5

Land Use Activities and Their Interaction With The Landscape

General Land Use

In the Upper Grande Ronde Subbasin, broad land use patterns can be identified based on topographic position. Map 12 shows general land use categories based on a 1979 USGS land use/land cover GIS datalayer (U.S. Dept. of Interior, 1982). Although this coverage is about 15 years old, general land use patterns have not changed dramatically in that time. Map 12 shows that agriculture is the dominant land use in the Grande Ronde Valley. As elevation begins to increase, land use changes from cultivated crops to more pasture and rangeland. Significant range activities occur in vegetation types identified as grasslands and shrublands in the GAP analysis (see Map 5). Grazing also occurs higher up in the subbasin, particularly in areas that have ponderosa pine as a predominant vegetation type. These areas tend to have an open canopy with sparse understory, resulting in forage availability for grazing animals. Grazing occurs in these areas on both public and private land. Range activities also occur in several large meadow areas on private land higher up in the subbasin, for example Vey Meadows. Industrial activities and wastewater treatment occur in and near urban areas. Mining activity is also scattered throughout the subbasin. In the higher elevations, the predominant land use is timber and related forest products. Extensive land use can have a detrimental effect on the ability of the subbasin to sustain the various resource values. The cumulative effect of impacts to riparian habitat is a major limiting factor to natural fish production in the subbasin (ODFW et al.,1990).

Agriculture

Most of the agricultural activity occurs within the Grande Ronde and Elgin Valleys. In developing this area for agricultural production, many acres of previously flooded valley-bottom land were drained, and several segments of the Grande Ronde River were channelized to prevent flooding and manage water delivery. The most significant channelization is the State Ditch, which bypasses approximately 33 miles of previous valley-bottom stream channel. The result of channelization and conversion to agriculture has been a dramatic decrease in riparian area within the Grande Ronde Valley, with subsequent loss of rearing habitat for juvenile salmonids (ODFW et al., 1990).

Due to low summer streamflows, much of the agriculture in the Upper Grande Ronde Subbasin is dependent upon irrigation water. Map 12 shows a breakdown of the surface irrigation water rights, calculated for each quarter-quarter section of land (40 acres). Although this only shows a "right" to irrigate, and not actual irrigation for any given season, it does provide an indication of where irrigation is occurring within the subbasin. These areas show irrigation from surface water only; additional irrigation occurs from groundwater sources. Areas with a large number of acres with an irrigation water right indicate locations of concern with regard to water quantity and quality issues. Associated with this information on irrigation water rights is a GIS map layer which shows location of irrigation diversions (not shown in this document). As documented in the discussion on water availability, water is overappropriated along the Grande Ronde River between La Grande and Elgin. Areas with a large number of irrigated acres have the potential for reduced water use through irrigation efficiency or changes in land use. Locations of large, ungaged irrigation diversions represent the potential for reduced water use through gaging and monitoring to prevent excess or illegal diversions. The information in these GIS layers, along with the associated database, should be used as a planning tool by water managers to improve water quantity conditions.

Water quality issues are also of concern in areas with heavy irrigation. Irrigation, particularly flood irrigation, increases runoff and subsurface drainage from agricultural fields. This can result in increased erosion and subsequent sediment delivery to streams, and movement of agricultural chemicals (pesticides, herbicides and insecticides) to surface and groundwater. Water quality problems have been documented in the Grande Ronde Valley. Further monitoring is needed to determine linkages between specific agricultural uses and water quality concerns.

An additional concern from irrigated agriculture is potential losses of fish at unscreened diversions, and passage problems due to diversion structures. Water and fisheries managers should review the maps showing irrigation water rights (Map 14) and location of irrigation diversions (not shown) to identify areas with a high potential for screening or passage problems. Subsequent field investigations and proposed solutions should follow. Agricultural development can also have an adverse impact on sensitive species such as the yellow-billed cuckoo, Lewis's Woodpecker and the painted turtle, which require naturally flowing streams and intact floodplain and riparian areas.

GRAZING

Unless properly managed, livestock congregate around stream channels, where water and forage are abundant. This causes severe reductions in the amount and diversity of riparian vegetation, and increases soil compaction and streambank erosion. These changes severely reduce riparian function, with subsequent increases in stream temperature, sediment deposition in spawning and rearing areas, and alterations in streamflow patterns (MacDonald et al., 1991; Platts, 1991; Rhodes, et al., 1994). Early records of livestock grazing in the subbasin indicate that the area had been subjected to overgrazing as early as the late 1800's (McIntosh, 1992). Although livestock grazing has declined since that time, some of the current grazing activity continues to contribute to the water quality and fish habitat limitations documented in Section 4, and the continued decline in salmonid populations. In many streams, habitat conditions are significantly lower than criteria levels. Grazing impacts may affect other sensitive vertebrates such as the yellow-billed cuckoo and Lewis's woodpecker due to loss of intact riparian area, and the upland sandpiper due to habitat modification in high-elevation meadows. Grazing by cattle, especially in early spring to mid-summer, can also cause damage to some special status plants such as many-flowered phlox, Oregon semaphoregrass, long-bearded mariposa-lily, grapeferns, and moonwort.

There is no site specific information on location of range activities for the Upper Grande Ronde Subbasin as a whole. Grazing occurs on private land within the Grande Ronde Valley and in high elevation meadow areas (Map 12). Grazing also occurs on public land within the Wallowa-Whitman and Umatilla National Forests on specified range allotments. In the Upper Grande Ronde Subbasin, there are currently 13 allotments on the Wallow-Whitman National Forest with a total of 139,750 acres. Most of the grazing on the Wallowa-Whitman is allocated for domestic livestock grazing an average of four months per year, primarily during the summer months (USDA-Forest Service, 1994b). On the Umatilla National Forest, there is currently 1 sheep allotment (6 units) with approximately 83,300 acres, and 1 cattle allotment (4 units) with approximately 2,440 acres (Northrup and Westlund, 1994; USDA-Forest Service, 1994a). Grazing occurs from June 1 through September 30.

Specific locations of allotments, number of grazing animals per allotment, utilization standards and management plans can be obtained from the Walla Walla Ranger District of the Umatilla National Forest, and the La Grande Ranger District of the Wallowa-Whitman National Forest as well as from the Biological Assessments completed for Section 7 consultation under the *Endangered Species Act*. Management of grazing occurs through allotment management plans and annual operating plans which identify utilization standards for vegetation subjected to grazing. Currently, the National Forests are focusing on meeting these standards, as well as forest plan standards and guidelines for riparian and stream conditions, through improved grazing management systems, riparian fencing and development of upland water systems. Future basin-wide efforts to improve riparian conditions need to focus on privately owned rangelands. Many restoration techniques are available, including excluding cattle from the riparian corridor, limited grazing periods, reduced stocking rates and various rotational systems.

MINING

Map 12 shows the location of mining sites obtained from the MILOC database (Gray, 1994). Historic placer gold mines are found in the headwaters of the Grande Ronde River, while aggregate mining for sand and gravel occurs along many of the stream channels throughout the subbasin. Placer mining began in the 1860's at the mouth of Tanner Gulch where it entered the Grande Ronde River. Operations at the Camp Carson site, one of the largest hydraulic placer mines in the state, began in 1863 and continued as recently as the 1980's. Two large earthen dams were constructed to serve as impoundments for captured water. Four major pits were sluiced into Tanner Gulch and Clear Creek, and a fifth pit discharged directly into the Grande Ronde River opposite the mouth of Muir Creek (USDA-Forest Service, 1994b). Significant mass wasting has occurred at Reed Pit at the Camp Carson site. The slide is a disturbed mass of silt, claystone and washed gravels that has been pushed up a steep hillside, and is now sliding into Tanner Gulch. This poses a serious sedimentation risk to critical spring chinook spawning habitat in the Grande Ronde River. Plans are to reclaim the site by stabilizing and revegetating the slide.

A number of smaller mines existed at the same time as the Camp Carson mine; several of these, although closed, may still be impacting the stream system. Dredging operations also occurred in the upper Grande Ronde River and some of its tributaries. The dredges worked the floodplain and active channel of the streams, leaving tailings composed of large boulders, cobble and gravel. The tailings, which are still present today, constrict the channel and have a significant impact on fish habitat. Several small natural and human-caused landslides in the area may also pose sedimentation risk to spawning habitat, the most notable being a slide on Clear Creek which is currently contributing sediment to the stream (Department of Geology and Mineral Industries, personal communication).

Aggregate mining is currently occurring along a number of stream systems within the subbasin. Active mines extract sand, gravel and rock used for construction purposes. Aggregate mining can impact streams by removing valuable spawning gravel, or altering channel morphology.

IDENTIFIED POINT SOURCES

There are several dischargers in the Upper Grande Ronde subbasin which have obtained National Pollution Discharge Elimination System (NPDES) permits. Of these, only one is considered a major source — the City of La Grande wastewater treatment plant discharge at RM 153.8. There are two permitted minor domestic wastewater treatment plant discharges: City of Union on Catherine Creek and City of Elgin on the mainstem Grande Ronde River downstream of the valley. These are all significant nutrient sources to the river. Effects of nutrient inputs to the Grande Ronde were discussed in the Water Quality section. There are also five minor permitted industrial discharges. In addition, there is a total of four toxic release inventory (TRI) and/or super fund (CERCLA) sites where spills (primarily petroleum products and resin components) have previously occurred.

VEGETATIVE HEALTH AND NOXIOUS WEEDS

• Forest Vegetation

Insect and disease outbreaks have occurred throughout this century as a result of both natural processes and management practices. While insect-mediated tree mortality is an important part of natural ecosystem processes, several factors have contributed to the decline in forest health documented today. The USFS began an active program of fire suppression the early 1900's. This led to a conversion from fire tolerant ponderosa pine and western larch to fire intolerant species such as true-fir and Douglas-fir. Selective harvest of late seral stage species, primarily Ponderosa pine, has furthered the move from open, patchy, uneven-aged stands to more dense, homogeneous, even-aged forests. Drought conditions over the past decade have added to vulnerability. Recent impacts from insects includes effects on lodgepole pine from mountain pine beetle in the late 1970's and early 1980's, and effects on douglas-fir and true-fir from western spruce budworm in the late 1980's through the present.

• Non-Forest Vegetation

Several factors affect the non-forested areas of the Upper Grande Ronde subbasin, which, in turn, affect the health of the rest of the system. For example, fire suppression has allowed big sagebrush to increase in blue-bunch wheatgrass communities, lowering forage quality for livestock and big game. Increases in rodent populations and grass-hopper outbreaks have had significant effects on upland shrublands. Upland mountain mahogany and bitterbrush communities in the Upper Grande Ronde Subbasin are currently below long-term natural levels because of periodic increases in deer and elk populations over the last 100 years. Invasive, introduced plant species occur over significant portions of the Upper Grande Ronde drainage, with several negative effects. Noxious weeds often completely replace the native vegetation, lowering forage value and habitat quality for wildlife and plants. Herbicide applications to control weed populations increase where the species invade, especially on agricultural lands and roadsides, which can increase concentrations of pesticide residues in aquatic systems. Some weeds are toxic to livestock (e.g., tansy ragwort), and weed seeds in crops lower the value of the harvest.

• Noxious Weeds

Noxious weed priorities for Union County and the Upper Grande Ronde are to:

- Prevent establishment of tansy ragwort,
- Slow the rate of spread of leafy spurge and yellow starthistle, and
- Prevent establishment of rush skeletonweed, squarrose knapweed, and common crupina through detection and eradication of infestations while they are still small (D. Isaacson, Oregon Dept. of Agriculture, pers. comm.).

Tansy ragwort in Union County is currently subject to treatment and/or monitoring, and no plants at over 100 known sites are allowed to go to seed. Leafy spurge is spreading aggressively in the drainage. Once established, the species is very persistent and can change riparian vegetation patterns. Most known infestations are subject to chemical treatment by Union County or biocontrol agents released by Oregon Department of Agriculture (ODA). Yellow starthistle is expanding its range rapidly in northeast Oregon, including the Upper Grande Ronde drainage, where some treatment has been initiated by Union County and ODA. A multi-agency project aimed at control of the species is underway near Cove. Other weed species in the subbasin include diffuse knapweed, purple loosestrife and whitetop.

TIMBER HARVEST AND ROAD CONSTRUCTION

• Overview

Timber harvesting and associated road building occur throughout the upper areas of the subbasin. Harvest activities began in the late 1800's and steadily increased through early 1990 (McIntosh, 1992). Timber harvest on private land remained at low levels until the mid-1920's, and increased somewhat through the 1930's and 1940's. Harvest levels remained fairly low on public land until the 1950's, when salvage logging began in response to insect outbreaks. Logging on private land also increased at this time. Currently, harvest activities continue at a fairly high rate, especially in areas experiencing outbreaks of the western spruce budworm.

Early harvest activities were limited to horse logging or splash dams, and were therefore focused on riparian areas and adjacent hillslopes. Splash dams, temporary structures built to impound large quantities of water which were then used to flush logs down channels, were used from the late 1800's to 1919 along Dark Canyon, Meadow and Fly Creeks and on the Grande Ronde River below Vey Meadows and Perry (McIntosh, 1992). Splash damming and associated log drives are believed to cause considerable damage to stream channels, and have a detrimental effect on all forms of aquatic life (Sedell, et al., 1991). Figures 4-1a,b,c through 4-3a,b,c and Figures 4-7a,b,c in Section 4 showed poor habitat conditions in these streams, which is likely a product of both past and current land use activities.

After 1920, the railroad extended its tracks to the upper portions of the subbasin, and timber was delivered to mills by rail. Road building also began at this time, although road densities remained low until the 1950's, when salvage operations began. McIntosh (1992) reports that the number of miles of roads on the Wallowa-Whitman National Forest increased steadily from 1957 to 1978, and more than doubled from 1978 to 1989. There are currently 952 miles of open roads and 508 miles of closed roads on Wallowa-Whitman National Forest land (Upper Grande Ronde Conservation Strategy) and approximately 450 miles of open, restricted and seasonal roads and 30 miles of closed roads on Umatilla National Forest land within the Upper Grande Ronde Subbasin (Northrup and Westlund, 1994; USDA-Forest Service, 1994a). Road densities vary from less than 1 mile/sq. mile to over 6 miles/sq. mile. The Access and Travel Management Plan for the La Grande Ranger District indicates that the number of open road miles will be reduced to 470 miles over the next four years (USDA-Forest Service, 1994b). On the Umatilla, the Access and Travel management plan should reduce the amount of open road to approximately 275 miles when fully implemented.

Road information for all land ownerships in the subbasin is less complete than on National Forest Land. Road locations and densities are obtained from the 1992 Tiger Line Files at a scale of 1:100,000. This information is somewhat general, and many of the small logging and farming roads do not register at this scale. Using this database, total roads in the subbasin cover about 7,500 miles. Average road density over the subbasin is approximately 2.3 miles/sq. mile, with densities of 2.19 miles/sq. mile in the Upper portion of the subbasin, 2.51 miles/sq. mile in the middle portion, and 2.26 miles/sq. mile in the Catherine Creek portion (see Map 1 and Table 2-1 in Section 2 for subdivision delineations). Roads within the riparian area are of particular concern due to stream channelization, reductions in stream shading and increased inputs of sediment.

• Impacts on Watershed Processes

Logging and roads in snow-dominated climates like eastern Oregon can increase peakflow (King, 1989; Chamberlin et al., 1991) and associated sediment delivery to streams, which can have serious impacts on fish and fish habitat (Everest et al., 1987; Chamberlin et al., 1991; Furniss et al., 1991; MacDonald et al., 1991). Changes in the flow regime can affect the complexity and stability of stream channels. The effect of management activities on flow can be the most pronounced in areas susceptible to rain-on-snow precipitation events. For the Upper Grande Ronde Subbasin, this generally occurs at elevations between 3,000 and 5,000 feet. Roading creates compacted surfaces that concentrate rainfall, creating increased runoff and subsequent erosion and sediment production (King and Tennyson, 1984). Roads cut across hillsides, intercepting subsurface flow and converting it to surface flow (Megahan, 1972). This reduces the travel time of water to the stream channel, as well as the baseflow contribution during summer low flow. Both of these changes can result in increased stream temperature. Sediment production and delivery from roads can be quite high (Megahan et al., 1978, Chamberlin et al., 1991), especially from unpaved or poorly roaded surfaces. Harvesting and roading within the riparian area create openings which directly reduce stream shade and potential input of Large Woody Material, and contribute to streambank instability.

• Analysis Methodology

Runoff and erosion are two watershed processes that can be greatly affected by timber harvest and roading. To facilitate analysis, the subbasin is stratified based on susceptibility to impacts that might affect these two physical processes. The subbasin is stratified separately for each of these processes to yield one stratification for runoff vulnerability and one stratification for erosion vulnerability. Data used in the schemes included soil sensitivity, slope, elevation and geology. Soil runoff potential and erosion potential were calculated as described in Section 2 (Soils). Elevation and slope are calculated using 90 m (1:250,000) Digital Elevation Model (DEM) data. Geology information is obtained from the 1:500,000 state geologic map.

Tables 5-1a,b show the matrices used for stratifying the watershed into runoff vulnerability and erosion vulnerability. For runoff, the matrix consists of a combination of soil and slope information. For erosion, the matrix consists of a combination of soil, slope and geologic information. Two geologic units are included in the stratification for erosion potential, units Tas and Tsfj (see Map 3 and Table 2-2 in Section 2). These two units tend to form fine-grained, easily erodible sediments; erosion potential is very high relative to the rest of the subbasin. Surveys have traced sediments from these two units many miles downstream (Ellen Bishop, personal communication).

Table 5-1a: Soils / Slope Stratification for Runoff Vulnerability

Soil Runoff Potential (as % of map unit)		Slope (%)					
High	Moderate	0 – 5	5 – 15	15 – 30	30 – 45	45 – 60	> 60
0 - 20	< 40	VL	VL	L	L	M	M
	> 40	VL	L	M	M	H	H
20 - 40	–	L	L	M	M	H	H
40 - 60	< 40	L	M	M	H	H	H
	> 40	L	M	H	H	H	VH
60 - 80	–	L	M	H	H	VH	VH
80 - 100	–	L	M	H	VH	VH	VH

LEGEND:

VL = Very Low L = Low M = Moderate H = High VH = Very High

Table 5-1b: Soils / Slope / Geology Stratification for Erosion Vulnerability

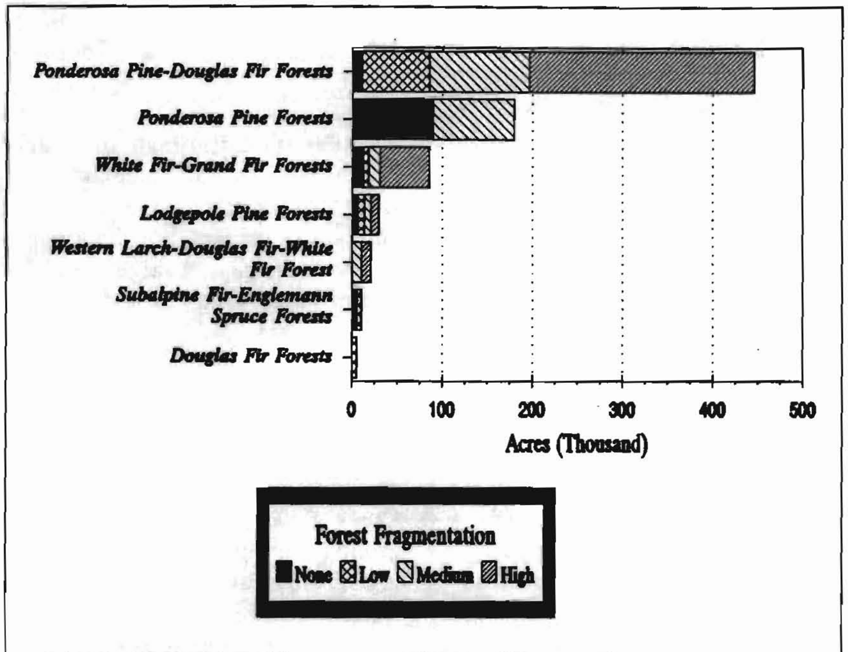
Soil Erosion Potential (as % of map unit)		Geology	Slope (%)					
High	Moderate		0 – 5	5 – 15	15 – 30	30 – 45	45 – 60	> 60
0 - 20	< 40		VL	VL	L	L	M	M
	> 40		VL	L	M	M	H	H
40 - 60	–	–	L	M	M	H	H	H
	–	Tas/Tsfj	M	H	H	H	VH	VH
60 - 80	–	–	L	M	H	H	VH	VH
	–	Tas/Tsfj	M	H	H	VH	VH	VH

LEGEND:

VL = Very Low L = Low M = Moderate H = High VH = Very High

Although slope information was also included in the original soil classification, this data represented very general slope information that was contained in STATSGO. Addition of slope information from DEM data further refines the influence of slope on the processes of runoff and erosion. Elevation data is not included in the matrix, but will be used in the analysis to delineate different precipitation regimes within the watershed. Elevations less than 3,000 feet are considered rain dominant regimes, elevations between 3,000 and 5,000 feet are considered rain-on-snow regimes, and elevations greater than 5,000 feet are considered snow dominant regimes. From the standpoint of runoff and erosion processes, the rain-on-snow regime is the most vulnerable to disturbance. For example, areas with high vulnerability to runoff that fall in the 3,000-5,000 foot zone are the most sensitive areas to watershed disturbance. Areas with high runoff vulnerability that are found either below 3,000 feet or above 5,000 feet would be less susceptible to disturbance as the precipitation regime tends to have less potential impact on the ground.

Information on forest fragmentation and roads is overlaid on runoff and erosion vulnerability to identify areas of high resource concern. Forest fragmentation refers the amount of an area that lacks intact, or continuous, forest cover due to natural conditions or management practices, and provides an indication of the impact of harvest activities. This information is delineated from the Oregon Gap Analysis (Kagan and Caicco, 1992). Figure 5-1 summarizes fragmentation for major forest species. Maps 13 and 14 show amount of forest fragmentation in



LEGEND:

None = No fragmentation Low = Up to 1/3 fragmented Medium = 1/3–2/3
High = Greater than 2/3 fragmentation

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

Figure 5-1: Fragmentation of Forest in The Upper Grande Ronde Subbasin

the subbasin, overlaid on runoff and erosion vulnerability, respectively. Also shown are areas of brushfields, recent clearcuts and fires, as delineated by the Oregon Gap Analysis. These are areas of limited or no canopy cover; they will be referred to here as "openings". Maps 15 and 16 show the distribution of roads in the subbasin, also overlain on runoff and erosion vulnerability.

• Results and Linkage to Aquatic Conditions

The impacts of landscape/landuse interactions and their effects on aquatic conditions are evaluated for selected areas with the subbasin, often referred to as "watersheds" Since there are many different delineations for watersheds, a generic definition is used here, with the terms "drainages" or "stream systems" referring to the area from ridgetop to ridgetop contributing to the stream and its tributaries. No specific watershed boundaries were drawn, but the information discussed can be tied to watershed boundaries that have been delineated for the subbasin by the U.S. Forest Service.

As can be seen in Maps 13-16, there are several areas that are of high concern for increased runoff and sediment production. High fragmentation occurs in the lower parts of the Clear and Limber Jim, and throughout most of the Chicken, Sheep and Fly Creek drainages as well as along the mainstem of the Grande Ronde between Fly and Clear Creeks (see Map 1 for streams and stream names). These areas show moderate to high vulnerability to runoff and high to very high vulnerability to erosion. Most of the area falls within the 3,000 to 5,000 foot elevation band identified as the rain-on-snow regime. Road densities are generally high in these areas, especially within the Sheep Creek drainage, and there are several openings in the Clear and Chicken Creek drainages. A fire in 1986 burned 383 acres in Clear Creek and a fire in 1994 burned 1,491 acres in Upper Sheep Creek and 6,794 acres in Fly Creek. Fires in 1986 and 1989 burned a total of approximately 4,500 acres in the headwaters of the Grande Ronde River (Wallowa-Whitman National Forest, unpublished data). Clear and Chicken Creeks support spring chinook, bull trout and summer steelhead, Sheep Creek supports spring chinook and summer steelhead, and Limber Jim supports bull trout and summer steelhead (Maps 6-8). The high amount of disturbance occurring on soils with high erosion vulnerability provides some indication of the reasons for the high cobble embeddedness and surface fines documented in Section 4. These watersheds are included in a detailed watershed analysis being conducted by the La Grande Ranger District of the Wallowa-Whitman National Forest (Jim Barrett, La Grande Ranger District, personal communication). Further details on impacts of upland conditions on stream habitat and fish populations can be obtained by contacting the ranger district regarding their analysis.

High fragmentation overlaying high vulnerability also occurs in the Five Points system and along the edge of Mt. Emily. Road densities are relatively low in this area, and there are three significant areas that are currently unroaded. Lack of extensive roading in this area indicates that the fragmentation may be due to natural conditions or forest health problems, rather than timber harvest activities. Although this area does not have spring chinook or bull trout, it is identified as an Aquatic Diversity Area (ADA) by the American Fisheries Society due to its relatively intact habitat (Table 3-1, Section 3). Future disturbances could negatively impact this stream system.

Fragmentation and road density are also fairly high throughout the Meadow Creek system; however, runoff and erosion vulnerability is low to moderate in most of this area. Meadow Creek provides spawning and rearing habitat for summer steelhead, but is not generally not used by spring chinook or bull trout. The high cobble embeddedness and surface fines documented earlier (Figure 4-3c, Section 4) may reflect sediment inputs from within the riparian area, which may be due to riparian logging or grazing. This is indicated by the low stream shading, high Width:Depth and low bank stability found in many of the tributaries to Meadow Creek (Figures 4-2a,b and 4-3b, Section 4). The Meadow Creek system is also included in the USFS watershed analysis.

In the Catherine Creek system, the upper part of the North Fork and most of the Middle Fork flow mostly through wilderness or roadless areas; therefore, disturbance is fairly low. Road densities and fragmentation are somewhat higher along the lower part of the North fork and most of the South Fork. Buck Creek, a tributary to the lower end of the North Fork is heavily roaded, and has fairly high fragmentation. Much of the area exhibits high runoff vulnerability, and variable erosion vulnerability. Except for the upper part of Buck Creek, the areas experiencing major disturbance fall within the rain-on-snow zone. These streams have very poor habitat conditions as shown in Figures 4-5a,b,c, Section 4. Chinook, bull trout and summer steelhead spawn and rear in the forks of Catherine Creek, while chinook rear in Buck Creek. Little Catherine Creek and Little Creek, both steelhead spawning and rearing streams, have high road densities and high fragmentation along the upper, forested reaches. These areas also have high runoff vulnerability and variable erosion vulnerability. The mainstem of Catherine Creek from Union to the forks is impacted by a major road within the riparian area. Stream shading is low and Width:Depth high along this section, which is an important area for chinook and steelhead spawning and rearing, and bull trout rearing.

The middle portion of Indian Creek has experienced substantial roading, and fragmentation is moderate to high. Several openings are shown in the drainage. The area appears to be more vulnerable to runoff than erosion, and is in general less sensitive to disturbance than the upper headwaters and tributaries of the Grande Ronde. However, the middle portion of Indian Creek falls within the rain-on-snow zone; therefore, significant runoff events are likely to occur in this area. Habitat conditions are mostly fair throughout Indian Creek (Figures 4-6a,b,c, Section 4), indicating that the channel should be able to handle potential increased peak flows due to high runoff conditions. Spring chinook and summer steelhead use the middle portion of Indian Creek for spawning and rearing, and bull trout use it for rearing. It is also designated as an ADA for both ecological function and genetic reserve.

In the Lookingglass system, road densities are fairly high along the lower parts of Lookingglass and Little Lookingglass, and throughout most of the Summer and Mottet Creek drainages. A large opening is also shown along the lower part of these three drainages. This is reflected in the low stream shade and high Width:Depth found along these reaches. Throughout the rest of the system, fragmentation and roading is moderate. Lookingglass Creek flows through an area of ground exhibiting high and very high vulnerability to runoff and moderate vulnerability to erosion. Elsewhere, the area shows generally moderate or low vulnerability to runoff and erosion. Most of the Lookingglass system falls within the rain-on-snow zone. Spring chinook and bull trout use the lower parts of Lookingglass and Little Lookingglass for spawning and rearing; summer steelhead use a large part of the Lookingglass system for spawning and rearing. Lookingglass Creek is designated as an ADA for genetic reserve. The moderate vulnerability and limited disturbance is reflected in the better habitat conditions within the Lookingglass streams.

• Impacts to Special Status Animals and Plants

Timber harvest and roading can cause significant impacts to special status animals and plants. Many species, including the northern goshawk, pacific fisher and several species of woodpecker require mature or old-growth forest habitat. Many of these species also require sufficient decaying timber and snags for foraging and nesting. Harvest of old-growth stands and removal of dead and dying trees through salvage operations have contributed to significant population declines. Further discussion can be found in Henjum et al. (1994).

Timber harvest can also threaten many plant species. For example, many-flowered phlox can be jeopardized by ground disturbance and removal of shade-producing trees. Logging could also damage populations of Sabine's and Blue Mountain lupine, male fern, ground cedar, and Sierra and swamp onion through placement of roads, landings, and yarding areas that compact soils and alter hydrology. Road widening or maintenance projects could harm lance-leaved grapefern, Sabine's lupine, and other species because some populations occur along or near roadsides. Sabine's lupine has been found along roadsides, indicating it may be tolerant of some disturbance. None of the special status plants that were documented historically from the Grande Ronde Valley (e.g., swamp onion, Sabine's lupine) are known to exist there today, with the exception of Oregon semaphoregrass in Ladd Canyon. The majority of populations that are known at this time are on public land, mostly properties managed by the U.S. Forest Service.

Fragmentation and roading also impact wildlife and special status plants and animals by altering habitats and isolating populations. These effects can be both positive and negative. Deer and elk may benefit from increased forest openings and edges (for both forage and cover), but increased road densities may be harmful to these same species if vehicular traffic is high. Sabine's lupine, found along Lookingglass and Gordon Creeks, may respond positively along roadsides; however, long-term road maintenance projects (such as vegetation control or road widening) may eliminate these populations, and past forest fragmentation may have damaged significant amounts of habitat. In general, increased fragmentation results in forest habitat loss, along with disturbance of associated non-forested areas such as meadows.

Specific areas that have been heavily fragmented and also contain high concentrations of special status plants include Lookingglass and Gordon Creeks (with Blue Mountain lupine, Sabine's lupine and male fern), the headwaters of the Grande Ronde River (gray moonwort and ground cedar), the headwaters of Indian Creek (several moonworts and grape-ferns) and the Meadow/McCoy systems (long-bearded mariposa lily and many-flowered phlox). Other special status plant species that are susceptible to timber harvest activities and occur in heavily fragmented areas include all of the moonworts and grapeferns (Botrychium spp.), and the Sierra and Swamp onions. It should be noted that the vulnerability of these species is related mostly to the site-specific habitat disturbance events, rather than the resulting landscape-level habitat fragmentation. Little or no information is available regarding the long-term effects of isolation through fragmentation on the population dynamics and genetics of these plants.

"Extensive land use can have a detrimental effect on the ability of the subbasin to sustain the various resource values. The cumulative effect of impacts to riparian habitat is a major limiting factor to natural fish production in the subbasin."

6

SUMMARY AND FUTURE DIRECTION

SUBBASIN CONDITIONS

The assessment provides information on resource values, factors influencing their distribution and health, and the natural processes and management activities that affect them. Linkages among this information can be used to identify specific resource concerns, and opportunities for protection and restoration. Due to the size of the subbasin, the document is broad in scope and provides a general overview of values, conditions and processes. The information in this document should be used to provide a screen for identifying areas of high resource value and high potential impacts. Much of the data gathered and summarized can be used as a planning tool for ongoing projects and programs. It should also serve to help prioritize watersheds for analysis, as well as help identify the focus and scope of these analyses. Identifying and developing site specific protection and restoration opportunities may require more detailed information. Sources include existing watershed analyses and site specific data collection.

A description of the data compiled and used in the Upper Grande Ronde Subbasin Assessment is given in Table A-1 (Appendix A). This table provides information on the source, scale and format of the data. All of the coverages developed for this assessment are housed at the Department of Administrative Services, State Service Center for GIS.

• Aquatic Resources, Conditions and Related Influences

Information on resource values, limiting factors and landscape/ landuse properties is summarized in Table 6-1. In general, stream temperature and habitat quality are important factors limiting salmonid viability throughout the subbasin. In specific streams and stream reaches, water quantity and quality is also of critical concern. Widespread grazing, timber harvesting and roading have contributed to moving these parameters away from their natural, or desired values, to more degraded conditions. Table 6-1 and the discussion found in the Sections 4 and 5 provide more specific information on the issues and concerns for selected stream systems in the Upper Grande Ronde Subbasin.

The information in this document provides a screen for identifying the most critical concerns in each stream system, and the highest priority needs for protection and restoration. For example, most of the headwater tributaries to the Grande Ronde are important spawning and rearing areas for salmonids. Habitat conditions are generally poor, except in the upper most reaches. Stream temperatures are

Table 6-1: Summary of Conditions for Stream Systems in The Upper Grande Ronde Subbasin

Stream Name		Predominant Uses[1]	Stream Class[2]	Stream Gradient	Stream Temperature Range of 7-Day Maximum 1993 / 1992	Water Quality Violations[3]	Water Quantity Concerns	Habitat — Relative to Criteria[4]: LWM	Habitat — Relative to Criteria[4]: Pools / Mile	Habitat — Relative to Criteria[4]: Width:Depth	Habitat — Relative to Criteria[4]: Cobble Embeddedness or Surface Fines	Habitat — Relative to Criteria[4]: Shade	Habitat — Relative to Criteria[4]: Bank Stability	Vulnerability to Runoff[5]	Vulnerability to Erosion	Fragmentation	Road Density	Potential Mining Influences[6]
HEADWATER TRIBUTARIES																		
Clear		CHSP-S,R Bull-S,R; STS	HG	11.0	59–68/59–68	ND	ND	M	DNM	M	DNM	?	DNM	M-H	H-VH	H	H	M
Limber Jim	Mainstem	CHSP-S,R; Bull-S,R; STS	LU	0.5	Lower Part: 59–68/ > 68	"	"	ND	"	DNM	"	DNM	"	Lower End: M-H	"	"	"	A
	North Fork 1	STS	HG	4.0		"	"	DNM	"	"	"	"	"	M-H	"	"	"	
	North Fork 2		HG	8.0		"	"	"	"	M	"	"	M	"	"	M	L	
	South Fork	STS	HG	5.0		"	"	"	"	"	M	"	"	"	"	H	H	
Chicken	1	CHSP-R; Bull-R; STS	LU	0.7	59–68/ > 68	"	"	ND	"	DNM	DNM	"	DNM	"	"	"	"	M
	2	CHSP-R; Bull-R; STS	HG	3.0	< 59/59–68	"	"	DNM	"	"	"	"	"	"	"	"	"	"
	3	Bull-S,R; STS	HG	5.0		"	"	M	"	"	"	"	"	"	"	"	"	"
	4	Bull-S,R; STS	HG	7.0		"	"	"	"	"	"	?	M	"	"	M	M	"
Sheep	1	CHSP-S,R; STS	LU	0.8	> 68/ > 68	"	"	ND	"	M	"	DNM	DNM	"	"	H	H	"
	2	CHSP-S,R; STS	LU	1.0	> 68/ > 68	"	"	M	"	DNM	"	"	"	"	"	"	"	
	3	CHSP-S,R; STS	LU	2.0	59–68	"	"	"	"	M	"	"	"	"	"	"	"	A
	4	STS	HG	4.0		"	"	"	"	"	"	?	M	"	"	M	"	"
Little Fly	1	STS	LU	0.4		"	"	ND	"	DNM	"	DNM	DNM	"	"	H	"	
	2	"	LU	0.6		"	"	"	"	"	"	"	"	"	"	"	"	
	3	"	HG	3.0	59–68/ > 68	"	"	M	"	"	M	"	"	"	"	"	"	
	4	"	HG	10.0		"	"	"	"	M	DNM	"	M	"	"	L	L	
Lookout	1	STS	HG	7.0	59–68	"	"	"	"	"	"	"	"	L-H	M-VH	H	H	
	2	"	"	9.0	< 59/59–68	"	"	"	"	"	"	?	DNM	"	"	"	"	
	3	"	"	9.0		"	"	"	"	"	"	?	M	"	"	L	L	

Table 6-1: Summary of Conditions for Stream Systems in The Upper Grande Ronde Subbasin **(Continued)**

Stream Name		Predominant Uses[1]	Stream Class[2]	Stream Gradient	Stream Temperature Range of 7-Day Maximum 1993 / 1992	Water Quality Violations[3]	Water Quantity Concerns	Habitat — Relative to Criteria[4]						Vulnerability to Runoff[5]	Vulnerability to Erosion	Fragmentation	Road Density	Potential Mining Influences[6]
								LWM	Pools / Mile	Width:Depth	Cobble Embeddedness or Surface Fines	Shade	Bank Stability					
HEADWATER TRIBUTARIES (Continued)																		
Fly	1	STS	LU	0.3	>68/>68	ND	ND	ND	DNM	DNM	DNM	DNM	DNM	L-M	M-VH	H	H	
	2	"	LC	0.3		"	"	"	"	"	"	"	"	"	"	"	"	
	3	"	LU	0.3	59-68	"	"	"	"	"	"	"	M	"	"	"	"	
	4	"	LU	2.0		"	"	DNM	"	M	"	"	"	"	"	"	"	
MEADOW CREEK SYSTEM																		
Meadow	1	STS	HG	3.0	>68/>68	ND	ND	M	DNM	DNM	M	DNM	M	L-M	L-M	H	H	
	2	"	"	3.0		N	"	"	"	M	DNM	"	"	"	"	"	"	
	3	"	"	5.0		ND	"	"	"	"	"	"	"	"	"	"	"	
McCoy	1	STS	LU	1.0	>68/>68	N	"	DNM	"	DNM	"	"	DNM	"	"	"	"	
	2	"	"	0.7		ND	"	"	"	"	"	"	"	"	"	"	"	
	3	"	"	0.8	59-68	"	"	"	"	"	"	"	ND	"	"	"	"	
McIntyre	1	STS	LU	0.7		"	"	DNM	"	"	"	"	M	"	"	"	"	
	2	"	LC	1.0		"	"	"	"	"	"	"	DNM	"	"	"	"	
	3	"	HG	3.0		"	"	"	"	"	"	"	"	"	"	"	"	
	4		HG	4.0		"	"	"	"	"	"	"	"	"	"	"	"	
Dark Canyon		STS	HG	2.2	>68/>68	N	"	ND	DNM	"	"	"	"	L-M	"	"	M	
Little Dark Canyon	1	STS	HG	4.0		"	"	M	"	"	"	?	"	"	"	"	"	
	2	STS	HG	3.0			"	"	"	"	"	DNM	"	"	"	"	"	
	3		LU	2.0			"	"	"	"	M	"	"	"	"	"	"	

Stream Name		Predominant Uses[1]	Stream Class[2]	Stream Gradient	Stream Temperature Range of 7-Day Maximum 1993 / 1992	Water Quality Violations[3]	Water Quantity Concerns	Habitat — Relative to Criteria[4]						Vulnerability to Runoff[5]	Vulnerability to Erosion	Fragmentation	Road Density	Potential Mining Influences[6]
								LWM	Pools / Mile	Width:Depth	Cobble Embeddedness or Surface Fines	Shade	Bank Stability					
GRANDE RONDE TRIBUTARIES																		
Beaver	1	STS	HG	3.0		ND	ND	DNM	DNM	DNM	DNM	DNM	DNM	M-H	H-VH	H	H	
	2	"	HG	3.0		"	"	"	"	"	"	"	"	"	"	"	M	
	3	"	LC	2.0		"	"	"	"	M	"	"	"	"	"	"	"	
	4	"	HG	5.0		"	"	"	"	DNM	M	"	"	"	"	"	"	
	5	"	LU	2.0		"	"	"	"	ND	"	"	"	"	"	M	L	
	6	"	HG	6.0	>68	"	"	"	"	DNM	DNM	"	"	"	"	"	M	M,A
Hoodoo		STS	HG	10.0		"	"	M	"	M	M	"	"	"	"	H	H	
Dry Beaver		STS	HG	15.0		"	"	"	"	"	DNM	"	"	"	"	"	"	
Jordan	1	STS	HG	5.0		"	"	DNM	"	DNM	"	"	"	H	M-H	"	M	
	2		HG	4.0		"	"	M	"	M	"	"	"	"	"	"	"	
Rock		STS	HG	4.0		"	"	DNM	"	DNM	M	"	M	M-H	M	M-H	"	
CATHERINE CREEK SYSTEM																		
North Fork Catherine	1	CHSP-S,R Bull-S,R; STS; REC	HG	5.0	59–68/>68	ND	N	DNM	DNM	DNM	DNM	DNM	DNM	H	M-H	H	M	
	2	CHSP-S,R Bull-S,R; STS	HG	4.0	59–68/59–68	"		"	"	"	"	"	"	"	"	"	"	
Middle Fork Catherine	1	Bull-S,R; STS	HG	7.0	<59/59–68	"	ND	"	"	M	M	?	"	M-H	L-H	L	L	
	2		HG	20.0		"	"	M	"	"	DNM	?	"	"	"	"	"	
South Fork Catherine	1	CHSP-S,R Bull-S,R; STS; REC	HG	5.0	59–69/>68	"	Y	DNM	"	DNM	"	DNM	"	"	"	M	H	

Table 6-1: Summary of Conditions for Stream Systems in The Upper Grande Ronde Subbasin (Continued)

Stream Name		Predominant Uses[1]	Stream Class[2]	Stream Gradient	Stream Temperature Range of 7-Day Maximum 1993 / 1992	Water Quality Violations[3]	Water Quantity Concerns	Habitat — Relative to Criteria[4]						Vulnerability to Runoff[5]	Vulnerability to Erosion	Fragmentation	Road Density	Potential Mining Influences[6]
								LWM	Pools / Mile	Width:Depth	Cobble Embeddedness or Surface Fines	Shade	Bank Stability					
South Fork Catherine (Continued)	2	CHSP-S,R Bull-S,R; STS	HG	3.0		ND	Y	DNM	DNM	DNM	DNM	DNM	DNM	M-H	L-H	M	M	
	3	Bull-S,R; STS	HG	10.0	> 59/59–68	"	"	"	"	M	"	"	"	"	"	H	"	
Buck	1	CHSP-R; STS	HG	7.0		"	ND	M	"	DNM	"	?	"	"	"	L-M	H	
	2		HG	13.0		"	"	DNM	"	M	"	?	"	"	"	"	"	
Catherine	1	CHSP-R; Bull-R; STS-R	LU			DO-C	Y	ND	"	DNM	M	DNM	M	L-M	L-M	NA	M	A
	2	CHSP-S,R Bull-R; STS-R; REC	LU	1.2		pH,DO-A	"	"	"	"	"	"	DNM	"	"	"	"	"
	3	CHSP-S,R; Bull-R; STS; REC	LU	1.3	59–68/ > 68	NH_3-Toxicity	"	"	"	"	"	"	"	"	"	"	H	
	4	CHSP-S,R; Bull-R; STS	LU	1.3			"	"	"	"	DNM	"	M	"	"	"	"	
	5	CHSP-S,R; Bull-R; STS	LU	1.5			"	"	"	"	M	"	"	"	"	"	M	
Little Catherine	1	CHSP-S,R; STS	LC	1.4		ND		"	"	M	DNM	"	DNM	L-H	M	"	H	
	2	STS	HG	3.5				"	"	"	"	M	"	"	"	"	"	
	3	STS	LC	1.0				"	"	"	"	"	M	"	"	"	"	
Lick	1		ND			ND	ND	M	"	"	M	ND	ND	H	M-H	H	L	
	2		ND			"	"	"	"	DNM	"	"	"	"	"	"	M	
	3		ND			"	"	DNM	"	"	"	"	"	"	"	"	L	
INDIAN CREEK SYSTEM																		
Indian	1	CHSP-S,R; Bull-R; STS	LU	1.8		ND	Y	ND	DNM	DNM	M	DNM	M	L-H	L-M	NA	L-M	
	2	CHSP-S,R; Bull-R; STS	HG	2.9		"		"	"	"	"	"	"	"	"	M	M	
	3	CHSP-S,R; Bull-R; STS	HG	3.3		"		"	"	"	"	"	"	"	"	M-H	"	

Table 6-1: Summary of Conditions for Stream Systems in The Upper Grande Ronde Subbasin (Continued)

Stream Name		Predominant Uses[1]	Stream Class[2]	Stream Gradient	Stream Temperature Range of 7-Day Maximum 1993 / 1992	Water Quality Violations[3]	Water Quantity Concerns	Habitat — Relative to Criteria[4]: LWM	Pools / Mile	Width:Depth	Cobble Embeddedness or Surface Fines	Shade	Bank Stability	Vulnerability to Runoff[5]	Vulnerability to Erosion	Fragmentation	Road Density	Potential Mining Influences[6]
Indian (Continued)	4	CHSP-S,R; Bull-R; STS	HG	2.3	< 59/59–68	ND		ND	DNM	DNM	M	DNM	M	L-H	L-M	M-H	M-H	
	5	CHSP-S,R; Bull-R; STS	HG	9.0		"		DNM	"	"	"	?	DNM	"	"	H	H	
	6	CHSP-S,R; Bull-R; STS	HG	12.0		"		"	"	M	DNM	?	M	"	"	"	"	
	7	Bull-S,R	HG	5.0		"		"	"	"	M	DNM	"	"	"	"	L	
	8	Bull-S,R	HG	5.0		"		"	"	ND	"	?	"	"	"	M	"	
	9	Bull-S,R	HG	5.0	5.0	"		"	"	M	DNM	DNM	DNM	"		"	"	
LOOKINGGLASS SYSTEM																		
Mottet	1	STS	HG	6.0		ND	ND	DNM	DNM	DNM	M	DNM	ND	M	M	H	H	
	2	STS	HG	5.0	59–68	"	"	M	"	"	DNM	M	"	"	"	L-H	"	
	3	STS	HG	4.0		"	"	DNM	"	M	"	DNM	"	"	"	"	"	M
	4		HG	3.0		"	"	M	"	"	M	"	"	"	"	"	"	
Little Lookingglass	1	CHSP-S,R; Bull-S,R; STS	HG	3.2		"	"	ND	"	DNM	"	"	M	L-H	L-M	H	"	
	2	CHSP-S,R; Bull-S,R; STS	HG	2.3	< 59/< 59	"	"	"	"	"	"	"	"	"	"	"	"	A
	3	Bull-S,R; STS	LC	2.0		"	"	DNM	"	"	"	"	ND	"	"	M	M	
	4	Bull-S,R; STS	HG	6.0		"	"	"	"	M	"	"	"	"	"	H	"	
	5	STS	HG	8.0		"	"	"	"	ND	DNM	"	"	"	"	"	"	
Jarboe	1	STS	HG	5.0		"	N	M	"	DNM	M	"	"	L-M	"	"	"	
	2		LU	1.0	59–68/> 68	"	"	"	"	"	"	"	"	"	"	"	"	
	3		LU	2.0	< 59/59–68	"	"	"	"	M	DNM	"	"	"	"	"	"	
Lookingglass	1	CHSP-S,R; Bull-S,R; STS	LC	1.6		"	"	ND	"	DNM	M	"	M	H-VH	M	"	H	
	2	CHSP-S,R; Bull-S,R; STS	LC	1.2	< 59/< 59	"	"	"	"	"	"	"	"	"	"	"	"	
	3	CHSP-S,R; Bull-S,R; STS	LU	2.0	< 59	"	"	DNM	"	"	"	"	ND	"	"	M-H	"	

Table 6-1: Summary of Conditions for Stream Systems in The Upper Grande Ronde Subbasin (Continued)

Stream Name		Predominant Uses[1]	Stream Class[2]	Stream Gradient	Stream Temperature Range of 7-Day Maximum 1993 / 1992	Water Quality Violations[3]	Water Quantity Concerns	Habitat — Relative to Criteria[4]: LWM	Pools / Mile	Width:Depth	Cobble Embeddedness or Surface Fines	Shade	Bank Stability	Vulnerability to Runoff[5]	Vulnerability to Erosion	Fragmentation	Road Density	Potential Mining Influences[6]
Lookingglass (Continued)	4	Bull-S,R; STS	HG	4.0		ND	N	DNM	DNM	M	M	DNM	ND	H-VH	M	M-H	L	
	5	Bull-S,R; STS	HG	5.0		"	"	"	"	DNM	"	"	"	"	"	"	"	
	6	Bull-S,R; STS	HG	6.0		"	"	"	"	"	DNM	"	"	"	"	"	"	
MAINSTEM GRANDE RONDE																		
Grande Ronde	1	CHSP-R; Bull-R; STS; REC	LC	1.8	>68/>68	pH, DO-A pH-C	Y	ND	DNM	DNM	DNM	DNM	M	Variable	Variable	NA	Variable	A
	2	"	LC	0.7	>68/>68	"	"	"	"	"	M	"	"	L	L	"	M	"
	3	"	LU	0.4	>68/>68	"	"	"	"	"	"	"	"	L-H	L-M	H	H	
	4	CHSP-S,R; Bull-R; STS	"	0.7		"	N	"	"	"	DNM	"	"	L	L	"	"	A
	5	"	"	0.7		"	"	"	"	"	M	"	"	"	"	NA	"	"
	6	CHSP-S,R; Bull-R; STS; REC	"	1.0	/>68	"	"	DNM	"	ND	DNM	"	DNM	L-H	L-H	H	"	
	7	"	LC	2.0		"	"	"	"	DNM	"	"	"	"	"	"	"	A
	8	"	LU	2.0		"	"	"	"	"	"	"	"	"	"	"	"	
	9	"	HG	3.0			"	"	"	"	"	"	"	"	"	"	"	M
	10	"	LC	1.4	>68/>68		"	ND	ND	"	M	"	M	"	"	"	"	
	11	CHSP-S,R; Bull-R; STS	LU	1.1			"	"	DNM	"	DNM	"	DNM	L-M	L-M	"	M	A
	12	CHSP-S,R; Bull-R; STS; REC	HG	3.0			"	DNM	"	"	"	"	"	M-H	M-H	"	"	M
	13	CHSP-S,R; Bull-R; STS	LU	2.0	/59–68		"	M	M	"	"	"	"	"	"	"	"	"
	14	STS	HG	4.0	59–68/59–68		"	"	M	"	"	?	"	"	"	L	"	"
	15	STS	HG	5.0			"	"	DNM	"	"	?	M	"	"	"	L	M,A

Table 6-1: Summary of Conditions for Stream Systems in The Upper Grande Ronde Subbasin **(Continued)**

Stream Name		Predominant Uses[1]	Stream Class[2]	Stream Gradient	Stream Temperature Range of 7-Day Maximum 1993 / 1992	Water Quality Violations[3]	Water Quantity Concerns	Habitat — Relative to Criteria[4]						Vulnerability to Runoff[5]	Vulnerability to Erosion	Fragmentation	Road Density	Potential Mining Influences[6]
								LWM	Pools / Mile	Width:Depth	Cobble Embeddedness or Surface Fines	Shade	Bank Stability					
Grande Ronde (Continued)	16	STS	HG	9.0			"	M	DNM	M	DNM	?	M	H	H-VH	L	L	M,A
	17	STS	HG	7.0			"	DNM	"	"	"	?	"	"	"	"	"	

LEGEND:

[1] CHSP = Spring Chinook.
Bull = Bull Trout.
STS = Summer Steelhead.
-R = Rearing.
-S,R = Spawning & Rearing.
REC = Water Contact Recreation.

[2] HG = High Gradient.
LC = Low Gradient Constrained.
LU = Low Gradient Unconstrained.

[3] C = Chronic.
A = Acute.
ND = No Data.
N = No Violations.

[4] M = Meets.
DNM = Does Not Meet.
? = Shade recorded as > 59%; actual value unknown.

[5] L = Low.
M = Moderate.
H = High.
VH = Very High.

[6] A = Aggregate.
M = Metals.

warmer than desirable, and in some cases are approaching limiting conditions for salmonids. In addition, the surrounding landscape exhibits a high vulnerability to erosion. The poor condition of the stream and riparian area is likely attributable to extensive land use activities occurring on these sensitive soils. This is indicated by the documented high levels of fragmentation and road densities. Heavy grazing has also traditionally occurred along many of these streams, although specific use is not documented. Early land-use practices which encouraged removing in-stream structure also contributed to poor habitat conditions. By looking at the information in Table 6-1, we can identify instream and upland protection and restoration opportunities for each stream and its associated watershed that will help mitigate specific concerns. For the headwater tributaries, some focus should be placed on reducing sediment loads to streams, and improving stream shading and therefore stream temperature. Some potential opportunities include planting areas that remain unvegetated from recent harvest, closing or obliterating roads in high density areas, controlling noxious weeds and improving riparian vegetation through livestock exclusion and planting.

• Terrestrial Resources

Very little site specific information is available for terrestrial plants and animals. The *Oregon Natural Heritage Program* database provides information on the abundance and status of Rare, Threatened and Endangered species (Table 3-2, Section 3). It also provides some information on the known threats to the species. The associated GIS coverage shows the locations of recorded sightings of these species (Map 6). Each location has an associated code (not shown in Map 6), which can be used to identify the species reported.

Several threatened, endangered or sensitive animal species rely on intact riparian areas and natural stream flow for their habitat requirements. These species have likely been greatly impacted by agriculture, grazing and riparian area timber harvesting and roading. Other species need mature or old-growth forests with sufficient dead and dying timber; these species have been impacted by clearcutting, selective harvesting of old-growth trees and salvage logging of insect and disease infected trees. The maps showing fragmentation and roading (Maps 13 through 16) should be overlaid with the maps showing locations of sensitive old-growth species to provide a screen for identifying where the highest impacts to these species are likely occurring. This will help determine where more complete and higher resolution information is needed on extent of existing old-growth habitat and harvest and roading activities.

DATA GAPS AND ADDITIONAL INFORMATION NEEDS

Although an extensive amount of information is available for the Upper Grande Ronde Subbasin, certain types of data are still unavailable for the subbasin as a whole. This information is especially critical for developing a true ecosystem-based analysis, as well as for identifying watershed or site-specific issues and concerns. Some of these data gaps may be filled as individual watersheds are targeted for watershed analysis. The following is a partial review of data that are currently insufficient for meeting assessment objectives:

- **Instream Conditions.** More detailed water quality and quantity information is needed, especially for smaller tributaries.

- **Riparian Vegetation.** Detailed spatial information is needed on the extent, species distribution and density of riparian vegetation, both canopy and ground cover. This should be linked to information on riparian site potential. Current vegetation data is too coarse to provide this information at the appropriate scale.

- **Upland Vegetation.** Complete high resolution vegetation information is needed for the entire Upper Grande Ronde Basin. This should include potential as well as actual vegetation. Currently available coverage is of very low resolution, and only depicts current vegetation complexes. Information at a higher resolution is only available for USFS land, and provides information on species, size/structure and canopy closure, but not potential natural vegetation. Complete vegetation information is needed for evaluating landscape processes, terrestrial habitat conditions and physical processes like runoff and erosion.

- **Wetlands.** Detailed information on the amount and location of historic and current wetland area is important for evaluating the conditions for salmonids and threatened and endangered plants and animals.

The National Wetlands Inventory should be linked to GIS to facilitate analysis of wetland information.

- **Soils.** SCS County Soil Surveys should be linked to GIS. This information is needed for more accurately identifying landscape processes.

- **Hydrogeology.** Data on groundwater is needed to better understand the subbasin water resources. Specific information that needs to be compiled includes:

  - Location and extent of recharge areas,
  - Influence of faults and other geologic structure on groundwater flow and recharge,
  - Rates of groundwater drawdown and recharge,
  - Groundwater-surface water linkages, and
  - Impacts on groundwater quality.

- **Climate.** High resolution precipitation information, especially precipitation intensity and duration is needed to help understand landscape disturbance regimes.

- **Riparian Activities.** Spatial information on extent of grazing activities within the riparian area should be linked to stream reach locations. Location of roads within the riparian area is also needed to provide an indication of potential sediment and temperature problems.

- **Agricultural Landuses.** Detailed spatial information is needed showing specific landuses such as irrigated versus non-irrigated agriculture and type of agriculture such as cultivated crops, orchards, hay and pasture, etc. This will help provide more specific knowledge of potential impacts to streams, and identify opportunities for protection and mitigation. Locations of water rights and points of diversion should be linked to GIS.

- **Roads.** More detailed and higher resolution information on road locations and timber harvest activities will help identify impacts to aquatic and terrestrial resources. Currently data is insufficient for private land-holdings, small roads and skid trails.

- **Mines.** Specific information on current mining activities, especially aggregate mining, will help identify impacts to streams.

The assessment provides information on resource values, factors influencing their distribution and health, and the natural processes and management activities that affect them. Linkages among this information can be used to identify specific resource concerns, and opportunities for protection and restoration.

7

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APPENDIX

A

DESCRIPTIVE DATA USED IN UPPER GRANDE RONDE SUBBASIN ASSESSMENT

Table A-1: Descriptive Data Used in Upper Grande Ronde Subbasin Assessment

THEME	SOURCES[1]	CONTACT[1]	TYPE	SCALE OR RESOLUTION	GIS	ASSOCIATED DATA
BASE MAP						
Land Ownership	SSC-GIS	SSC-GIS	Polygon	1:100k	Y	
Subbasin Boundaries	USGS HUC	SSC-GIS	Polygon	1:500k	Y	
Streams	EPA River Reach Coded	SSC-GIS	Line	1:100k	Y	
RESOURCE VALUES						
Fish Distributions – Major Anadromous & Resident.	ODFW	ODFW, SSC-GIS	Line	1:100k	Y	Location of spawning / rearing
AFS Aquatic Diversity Areas	AFS	SSC-GIS	Polygon	1:180k-1:370k	Y	Ecological criteria, species, condition.
T & E Plants/Animals	Oregon Natural Heritage Program	ODA	Point		Y	
Drinking Water	Health Department	DEQ	Point		Y[2]	Location of surface water sources.
Major Water Contact Recreation	Agency Personnel	DEQ	Polygon	1:125k	Y[2]	
FACTORS AFFECTING RESOURCE VALUES						
Stream Temperature	DEQ, USFS, BLM, ODFW, ODF	DEQ	Point		Y[2]	Seasonal max, seasonal min, 7-day mean max, 7-day mean min.
Water Quality	STORET	DEQ	Point		Y[2]	pH, DO, NH_3 – toxicity.
Water Quantity	WRD – Water Availability Database	SSC-GIS	Polygon	1:24k	Y	Natural streamflows, consumptive use, instream water rights, available water.
Stream Habitat	ODFW/USFS	ODFW/DEQ	Flat File	Flat File	N	Stream width, gradient, wood, pools, fines, shade, etc.
Diversions, Fish Barriers	ODFW, USFS	SSC-GIS	Point		Y[2]	
LANDSCAPE CHARACTERISTICS						
Geology	State Geology Map	DOGAMI	Polygon	1:500k	Y	
Soils – Erosion Potential & Runoff Potential	STATSGO	OSU, SSC-GIS	Polygon	1:250k 1544 ac mmu[3]	Y	Various soil properties.
Precipitation	State Climatologist	SSC-GIS	Line		Y	Average annual precipitation isolines.
Elevation, Slope, Aspect	Digital Elevation Model Data	SSC-GIS		1:250k 90m Resolution	Y	
Vegetation	GAP Analysis	USFWS, ODA, SSC-GIS	Polygon	1:250k 320 ac mmu	Y	
LAND USE ACTIVITIES						
General Agriculture / Range / Forest / Urban	1979 USGS Land Use/Land Cover	SSC-GIS	Polygon	1:250k 40 m resolution	Y	

Table A-1: Descriptive Data Used in Upper Grande Ronde Subbasin Assessment **(Continued)**

THEME	SOURCES[1]	CONTACT[1]	TYPE	SCALE OR RESOLUTION	GIS	ASSOCIATED DATA
Irrigation Water Rights / No. Points of Diversions	WRD Water Rights Information System	SSC-GIS	Polygon	Quarter Quarter Section Resolution	Y	
Mines	Milo Database	DOGAMI	Point		Y	
Point Sources	DEQ	DEQ	Point		Y[2]	
Managed Areas	SSC-GIS	SSC-GIS	Polygon	1:100k	Y	
Roads	Tiger Files (US Census Bureau)	SSC-GIS	Line	1:100k	Y	Primary & secondary roads.
Fragmetation/Large Openings	GAP	SSC-GIS	Polygon	320 ac mmu	Y	
Openings from Fire	USFS	USFS	Published Reports		N	
ADDITIONAL SOURCES OF INFORMATION						
Fish Presence	Northwest Environmental Database (NED) / Oregon Rivers Information System (DRIS)	ODFW	Line	1:250k	Y	Presence / absence with associated information.
Fish Location, Abundance	USFS / BLM / ODFW Files		Flat Files, Published Reports		N	
Water Quality	1988 Nonpoint Source Assessment	DEQ	Line	1:250k	Y	Water quality ratings, types of beneficial uses, probable causes.
1978 Statewide Assessment Erosion, Sediment Yield	DOGAMI	SSC-GIS	Polygon	1:500k	N	Erosion / sedimentation, bank erosion.
Geology Publications	DOGAMI	Nature of Oregon Information Center	Published Reports		N	Lists DOGAMI publications from 1937–1993; bulletins, papers, maps, etc.
County Soil Survey	SCS	SCS, SCWD	Polygon	1:24k	N	Various soil properties.
Vegetation	Pacific Meridian Resources (PMR)	USFS	Polygon	25 m pixel size	Y	Species size / structure, canopy closure. USFS land only.

LEGEND:

[1] SSC-GIS = State Service Center for GIS, Oregon Department of Administrative Services.
USGS = U.S. Geological Survey.
EPA = Environmental Protection Agency.
ODFW = Oregon Department of Fish and Wildlife.
AFS = American Fisheries Society.
ODA = Oregon Department of Agriculture.
DEQ = Oregon Department of Environmental Quality.
USFS = United States Forest Service.
BLM = Bureau of Land Management.
ODF = Oregon Department of Forestry.
WRD = Water Resources Department.
DOGAMI = Department of Geology and Mineral Industries.
OSU = Oregon State University.
USFWS = U.S. Fish and Wildlife Service.

[2] GIS coverages created specifically for the Upper Grande Ronde Subbasin Assessment Project.

[3] Minimum Mapping Unit.