CHAPTER III

PAST AND CURRENT CONDITIONS

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

THE PHYSICAL DIMENSION

AQUATIC

Where and how have management activities affected riparian function?

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

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

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

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

Hydrologic

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

Current Condition

***Streamflow*:** There are currently xx La Grande Ranger District gauging stations within Watershed 85: (see Map 3-1 for location of gauging stations). Gauging stations have been in operation for x years from 1992 to 2000. Hydrographs for each gage are displayed in Figure 3-1.

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

Figure 3-1. 1999 Water Year discharge (Q) for Watershed 85.

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

Table 3-1. 1999 water year mean flow, total flow and drainage density for Watershed 85 gauging stations.

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

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

Width/Depth Ratio**:** The width/depth ratio of a stream affects the ability of various discharges occurring within the channel to move sediment and aid in floodplain development. Width/depth ratio is a sensitive and positive indicator of trends in channel instability. Management activities can affect width/depth ratios through road building (constriction of the channel), riparian vegetation removal, and creation of erosional nick points. Figure 3-2 displays the bankfull width/depth ratio for all surveyed streams in Watershed 85.

Figure 3.2. Bankfull width/depth ratios for surveyed streams in Watershed 85.

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

Because of the uncertainty of ECA values and assumptions, Historic Range of Variability (HRV) values were analyzed by the La Grande Ranger District to determine the percentage of forested National Forest System (NFS) lands within the Watershed that would typically be in an early aged forest or ECA-like condition. The Stand Initiation (SI) structural stage, one of seven stages within the historic range of variability, is equivalent to the ECA condition. Stands between 0 to 20 years of age are generally considered to be in the SI structural stage. At year 20, stands are considered hydrologically recovered. Table 3-2 displays the percent of forested acres in the SI structural stage per subwatershed in Watershed 85.

Table 3-2. Perent of forested NFS lands in the Stand Initiation (SI) Structural Stage per subwatershed (SWS) in Watershed 85.

SWS	Forested NFS Acres	Percent Forested NFS Acres in SI Structural Stage	SWS	Forested NFS Acres	Percent Forested NFS Acres in SI Structural Stage
85A			85G		
85B			85H		
85C			85I		
85D			85J		
85E			85K		
85F			85L		

SI structural stage acres are further adjusted based on the presence of roads (open, closed and obliterated). Acres estimated to be in the SI structural stage condition are calculated by multiplying total lengths of existing roads by road width. All roads are estimated to be 20 feet wide for simplicity. Obliterated roads are estimated to be hydrologically recovered at year 20. (Hydrologic recovery on obliterated roads is considered to be the same as that for forested stands.) All roads are considered to be on previously forested areas. Table 3-3 displays the total (roaded and forested) percent of forested NFS acres in the SI structural stage per subwatershed in Watershed 85.

Table 3-3. Total (roaded and forested) percent of forested NFS acres in the Stand Initiation (SI) Structural Stage per subwatershed (SWS) in Watershed 85.

SWS	Percent Roaded NFS Acres in SI Structual Stage	Percent Forested NFS Acres in SI Structual Stage	Total Percent NFS Acres in SI Structual Stage	SWS	Percent Roaded NFS Acres in SI Structual Stage	Percent Forested NFS Acres in SI Structual Stage	Total Percent NFS Acres in SI Structual Stage
85A				85G			
85B				85H			
85C				85I			
85D				85J			
85E				85K			
85F				85L			

<u>Reference Conditions</u>

Streamflow: Little information on streamflow exists prior to 1992 within Watershed 85, however, reference conditions can be derived from streamflow data analysis for the USGS Grande Ronde River gauging station at La Grande (#13319000). The La Grande gauge provides the most comprehensive streamflow record (1904-1989) in the area. The contributing area of the La Grande gauge is 433,920 acres; Watershed 85 comprises 31 percent (133,710 acres) of this area.

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

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

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

Table 3-4. Rosgen channel classifications.

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

A majority of surveyed streams in Watershed 85 can be categorized as Rosgen A2 and B3 channel types, of which the numeric designation refers to channel material. Rosgen A2 streams have steep gradients (> 4%) with boulder substrates. Rosgen B3 streams have moderate gradients (2 – 4 %) with cobble/coarse gravel substrates. Table 3-5 displays channel gradient, bankfull width/depth ratio and channel type for surveyed streams in Watershed 85. Channel type (letter designation only) was determined from stream survey data and topographic maps.

Table 3-5. Channel gradient, bankfull width/depth ratio (W/D) and channel type for surveyed streams per subwatershed (SWS) in Watershed 85.

SWS	Stream	Gradient (%)	Bankfull W/D	Channel Type	SWS	Stream	Gradient (%)	Bankfull W/D	Channel Type
85A	Cr.	2-4			85F		2-4		
		2-4					>4		
85B	Cr.	2-4			85G		2-4		
		2-4					2-4		
85C		2-4			85H		>4		
85D		2-4					2-4		
		2-4					>4		
		*					2-4		
85E		2-4			85I		>4		
		2-4					2-4		
		2-4			85J		>4		
							2-4	*	

* = Inadequate information.

***Equivalent Clearcut Area*:** There is no specific reference condition for ECA. An unmanaged ECA value would reflect the influence of natural disturbances, such as fire, and insects and disease, on created openings. The National Marine Fisheries Service (NMFS) suggested that 15 percent ECA was a threshold that when reached more specific analysis needed to be conducted in order to proceed with additional management activities (NMFS Biological Opinion 1995). The cumulative effects risk analysis developed by the Forest Service Region 6 Office (1993) considers less than 15 percent to be in the low risk category. Neither value was referenced with methodologies, so 15 percent is an uncertain value. A surrogate reference condition is the HRV SI structural stage range of 5 to 15 percent. Historically 5 to 15 percent of the forested NFS lands in Watershed 85 were in the SI structural stage, or ECA-like condition.

Interpretation

Streamflow**:** Streamflow discharge in Watershed 85 is characteristics of a snowmelt hydrograph, with late spring and fall rains contributing to the annual average flows. Peak flows usually occur in March and April with flows gradually decreasing to minimum discharges in August and September.

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

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

Equivalent Clearcut Area/SI Structural Stage**:** Of the 12 subwatersheds in Watershed 85, subWatershed 85 is within the HRV for SI structural stage (5 to 15 percent), and subWatershed 85A is below (Table 3-3). The remaining eight subwatersheds are above the range. The hydrologic response of Subwatersheds 85 , due to timber harvest and roads is expected to be outside the historic range. However, as discussed above under streamflow, discharge data from the two gauging stations with Watershed 85 are in line with discharge data from the USGS La Grande gauging station. Therefore, hydrologic response within Watershed 85 would appear to be within the historic range.

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

Vegetative

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

Current Condition

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

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

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

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

Table 3-7 displays acres of understocked, adequately stocked, and overstocked stands in each plant association on NFS lands within RHCAs in Watershed 85 by subwatershed. Stocking level acreages are based on the SDI for individual stands within a specific plant association series. (RHCAs are PACFISH Riparian Habitat Conservation Area stream buffers).

Table 3-7. Acres of under, adequately and over stocked stands per plant associations on NFS lands within RHCAs in Watershed 85 by Subwatershed (SWS).

SWS	Plant Association	Stocking Level		
		Understocked (acres)	Adequately Stocked (acres)	Overstocked (acres)
85A	CD			
	CP			
	CW			
	Total			
85B	CD			
	CL			
	CP			
	CW			
	Total			
85C	CD			
	CL			
	CP			
	CW			
	Total			
85D	CD			
	CL			
	CP			
	CW			
	Total			
85E	CD			
	CL			
	CP			
	CW			
	Total			
85F	CD			
	CE			
	CL			
	CP			
	CW			
	Total			
85G	CD			
	CL			
	CP			
	CW			
	Total			
85H	CD			
	CL			
	CP			
	CW			
	Total			
85I	CD			
	CL			
	CP			
	CW			
	Total			
85J	CD			
	CL			
	CP			
	CW			
	Total			

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

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

Table 3-8. Acres and percent timber harvest within forested RHCAs on NFS lands by harvest type (partial and regeneration) in Watershed 85 per subwatershed (SWS).

SWS	Forested RHCA (acres)	Partial Harvest (acres)	Regen Harvest (acres)	Total Harvest in RHCAs (acres)	Percent Partial Harvest in RHCAs	Percent Regen Harvest in RHCAs	Total Percent Harvest in RHCAs
85A							
85B							
85C							
85D							
85E							
85F							
85G							
85H							
85I							
85J							

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

Large Woody Debris**:** Large woody debris (LWD) is needed in the channel to store sediments, scour pools, and to create stream structure and fish habitat. Figure 3-3 displays the pieces of LWD per mile in surveyed streams within Watershed 85.

Figure 3-3. Pieces of LWD per mile of surveyed stream in Watershed 85.

Reference Condition

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

Timber Harvest within RHCAs**:** There is no specific reference condition for timber harvest within RHCAs. However, an unmanaged RHCA would contain openings created from natural disturbances, such as fire, and insects and disease. Therefore the District's estimated Historic Range of Variability (HRV) for the stand initiation (SI) structural stage will be used as a surrogate reference condition for timber harvest in RHCAs. The HRV estimates approximately 5 to 15 percent of forested lands within Watershed 85 would be in an open to stand initiation stage like condition.

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

Interpretation

Riparian Vegetation: Overall, less than one third of the stands within riparian areas are adequately stocked. The vast majority of stands are about one third to one half understocked or overstocked. Table 3-9 shows the percent of acres that are understocked, adequately stocked and overstocked within each subwatershed. Subwatersheds 85B, C, D, and J have the highest amount (40 percent or greater) of understocked RHCA stands. Subwatersheds 85A, E, F, H, and I have the highest amount (50 percent or greater) of overstocked RHCA stands.

Table 3-9. Percent stocking level of under, adequately and over stocked acres within RHCAs in Watershed 85 by subwatershed (SWS).

SWS	Stocking Levels		
	Percent Understocked Acres	Percent Adequately Stocked Acres	Percent Overstocked Acres
85A			
85B			
85C			
85D			
85E			
85F			
85G			
85H			
85I			
85J			

***Timber Harvest within RHCAs*:** Timber harvest within RHCAs exceeds the HRV SI structural stage reference condition, of 5 to 15 percent, in all subwatersheds (see Table 3-8). The majority of timber harvest in subwatersheds 85B-F and I and J involved regeneration harvest. In subwatersheds 85A, G and H, the majority of timber harvest was partial harvest. The partial harvests involved salvage harvests of dead and dying materail after insect infestations, and were mapped as large areas of land in the GIS database, however not every acre of land received harvest. Most harvest activity, in all subwatersheds, occurred from 1981 to present, therefore a majority of forest regeneration is currently 1 to 20 years old.

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

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

Erosion/Deposition

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

Current Condition

***Streambank Stability*:** Streambank instability, above natural rates, can be an indicator of excessive erosion. Table 3-10 shows an estimate of streambank stability/condition for subwatersheds in Watershed 85 based on best professional judgement of the La Grande District Hydrologist and Fisheries Biologist using U. S. Fish and Wildlife Service (USFWS) standards.

Table 3-10. Estimated streambank stability/condition for subwatersheds in Watershed 85.

USFWS Diagnostic/Pathway	Properly Functioning (>80% of any stream reach has ≥90% stability)	Functioning at Risk (50 to 80% of any stream reach has ≥90% stability)	Not Properly Functioning (<50% of any stream reach has ≥90% stability)
Streambank condition		85A-J	

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

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

Current information on road lengths, status and location was obtained through a query of the La Grande Ranger District GIS Transportation layer (Tables 3-11, 12 and 13). This database contains information for roads located on NFS and non-NFS lands within Watershed 85. Information on non-NFS roads was interpreted from 1994 ortho quadrangles. All non-NFS roads were considered to be open.

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

Table 3-11. Drainage area, existing road lengths (miles) and densities (miles per square mile) of NFS & non-NFS open and closed roads for each subwatershed (SWS) within Watershed (WS) 85 and for the entire Watershed.

SWS	NFS & Non-NFS Area (mi^2)	All Roads (Open and Closed)				
		NFS Open Roads (miles)	NFS Closed Roads (miles)	Non-NFS Roads* (miles)	Total Roads (miles)	Total Road Density (mi/mi^2)
85A						
85B						
85C						
85D						
85E						
85F						
85G						
85H						
85I						
85J						
85K						
85L						
WS 85						

* All Non-NFS roads are considered open

Table 3-12. Drainage area, existing road lengths (miles) and densities (miles per square mile) of NFS open roads for each Management Area per subwatershed (SWS) in Watershed 85.

SWS	LRMP Mngt Area	NFS Area (mi^2)	Open Roads Only		SWS	LRMP Mngt Area	NFS Area (mi^2)	Open Roads Only	
			Roads (miles)	Road Density (mi/mi^2)				Roads (miles)	Road Density (mi/mi^2)
85A	3				85E	15			
	14				85F	1			
85B	1					3			
	1W					14			
	3				85G	1			
	15					14			
	C4					15			
85C	1				85H	1			
	3					14			
	12					15			
	14					16			
	15				85I	1			
	C4					15			
85D	1					16			
	3					E2			
	14				85J	1			
	15					15			
	C4					C3			
	C5					C4			
85E	1					E2			
	3				**Totals**				

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

Table 3-13. Miles of open and closed road within RHCAs by stream class on *NFS and non-NFS lands* per subwatershed within Watershed 85.

Subwatershed	Miles of Open and Closed Road per RHCA						
	Stream Class I		Stream Class III		Stream Class IV		Total
	Open	Closed	Open	Closed	Open	Closed	
85A							
85B							
85C							
85D							
85E							
85F							
85G							
85H							
85I							
85J							
Total							

Reference Condition

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

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

The W-W National Forest administers a small portion of Umatilla National Forest lands within Watershed 85. Management Area allocations on these lands include C3, C4 and E2. The Umatilla LRMP S&Gs require open road densities that meet each allocation's management objectives. Management Area S&Gs, on both forests, are primarily related to road densities that would best meet the needs of wildlife species and are not necessarily related to water quality and fish needs.

A reference condition that best meets the needs of fish species which is closely related to water quality needs is the National Marine Fisheries Service's (NMFSs) recommended open and closed road density for summer steelhead. Watershed 85 contains summer steelhead habitat, but no occupied or potential bull trout habitat, therefore the USFWS open and closed road density for bull trout will not apply. The NMFS considers < 2 miles per square mile and no valley bottom roads as “properly functioning,” 2-3 miles per square mile with some valley bottom roads as “functioning at risk,” and > 3 miles per square mile with many valley bottom roads as “not properly functioning” (NMFS 1996 Matrix of Pathways and Indicators in Making Endangered Species Act Determinations of Effect for Individual and/or Grouped Actions at the Watershed Scale). The NMFS did not define valley bottom roads in the1996 Matrix, so the meaning of the term is uncertain. For this analysis, valley bottom roads/road location was considered as open and closed roads within PACFISH Riparian Habitat Conservation Areas (RHCAs).

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

Interpretation

Streambank Stability: All subwatersheds rate as “Functioning at Risk” within Watershed 85. Degradation of streambank conditions is assumed to be a result of historic overgrazing, past harvest of trees in riparian areas, and increased sediment delivery from road construction.

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

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

Subwatershed	Existing Road Density (mi/mi^2)	Existing Miles of Road in RHCAs	Condition Rating		
			PF	FAR	NPF
85A					
85B					
85C					
85D					
85E					
85F					
85G					
85H					
85I					
85J					

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

Table 3-14 shows XXXX subwatersheds have road densities greater than 3.0 miles per square mile and “many” RHCA/valley bottoms roads, therefore Subwatersheds 85 XXXXconsidered “not properly functioning.” Subwatersheds 85A and E have 2-3 miles per square mile road densities, and “some” RHCA/valley bottom roads; therefore these two (2) subwatersheds are considered “functioning at risk.”

Data Gap - Field surveys need to be conducted on both open and closed NFS roads to determine location and extent of any active erosion within the Watershed. In Subwatersheds 85B-D and H erosion is likely to be greater then in the other subwatersheds because of the higher miles of open road (see Table 3-12). Erosion on open native surface roads is greater then on closed roads due to higher surface disturbance. Closed roads need to be surveyed to determine effectiveness of road closures and whether further action needs to be taken to stop erosion activity. Information on sediment delivery following road obliteration is needed to determine a resource based threshold for amount of obliteration to implement per subwatershed per year.

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

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

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

Table 3-15. Summary of current riparian function parameter conditions, and overall Proper Functioning Condition rating for each subwatershed (SWS) in Watershed 85.

SWS	Stream Name	W/D Ratio	SI* (%)	Percent Adequately Stocked RHCA Acres*	Percent Total Harvest in RHCAs*	LWD (pieces /mile)	Stream-bank Condition*	Road Density/ Location *	Summary PFC Rating**
85A									
85B									
85C									
85D									
85E									
85F									
85G									
85H									
85I									
85J									
85K									
85L									

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

The above PFC ratings show that X OF THE 12 subwatersheds (85B, C, D, F, G, H, I, and J) are "Not Properly Functioning," and 2 subwatersheds (85A, and E) are "Functioning-At-Risk" relative to riparian function. The primary influential factors for all subwatershed condition ratings are low percentages of adequately stocked RHCA stands, high percent harvest within RHCAs, high road densities, and high miles of road within RHCAs. All subwatershed PFC ratings need to be assessed in the field to verify this cursory office review and to determine monitoring/restoration needs for that subwatershed.

Data Gap - Stream reaches in Watershed 85 need to be field assessed using the PFC protocol.

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

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

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

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

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

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

A culvert inventory was completed in 2001 on the La Grande RD involving 73 culverts. The inventory consists of data on culverts assessed for fish passage through the Forest Fish Passage at Road Crossings Assessment program. Culverts that pass fish are also able to handle the 100-year flood event. XX culverts were surveyed within Watershed 85.

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

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

NATURAL FEATURES

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

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

GEOLOGY

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

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

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

[Insert Map 3-1 here]

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

The Upper Grande Ronde River Watershed has no active slides within the watershed analysis area; this is due to basalt bedrock dominance in the watershed.

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

Rock Type	***Geologic Group Information***	***UGRR Acres***	***Upper Grande Ronde River Acres/1***	***% Of Upper Grande Ronde River***
Basalts	Columbia River basalts			
Alluvial	Tertiary, Pleistocene and Recent			

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

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

LANDFORM PROCESSES AND AGE

Some of the major landform processes are reflected in the surficial geology. The most common process is erosion by water. Dissection by streams through channel erosion is actively oversteepening some hillslopes by cutting away the base of the slopes. The most active area of the Upper Grande Ronde River Watershed is in subwatershed (SWS) 85E where very steep (> 60%) slopes lie adjacent to stream channels. Much of the adjustment to downcutting is from dry ravel or mass failure but may also include sheet and rill erosion. These are some of the most sensitive lands because of the high sediment delivery potential (See Sediment Production and Delivery section). Overland flow is a more common form of the dissection and is associated with highly erosive settings (see Sheet and Rill Erosion section). This natural or background form of sheet and rill erosion is primarily associated with steep, sparsely vegetated slopes of lower elevations (see Sheet And Rill Erosion map on opposite page). Most of the watershed has had a forest canopy that prevents erosion but can become a source of sediment if the protective vegetation is removed.

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

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

The stability of any of the surfaces created by geologic and geomorphic processes is indicated by the degree of weathering expressed in the soil (Birkland, 1964). The degree of weathering is also dependant on climatic considerations as discussed below. Most have strongly weathered soil because of the relative absence of surface erosion. This land is still undergoing a downcutting process that contributes minerals to streams. On these very stable surfaces, minerals are dissolved and carried into the groundwater some of which eventually is carried away in the stream system. This chemical denudation may equal or exceed erosional denudation on some stable forested slopes (Clayton and Megahan, 1985).

SOILS

Soil Genetic Processes

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

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

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

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

Soil Inherent Properties

Fertility Related

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

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

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

Table 3-18: Fertility Related Properties of Ash in Major Temperature/Moisture Groups						
Temperature Moisture	***Phosphorous Retention (%)***		***Acid Oxalate Al & 1/2 Fe (%)***		***Base Saturation Percent (%)***	
Group	***mean***	***range***	***mean***	***range***	***mean***	***range***
G1 cold/moist	95	-	2.8	-	20	-
G2 cool/moist	55	40-70	1.9	1.1 - 2.6	53	40-75
G4 cool/dry	55	30-80	1.3	0.5 – 2.0	65	45-90
G5 cool/dry	25	10-40	0.6	0.1 – 1.1	84	40-100
G6 cool/dry	33	25-40	0.8	0.5 – 1.0	66	58-77
NF6 cool/dry	30	20-40	0.7	0.2 – 0.9	89	75-100
NF8 warm/dry	28	25-30	0.3	-	91	85-100

Organic matter amount and location is strongly correlated to temperature and moisture groups and cover type (Stevens, 1982). As the forest canopy closes there is less organic matter in the mineral soils but more, which occurs as the litter layer of the forest floor. The subalpine fir and grand fir plant associations in temperature/moisture groups G1, G3 and G4 are dominated by ochric (light) surface horizons and have organic matter dominantly occurring as litter. These make up about 30 percent (25,508 acres) of the watershed and are generally at higher elevations or north aspects of lower elevations. The Douglas-fir and ponderosa pine plant associations of temperature /moisture groups G5 and G6 have organic matter both as a surface litter layer and as a mollic horizon. These two groups make up about 32 percent of the watershed (26,877 acres). Due to the large amount of organic matter in the A horizon of these soils they are considered to respond differently to fire than soils of higher elevations. The impact of nutrient loess to volatilization is considered to be much less in this zone than in temperature/moisture groups G1, G3 and G4. The drier Douglas-fir and ponderosa pine plant associations of temperature /moisture groups G7 and G8 have organic matter both as a thin surface litter layer and as a mollic horizon. These two groups make up about 12 percent of the watershed (10,501 acres). Due to the large amount of organic matter in the A horizon of these soils they are considered to respond differently to fire than soils of higher elevations. The impact of nutrient loess to volatilization is considered to be much less in this zone than in temperature/moisture groups G1, G3 and G4. The third major organic matter condition is the nonforest area where nearly all of the nonphotosynthesizing organic matter is in the mineral soil. This group includes all of the nonforest temperature/moisture groups. The main exceptions are inclusions in the cold/moist and some cool/moist plant associations where peat accumulates on the surface in wet sites. The bulk of the nonforest groups in the Upper Grande Ronde River drainage are in the dry settings of low precipitation uplands and make up about 1 percent (1,337 acres) of the watershed. There is 25 percent (acres) that has not been mapped in Biophysical Environment Groups, this is mostly soils that have been assigned to a group within the watershed.

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

Physical Properties

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

PAST ACTIVITIES

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

Soils Ephemeral Properties

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

Physical Properties

Physical properties of the soil, such as bulk density and porosity, are affected naturally by large ungulates like elk and deer. Grazers can compact soil particularly if the soil is moist (Meeuwig, 1965, Warren et al, 1985). Management activities have increased the magnitude and/or extent of this kind of disturbance through increasing stocking levels (Reed and Peterson, 1961, Rauzi and Hanson, 1966). Livestock grazing, fencing and herding has focused this impact in small areas while natural dispersal of game created a more widespread impact. Range condition in the Upper Grande Ronde River Watershed is generally good or better so has not suggested large-scale changes in soil properties (see Range section). The level of inventory is not at the detail that could recognize localized compaction due to concentrations around watering areas or travel corridors.

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

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

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

Chemical and Biological Properties

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

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

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

SOCIAL ASSESSMENT-UNION COUNTY

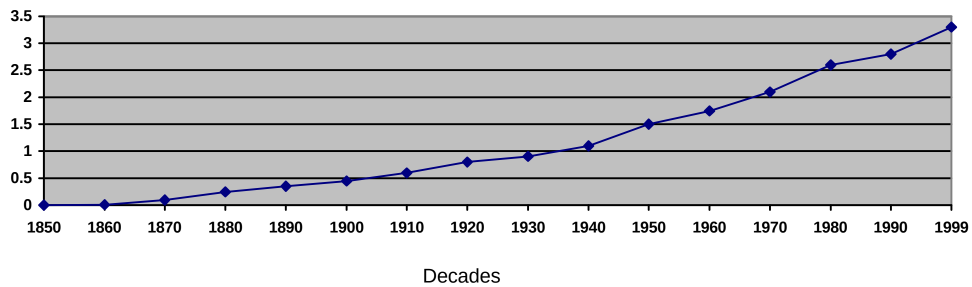
COUNTY POPULATION

COUNTY POPULATION

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

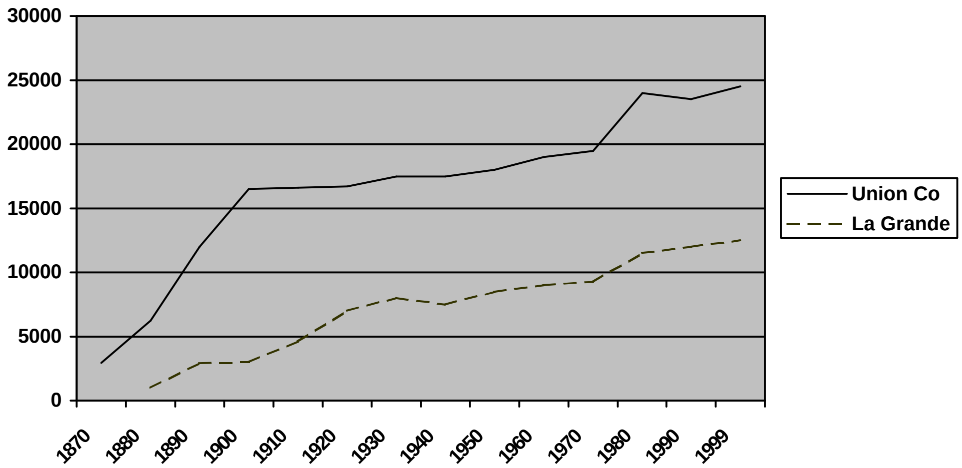
The total population of the State of Oregon has slowly grown since its inception as a state in 1859. From that time until just after the end of World War II, a period of approximately 100 years, the state grew from essentially zero to slightly more than 1.5 million. In the next forty years it surged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

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



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

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



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

The steady growth in Union County and the urbanization of the total county population seems to indicate that Union County, and especially the city of La Grande, is becoming a service center for the surrounding region of Eastern Oregon. This may be seen in Figures 3-5 and 3-6. Whether one looks at total labor force figures (Figure 3-5) or labor force as a percentage of the total labor force (Figure 3-3), one fact becomes rather apparent. The traditional economic base of the county, established during the early formative years of the county, 1850-1900, agriculture, forestry, and mining, are, based upon 1980 and 1990 Census data (2000 data is not yet available), minority factors in the overall labor force for the county. As can be seen, wholesale, retail, and services make up the bulk of the total labor force in the county, which tends to agree with the concept of the city of La Grande functioning as a service center for the larger region of Eastern Oregon. Adding these three sectors together we can see that in 1980 they accounted for 53.8% of the total labor force, growing to 55% in the 1990 census. By contrast, in 1940, farming activities generated 27% of the jobs. By 1990, it had dwindled to 6.3%.

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

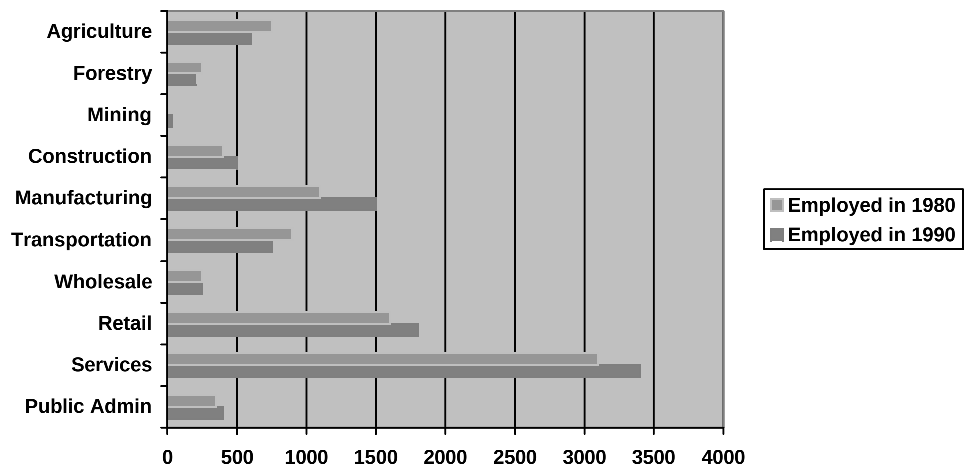
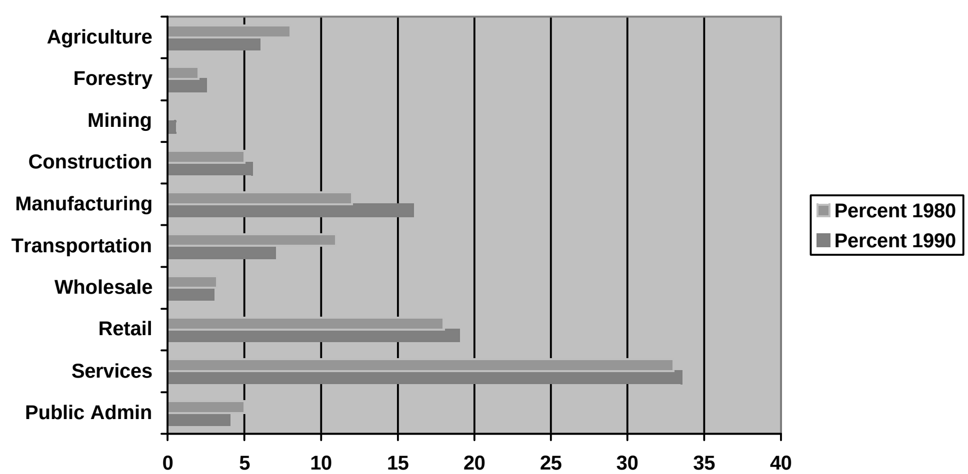


Figure 3-6
Percent Labor Force Employed
Union County – 1980 & 1990



Management Implications for the Upper Grande Ronde drainage:

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

AGE DISTRIBUTION AND MEDIAN AGE

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

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

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

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

ECONOMIC BASE

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

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

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

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

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

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

TRANSPORTATION SYSTEM

Historic Activities

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

Initially the only road crossing, north to south, through the watershed area was the wagon track that ran from Umatilla Landing on the Columbia River to Granite, passing through the mining camp, Camp Carson, and called the Granite Creek Wagon Road on the 1882 GLO maps. This road was constructed in 1853, a precursor of several other road building projects through this area. In 1854 two other roads were built, both had junctions near the area where the Granite Creek Wagon Road crossed the Grande Ronde River.

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

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

However, by 1942, seven years later, a Forest Service map shows a proliferation of roads, especially true in the Upper Grande Ronde River Watershed (85). They appear to be mainly concentrated on private lands or lands that had been private but exchanged into the Forest Service holdings.

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

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

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

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

Erosion potential

Currently the Upper Grande Ronde River drainage and all of its tributaries are roaded right up to their headwalls. There are approximately xxx miles of open and closed roads on National Forest land located in the Watershed 85 and about xxx miles of road on non-Wallowa-Whitman National Forest land within Watershed 85 (See tables for detailed road information). Over 2000 miles of road have been inventoried on the La Grande District. From this inventory it was found that several items have a direct effect on erosion potential.

Location

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

Grades

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

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

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

Surfacing

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

Contributing Activities

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

Road Maintenance and Management

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

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

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

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

Current situation

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

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

<u>Maintenance Levels</u>

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

<u>Surface Type</u>

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

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

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

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

<u>Other Status</u>

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

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

Table 3-19 Upper Grande Ronde River Watershed Assessment and Road Analysis						
Surface Type Road Miles by Status and Subwatershed Only Forest Service Roads on National Forest land						
	All Existing Roads		**Decommissioned Miles**	**Drawbottom Roads**		**Decommissioned Drawbottom Miles**
Surface Type	**Open Miles**	**Closed miles**		**Open Miles**	**Closed miles**	
SubWatershed 85A						
Aggregate		-	-		-	-
Improved		-	-		-	-
Native						
SubWatershed 85B						
Aggregate			-		-	-
Improved						
Native						
SubWatershed 85C						
Aggregate			-	-	-	-
Improved					-	-
Native						
SubWatershed 85D						
Aggregate						
Improved						
Native						
SubWatershed 85E						
Aggregate						
Improved						
Native						
SubWatershed 85F						
Aggregate						
Improved						
Native						
SubWatershed 85G						
Aggregate						
Improved						
Native						
SubWatershed 85H						
Aggregate						
Improved						
Native						
SubWatershed 85I						
Aggregate						
Improved						
Native						
SubWatershed 85J						
Aggregate						
Improved						
Native						
SubWatershed 85K						
Aggregate						
Improved						
Native						

Table 3-19 Upper Grande Ronde River Watershed Assessment and Road Analysis						
Surface Type Road Miles by Status and Subwatershed Only Forest Service Roads on National Forest land						
	All Existing Roads		**Decommissioned Miles**	**Drawbottom Roads**		**Decommissioned Drawbottom Miles**
Surface Type	**Open Miles**	**Closed miles**		**Open Miles**	**Closed miles**	
Subwatershed 85L						
Aggregate						
Improved						
Native						
Watershed 85 Totals						
Aggregate						
Improved						
Native						

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

Table 3-20 Upper Grande Ronde River Watershed Assessment and Road Analysis Subwatershed Road Densities by Management Area and Ownership Miles per Square Mile (mi/mi²)					
SWS	**Management Area**	**Acres**	**Miles**	**Mi/Sq.Mi**	**Forest Plan Guidelines**
85A	3				1.5
85B	1 1W 3 15				2.5 1.5 1.5 None 1.5
85C	1 3 12 15				2.5 1.5 None None
85D	1 3 15				2.5 1.5 None
85E	1 3 15				2.5 1.5 None
85F	1 3 14				2.5 1.5
85G	1 14 15				2.5 None
85H	1 14 15 16				2.5 None Admin Site
85I	1 15 16				2.5 Admin Site 2.0
85J	1 15				2.5 None 1.5

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

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

Table 3-21 Upper Grande Ronde River Watershed Assessment and Road Analysis
Subwatershed Road Densities by Status and Ownership
Miles per Square Mile (mi/mi^2)

	W-W National Forest Land			Private and Others	Densities On All Land in WS85	
SWS	**Open**	**Closed**	**Total**	**P/O**	**Open**	**Total**
85A						
85B						
85C						
85D						
85E						
85F						
85G						
85H						
85I						
85J						
85K						
85L						
Total						

SubWatershed 85A

SubWatershed 85B

SubWatershed 85C

SubWatershed 85D

SubWatershed 85E and F

SubWatershed 85G

SubWatershed 85H

SubWatershed 85I

Current Budgets

Current budgets do not allow enough funds to be allocated each year for maintaining the Forest Service's Upper Grande Ronde River Transportation System.

Maintenance Levels	Annual Budget
All levels Operational Maintenance Level	$ per year
All Levels Objective Maintenance	$ per year

Deferred Maintenance Costs

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

Maintenance Levels	Cost Per Mile
Maintenance Level 3	$23,087 per mile
Maintenance Level 2	$20,150 per mile
Maintenance Level 1	$2,859 per mile

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

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

Current costs to decommission roads are as follows:

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

RECREATION

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

Visual corridors along Road 51. The La Grande Ranger District, the Wallowa-Whitman NF, and the Umatilla National Forest has an over-abundance of Roaded Modified ROS opportunities. Supply of this recreation setting greatly exceeds demand. There is a shortage of Roaded Natural settings relative to supply on La Grande District.

Developed Sites

Use

During late summer and fall the watershed is heavily used for hunting-related recreation. The use is dispersed throughout the watershed. At other times of the year, use levels are low. Dispersed camping, backcountry driving for pleasure, gathering forest products and scouting hunting camps are the primarily uses outside of hunting season.
Off Highway Vehicles are in the Upper Grande Ronde River Watershed, particularly during hunting season. Except in areas with Area Closures, OHV riders are allowed to travel cross-country at will. They may use all roads closed to full sized vehicles. And they are allowed to create user-established

trails from repeated use, so long as trees are not cut and soil is not excavated. A moderate level of OHV use is experienced during hunting season. Hunters use their machines to carry game, travel to remote locations, hunt, and herd game animals. During the spring and summer, OHV use is low. Most is associated with small game hunting, gathering plants, scouting firewood, accessing remote locations, driving cross country for pleasure, and trail riding on open and closed roads.

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

ADMINISTRATIVE SITES/FACILITIES

THE BIOLOGICAL DIMENSION

OLD GROWTH and STRUCTURAL DIVERSITY

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

Reference Condition:

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

Late/Old Structural Habitat

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

Table 3-22: Acres by Biophysical Groups.

Biogroup	Acres	Definition
G1	21,679	Cold, Dry PIAL/TSME/ALBA2
G2	357	Cool Moist, Very Moist, Wet ABLA
G3	26,624	Cold, Dry ABGR
G4	18,339	Cool ABGR
G5	22,644	Warm ABGR
G6	805	Warm, Moist PSME
G7	7,010	Warm, Dry PSME, PIPO
G8	1,799	Hot, Dry Pipo
G9	0	Hot, Dry Juniper

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

Biophysical Group	Total Acres In Biogroup	MSLT (Existing)		HRV for MSLT	
		Acres	% of Biogroup	Range	Average
G1	21,679	5,003	23	1-10%	10%
G2	357	0	0	5-25%	10%
G3	26,624	1,885	7	30-60%	40%
G4	18,339	442	2	30-60%	40%
G5	22,644	1,452	6	5-25%	15%
G6	805	0	0	10-30%	20%
G7	7,010	735	10	5-25%	15%
G8	1,799	27	2	2-20%	10%
G9	0	0	0	2-20%	15%

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

Biophysical Group	Total Acres In Biogroup	SSLT (Existing)		HRV for SSLT	
		Acres	% of Biogroup	Range	Average
G1	21,679	96	1 <	1-10%	10%
G2	357	0	0	N/A	N/A
G3	26,624	0	0	N/A	N/A
G4	18,339	0	0	N/A	N/A
G5	22,644	26	1 <	15-55%	40%
G6	805	0	0	15-55%	25%
G7	7,010	17	1 <	15-55%	40%
G8	1,799	0	0	20-70%	55%
G9	0	0	0	20-70%	40%

Acreages in Tables 3-22, 3-23, and 3-24 are taken from the Upper Grande Ronde River Structural Stage GIS layer (EVEG data) through a query completed in April 2004. For the purpose of this analysis, late/old structure as defined by Charles Grier Johnson, Jr. (Blue Mts plant ecologist), is synonymous with Kevin O'Hara's single-stratum with large trees and multi-stratum with large trees structural stages. The following discussion on HRV is based on calculations from the entire watershed (forested acres), and is not divided by subwatershed or finer scales. The watershed is an appropriate scale to analyze HRV, and is meaningful in terms of landscape patterns as they relate to the distribution of wildlife habitat.

Approximately 9.7% of the forested area in this analysis area is in a late/old condition. The HRV for late/old habitat ranges from 1-70% depending on biophysical environment. Table 2 indicates deficiencies in MSLT structure in all biogroups except G1 and G7.

Table 3-24 shows that very little SSLT exists in the watershed. However, the HRV for SSLT in biogroups G5 – G9 ranges from 15-70%.

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

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

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

There are 23 allocated old growth areas within the Upper Grande Ronde River Watershed totaling 5,061 acres. Surveys revealed a lack of quality old-growth habitat in these allocated stands. From general field observation, stands with a rating of greater than 70% appeared to provide suitable old-growth habitat. Only five of the 23 allocated stands in the Upper Grande Ronde River drainage were rated above 70%. Scores range from a low of 32.9% to a high of 77.9%. Fourteen stands rated less than 60%, and seven stands rated less than 50%. Habitat components that are commonly lacking include: large live trees, large snags, and large logs.

Table 3-25: Field Ratings Of Forest Plan Allocated Old Growth Stands In the Upper Grande Ronde River Subwatersheds				
Stand Name	***Stand Number***	***Acres***	***SWS***	***Field Rating (%)***
Cabbage	127	255	85B	36.3
Johnson Rock 1	125	57	85B	46.3
Johnson Rock 2	122	212	85B	40.9
Johnson Rock 4	120	77	85B	53.8
Tower Mountain	146	570	85C	66.9
Squaw	117	179	85D	54.1
Johnson Rock 5	121	185	85E	72.6
Time and a half	133	39	85E	51.4
Whitehorse 1	123	62	85E	32.9
Whitehorse 2	124	372	85E	37.8
Indiana	149	165	85G	55.5
Leghorn	148	110	85G	51.0
West Chicken	150	427	85G	52.6
White Pine	147	56	85H	44.4
Erickson	153	686	85J	75.8
Limber 1	154	27	85J	44.8
Limber 2	132	100	85J	52.2
Marion	164	141	85J	61.3
Clear Creek	155	478	85K	75.6
Chopstick 2	151	192	85L	75.6
East Fork	152	128	85L	77.1
Grande Ronde Lake	178	283	85L	67.8
Upper Grande Ronde	156	260	85L	62.8
Total	**23**	**4961**		

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

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

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

Interpretation

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

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

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

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

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

STRUCTURAL DIVERSITY

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

Historic/Current

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

Structural Stage breakdown by Watershed and Subwatersheds.

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

HISTORIC RANGE

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

Biophysical Environment	**Stand Initiation**			**SEOC**			**SECC**			**UR**			**MS w/o LT**			**MSLT**			**SSLT**		
	H	**C**	**D**	**H**	**C**	**D**	**H**	**C**	**D**	**H**	**C**	**D**	**H**	**C**	**D**	**H**	**C**	**D**	**H**	**C**	**D**
G1-Cold & Cool/Dry (Average)	1-63 (5)	30	+25	0	0	0	5-25 (10)	0	-10	5-25 (15)	43	+28	50-70 (60)	2	-58	1-10 (5)	23	+18	1-10 (5)	0	-5
G2-Cool & Moist/Wet (Average)	1-10 (5)	11	+6	0	0	0	5-25 (10)	10	0	5-25 (15)	76	+61	50-70 (60)	3	-57	5-25 (5)	0	-5	0	0	0
G3- Cold, Dry (Average)	1-5 (5)	23	+18	0	0	0	5-25 (5)	0	-5	5-25 (15)	63	+48	20-50 (35)	6	-29	30-60 (40)	7	-33	0	0	0
G4-Cool & Dry/Moist/ Wet (Average)	1-10 (5)	23	+18	0	0	0	5-25 (5)	0	-5	5-25 (20)	64	+44	20-50 (30)	10	-20	30-60 (40)	2	-38	0	0	0
G5-Warm & Dry/Moist (Average)	1-10 (10)	26	+16	5-20 (10)	0	0	1-10 (5)	0	-5	1-10 (5)	64	+59	5-25 (15)	4	-11	5-25 (15)	6	-9	15-55 (40)	0	-40
G6- Warm, Moist (Average)	1-15 (10)	7	-3	5-20 (10)	0	0	1-10 (10)	0	-10	1-10 (5)	91	+86	10-30 (20)	1	-19	10-30 (20)	0	-20	15-55 (25)	0	-25
G7- Warm, Dry (Average)	1-15 (10)	13	+3	5-20 (10)	0	-10	1-5 (5)	1	-4	1-10 (5)	70	+65	5-25 (15)	6	-9	5-25 (15)	10	-5	15-55 (40)	0	-40
G8- Hot & Dry/Moist (Average)	1-15 (15)	6	-9	5-25 (15)	0	0	0	4	+4	0	78	+78	5-10 (5)	11	+6	2-15 (10)	2	-8	20-70 (55)	0	-55
G9- Hot Dry/Moist (Average)	5-15 (10)			5-35 (25)	0	0	0			0			5-20 (10)			2-20 (15)			20-70 (40)		

Biophysical Groups		**Acres**	**Data Gap Acres**
G1	Cold, Dry–Cool, Dry	21,679	
G2	Cool, Moist-Cool, Wet	357	
G3	Cold, Dry	26,624	
G4	Cool, Dry-Cool, Moist-Cool, Wet	18,339	
G5	Warm, Dry-Warm, Moist	22,644	
G6	Warm, Moist	805	
G7	Warm, Dry	7,010	
G8	Hot, Dry-Hot, Moist	1,799	
G9	Hot, Dry-Hot, Moist	0	

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

Reference Stand Conditions and Definitions.

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

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

Structural Stage	Avg HRV acres	Existing Acres	Difference
Stand Initiation	6,035	23,927	+17,892
Stem Exclusion Open Canopy	6,120	220	-5,900
Stem Exclusion Closed Canopy	6,015	357	-5,658
Understory Reinitiation	12,139	59,717	+47,578
Multi stratum w/o large trees	29,344	5,371	-23,971
Multi stratum w/o large trees	24,978	9,544	-15,435
Single Stratum w/Large Trees common	14,136	139	-13,997

Interpretation

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

ELK AND DEER HABITAT EFFECTIVENESS

What is the quality of habitat for deer and elk?

Historic/Current

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

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

National Forest Lands in the watershed (approximately 116,863 acres) are primarily summer-transition range with the exception of approximately 00000 acres of winter range located in the

BIG GAME COVER

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

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

Cover:Forage

A cover:forage ratio is best used to display the relative amounts of cover to forage. The optimal ratio of cover to forage is 40:60 for summer range (Thomas 1979). The existing cover:forage ratio in all the Upper Grande Ronde River Subwatersheds is xxxxxx 40% cover and xxxxxx the 60% forage (Table 3-26). Subwatersheds 00000 have poor cover:forage ratios and are deficient in marginal and satisfactory cover due to timber harvest and affects of defoliating insects. Cover effectiveness is compromised by unrestricted motorized access.

Thermal Cover

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

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

Upper Grande Ronde River Subwatershed	Cover: Forage	Percent Thermal Cover
A		
B		
C		
D		
E		
F		
G		
H		
I		
J		
K		
L		
Desired Condition	40:60	30

Road Densities

Excessive road densities have deleterious effects on habitat effectiveness by taking land out of production (1 mile = 4 acres of land), reducing the effectiveness of cover and increasing disturbance to elk. The Forest Plan states that open road densities in MA-1 should not exceed 2.5 mi/mi^2. In MA-1W and MA-3 goals for the open road densities during the critical winter range use periods are 1.5 mi/mi^2. While the winter range within 00000 currently exceeds Forest Plan standards, the Forest Plan indicates that the winter range objectives can be adequately achieved if the area is closed by snow during the critical use period. Therefore the winter range road density level is not necessarily a year round objective. The Upper Grande Ronde River Watershed has an open road density of 0000 mi/mi^2 (Table 3-27). In some low-snow years, open road densities exceed Forest Plan standards in winter range (MA-3, 1W). Standards in transitional range (MA-1) in subwatersheds 00000 currently being exceeded.

It is likely that the 1.5 mi/mi^2 standard is being met within

Unregulated use of off-highway vehicles (OHVs) continues to have a deleterious effect on elk distribution. OHVs currently have access on 441 miles of road (includes open and closed roads except 60 miles of Level 3 roads and 78 miles of obliterated roads). In addition, OHVs are allowed to travel cross-country; therefore, with the relatively open and flat terrain in the Upper Grande Ronde River Watershed, OHVs have access to most areas except the 00000 Winter Range from December 15 through March 31.

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

Upper Grande Ronde River Subwatershed	Forest Density MA-3;1w (mi/mi^2)	Forest Density MA-1 (mi/mi^2)	Forest Density Total (mi/mi^2)
A			
B			
C			
D			
E			
F			
G			
H			
I			
J			
K			
L			

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

THREATENED, ENDANGERED, AND SENSITIVE TERRESTRIAL VERTEBRATE SPECIES

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

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

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

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

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

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

NORTHERN BALD EAGLE
(*Haliaeetus leucocephalus*)

Status: Threatened

Bald eagles inhabit forested areas primarily near larger bodies of water including lakes and rivers (Peterson 1985). Eagles are protected by the 1940 Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and the Endangered Species Act of 1973 as amended.

The bald eagle uses a wide range of food items ranging from fish, small mammals and waterfowl to available carrion. Several studies have indicated the staple of their diet is fish (Peterson 1985, Rees 1990, Bent 1937) and can comprise as much as 70 to 90 percent of their diet.

Bald eagles prefer to nest in large dominant trees where they build their nests on large branches or forks of trees (Peterson 1985). Most nest trees are located close to water. Eagles prefer to nest in mature or old growth trees with an average height of about 100 feet. Many times these birds will also have one or more alternate nests (Bent 1937). Perch trees and sites adjacent to the nest tree are also important since the adult male may spend much of his daytime hours perched.

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

PEREGRINE FALCON
(*Falco peregrinus*)

Status: R-6 Sensitive.

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

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

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

Current: There are neither known peregrine nest sites nor suitable nesting habitat within the Upper Grande Ronde River Watershed.

CANADA LYNX
(*Felix lynx Canadensis*)

Status: Threatened

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

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

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

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

SPOTTED BAT
(Euderma maculatum)

Status: R-6 Sensitive

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

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

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

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

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

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

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

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

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

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

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

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

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

Ferruginous Hawk
(*Buteo regalis*)

Status: Region-6 Sensitive

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

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

Upland Sandpiper
(*Bartramia longicauda*)

Status: Region-6 Sensitive

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

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

Columbia Spotted Frog
(*Rana luteiventris*)

Status: Sensitive Region-6

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

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

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

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

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

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

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

FISHERIES

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

Current and Historic Condition

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

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

Spring/Summer Chinook Salmon

The historic and present distribution of spring/summer chinook salmon in the Watershed is presented in Table 3-29 below. It is estimated that spring/summer chinook salmon historically utilized 0000 miles of stream habitat in the Watershed for spawning and rearing. Chinook salmon no longer spawn in the watershed and rear only in the lower reaches. An occasional spring chinook juvenile has been observed to use habitat up to 10 miles upstream from the mouth of Upper Grande Ronde River. This use is considered very limited. It is estimated that existing populations of spring chinook salmon utilize xxx miles of stream less than they did historically for spawning and no longer occupy xxx miles of formerly occupied habitat in the Watershed.

In 1999 Pacific Northwest Research Station (PNW) personnel found 00 juvenile chinook rearing in the first approximately 0.6 miles of stream upstream from the mouth of Burnt Corral Creek and 00juvenile chinook in the approximately 0.6 miles of stream upstream from the Forest Boundary (approximately 2.5 miles upstream from the mouth) Subsequent PNW sampling in 2000 found no chinook rearing in

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

MILES OF SPRING/SUMMER CHINOOK SALMON HABITAT							
		HISTORIC HABITAT			EXISTING HABITAT		
SWS	Primary Stream	Spawn & Rear	Rear Only	Total	Spawn & Rear	Rear Only	Total
85A							
85B							
85C							
85D							
85E							
85F							
85G							
85H							
85I							
85J							
85K							
85L							
TOTAL	**Upper Grande Ronde River Watershed**						

Steelhead/Redband Trout

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

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

Subwatershed	Primary Stream	Spawn and Rear (miles)
85A		
85B		
85C		
85D		
85E		
85F		
85G		
85H		
85I		
85J		
85K		
85L		
TOTAL	**Upper Grande Ronde River Watershed**	

Bull Trout

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

Water Quality and Habitat

Reference Condition

Historic data is lacking throughout Watershed 85. Riparian Management Objectives (RMOs) as defined in the National Marine Fisheries Service (1996) and U.S. Fish and Wildlife Service (1998) matrices are summarized in Table 3-31 below. Only those indicators with adequate data and/or considered critical to this analysis are included in this analysis. These matrices were developed specifically for summer steelhead (NMFS) and bull trout (FWS). These are the RMOs against which Table 3-31 is rated.

Reference Condition

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

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

-

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

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

Steelhead Pool frequency RMO:

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

Bull Trout Pool Frequency RMO:

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

Existing Condition and Interpretation

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

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

SWS	Stream	Reach Listed	Parameters
		Mouth to headwaters	HM, S, T(s)
		Mouth to headwaters	HM, S, T(s)
		Mouth to headwaters	HM, S
		Mouth to headwaters	HM, S, T(s)
		Mouth to headwaters	T(s)
		Mouth to headwaters	T(s)
		Mouth to headwaters	T(s)

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

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

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

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

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

Water Quality:

Temperature: Temperature is an important attribute of habitat quality for fish and often is a limiting factor for fish survival and productivity. Water temperature has over various years, been continuously recorded at 00 locations on NFS lands in Watershed 85. Water temperature data for Watershed 85 is summarized in the form of maximum weekly average temperature by site and year in Table 3-34 below.

Table 3-34 - Maximum Weekly Average Temperature (MWAT) data for the Upper Grande Ronde River Watershed

SWS	Location	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
85A											
85B											
85C											
85D											
85F											
85F											
85G											
85H											
85H											
85I											
85J											
85K											
85L											

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

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

Water temperature can be a limiting factor for aquatic species. Each species of fauna has a specific temperature regime in which optimum growth occurs. The importance of stream temperatures in Watershed 85 is focused mainly on the needs of the salmonid inhabitants. Unsuitable temperatures for salmonids can lead to disease outbreaks, altered timing of migration for anadromous species, and changes in the rate of maturation (Bjornn and Reiser 1991). Juvenile spring chinook salmon have a zero net growth rate when stream temperatures exceed 66.4 F and reduced growth rates between 58.6° and 66.4° F (Armour 1991). Temperatures exceeding 79°F may be lethal to juvenile spring chinook salmon (Bjornn and Reiser 1991). Scott and Crossman (1973) found this upper lethal threshold to be 77.2° F. Upstream migration of adult salmon may be curtailed when stream temperatures reach 70° F (Salo and Cundy 1987). Temperatures exceeding 60° F are lethal to incubating spring chinook salmon eggs (Reiser and Bjornn 1979). Bell (1985) found temperatures exceeding 75° F to be lethal to steelhead and 50 to 55.4° F to be their preferred temperature range. As shown in Table 3-34, critical temperatures are approached and often exceeded in the Upper Grande Ronde River Watershed.

Given the level of disturbance, the poor health of riparian vegetation (see “Where and how have management activities affected riparian function?” portion of this watershed analysis.), and the poor quality of aquatic habitat in the Watershed, temperatures are likely altered from historic values in the

NFS portion of the Watershed. Where temperatures have been altered, they are assumed to be on an improving trend as a result of the relatively recent implementation of no harvest stream buffers and improved grazing practices in the Watershed. The failure of streams in the watershed to meet relevant summer temperature standards and the reduction of chinook habitat combined with the fact that summer water temperatures typically exceed the preferred temperatures ranges and sometimes exceed lethal limits for the TES fish present in the Watershed indicate that temperature, is not currently meeting the biological requirements of the TES fish populations in the Watershed.

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

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

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

		All Roads (Open and Closed)				Open Roads Only			Obliterated
SWS*	Area (mi2)	FS Roads (miles)	Non-FS Roads (miles)	Total Roads (miles)	Road Density (mi/mi2)	FS Roads (miles)	Total Roads (miles)	Open Rd Density (mi/mi2)	FS Roads (miles)
85A									
85B									
85C									
85D									
85E									
85F									
85G									
85H									
85I									
85J									
85K									
85L									
WS 85									

***SWS – Subwatershed**

Road densities in all subwatersheds are in the Not Properly Functioning/Functioning at Unacceptable Risk (NMFS values; see Table 3-33). Road densities (shown in Table 3-35 above) are 00 miles per square mile for the Upper Grande Ronde River Watershed as a whole. These densities in conjunction with the associated increases in drainage network and xxx miles of drawbottom road (roads within 100 feet of stream channels; see Transportation portion of this watershed analysis) places the Upper Grande Ronde River Watershed in the Not Properly Functioning/Functioning at Unacceptable Risk category for road density/location. This determination was made using both the NMFS and USFWS values. Roads are the primary contributors of sediment for most subwatersheds and soil erosion rates are directly related to the amount of unprotected and/or compacted soils that are exposed to rainfall or runoff (Chamberlin et al., 1991). It is assumed that the elevated road densities in the Upper Grande Ronde River Watershed have increased sediment input to streams in the Watershed over historic levels. This assumption is further supported by personal observations as well as the large decreases in overall pool frequency and the reduction in large pools in the watershed from 1941 to 1991 reported by McIntosh (1992) discussed in detail below.

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

Habitat Access

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

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

Table 1-36: Stream Survey Summary Data, 1989-1999, Upper Grande Ronde River Watershed

Stream Name	Surveyed Length (Miles)	Percent Area by Habitat Type			Pools/ Mile	Avg. Pool Depth (ft)	Mean Riffle Width (ft)	# Pieces of LWM
		Pool	Glide	Riffle				

*Medium and large wood count as LWM toward RMOS.

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

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

Figure 3-7 – Summary of Large Woody Material Values for Surveyed Streams in the Upper Grande Ronde River Watershed

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

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

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

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

Stream	SWS*	Average Wetted Width (ft.)	Matrix Standard for Functioning Properly (Pools/Mile)	Surveyed Pools/Mile
				6

*sws = subwatershed

Figure 3-8 – Pools per Mile for Surveyed Streams 0-5 Feet Wide in the Upper Grande Ronde River Watershed.

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Figure 3-9 – Pools per Mile for Surveyed Streams 5-10 Feet Wide in the Upper Grande Ronde River Watershed.

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

Pool Quality: Streams in the Upper Grande Ronde River Watershed are lacking large pools. Survey results from McIntosh (1992) indicate that there has been a xxx percent decrease in large pools in Upper Grande Ronde River and an xx percent decrease in large pools in xxxxx Creek. Decreases in pool quality and large pools in the UGRR WA are assumed to be a result of past harvest of trees in riparian areas, increased sediment delivery from road construction, and the long-term effects of splash damming.

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

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

Interpretation Summary

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

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

How and where does the road system affect water quality?

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

Because roads are the primary contributors of sediment for most subwatersheds and soil erosion rates are directly related to the amount of unprotected and/or compacted soils that are exposed to rainfall or runoff (Chamberlin et al., 1991). It is assumed that the elevated road densities in the Upper Grande Ronde River Watershed have increased sediment input to streams in the Watershed over historic levels (see sediment discussion under the "Where are the water quality and habitat condition NOT meeting the physical and biological requirement of TES fish species?" question above). Although no reliable data exists to quantify the amount of suspended sediment generated by roads in the Upper Grande Ronde River Watershed, it is assumed to be elevated over historic levels especially in subwatersheds 85x and 85x where there are over xx total miles per subwatershed of drawbottom road. Of these miles, approximately xxxx and xx miles respectively of open, native surface drawbottom road are adjacent to fishbearing streams (see Transportation portion of this document). Sediment input to fishbearing streams in all subwatersheds in the Upper Grande Ronde River Watershed is likely elevated over historic levels given the fact that there are approximately 258 miles of drawbottom road throughout the Watershed. All subwatersheds in the Watershed also contain over two miles of open, native surface drawbottom roads adjacent to fishbearing streams.

The other primary way in which roads affect water quality is through the long-term removal of large shade-producing trees when roads are constructed in riparian areas and floodplains, which leads to elevated stream temperatures as a result of increased solar radiation. It is likely that roads are having the largest effects on stream temperature in areas where roads occur within 100 feet of perennial (class I and III) streams (see table 3-38). Roads in these areas reduce the critical shade-producing vegetation near water in the lowest flow, highest water temperature period of late summer. Table 3-38 shows that all subwatersheds have likely been affected by the loss of shade producing vegetation to roadways, as values range from 3.8 to 22.85 miles of drawbottom road adjacent to perennial streams per subwatershed.

Table 3-38 – Total Miles of Drawbottom Road by Subwatershed and Stream Class in the Upper Grande Ronde River Watershed

SWS	Class I	Class III	Class IV	TOTAL
85A				
85B				
85C				
85D				
85E				
85F				
85G				
85H				
85I				
85J				
85K				
85L				
TOTAL				

SWS – Subwatershed

How and where do roads affect aquatic species?

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

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

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

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

Reference Condition

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

Current Condition

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

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

Interpretation

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

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

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

PLANT SPECIES of CONCERN

Sensitive Plant Species Known to occur in the Upper Grande Ronde River Drainage

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

TABLE 3-39: Sensitive Plant Species Known To Occur Within the Upper Grande Ronde River Drainage, By Subwatershed (SWS)	
Species Name	***SWS***
Botrychium minganense Victorin (Mingan moonwort)	
Botrychium montanum W.H. Wagner (Mountain moonwort)	
Botrychium pinnatum St. John (Northern moonwort)	
Calochortus longebarbatus var. *longebarbatus* S. Wats (Long-bearded mariposa lily)	
Phlox multiflora A. Nels (Many-flowered phlox)	
Trifolium douglasii House (Douglas' clover)	

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

Botrychium (Moonworts/grapeferns)

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

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

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

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

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

***Botrychium** minganense*

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

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

One of the more commonly occurring sensitive *Botrychium* species, it has been found on the Eagle Cap, Baker, and Unity Ranger Districts and elsewhere on the La Grande Ranger District. *Botrychium minganense* is located at seven sites within four Upper Grande Ronde River Subwatersheds (85B, 85D, 85H and 85I) for a total of less than 3 acres.

***Botrychium** montanum*

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

Documented for the Ochoco, Mt. Hood, Umatilla, and Willamette National Forests, Mountain moonwort (*Botrychium montanum)* also occurs on the Eagle Cap, Baker and Unity Ranger Districts of the Wallowa-Whitman. There are five sites, on less than 2.5 acres within three of the Upper Grande Ronde River subwatersheds (85B, 85D and 85I). Additional locations for this species are known to occur on the La Grande Ranger District.

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

***Botrychium** pinnatum*

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

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

One site within subWatershed 85x is known for the Upper Grande Ronde River Watershed. The two other previously discussed sensitive *Botrychium* species (*minganense* and *montanum*) are also growing at this location. Moist sites in coniferous forests, and wet to moist meadows are considered potential habitat.

***Calochortus** longebarbatus* var. *longebarbatus*

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

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

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

Twenty seven occurrences, totaling less than 170 acres have been located within five different subwatersheds (85C, 85D, 85G, 85H and 85 I) of the Upper Grande Ronde River Watershed.

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

***Phlox** multiflora*

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

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

Approximately 63 occurrences, supporting many thousands of *Phlox multiflora* plants, are scattered across the hillside, cliffs and rocky openings of approximately 280 acres of National Forest land within five subwatersheds (85C, 85D, 85G, 85H and 85 I) of this Upper Grande Ronde River Watershed.

***Trifolium** douglasii*

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

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

Federally Listed or Proposed Plant Species which may occur in the Upper Grande Ronde River Drainage

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

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

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

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

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

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

Spiranthes diluvialis

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

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

Thelypodium howellii ssp. ***Spectabilis***

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

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

Sensitive Plant Species Suspected to occur in the Upper Grande Ronde River Drainage

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

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

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

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

Sensitive Plant Surveys

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

Estimations show that surveys have been conducted on 15% of the National Forest land within the Upper Grande Ronde River Watershed (85). Records indicate that have significant botanical survey information available. Surveys within subwatersheds 85F, 85G, 85H and 85I have been conducted over only 8 to 12% of the NFS land. Subwatersheds having information on less than or equal to 5% of the NFS acreage include 85A, 85E and 85J.

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

SWS Acres		*FS Acres in SWS*		
SWS	***Total***	***Total***	***Surveyed***	***Percentage***
85A				
85B				
85C				
85D				
85E				
85F				
85G				
85H				
85I				
85J				
85K				
85L				

Undiscovered populations of sensitive plants may yet exist within any of the subwatersheds since there is only a limited timeframe for locating many of the sensitive species, and areas cannot necessarily be surveyed for all possible species at once. All subwatersheds support at least one known sensitive plant species, No Forest Service survey information is available for threatened, endangered or sensitive plant species on land outside the NFS system for the watershed. It is possible that sites for some species occur on land comprised of these other ownerships. Approximately 12.5% of the Upper Grande Ronde River Watershed is under other ownership. Acreage varies for each subwatershed (see Chapter I - Charts Upper Grande Ronde River Watershed acreages).

Other Species of Concern

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

Native Species/Species Diversity

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

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

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

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

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

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

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

SPECIAL FOREST PRODUCTS

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

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

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

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

FIRE and FUELS MANAGEMENT

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

Reference (Historical) Condition

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

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

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

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

Current Condition

A. PRIMARY VEGETATION CONDITIONS

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

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

North aspects area consist of mixed conifer types. Ridgetops and south aspects transition into ponderosa pine, Douglas-fir, and dry Grand fir types. Areas that have not had harvest activity or prescribed fire applied are generally overstocked or have true fir encroachment with heavy amounts of biomass accumulation. True fir establishment provided host species for many insects and diseases. As a result riparian areas experienced high mortality, and many drier aspects are overstocked with a high risk of insects, disease (especially dwarf mistletoe), and wildfire damage.

The following table displays acres of current ecoclass groups and associated fire regimes found within the Upper Grande Ronde River Watershed:

Table 3-41 Ecoclass and Fire Regimes by Subwatershed

Ecoclass Description	Ecoclass	Fire Regime	Sub-watershed 85A	85B	85C	85D	85E	85F	85G	85H	85I	85J	85K	85L
PP/DF Elk Sedge	CDG111	1												
DF/Pinegrass	CDG112	1												
DF/Pinegrass	CDG121	1												
PP/Bluebunch Wheatgrass	CPG111	1												
PP/Idaho Fescue	CPG112	1												
PP/Idaho Fescue	CPG131	1												
PP/Pinegrass	CPG221	1												
TOTALS														
Mixed Con/Pinegrass	CWG111	1												
Mixed Con/Pinegrass	CWG112	1												
GF/Pinegrass	CWG113	1												
GF	CWG211	1												
TOTALS														
PP/Common Snowberry	CPS522	1												
PP/Spirea	CPS523	1												
PP/Common Snowberry	CPS524	1												
TOTALS														
Juniper	CJG111	2												
Bluebunch wheatgrass/Wyeth's Buckwheat	GB4111	2												
Wheatgrass scab land	GB4911	2												
Sandberg's Bluegrass/onespike oatgrass	GB9111	2												
TOTALS														
Dry Meadow	MD	2												
Mt Mahogany/Idaho Fescue-Bluebunch Wheatgrass	SD	2												
PP/DF Snowberry-Oceanberry	CDS611	3												
DF/Common Snowberry	CDS622	3												
DF/Spirea	CDS634	3												
PP/DF/Ninebark	CDS711	3												
DF/Big Huck	CDS812	3												
TOTALS														
Grand Fir/Big Huck	CWS211	3												
GF/Big Huck	CWS212	3												
Grand Fir/Grouse Huck	CWS811	3												
TOTALS														
SA/Grouse Huck	CES411	4												
GF/Twin flower/forb	CWF311	4												
GF/Twin flower/forb	CWF312	4												
GF/Spirea	CWS321	4												

Table 3-41 Ecoclass and Fire Regimes by Subwatershed

Ecoclass Description	Ecoclass	Fire Regime	85A	85B	85C	85D	85E	85F	85G	85H	85I	85J	85K	85L
			Sub-watershed											
GF/Spirea	CWS322	4												
TOTALS														
LP/Twinflower	CLF211	4												
LP/Pinegrass/Grouse Huck	CLG211	4												
LP/Grouse Huck	CLS411	4												
LP/Pinegrass	CLS416	4												
LP/Big Huck	CLS511	4												
TOTALS														
Orchards	AQ	5												
Other Admin	AX	5												
Buildings, Structures, roads	AB	5												
TOTALS														
GF/Rocky Mt Maple	CWS912	5												
Meadow Moist	MM	5												
Rigid Sage/Bluegrass scabland	SD9111	5												
Meadow Wet	MW	5												
TOTALS														
Grand Totals														

B. FIRE REGIMES

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

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

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

C. MANAGEMENT ACTIVITY

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

Timber Sales:

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

Prescribed Burning:

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

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

Grazing:

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

Table 3-43: Grazing Allotment In Acres

Allotment Name	Acres	Location
Dark Ensign	21,902	85B, 85C, 85D
* Cunningham	24,543	85D, 85G, 85H, 85I, 85J
Starkey	28,279	85A, 85C, 85F, 85G, 85H,
McCarty	7624	85A, 85E, 85F
Tin Trough	3010	85E, 85F

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

D. ECOLOGICAL RISK

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

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

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

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

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

Table 3-44: Fire Return Interval Departures

Low Departures From Fire Return Intervals

SWS	Fire Regime Group 1	Fire Regime Group 2	Fire Regime Group 3	Fire Regime Group 4	Fire Regime Group 5	No Fire Group	TOTAL
85A			136				136
85B			587	966			1553
85C	22		328	733			1083
85D	4		1338	895			2237
85E	3		358	73			434
85F	51		610	338			999
85G			315	89			404
85H	30		984	1145			2159
85I	33		855	2122			3020
85J	51		1193	1078			2322
Totals	194	0	6714	7439	0	0	14347

Table 3-45: Fire Return Interval Departures

Moderate Departures From Fire Return Intervals

SWS	Fire Regime Group 1	Fire Regime Group 2	Fire Regime Group 3	Fire Regime Group 4	Fire Regime Group 5	No Fire Group	TOTAL
85A	734		154				888
85B	1782		694	1165			3641
85C	1316		311	489			2116
85D	2805		746	937			4488
85E	949		215	296			1460
85F	2500		569	332			3401
85G	1483		208	444			2135
85H	1983		746	1384			4113
85I	1347		142	1378			2857
85J	1909		634	846			3389
Totals	16808	0	4419	7271	0	0	28498

Table 3-46:	Fire Return Interval Departures						
High Departures From Fire Return Intervals							
SWS	Fire Regime Group 1	Fire Regime Group 2	Fire Regime Group 3	Fire Regime Group 4	Fire Regime Group 5	No Fire Group	TOTAL
85A	1053		303				1356
85B	1410		801	391			2602
85C	1052		775	190			2017
85D	1654		325	96			2075
85E	930		130				1060
85F	1201		794	49			2044
85G	2159		470				2629
85H	2589		761	139			3489
85I	516			34			550
85J	723		142	9			874
	13287	0	4501	908	0	0	18596

Table 3-47:	Fire Return Interval Departures						
Data Gaps - Not Ranked							
SWS	Fire Regime Group 1	Fire Regime Group 2	Fire Regime Group 3	Fire Regime Group 4	Fire Regime Group 5	No Fire Group	TOTAL
85A		1709	610			228	2547
85B		1834	339	5	3		2181
85C		1376	378		15	29	1798
85D	7	1479	288	33	49	6	1852
85E		1708	34		13		1755
85F		2268	17			46	2331
85G	38	2256	91	24	4	24	2437
85H		3388	278	30	93	720	4509
85I		1944	133		83	189	2349
85J	23	1311	67	5	26	448	1880
	68	19273	2235	97	285	1690	23649

Interpretation

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

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

Table 3-48:	% of Acres In Fire Regime 1 and 3 Within SWS		
SWS	**% of Acres in Fire Regime 1 (Historical FRI 0 – 35 Years)**	**% of Acres in Fire Regime 3 (Historical FRI < 50 Years)**	**Total % of SWS in Fire Regimes 1 and 3 (Frequent Historical Fire Return Intervals)**
85A			
85B			
85C			
85D			
85E			
85F			
85G			
85H			
85I			
85J			
85K			
85L			
Avg for Upper Grande Ronde River Watershed			

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

Table 3-49:	Areas of Moderate and High Fire Return Intervals	
SWS	**% of Acres with Moderate Departures from Historical Fire Return Intervals**	**% of Acres with High Departures from Historical Fire Return Intervals**
85A		
85B		
85C		
85D		
85E		
85F		
85G		
85H		
85I		
85J		
85K		
85L		
Average for Entire Upper Grande Ronde River Watershed		

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

Reference Condition

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

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

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

Current Condition

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

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

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

A. Wildfire Analysis

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

Fire Occurrence:

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

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

Table 3-50:

Cause of Fire		Total Number of Fires by Cause	% of Fires by Cause	Total Acres by Cause	Percent of Acres by Cause
Lightning	1				
Equipment	2				
Camp Fire	3				
Warming Fire	4				
Debri Burning	5				
Railroad	6				
Arson	7				
Children	8				
Other	9				
TOTAL					

The following table indicates the number of fires and size of fires since 1970 within the Upper Grande Ronde River Watershed:

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

Table 3-52: Fire Occurrence			
Fire Occurrence Rates per 1,000 Acres Based on Years 1970 – 2000 (30 Years)			
Area/SWS	**Total Fires**	**Avg Annual Fire Frequency**	**Fire Occurrence Rate per 1,000 Acres**
WWNF			
4th HUC (Upper Grande Ronde)			
5th HUC (85 - Upper Grande Ronde River)			
85A			
85B			
85C			
85D			
85E			
85F			
85G			
85H			
85I			
85J			

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

Large Fires:

There have been xx fires greater than 100 acres within the Upper Grande Ronde River Watershed within the last 40 years (**1960 to 2000)**. However, there have been xx large fires within adjacent watersheds dating from 1960 – 2000. These fires burned at moderate and stand replacement severity. The following table displays large fire activity for the Upper Grande Ronde (4^{th} HUC Waterhsed):

Table 3-53: Large Fire Description					
Fire Name	**Month**	**Year**	**Fire Size**	**Statistical Cause**	**Total Acres**
Squaw Butte	August	1987	E	Lightning	785
Railroad	August	1981	D	Railroad	130
Spring Creek	August	1985	E	Lightning	319
Ditch Creek	August	1987	E	Lightning	934
Three Cabin	August	1985	D	Lightning	105
Tanner Gulch	July	1989	F	Lightning	4,700
Bear/Frizzel	August	1985	D	Lightning	250
Grande Ronde River	July	1970	D	Lightning	180
Ma	October	1985	D	Lightning	293
Clear	August	1985	G	Lightning	6,411
Total Acres					14,108

B. FOREST RISK ASSESSMENT PROCESS (WRAPPS):

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

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

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

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

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

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

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

Table 3-54:	Fire Risk Assessment By SWS				
Fire Hazard Acres by Subwatershed					
SWS	Low	Moderate	High	Not Rated	TOTAL
85A					
85B					
85C					
85D					
85E					
85F					
85G					
85H					
85I					
85J					
85K					
85L					
TOTAL					

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

C. FIRE ACCESS

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

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

Interpretation

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

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

The above national goals should influence management decisions in determining where to invest in the future for the greatest benefit to risk reduction. Considering this and the previously described Forest Risk Process the following priority areas in the Upper Grande Ronde River Watershed are:
In addition, reducing under growth (ladder fuels) and down material will provide beneficial long- term forest health and reduce wildfire effects within or adjacent to the analysis area. Treating places with dense stand conditions and heavy fuel loadings, and utilizing treated sites that exist throughout the planning area, will create defensible locations to prevent wildfires managed for resource benefits from spreading outside or into the Upper Grande Ronde River drainage.

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

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

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

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

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

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

Reference Condition

Estimated amount of emissions released by burning:

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

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

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

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

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

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

Current Condition

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

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

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

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

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

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

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

Wildfire: 584 acres
Prescribed burning: 6,570 acres

The Upper Grande Ronde River Watershed is located 25 to35 air miles west, southwest of the City of La Grande. The prevailing wind during fire season is out of the southwest. Under the Clean Air Amendments of 1990, La Grande was evaluated as a possible non-attainment area for PM10. From 1985 through 1994, air quality standards were violated ten days with a high of five violations in 1988. The last air quality violation was in 1991. None of ten violations were caused by smoke generated on the La Grande Ranger District, or other Forest Service activities. In December 1994, the Department of Environmental Quality declared that the City of La Grande had met Federal Clean Air guidelines for attaining air quality standards for fine particulate matter (PM10). La Grande is currently classified as a "non-restricted" air quality area; however, the District participates in a "voluntary" program for smoke and particulate monitoring to minimize smoke impacts (Oregon Smoke Management Annual Report for 1995). In 2000 modification to the particulate measurements changed from (PM10) to (PM2.5).

Nearby Sensitive areas that may be affected by smoke generating events in the Upper Grande Ronde River Watershed are as follows:

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

For prescribed burning in logged areas the district average woody fuel consumption tonnages are used. These consumption averages are based on over 400 pre and post burn inventory plots that have been done between 1985 and 1993.

Table 3-55: Underburn Fuel Consumptions

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

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

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

Interpretation

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

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

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

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

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

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

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

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

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

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

6. Cull decks utilization.

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

NOXIOUS WEEDS/INVASIVE SPECIES

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

Weed Species Known to occur within the Upper Grande Ronde River Drainage on NFS lands

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

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

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

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

Table 3-56: Noxious weed species acreage and location by subwatershed for WA 85

Species Name	Acres	SWS
Whitetop (Cardaria draba)		
Musk thistle (Carduus nutans)		
Diffuse knapweed (Centaurea diffusa)		
Leafy spurge (Euphorbia esula)		
Tansy ragwort (Sececio jacobia)		
Canada thistle (Cirsium arvense)		
Bull thistle (Cirsium vulgare)		
TOTAL NET ACRES		

Table 3-57: Site Specific Known Noxious Weed Locations

SITE ID	SITE ITEM	SPECIES	LOCATION	SWS	LEGAL DESCRIPTION

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

Inventory information for private lands within the watershed is not available. It is known however that there are several large infestations (>50 acres) of leafy spurge on the private lands which have received some herbicide treatment in recent years. These locations are within SWS and 85x.

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

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

Carduus **nutans** L. (musk thistle) CANU5

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

Centaurea **diffusa** Lam. (diffuse knapweed) CEDI

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

Cirsium arvense (Canada thistle) CIAR

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

Euphorbia esula L. (leafy spurge) EUES

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

Senecio jacobaea L. (tansy ragwort) SEJA

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

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

Weed species with potential to occur within the Upper Grande Ronde River drainage

Additional species, which occur just outside the watershed and may spread or be transported to areas within the Upper Grande Ronde River drainage include the following:

Centaurea maculosa Lam. (spotted knapweed)

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

Centaurea solstitialis L. (yellow starthistle)

Yellow starthistle is documented within the Grande Ronde Hilgard Watershed (87G), although no sites are currently known within the Upper Grande Ronde River drainage. An introduced species from Europe, yellow starthistle is typically introduced on roadsides and disturbed areas such as campsites.

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

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

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

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

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

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

INSERT WEED LOCATION MAP WITH SPECIES LEGEND

Range allotment map insert here.

NON-FOREST VEGETATION

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

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

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

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

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

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

Grassland Condition and Trend:

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

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

GRAZING/RANGE MANAGEMENT

Historic Activities

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

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

Many utilized The Homestead Act of 1852, which required the building of a home, five years' continuous residence, cultivation of a portion of the land, and a fifteen-dollar filing fee. An alternative was to reside for six months, make certain minimal improvements, and pay $1.25 an acre under the preemption aspect of this same law. The Timber Culture Act also enabled settlers to acquire an additional 160 acres by planting and maintaining ten acres of trees on the tract.

Sheep began moving into the Pacific Northwest during the westward migration along the Oregon Trail, with herds crossing the plains in 1844-1847, with first large sheep drive in 1848 (435 head). Between 1850 and the mid-1890's, the number of sheep in the western states and territories increased from less than 10 percent of the nation's flock to more than half. By 1890, four times more sheep than cattle were grazed on the Columbia Plateau, and during the next decade the numbers would exceed 1.1 million, more than eight times the size of the remaining cattle herds. Part of this change had to do with the economics of livestock raising.

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

Some of the sheepmen began running their flocks into the Blue Mountains for summer range in 1858-72 (Strickler and Wade 1980).

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

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

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

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

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

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

Beyond strains across occupation lines were the strains placed on the sheep industry by the variable winter in the Columbia Plateau. The winter of 1885-87 was severe enough that numbers of sheepmen lost sizable portions of their stock (running out of hay). Shortly thereafter, the winter of 1889-90, following two years of abnormally light rainfall, killed large numbers of livestock, estimates ranged from 60 to as high as 90 percent mortality.

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

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

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

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

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

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

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

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

Allotment

Allotment –

Allotment –

Allotment –

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

Current Situation

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

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

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

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

Recent management changes (since 1992) within the NFS administered lands and restoration projects on the private lands have helped to begin the return to more near natural conditions

Recent management changes (since 1992) within the NFS administered lands and restoration projects on the private lands have helped to begin the return to more near natural conditions. Completion of restoration activities within the McIntyre Creek riparian area will occur within the next two years

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

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

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

Summary of key indicators

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

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

Current management on all allotments within the watershed

Allotment

Allotment

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Allotment

Allotment

Allotment

Allotments:

Range Management Planning

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Condition Thresholds

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

2) Riparian area alteration

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

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

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

Stubble Height and Percent Utilization

The following example displays the relationship between percent use and stubble height for Kentucky bluegrass (Poa pratensis) and was derived from the Utilization Gauge (Rocky Mountain Experiment Station). Data from the Utilization Gauge is very closely correlated with similar data collected on the WWNF. Percent utilization is determined by creating a height/weight curve for the species of interest, then comparing the ungrazed height to the grazed, stubble height. A total percent utilized is then calculated. Stubble heights are directly related to percent utilization with one essentially being the inverse of the other.

Table 3-58: -Percent Utilization for *Poa pratensis* for Ungrazed Heights of 5 to 20 inches

Grazed Stubble Height	**6 inches**	**4 inches**	**3 inches**	**2 inches**
Ungrazed Height	**Percent Utilization**			
20 inches	28%	40%	52%	65%
15 inches	20%	32%	40%	57%
12 inches	12%	24%	34%	45%
10 inches	8%	18%	28%	40%
8 inches	2%	12%	18%	34%
5 inches	-	<2%	8%	17%

The amount of plant growth each season greatly influences the calculated percent utilization. Kentucky bluegrass will grow to different heights depending on the location of the site (i.e. taller in moist areas, shorter in perched terraces). In moist years, an average ungrazed height for Kentucky bluegrass and associated species is near 20 inches. Using the utilization table above, this would equate to a percent utilization of 65 – 40 percent for a stubble height of 2 to 4 inches (respectively). In a dryer year or on a less productive site (such as perched terraces), ungrazed height for Kentucky bluegrass and associated species may approximate an average of 12 inches which equates to a 45- 24 percent for a stubble height of 2 to 4 inches (respectively). Therefore, although using stubble height measurements solely can allow more utilization in wet (high precipitation) years, it will allow for less in the dry years when the risk of riparian damage is higher. The use of stubble height measurements will provide for the application of a more conservative use standard over time on less productive sites and in drier years through maintenance of a minimum standing residual herbaceous crop designed to meet site objectives.

Key areas have been established on each allotment where forage utilization rates are to be monitored. These key areas are located in suitable rangeland where excessive forage utilization first becomes evident, or areas where forage utilization may be causing resource conflicts (i.e., riparian areas). When utilization standards are met in these areas, the entire allotment is estimated to have met the standards. Small areas within the allotment that have unavoidable livestock concentration such as salt licks, water developments, gateways or corrals are not designated as key areas. Forage utilization outside of riparian areas will be limited to 55 percent of available forage for all allotments. Table 3-59 displays the maximum annual utilization standards. Included in the following table are the management guidelines for riparian areas following the original Wallowa-Whitman National Forest Plan guidelines.

Table 3-59: Maximum Annual Utilization of Available Forage in Riparian and Upland Areas.[1]

Management Level[3]	Grass and Grasslike Species[2]				Shrub Species[2]	
	Riparian		Upland		Riparian	
	[4] Sat. Condition	Unsat. Condition	Sat. Condition	Unsat. Condition	Sat. Condition	Unsat. Condition
Low	40%	0-30%	50%	0-30%	30%	0-25%
Moderate	45%	0-35%	55%	0-35%	40%	0-30%
High	50%	0-40%	60%	0-40%	50%	0-35%

*****Notes:**

1/ This is the cumulative annual utilization of forage by both big game and livestock.
2/ Percent utilization for grass and grasslike species is based on percent of annual production removed, by weight. Percent utilization for riparian shrub species is based on a measurement of twig length of the currently available leader growth.
3/ **Low** = Livestock use managed within current grazing capacity by riding, herding, and salting. Cost-effective improvements used only to maintain stewardship of range.
Moderate = Livestock managed to achieve full utilization of allocated forage. Management systems designed to obtain distribution and maintain plant vigor include fencing and water development.
High = Livestock managed to optimize forage production and utilization. Cost effectiveness culture practices improving forage supply, forage use, and livestock distribution may be combined with fencing and water development to implement complex grazing systems.

4/ Satisfactory/Unsatisfactory condition refers to rangeland condition which is determined through a combination of allotment classification and forage condition. Factors such as existing stream condition are also considered for this determination.

Table 3-60: Upper Grande Ronde River Watershed Allotment Overview

Allotment	SWS	AMP Date	Planned AMP revision date	Range Cond.	Range Trend	Stock Level	Type	Season of Use	Permitted Livestock (AUMs)	Total Acres

Notes:
/1 = Allotments administred by the Umatilla National Forest
/2 = Allotment included in the Upper Grande Ronde Allotment Management Plan Analysis. This analysis will form the base for development of current allotment management plans. Decision in 2001.
/3 = Allotment administered by CTUIR.
AMP Date = Date of latest revision to the Allotment Management Plan.
Range Cond. = Range determination of range condition based on plant health, determined with vegetation transects, information or professional judgment.
Range Trend = Range determination of the trend of plant health over time.
Stream Cond. = General rating of stream habitat condition as related to potential impacts from rangeland management, based on stream survey data and field reconnaissance.
Stock Level = Number of cow/calf pairs, or five ewe/lamb pairs.
Type = Indicates the type of livestock grazed on the allotment.
Upper Grande Ronde River Acres = The portion of the allotment acres that are within the Upper Grande Ronde River D

INSECTS AND DISEASE

Historic/Current

Endemic levels of insect and disease provide diversity to forest stands and the landscape, however, many mixed conifer stands in the Blue Mountains have been damaged by a variety of insects and diseases, compounded by protracted draught, overstocking, and inappropriate past management (Schmitt and Scott, 1993).

Many factors affect tree and stand susceptibility to insects and diseases. Both inherited and environmental factors play a role in predisposition to insects and diseases. The availability of growing space available in a stand is an important factor governing tree and stand vigor (Cochran, et al, 1994).

Outbreaks of insects have become more widespread and damaging since 1950 (Gast et al, 1991). Major outbreaks that have affected stands in the watershed are western spruce budworm during the 1980's through 1992, followed by a severe outbreak of Douglas-fir bark beetles. Mature lodgepole pine communities are limited within the watershed due to a major epidemic of mountain pine beetle during the 1970's and early 1980's. Nearly all mature lodgepole pine stands within the watershed were attacked and these stands are not yet again susceptible to beetles. Upper Grande Ronde River Watershed was severely defoliated by Douglas-fir Tussock moths during the early 1970's outbreak.

Tree diseases that may be on an increase due to conditions that have allowed shade tolerant, susceptible species to increase in numbers include: laminated root rot, armillaria root disease and annosus root disease. In addition, both western dwarf mistletoe and Douglas-fir dwarf mistletoe have increased due to exclusion of fire and an increase in stocking levels.

Interpretation

Risk Analysis

Risk relates to the potential or expected levels of mortality to trees from insects and diseases. There are three levels of risk identified: low, moderate, and high. A composite rating to the risk of insect and disease is calculated for the watershed for each category (see complete Analysis of Insect and Disease Risks for the Upper Grande Ronde River Watershed in Appendix Veg.III BMPMSC-01-09 completed April 3, 2001). Risk analyses help to locate those portions of the watershed that have a greater chance of insect and disease incidence. The reference condition is to manage landscapes at density levels and species composition that reduces the risk of epidemic conditions of insects and diseases.

Insect or disease risks are determined using several published risk-rating or hazard-rating models, and/or other risk rating methodology built into the UPEST risk rating calculator, a computer program include in UTOOLS software (Ager et al. 1995aa, 1995b). The classification of “risk” in regard to forest insects and diseases within a specified period of time, that interferes with management of resources associated with forested landscapes (adapted by Gast et al. 1991, and Shore and Safranyik 1992). UPEST analysis should be viewed in the context of relative likelihood of risk of occurrence and severity, rather than actual on the ground situations.

Since various risk-rating models calculate risk indices in differing formats, the following results have been standardized to report risk ratings for each insect and disease calculated by the UPEST program. Three levels have been identified: low, medium, and high. These should be viewed in relative terms. That is, the demarcation between high and medium, and medium and low is artificial, and there is only a relative likelihood of a given insect or disease being more active in the higher risk rating. However, since these ratings do identify risk, most attention should be given to those stands that are identified as having high and medium ratings for multiple insects and diseases.

The composite rating below for insects and diseases in the UPEST analysis is a weighted summation score. Insects and diseases which readily cause mortality are given a higher weight than those which result in growth loss of defect. The importance of these weightings would differ between different management allocations or management objectives, while the composite score is standard across the watershed of the sake of simplicity. The complete UPEST analysis including maps is included in the Appendix.

Table 3-61: UPEST Results for Upper Grande Ronde River Watershed				
Insect or Disease	**Low Risk Acres**	**Medium Risk Acres**	**High Risk Acres**	**Data Gap Acres**
W. Dwarf Mistletoe				
W. Larch Dwarf Mistletoe				
Indian Paint Fungus				
Tomentosa root and butt rot				
Spruce Beetle				
Schweinitzii root and butt rot				
Doug-fir Dwarf Mistletoe				
Doug-fir Beetle				
Western Spruce Budworm				
Fir Engraver Beetle				
Doug-fir Tussock Moth				
Mtn Pine Beetle (lodgepole)				
Mtn Pine Beetle (ponderosa)				
Blister Rust				
Composite Risk				

Preventative work needs to be done to correct the underlying imbalances that set the stage for such large increases in insect activity. Effective prevention needs to include landscape level silvicultural treatments to restore healthy stand conditions. Planting a mix heavy to non-host and resistant species and thinning of overstocked stands, leaving larger trees room to grow are the keys (Schmidt, 1994).

Due to the extent of thinning in the watershed the threat of a future Mountain Pine Beetle epidemic developing throughout the lodgepole stands has been reduced. None of these stands are of an age and stocking level to sustain an epidemic at this time.

The most damaging group of tree diseases are root rots. Ratings are currently not available.
This part of the analysis will be updated when the root disease model is working correctly.

Continued restoration work, balanced by knowledge of pest dynamics is recommended. Chapter 4 of this watershed assessment outlines some opportunities for treatments through use of prescribed fire or timber harvest to reduce insect and disease related damage.