations.

A sustained supply of water is also needed for industrial and agricultural activities. Irrigated agriculture, which occurs throughout the Grande Ronde and Elgin Valleys and along parts of Catherine Creek, is dependent upon streamflow during the summer growing season. Supply is often insufficient to meet demand.

Table 3-3: Ecosystem Cells Identified in The Oregon Natural Heritage Plan That Occur in The Upper Grande Ronde Subbasin

None of these ecosystems are adequately protected at this time, and priority for protection is high.		
Vegetation of Ecosystem Type	**Ecosystem Name**	**Land Owner of Known Locations**
Terrestrial Ecosystems		
Ponderosa Pine Zone	Ponderosa pine/Idaho fescue community	USFS
	Douglas fir/ocean spray community	USFS
Grand Fir Zone	Grand fir/beadily community	USFS
	Grand fir/swordfern-wild giner community with grand fir/oakfern	USFS
	Grand fir/pinegrass with grand fir/Columbia brome	USFS
	Grand fir/Pacific yew communities	USFS
Shrub-Grasslands	Valley margin shrubland/grassland with big sagebrush, threetip sagebrush and bunchgrasses	BLM, PVT
Special Types	Mid-elevation riparian forest with cottonwood and Ponderosa pine	USFS
Aquatic & Wetland Ecosystems		
Riverine	First to third order stream systems in Dougals Fir zone, with waterfall/plunge pools	USFS
	First to third order stream systems in Grande Fir zone, with waterfall/plunge pools	USFS
Palustrine	Low elevation vernal pond with saltgrass and cordgrass	BLM, PVT
	Bulrush-cattail marsh, with aquatic beds	ST
	Hot springs	ST, PVT
	Playa with greasewood, alkali bluegrass, Great Basin wildrye and tufted hairgrass	BLM, PVT
	Riparian community dominated by mountain alder and snowberry, with Douglas spiraea	USFS, BLM, PVT
	Riparian community dominated by mountain alder, creek dogwood, and black cottonwood, with snowberry	USFS
	Riparian community dominated by mountain alder and quaking aspen	USFS, PVT
	Riparian community dominated by mountain alder, western birch and willow	USFS, BLM
	Riparian community dominated by Booth willow and Lemmon willow	USFS, PVT
	Riparian community dominated by coyote willow and Pacific willow	BLM, PVT
	Riparian community dominated by rigid willow and golden currant	BLM, USFS, PVT
	Riparian community dominated by coyote willow with black cottonwood	USFS, PVT

LEGEND:

USFS = U.S. Forest Service BLM = Bureau of Land Management PVT = Private ST = State