Chapter 4 - Presettlement and Existing Conditions

4.0 Introduction

This chapter describes presettlement and existing conditions and processes, and identifies important changes in the assessment area. The discussion of watershed conditions is organized into four broad resource categories: *Physical* includes discussions of the climate, air quality, geology, and soils of the watershed; *Aquatic* includes stream conditions and aquatic species population dynamics; *Terrestrial* includes vegetation and terrestrial wildlife populations, and *Social* includes the social and economic dynamics, activities, goals and objectives, and ideas and interests of the human populations within and near the watershed, and interacting with the watershed. Key findings in this chapter are also summarized in Chapter 5.

4.1 Physical Resources

4.1.1 Climate

Climate is a basic element that affects soil development, stream flow regime and vegetation dynamics. As in the rest of northern Idaho, the Red River climate is influenced significantly by warm, moist Pacific maritime air masses and prevailing westerly winds. The southern-most and high elevation eastern portions of the Clearwater basin experience dryer and colder climate conditions typical of the northern Rocky Mountains (Bugosh 1999; Finklin 1977; N. Gerhardt, Nez Perce National Forest, personal communication February 2000).

The Aleutian low and the Pacific high are weather systems that strongly influence local climates. The Aleutian Low dominates the winter months; bringing periods of heavy precipitation, mostly snow. The Pacific High dominates during the summer, resulting in warm and dry weather. Low-intensity, long duration frontal storms are common in fall, winter and spring, bringing fog, cloudiness and high humidity. High intensity, short duration thunderstorms accompanied by locally high winds commonly occur between May and September.

Annual precipitation in Red River ranges from about 30 inches at the lower elevations to about 50 inches at the higher elevations (University of Idaho, 1993 and Abramovich, et al, 1998). Nearby long term weather stations are located at Elk City (elevation 4060 feet) and Dixie (elevation 5620 feet). There is also a SNOTEL site located at Mountain Meadows (elevation 6360 feet), just east of upper Red River. These stations are considered representative of similar elevations in Red River. There is also a seasonally-operated remote automated weather station (RAWS) at the Red River Ranger Station. It is used primarily for fire danger ratings.

At Elk City, the annual precipitation for the period 1961-1990 was 30.03 inches. About 50% of the annual precipitation occurs from November through March, with much of it as snow. The wettest months are December and January, though May and June are also relatively wet due to a combination of frontal and convective storms. The driest months are July and August, respectively. Average annual air temperature at Elk City is 41°F. The warmest month is July, with an average daily temperature of 61°F, an average daily maximum of 81°F and an average daily minimum of 41°F. The coolest month is January, with an average daily temperature of 22°F, an average daily maximum of 34°F and an average daily minimum of

10°F. During the growing season, eight years out of ten can be expected to have 11 consecutive days when temperatures do not drop below freezing (Abramovich, et al, 1998).

At Dixie, the annual precipitation for the period 1961-1990 was 29.32 inches. Precipitation patterns are similar to Elk City, though a deeper snowpack tends to accumulate due to cooler average temperatures. Average annual air temperature at Dixie is 36°F. The warmest month is July, with an average daily temperature of 56°F, an average daily maximum of 75°F and an average daily minimum of 37°F. The coolest month is January, with an average daily temperature of 17°F, an average daily maximum of 30°F and an average daily minimum of 4°F. During the growing season, eight years out of ten can be expected to have 2 consecutive days when temperatures do not drop below freezing (Abramovich, et al, 1998).

At Mountain Meadows, the average annual precipitation for the period 1961-1990 was 47.6 inches. The snow water equivalent (amount of water stored in the snowpack) typically peaks around May 1, with the average being 26.5 inches.

4.1.2 Air Quality

Air quality associated with Red River is generally considered good to excellent. Local adverse effects result from occasional wildfires during the summer and fall, and prescribed burning during spring and fall.

Smoke from wildland fires and prescribed fires usually drifts eastward and eventually into Montana. The western boundary of the Selway Bitterroot Wilderness, a Class I airshed under the Clean Air Act, is about 15 miles east of the Red River watershed. Restrictions on Nez Perce Forest prescribed fires have been imposed in the past because of adverse effects on air quality in the Bitterroot Valley of western Montana. Smoke produced by wildland fires and prescribed fires in upwind airsheds, including southern Idaho and eastern Oregon, has also impacted this area in the past.

Locally, all major canyons are subject to temperature inversions, which trap smoke. These inversions may occur and affect smoke dispersal in topographic basins at different scales such as the South Fork Clearwater Canyon or the Red River Canyon. Temperature inversions can occur anytime during the year, but are most common in the fall.

Historic

Based on fire history information, the range of natural variability in Red River probably ranged from very clear and clean during the non-fire months (November – May) to hazy and smoky for extended periods during the fire months (June – October).

Current

Current Red River air quality during non-fire months is probably close to the range of natural variability. During the fire months, air quality is probably clearer and cleaner and outside the natural range of variability. The exception to this is when large wildland fires are burning. Under current policy, most wildland fires are suppressed. Therefore, the amount of smoke has been greatly reduced from previous historical levels.

Of the six national ambient air quality standards (NAAQSs), particulate matter (PM) is the only one applying to prescribed burning. This standard is based on the amount of particulate matter of a particular size (less than or equal to 10 microns), produced by a given activity, averaged over 24 hours. The Environmental Protection Agency (EPA) has accepted PM2.5 as a new standard, but states have yet to adopt this standard. PM2.5 represents approximately 80% of the PM10 produced by prescribed burning. Guidelines for regional haze, a visibility requirement under the Clean Air Act, are currently under development.

Prescribed Fire vs. Wildfire

Using prescribed fire will reduce impacts to air quality when compared to the same area being burned by a naturally occurring fire. By monitoring fuel and weather conditions, a time can be identified to implement prescribed burns when smoke dispersal is optimal, the number of acres consumed can be controlled and fuel consumption can be limited.

Under wildland fire burning conditions, nature selects the weather and fuel conditions under which the burn takes place. Often more fuel is consumed, because the fuel conditions are drier, and wildland fires often last for extended periods. As a result, impacts to air quality can last for extended periods with greater volumes of smoke. Wildland fires occur during the warmest and driest months of the year (June – October); this is also when the Pacific high dominates the weather patterns and temperature inversions are common, causing smoke to pool in basins.

4.1.3 Geology

The Red River watershed is located in the southern Clearwater Mountains portion of the Rocky Mountain physiographic province. The topography is generally one of gently rolling hills especially near ridge tops. Slopes near river and stream margins are steep in some locations. The lower six miles of Red River are confined in a narrow rocky gorge. In the remainder of the watershed numerous, isolated rock outcrops exist and some are spectacular. Map 10 displays the Geologic Groups for Red River.

The geologic history of the Red River watershed is complex. In general, older rocks tend to be in the central and western part of the watershed while younger rocks are found in the eastern part of the watershed. The mix of rock types and their interrelationship is not predictable. Only site-specific review will allow determination of potential concerns and impacts. The fracturing and weathering has produced a geologic condition that should be carefully considered when planning management activities in the Red River watershed. Much of the granitic rock is deeply weathered and highly erosive when exposed. In addition, the rock formations in the watershed have been deformed and fractured by faulting, specifically along the 14-mile Blanco shear zone, and by the emplacement of the Idaho batholith. These factors may present situations that need to be evaluated for each specific management proposal that would create surface disturbance. For further information and recommendations see Red River EAWS, Geology Field Review, Jo Ellis, District Geologist, February 5, 2003.

4.1.4 Soils

Soils are the biologically active zone at the interface of earth and atmosphere. Soils regulate movement and storage of energy, water and nutrients. Soil physical properties, such as bulk density and texture, affect water holding capacity, hydrologic response, and surface stability. Soil erosion reduces soil productivity and the eroded material may be delivered as sediment to stream channels. Soil compaction alters runoff patterns and soil water availability and can reduce vegetation growth potential. Soil disturbance can also alter slope hydrology and runoff peak flows and timing, affecting channel morphology as well as sediment regimes. Soil chemistry derived both from parent material and biological processes, affects inherent productivity through nutrient availability, and structure through interactions with biological processes. For example, a forest soil where knapweed has supplanted native vegetation will eventually lose soil structure and nutrients as well as resistance to erosion through loss of root biomass and surface litter.

Summary of Findings

Erosion in the watershed has moved from pulse post-fire or flood events punctuated by relatively long periods of stability to chronic erosion associated with the dense road network, and residual effects of past mining and localized effects of logging or grazing. At least some of the numerous large fires in the late 1800s were likely to have been miner-caused. These have resulted in loss of soil wood and erosional soil losses potentially in excess of a natural fire regime.

Potential **soil productivity** in the watershed is low in areas of Belt metasediments and moderate in areas of granitics. On-site productivity has been altered in mined areas with loss of soil, and alteration of basic landforms and valley substrate. Loss of soil productivity has occurred in many timber-harvested areas due to soil disturbance associated with ground-based logging systems. An estimated 87 percent of the 977 tractor harvested units (comprising 28,465 acres) will not meet forest plan standards or regional guidelines for soil quality. Soil damage on cable-harvested stands (1,221 acres) is much less and easily meets forest plan standards. Appreciable natural recovery is not apparent on tractor-harvested areas, even after 40 years. Whole tree harvesting has become more common and represents a potential nutrient loss, when tops and branches are removed from the site and burned at a landing. Logging residue left on-site contributes to soil productivity and micro site diversity, even when broadcast burned. These advantages must be balanced with the need to sustain fuels at acceptable levels.

Loss of soil productivity has occurred over the network of 585 miles of road (approximately 2,340 acres), where surface soils have been lost or displaced, and natural slope hydrology altered. Fire suppression, since the 1930s, has reduced the rate of soil and soil nutrient loss from fire, but harvest, slash treatment, site preparation, and road building have imposed a regime of chronic soil disturbance in almost all subwatersheds.

Soil Erosion - Historic

The dominant erosion processes that have shaped the analysis area have been influenced by geology, landform, parent material, and climate. The decomposed granitics in the watershed (see Map 10) are very highly erodible if exposed. This would have happened rarely historically, except near and within stream channels after fire or severe storm and flood events. Historically, the primary erosional mechanism would have been post-fire stream bank erosion and less common debris flows in steep channels, and relatively rare overland flow, where volcanic ash was absent. The well-developed alluvial valleys in Bridge and Otterson Creek express this process of erosion and valley filling. The sandy raveling road cuts along South Fork Red River, Siegel Creek, interior of the Deadwood watershed, parts of the Blanco Road and up Little Moose Creek show the behavior of decomposed granitic material when exposed. Siegel Creek and Lower Red River contain Tertiary sediment deposits. Subsoils in this material may have clay layers that perch water and result in small slumps and slick roads. These deposits are also highly associated with past placer mining. The soils over the rest of the assessment area are derived from Belt age schist, gneiss and quartzite. They usually have sandy-to-sandy loam subsoils that are highly erodible. Eroded material is delivered to streams where slopes are steep, where a high-density channel system occurs, or where road drainage systems efficiently move eroded material to channels.

Map 11 shows areas of sediment hazard from roads or other disturbances that expose soil substrata, like mines. About 62,410 acres of high, very high, or high-where-wet-hazard exist. This is about 60 percent of the assessment area. This is probably an under-estimate, because much of the higher elevation areas in the watershed are more deeply weathered and erodible than the norm for these landtypes. In natural disturbance regimes the primary sources of these sediments would be mass wasting and near or in-channel processes like bank failure and bank scour during flood years. Sediment effects would be heightened by wildfires that increased water yield, or decreased slope or streambank stability.

Most of the surface soils include a significant proportion of volcanic ash influenced loess. These materials generally are resistant to erosion unless highly confined by a water table or rock at shallow depth. Steep south aspects typically have thin or mixed volcanic ash influenced surface layers and are more susceptible to erosion. Even though erosion hazard is often low or moderate, the dense drainage system means that such materials that do erode are likely to reach a stream. Surface sediment hazards are shown in Map 12. These occur on steep slopes where the volcanic ash-influenced loess surface layer is thin or mixed. About 9451 acres of high or high-where-wet surface sediment hazard exist, or about nine percent of the Red River assessment area.

Figure 4-12 shows how fire caused sediment varied across subwatersheds over time. Results are dampened in these figures by showing yields by decade rather than annual sediment yields. Fire frequency and sediment peaks may have been highly influenced by miner-caused fires in the 1870-1898 period. Some naturally ignited fires would have certainly been probable in the period 1870-1930, prior to effective fire suppression. However, the mean frequency of larger fires at the subwatershed scale is more likely to have been two to three times per century, rather than the mean of four times documented for subwatersheds in Red River. Sediment pulses from extreme storm years tended to occur about once in any twenty-year period, and their effects would be magnified when periods of flooding followed wildfire.

Preliminary landslide prone areas were mapped and modeled using aerial photos and digital elevation data. Only 979 acres of steep slopes in excess of 60 percent occur in the watershed, along main Red River, and along the lower reaches of Trapper, Ditch, and Little Moose Creek. An additional 548 acres of areas mapped as old landslides occur mostly along streams on moist aspects. They do not appear to be associated with particular geologic formations or fault zones. Total preliminary landslide prone acres are 1,524 or 1.5 percent of the watershed. More small areas of landslide prone terrain would be identified with site-specific field reviews. These areas are generally confined to the main canyon and wet drainage headwalls in other landforms. Mass wasting (landslides) may deliver large volumes of soil, rock, and organic material to stream channels under both natural and managed disturbance regimes. Under natural conditions, earthquakes or prolonged soil saturation on susceptible terrain may trigger landslides. These are usually highly localized on steep slopes and lower slope positions, except for geologic contact zones. The severe flood events that may occur about once in twenty years could trigger some landslide activity on the most susceptible sites.

Areas that include soils and channels subject to debris torrents are confined to steep channels and drainage headwalls. They are very uncommon in the Red River watershed and are usually found in similar canyon settings as slope-related landslide prone terrain. Debris torrents scour channels and transport sediment, rock, trees and other organic matter down high gradient channels to lower gradient channels, where the deposits form terraces and fans. In natural disturbance regimes, these are typically episodic events associated with severe storms or rain on snow, and may be more common after fire has killed vegetation. An average frequency of 20 to 30 years would be likely in the assessment area, primarily in the steep headwalls below about 4,000 feet elevation. They are often highly localized in response to local storm cells. Areas of shallow soil on steep slopes are the usual initiation point for such torrents; because soils are rapidly saturated and deeply rooted vegetation may be scarce. Only 295 acres, or .3 percent of the watershed, include channels and headwalls highly subject to debris torrents.

Soil Erosion - Current

Sediment regimes are the erosion processes most changed from historic in the analysis area, primarily due to the high-density road network and past mining.

Three component subwatersheds are currently exceeding Forest Plan guidelines for sediment yield based on surface erosion predictions from the NEZSED model (see Section 4.2.5 and Table 4-2). This suggests an erosion and sediment regime both more widespread and persistent than under natural disturbance regimes. This represents a shift from a pulse to press disturbance sediment regime due largely to the effects of roads and timber harvest. Figure 4-11 shows how a very high proportion of watersheds today exhibit chronically elevated sediment yields. Historic mining-caused sediment is not modeled because of the lack of good data. Comparison of historic to existing sediment regimes suggests that sediment regimes in the area have changed from episodic and localized events after wildfire or associated with extreme storm years, to persistent and widespread increased sediment levels, primarily from roads. Map 11 displays roads crossing areas of high substratum sediment hazard. Three hundred ninety miles, or about 67 percent of all road miles in the Red River assessment area, cross lands of very high, high, or high-where-wet substratum sediment hazard. This is probably an underestimate, because in Red River even the higher elevation landtypes, which are usually buffered from erosion by abundant rock fragments, have fairly deeply weathered materials that erode readily. Additional sources of road related sediment include undocumented old temporary roads, excavated skid trails, and old mining roads.

Landslides play a very modest role in landscape formation within the Red River watershed. They have been seldom documented in historic photos, and few occurred in response to severe flood years like 1996-1997. Roads in landslide prone terrain can trigger landslides when they have concentrated drainage or diverted road drainage onto unstable slopes or saturated road prisms near crossings. Mass wasted material from roads may have more fine sediments and less rock and large wood than under natural disturbance regimes. Only 1.4 miles of road occur on landslide prone terrain, mostly in isolated small segments crossing steep slopes along the main canyons and at a few stream crossings. More site-specific field inventories will usually identify additional small areas of high landslide risk and local road failures due to instability.

Mass wasted material from harvest units may have less large wood than under natural disturbance regime. Surface soil may be lost to streams or deposited in lower slope positions. Fire or timber harvest on unstable terrain can increase the risk of slope failure because of the loss of root strength and the increased likelihood of soil saturation. No observable slope stability responses were observed in reviewing the 1936-1948 photos that provide the oldest pictures we have of post-fire landscape processes. About 285 acres of timber harvest have occurred on areas estimated to be landslide prone terrain, or about .3 percent of the landslide prone area. It is likely that the actual level of harvest on unstable slopes is less, because when unstable areas are identified within units, harvest has, at least recently, been foregone or modified to protect slope stability. In reviewing aerial photos from 1936, 1948, 1970, 1980, 1985, 1991, and 1996, no evidence of harvest-generated landslides was apparent.

Timber harvest on soils highly subject to erosion has not played a significant role in alteration of erosion regimes in Red river watershed. About 1,220 acres or 1.2 percent of the watershed has been harvested on steep slopes where erosion hazards are high or where wet areas are numerous so that soil is readily detached and transported (Map 12). Extensive harvest on low and moderate risk soils has probably cumulatively contributed more material to streams, but extent of the harvest at the subwatershed scale has been no more than fire disturbance. However, harvest-related erosion has occurred in small increments at much higher frequencies.

Soil Productivity - Historic

Soil productivity is the ability of the soil to support the natural or desired plant communities, growth rates, stocking, and rates of recovery from disturbance. It includes soil physical, chemical, and biological properties.

Soil productivity in the Red River area is highly influenced by the presence of a volcanic ash surface layer deposited about 6,700 years ago. This silt loam layer about 6-15 inches thick is important in holding moisture, organic matter, and nutrients. It is highly permeable to water and is resistant to erosion where it does not overlie impermeable subsoils. It is usually much more favorable for plant growth than the underlying subsoils. This surface layer is highly susceptible to compaction and displacement by heavy machinery.

Map 13 shows where the areas of compactable ash surface soils occur in conjunction with slopes less than 45 percent, where heavy equipment is likely to be used. About 76,451 acres, or 74 percent of the watershed has soils with compactable surface layers. Compaction can result in decreased plant growth, higher plant stress, changed successional pathways, and altered subsoil water movement. Although some soils will recover from compaction with natural freeze-thaw cycles, there is substantial evidence that volcanic ash influenced soils recover little porosity naturally over time.

Soil nutrients, like nitrogen, exist as pools in living and dead organic matter and some as weathering products of soil minerals. Nitrogen, in particular, often limits plant growth, and is not derived from rocks so much as from atmospheric or bacterial fixation (Armson 1978). Nitrogen is readily volatilized in fires so hot fires can result in both substantial loss of total nitrogen and increased availability of residual nitrogen because of its transformation. Whole tree harvesting and hot slash fires can also remove significant nitrogen from a site. In fact, half or more of the total nutrient pool for some elements may be held in the standing crop of trees, so that removal of whole trees means that the site is depleted of these nutrients. If the rate of replacement through mineral weathering or atmospheric inputs is less than the rate of loss, site productivity degrades. Where site productivity is low, such as the Belt metasediments and Tertiary sediments, whole tree harvesting results in higher proportional losses of nitrogen, phosphorus and potassium, since the nutrient pool is small.

Mechanical site preparation even more drastically alters soil chemistry through soil displacement and removal of organic matter (Garrison and Moore 1998). Fire, if not severe, retains more nutrients on site and makes them more available for uptake. Severe fires in slash piles are the most likely to cause high nutrient losses, as well as hydrophobic and sterilized soils.

Low potassium levels have been associated with high incidence of root rot. Metasediments, such as the Belt age gneiss and quartzite in Red River, tend to have low potassium levels and hence are more likely susceptible to root rots (Garrison and Moore 1998). Generally, higher levels of productivity and lower levels of mortality are associated with granitics compared to metasediments or 'deep deposits' like Tertiary sediments.

In natural stands, most nutrients are taken up in greatest quantity by shade tolerant species like grand fir and Douglas fir, Engelmann spruce, and less by ponderosa pine or lodgepole pine. This suggests that in mixed conifer stands, shade tolerants can out-compete the intolerants for nutrients, but then these shade-tolerants sustain nutrient imbalances that make them more susceptible to root disease.

Soil Productivity - Current

About 28,465 acres, or about 37 percent of the lands susceptible to compaction, have experienced tractor logging and/or dozer piling of slash (Map 44). Seventeen stands were sampled using the Region 6 transect protocol. Stands that were tractor logged and dozer piled averaged 52 percent damaged area; stands that were tractor logged and broadcast burned averaged 38 percent damage. All stands that had been tractor logged and dozer piled far exceeded forest plan standards (30-82 percent damage). Stands tractor logged but not dozer piled or scarified sustained 12-42 percent damage. Many of these would substantially exceed the current Forest Plan standard of 20 percent for soil damage. Compacted and excavated skid trails and landings are still evident in tractor-logged areas. Invasion by weeds and slow tree establishment and growth are apparent in compacted and displaced areas. Soil compaction may also contribute to increased erosion in skid trails where ruts channel water. The subwatersheds most affected by soil disturbance associated with logging equipment include Deadwood, Lowest Red River, Lower Red River, Dawson, Little Moose, Moose Butte, Blanco, and Upper Main watersheds. The one sampled unit that had been cable logged and broadcast burned sustained only four percent damage.

Localized mining impacts have dramatically altered soils and even landform setting. Placer mining in Deadwood, Siegel, and Lower Main Red River has reduced alluvial valley materials with fine textured surface layers to coarse dredge spoils. Soil recovery has been almost negligible in many of these areas.

About 588 miles of road occur in the analysis area. Additional excavated skid trails, legacy temporary roads, and undocumented mining roads may act like roads in interrupting subsoil movement or concentrating water, reducing growing capability, or presenting barriers to plant migration. Unless they are obliterated, both kinds of roads represent a long-term reduction in productivity. The documented roads amount to about 2,340 acres, or about a 2.2 percent loss.

Loss of soil wood represents a reduction in soil moisture and nutrient holding capacity as well as sites for nitrogen fixation or mycorrhizal activity. VRUs 7 and 10 and, to a lesser degree, moist aspects in VRUs 6 and 7 typically burned at infrequent intervals, and often patchily, so soil wood levels were often high in natural stands. Harvest has not replicated this soil wood regime. VRUs 3 and 4, because of more frequent fire, would have typically maintained low to moderate pools of soil wood, with periodic influxes where more mixed or stand replacing fire occurred.

Most of the harvested acres were harvested prior to implementing soil wood prescriptions, and much of the harvest occurred in areas where repeated fires in the late 1800s reduced snag and soil wood recruitment. About 29 percent of the Red River watershed has been harvested, mostly clear-cut, with little provision for maintenance of soil wood or snags to recruit soil wood. This harvest level is slightly higher than that recorded elsewhere in this document because some older harvest was not recorded in the timber stand record system, although the dozer tracks and low canopy attest to this harvest, and recent harvest on private lands is here included where observed. This represents a long-term reduction in soil productivity, until regrowth and disease or fire renew inputs of soil wood.

The Belt-age metasediments in Red River are likely to be limited in potassium. Whole tree harvesting can remove important nutrients from the site, and where such nutrients are already in short supply, forest growth may be significantly reduced (Garrison and Moore, 1998). This form of harvest has been a minor component until recently.

4.2 Aquatic Resources

4.2.1 Channel Characteristics

Stream Order/Gradient

Red River is a fifth order stream at its confluence with the South Fork of Red River (Table 4-1). The South Fork of Red River is the only 4th order tributary in the watershed. Table 4-1 lists the primary tributaries associated with 6th Code HUCs entering Red River. At their pour points, these HUCs consist of one 1st order channel, four 2nd order channels, fifteen 3rd order channels, and one 4th order channel. Figure 4-1 provides a longitudinal representation of stream gradients in the Red River watershed. Deadwood and Red Horse creeks both display a slightly steeper gradient near the mouths of their channels than do the remaining systems. However, both Deadwood and Red Horse creeks are predominantly lower gradient systems with 52% and 42%, respectively, of their channels being in the 0 – 2% gradient range. Red Horse Creek has a substantial meadow reach located approximately in the middle one-third of its entire system. The West Fork, South Fork, Middle Fork, and Moose Butte channels each reflect a lower gradient system near their mouths but then tend to increase sharply in their uppermost reaches. These upper reaches are within the 10 – 20% gradient range.

Table 4-1 further defines gradient percentages and total stream primary stem miles for Red River mainstem and each of the primary tributaries to Red River. The headwaters of Red River and Baston Creek have reaches that exceed 40% gradients. However, 85% of the mainstem of Red River falls within the 0-2% gradient, while Baston Creek has 59% of its reaches in the 10-20% gradient range. Soda Creek, the Middle Fork of Red River, and Campbell Creek each have approximately one-fourth to one-third of their channel reaches in the 10-20% gradient range. Streams dominated by lower gradients reaches (>50% of their overall length with gradient <4%) include Dawson, Siegel, Ditch, Trail, Otterson, Pat Brennan, Deadwood, and Red Horse creeks and the South Fork Red River.

Gradient is an important factor in determining the utility of various channels by fishes, particularly anadromous species. Stream segments with gradients less than 2% are generally most accessible to chinook salmon and, within the Red River watershed comprise approximately 42% of all stream miles.

Due to their low gradient, these same channels are also most susceptible to fine sediment deposition resulting from upland disturbances within the watershed. These segments are generally found in association with low elevation breaklands (ALTA 3) and alluvial valleys (ALTA 18). They occur predominately along portions of the mainstem of Red River and the South Fork of Red River, Moose Butte Creek, Red Horse Creek, Deadwood Creek, Soda Creek, and Siegel Creek. Additionally, the lower reaches of Otterson Creek, Trail Creek, and Bridge Creek are associated with the alluvial valley types (ALTA 18; Map 6). These low gradient reaches represent critical spawning and rearing areas for chinook salmon, and are important for various life history stages of other salmonid species as well.

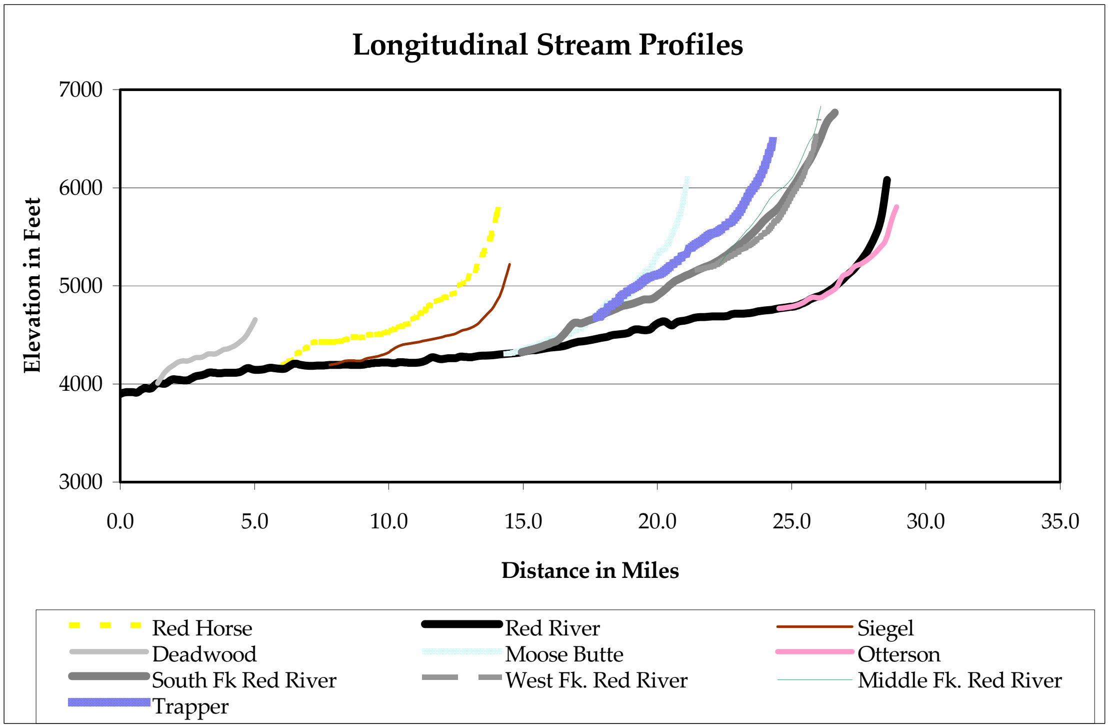

Figure 4-1 Longitudinal Profiles of Red River and its Major Tributary Streams

Stream reaches with gradients between 2% and 4% make up an estimated 21% of all stream channels in the watershed (Table 4-1). With the exception of uppermost headwaters, the highest gradient reaches of the mainstem Red River fall into this gradient class, affording widespread access for migratory salmonids to both the mainstem and associated tributaries throughout the watershed. Similar relatively low gradient reaches occur in the lower half of most mainstem tributaries throughout the entire watershed. These stream reaches have comparatively low stream competence and may function as depositional areas (stream competence is essentially the ability to do work, including transport sediments and other materials). This is especially true in mid-elevation reaches that occur downstream from sections of steep channel reaches, such as Red Horse Creek, Siegel Creek, Little Moose Creek, Moose Butte Creek, West Fork of Red River, Blanco Creek, Otterson Creek, and Bridge Creek (0-2% gradients followed by 4-10% gradients). When located upstream from higher gradient (>8%) reaches, the areas of reduced gradient may be inaccessible to certain migratory species (i.e. chinook) at various times of the year, but are commonly used by other migratory (i.e. steelhead) and/or resident salmonids.

In summary, roughly 63% of all stream length in the Red River watershed is of suitable gradient (not necessarily sufficient habitat quality) to provide aquatic habitat for anadromous species. Low gradient (<2%) reaches accessible to both species are widely available including the majority of the mainstem of Red River, and approximately 30% or greater of Moose Butte Creek, Red Horse Creek, Deadwood Creek, Soda Creek, Ditch Creek, Otterson Creek, Pat Brennan Creek, and Siegel Creek. These habitat reaches are extremely important to salmonid spawning and/or rearing and should be protected, enhanced, or maintained for their benefit.

Reaches with gradients between 4-10% are common in the Red River watershed (Table 4-1), making up an estimated 27% of all channel lengths in the watershed. This gradient class is frequent among low order tributaries and headwater areas (Map 15). Because of their higher stream competence, continuous reaches of anadromous spawning substrate are uncommon. These reaches do however, represent potential large woody debris (LWD) recruitment areas and offer substantial habitat for resident species such as westslope cutthroat and bull trout.

Table 4-1 Stream order/gradient summary for mainstem rivers and tributaries.

EAWS Reporting Unit/ Stream Name	Order (at mouth)	Percent of length within each Gradient class						Stream Length (miles)
		0-2	2-4	4-10	10-20	20-40	>40	
Mainstem Red River[1]	**5**	**85**	**7**	**6**	**1**	**1**	**1**	**30.68**
Lower Red River ERU								
Siegel Creek	3	60	21	13	6	0	0	6.78
Deadwood Creek	3	52	15	28	5	0	0	3.76
Red Horse Creek	3	42	24	25	8	1	0	8.49
French Gulch Creek	1	26	5	69	0	0	0	1.76
Campbell Creek	2	25	5	39	31	0	0	2.19
Middle Red River ERU								
Dawson Creek	3	3	60	32	4	0	0	2.30
Moose Butte Creek	3	36	24	27	10	3	0	6.82
Little Moose Creek	3	27	21	35	13	4	0	4.83
Blanco Creek	2	7	34	58	0	0	0	2.44
Upper Red River ERU								
Ditch Creek	3	32	42	21	6	0	0	3.55
Trail Creek	3	54	20	13	11	2	0	5.72
Otterson Creek	3	44	24	22	10	0	0	3.67
Bridge Creek	2	6	41	37	14	2	0	4.10
Baston Creek	3	9	17	8	59	3	4	2.29
Soda Creek	3	11	10	44	35	0	0	4.43
South Fork Red River ERU								
Schooner Creek	3	4	0	77	20	0	0	2.39
Trapper Creek	3	12	28	53	6	1	0	6.60
Pat Brennan Creek	2	42	24	25	8	1	0	2.78
South Fork Red River	4	24	42	32	2	0	0	11.82
Middle Fork Red River	3	0	9	66	25	0	0	3.80
West Fork Red River	3	18	24	50	8	0	0	4.11

1 Summarizes mainstem Red River along its entire length without consideration of various ERUs.

Streams with reaches in excess of 10% gradient are also common throughout the watershed. These high gradient reaches are primarily first order headwater streams (Map 15). These sections of stream channel likely contribute sediment and LWD to downstream reaches during runoff periods or following storm events. Many of the reaches with gradients in excess of 10% are Rosgen "A"-type channels, have low complexity, and are defined by a single thread channel. These channel types are also considered quite stable unless disturbed extensively by activities such as road building, timber harvest and/or mining. These characteristics do not provide for substantial salmonid habitat and may restrict movement of fish species.

Rosgen Channel Types

Based on stream survey records from 1990 thru 2002, a total of 22 different Rosgen channel types have been defined across 99 different USFS stream reaches in the Red River watershed (Map 16). Streams surveyed included the mainstem of Red River, the South Fork of Red River, West Fork of Red River, Moose Butte Creek, Little Moose Creek, Red Horse Creek, Trapper Creek, Ditch Creek, and Otterson Creek. Of the total reaches surveyed, approximately 43% are "C" channels, 35% are "B" channels, 5% are "A" channels, and the remaining 17% are "E", "F", or "G" channels. Division of each major channel type shows that 30% of all reaches surveyed are "C-4", 20% are "B-4", 5% are "A-4", 5% are "F-4", and the remaining 40% are assorted ranging from "A-1" thru "G-3".

In the Red River watershed, current channel types (based on Rosgen classification methods) are likely similar to presettlement/disturbance periods. However, three stream reaches located in the mainstem of Red River, Red Horse Creek, and Ditch Creek have been determined to be "F" and "G" channel types (Map 16). Historically, these three reaches appear to have most likely been "B/C" channel types. Past dredge mining activities are suspect to have been the primary influencing activity having caused channel type changes. Stream and riparian processes may have been impacted severely enough within these reaches to change these channels from unentrenched or unconfined channel types to the moderately entrenched, less sinuous, higher gradient "F" and/or "G" type channels. Historical dredge mining activities is evident to have occurred within each of these reaches, and may have contributed to the suspected channel type changes.

4.2.2 Valley Bottoms

No information.

4.2.3 Streamflow Regime

The relative pattern of annual discharge throughout the upper South Fork Clearwater drainage is reasonably uniform, and represented in gage data recorded from the South Fork Clearwater River near Elk City (USGS gaging station 13337500). The station is located just above the mouth of Crooked River and reflects mostly the combined flows of Red and American Rivers. Operation of the gage was discontinued in 1974, but was reactivated in 2002 as part of the USGS' long-term baseline stream gaging network. Figure 4-2 shows mean daily flows at this stream gage from water years 1945 through 1974. The water year runs from October 1 through September 30.

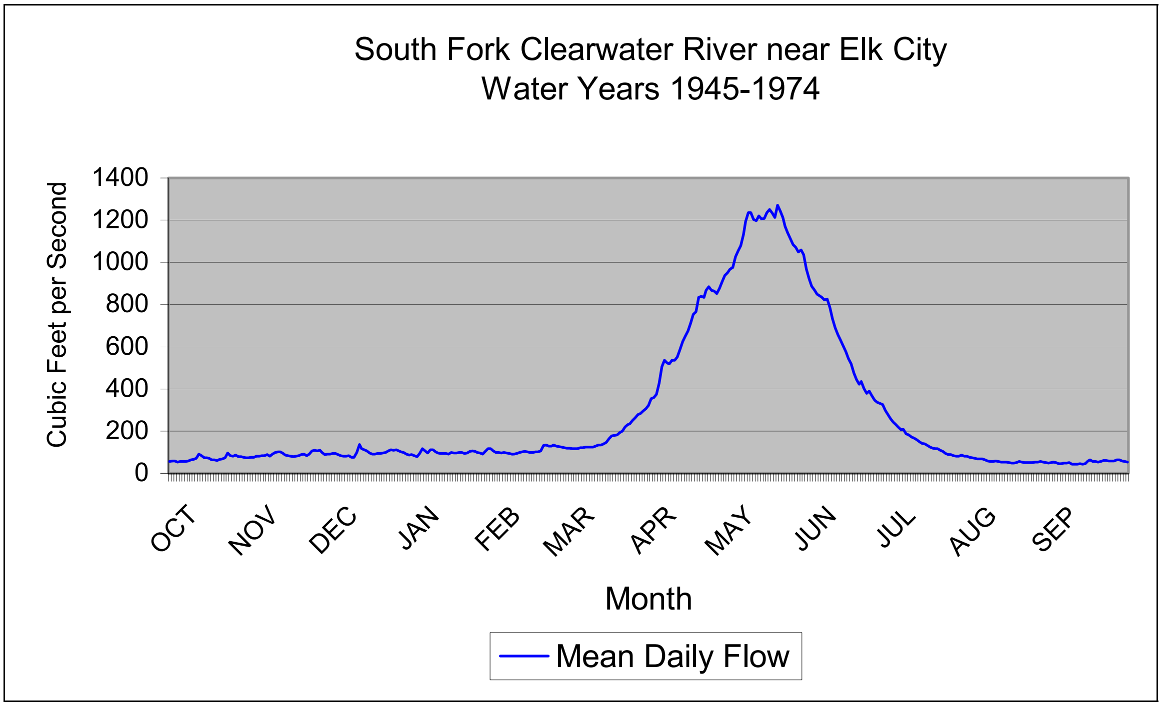

Figure 4-2 Mean Daily Streamflow of South Fork Clearwater near Elk City

Flows generally begin to increase in April, peak in mid May, and decline through June. Relatively stable low flow conditions typically exist from August through February. Floods are a primary process in the Red River system and occur predominately in the spring. They are generated from snowmelt, often augmented by rain. At the South Fork Clearwater River near the Elk City gaging station the two largest floods during the period of record occurred on June 8, 1964 and May 29, 1948.

Floods occasionally result from snowmelt or rain-on-snow events between November and March, although such events are infrequent in the upper portions of the South Fork Clearwater subbasin. At the gage, 95% of the peak flow events occurred April through June, 5% occurred November through March, and none occurred July through October. Due to the elevation, climate, relatively deep soils, and moderate topography, the Red River drainage does not typically exhibit a flashy response to storm events. Summer thunderstorms may cause localized peak flows, but these are typically restricted to smaller subwatersheds, typically in first through third order streams.

In Red River, stream gaging stations operated by the Nez Perce National Forest are located on upper Red River (at the Ranger Station), South Fork Red River (at the Ranger Station) and Trapper Creek (upstream of Road #421). Data collected (Figure 4-3) at these stations include streamflow, suspended sediment and bedload sediment. Streamflow data are typically collected from April 1 through September 30 of each year, with available records starting in 1986. The graph below shows streamflows at the upper Red River gage for two contrasting water years, with 1992 representing a low water year and 1997 representing a high water year.

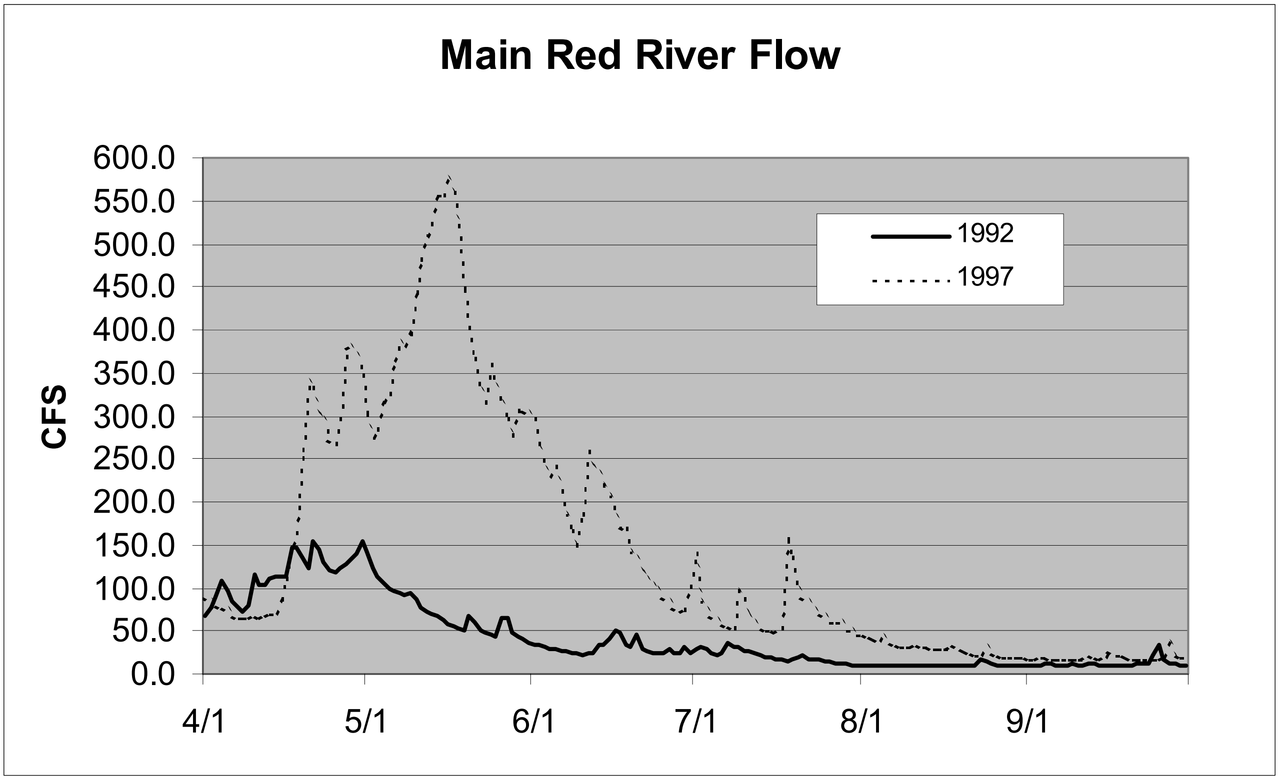

Figure 4-3 Main Red River Flow

[Note to reviewers – Additional analysis of data associated with the gaging stations is underway. This includes a trend analysis of sediment yields from 1986 to the present. If available, the results of this analysis will be included in the final EAWS.]

4.2.4 Water Yield

A general discussion of the importance of water yield, its ties to sediment yield, channel morphology and function, and other factors, and the use of equivalent clearcut area (ECA) as a surrogate measure to examine changes in water yield is available in Sections 3.3.1 and 3.3.2.

Changes in ECA throughout subwatersheds of the Lower Red River, Middle Red River, Upper Red River and South Fork ERUs, since approximately 1870 (as decadal averages), are shown in Figure 4-4, Figure 4-5, Figure 4-6, and Figure 4-7, respectively. Subwatersheds are grouped in these figures to facilitate spatial examination of changes in water yield through time, and trends in ECA are projected into the near future (2000-2009 decade) to facilitate future planning. Although records are relatively good for the past 130 years, it is unknown to what extent ECA varies naturally over longer periods than shown in this series of figures. The following spatial and temporal characterization of changes in ECA (water yield) considers both natural (fire) and induced (timber harvest, roading) disturbance regimes. However, it is important to note that the ECA analysis does not include the potential impacts of grazing and mining activities on water yield, nor the recent effects of the mountain pine beetle.

The effects of historic wildfires on ECA and water yield are evident throughout the Red River watershed. The most substantial impacts of pre-1900 fires are seen throughout much of the Lower and Middle Red River ERUs (Figure 4-4 and Figure 4-5, respectively), and select subwatersheds within the Upper Red River ERU (Ditch Creek and Main Red River; Figure 4-6), and South Fork ERU (Pat Brennan; Figure 4-7). Since 1900 fire impacts have been less widespread, and with little notable impact after the 1920s. Subwatersheds showing substantial (>50% ECA) hydrologic impacts by these early century fires include Red Horse Creek (Figure 4-4), Otterson and Bridge creeks (Figure 4-6). Although fire impacts from early century fires (1900-1909) were widespread throughout subwatersheds of the South Fork ERU, the relative degree of impact was typically less than that seen due to fires throughout other ERUs, and only rarely exceeded 35% ECA in any component subwatershed (Figure 4-7).

Both the timing and relative impact of historic fires on water yield (ECA) has been most consistent within the Middle Red River and South Fork ERUs (Figure 4-5 and Figure 4-7, respectively). Subwatersheds within the Middle Red River ERU generally show the greatest fire impacts in the 1880s with ECA levels from 50-60%; those in the South Fork ERU were most impacted by fires during the 1900s, with resultant ECA levels typically from 20-40%. Both the Lower and Upper Red River ERUs show more variable spatial and temporal impacts of fire on ECA, with primary impacts ranging in time from the 1880s through the 1920s, and related ECA peaks ranging from approximately 10-80% (Figure 4-4 and Figure 4-6, respectively).

Most of these subwatersheds follow a similar pattern of impact following fires, with swift increases in ECA values and subsequent forest regeneration and regrowth resulting in a steady reduction in ECA values until approximately 1960 when substantial commercial timber harvests (and associated roading) began (Figure 4-4, Figure 4-5, Figure 4-6 and Figure 4-7). With the exception of the Otterson and Bridge Creek subwatersheds, timber harvest has impacted water yield in all subwatersheds. Although highly variable throughout the watershed, roading and timber harvest activities most substantially increased water yields in the Lowest Main Red River, Deadwood, Dawson, Blanco, and Upper Main Red River subwatersheds, where ECA has exceeded 25% at some times since the 1960s. Impacts of roading and timber harvest in other subwatersheds were less substantial, with maximum ECA typically less than 20%.

The relative degree of impact from natural vs. induced disturbance on water yield is variable throughout the Red River watershed. In the majority of component subwatersheds, increases in ECA related to fire events far exceeded that due to roading and timber harvest activities (Figure 4-4 through 4-6). However, in the Lowest Main Red River (Figure 4-4), Moose Butte (Figure 4-5), Baston, Soda, Upper Main Red River (Figure 4-6), Schooner, and Upper South Fork (Figure 4-7) subwatersheds, impacts to water yield from natural and induced events were similar in magnitude.

Although ECA and impacts to water yield currently show a general recovery trend throughout the watershed, existing impacts remain highly variable amongst both ERUs and component subwatersheds. Average current ECA values across component subwatersheds within the Lower and Middle Red River ERUs are approximately 20% (range <10-30%; Figure 4-4 and Figure 4-5, respectively); Within the Upper Red River and South Fork ERUs average current ECA values across component subwatersheds are approximately 10% (range 1-14%; Figure 4-6 and Figure 4-7, respectively).

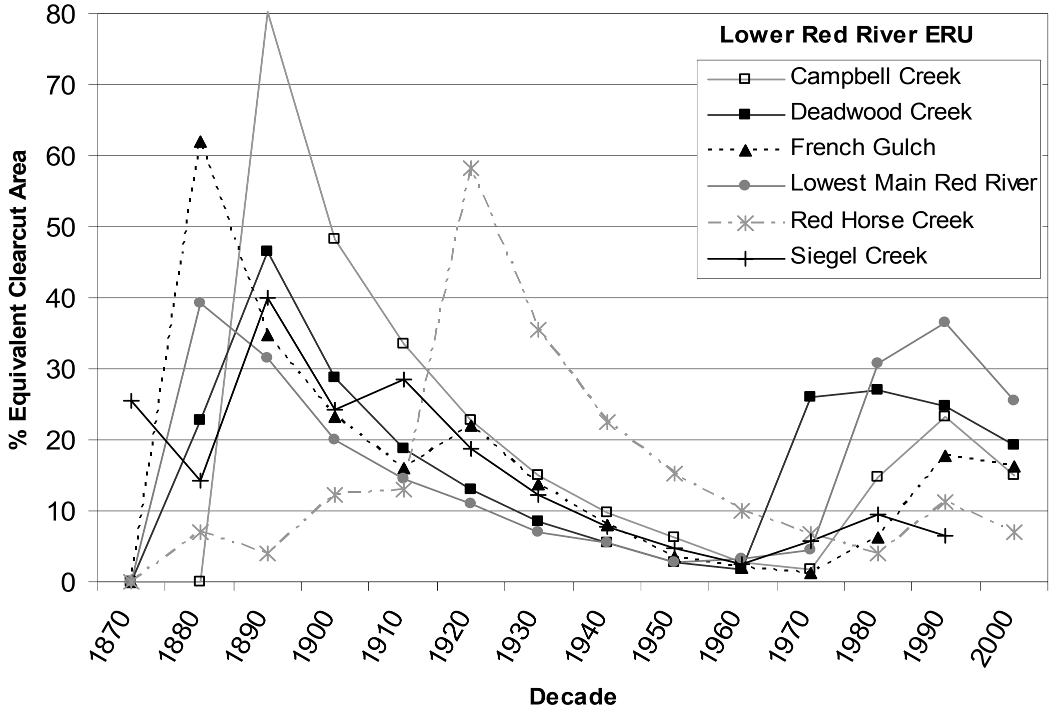

Figure 4-4 Percent equivalent clearcut area (ECA) over time for individual subwatersheds in the Lower Red River ERU.

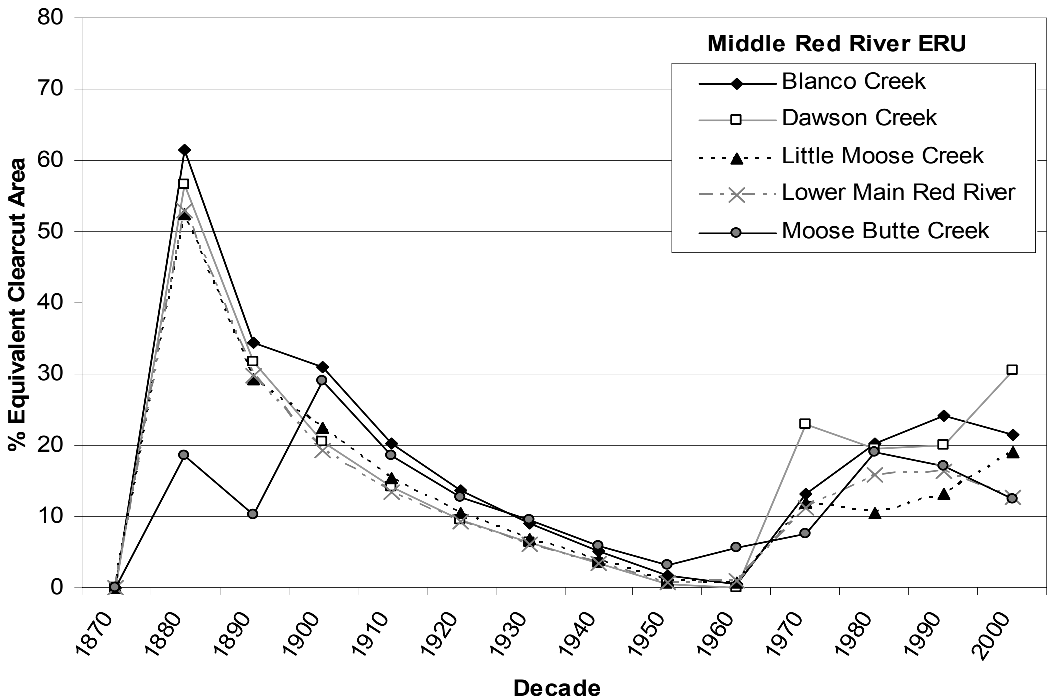

Figure 4-5 Percent equivalent clearcut area (ECA) over time for individual subwatersheds in theMiddle Red River ERU.

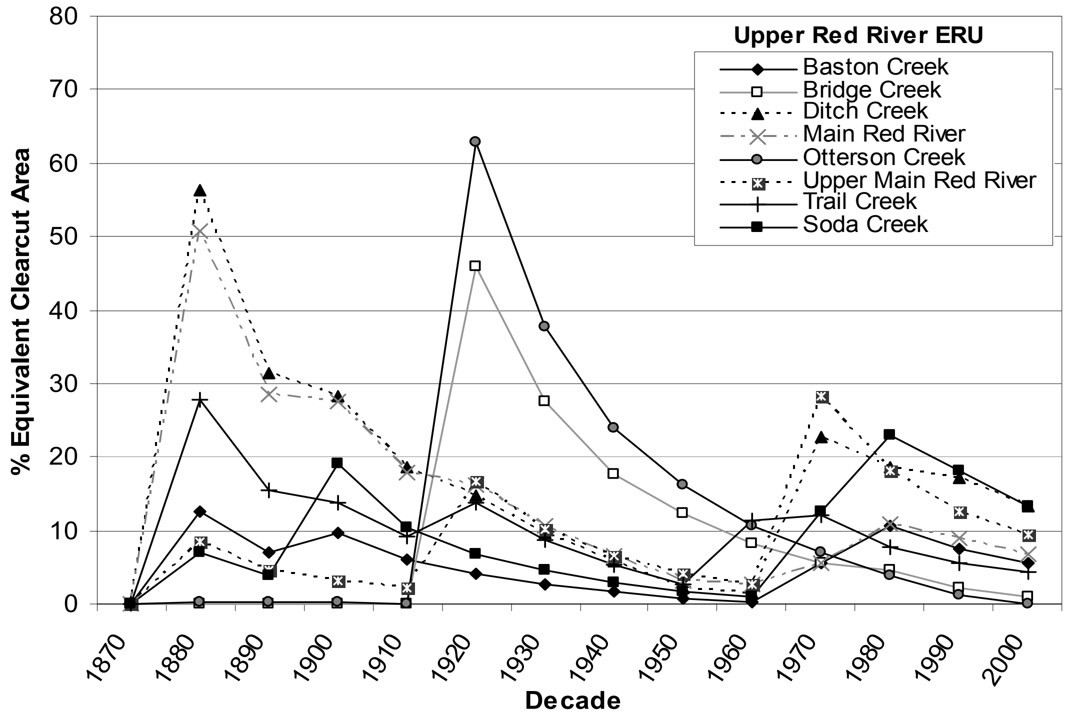

Figure 4-6 Percent equivalent clearcut area (ECA) over time for individual subwatersheds in theUpper Red River ERU.

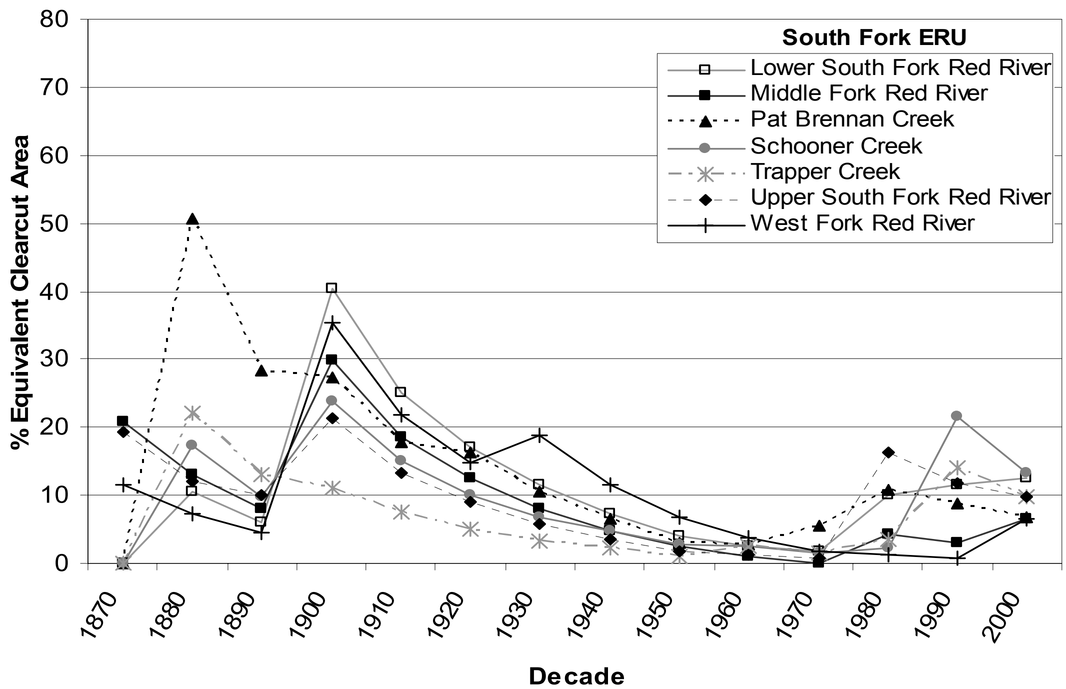

Figure 4-7 Percent equivalent clearcut area (ECA) over time for individual subwatersheds in the South Fork ERU.

4.2.5 Sediment Yield

A general discussion of the importance of sediment yield, its ties to water yield, channel morphology and function, and other factors, is available in Section 3.3.2. Also included in Section 3.3.2 is a brief discussion of the limitations of the NEZSED model in estimating sediment yield: in summary, the model does not address sediment generated from mass wasting, grazing, or mining impacts. The model does address changes in sediment yield due to roads, timber harvest, and fire.

The Nez Perce National Forest Plan (USDA 1987) establishes a guideline that, in order to meet fish and water quality objectives, the maximum sediment yield in component subwatersheds should not exceed levels shown in Table 4-2. Based on modeled data, three component subwatersheds (Lower and Main Red River, and Moose Butte) are currently exceeding the Forest Plan guidelines for sediment yield. In addition the Ditch Creek subwatershed is approaching the prescribed sediment yield guideline. The current situation in these subwatersheds may inhibit the ability to conduct certain landscape level treatments while ensuring compliance with Forest Plan guidelines, although this is highly dependent on type and scope of proposed activities or treatments, as well as the balance of short and long term objectives.

Trends in modeled changes in sediment yield in component subwatersheds of the Lower, Middle, and Upper Red River and South Fork ERUs since approximately 1890 are illustrated in Figure 4-8, Figure 4-9, Figure 4-10, and Figure 4-11, respectively. Figure 4-12 combines data from all component subwatersheds in Red River to examine changes in the percentage of those subwatersheds within various sediment yield condition classes over time. In all of these figures, trends are projected throughout the current decade (2000-2009) to facilitate planning.

Following even major fire events, recovery to base sediment yield conditions typically occurs within a relatively short time (3-4 years), creating a pulse type impact to aquatic systems. In contrast, recovery of sediment yield following roading and harvest activity is incomplete since roads remain after the impacts of harvest have diminished. This results in both a pulse type impact to aquatic systems from the initial road construction and harvest activity, and a long-term or press type influence associated with the continued existence of roads.

In general, impacts to sediment regimes from timber harvest activities (and associated roading) are more substantial in both magnitude and duration than those caused by fires. The short-term pulse impact of historic fires on sediment regimes throughout the watershed is readily apparent in Figure 4-8, Figure 4-9, Figure 4-10, and Figure 4-11. Short term sediment yield pulses related to fires often approximate 50% over base levels, and occasionally exceed 100% over base levels, with major pulses occurring every 15-50 years. In contrast, sediment pulses related to substantial roading and harvest activities (beginning in approximately 1960) often exceed 100% over base levels, and occur much more frequently than those due to historic fires (commonly at 5-10 year intervals).

Since limited harvest activity has occurred within the watershed since the 1990s, pulse type increases in sediment yield resulting directly from harvest activities have diminished. However, the long term press type disturbance following roading and harvest activities are very apparent, with many watersheds now having relatively stable sediment yields between 15 and 36% over base levels (Table 4-2); historically, sediment yield in these same watersheds was generally maintained at or near base levels between fire disturbances. Figure 4-12 clearly illustrates the increase in press type effects of land use activities over time, with relatively high sediment yields being maintained in a higher percentage of watersheds than was historically realized, particularly since approximately 1960 when implementation of substantive land management activities throughout much of the watershed began in earnest (Figure 4-8, Figure 4-9, Figure 4-10, and Figure 4-11). As previously mentioned, only four of these component subwatersheds (Lower and Main Red River, Moose Butte, and Lower South Fork) are currently exceeding the Forest Plan guidelines for sediment yield (Table 4-2).

Table 4-2 Comparison of Current Sediment Yield and Associated Forest Plan Guidelines

EAWS Reporting Unit/ Subwatershed	2002 Sediment Yield (% over base)	Forest Plan Sediment Yield Guideline[1]	Forest Plan Entry Frequency Guideline[2]	Meeting FP Guidelines? [3]
Lower Red River ERU				
Siegel Ck.	23	35	1	Yes
Deadwood Ck.	34	60	3	Yes
Redhorse Ck.	13	30	1	Yes
French Gulch	16	60	3	Yes
Campbell Ck.	28	60	3	Yes
Lowest Red R[4].	23	Undefined	Undefined	Unknown
Middle Red River ERU				
Dawson Ck.	45	60	3	Yes
Lower Red River[4]	22	20	1	**No**
Moose Butte Ck.	36	30	1	**No**
Little Moose Ck.	36	60	3	Yes
Blanco Ck.	34	60	3	Yes
Upper Red River ERU				
Ditch Ck.	27	30	1	Approaching
Trail Ck.	13	30	1	Yes
Otterson Ck.	0	30	1	Yes
Bridge Ck.	13	30	1	Yes
Upper Main Red R.[4]	21	30	1	Yes
Baston Ck.	8	15	1	Yes
Soda Ck.	22	30	1	Yes
Main Red R.	28	25	1	**No**
South Fork Red River ERU				
Schooner Ck.	21	35	1	Yes
Trapper Ck.	11	30	1	Yes
Pat Brennan Ck.	14	60	3	Yes
Lower S. Fk. Red R[4]	15	30	1	Yes
Upper S. Fk. Red R	10	35	2	Yes
Middle Fk. Red R.	10	35	2	Yes
West Fk. Red R.	6	30	1	Yes

1 Approximate maximum sediment yield to meet fish and water quality objectives (% over base).
2 Number of years per decade that Sediment Yield Guideline can be approached or equaled.
3 Defined as "approaching" if within 15% of Forest Plan Sediment Yield Guideline.
4 Sediment yield is routed as a true watershed, considering all upstream subwatersheds.

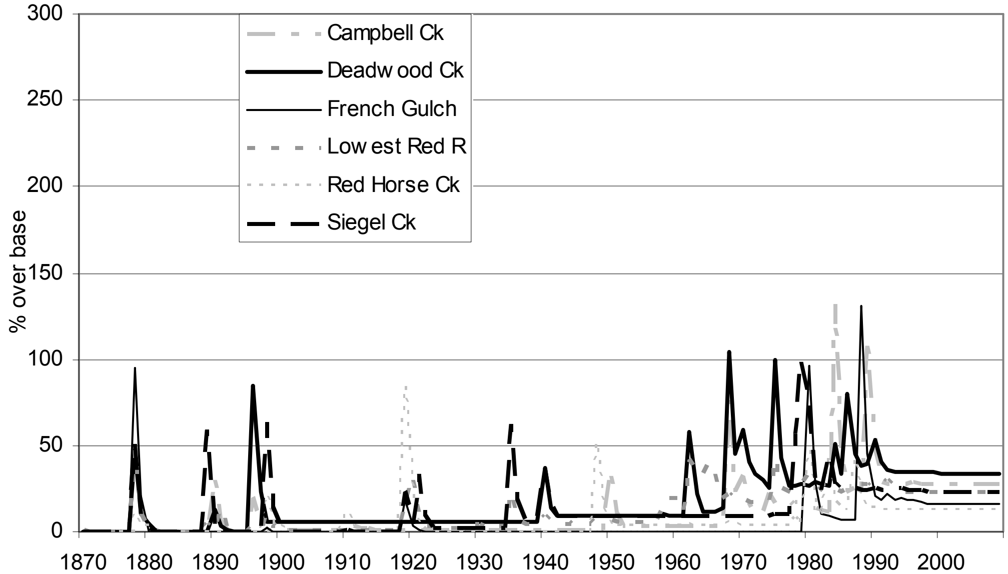

Figure 4-8 Decadal Average Sediment Yield (as percent over base; 1890-2009) for Individual Subwatersheds within the Lower Red River ERU

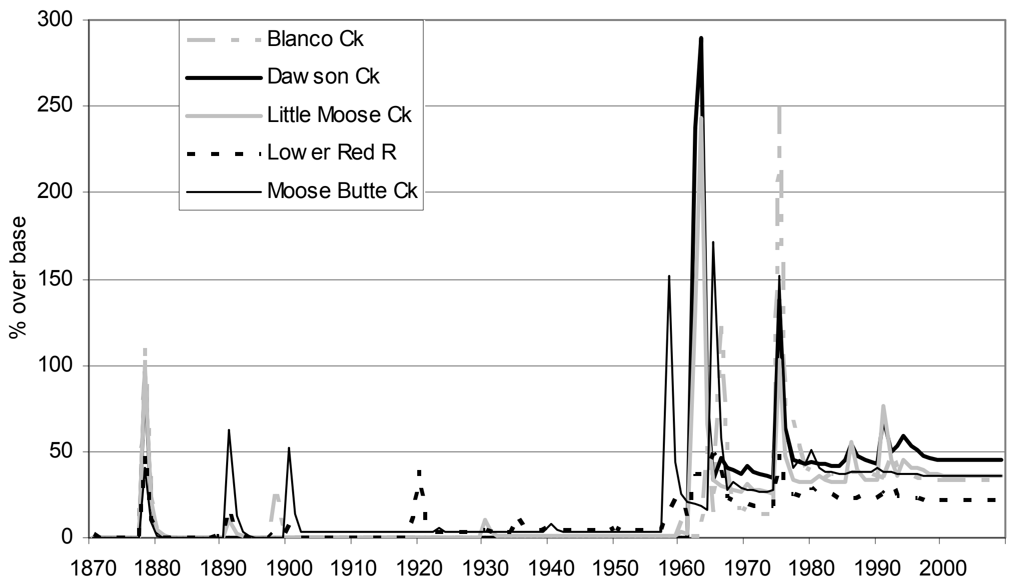

Figure 4-9 Decadal Average Sediment Yield (as percent over base; 1890-2009) for Individual Subwatersheds within the Middle Red River ERU

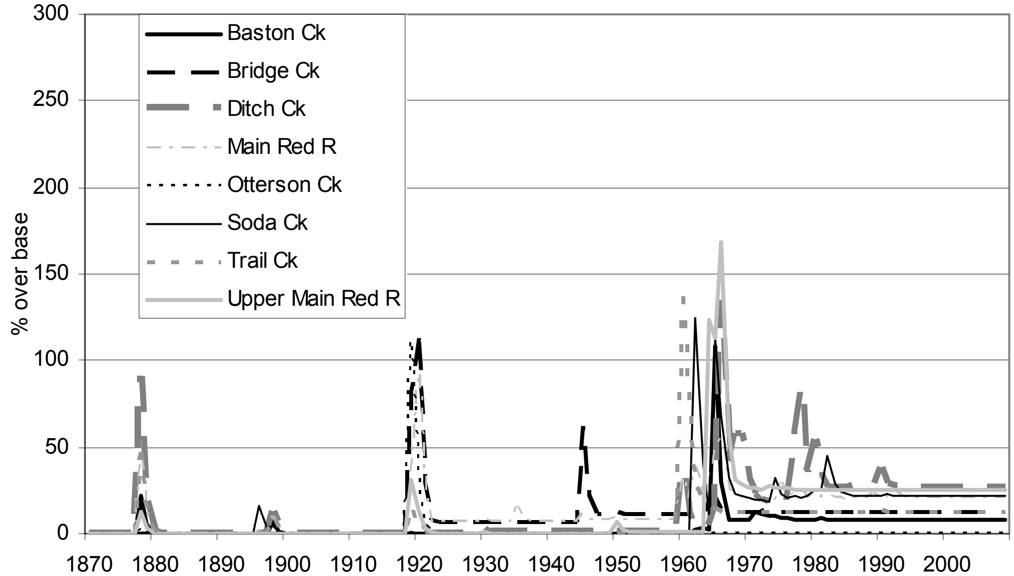

Figure 4-10 Decadal Average Sediment Yield (as percent over base; 1890-2009) for Individual Subwatersheds within the Upper RedRiver ERU

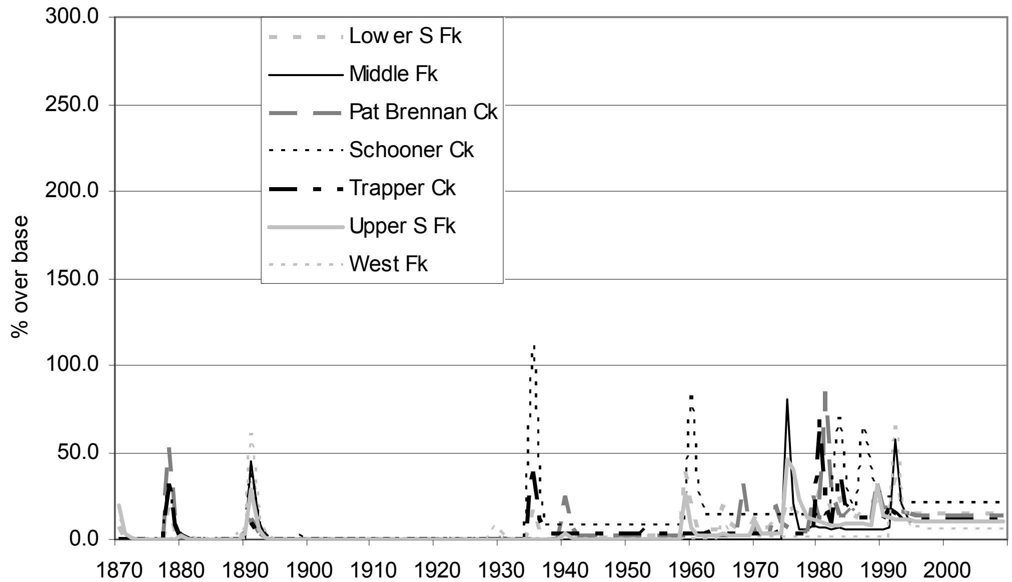

Figure 4-11 Decadal Average Sediment Yield (as percent over base; 1890-2009) for Individual Subwatersheds within the South Fork ERU

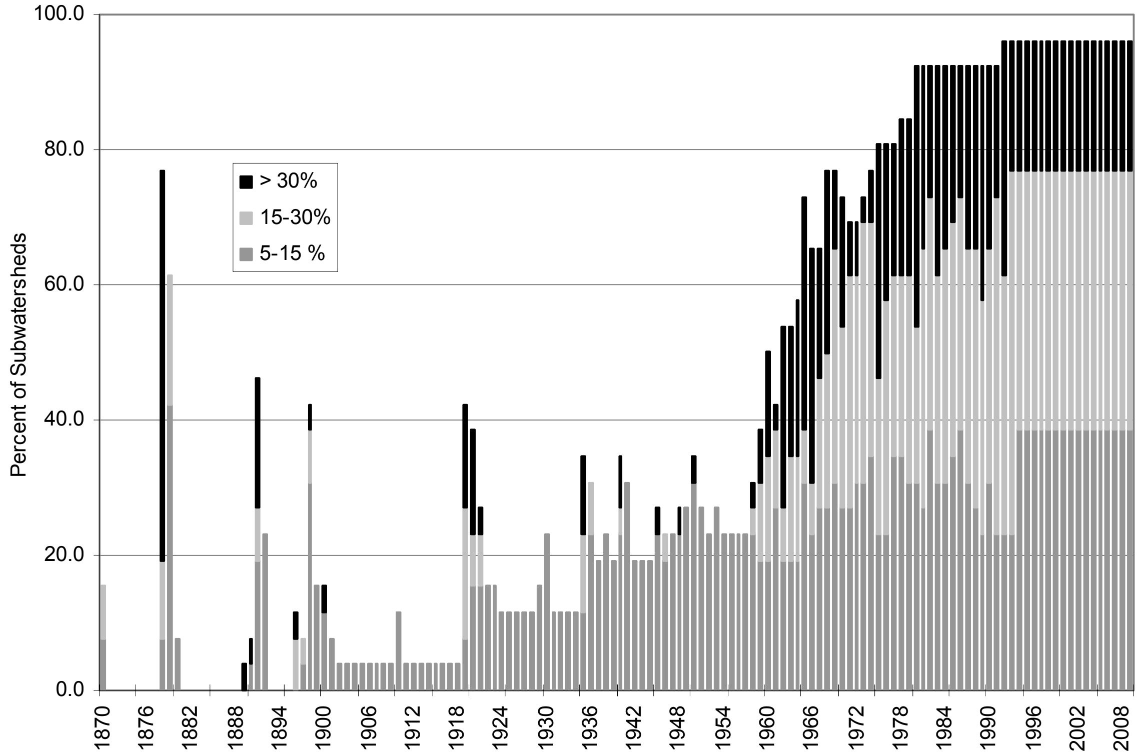

Figure 4-12 Percent of subwatersheds in various sediment condition classes expressed as percent over base sediment yield (1870-2010).

4.2.6 Water Quality

South Fork Clearwater River TMDLs

Red River and several of its tributaries were placed on the 1994-303(d) list. In 1998, Red River and all of its tributaries, with the exception of Dawson Creek, were delisted. However, Dawson Creek remains on the 303(d) list as being water quality limited with sediment as the only pollutant. It will be recommended for delisting as part of the draft South Fork Clearwater Assessment and TMDL. The mainstem South Fork Clearwater River will remain listed for sediment and water temperature.

The confluence of American and Red Rivers is the origin of the South Fork Clearwater River. Water temperature has been documented to be elevated at this point (IDEQ, et al, 2002). Downstream of the confluence, water temperatures tend to slightly decrease. This would indicate that influencing factors in the headwater reach of the South Fork Clearwater River are different than those in the American and Red systems. A substantial portion of the heat loading to the South Fork Clearwater River has been determined to be from its tributaries. Red River and its tributaries are included in the draft South Fork Clearwater water temperatureTMDL, with reach-specific canopy density targets, even though they are not on the current 303(d) list.

The South Fork Clearwater River is also listed for sediment under the 303(d) process. Deposited sediment has been determined to be a fish habitat concern in the upper mainstem South Fork Clearwater River. IDEQ, EPA, and the Nez Perce Tribe have agreed that the draft TMDL will target a 25% sediment load reduction in the mainstem South Fork Clearwater River. Sediment reduction targets will not be assigned to individual tributaries. However, there is an expectation that loading reductions will need to occur in tributary watersheds, such as Red River, in order to meet the mainstem targets. The TMDL implementation plan will provide additional guidance.

Water Temperature

Water temperature is an important water quality parameter for aquatic organisms which are affected by, and highly adapted to, its fluctuations. Water temperature varies temporally and spatially within the stream channel network. Temporal variations occur on a daily, seasonal, and annual basis. Spatial variation occurs between watersheds and from the headwaters of a watershed to its mouth. In any given stream reach, water temperature is dependent primarily on the water temperature coming into the reach, the volume of discharge, channel morphology, streamside shade, and weather.

Water Temperature Criteria

Water temperature criteria that currently apply to the Nez Perce National Forest come from six sources:

- Idaho Water Quality Standards;
- Environmental Protection Agency Rules;
- Forest Plan Desired Future Condition (DFC) Tables;
- PACFISH Interim Riparian Management Objectives (RMOs);
- Matrix of Pathways and Indicators of Watershed Condition; and
- Interior Columbia Basin Supplemental Draft Environmental Impact Statement.

These criteria apply in various ways. For example, the Idaho Water Quality Standards and EPA Regulations apply as legal direction for implementation of the Clean Water Act. The Forest Plan, as amended, carries similar legal direction for implementation of the National Forest Management Act. The Matrix of Pathways and Indicators of Watershed Condition (NMFS 1998) is a working tool used in consultation under Section 7 of the Endangered Species Act. The criteria from these sources are paraphrased in Appendix C.

Current Water Temperature Conditions

The following graphics display spatial variation among sites and temporal variation at individual sites over the summer and fall months. Spatially distinct sites can reveal longitudinal patterns between multiple sites within the same stream, and allow comparisons of these patterns among several different streams.

Temperature data were collected from the late 1980s through 2002 using thermographs at a wide range of sites across the watershed (only 2001-2002 data are displayed in the graphs). Data from 2001 and 2002 were collected specifically for this EAWS. Data were collected at five sites in the mainstem of Red River, two sites each in South Fork Red River and West Fork Red River, and one site each in several smaller tributaries. Water temperature records from the South Fork Clearwater River at Mt Idaho Bridge indicated that 2000 had the second highest peak temperatures recorded during the period 1992-2001.

Temperatures in all Red River streams in 2001 and 2002 showed the typical seasonal fluctuations seen in other stream systems on the Nez Perce National Forest. Temperatures in Red River rise steadily in late June and early July as the snowmelt runoff declines, reach their highest points in mid to late-July which typically coincides with maximum daily air temperatures, and then begin to fall in late August as the nights become longer and colder. In most years, temperatures drop off significantly from October through December, and then remain relatively stable at 0-3° C until early thawing begins in March.

The greatest difference in average daily temperature between sites in the 2001-2002 data was 8-9° C. This difference was revealed when comparing the site at the mouth of Red River to the sites at Red River above Shissler Creek and the upper West Fork (Figure 4-14). Red River near the mouth is a relatively wide channel with relatively little shade located at about 3,950 ft elevation, and the channel at the upper West Fork site is approximately 3.0 ft wide with a fairly dense canopy at about 6,000 ft elevation.

In July 2002, maximum daily temperatures in the main stem of Red River ranged from 22.8° C near the mouth of Ditch Creek, to 16° C at Red River just above the mouth of Shissler Creek, a distance of approximately six river miles (Figure 4-15). The maximum daily temperature at the mouth of Red River (not shown) reached approximately 25° C, 9° C greater than the maximum near Shissler Creek.

The upper W Fk of Red River, W Fk Red River at the mouth, and Red River above Shissler Creek were the coldest stream reaches in the watershed (Figure 4-13). The average daily temperature in Red River above Shissler Creek reached only 13.5° and 12.4° in 2002 and 2001, respectively. The maximum temperature recorded at the Red River site above Shissler Creek in 2002 was 16° C, which was reached only one day that season at that site. In 2002, the site at the mouth of Red River consistently averaged 3-4° C warmer than any other site (Figure 4-15). This site is much further downstream and lower in elevation than any other temperature site in the watershed.

It is apparent that State and Federal water quality criteria for temperature are commonly exceeded in main Red River and several of its tributaries. Natural climatic and physical factors account for some of the standards being exceeded, but in some cases temperatures have been influenced by shade removal and channel morphology changes.

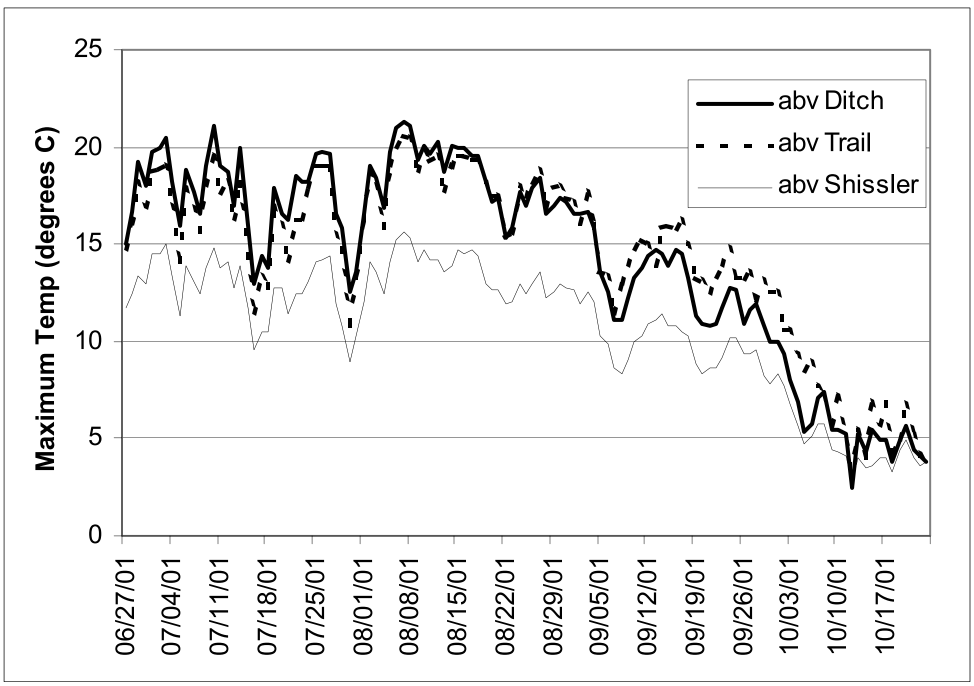

Figure 4-13 Mainstem Red River Maximum Daily Temperatures, 2001

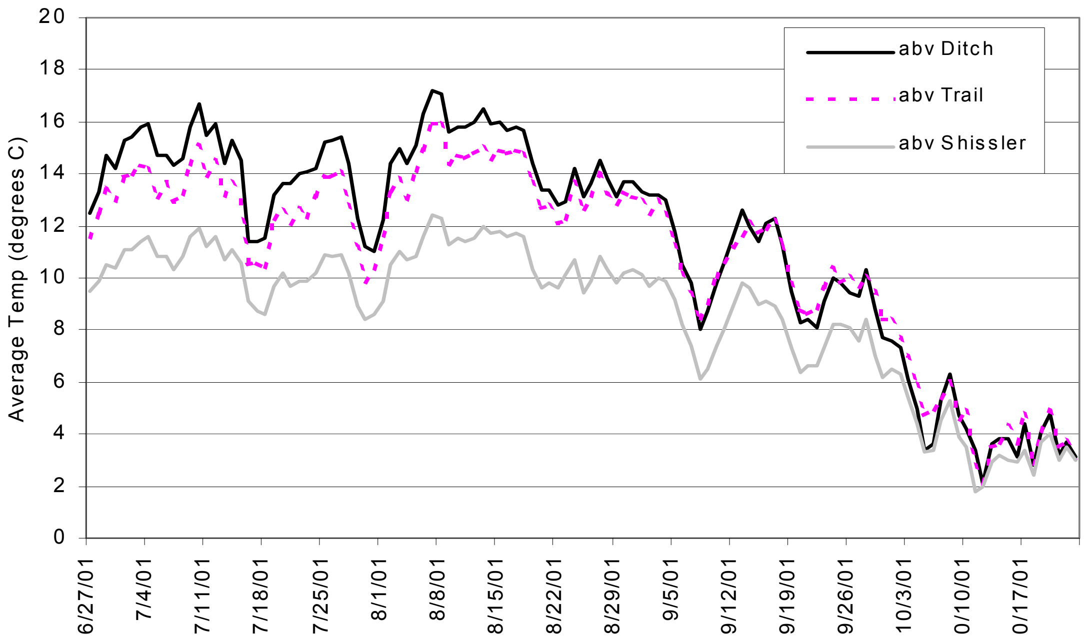

Figure 4-14 Mainstem Red River average daily temperaures, 2001.

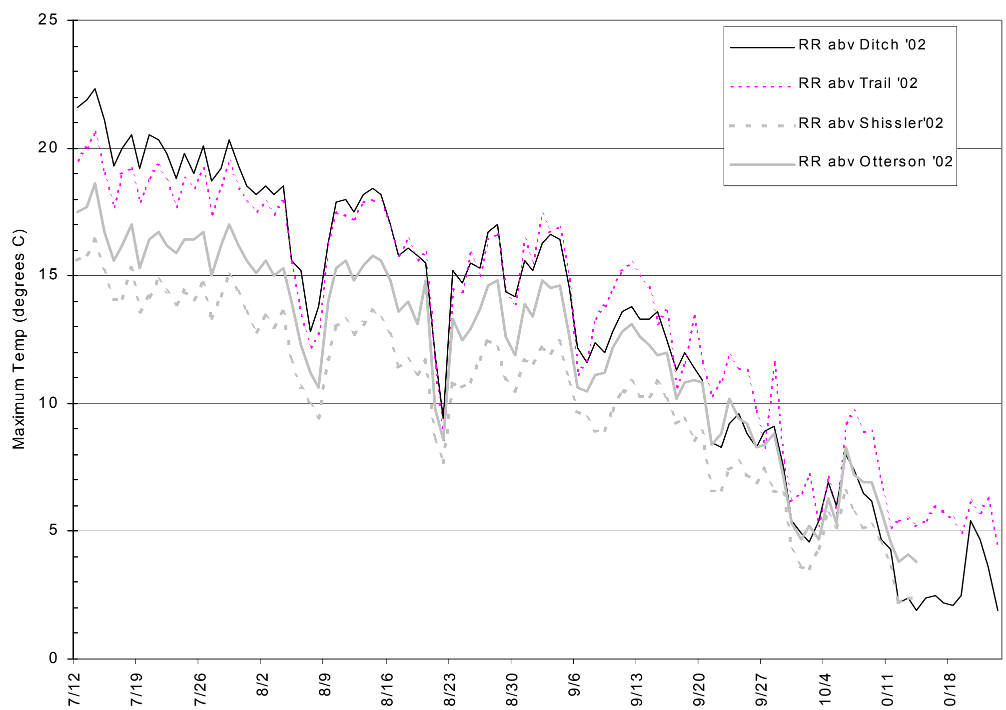

Figure 4-15 Mainstem Red River maximum daily temperaures, 2002.

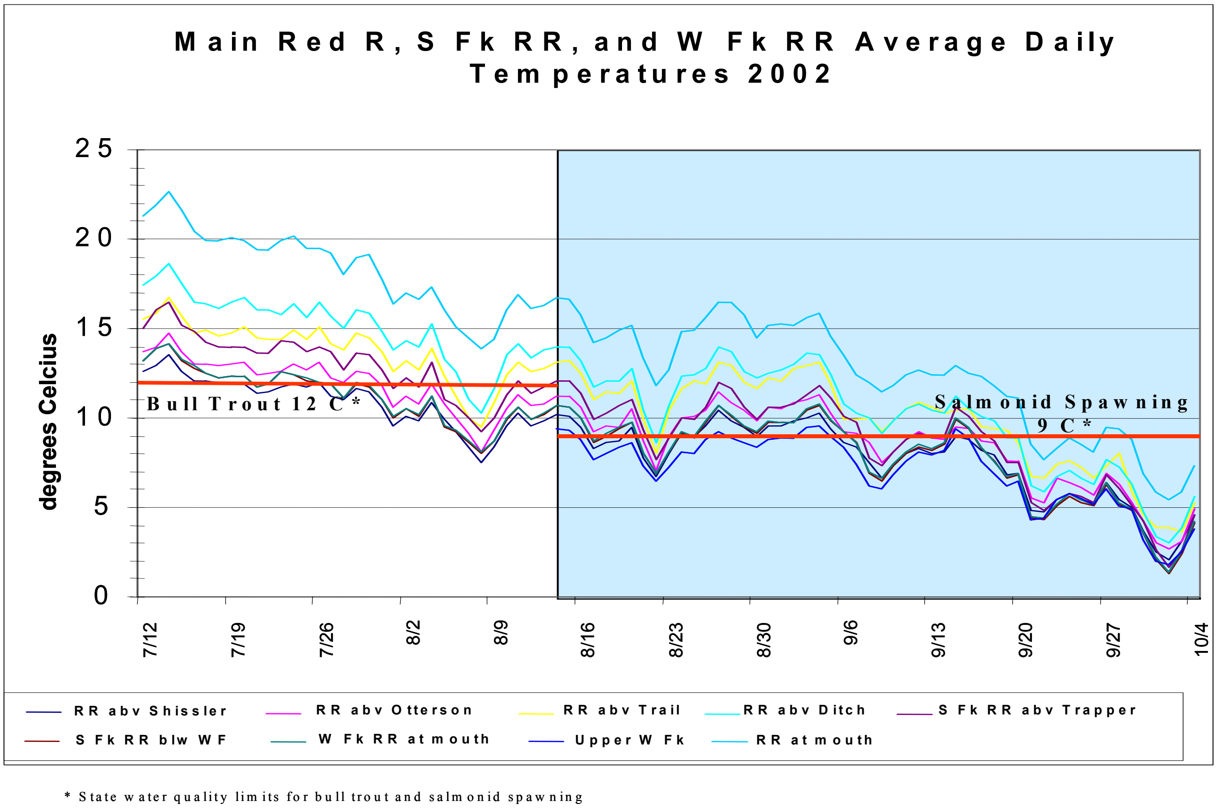

Figure 4- 16 Main RedRiver, South Fork RedRiver, and West Fork Red River Average Daily Temperatures, 2002

Miscellaneous Water Quality Parameters

During the period of 1974 through 1980, spot water quality samples were collected at nine sites within the Red River watershed. These were Red River (at the Ranger Station), Moose Butte Creek, Trapper Creek, West Fork Red River, lower South Fork Red River, upper South Fork Red River, Ditch Creek, Siegel Creek and Little Campbell Creek.

Conductivity is an index of the amount of dissolved ions in the water. It is indexed by the ability of water to pass electric current and is measured in micromhos. Conductivity is highly dependent on geologic conditions, but can also be an indicator of certain types of pollution. In total, 385 conductivity samples were taken at the nine sites. The overall mean was 27.7 micromhos, with an individual sample range of 8 to 66 micromhos. Trapper Creek had the lowest mean at 19.6 micromhos and Siegel Creek and Red River were highest at 34.6 micromhos. These are all relatively low values indicating low levels of dissolved ions.

The parameter pH is an index of hydrogen ion concentration and is an indicator of how acidic or basic the water is. It is a unitless value that ranges from 1 to 14, with 1 being highly acidic, 7 being neutral, and 14 being highly basic. In total, 302 pH samples were collected at the nine sites. The overall mean was 6.90, with an individual sample range of 5.4 to 8.0. Upper South Fork Red River had the lowest mean at 6.78 and Siegel Creek had the highest mean at 7.11. The mean values are considered near neutral and within expected ranges. Significance of the low individual reading of 5.4 is unknown, but low pH values increase sensitivity of fish to dissolved metals.

Alkalinity is an indicator of the capacity of water to neutralize acid. It is also correlated to geology and is related to aquatic productivity. It is commonly reported in milligrams per liter of equivalent amounts of calcium carbonate. Lower values indicate less acid neutralizing capacity and generally lower productivity. In total, 362 alkalinity samples were taken at the nine sites. The overall mean was 15.7 mg/l, with an individual sample range of 8 to 38 mg/l. Trapper Creek had the lowest mean at 12.9 mg/l and Siegel Creek had the highest at 19.5 mg/l. All of these values are considered to be at the low end for natural waters.

Hardness is a concept that relates to the ability of soap to form lather and is caused by dissolved ions. It is related to alkalinity and is also reported in milligrams per liter of equivalent amounts of calcium carbonate. Lower values indicate soft water and generally lower productivity. In total, 383 hardness samples were collected at the nine sites. The overall mean was 11.4 mg/l, with an individual sample range of 1 to 34 mg/l. West Fork Red River had the lowest mean hardness at 8.4 mg/l and Siegel Creek had the highest at 16.4 mg/l. All of these values are considered to be at the low end for natural waters.

4.2.7 General Watershed Condition

Spatial variation in physical watershed condition can be discussed in terms of disturbance indicators (Figure 4-4). Data presented in Figure 4-4 is for comparative purposes while a detailed discussion of fire and timber harvest and the transportation network is presented in Section 4.3.5 and Section 4.4.7 respectively. Discussion of equivalent clearcut area (ECA) as a disturbance indicator is presented with previous discussions of water and sediment yield (see Sections 4.2.4 and 4.2.5).

Road density is a commonly used indicator of disturbance within a watershed since roads provide access to areas lending to the occurrence of other disturbance activities such as timber harvest and/or mining. By providing easier accessibility to many areas, roads may also lead to reduced impacts of some disturbance regimes, as is the case with fire suppression.

The relative impact of road density on watershed condition has been rated on various scales. For this analysis, road density ratings are presented in the locally adapted Matrix of Pathways and Indicators of Watershed Condition (NMFS 1998) in which watershed condition is rated based on road density as either High (<1mile/mile^2), Moderate (1-3 mile/mile^2), or Low (>3mile/mile^2).

Only one subwatershed (Otterson Creek) is considered to have high watershed condition based on existing road densities, and this watershed is roadless. Nine of the subwatersheds have a moderate watershed condition while the remaining sixteen have a low watershed condition. Illustrating the heavily roaded nature of the Red River watershed as a whole, 11 of the 16 subwatersheds rated as having low watershed condition based on road density alone have densities which exceed 150% (4.5 mile/mile^2) of the low condition definition criteria of >3mile/mile^2; Dawson Creek, Lower Main Red River, Ditch Creek, Upper Main Red River, Lower South Fork Red River, Moose Butte Creek, Little Moose Creek, Blanco, Campbell, Deadwood Creek, and Lowest Main Red River.

Table 4-3 Watershed Condition Indicators

ERU/ Subwatershed	Area (acres)	Roads (miles	Road Density (mi/mi^2)	Timber Harvest (acres)	Timber Harvest (%)	ECA (%)	Sediment Yield (% over base)
Red River[1]	103,348	588	3.6	22,939	22	12	24[4]
Lower Red River ERU							
Siegel Creek[2]	7790	39.9	3.28	792	10	6.6	23
Deadwood Creek	3965	40.7	6.56	1905	48	19.0	34
Red Horse Creek	5832	20.2	2.22	576	10	7.0	13
French Gulch	704	2.9	2.67	172	24	16.3	16
Campbell Creek	1153	10.1	5.61	261	23	15.1	28
Lowest Main Red River	4548	39.4	5.54	1513	33	10.9[3]	23[4]
Middle Red River ERU							
Dawson Creek	2117	20.6	6.24	1164	55	30.6	45
Lower Main Red River	8969	64.8	4.63	2992	33	10.3[3]	22[4]
Moose Butte Creek	7095	57.2	5.16	1783	25	12.5	36
Little Moose Creek	3540	39.8	7.19	118	33	19.1	37
Blanco Creek	1445	10.5	4.64	625	43	21.6	34
Upper Red River ERU							
Ditch Creek	2999	25.7	5.48	771	26	13.2	27
Trail Creek	4578	16.9	2.36	702	15	4.4	13
Otterson Creek	2463	0	0	0	0	0	0
Bridge Creek	2367	8.4	2.28	42	2	0.98	13
Upper Main Red River	3926	37.3	6.08	1054	27	9.4	25
Baston Creek	1653	6.5	2.52	287	17	5.5	8
Soda Creek	3365	21.7	4.13	1008	30	13	22
Main Red River	10,674	50.8	3.08	1659	16	6.7[3]	21[4]
South Fork Red R. ERU							
Schooner Creek	1613	10.7	4.26	353	22	13.4	21
Trapper Creek	5822	23.0	2.53	1268	22	9.8	11
Pat Brennan Creek	1261	8.3	4.23	357	28	6.7	14
Lower South Fork Red River	4835	35.3	4.67	955	20	9.6[3]	15[4]
Upper South Fork Red River	4730	24.3	3.29	1009	21	9.7	10
Middle Fork Red River	1894	7.1	2.41	196	10	6.5	10
West Fork Red River	4010	13.2	2.11	317	8	6.5	6

1 Figures taken from South Fork Landscape Assessment.
2 Remaining figures taken from NPNF Watershed database report dated 1998. Road miles and densities are subject to change when calculated from the INFRA database as known differences between INFRA and Watershed Activities database exist.
3 ECA is calculated for the true watershed, considering all upstream subwatersheds.
4 Sediment yield is routed as a true watershed, considering all upstream subwatersheds.

4.2.8 Riparian Areas and Floodplains

Riparian areas and floodplains play an important role in how material (e.g. sediment or wood) and energy (e.g. flowing water and solar radiation) are processed within the aquatic system, and are disproportionately important to aquatic and terrestrial biota. Riparian areas include streamside and lakeside areas, wetlands, and areas with high groundwater tables. They support vegetation that either seasonally or continuously requires standing or flowing water, thereby providing bank stability and shading along most streams.

Floodplains are also important components of riparian areas, and include low areas adjacent to streams that are periodically inundated when flows exceed bankfull stage. This is typically expected to occur about every one to two years. Floodplains allow for energy dissipation, affect channel morphology, and support riparian vegetation.

The term Riparian Habitat Conservation Areas (RHCAs) was introduced by PACFISH to establish special management direction for these areas (USDA 1994). RHCAs are primarily delineated using fixed widths relative to physically defined features. In addition to riparian areas, wetlands, and floodplains, the full delineation of RHCAs includes landslide-prone areas.

The localized importance of riparian areas can be discussed relative to ALTAs within which they are located. Table 4-4 provides a comparison of the percentage of riparian areas (as defined by RHCAs) within individual ALTAs, and within the Red River watershed as a whole. Areas containing a higher percentage of their total area within the RHCA can be presumed to be more dependent on proper riparian condition and function to maintain their ecological character and resiliency. Approximately 31% of the entire Red River watershed lies within the defined RHCA boundary, and relatively substantial percentages (> 19%) of all ALTAs are contained within the defined RHCA (Table 4-4). This illustrates the relative importance of maintaining functional riparian areas throughout the Red River watershed, particularly in ALTA 3 (45.8% within RHCA) and ALTA 18 (89.8% within RHCA); ALTA represents alluvial valleys, which logically are found almost entirely within the defined RHCA. Riparian areas within ALTAs 3 and 18 are critical to maintaining the localized ecological function of these areas, which contain much of the anadromous spawning and rearing area within the watershed. Localized disturbance to riparian areas within these areas may have substantial impacts due to the limited extent of these ALTAs, and the high relative importance of riparian areas within them.

In much of ALTA 18, historic dredge mining operations have substantially altered riparian areas and their function, most commonly through removal of riparian vegetation and alteration of floodplain areas.

When examined at the watershed scale, a somewhat different view of the relative importance of riparian areas across the landscape emerges. Since ALTAs 6 and 1 are most common throughout the watershed, riparian areas within these ALTAs compose a much higher percentage (19.4 and 6.7%, respectively) of the overall landscape than those within other less widely distributed ALTAs (Table 4-4). These ALTAs encompass areas critical to the success of resident fish populations (e.g. bull trout and westslope cutthroat trout) in the watershed. Because of their widespread nature, the overall function of riparian areas within ALTAs 6 and 1 is less susceptible to localized disturbances. However, widespread disturbances within these ALTAs may have substantial impacts both locally, and in downstream areas receiving flow, sediment, wood, etc., from these areas, particularly ALTAs 3 and 18.

Natural disturbance processes within RHCAs should not be considered detrimental to ecosystem function, unless their frequency or magnitude is thought to have been altered by human influences. Natural debris torrents occur within some areas, particularly within the steep breaklands of ALTA 3. Although these events can be considered a disturbance, when of a natural frequency and magnitude, they provide a valuable source of sediment and LWD to downstream channels as part of their natural ecological function.

Table 4-4 Relative abundance of RHCA area within individual ALTAs and the entire Red River watershed.

	ALTA 1 (28.70)[1]	ALTA 3 (2.50)	ALTA 4 (3.32)	ALTA 6 (61.10)	ALTA 18 (3.01)	ALTA 21 (1.37)	Totals
Percentage of area encompased by each ALTA							
Wetlands[2]	0.50	0.10	0.54	1.25	47.35	0.44	
Landslide Prone	0.37	7.39	0.45	0.47	0.00	0.86	
Other RHCA[3]	22.49	38.32	28.09	29.98	42.45	18.23	
Total RHCA	23.35	45.82	29.07	31.70	89.80	19.53	
Percentage of area encompassed by entire watershed							
Wetlands	0.14	0.00	0.02	0.76	1.43	0.01	2.36
Landslide Prone	0.11	0.18	0.01	0.29	0.00	0.01	0.61
Other RHCA	6.45	0.96	0.93	18.32	1.28	0.25	28.19
Total RHCA	6.70	1.15	0.96	19.37	2.70	0.27	31.15

1 Numbers in parentheses indicate percentage of the Red River watershed in each ALTA.
2 Wetland areas are based on data from the National Wetland Inventory.
3 Other RHCA area is comprised of buffers surrounding both streams and wetlands.

Human disturbances affecting streamside areas are portrayed in Table 4-5. Encroachment by various roads has had the most substantial impacts to instream and streamside conditions along most major channels in the Red River watershed. Most notable impacts to riparian and floodplain processes are likely to occur from roads 222 (Lower Red River and South Fork Red River), 1807 (Red Horse Creek), the 1182 road system (Siegel Creek), 1150 (Moose Butte Creek), and 234 (Upper Red River), each of which extends for considerable distance within the RHCA (Map 17).

Some areas currently impacted by road encroachment have also been impacted by historic dredge mining activities, with both activities having generally similar impacts to aquatic ecosystems (increased sediment yields to stream channels, reduced floodplain access, and reduced riparian condition impacting LWD recruitment, and stream shading). However, the relative impacts of recent (roading) versus historic (mining) activities is not likely to be consistent in all areas where the impacts overlap; the most important impact should be defined on a site specific basis if and when restoration activities are proposed in these areas.

Historic dredge mining activities have had substantial impacts to instream and streamside conditions in localized portions of the Red River watershed. Negative impacts to riparian and aquatic habitat conditions (and subsequent impacts to aquatic species) due to dredge mining have been previously discussed throughout this document and include loss of floodplain connectivity, reduced riparian vegetation and associated sediment control and thermal (shading) benefits, and reductions in aquatic habitat conditions including pool size and frequency, LWD presence/recruitment, and bank stability. Although ongoing stresses to aquatic ecosystems due to dredge mining have been reduced in some areas by past restoration efforts, the conditions created by these historic activities continue to affect riparian and floodplain processes in portions of the watershed, particularly in Red River and Red Horse and Siegel creeks.

Various streamside condition indicators are summarized by subwatershed in Table 4-5. The percentage of streamside (RHCA) area is lower in the South Fork Red River ERU (24%) than the three other ERUs (range 31-34%). Trends in streamside area observed at the ERU scale are typically similar when individual subwatersheds are examined, with those subwatersheds in the South Fork Red River ERU typically having lower percentages of streamside area (range 22-27%) relative to subwatersheds within other ERUs (range 26-36%).

Impacts of streamside roading and timber harvest are lowest in the Upper Red River and South Fork Red River ERUs (Table 4-5) due in part to the existence of inventoried roadless area (IRA) within these ERUs. The Middle Red River ERU exhibits the highest relative degree of streamside disturbance related to roads and harvest activity (Table 4-5).

The relative impacts of streamside roading and harvest activities vary substantially amongst subwatersheds within each ERU. Streamside harvest tends to be consistently high throughout the subwatersheds of the Middle Red River ERU, and highly variable throughout subwatersheds in other ERUs. Road crossing densities (crossings/streamside road mile) tend to be relatively high throughout the subwatersheds in the Lower and Upper Red River ERUs (Table 4-8). Road crossing densities are more variable between subwatersheds within the South Fork and Middle Red River ERUs.

From an aquatic condition viewpoint, streamside roads and road crossing generally generate different concerns (e.g. chronic sediment and hydrologic impacts vs. fish passage and potential mass failure impacts). However, the most substantial concerns over streamside roads lie in those areas where both streamside road density and road crossing densities are relatively high. Within the Red River watershed, this applies to the following subwatersheds; Deadwood, Dawson, Little Moose, Ditch creeks and Lower, Upper Main, and Lower South Fork Red River (Table 4-5).

Table 4-5 Streamside condition indicators by EAWS reporting unit and component subwatersheds.

EAWS Reporting Unit/ Subwatershed	Area (acres)	Streamside %	Streamside Roads (mi)	Streamside Rd Density (mi/mi²)[1]	Road Crossings per Streamside Rd Mile	Streamside Harvest (%)
Lower Red River ERU	**23,984**	**32.13**	**13.64**	**1.13**	**7.77**	**5.17**
Siegel Ck.	7,792	34.55	3.48	0.83	8.33	3.39
Deadwood Ck.	3,961	32.14	3.31	1.67	8.75	12.89
Redhorse Ck.	5,834	31.49	1.83	0.64	8.18	2.50
French Gulch	713	31.45	0.23	0.66	4.32	5.05
Campbell Ck.	1,146	35.81	0.57	0.88	10.60	4.02
Lowest Red R.	4,538	27.96	4.22	2.13	6.17	5.25
Middle Red River ERU	**23,156**	**31.07**	**17.81**	**1.58**	**7.69**	**10.22**
Dawson Ck.	2,117	31.87	1.72	1.63	6.98	17.21
Lower Red River	8,951	35.26	6.19	1.25	11.15	7.16
Moose Butte Ck.	7,104	25.67	6.58	2.31	4.71	11.55
Little Moose Ck.	3,539	30.20	2.62	1.57	6.48	12.67
Blanco Ck.	1,445	32.55	0.70	0.96	11.39	6.37
Upper Red River ERU	**32,004**	**33.72**	**13.77**	**0.82**	**8.57**	**4.17**
Ditch Ck.	2,995	36.42	1.83	1.08	6.55	8.15
Trail Ck.	4,576	34.77	1.80	0.72	8.90	4.77
Otterson Ck.	2,465	36.30	0.00	0.00	0.00	0.00
Bridge Ck.	2,368	34.24	0.33	0.26	9.07	<0.01
Upper Main Red R.	3,927	30.23	2.60	1.40	10.37	4.28
Baston Ck.	1,640	29.78	0.27	0.36	11.01	2.44
Soda Ck.	3,383	29.52	1.44	0.92	14.58	5.98
Main Red R.	10,651	35.01	5.49	0.94	6.55	4.34
South Fork Red River ERU	**24,126**	**24.65**	**7.96**	**0.86**	**7.54**	**4.35**
Schooner Ck.	1,614	27.29	0.56	0.81	1.80	6.70
Trapper Ck.	5,829	24.59	1.29	0.57	13.23	4.46
Pat Brennan Ck.	1,263	25.36	0.34	0.68	2.92	5.71
Lower S. Fk. Red R	4,839	24.03	3.35	1.85	5.96	2.81
Upper S. Fk. Red R	4,677	23.58	1.68	0.97	8.94	8.26
Middle Fk. Red R.	1,894	21.98	0.30	0.47	9.88	1.59
West Fk. Red R.	4,010	26.70	0.44	0.26	6.84	1.40

1 Represents miles/sq. mile of streamside RHCA (not subwatershed or ERU area).

4.2.9 Aquatic Species Habitat

Gradient, channel characteristics, and valley bottom type are the landscape level components, which strongly influence aquatic habitat condition (See sections 4.2.1 and 4.2.2). The relative abundance and distribution of various habitat types (pools, riffles, runs/glides, pocket water, and side channels) is also critical in defining the utility of aquatic habitats by aquatic species. Given adequate abundance and distribution of suitable habitat types, the quality of the habitat components is important to the maintenance or establishment of strong aquatic populations. Headwater conditions are also highly important in defining overall habitat condition, as they often provide the habitats used by resident salmonid species, and contribute to habitat conditions in downstream areas utilized by migratory salmonids. The following discussion includes a characterization of aquatic habitats as defined by both the availability of various instream habitat types, and the relative condition of aquatic habitat components throughout the watershed. These discussions are based on data collected between 1992 and 2002 by the USDA as part of standardized R1/R4 habitat surveys. In addition, a brief discussion of headwater conditions is provided based on physical surveys conducted during 2002.

Stream survey data was collected by the Nez Perce National Forest in 1990 (Little Moose Creek), 1992 (Red Horse, Ditch, Otterson creeks and Red River above the South Fork), 1995 (Red River between Moose Butte and Little Moose creeks), 2001 (Trapper Ck., West Fork Red River, and mainstem Red River between Cartwright and Blanco creeks), and 2002 (Moose Butte Creek and South Fork Red River). With the exception of Little Moose Creek and the lower mainstem of Red River (below the mouth of the South Fork Red River), habitat surveys are relatively complete along the entire length of surveyed streams. Due to the high degree of variability in habitat condition amongst surveyed stream reaches, the existing habitat data has been summarized across larger segments to facilitate condition comparisons between various stream sizes, dredged/undredged channels, and channels within areas disturbed/undisturbed by upland activities (e.g. roading and harvest). Stream segments used to summarize habitat data are presented in Map 23, with habitat conditions characterized in Table 4-6 and Table 4-7.

Relative Abundance of Aquatic Habitat Types

Six different habitat types were identified in stream surveys conducted throughout the Red River watershed and include pools, riffles, runs/glides, pocket water, side channels, and alcoves. The relative percentage of respective habitat types to total surveyed area is shown in Table 4-6 for each characterized segment. In general, stream segments with a more diverse array of habitat types will be better suited to supporting the various life history needs of many fish species.

Table 4-6 Percentage of surveyed area comprised of various habitat types.

Stream Segment[1]	Stream Order[2]	Avg. Bankfull Width (m)	Predom. Channel Type[3]	% Pools	% Riffles	% Run/Glide	% Pocket Water	% Side Channel	% Alcove
Lower Order Channels									
Ditch Creek	**2**-3	3.1	B	2.0	69.9	27.3	0.0	0.8	0.1
West Fork Red River	**2**-3	3.3	C	29.9	55.1	2.8	0.0	12.3	0.0
Trapper Creek	2-3	5.0	E	11.3	63.7	24.7	0.0	0.3	0.0
Upper South Fork Red River (above W. Fk.)	2-3	4.8	A/B/C	14.7	36.2	48.0	0.0	0.5	0.5
Upper Red Horse (above Wigwam Ck.)	2-**3**	3.5	B	23.7	44.1	31.8	0.0	0.3	0.0
Moose Butte Creek	2-**3**	3.3	A/B/C/E	34.6	45.1	20.1	0.0	0.2	0.0
Little Moose Creek	3	No Data	B	16.5	44.9	35.1	0.8	1.2	1.4
Lower Red Horse Ck. (below Wigwam Ck.)	3	3.8	B	10.1	30.8	56.8	0.0	1.4	0.9
Upper Red River	3	4.2	B	35.0	29.0	17.2	0.0	6.3	12.5
Otterson Creek	3	2.7	E	15.3	76.5	4.8	0.0	3.4	0.1
Average %				**17.7**	**53.1**	**25.6**	**0.0**	**3.1**	**0.4**
Higher Order Channels									
Middle Red River	4	9.5	C/E	7.8	31.6	55.2	2.9	1.8	0.8
Lower South Fork Red River (below W. Fk.)	4	7.5	C	9.1	66.0	15.6	5.5	3.7	0.1
Lower Red River (below S. Fork)	5	14.5	F	3.2	48.3	42.5	0.0	5.7	0.4
Average %				**7.0**	**49.1**	**36.9**	**3.1**	**3.6**	**0.4**

1 Refers to locations presented in Map 23, which may include averaged information from multiple surveyed stream reaches.
2 Where a range of stream orders is shown, the bold number represents the dominant stream order (if not a relatively even distribution).
3 Shows predominant Rosgen channel classification within reach; where no single classification predominates, all channel types are listed.

Table 4-7 Aquatic habitat comparison using percent DFC – Bold numbers indicate DFC is currently being met.

Stream Segment[1]	Impact	Bankfull Width[2] (Avg - m)	Acting LWD[2]	Potential LWD[2]	Instream Cover[2]	Bank Cover[2]	Bank Stability[2]	Cobble Embed.[2]	Fines[2]	Pool Quality[2]	Pool-Riffle Ratio[2]
Lower Order Channels (2-3)											
Ditch Creek	Impacted	2.8	83	79	**100**	**100**	87	62	60	88	63
West Fork Red River	Roadless	3.2	86	32	**90**	**100**	60	18	50	88	53
Trapper Creek	Impacted	3.8	53	28	**96**	**100**	69	38	12	84	40
Upper South Fork Red River (above W. Fk.)	Impacted	4.9	34	40	71	**81**	**99**	66	67	77	48
Upper Red Horse (above Wigwam Ck.)	Roadless Dredged	3.5	41	52	**90**	**92**	83	45	33	89	58
Moose Butte Creek		3.2	17	24	71	**94**	**94**	60	56	76	64
Little Moose Creek	Dredged	No Data	10	10	**80**	**90**	**70**	No Data	**100**	No Data	**90**
Lower Red Horse Ck. (below Wigwam Ck.)	Dredged Impacted	3.7	31	37	89	82	80	44	49	**91**	81
Upper Red River	Mixed lgly unrd	4.4	35	29	**90**	**92**	86	54	62	**96**	77
Otterson Creek	Roadless	2.5	56	49	84	**93**	87	51	59	87	**94**
Average %DFC		3.7	45	38	86	93	83	50	55	85	65
Higher Order Channels (4-5)											
Middle Red River	Mixed	10.1	13	17	89	78	78	45	50	**96**	59
Lower South Fork Red River (below W. Fk.)	Impacted	7.6	22	26	78	70	**96**	66	78	**90**	34
Lower Red River (below South Fork)	Dredged Impacted	16.3	13	10	88	83	70	31	54	**95**	44
Average %DFC[2]		10.0	17	20	85	75	84	52	63	93	49

1 Refers to locations presented in Map 23, which may include averaged information from multiple surveyed stream reaches.
2 Values represent the weighted (by reach length) average.

Habitat types in surveyed stream segments are dominated by riffle, pool, and run/glide areas, with pocket water, side channels, and alcoves generally of relatively limited significance (Table 4-6). Riffles are the dominant habitat type throughout most stream segments examined and generally comprise 30-70% of the total stream area, with similar frequency of occurrence in both lower and higher order channels. Run/glide percentages are variable but typically make up 20-55% of the total stream area, with similar ranges observed in both lower and higher order channels. Run/glide habitats create substantially more usable fish habitat than is found in riffles. Pools typically comprise a higher percentage of overall area in lower order channels (mean=17.7%) than in higher order channels (mean=7.0%). Side channels are alcoves, respectively, are disproportionately abundant in the West Fork Red River (12.3% of total habitat area) and upper Red River (above Ditch Creek; 12.5% of total habitat area). Although side channels and alcoves are limited in abundance, they do provide important rearing and overwinter habitats for salmonid and other aquatic species.

Surveys of dredged reaches have occurred in Red Horse Creek and portions of mainstem Red River and Little Moose Creek. The general impacts of dredging on channel structure and function can often be noted through comparison of dredged to undredged segments. Due to the variability in habitat type abundance within surveyed reaches of the Red River watershed however, such impacts are not clearly discernable. Riffle habitats do appear somewhat more abundant, and run/glide and pool habitats somewhat less abundant in dredged segments of Lower Red Horse Creek and the mainstem Red River when compared to similar undredged segments (Table 4-6).

The undisturbed nature of Otterson Creek and West Fork Red River subwatersheds presents an opportunity to examine the potential influence of upland disturbance on stream habitats, as both channels flow from Inventoried Roadless Areas. The expectation would be for undisturbed systems to maintain a higher proportion of pools, and lower proportion of riffles relative to disturbed systems. Both of these systems also contain primarily low gradient (C and E) channels (when compared to other second and third order channels), which would also be expected to contribute to a higher proportion of pools and lower proportion of riffles. As anticipated, pools and side channels are more abundant in the West Fork Red River relative to surveyed reaches in most other subwatersheds. However, this is not the case in Otterson Creek, which has the greatest percentage of riffle habitat of any surveyed reach (Table 4-6). This may represent an anomalous situation, or suggest that conditions in Otterson Creek are (at least in part) impacted by passive disturbances (e.g. fire suppression). It is unclear from the existing data however why a relatively undisturbed system appears to have similar or diminished habitat condition relative to more disturbed systems.

Relative Condition of Aquatic Habitat

Aquatic habitat components evaluated include acting and potential LWD, instream cover, bank cover, bank stability, substrate composition (surface fines and cobble embeddedness), pool quality, and pool-riffle ratio. Comparison of the condition of habitat components throughout the watershed is done relative to the desired future condition (DFC) developed as part of the Forest Plan. Appendix A of the Forest Plan assigned fish/water quality objectives to prescription watersheds throughout the Red River watershed (USDA 1987) providing a uniform reference to which current habitat conditions can be compared. For most surveyed reaches, values approaching 90-100% DFC (70% in Little Moose Creek and 80% in upper South Fork Red River) represent properly functioning systems believed to be meeting their ecological potential. Lesser values represent disturbed or improperly functioning conditions, with lower numbers reflecting worse relative conditions. Using the established DFC as a "benchmark", comparisons can be made between current and desired condition, as well as the relative condition of habitats between areas.

When considering information in Table 4-7, no discernable patterns exist between habitat conditions in surveyed channels that have been disturbed through dredging (mainstem Red River, Little Moose and

Red Horse creeks) or upland processes, and those within undisturbed areas (Otterson Creek, West Fork Red River) within the Red River watershed. Much of the observed difference in habitat condition between lower and higher order channels (see Table 4-7) in the Red River watershed is likely the result of differing channel gradients and stream settings. Gradient differences can be inferred through the dominant channel types observed. Higher order channels surveyed tend to be classified as C or E channels whereas lower order channels surveyed tend to be classified as A and B channels (see Table 4-6) which have higher gradients. In addition, higher order channels within the Red River watershed tend to be associated with broader valley bottom types often associated with meadow complexes. These differences have a substantial influence on how channel segments respond to various inputs (flow, sediment, LWD, etc.

Instream cover, bank cover, bank stability, and pool quality tend to meet or be the habitat variables nearest to meeting DFCs for surveyed stream segments within the Red River watershed (Table 4-7). In contrast, acting and potential LWD, cobble embeddedness, and fine sediments (fines) are typically the habitat variables most divergent from DFC criteria throughout the watershed. Instream and bank cover tend to be higher in lower order (2-3) channels than in higher order (4-5) channels, meeting the DFC criteria in most low order channels. Although values are generally relatively high (>70%) in larger channels surveyed within the watershed, instream and bank cover DFC criteria are not being met in these higher order channels.

Although instream and bank cover is relatively good throughout surveyed segments, pool-riffle ratios throughout much of the watershed appear to be well removed from the defined DFC levels showing that available pool habitat is limited. Pool-riffle ratios meet the DFC criteria in Little Moose and Otterson creeks, but are typically less than 65% of DFC in most other surveyed channels. Pool-riffle ratios are generally nearer to DFC in lower order channels (mean=65%) than in higher order channels (mean=49%) surveyed. The general lack of pool area (Table 4-6 and Table 4-7) and apparent abundance of instream cover suggests that much of the existing instream cover is provided by surface turbulence in riffle areas. Although this provides cover necessary for aquatic species, it does not commonly provide other necessary attributes of complex, high quality habitat areas (e.g. suitable feeding, spawning or rearing areas).

With few exceptions, acting and potential woody debris counts within surveyed channels are less than 50% of the desired future condition throughout surveyed reaches within the Red River watershed (Table 4-7). Notable exceptions exist in Ditch Creek (acting and potential LWD) and in the West Fork Red River (acting LWD) where values approach or exceed 80% of the DFC. The divergence of LWD counts from DFCs is greater in higher order channels than in lower order channels where values average approximately 20% and 40%, respectively, of established DFC criteria.

Short-term opportunities to increase LWD in channels should be considered, particularly in areas where salvage activities generate otherwise unusable LWD within reasonable reach of stream channels. However, the current the lack of LWD in channels throughout much of the watershed is not unexpected given the history of the watershed, and is probably at the "low-end" of a semi-natural long-term cycle. The fire and mining history of the area is the likely cause of a current lack of LWD in aquatic systems; Broad scale fires in the late 1800s and early 1900s removed much of the recruitable wood from the landscape, and mining and associated activities often included removal of LWD from channels during dredging or for home building or use as shoring. The recent history of the Red River watershed (including regrowth of previously burned areas, fire suppression and beetle infestation) coupled with the current protection of PACFISH (RHCA) streamside buffers have many of the stream channels poised to show an improving long term trend in LWD recruitment as older or dead/dying trees within these buffer areas begin to fall and reach the stream channels.

Based on existing survey information, cobble embeddedness and percent fine sediment values are well removed from the defined DFC throughout the watershed (Table 4-7). Sedimentation concerns (% fines and cobble embeddedness) are generally about 50% of the DFC throughout the watershed, including both lower and higher order channels. This condition is probably, in part, indicative of the generally erodible geologic formations in the watershed which weather to produce fine-grained sediments. Given the localized geologic conditions, achievement of DFCs for cobble embeddedness and fine sediments may not be possible, although efforts should be made to improve current conditions to the extent possible.

The Red River watershed (and particularly the surveyed habitat reaches) has a widespread and relatively substantial disturbance history throughout its boundaries, making interpretation of habitat data from within the watershed itself difficult. To evaluate the potential influence of these widespread impacts to aquatic habitats, comparisons can be drawn between conditions in the Red River watershed and those in nearby undisturbed watersheds within similar ecological settings to assess anthropogenic influence on in-channel sediment processes. For the purposes of the following comparisons, reference reaches were selected from within the relatively undisturbed Bargamin and Meadow Creek watersheds; reference reaches used include all of those from these two watersheds which lie within similar settings and have similar channel types to those surveyed in the Red River watershed.

Fine sediment loading is considered to be one of the most substantial issues limiting aquatic resources within the Red River watershed, and the following discussion will focus on sedimentation concerns. Excess fine sediments can be observed directly (percent fines or cobble embeddedness) or indirectly (e.g. lessened pool volume) in habitat data.

Estimated (Figure 4-17) and measured (Figure 4-18) fine sediments (<6mm) show similar discrepancies between Red River and nearby reference watersheds (Bargamin and Meadow creeks), suggesting that a substantial portion of the fine sediments in streams within Red River are derived from anthropogenic disturbances. Within undisturbed watersheds the estimated percent fines is most commonly <10% and rarely exceeds 30%; in contrast, sites within Red River watershed are most commonly estimated to have 21-30% fines, and estimates may exceed 50% of total substrate composition (Figure 4-17). Pebble count data shows a similar discrepancy with samples only uncommonly having more than 30% fines in Bargamin and Meadow creeks; in Red River substrate composition most commonly shows 21-30% fines, with levels approaching 70% in some sampled locations (Figure 4-18).

The degree to which increased fine sediment loading due to anthropogenic sources impacts aquatic habitats is illustrated through comparison of cobble embeddedness data between locations within the Red River watershed and in otherwise similar, but relatively undisturbed areas (Bargamin and Meadow creek watersheds; Figure 4-19). The distribution of cobble embeddedness values is similar in shape for both the Red River watershed and the Bargamin and Meadow creek watersheds. However, the central tendency of the cobble embeddedness values observed in the Red River watershed (mode 41-50%) is approximately 20% higher than that in the undisturbed watersheds (mode 21-30%). In undisturbed watersheds, cobble embeddedness values only exceed 50% approximately 11 percent of the time; in the Red River watershed, cobble embeddedness values exceeded 50% in more than 40 percent of the observed locations.

The potential degree of impact to aquatic habitats due to excess sediment loading is illustrated in Figure 4-20; pools occurring within surveyed sections of Red River typically have a reduced volume when compared to those with similar surface area in Bargamin and Meadow creeks. This situation suggests that excess fine sediment loading due to anthropogenic sources has reduced habitat quantity and complexity within the Red River watershed by reducing the amount of pool habitat and, more importantly, the frequency or availability of large pools in particular. Such aquatic habitat limitations will likely continue until sediment loading is reduced.

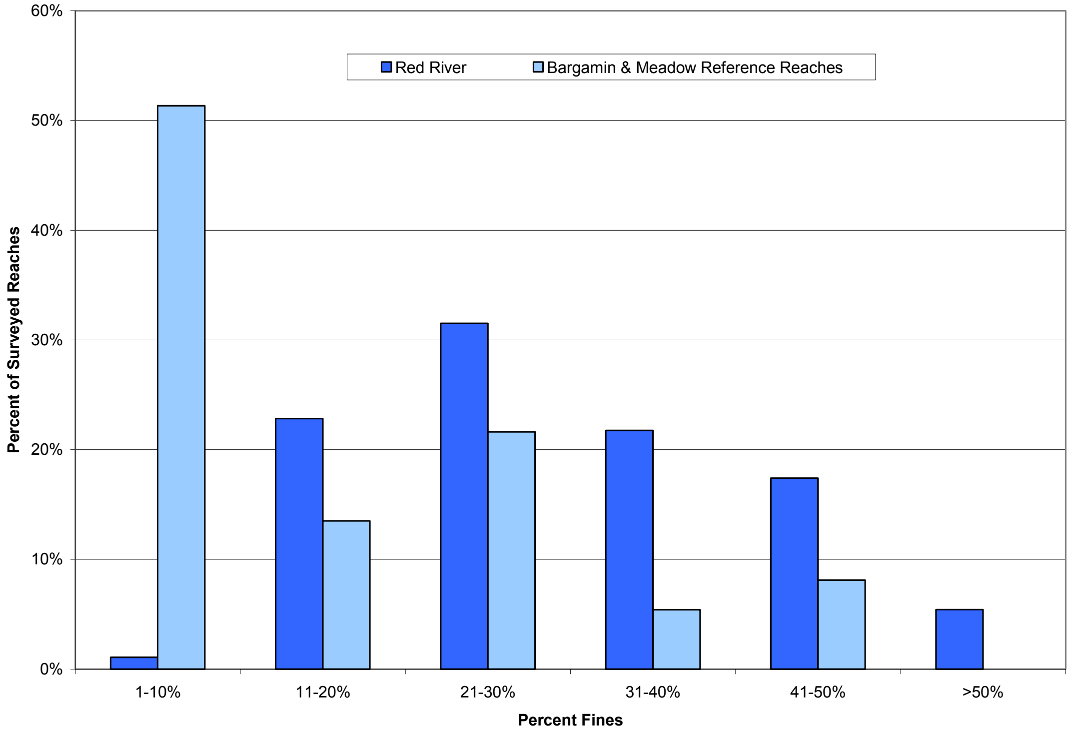

Figure 4-17 Comparison of percent fines in surveyed reaches within the Red River and reference watersheds.

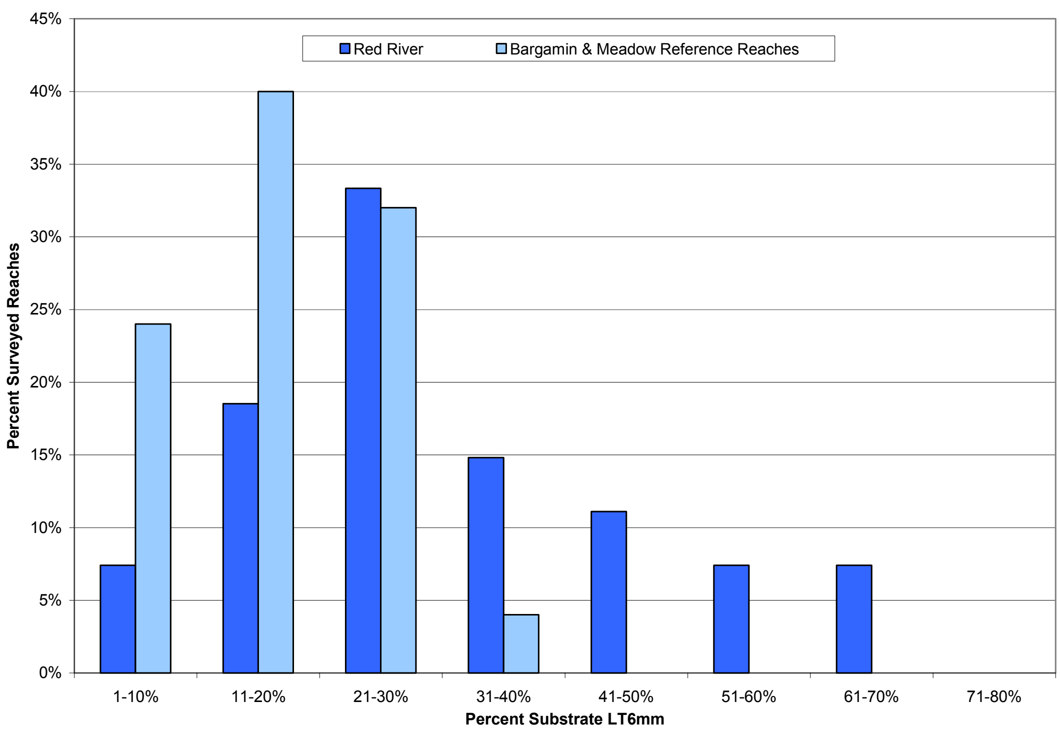

Figure 4-18 Comparison of percent of sediments less than 6mm in surveyed reaches within the Red River and reference watersheds.

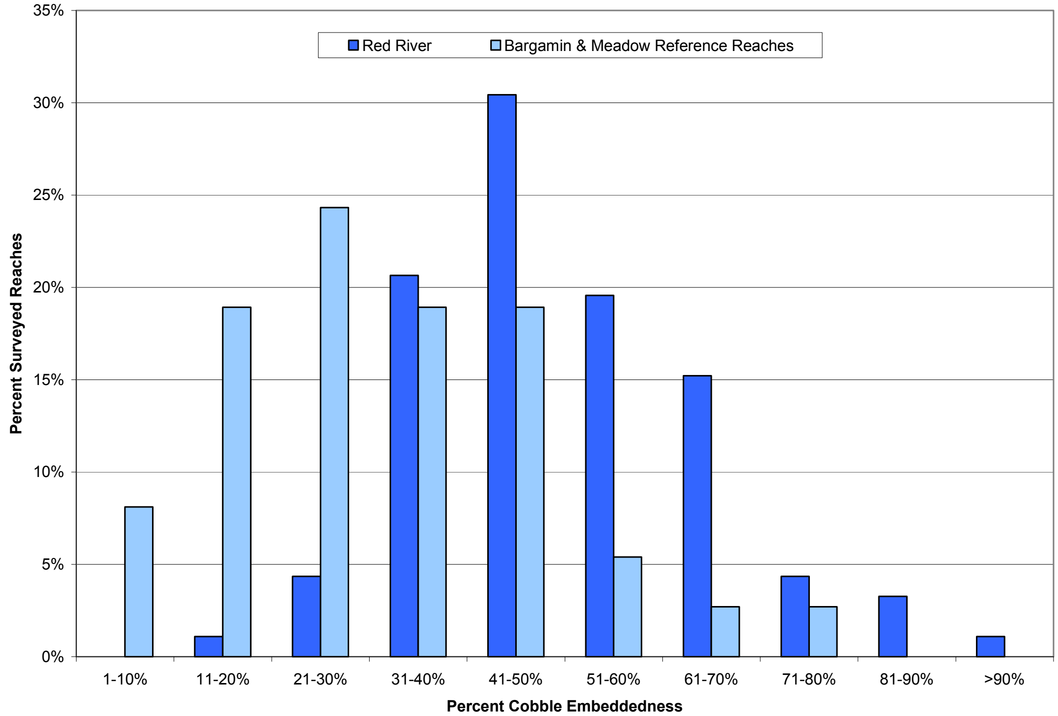

Figure 4-19 Comparison of percent cobble embeddedness in surveyed reaches within the Red River and reference watersheds.

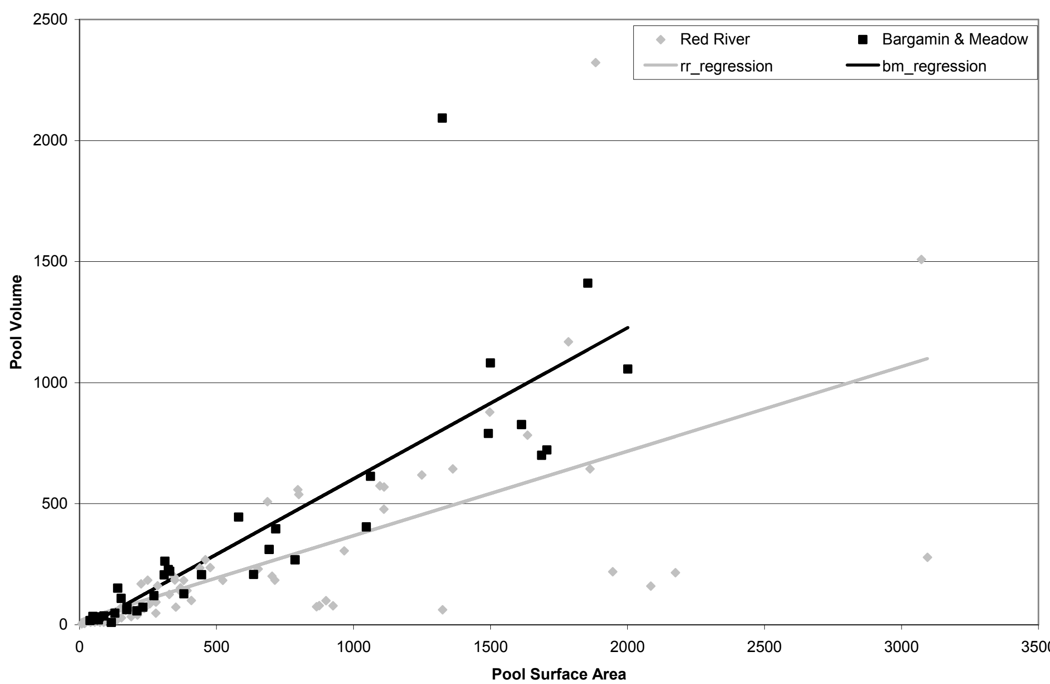

Figure 4-20 Evaluation of possible pool filling (reduced volume) due to excess instream sedimentation in the Red River watershed relative to reference areas.

Headwater surveys

Inventories were completed on eleven 1st-order and one 2nd-order headwater tributaries within the Red River 6th- code HUC watershed by Nez Perce National Forest staff during the 2002 field season. Sites were selected with an effort made to sample an overall range of conditions within the watershed. For each disturbed site selected an undisturbed site of similar geology and elevation was also selected, thus providing a comparison between disturbed and undisturbed sites. The surveys characterized channel morphology and near-stream conditions. Observations and measurements were made at a representative reach on each stream. The Nez Perce National Forest Headwaters Stream Survey methodology was used for each site. Additionally, the R-1 Stream Reach Inventory and Channel Stability Evaluation was completed with a Pfankuch rating determined for each site. Pebble count information was also collected at each site using the Wolman methodology.

Locations and data inventory results are outlined in Table 4-8. As indicated in the table, Rosgen channel types are fairly consistent, and are predominantly an A-type with three B-type channels, and one E-type. Stream gradient does appear to have a wide range of variation, from 1 up to 32 percent. Percent fines of less than 6 mm is relatively high in all channels, with a mean of 46% and an overall range of 14%-80%. It cannot be said that disturbed sites have a higher percent of fines due to management activities, as several undisturbed sites actually have a higher percent of fines than some of the disturbed sites. Channel morphology measurements, particularly the width-to-depth ratios and entrenchment ratios appear to be within an accepted normal range for specific channel types. This would suggest that the channels are not experiencing high levels of degradation (vertical downcutting) or aggradation (coarse deposition), as is also evidenced in Table 4-8.

A low occurrence of mass erosion and debris torrents is reflected for all sites. As the majority of the Red River watershed is comprised of low relief landscapes, this would be considered within normal range. Although not represented in Table 4-8, large organic (woody) debris was noted at all sites. Fire suppression has possibly limited large woody debris recruitment to these small streams; the overall average was one piece of large woody debris per 10 meters of stream length in surveyed headwater channels. Observed channel stability was variable across surveyed sites, with no clear difference between those sites within disturbed or undisturbed subwatersheds. In general, this could be interpreted as headwater channels within the Red River watershed are relatively resistant to changes in channel morphology induced by watershed changes.

The Deadwood Creek and Upper Main Red River subwatersheds are specific areas that have been substantially impacted by past watershed activities that directly affect stream channel morphology, including mining, timber harvest, and road construction. Observations and analysis completed at the site located in the Red Horse Creek subwatershed imply a relatively stable channel. The channel selected was for an undisturbed site and field observations indicated that the channel is stable. However, near the mouth of the sampled tributary past mining impacts were observed. While these impacts have not adversely affected the majority of the channel, they do impact the mouth of this channel and also the main stem of Red Horse Creek. It is important to recognize that for this site, the analysis is reflective of the sample site and that portion of the channel located above the sample site. Sites located in both the West Fork of Red River and Little Moose Creek subwatersheds indicate relatively stable channel morphology with little impact from forest management activities observed. All four of these sites within disturbed watersheds rank out as a high on the Pfankuch scale.

Lower Red River Meadow Restoration

The Lower Red River Meadow Restoration Project is located on Red River between Dawson and Siegel Creeks. It includes about 4.5 miles of stream and the associated valley bottom. The project background is described in Section 1.2.2. On a local scale, the river channel has been straightened and riparian vegetation reduced due to dredge mining and efforts to maximize grazing through the meadow. The river ecosystem has responded in the following ways:

- The river length has been reduced,
- The river's erosive power has increased,
- The channel bed has downcut,
- The groundwater table has lowered,
- The meadow floodplain is inundated less frequently,
- The river has less diversity of instream fish habitat (pools, riffles, overhanging banks, woody debris, spawning gravels), and
- Summer water temperatures are elevated.

A portion of the decline of both resident and anadromous fish populations in the Red River has been linked to habitat and water quality degradation. The Nez Perce Tribe and IDFG recognize the Red River as a major spring chinook and steelhead production stream and the upper and lower meadows were identified early on in the FWP as a high priority for spawning and rearing habitat enhancement.

The project has the following objectives:

- Restore natural river channel shape, meander pattern, and substrate conditions to enhance the diversity of spawning and rearing habitat for chinook salmon, steelhead trout, bull trout, and other fish species.
- Restore meadow and riparian plant communities to enhance fish and wildlife habitat, stabilize streambanks, and improve water quality.
- Promote public and agency awareness and scientific knowledge of watershed restoration principles and techniques.
- Measure and document progress in satisfying short- and long-term project goals, objectives, and outcomes.
- Manage and communicate project activities to efficiently accomplish project goals.

It was recognized that recreating historical conditions, given permanent changes in the watershed, is unrealistic. A restoration design was used that mimics natural, wet meadow ecosystem conditions, functions, and values by restoring the natural physical and biological processes. Key features of this design include:

- The stream is unconfined by rigid, unnatural bank stabilizing structures.
- The stream is returned to a state of dynamic equilibrium, self-sustaining over time (*requiring minimal human intervention in the future*). The engineering objectives include restoration of:
- river channel geometry and meander pattern,
- hydroperiod in the meadow,
- groundwater-meadow relationship,
- sediment transport regime, and
- high quality and diverse fish habitat.
- Riparian plant communities provide the natural bank stabilizing force where
- establishment of native communities is accelerated by plantings,
- plants are produced from cuttings or seed collected on-site or as near the site as possible,

- deep and dense root systems increase bank stability, thereby reducing erosion and improving water quality,
- restoration of the river's hydrologic function improves conditions for natural regeneration of native riparian and wetland plant communities in the future, and
- improvements to fish habitat include overhanging vegetation, undercut banks, and sources of nutrients and instream woody debris.

The implementation phases of the project began in 1996. Restoration of the 1.5 miles of stream on the Red River Wildlife Management Area (RRWMA) was divided into four phases with the intent of completing one phase/year, beginning on the upstream end of the property. Phases I and II were completed 1996 and 1997 and Phases III and IV were completed in 1999 and 2000. Phases V - VIII will move restoration work to willing landowners upstream and downstream of the RRWMA.

Restoration activities included reconnecting historic channel meanders, constructing new meanders, installing rock grade control structures, and planting native riparian and wetland vegetation. With the completion of Phase IV, the river length through the RRWMA increased from 8,430 feet to 13,480 feet, an increase of 5,050 feet. The historic length in 1936 was 12,300 feet. Through the end of 2000, about 91,100 pole cuttings, herbaceous seedlings and woody seedlings were planted.

A comprehensive monitoring program began in 1997 to assess the short- and long-term effectiveness of our restoration designs. Data are collected on a number of parameters including turbidity and suspended sediment, revegetation success, stream channel response, summer water temperature regime, groundwater levels, wildlife habitat area, greenline and riparian composition, substrate conditions, fish microhabitat features, and fish populations and densities.

Summary Aquatic Habitat Findings

Sediment loading and lack of LWD are the primary factors limiting aquatic habitats within the Red River watershed.

Pool frequency (Pool-Riffle ratio) is well below DFCs throughout the watershed, and comparison with reference reaches suggests pool sizes are being reduced by sedimentation.

Habitat condition within the Red River watershed is highly variable in both disturbed and undisturbed areas, and no clear patterns of difference can be seen between impacted and non-impacted sites within Red River; Conclusions of habitat impact from watershed activity can be drawn from comparison of conditions in Red River with those in Bargamin/Meadow Creeks (as reference sites).

Headwater surveys show no clear difference in channel conditions within disturbed vs. undisturbed subwatersheds. Overall, headwater surveys show similar conditions to other habitat surveys, with high fine sediment and low LWD levels throughout much of the watershed.

Table 4-8 Summary of Red River Headwater Stream Surveys

Location *	Elevation (ft)	Channel Type	Stream Order	Bankfull Width (ft)	Localized Disturbance	Gradient (%)	Width/Depth	% Fines <6mm	Channel Stability	Entrenchment Ratio	Mass Erosion	Degradation	Aggradation
Unnamed Trib to Deadwood Creek	4700	A4a	1	2.79	Mining / Roads	18	4.12	20	80	2.29	Yes	Yes	Yes
Unnamed Trib to Lower Main Red River	5080	A4a	1	2.03	Roads	32	4.65	46	51	1.86	No	No	No
Unnamed Trib to Red Horse Creek	4730	A4	1	2.62	No	8	5.31	64	52	5.27	No	No	No
(1) Unnamed Trib to Red River	4820	A4	1	2.66	No	15	4.69	49	60	2.43	No	No	No
(1) Unnamed Trib to Trail Creek	5120	A5a	1	1.71	Roads	19	4.75	86	64	1.57	No	No	No
(2) Unnamed Trib to Red River	5120	A4	1	2.3	Mining	5	3.05	57	97	2.14	No	Yes	Yes
(2) Unnamed Trib to Red River	5980	A4a	1	2.2	No	24	3.06	50	54	2.09	No	No	No
(3) Unnamed Trib to Little Moose Creek	5600	B4a	2	6.89	No	12	18.62	14	48	1.62	No	No	No
(3) Unnamed Trib to Little Moose Creek	5000	A4a	1	1.41	Harvest/ Roads	16	3.02	48	53	1.63	No	No	No
Unnamed Trib to W Fork	6150	B4a	1	2.86	No	7.5	9.53	30	50	2.41	No	No	No
Unnamed Trib to Middle Fork	6070	B4a	1	6.4	No	18	9.9	40	54	3.28	No	No	No
Bridge Creek	5120	E4	1	4.4	No	1	5.22	52	70	1.68	No	No	Yes

* Numbers denote paired watersheds for undisturbed/disturbed comparisons

4.2.10 Aquatic Species

For the purposes of this assessment, five focal fish species have been selected for detailed consideration based primarily on the availability of information; chinook salmon, steelhead/rainbow trout, westslope cutthroat trout, bull trout and brook trout. Limited information regarding other fish and amphibian species in the watershed is presented when available.

Spring chinook salmon, steelhead/redband trout, westslope cutthroat trout, and bull trout have been chosen due to their at-risk status. Brook trout, an introduced species, are discussed primarily based on the potential risk they pose to other species in the watershed through competitive interaction(s) and/or interbreeding. Brook trout also have the potential to contribute to a sport fishery. Steelhead and redband trout are considered together because they are anadromous and resident forms of the same species. In Red River, no redband trout populations are known to be distinct from steelhead trout (e.g. above a barrier); individuals considered to be redband trout are likely residualized individuals associated with the existing steelhead trout population (Dave Mays, USDA Fisheries Biologist, personal communication, November 16, 2001).

Density information presented for focal species is limited in scope, but is nonetheless helpful to provide information regarding distribution and relative abundances of various focal species. Density information presented in subsequent species discussions is simplified from databases maintained by the U.S. Forest Service and/or Idaho Department of Fish and Game (IDFG). Additional detail regarding the raw data available and the synthesis of fish density information is presented in Appendix D and should be reviewed by readers interested in further detail regarding fish densities.

Spring Chinook Salmon (Oncorhynchus tschawytscha)

Life History, Status, and Watershed Context

Spring chinook salmon in the South Fork Clearwater subbasin are considered a species of special concern by the State of Idaho and a sensitive species by Region 1 of the U. S. Forest Service (March 12, 1999). They are not listed as threatened in this subbasin as indigenous populations were likely eliminated from the Clearwater River by construction of the Lewiston Dam (Schoen et al. 1999; U.S. Fish and Wildlife Service 1999; Murphy and Metsker 1962). However, naturalized populations of spring chinook salmon have been re-established in the South Fork Clearwater subbasin and including Red River as a result of reintroduction efforts (Schoen et al. 1999; Larson and Mobrand 1992) by federal and state agencies and the Nez Perce Tribe. Even though they are excluded from the ESA listing that encompasses other spring and summer chinook stocks throughout the Snake River basin, they do represent an important effort aimed at restoring an indigenous species to an area where they had been extirpated.

Spring chinook salmon enter the Columbia River and begin spawning migrations during April and May, reaching the Clearwater subbasin from April through July (NPT and IDFG 1990). Spawning typically occurs in tributaries and headwater streams in August and September. Eggs hatch in December with emergence complete by April (NPT and IDFG 1990; U.S. Fish and Wildlife Service 1999). Spring chinook salmon remain in freshwater for one year, migrating to the ocean in the spring of their second year, typically from March through June (U.S. Fish and Wildlife Service 1999; Walters et al. 2001). Nearly all adult spring and summer chinook that return to the Snake River basin result from fish that smolted as yearlings in April-May (Matthews and Waples 1991).

Although spring chinook salmon smolt as yearlings, in-basin migrations as fry or parr are common. Fry dispersal was well documented during studies of chinook salmon re-introductions (Cramer 1995). A second downstream migration of spring chinook salmon in the upper portion of the rearing areas may again occur in fall as juveniles seek suitable winter habitat (Hesse et al. 1995; Walters et al. 2001).

Habitat Potential

Habitat requirements of chinook salmon vary by season and life stage, and the fish occupy a diverse range of habitats (USFS 1998). Distribution and abundance of chinook salmon may be influenced by cover type and abundance, water temperature, substrate size and quality, channel morphology, and stream size. Cover is essential for adult chinook salmon prior to spawning, especially for early migrants that remain in tributaries for several months prior to spawning. Key habitat factors for juvenile rearing includes streamflow, pool morphology, cover, and water temperature (Steward and Bjornn 1990). Abundancy of chinook salmon parr has been found to occur in low gradient, meandering channels. Juveniles also seek areas with cobble or rubble substrate or undercut banks for use as concealment cover (Hillman et al. 1987).

Red River watershed had a high inherent capability to support spring chinook salmon (USFS 1998). This is based on features such as climate, elevation, relief, and geology. Historic spawning and early rearing habitat in Red River most likely included the mainstem of Red River and the lower reaches of some of the larger tributaries, but it is unlikely that it extended into the upper reaches and headwaters of these tributaries. Limiting factors would have included higher gradient, larger substrate, and higher velocities. Red River is an unconfined, alluvial, mostly meadow system and most likely provided the optimal habitat conditions for production of this species (ALTA 18), offering large contiguous areas of appropriately sized spawning gravels as well as preferred low gradient rearing habitat for juveniles.

Habitat degradation has occurred extensively throughout Red River, particularly on the mainstem of Red River. Historic dredge mining activities, domestic livestock grazing in the meadows both historic and present day, property development by private landowners, road construction, and harvest activities have all contributed to reduced habitat potential within the Red River watershed causing changes in channel structure and function, substrate availability and distribution, and loss of suitable pool habitat.

Distribution and Status

Red River's current distribution of spring chinook salmon is most likely similar to its historic distribution, with use limited primarily to low gradient, higher order reaches within the watershed. Data collected by USFS personnel reflects that spawning and rearing use throughout the mainstem of Red River (primarily limited to those reaches downstream of the Ranger Station) and in the lower reaches of some tributaries (Siegel Creek, Little Moose Butte Creek, South Fork Red River; (Map 18). Chinook salmon redds have been observed within the reach referred to as the 'narrows' on main Red River. This area is more specifically located between the two meadow segments and slightly upstream of Dawson Creek. Additionally, data from IDFG indicates that spring chinook salmon fry have been observed in the following streams: Baston, Bridge, Dawson, Ditch, Moose Butte, Otterson, Red Horse, Middle Fork of the South Fork, South Fork, West Fork of the South Fork, Schooner, Siegel, Soda, Trail, and Trapper (Table 4-9). It should be noted that tributaries not included in the above list may not have been surveyed and thus presence/absence is unknown.

Currently, the status of chinook salmon in Red River is considered weak throughout the majority of the known use area (Map 18). Available information on densities of juvenile chinook salmon in the Red River watershed is limited to the above listed streams. During USFS surveys, average observed densities of juvenile chinook salmon ranged from 0-0.15 fish/100m^2 in tributary systems, and as high as 6.76 fish/100m^2 in lower portions of the mainstem of Red River (Table 4-9). IDFG personnel observed mean densities of chinook salmon fry were generally less than 0.8 fish/100m^2, but ranged as high as 2.07 fish/100m^2 (Schooner Creek; Table 4-9).

Table 4-9 Tabular summary of USFS fish density information available within the Red River watershed.

			Average Observed Density				
Stream	**Reaches Surveyed[1]**	**Years Surveyed**	**Chinook fry**	**Steelhead/ Rainbow**	**Cutthroat**	**Bull Trout**	**Brook Trout**
Lower Mainstem	6	1995, 2001	6.76 (0-22.44)	0.68 (0-1.80)	None observed	None observed	0.02 (0-0.12)
South Fork Red R	10	2002	0.05 (0-0.39)	1.39 (0-7.24)	5.32 (2.30-13.19)	0.04 (0-0.19)	0.17 (0-0.92)
Upper Main Red R	26	1992	1.91 (0-9.97)	1.54 (0-4.31)	1.00 (0-2.61)	0.22 (0 -1.97)	2.30 (0-14.26)
West Fork Red R	5	2001	None observed	0.13 (0-0.63)	3.35 (1.69-4.84)	0.06 (0-0.20)	0.27 (0.02-0.95)
Trapper Creek	4	2001	None observed	0.03 (0-0.08)	6.29 (0-11.73)	0.07 (0-0.17)	0.08 (0-0.33)
Red Horse Creek	12	1992	0.02 (0-0.25)	0.25 (0-2.45)	1.59 (0-4.84)	None observed	4.52 (0-10.88)
Moose Butte Creek	5	2002	0.15 0-0.76	3.95 (0.29-14.47)	5.71 (1.81-14.34)	0.03 (0-0.16)	0.61 (0-1.54)
Ditch Creek	9	1992	None observed	2.40 (0-14.08)	0.05 (0-0.50)	0.03 (0-0.23)	0.30 (0 -1.54)
Little Moose Creek	1	1990	None observed	None observed	None observed	None observed	None observed

1 Count of reaches surveyed across all years (total); Number of reaches surveyed is not consistent across years at a given stream.

Table 4-9 (cont.) Tabular summary of IDFG fish density information available within the Red River watershed.

			Average Annual Observed Reach Density (Range)[1]				
Stream	**Reaches Surveyed**[2]	**Years Surveyed**	**Chinook fry**	**Steelhead**	**Cutthroat**	**Bull Trout**	**Brook Trout**
Baston	5	97	0.67	2.55	0.14	0.14	0.28
Bridge	14	97	1.32	0.06	8.16	0.06	2.87
Dawson	8	97	0.44	0.00	10.07	0.10	3.77
Ditch	12	98	0.41	0.61	1.38	0.00	6.00
Moose Butte	9	90-97,99	0.31 (0.00-2.34)	0.67 (0.00-3.74)	0.05 (0.00-0.47)	0.00 (0.00-0.00)	3.27 (0.00-25.66)
Otterson	14	97	1.73	0.00	4.09	0.00	6.34
Red Horse	29	98	0.98	1.07	3.47	0.00	1.67
Red River	546	85-00	1.09 (0.00-34.44)	2.79 (0.00-12.73)	0.82 (0.00-1.95)	0.01 (0.00-0.19)	1.69 (0.00-7.09)
Middle Fork Red	15	95,99	1.45 (1.07-2.49)	0 (0.00-0.00)	4.03 (3.37-4.26)	0.09 (0.00-0.13)	0.00 (0.00-0.00)
South Fork Red	3	91	0.52	0.94	3.01	0.16	0.50
West Fork Red	24	95,99	0.64 (0.43-0.84)	0.20 (0.00-0.41)	3.16 (2.75-3.58)	0.15 (0.08-0.21)	0.12 (0.05-0.19)
Schooner	9	95	2.07	0.17	9.63	0	0.00
Shissler	7	94,97	0.00 (0.00-0.00)	0.30 (0.00-0.35)	1.68 (0.00-1.96)	0.35 (0.00-2.48)	5.01 (0.00-5.85)
Siegel	23	97	0.46	0.00	3.56	0.06	4.35
Soda	18	97	0.73	0.00	4.96	0.04	1.74
Trail	24	97	0.54	0.00	3.47	0.00	10.64
Trapper	18	95	1.62	0.00	9.38	0.00	1.11

1 Data provided by IDFG includes average densities across all reaches surveyed within a given year. Ranges are therefore only reported in streams surveyed in multiple years.

2 Count of reaches surveyed across all years (total); Number of reaches surveyed is not consistent across years at a given stream.

Population Dynamics

Chinook salmon within the Red River drainage are made up of a naturalized stock with limited outplantings. Since no wild chinook salmon are thought to exist within the watershed, genetic integrity of chinook salmon is not currently a primary concern. However, understanding the genetic makeup of the population remains an important consideration for restoration planning. Extensive hatchery supplementation in the South Fork and other areas has blurred the lines between the historic South Fork stock with that of the North Fork Clearwater, Lochsa, and Selway rivers.

Founding hatchery stocks used for spring chinook salmon reintroductions throughout the Clearwater subbasin were primarily obtained from the Rapid River Hatchery (Kiefer et al.1992; NPT and IDFG 1990). Initially however, spring chinook stocks imported for restoration came from Carson, Big White, Little White, and or other spring chinook captured at Bonneville dam (NPT and IDFG 1990). Genetic analyses confirm that existing natural spring chinook salmon in the Clearwater River subbasin are derived from reintroduced Snake River stocks (Matthews and Waples 1991). Additional supplementation of spring chinook stocks come from the IDFG satellite hatchery facility located on the mainstem of Red River. This facility was constructed in 1985 and has operated consistently since 1987 for spring chinook trapping and relocation. Unmarked returning adult chinook are trapped and released upstream for spawning (J McGehee pers conv 2002). Additionally, marked adult chinook are trapped and transported to the Clearwater Hatchery for spawning. There have also been occasions where marked adults have been released upstream of the facility for natural spawning. Idaho Department of Fish and Game has outplanted ~80,000 pre-smolts in the past 4 years in Red River.

No known natural barriers occur to the migration of chinook salmon throughout their current range in the watershed, which is thought to be similar to their historic distribution. The connectivity (potential movement) within the Red River watershed is therefore currently high. However, realized connectivity (actual movement) of chinook salmon may have been reduced from historic conditions due to habitat degradation due primarily to mining activity and livestock grazing. Mining and grazing impacts have resulted in a loss of habitat complexity in some areas, and this may inhibit the movements of chinook salmon throughout the watershed to some degree. Additionally, Red River watershed has a high density of roads within its interior boundary with metal and log culverts located throughout. Fish passage may therefore be restricted or limited as a result of the location and/or type of construction of these structures. The impacts from a low effective population size that is currently found in the watershed most likely exceeds those impacts from lost connectivity on movement and/or genetic interchange.

Key Factors and Threats

Key factors and threats to chinook salmon in the Red River watershed are related to both in-watershed and downstream factors. Although downstream factors (harvest, passage mortality at dams, predations, competition with exotic species, and ocean conditions) certainly influence the numbers of spawners returning to Red River, consideration of these factors is beyond the scope of this assessment.

The principle factors and threats currently limiting chinook salmon populations within the Red River watershed include habitat degradation and low population size. Chinook salmon were extirpated from Red River earlier in the century by downstream dams and the current population is believed to be completely derived from hatchery outplants, so that hatchery influences are not currently considered a threat to the population.

Habitat degradation is likely the most substantially limiting factor to chinook salmon within the Red River watershed. Habitat degradation in the Red River watershed results from cumulative impacts of roading and timber harvest, mining, and other land use activities. Modeling efforts illustrate that the hydrologic and sediment regimes within the watershed have been altered substantially by roading and harvest activities; Altered sediment and hydrologic regimes due primarily to roading and timber harvest, have resulted in a loss of complex pool habitats suitable for both adult and juvenile rearing, and the loss of overwintering habitat due to increased cobble embeddedness in many areas. Portions of the accessible habitat area for chinook salmon have undergone extensive alteration by dredge mining. Mining activities straightened channels, resulting in their being over-steepened, and a subsequent loss of complex glide and pool habitats suitable for both adult and juvenile rearing, and the loss of overwintering habitat due to increased cobble embeddedness in many areas. Alteration of riparian communities and function due to mining, domestic grazing, and other disturbances results in altered instream habitats through loss of woody debris recruitment, lost floodplain function, and alteration of hydrologic regimes.

Continued viability of spring chinook salmon to the Red River drainage is directly related to the key factors/threats discussed below. Downstream efforts probably contribute proportionately more to the risk of extinction than local effects, although all effects contribute cumulatively to a lack of viability.

Summary Findings

The naturalized population of chinook salmon that exists in the watershed represents an important effort aimed at restoring an indigenous fish population to an area from which they were extirpated. The population is weak/depressed and exists at a high risk of extinction.

Historic dredge mining activity and other impacts by human intervention have substantially altered habitat potential for chinook salmon in the Red River watershed.

Current distribution of chinook salmon within the watershed is thought to be similar to historic distribution.

Realized connectivity of the chinook salmon population in the Red River watershed has likely been reduced relative to historic conditions, primarily as a result of habitat degradation. The impacts of reduced connectivity to genetic integrity are likely outweighed by the greater impact of the current low effective population size.

Steelhead / Redband Trout (*Oncorhynchus mykiss)*

Life History, Status, and Watershed Context

Steelhead trout utilize the Red River drainage for both spawning and rearing purposes, and maintain a naturally reproducing population, but are also influenced by hatchery production. Steelhead trout within the Red River watershed are classified as "B-run steelhead", and are found in only two river basins (Clearwater and Salmon) in the Columbia River system (although variable, B-run steelhead typically spend two years in the ocean before returning to freshwater to spawn whereas A-run steelhead typically spend only one year in the ocean). The B-run summer steelhead trout utilizing the Red River watershed are listed as threatened under the ESA. The South Fork Clearwater River (including Red River) may have historically maintained a genetically unique stock of steelhead trout within the Clearwater subbasin, but hatchery supplementation has since clouded the lines of genetic distinction between stocks throughout the subbasin (NPNF 1998).

Adult steelhead trout generally arrive at the mouth of the Clearwater River from September through November, and migrate to tributary streams from January through May. Spawning occurs from mid-March through early June, typically on a rising hydrograph and prior to peak streamflow (Thurow 1987). Fry emergence typically occurs during June in Red River, and the majority of juveniles rear for two years in freshwater, typically outmigrating from March through May.

Redband trout are the non-anadromous form of this same species and, in the Red River drainage, have evolved in sympatry with the anadromous population(s). Sympatric redband trout are often termed "residuals", and are morphologically indistinguishable from juvenile steelhead trout. Due to a lack of barriers to steelhead trout, it is unknown if any reproducing population of redband trout exists within the Red River watershed. For these reasons, steelhead and redband trout will be considered together for the purposes of this EAWS.

Habitat Potential

Red River historically had a high inherent capacity to support steelhead/redband trout spawning and rearing. The highest habitat potential was likely associated with the larger stream channels within the watershed including the mainstem Red River and its higher order tributaries associated with ALTAs 3, 4, and 6 (NPNF 1998). Habitat potential for spawning/rearing of steelhead/redband trout is thought to have been moderate in the higher elevation portions of the watershed and associated lower order tributary reaches in ALTA 1 (NPNF 1998).

With regard to steelhead/redband trout, current relative habitat potential in Red River is considered reduced relative to historic capacity (NPNF 1998). Substantial alteration of sediment regimes (primarily through road construction, timber harvest, and, in some areas, large scale mining activities) has reduced the habitat potential relative to historic conditions in much of the Red River watershed (NPNF 1998).

Distribution and Status

Current distribution of steelhead/redband trout use in the Red River watershed is thought to be similar to the historic distribution. Spawning and rearing use is known to exist throughout much of the mainstem of Red River as well as portions of numerous tributaries (Map 19). USFS surveys show spawning and rearing of steelhead/redband trout is known to occur in Red Horse, Siegel, Little Moose, Trapper, Ditch, Baston, Shissler and Bridge creeks as well as the South and West Forks of Red River. Steelhead/rainbow trout have also been observed in Moose Butte and Jungle creeks, although it is unknown if spawning occurs in these systems. IDFG surveys have documented steelhead trout fry in Schooner Creek (Table 4-9); it is unclear if spawning occurs in Schooner Creek or if juveniles move in from other areas to utilize available rearing habitat. During IDFG surveys no steelhead/rainbow trout were observed in surveyed portions of Dawson, Otterson, Siegel, Soda, Trail, and Trapper creeks or in the Middle Fork Red River.

The distribution of spawning and rearing use by steelhead/redband trout in Ditch Creek is likely overestimated in Table 4-6 due to methods used to maintain existing databases; actual distributions of spawning and rearing use likely terminates nearer to the mouth than is represented. Based on channel size and gradient characteristics, spawning distributions in other tributaries historically most likely did not extend farther upstream than illustrated by current distributions presented in Table 4-6.

Steelhead/redband trout density information from USFS surveys is difficult to interpret due to large numbers of unidentified juvenile salmonids, many of which may be steelhead/redband trout. Of salmonids identified as steelhead trout during USFS surveys, the highest average densities have been observed in the lower reaches of Moose Butte and Ditch creeks (3.95 and 2.40 fish/100m^2, respectively; See Table 4-9). Mean densities observed by USFS personnel were intermediate (1.4-1.5 fish/100m^2) in the lower South Fork and throughout the upper mainstem of Red River, and lower in other surveyed reaches (See Table 4-9). IDFG surveys show similar trends, with the highest densities of steelhead/rainbow trout (2.5-3/100m^2) in Red River and Baston Creek (Figure 4-7). Moderate densities (0.6-1.1/100m^2) have been observed by IDFG in Red Horse, Moose Butte, and Ditch creeks and in the South Fork Red River, with lower densities observed in Bridge, Schooner and Shissler creeks and West Fork Red River (Figure 4-7).

The steelhead/redband trout population in the Red River watershed (and throughout the South Fork Clearwater River watershed) is considered depressed (Cichosz et al. 2001). Although the facilities primary operations revolve around chinook salmon, weir counts from the Red River satellite facility operated by IDFG have no adult steelhead recoveries between 1997 and 2000 (Cichosz et al. 2001).

Population Dynamics

Steelhead trout within the Red River drainage are made up of a naturalized stock, which experiences regular hatchery outplantings. The relative influence of wild stock in these naturally reproducing population(s) is unclear, but is unlikely to be substantial. Steelhead trout runs into the Clearwater subbasin (and Red River) were substantially impacted by the Lewiston Dam, built in 1927, prior to dam modification to improve fish passage (NPT and IDFG 1990). Another dam constructed by Washington Water Power in 1910 on the lower South Fork Clearwater River (RM 22) near the town of Harpster blocked anadromous fish passage from 1911 to 1935 and from 1949 until 1963 when the dam was removed (USDA 1999). Between 1935 and 1949 steelhead trout were able to pass over the dam (Murphy and Metsker 1962) but the dam failed to pass significant numbers of fish during this period (Siddall 1992). Given their total exclusion from the system for multiple generations, and impaired access for nearly 65 years due to dams, it is unlikely that steelhead trout stock(s) existing in the Red River watershed maintain much of the genetic diversity or distinction associated with the original wild population.

Key Factors and Threats

Key factors and threats to steelhead trout in the Red River watershed relate to both in-watershed and downstream factors. Although downstream factors (passage mortality at dams, predation, competition with exotic species, and ocean conditions) certainly influence the numbers of steelhead trout spawners returning to Red River, consideration of these factors is beyond the scope of this assessment.

The principal factors and threats currently limiting steelhead trout populations within the Red River watershed include habitat degradation, low population size, hatchery influences, and harvest. Each of these factors is applicable to different degrees.

Habitat degradation is probably the most substantially limiting factor to steelhead trout within the Red River watershed. Altered sediment and hydrologic regimes due primarily to roading and timber harvest, have resulted in a loss of complex pool habitats suitable for both adult and juvenile rearing, and the loss of overwintering habitat due to increased cobble embeddedness in many areas. Alteration of riparian communities and function from mining and other disturbances results in altered instream habitats through loss of woody debris recruitment, lost floodplain function, and altered hydrologic regimes in some areas of the watershed.

Steelhead trout population(s) in the Red River watershed are listed as threatened under the ESA, and the population risk is inherently increased by their limited abundance. However, Red River steelhead are probably very similar genetically to those throughout much of the upper South Fork Clearwater drainage and likely function as a component of a larger metapopulation structure. The population is considered naturalized (not wild) due to past introductions of hatchery rainbow and steelhead trout, which may have negatively impacted the genetic integrity, although no direct data exists to substantiate this. Stocking of hatchery reared steelhead trout began as early as 1969 in Red River, and has occurred as recently as 2002, with juveniles stocked in at least 22 years during this period.

It is not legal to harvest adult steelhead trout from the Red River watershed, although harvest of adult steelhead occurs outside of the watershed. Adult steelhead (hatchery origin only) may be harvested from the South Fork Clearwater River, as well as most major river reaches downstream. Idaho fishing regulations invoke no restrictive regulations for Red River, allowing up to 6 trout per day to be harvested by anglers, with no size restriction. Due to substantially limited numbers of fluvial westslope cutthroat available to anglers, the majority of fish harvested from Red River probably represent juvenile (yearling) steelhead trout. The magnitude of harvest in Red River watershed is unknown, but has the potential to substantially impact numbers of steelhead smolts that ultimately outmigrate from the watershed.

Summary Findings

Current distribution of steelhead trout within the watershed is thought to be similar to the historic distribution.

The population status of naturalized steelhead trout is weak/depressed throughout the watershed.

Genetic integrity of the steelhead trout population in the watershed has likely been substantially altered through the impacts of dams, hatchery influence, and low effective population size.

Altered sediment and hydrologic regimes have substantially altered habitat potential for steelhead trout in the Red River watershed.

Realized connectivity of the steelhead trout population in the Red River watershed has likely been reduced relative to historic conditions, primarily as a result of habitat degradation.

Bull Trout (Salvelinus confluentus)

Life History, Status, and Watershed Context

Bull trout in the South Fork Clearwater River watershed are contained within the Columbia River ecologically significant unit (ESU), which has been proposed for listing under the ESA. The current distribution of bull trout in the Columbia River basin occupies about 44% of the historic range, with the core remaining distribution in the central Idaho mountains (including Red River; NPNF 1998). The South Fork Clearwater River watershed has been identified as a key watershed for bull trout in the State's Bull Trout Conservation Plan (Batt 1996). The Red River watershed is a very important component of the South Fork Clearwater River watershed with regard to bull trout population potential, production, and resiliency (NPNF 1998).

Bull trout in the Red River watershed exhibit two distinct life history forms, resident and fluvial. Resident populations generally spend their entire lives in small headwater streams. Fluvial bull trout rear in tributary streams for several years before migrating to larger river systems. Both forms may coexist in some areas. These divergent life histories are viewed as alternative strategies that contribute to the persistence of populations in variable environments.

Bull trout spawn from August through November and, although hatching may occur in winter or early spring, alevins may stay in the gravel for extended periods following yolk absorption (McPhail and Murray 1979 cited in Quigley and Arbelbide 1997). In the South Fork Clearwater drainage (including Red River) peak spawning generally occurs in mid September (Dave Mays, USDA Fisheries Biologist, personal communication, November 16, 2001). Growth, maturation, and longevity vary considerably with environment although first spawning is often noted after age four, and individuals may live more than 10 years (Rieman and McIntyre 1993).

Habitat Potential

Given its general features including climate, elevation, relief, and geology, the South Fork Clearwater River drainage has a high inherent capacity to support bull trout populations (NPNF 1998). Much of the higher elevation portions of the Red River watershed are contained within granitic high elevation broad convex ridges (ALTA 1) which are considered to have historically had a very high capability to support bull trout spawning and rearing (NPNF 1998). However, habitats within this ALTA typically have only a moderate resilience to disturbance events, and the population ability to persist or rebuild following disturbance is low to moderate (NPNF 1998). Connectivity (both within the watershed and within the surrounding subbasin) is considered critical for long-term persistence of bull trout populations within ALTA 1, to allow for refounding after disturbance events (NPNF 1998). A high degree of human activity in portions of this ALTA has substantially reduced the habitat potential for bull trout relative to historic conditions. However, the strongest bull trout population areas currently found within the Red River watershed are believed to exist in relatively undisturbed portions of ALTA 1 including the West/Middle/upper South Fork Red River area and upper Red River and surrounding tributaries (Soda, Shissler, Baston, and Bridge creeks).

The mid to upper elevation low relief hills (ALTA 6) found throughout much of the Red River watershed historically provided aquatic habitats with high to very high potential for bull trout (NPNF 1998). Relatively frequent disturbance intervals within this ALTA may have negatively impact local subpopulations. However, low gradient, dendritic channel networks allowed for dispersal of the species throughout the landscape, thus limiting the degree of population impact from localized disturbance patterns. Areas within ALTA 6 are believed to have had been likely population source areas within the subbasin (NPNF 1998), particularly during colder climatic periods, or during long intervals between substantial disturbance (fires/floods).

There has been a significant reduction in the bull trout habitat capability in portions of ALTAs 1 and 6 due to changes in disturbance patterns and resultant increased risks to bull trout associated with highly altered sediment regimes and riparian function (NPNF 1998). Although these habitat areas are still considered to have moderate to high capability to support bull trout populations, the population resilience and potential of these areas to serve, as source populations are believed to have been significantly reduced (NPNF 1998).

Alluvial valleys (ALTA 18) are generally considered to have high habitat potential similar to that noted in mid to upper elevation low relief hills (ALTA 6). However, within the Red River watershed, the majority of alluvial valleys have been heavily impacted by historic dredge mining, resulting in their also having substantially reduced potential to support bull trout spawning and rearing. Major impacts to these areas include altered sediment regimes, riparian function, and loss of channel and habitat complexity, and impacts have been most substantial in portions of Red River, Red Horse Creek, and Siegel Creek.

Mountain uplands (ALTA 21), which encompass primarily face drainages along the lower mainstem of Red River, historically had a moderate to high potential to support bull trout (NPNF 1998). In the Red River watershed, areas within ALTA 21 are generally considered adjunct habitats, with patchy distribution of high capability habitats (NPNF 1998). Current reductions in bull trout habitat capability within these areas due to human activities have been substantial.

Distribution and Status

Bull trout are known to utilize Red River and the majority of its tributary systems. Forest Service databases illustrate use of Red Horse, Siegel, Little Moose, Trapper, Bridge, Baston and Dawson creeks, and the West and South Forks of Red River (Map 20). Mean densities of bull trout observed in USFS surveys are typically less than 0.1 fish/100m^2, and highest in the upper mainstem of Red River (mean 0.22 fish/100m^2; max. 1.97 fish/100m^2; See Table 4-9). Recent data collected in the upper West Fork Red River suggest bull trout densities, although variable, may be similar or greater in some areas to those previously observed in upper Red River (Dave Mays, USDA Fisheries Biologist, personal communication, January 21, 2003). Data obtained from IDFG confirms bull trout use of most of these waterways, and also documents low densities of bull trout (<0.35 fish/100m^2) in Moose Butte, Shissler, and Soda creeks and the Middle Fork Red River (Table 4-9).

Bull trout populations are often distributed in a patchy nature in headwater areas where they exist (Batt 1996). Although surveys have been conducted and bull trout not found in various tributaries throughout the watershed, it is important to note that low numbers may be present in some or all of these subwatersheds. The designation of "Surveyed – Not Found" is applied to areas where bull trout may be present temporarily and/or in low densities, and survey intensity has not been sufficient to document their absence from the area (Table 4-6).

Bull trout population status in the Red River watershed is considered to be weak throughout all of the areas where information exists (Table 4-6). As previously mentioned, the strongest bull trout population areas currently found within the Red River watershed are believed to exist in two relatively undisturbed headwater areas within ALTA 1 including the West/Middle/upper South Fork Red River area and upper Red River and surrounding tributaries (Soda, Shissler, Baston, and Bridge creeks).

Population Dynamics

Bull trout in the Red River watershed are thought to be part of a larger metapopulation, which likely includes all of the South Fork Clearwater drainage, and may include much of the Clearwater subbasin. The primary mechanism of connection within the metapopulation is thought to have been the dispersal of larger fluvial fish throughout the subbasin (NPNF 1998). There has been a significant loss of fluvial bull trout and associated subadult/adult rearing habitats throughout the South Fork Clearwater drainage (NPNF 1998). It is also presumed that the overall abundance of resident bull trout has also declined thereby decreasing the long-term population stability in Red River and throughout the South Fork Clearwater drainage.

Degradation of mainstem and tributary habitats in Red River currently limits connectivity within the watershed. The overall connectivity within the South Fork Clearwater subbasin has been reduced through the loss of suitable habitats, particularly in the mainstem tributary streams (e.g. Newsome Creek, Red and Crooked Rivers; NPNF 1998). Degradation or loss of these habitat areas increases the distance between existing good or refuge habitats and strong populations, and leads to reduced likelihood of effective dispersal.

The genetic integrity of bull trout population(s) within the Red River watershed is unknown. No hatchery influence has been applied to bull trout population(s) in Red River or the South Fork Clearwater River drainage. However, due to substantial overlap of existing species distributions, introgression by introduced brook trout may pose a risk to bull trout populations throughout the Red River watershed. Although relatively widespread, this risk is highest where brook trout populations are strongest, particularly Red Horse Creek and the upper Red River.

Key Factors and Threats

Harvest of adults is considered to have had a significant impact on the number of fluvial bull trout in the South Fork Clearwater subbasin (NPNF 1998), impacting population(s) within the Red River watershed as well. Current harvest restrictions do not allow for harvest of bull trout, although illegal (intentional or unintentional) harvest may still occur. Harvest impacts are not thought to impact resident population(s) due to the small sizes attained by individuals, presumably not making them attractive to anglers or poachers.

Brook trout are a threat to bull trout where the species co-exist (Leary et al. 1991) due to competitive interactions and hybridization. Brook trout distribution overlaps that of bull trout in the Red River watershed. Although brook trout are not equally well established throughout the Red River watershed, they pose a potentially substantial threat to bull trout in some areas (particularly in the Red Horse Creek drainage and upper reaches of Red River). Further range expansion or population growth by brook trout within the watershed is not thought to be substantial, but should be considered as a potential future threat.

Long-term viability of bull trout populations is thought to be dependent on interconnections of local subpopulations within larger metapopulations (Rieman and Dunham 1999). The significant reduction of migratory (fluvial) bull trout and the habitats necessary to support them are considered key threats to the population due to the increased isolation of remaining subpopulations (NPNF 1998).

Summary Findings

Current distribution of bull trout within the watershed is thought to be similar to the historic distribution although the population status is thought to have been reduced substantially, particularly through the loss of the fluvial population component.

Although information on distribution and status is limited, the population status of bull trout is weak/depressed throughout the majority of the known use area within the watershed. Strongest existing population areas are believed to be the West/Middle/upper South Fork Red River area and upper Red River and surrounding tributaries (Soda, Shissler, Baston, and Bridge creeks).

Genetic integrity of the bull trout population in the watershed is unknown due to the substantial overlap with brook trout distributions in the watershed (and associated possibility of interbreeding). Genetic integrity may also be reduced by a loss of genetic exchange at broader scales due to reduced abundance of fluvial fish.

Upland disturbance activity (predominantly roading and timber harvest) has substantially altered bull trout habitat in the Red River watershed.

Combined impact of upland disturbance factors and historic dredge mining activity has substantially reduced connectivity of bull trout both within Red River and between Red River and surrounding watersheds.

Realized connectivity of the bull trout population in the Red River watershed has likely been reduced relative to historic conditions, primarily as a result of habitat degradation.

Westslope Cutthroat Trout (*Salmo clarki lewisi)*

Life History, Status, and Watershed Context

Within the Red River watershed, two life history forms of westslope cutthroat trout occur, fluvial and resident. Variation in life history strategies within a single species or population is generally considered to contribute to the persistence of populations in variable environments. Fluvial forms are migratory, spending the majority of their time in large rivers and tributary streams, and moving to smaller tributaries for spawning purposes. Although resident forms most often spend their entire life cycle in small tributary streams, migrations may occur in late fall if suitable winter habitat is locally unavailable. Both fluvial and resident cutthroat trout may enter deep pools or interstitial substrate crevices to overwinter (Meehan and Bjornn 1991).

Migratory behaviors in cutthroat trout are seasonal in nature and associated with finding suitable spawning or wintering habitat (Bjornn and Mallett 1964). Little movement of westslope cutthroat trout tends to occur during summer when the primary behavioral pattern revolves around establishment of feeding stations (Liknes and Graham 1988).

Although westslope cutthroat trout are commonly found throughout large river basins, spawning and rearing occurs mostly in headwater streams (Rieman and Apperson 1989; Mullan et al. 1992). Spawning activity is strongly correlated with water temperature, and typically occurs in April and May, with emergence during June and July. Spawning generally occurs in small tributaries, and fluvial forms may spawn in the lower reaches of the same streams used by resident forms (McIntyre and Rieman 1995).

Substrate composition is believed to strongly influence survival of eggs and fry as well as the amount and quality of winter rearing habitat. Although it is known that larger fish congregate in pools in the winter (Peters 1988), highly embedded substrates may be particularly harmful for juvenile cutthroat trout that typically enter the substrate in the winter (McIntyre and Rieman 1995). Although some populations persist despite abundant sediment (Magee 1993), increases of fine sediment in substrates should be viewed as a risk for any population. Small (<100 mm) westslope cutthroat trout are predominantly found in pools and runs, whereas the distribution of larger fish is more strongly associated with pools (Pratt 1984).

Westslope cutthroat trout in the South Fork Clearwater River drainage represent an important but greatly reduced metapopulation within the Clearwater subbasin (NPNF 1998). Westslope cutthroat trout within the Red River watershed form an important subpopulation within the South Fork Clearwater drainage. The species is listed as a sensitive species in Region 1 of the USDA, and as a species of special concern in the state of Idaho. While the species remains widely distributed throughout much of its historical range, there appear to be few remaining healthy populations outside of the central Idaho mountains. Rieman and Apperson (1989) estimated that strong westslope cutthroat trout populations persisted in 11 percent of the historical range in Idaho, and those that were both numerically strong and genetically pure existed in only 4 percent of the historical range.

Habitat Potential

Based on available information, habitat potential for westslope cutthroat trout in the Red River watershed is considered to be the same as that previously described for bull trout. General characteristics of habitat potential for westslope cutthroat trout will be summarized here, and readers are referred back to Section 5.5.3 for additional details.

The South Fork Clearwater River drainage (including Red River) has a high inherent capacity to support westslope cutthroat trout populations (NPNF 1998). The granitic high elevation broad convex ridges (ALTA 1) and mid to upper elevation low relief hills (ALTA 6) encompassing most of the Red River watershed historically provided aquatic habitats with high to very high potential for westslope cutthroat trout. Areas within ALTA 6 are believed to have been likely population sources within the subbasin (NPNF 1998). Mountain uplands (ALTA 21), which encompass headwater areas throughout much of the Red River watershed, historically had a moderate to high potential to support westslope cutthroat trout in a patchy distribution (NPNF 1998).

Habitat potential in portions of all ALTAs within the Red River watershed is believed to have been reduced from historic conditions, and current distribution and abundance is probably limited by fishing pressure and declines in habitat condition due to human impacts, both of which are strongly correlated to streamside road density. The most substantial human impacts are caused by altered sediment regimes and riparian function caused by both upland disturbances and in-channel mining (NPNF 1998).

Distribution and Status

Westslope cutthroat trout are widespread within the Red River watershed, and have been found in virtually all tributaries where surveys have been conducted (Map 21). Population segments may also be present in additional areas where surveys have not been conducted or where existing information is insufficient to define species presence or absence.

Although population status of westslope cutthroat trout is thought to be weak throughout the watershed (Table 4-6) it is thought to be weakest in the mainstem of Red River, and stronger in the larger tributaries and headwater areas. Based on limited information from USFS and IDFG surveys, mean westslope cutthroat trout densities are generally low throughout the mainstem of Red River (<1 fish/100m^2) and higher (2-6 fish/100m^2) in most major tributary systems. Highest densities (>8 fish/100m^2) have been observed in portions of Bridge, Dawson, Schooner and Trapper creeks and in the South Fork Red River (Table 4-9).

Population Dynamics

Population dynamics of westslope cutthroat trout in the Red River watershed are thought to be similar to those previously described for bull trout. Westslope cutthroat trout populations in the Red River watershed have undergone substantial reductions in fluvial population components. Degradation of migratory habitats in mainstem and several tributary streams has resulted in increased distance between good or refuge habitats and strong populations throughout the South Fork Clearwater subbasin (NPNF 1998), including Red River. Loss of fluvial population components limits genetic exchange between population areas, and the ability to recolonize following disturbances or extirpation.

Red River has a high degree of potential connectivity for westslope cutthroat trout population(s) based on limited migration restrictions (e.g. barriers). However, habitat degradation in the mainstem and lower tributaries decreases existing connectivity by increasing the functional distance between suitable or high quality habitat areas or populations, thereby reducing the likelihood of effective dispersal.

No data is currently available regarding the genetic integrity of westslope cutthroat trout population(s) in the Red River watershed. Direct hatchery outplants of cutthroat trout are known to have been conducted regularly throughout the major tributaries between 1915 and 1966; the subspecies and genetic origin of these fish is however unknown. Rainbow trout were also routinely stocked in Red River in most years between 1920 and 2002. Non-native rainbow trout often hybridize with westslope cutthroat trout where the species coexist although the degree to which this occurs may be less in areas where westslope cutthroat trout coevolved with steelhead trout (Behnke 1992). Hybridization between stocked rainbow and native westslope cutthroat trout has been documented in the North Fork Clearwater River system where the westslope cutthroat trout population has coevolved with steelhead trout (Weigel 1997). This suggests that hybridization is also possible in the Red River watershed, although no documentation of it occurring is available.

Key Factors and Threats

The primary existing threat to westslope cutthroat trout population(s) in the Red River watershed are related to habitat degradation and the associated loss of the fluvial population component and population connectivity. By limiting dispersal between population areas within the watershed (and the larger subbasin), habitat degradation poses a substantial risk to long-term population persistence if catastrophic changes (e.g. major wildfire) should occur throughout portions of the watershed.

Inter-specific competition with introduced brook trout may pose a risk to westslope cutthroat trout populations where the species distributions overlap, particularly in upper Red River and Red Horse Creek where brook trout are most abundant. Further range expansion or population growth by brook trout within the watershed is not thought to be substantial, but should be considered as a potential future threat.

Harvest of adults is considered to have had a significant impact on the number of fluvial westslope cutthroat trout in the South Fork Clearwater subbasin (NPNF 1998), impacting population(s) within the Red River watershed as well. Current harvest restrictions allow for harvest of westslope cutthroat trout from the Red River watershed. However, harvest impacts are not thought to have substantial impacts on resident population(s) due to the small sizes attained by individuals (presumably making them unattractive to anglers) and the fact that they are typically far outnumbered in abundance by juvenile steelhead trout in mainstem reaches where angling generally occurs.

Summary Findings

Current distribution of westslope cutthroat trout within the watershed is thought to be similar to the historic distribution although the population status is thought to have been reduced substantially, particularly through reduction of the fluvial population component.

Based on limited status information, the westslope cutthroat trout population is generally considered weak/depressed throughout the mainstem of Red River, and stronger in upper tributary and headwater areas. Westslope cutthroat trout densities in Red River tributaries are typically above average when compared to areas throughout the Nez Perce National Forest.

Upland disturbance activity (predominantly roading and timber harvest) has substantially altered bull trout habitat in the Red River watershed.

Realized connectivity of the westslope cutthroat trout population in the Red River watershed (and between Red River and surrounding areas) has likely been reduced relative to historic conditions, primarily as a result of habitat degradation.

Genetic integrity of the westslope cutthroat trout population(s) in Red River is currently unknown, although likely reduced from historic conditions through hybridization with stocked cutthroat and rainbow trout. Genetic integrity may also be reduced by a loss of genetic exchange at broader scales due to reductions in fluvial fish abundance and reductions in connectivity between habitat areas.

Brook Trout (Salvelinus fontinalis)

Life History, Status, and Watershed Context

Due to their non-native status, brook trout are assessed in this document to a lesser degree than salmonids native to the Red River watershed. The native range of brook trout is from Labrador, south to Georgia, and westward to Minnesota and Wisconsin (Simpson and Wallace 1982). Brook trout have been widely introduced in western states and provide important recreational fishing opportunities in some areas where they are introduced. However, the life history and habitat use by brook trout overlaps with many native western salmonids, resulting in the potential for competition and hybridization.

Brook trout can occupy a wide range of habitats, and therefore have the potential to compete with a variety of native resident salmonids including westslope cutthroat trout, bull trout, and redband trout. Competition may also occur with juvenile anadromous species. In degraded habitats, brook trout will often outcompete bull trout (Clearwater Basin Bull Trout Technical Advisory Team 1998a). Where the species coexist, brook trout are more likely to displace westslope cutthroat trout in lower gradient reaches, with the opposite holding true in higher gradient areas (Griffith 1998, cited in Behnke 1992).

Brook trout are fall spawning char, and hybridization with bull trout is common in areas where the species coexist. Brook/bull trout hybrids are often sterile (Clearwater Basin Bull Trout Technical Advisory Team 1998b).

Distribution and Status

Brook trout are known to occur throughout Red River and most of its major tributary systems including Red Horse, Siegel, Moose Butte, Ditch, and Trapper creeks, and the South and West Fork Red River (Map 22). USFS surveys show the highest mean densities of brook trout in Red Horse Creek (4.52 fish/100m^2) and the upper main Red River (2.3 fish/100m^2; See Table 4-9). This same data suggests that the brook trout in these reaches are most strongly associated with low gradient meadow reaches where observed densities commonly range between 5 and 10 fish/100m^2 (See Appendix D). Observed densities of brook trout in other areas of the watershed rarely exceeded 1 fish/100m^2 during USFS surveys (See Table 4-9).

Surveys conducted by IDFG show brook trout present in virtually all streams sampled within the watershed (Table 4-9). During IDFG surveys, relatively high brook trout densities (5 and 10 fish/100m^2) were also observed in Ditch, Otterson, Shissler, and Trail creeks. In such tributary systems, IDFG surveys are typically conducted only in the lower reaches, thereby providing little or no information about densities or distribution of the species higher in the systems. When coupled with USFS data showing densities throughout the entire length of selected tributaries, this information suggests that the high densities of brook trout observed in these tributaries is likely limited to the lower reaches, and associated with the proximity of surveys to the low gradient meadow reaches of upper Red River.

The Red Horse Creek system appears to maintain a relatively isolated population of brook trout. It is thought that brook trout were historically introduced to the middle and upper reaches of Red Horse Creek and the relatively high gradient reach near the mouth of Red Horse Creek likely prevents brook trout migration into the system from areas downstream. Review of historical stocking records support this scenario, but leaves some uncertainty due to incomplete or non-specific information regarding fish stocking locations. Based on available information, Red Horse Creek appears to provide a unique opportunity within the Red River watershed to attempt a brook trout suppression or eradication effort to reduce competition with native species.

Summary Findings

The brook trout population is currently widespread within the Red River watershed, inhabiting most major drainage systems.

Brook trout densities are highest in the low gradient meadow reaches of Red Horse Creek and the upper mainstem of Red River (and lower reaches of surrounding tributaries) relative to other areas of the watershed.

Based on the distribution and abundance of brook trout, the current potential for competition with native species is thought to be moderate throughout much of the watershed, and high where brook trout densities are highest.

Brook trout suppression or eradication within the Red Horse Creek system may be a relatively unique opportunity within the Red River watershed to reduce competitive interactions with native species.

Pacific Lamprey and Other Aquatic Species

Recent limited sampling in Red River did document the presence of Pacific lamprey (*Lampetra tridentata*; Cochnauer and Claire No Date), a species listed as endangered by the State of Idaho and as a species of concern by USDA Region 1. Similar sampling in Crooked River and American River during 2001 did not collect Pacific lampreys, suggesting a relatively high importance of the Red River watershed in supporting this species within the upper South Fork Clearwater subbasin. Pacific lamprey were collected via a rotary screw trap near the mouth of Red River, and by electro fishing in the mainstem of Red River in both 2000 and 2001 (Cochnauer and Claire No Date). No Pacific lamprey were collected from Siegel and Red Horse creeks, and the South Fork Red River during electro fishing surveys conducted as part of this same study suggesting that the current distribution of the species may be limited to the mainstem of Red River.

The Red River watershed is also known to support various other aquatic species and amphibians. Mountain whitefish (*Prosopium williamsoni*), sculpins (*Cottus* spp.), and dace (*Rhinichthys* spp.) have been observed throughout much of the mainstem of Red River. Mountain whitefish have also been documented in the lower reaches of the South Fork Red River.

Tailed frogs have been documented in the mainstem and Middle Fork of Red River, and are believed to be relatively widely distributed throughout the drainage. Other amphibians documented within the watershed include Columbia spotted frogs and Idaho giant salamanders. Western toads and long-toed salamanders are also very likely present.

4.2.11 Trend Monitoring – Forest Plan Monitoring Stations

The Nez Perce National Forest established monitoring and evaluation requirements related to various objectives established as part of the Forest Plan (See Chapter 5 and Appendix O of the Forest Plan for more detail). These monitoring and evaluation requirements relate, in part, to aquatic conditions. As part of this monitoring and evaluation strategy, various long-term monitoring stations have been established within the Red River watershed.

Trend data exists for three aquatic monitoring stations within the Red River watershed; one each on upper Red River (just below Shissler Ck.), lower Red River (above Red R. Ranger Station), and Trapper Creek (at gaging station above Rd 421 crossing). These stations, although limited in number, allow for some inference of trends in aquatic conditions in three of four ERUs established for this EAWS (Upper and Lower Red River and South Fork, respectively). Monitoring data were collected in five different years at the upper Red River station, three years at the lower Red River station, and two years at the Trapper Creek station Table 4-10.

Data collection from aquatic monitoring stations is typically conducted using protocols established for basinwide stream surveys. Much of the information collected is in categorical form (e.g. pool conditions, instream and bank cover, bank stability), making evaluation of trends difficult unless very large changes in condition are observed (with a categorical ranking of 1-5, a 20% change in condition may be required for that change to be reflected in the data collected).

Cobble embeddedness is a particularly appropriate variable to evaluate given the high concern in the Red River watershed over elevated sediment yields and the resultant impact on aquatic conditions and habitats. Cobble embeddedness data has been collected in quantitative manner from five transects at each of the established monitoring stations, and will be presented here to facilitate discussion of trends in aquatic conditions.

Table 4-10 summarizes monitoring data and relevant regression statistics (regression slope and associated significance) at each monitoring station both for individual transects, and with all transects combined. Evaluation of transect data is most appropriately used to evaluate local variability of a given dynamic parameter (e.g. cobble embeddedness). For long term trend monitoring it is most applicable to evaluate combined data (across all transects) at each monitoring location, thereby accounting for localized variability in the analyses. In Table 4-10, results of analyses of combined data are presented in **bold** print.

Weighted cobble embeddedness at the upper Red River monitoring station (all transects combined) shows a statistically significant (p=0.048) improving trend (illustrated by a negative slope and decreasing embeddedness over time) since the late 1980s. Four of five transects at the upper Red River station show an improving trend (negative slope) in weighted cobble embeddedness over this same time period. At the lower Red River monitoring station, two of five transect show an improving trend in weighted cobble embeddedness. The trend for the lower Red River monitoring station as a whole (transects combined) is unclear; regression analysis reveals an overall declining trend in condition (positive slope) although statistical evaluation of that trend is not significant (p=0.597). Weighted cobble embeddedness values were only recorded in two years at the Trapper Creek monitoring station making statistical evaluation of trend data inappropriate. Two of five transects at the Trapper Creek station showed higher levels of (weighted) cobble embeddedness in 2002 than in 1989. However, data combined across all transects suggests a possible improving trend (slope = -0.32) at this station.

It is important to note that the power of statistical analyses is limited by low sample sizes (number of years sampled) at all aquatic monitoring locations. Although discussion of trends is presented, readers should not take these analyses as definitive proof of existing trends. Graphs of raw data (see Appendix E) show a high degree of inter-annual variability in weighted cobble embeddedness values. Some or all of the inter-annual variability observed may be real, or may represent sampling bias introduced by having sampling conducted by different crews from year to year.

It is also important to note that even where weighted cobble embeddedness values appear to be improving, existing conditions are still well removed from desirable levels. The minimum level observed at any station/transect was over 33% (Trapper Creek station, transect 1, 2002) and <u>minimum</u> levels observed at other sites commonly exceed 40% (Table 4-10). Although there is no rule of thumb “acceptable level” for cobble embeddedness, Crouse et al. (1981 cited in Bjornn and Reiser 1991) found that salmonid production is reduced in direct proportion to the degree of embeddedness. In a separate study, Bjornn et al. (1977 cited in Bjornn and Reiser 1991) showed a similar response, with sustainable winter steelhead densities decreased by as much as 25 percent with a 10 percent increase in embeddedness levels. For both chinook and steelhead, densities observed in areas with 40-50% embeddedness were approximately 25-30 % of those observed in areas with 5-10% embeddedness.

Table 4-10 Summary of weighted cobble embeddedness monitoring data and relevant statistical analyses.

Station	Transect	n	Years Evaluated	Minimum Wtd CE	Maximum Wtd CE	Regression Slope	p-value[1]
Upper Red River	1	5	88, 89, 90, 94, 02	36.22 (2002)	87.06 (1988)	-2.72	0.130
	2	4	89, 90, 94, 02	39.51 (1990)	69.22 (1994)	-0.40	0.830
	3	4	89, 90, 94, 02	55.22 (1990)	74.38 (1989)	-0.69	0.559
	4	4	89, 90, 94, 02	38.26 (2002)	85.75 (1994)	-2.39	0.389
	5	3	88, 90, 94	37.43 (1990)	84.01 (1988)	+1.04	0.922
	Combined	20				-1.56	0.048
Lower Red River	1	3	90, 94, 02	51.29 (1994)	67.82 (2002)	+0.80	0.600
	2	3	90, 94, 02	41.11 (1994)	80.13 (1990)	-0.17	0.968
	3	3	90, 94, 02	59.77 (1990)	73.20 (1994)	+0.88	0.492
	4	3	90, 94, 02	37.21 (1994)	64.76 (1990)	+0.24	0.938
	5	3	90, 94, 02	63.9 (2002)	66.31 (1994)	-0.09	0.722
	Combined	15				+0.33	0.597
Trapper Creek	1	2	89, 02	33.46 (2002)	46.20 (1989)	N/A[2]	N/A
	2	2	89, 02	49.41 (1989)	61.23 (2002)	N/A	N/A
	3	2	89, 02	42.80 (2002)	62.19 (1989)	N/A	N/A
	4	2	89, 02	65.03 (1989)	70.04 (2002)	N/A	N/A
	5	2	89, 02	44.78 (2002)	50.01 (1989)	N/A	N/A
	Combined	10				-0.32	0.605

Represents the p-value specifically associated with the regression slope (trend).
Calculation of slopes and associated statistics relevant to individual transects is Not Appropriate based on having only two data points.

4.2.12 Overall Aquatic Species and Habitat Summary

This section provides a very brief summary of information presented throughout Section 4.2 (Aquatic Resources). The intent is not to reiterate, but rather to present the 'highlights' of the extensive amount of information presented as it relates to aquatic systems and their function. Although this section is useful in understanding the current condition of aquatic resources throughout the Red River watershed, it must be emphasized that it would be inappropriate to base future watershed planning or activities solely on information presented in this section; the most complete understanding of aquatic resource conditions and function will still be gained by reading and understanding all of the relevant information presented in this EAWS.

Table 4-11 summarizes aquatic condition with regard to species use, watershed condition (road density), current hydrologic impacts of roading and harvest (ECA), relationship of current conditions relative to important Forest Plan Guidelines. Table 4-11 also attempts to draw attention to other major issues currently impacting aquatic resource conditions throughout component subwatersheds of the Red River watershed. Anadromous fish species are known to use the majority of the component subwatersheds within Red River (although lamprey are known to utilize only a single subwatershed). Use of three subwatersheds is believed to be limited to resident fish species, and three subwatersheds are not known to have fish present; all of these subwatersheds contribute to downstream areas important to both resident and anadromous species.

Twenty-five of twenty-six component subwatersheds within Red River have Fish/Water Quality and Sediment guidelines established in the Forest Plan. Twenty of those subwatersheds currently fail to meet established fish/water quality guidelines (Table 4-11). Only 4 component subwatersheds currently fail to meet established Forest Plan guidelines related to sediment. These results are based on modeled data and contain some level of uncertainty; one study in particular has found that the model used generally underestimated sediment yields within the Red River watershed (Gloss 1995). In addition, sediment yield guidelines developed as part of the Forest Plan pertain not to chronic or press levels of sediment yield (as is currently observed), but rather to maximum (pulse) levels to be approached occasionally. Sedimentation is considered a major limiting factor to aquatic resources throughout the watershed, and sedimentation from press disturbances in most subwatersheds is such that additional pulse disturbances associated with upland activities may result in exceedence of sediment yield guidelines.

Twenty of twenty-six component subwatersheds within Red River have special notes or concerns listed in Appendix A of the existing Forest Plan which reflect the condition of aquatic resources and may impact future/continued management of these areas. In Table 4-10 these concerns are summarized as Mining, Sediment, Aquatic Priority, or Cumulative; the associated text from the Forest Plan is as follows:

- Mining – Streams listed are below carrying capacity due primarily to a lack of diversity (pool structure) caused by the removal of all large boulders and woody debris from the stream through placer mining. These habitat components will be replaced through direct habitat improvement projects. Timber management activities can occur in these drainages, concurrent with habitat improvement efforts, as long as habitat capacity shows a positive, upward trend.
- Sediment – Sediment is the primary limiting factor in these streams. Improvements will be scheduled between 1986 and 1995. Timber management can occur in these watersheds, concurrent with improvement efforts, as long as a positive, upward trend in habitat carrying capacity is indicated.
- Aquatic Priority – These streams are the Forest's priority drainages. Management-derived sediment that could affect fish habitat will not be allowed until monitoring indicates habitat has recovered to planned levels.
- Cumulative - These streams are suffering from both a lack of diversity (similar to that described for "Mining") and excess sediment from past roading and timber management activities. Along with increasing diversity through direct habitat improvement, state-of-the-art techniques will be used to remove excess sediment from the gravel environment. Timber management activities can occur in these drainages, concurrent with habitat improvement efforts, as long as habitat capacity shows a positive, upward trend.

Road densities throughout much of the Red River watershed have a substantial impact on aquatic resources, primarily through sediment production and alteration of hydrologic regimes. Seventeen component subwatersheds in Red River are currently considered to have a low watershed condition based on high (>3mi/mi^2) road densities alone (Table 4-11). Although high road densities may alter hydrologic regimes, water yield (as % ECA) is not excessive (> approximately 25%) throughout most of the Red River watershed; increased water yield do to additional landscape activities should be considered during future planning effort, particularly in subwatersheds where current ECA levels approach or exceed 20-25%.

Various conditions negatively impacting aquatic conditions are relatively ubiquitous throughout component subwatersheds of Red River, and therefore not specifically highlighted in the final column of Table 4-11. These issues include reduced frequency/size of pools, reduced habitat complexity, elevated fine sediment levels, and limited acting and potential LWD. Impacts of streamside roading (SSR), streamside harvest (SSH), and historic mining are additional issues that negatively impact aquatic resources in select subwatersheds within Red River (Table 4-11). These conditions may contribute to, or act independently of, other issues impacting aquatic resources in these areas (e.g. reduced pool volume, sediment yield).

A compilation of potential restoration projects within the Red River watershed can be found in Appendix L. Watershed and aquatics staff created this appendix in an attempt to identify areas of concern within the Red River watershed. It must be noted that this list is only as complete as the field surveys allowed. There are likely more areas within the watershed that have impacts from past activities and are in need of some degree of restoration, but are not included in this appendix as these areas have not been inventoried.

Table 4-11 Overall Summary of Aquatic Resource Condition by EAWS Reporting Unit & Component Subwatersheds.

EAWS Reporting Unit/ Subwatershed	**Fish Use**	**Forest Plan Guidelines** (Guideline/Current Condition) [1] **Fish/WQ**	**Sediment**	**Appendix A Concerns**[2]	**Rd Density (mi/mi²) and Watershed Condition**[3]	**ECA %**	**Other Concerns** [4] **(streamside harvest, pools, LWD, cover, mining, Temp**
Lower Red River ERU							
Siegel Ck.	A	**90 / 60**	35/23	Mining	**3.28 – Low**	6.6	Mining
Deadwood Ck.	R	**70 / 40**	60/34	Cumulative	**6.56 – Low**	19.0	Mining, SSR, SSH
Redhorse Ck.	A	**90 / 71**[5]	30/13	Mining	2.22 – Mod.	7.0	Mining
French Gulch	None	70 / NA	60/16		2.67 – Mod.	16.3	Mining
Campbell Ck.	None	70 / NA	60/28		**5.61 – Low**	15.1	
Lowest Red R.	A	Undefined	Unk./23		**5.54 – Low**	10.9[7]	Lamprey, Mining, SSR
Middle Red River ERU							
Dawson Ck.	A	**70 / 50**	60/45	Mining	**6.24 – Low**	**30.6**	Mining, SSR, SSH
Lower Red River	A	**90 / 64**[5]	**20/22**	Mining	**4.63 – Low**	10.3[7]	Mining, SSR
Moose Butte Ck.	A	**90 / 64**[5]	**30/36**	Sediment	**5.16 – Low**	12.5	SSR, SSH
Little Moose Ck.	R	70 / 70	60/36		**7.19 – Low**	19.1	Mining, SSR, SSH
Blanco Ck.	None	70 / NA	60/34		**4.64 – Low**	21.6	
Upper Red River ERU							
Ditch Ck.	A	**90 / 74**[5]	**30/27**	Aq. Priority	**5.48 – Low**	13.2	SSR
Trail Ck.	A	**90 / 50**	30/13	Aq. Priority	2.36 – Mod.	4.4	
Otterson Ck.	A	**90 / 76**[5]	30/0		0 - High	0	
Bridge Ck.	A	**90 / 70**	30/13	Aq. Priority	2.28 – Mod.	1.0	
Upper Main Red R.	A	**90 / 79**[5]	30/25	Aq. Priority	**6.08 – Low**	9.4	SSR
Baston Ck.	A	**90 / 80**	15/8	Aq. Priority	2.52 – Mod.	5.5	
Soda Ck.	A	**90 / 60**	30/22	Aq. Priority	**4.13 – Low**	13.0	
Main Red R.	A	**90 / 65**[5]	25/21	Aq. Priority	**3.08 – Low**	6.7[7]	

Table 4-11. Continued.

EAWS Reporting Unit/ Subwatershed	**Fish Use**	**Forest Plan Guidelines** (Guideline/Current Condition)[1]			**Rd Density (mi/mi²) and Watershed Condition[3]**	**ECA %**	**Other Concerns[4] (streamside harvest, pools, LWD, cover, mining, Temp**
		Fish/WQ	**Sediment**	**Appendix A Concerns[2]**			
South Fork Red R ERU							
Schooner Ck.	A[6]	**80 / 50**	35/21	Sediment	**4.26 – Low**	13.4	
Trapper Ck.	A	**90 / 64[5]**	30/11	Sediment	2.53 – Mod.	9.8	
Pat Brennan Ck.	R	70 / 70	60/14	Sediment	**4.23 – Low**	6.7	
Lower S. Fk. Red R	A	**90 / 67[5]**	30/15	Sediment	**4.67 – Low**	9.6[7]	SSR
Upper S. Fk. Red R	A	**80 / 67[5]**	35/10	Sediment	**3.29 – Low**	9.7	
Middle Fk. Red R.	A	**80 / 55**	35/10	Sediment	2.41 – Mod.	6.5	
West Fk. Red R.	A	**90 / 68[5]**	30/6	Sediment	2.11 – Mod.	6.5	

1 Items in bold currently fail to meet established Forest Plan Guidelines related to Fish/Water Quality and/or Sediment Yield.

2 See supporting text for detailed description of concerns listed in Appendix A of the Forest Plan.

3 Listed watershed condition is based solely on road density – see Section 4.2.7 for more detailed description of the derivation of this rating.

4 Mining refers specifically to in-channel dredging; other mining activities may impact aquatic resources elsewhere.

SSR = Streamside Roads; listed if density is over 1 mile per square mile of streamside (RHCA) area.

SSH = Streamside harvest; listed if over 10% of RHCA area has been harvested.

5 Recent habitat data was used to estimate current Fish/Water Quality condition; Data for other sites is taken from Forest Plan due to lack of more recent data.

6 Changed from designation listed in the Forest Plan (R) based on results of IDFG surveys documenting use by anadromous species.

7 ECA at these points is calculated for the pure watershed, including all upstream subwatersheds.

4.3 Terrestrial Resources

4.3.1 Summary: Plant Community Composition, Structure and Process

Characterization of the vegetation in Red River was made difficult by the dynamics of recent mountain pine beetle activity, lodgepole mortality, and understory response. Inventory data in the watershed is mostly more than 15 years old and predates any of these processes. We used 1996 air photos adjusted to 2002 by using stand exam data, insect and disease overflight maps, change detection imagery, and limited field reconnaissance. As a result the composition and structure of vegetation in the Red River area probably has a higher degree of error than in other watershed assessments.

Historical (1930s) data for the watershed have been compiled, but it appears that the landscape had already been highly altered by stock grazing, large miner-caused fires, and selective logging. The 1930s data for Red River should not be considered a good reference landscape for this area, but were still free of the widespread clear cutting that came later. These data are presented here and interpreted where possible considering ranges of vegetation by Vegetation Response Unit and natural disturbance regimes, which provide a better picture of reference conditions.

The landscape in the Red River area has changed in the last 120 years of record in response to direct changes in composition and structure, and alteration of disturbance processes (see Table 4-12 through Table 4-16). Succession, insect and disease activity, timber harvest, man-caused fire and later fire suppression have resulted in changed landscape composition, structure, pattern, and process. Grazing and introduction of non-native species have caused changes in local areas. Major changes have occurred in nonforest and forest cover types, size class, canopy layers, and patch size.

Landscape Dynamics

Perhaps the most important change is in disturbance regimes that affect the pattern of vegetation. Infrequent mixed and lethal fire over moderate to large areas has been altered to a timber harvest regime of greater frequency, smaller scale, greater uniformity, and ubiquity compared to natural fire regimes. Aging lodgepole pine has become susceptible to mountain pine beetle. The natural consequence is likely to be transition to later seral species like grand fir and subalpine fir, accumulation of dead and down wood, and, typically, a fire event which will help re-establish lodgepole pine.

Management agencies and citizens will have to consider how to build a successful approach to incorporating the concepts of infrequent, broader scale disturbance, suited to restoring and sustaining terrestrial and aquatic ecosystem processes in this watershed.

Cover Types

Repeated fires and subsequent harvest and fire suppression have resulted in extensive areas of lodgepole pine dominance, probably greater than the norm under a natural fire regime, and much of that pine is now 80-130 years old, and susceptible to mountain pine beetle. Subsequent harvest and regeneration to lodgepole has reset that cycle. Man-caused and natural fires and logging have removed much of the larch and ponderosa pine overstories that occurred at low and mid elevations, leaving small tree lodgepole and mixed conifer understories.

The South Fork Clearwater Landscape Assessment identified high elevation ridges around Red River as having had historic potential for whitebark pine, but stand exam data and field reviews did not attest to significant historic occurrence of whitebark pine. Some remnants of whitebark pine may still occur on the upper elevation ridgeline between Meadow Creek and Upper Red River. Mining, grazing, hay or crop production, and introduction of nonnative herbs have resulted in changed plant community composition in the larger meadows, but small isolated wetlands remain with high integrity. Shrub types in old burns and riparian areas have declined.

Forest Size Classes

The most conspicuous loss has been in mature forest of medium and large trees, due to harvest. Early seral nonforest may become limiting within another decade, with recent declines in harvest levels. Small trees (9-14 inch diameter breast height (dbh)) are probably more abundant than typical of a natural landscape.

Tree Canopy Cover

Tree canopy cover shows a decline from the 1930s. This may be due in part to lodgepole mortality, but some may also be due to inconsistent interpretation. Other loss of canopy is due to harvest.

Forest Canopy Layers

Relatively simple one and two story stands have transitioned to more complex multi-story stands in some places. Lodgepole pine mortality will accelerate the shift toward multi-story conditions.

Patch Size and Fragmentation

Natural heterogeneity in within-stand and between-stand structure has declined. Most harvest units are simple, small to medium patches, usually clearcut, without snags or residual large fire-resistant trees. Natural stands often had important snag and residual large tree components, and varied widely in size and shape. Stands of mature forest have been highly fragmented by harvest at low and mid elevations.

Snags and Down Wood

The combined numerous fires of the late 19^{th} –early 20^{th} century plus the clearcut harvest of 1950s to the present have left many areas low in large legacy trees, snags and down wood. The recent lodgepole pine mortality has created snag patches in other areas, but these are small trees not useful for cavity nesting birds and will not stand for many years.

Old growth

Old growth is often naturally limited in VRUs 1 and 6 because fire spreads readily in the low relief terrain, and the infrequent fires were often lethal. VRUs 3, 4, 7, and 10 historically supported more old growth, but old growth in VRUs 3, 4, and 7 has been reduced and fragmented by harvest. Miner-caused fires and harvest have reduced old growth and fragmented it into smaller patches that are often poorly connected by mature forest.

Old growth has decreased significantly from historic, and probably even from the 1930s condition, based on losses of mature forest size classes. Total potential existing old growth about 10 percent of the watershed, based on evaluation of cover type, size, lack of harvest activity, and years since last fire.

Fire Risk

Large severe fires occur in drought years with lightning or man-caused ignitions followed by severe burning weather of low humidity and high winds. Man-caused ignitions are subject to our control. The quantity and distribution of fuels are the other factors that can be manipulated by management. Heavy fuels can result in higher energy release; contribute to spotting, torching, crown fires, more difficulty of control, and more severe soil effects. The widespread lodgepole mortality is not unnatural in lodgepole ecosystems, nor would a subsequent large stand replacing fire be unnatural. However, the social setting of Red River and its current degraded aquatic condition, suggest that measures to reduce the continuity of fuels in the landscape might locally reduce the likelihood of severe effects, risk to structures, ecological values, and firefighter and public safety; and improve chances for effective fire suppression.

Insect and Disease Dynamics

Numerous insect and disease pathogens have always been active in Red River forests, and have interacted with fire, drought, and other climatic events to shape successional trends and structure plant communities. The current widespread mountain pine beetle activity is a result of natural successional processes, natural and man-caused fire that established widespread lodgepole dominance, subsequent fire suppression, and consequently the convergence of extensive lodgepole communities at the age and size of susceptibility. Harvest has reduced the extent of susceptible mature lodgepole in some areas, but has also renewed lodgepole dominance in regenerated stands.

One introduce pathogen has been identified, the balsam wooly adelgid. The interaction of native and introduced pathogens in a fluctuating climatic regime, and a context of altered disturbance regimes may result in unexpected consequences.

4.3.2. Early Characterization of the Watershed

Leiberg (1898) did not visit the South Fork Clearwater until the late 1890s, so the landscape had already been changed by miner and settler activity, including fire. He observed extensive areas of lodgepole regeneration from the fires of 1870-1890s. The meadow area is described as 'grazing area' and appears considerably expanded from its current boundaries. Mature forest is limited in his map to along Middle Main Red River, Moose Butte Creek, and the upper West Fork. Much of the remainder of the watershed is mapped as lodgepole pine immature forest. Dense uniform lodgepole forest is mapped as occurring in a large area occupying almost one-fourth of the watershed from Trapper Creek to Upper Main. Leiberg emphasized the dominance of lodgepole pine of all ages in the South Fork Clearwater basin, including senescence and transition to mixed conifer stands. From this he inferred repeated severe fires, and that some old lodgepole did escape fire and shift to other forest types. Ponderosa pine was important all along the south aspects of Lower, Middle and Main Red River. Whitebark pine is mapped along the high elevation ridges from Moose Butte around the south end of the watershed, but there are only anecdotal reports of whitebark today. Perhaps it had been established in a colder climatic era and subsequently eliminated, but it would be unusual that snags were not still found. Douglas fir was common, if only locally dominant in the watershed, at middle and low elevations. Subalpine fir was common at mid and upper elevations, and important in those areas not recently burned. Larch was seldom dominant, but occasional, and he observed the lack of regeneration throughout the South Fork Clearwater, except for small areas in Crooked River. Locally important stands occurred in Moose Butte Creek and near the confluence of South Fork and Main Red River. Grand fir was common, at least at lower elevations in the Red River watershed, and he noted its susceptibility then, as now, to root disease pathogens. Engelmann spruce was also common.

In 1914 (USDA Forest Service, 1914) a more intensive land classification investigation noted the same dominance of lodgepole from earlier fires, and mature ponderosa pine along Main Red River. Mature larch, Douglas fir, grand fir, and spruce forests occupied north aspects and ridge tops. Spruce dominated stream bottoms. Cattle ranching was well established in the meadows. The Deadwood area was notable for its extensive stands of mature mixed conifer forest.

A map prepared in 1959 (USDA Forest Service, 1959) mapped stands, probably using 1936-1948 photography. They showed that mature larch was still important in areas corresponding to the areas noted in 1914, and these stands had originated in fires from around 1750, 1800, 1850, and 1870. Ponderosa pine was still present, but reduced, probably from harvest. This pine appeared to have originated from 1750 through 1800. Mature mixed conifer stands with grand fir also had originated from 1800 through 1870 and were common throughout the watershed on moist aspects.

4.3.3 Watershed Scale Changes Since the 1930s

Although the 1930s vegetation cannot be considered a reference because of the degree of human disturbance, it still represents a more natural landscape than the current condition, and some comparisons are useful to infer process. Maps 24 through 28 display current and 1930s cover types and size classes.

Forest Size Classes

The extensive areas of lodgepole and mixed conifer forest established from fires in the late 1800s have grown to small tree size, even though harvest has kept pace with a typical fire regime as far as cumulative acres of stand regeneration. Harvest targeted the medium and large tree stands and has reduced these below the 1930s levels (Table 4-12).

Table 4-12 Changes in Vegetation (1930s to 2002) by Size Class

Size Class	1930s Percent	2002 Percent	Change Percent
Nonforest	4.1	6.2	+ 2.1
Seedling/Sapling	11.7	11.7	0
Pole (5-9 inch DBH)	27.2	16.1	- 11.1
Small Tree (9-14 inch DBH)	24.7	52.5	+ 27.8
Medium Tree (14-21 inch DBH)	22.7	12.9	- 9.8
21+ inch DBH	9.7	.7	-9.0

Cover Types

The amount of herbaceous clear cuts added since the 1930s has about compensated for the amounts of post-burn montane park, although the character and setting may not be the same. Lodgepole pine has declined, while lower subalpine and mixed mesic conifer has increased, with succession and salvage harvest of the 1980s lodgepole mortality. There is, in addition, a significant area that is now barren, in open roads or rock pits, about 700-800 acres (Table 4-13).

Table 4-13 Changes in Vegetation (1930s to 2002) by Cover Type

Cover Type	1930s Percent of Watershed	2002 Percent of Watershed	Change
Farmland	.2	.8	+. 6
Barren	.1	.1	0
Herbaceous Clearcut	.0	3.6	+ 3.6
Foothills Grassland	.2	0.0	- .2
Riparian Meadow	1.7	1.0	- .7
Upland Herbaceous	.3	.1	- .2
Mesic Shrub	1.4	.4	- 1.0
Riparian Shrub	.2	.3	+. 1
Ponderosa Pine	1.3	.2	- 1.1
Xeric Conifer	.7	1.3	+. 6

Cover Type	1930s Percent of Watershed	2002 Percent of Watershed	Change
Lodgepole Pine	38.6	24.3	-14.3
Lower Subalpine Mix	4.8	11.0	+ 6.2
Mixed Mesic conifer	48.4	56.1	+ 7.7
Douglas fir	2.1	.9	- 1.2

Forest Canopy Layers

Tree canopy cover has apparently declined (Table 4-14). Some of this may be due to mapping discrepancies, some is probably due to very low-density residual overstory in harvest units, and some is due to loss of lodgepole canopy. Tree canopy layers have moved toward more multi-layered canopies (Table 4-15) with the loss of early seral stand structure, and ingrowth of grand fir, particularly in areas of lodgepole mortality.

Table 4-14 Changes in Vegetation (1930s to 2002) by Tree Canopy Cover

Canopy Cover	1930s Percent	2002 Percent	Percent change
Low	13.3	14.6	+ 1.3
Moderate	33.8	64.4	+ 30.6
High	48.8	14.8	-34.0

Table 4-15 Changes in Vegetation (1930s to 2002) by Tree Canopy Layers

Tree Canopy Layers	1930s Percent Watershed	Current Percent Watershed	Percent Change
0	4.1	6.2	2.1
1	40.9	22.4	-18.5
2	50.0	40.7	-9.3
3	5.1	30.7	+25.6

Patch Size and Fragmentation

Patch sizes of early seral open and closed canopy forest have declined, generally due to harvest units. Late seral forest patch size has declined, also due to fragmentation from harvest (Table 4-16). In general, the variability in patch size has declined, except for mid seral open forest that dominates much of the current landscape. It has high variability because it includes the large dominant matrix as well as isolated patches.

Table 4-16 Changes in Vegetation (1930s to 2002) by Patch Size

Patch size	1930s mean size & range (acs)	1930s standard deviation	2002 mean size & range (acs)	2002 standard deviation	Change in mean size
Early seral, closed canopy	101 (1.7 - 2535)	280	41 (1 - 312)	54	- 60
Nonforest/open early seral	120 (1 - 4679)	461	90 (1-2030)	221	- 30
Mid seral closed canopy forest	193 (1 - 8633)	787	91 (1 –3404.3)	290	- 102
Mid seral open canopy forest	125 (2 – 3308)	352	244 (1-14,410)	1396	+ 119
Late seral closed canopy forest	51 (3 - 352)	68	40 (23.9 – 58.7)	18	- 11
Late seral open canopy forest	60 (4 – 436)	80	36 (9 – 85)	30	- 24

Snags and Down Wood

Snag levels cannot be estimated for 1930s conditions. It is likely that repeated fires in the late 1800s, and subsequent downfall and decomposition, had left snag levels low in some areas. This is reflected in widespread low levels of woody debris in surveyed streams. Figure 4-21 shows snag levels from 1980-1992 data for stands that have not subsequently been harvested; areas affected by 1980s mountain pine beetle are probably over-represented because of sampling priorities for salvage. Probably many of the lodgepole snags generated in the 1980s beetle activity have since fallen, but the 1996-2002 mortality has generated many more, most in the pole or small tree class. It is clear that snags of large size and high value to wildlife, like larch or ponderosa pine, are limited in some areas in the watershed. Large larch, ponderosa pine, or Douglas fir snags are highly coveted for firewood, so areas close to roads are particularly low in snags. In addition, about 15.7 percent of the watershed (16,209 acres) has had regeneration harvest, where virtually no snags were left or large trees from which snags might be recruited. Another 2.6 percent (2,664 acres) has been salvage logged so snags have been removed from these areas. The long-interval natural fire regimes of this watershed would have resulted in infrequent pulses of fire disturbance that generated moderate to large patches of dense snags (perhaps about once every 15-20 years within the watershed). Beetle activity would have been similar to today, although possibly in smaller, frequent episodes cycling with fire episodes. This would produce abundant small snags, which then would have been consumed by fires that may have created additional snags.

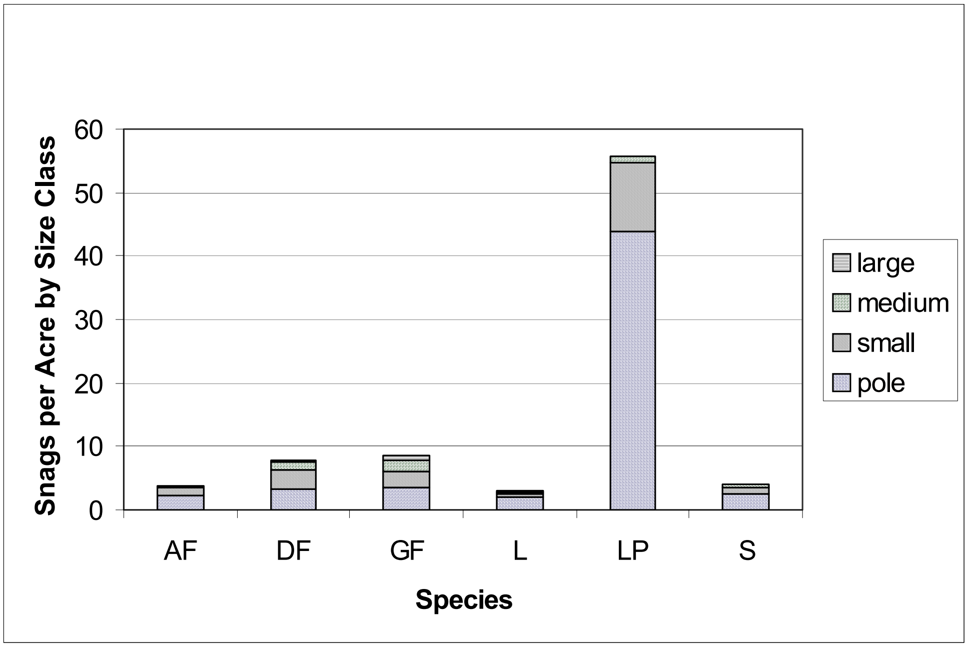

Figure 4-21 1980s to 1990s Snag Level in Unharvested Stands

Old Growth

Old growth may be described as forests having old trees and related structural attributes, like snags and down wood (Moir, 1992). Old growth characteristics vary by region, forest type, and local conditions. In the Red River watershed, old growth and its historic settings can include (1) open stands of ponderosa pine with grassy and low shrub understories maintained by frequent fire; (2) multi-layered stands of grand fir and Engelmann spruce with periodic small fires, much rot and down wood; (3) mixed stands of young and old Douglas-fir, western larch, ponderosa pine, and grand fir with periodic mixed severity fire which usually left some large old trees intact; (4) multi-layered stands of Engelmann spruce and subalpine fir along stream bottoms or other areas protected from fire, and (5) occasional stands of lodgepole pine, or Douglas-fir missed by past fire, but seldom persisting long in a specific landscape position.

Leiberg (1898) described no significant old growth in Red River, unlike Newsome Creek to the west, but part of this may be due to miner-caused fires. Current age class data indicate that patches of old growth must have been present. They were probably old growth with relatively few large old trees and an understory of younger trees. To develop a basis for estimating the possible amount and location of current old growth, we delineated areas of mature forest in the 1930s and subtracted the areas that had been affected by harvest or high severity fire. Table 4-17 shows the extent of validated old growth, using criteria in Green et al. (1992), and also the extent of stands with large trees that meet the old criteria for size. Some of these stands will also likely meet the criteria for age. These data have been refined from the old growth data in the SFA (1998) with some field validation and augmented with timber stand exam data where available. Many of the stands of fairly large trees in the 1930s that still exist now would probably be considered old growth today, using the North Idaho criteria (Green et al. 1992).

Table 4-17 shows old growth as percent of potentially forested acres in the watershed. In most watersheds on the Forest, existing old growth is generally around 20-25 percent, as a result of the combined effects of fire suppression (increasing old growth) and harvest (reducing old growth). Red River appears to have particularly low levels of old growth because of the many fires in the late 1800s-early 1900s and cumulative loss to harvest.

Table 4-17 Existing and Potential Old Growth

Existing Validated OG (Percent of Watershed	Stands w/ Large Trees, not Validated for Age (% of Watershed)	Total Potential Old Growth (% of Watershed)
6.2	4.5	10.7

Patch statistics cannot be compared for old growth because old growth data are not available for the 1930s. Referring to the late seral communities in Table 4-16, it is evident that mature forest has been highly fragmented. This would apply to old growth as well. The greatest effects appear to be fragmentation of the largest patches, which is related to the loss in variability of patch size.

Table 4-18 shows the existing old growth as a percent of the potentially forested acres within each Vegetation Response Unit, compared to historic ranges. VRU 6 is at the low end of its range; all other VRUs are highly deficit for old growth. VRUs 1 and 6 might be expected to show wide fluctuations in old growth over time, because of their infrequent fire regimes, but the disturbance history in Red River indicates that man-caused fire and harvest have likely been responsible for much of this deficit.

Table 4-18 Existing Old Growth Compared to Historic Range by VRU

VRU	Existing Validated OG (Percent of VRU)	Existing Stands w/ Large Trees, not Validated for Age (% of VRU)	Total Potential Old Growth (% of VRU)	Historic Range
1	4.6	3.3	7.9	10-15
3	3.4	0.1	3.5	20-30
4	4.2	.1	4.3	10-25
6	4.9	1.6	6.5	5-15
7	18.5	3.4	21.9	30-40
10	7.3	1.4	8.7	15-30

4.3.4 Assessment by Vegetation Response Unit

Plant communities in the Red River watershed appear as a mosaic of patches that change in composition, structure, and pattern in the landscape over time. Wildlife and human uses respond to the existing pattern of vegetation. Processes like plant community succession, fire, insect and disease activity, drought and grazing, all change the pattern that exists at any one time. Features like climate, soil, slope, aspect and elevation, control the bounds within which patterns can change. Vegetation Response Units (VRUs) and Habitat Type Groups (HTGs) within VRUs were used to describe these bounds. VRUs and Habitat Type Groups within VRUs are shown in Map 4 and Map 5, respectively. Within these delineations, climate and disturbances, including fire and insect and disease activity, were likely to operate within predictable ranges. VRUs have similar patterns of successional processes. Understanding how these disturbance regimes worked, and the pattern of vegetation change, is fundamental to ecosystem management in the watershed. This understanding can be used to design management systems that sustain patterns of vegetation and the scale, frequency, and kind of change to which native species are adapted. It is important to note that these ranges are best applied at broad scales like the subbasin, rather than a 5th or 6th code watershed. Additionally, VRUs with long-interval, large fire disturbances (like VRUs 1 and 6) might fluctuate widely over time .

Patterns of plant community composition, age, class structure, and patch size will tend to fall within certain ranges for each VRU when evaluated across large areas. The Red River area consists of VRUs 1, 3, 4, 6, 7 and 10. Maps 24 and 25 show 1930s and Maps 26-28 show 2002 cover types and size classes. The following discussion describes vegetation composition, structure, and process by VRU.

VRU 1: Convex slopes, subalpine fir and grand fir habitat types – 29,210 acres

Presettlement Composition and Structure

This VRU is common in the Red River watershed at mid and upper elevations. Grand fir and subalpine fir habitat types are dominant. Lodgepole pine was historically dominant in many settings. Engelmann spruce, western larch, and Douglas fir were less common. Whitebark pine could have grown here, and remnants may still exist but have not yet been identified. Large, infrequent, severe and mixed severity fires were typical of upland settings. Moist lower slopes were most prone to mixed fire. Wet meadows are rare elements in this landscape. Relative proportion by size class was about 5-10 percent nonforest, 20-30 percent seedling/sapling, 20-30 percent pole, 20-30 percent small and medium tree, and 5-15 percent large tree at any one time over this VRU at the subbasin scale. However, given the infrequent, often lethal, and sometimes large fires, composition might vary widely over time. Most delineations of this VRU would tend to be dominated much of the time by young to mature forest. Old growth was typically limited to moist draw bottoms and north slopes, and usually comprised from 10 to 15 percent of the area.

Presettlement Process

About 60-80 percent of stands originated from stand replacing fire, and 20-40 percent from mixed severity fire. Lodgepole, western larch and Douglas fir sometimes survived one or more fires to form a scattered overstory. Large blocks of pole and medium size fire killed trees (500 to 2000 acres) were typically present at any time within 10,000 acres of this VRU. Mountain pine beetle activity cycled with fire and lodgepole pine, and may have been important in developing fuel conditions that favored stand-replacing fire.

This VRU historically provided habitat for sensitive species requiring relatively large home ranges, interior habitat and small mammal prey bases: wolverine, fisher, and boreal owl. This VRU is often adjacent to roadless or wilderness areas, which can increase effective interior habitat and provide additional buffering from human caused disturbance. In presettlement conditions, large blocks of burned area provided habitat for those species preferring mid to high elevation habitat. It provided summer range, but produced less forage than lower elevation, more productive VRUs.

Changes from presettlement

With harvest, advancing forest succession, and fire suppression, seral lodgepole pine and western larch have declined, while more shade tolerant grand fir and subalpine fir have increased. In Red River, the lower elevations of this VRU have fairly high road densities and are fragmented by recent harvest (Map 29). Some 30 percent of this VRU has been harvested within the last 30 years, mostly in the South Fork, Trapper Creek and Soda Point areas. The last major natural disturbances were the fires of 1870, 1878, and 1891; few individual stands are outside the range of presettlement fire frequency, but harvest has targeted the stands of larger, older and more fire resistant larch and Douglas fir. Currently there are more early seral herbaceous, shrub, sapling, and small tree stands than in the 1930s. Small trees are in excess of the VRU range, but medium and large trees are deficit. Nonforest openings are also slightly below their historic range. Old growth is currently estimated at 4.6 percent of the potential forested acres of this VRU, below the historic norm. The forest is now largely a matrix of small tree stands perforated with clearcut openings. Recent harvest patterns have replaced large-scale, infrequent fire with frequent, small harvest units more uniformly distributed across watersheds. The average harvest unit size is smaller than many presettlement burn patches and heterogeneity within harvested stands is low. Each watershed is more like other watersheds in terms of the representation of structural stages. Fire suppression has curtailed creation of extensive snag patches, but lodgepole mortality has created patches of small snags.

VRU 3: Stream breaklands, Douglas fir and grand fir habitat types – 1,604 acres

Presettlement Composition and Structure

This VRU is limited to lower to mid elevations in canyons. On south aspects, dry Douglas fir habitat types are dominant. Open stands of large, often uneven age Douglas fir and ponderosa pine were historically common. Ponderosa pine or mixed pine and Douglas fir old growth occupied about 40 to 60 percent of these warm dry sites. Indian burning may have helped to perpetuate the ponderosa pine along the main valley.

On north aspects, grand fir habitat types are dominant. Grand fir and Douglas fir were common cover types, with ponderosa pine and western larch and sometimes Engelmann spruce or lodgepole pine. Pacific yew occurred on lower slopes. Twenty to 30 percent of stands included at least 10 trees per acre older than 150 years. Ponderosa pine, western larch, Douglas fir, and grand fir formed the old overstory.

Small to medium blocks of pole to medium fire killed trees were abundant at any time within 10,000 acres of this VRU. Old growth pine and western larch, bunchgrass understories, and rock outcrop are important elements of this landscape. On this VRU as a whole, relative proportion by size class was about 5-20 percent nonforest, 5-30 percent seedling/sapling, 10-20 percent pole, 20-40 percent small and medium tree, and 20-40 percent large tree. Steep slopes, high drainage dissection and sharp aspect changes favored diverse fire effects and a fine- to moderate-grained spatial patchiness (stands of 10 to 100s of acres). Surface fires kept down wood and snags at low levels on steep south aspects, but the longevity of larch and pine snags provided continuity through time, and frequent fire maintained a steady, if low level of recruitment.

Presettlement Process

On south aspects, low and mixed severity fire occurred at frequent intervals. Here, 60-90 percent of stands showed evidence of survival through one to many fires.

Mixed severity fire at moderate intervals was common on north aspects. About 30-60 percent of stands retained 10 or more trees per acre through at least one fire.

In Red River this VRU is small and its disturbance regimes are influenced by adjacent VRU 4 and 6; fire regimes were somewhat more mixed and lodgepole pine was sometimes more important than in larger canyons.

This VRU provided habitat for sensitive species requiring relatively small home ranges and avian or insectivorous prey bases: goshawk, pileated woodpecker, flammulated owl, black-backed woodpecker, and white-headed woodpecker. Riparian areas provided habitat for fisher. Open south aspects were important winter range for ungulates. Early seral shrub dominated communities provided habitat for prey for wolverine and fisher in riparian areas and north slopes.

Changes from presettlement

With man-caused fire, and subsequent fire suppression and harvest, some ponderosa pine stands have shifted dominance to Douglas fir. Lodgepole stands generated in the many fires of the late 1800s have shifted to mixed conifer, but lodgepole may still exceed historic ranges in more natural disturbance regimes. The importance of lodgepole, as well as harvest, may explain the dominance of small trees and lack of medium and large trees. Vertical canopy layers appear to have increased, even while canopy density seems to have declined. This may be due to mapping discrepancies, but could also be explained by thinning effects of overstory harvest, lodgepole mortality and uneven regrowth of more tolerant grand and Douglas fir. Foothills grassland has been encroached upon in some areas by forest. About 24 percent of this VRU has been harvested within the last 30 years; so many stands have lost larch and ponderosa pine. Knapweed is established along roads and trails and can spread into open stands or when ground disturbance occurs. Current estimated old growth is 3.4 percent of potential forested acres in this VRU, far below historic ranges. The ratio of stand replacement harvest to mixed or low severity treatments is higher than would have occurred under natural disturbance regimes, and mixed severity treatments have often removed fire resistant overstory trees. Historically extensive snag patches are no longer being created as a result of fire suppression, but small snags are being produced as lodgepole pine die.

The current condition appears to be outside the likely presettlement range for tree size classes, vertical stand structure, importance of ponderosa pine and larch, and presence of scattered large old trees.

South Aspects
Harvest has been moderate in these habitat type groups, but has removed large trees, instead of thinning out shade tolerant understory trees. Patches of large old trees have become smaller.

North Aspects
On north aspects and moist lower slopes, diversity of age class representation has been reduced. Much more of the landscape is in closed stands of small trees. Old growth is in short supply. Grand fir and Douglas fir cover types are more common than historically. Ponderosa pine is less well represented today than historically. Two-age stands or single-age with old residuals are, through harvest, succession and insect and disease activity, becoming all-aged. Where harvest has occurred, it has not recreated any of the more complex structures or diversity of patch shape and size represented historically. Patch pattern has generally shifted from a wide array of patch sizes and complex shapes to a matrix of closed forest with smaller patches of recent harvest.

VRU 4: Rolling hills, grand fir and Douglas fir – 8,308 acres

Presettlement Composition and Structure

This VRU is common at low elevations along the middle main stem of Red River. Grand fir habitat types are dominant, but Douglas fir habitat types occur on south aspects and were important sites for open stands of ponderosa pine. Grand fir, Douglas fir, ponderosa pine, and western larch were historically dominant species. Lodgepole pine and Engelmann spruce were less common. Historically, this VRU exhibited high diversity in patch composition and size. Ponderosa pine, western larch, Douglas fir, and grand fir often survived low and mixed severity fires to form a scattered overstory of old large trees, or two-storied stands. Ten to 25 percent of stands included at least 10 trees per acre older than 150 years. Small to large blocks (100 to 2,000 acres) of pole to large fire killed trees were common at any time within 10,000 acres of this VRU. Old growth pine and western larch and meadow complexes are important elements of this landscape. Relative proportion by size class was about 5-10 percent nonforest, 5-50 percent seedling/sapling, 10-30 percent pole, 20-30 percent small and medium tree, and 10-50 percent large tree at the subbasin scale.

Presettlement Process

Mixed and stand replacing fire occurred at moderate intervals. About 50-60 percent of stands originated from stand replacing fire and 40-50 percent from mixed and low severity fire.

This terrain provided important cover for animals using the main meadows, including important calving and early season forage for ungulates in the moist openings, and could provide denning and rendezvous sites for wolves. Big game fawning and calving habitat was associated with meadow complexes or brushy draws. This VRU supported small to large patch sizes and diverse stand structures, from single story lodgepole to multistory larch, pine or mixed conifer stands. This provided habitat for species requiring smaller home ranges and avian or insectivorous prey bases: goshawk, pileated woodpecker, flammulated owl, black-backed woodpecker, and white-headed woodpecker.

Changes from presettlement

This VRU has sustained more harvest than any other: 48 percent has had documented harvest. Additional harvest occurred prior to record keeping to provide house and fence logs, and fuel to adjacent homesteads. With overstory harvest and advancing forest succession and fire suppression, ponderosa pine/Douglas fir forests and mixed conifer forest have increased while ponderosa pine forest has decreased. Lodgepole pine generated by the numerous fires in the late 1800s has also succeeded to mixed conifer forest in some areas. Canopy density has declined with loss of lodgepole pine and harvest, even while succession has introduced more grand fir and Douglas fir. Wet meadows, foothills grassland and shrubland have declined with agricultural development and forest encroachment. There are more small tree and less medium and large tree structural classes. Current estimated old growth is 5.8 percent of the potential forested acres of this VRU, well below the historic norm. Harvest has not simulated natural disturbances. The greatest changes are that large and medium trees are less well represented now, ponderosa pine and western larch have been lost and are threatened by encroaching grand and Douglas fir, and clear cut harvest and lodgepole regeneration have set the stage for eventual stand replacement, rather than a more normal mosaic of mixed and stand replacing fire. Patches created by harvest tend to be smaller and more uniform in size than under a natural disturbance regime. The ratio of stand replacement harvest to mixed or low severity treatments has been about 67 percent replacement to 33 percent less severe treatments. This is more replacement than would have occurred under natural disturbance regimes, and many of the less severe treatments have removed older overstory trees rather than thinning from below. Extensive snag patches are no longer being created by fire but lodgepole mortality is creating patches of small snags.

The current condition appears to be outside the likely presettlement range for tree size distribution, vertical canopy layers, diversity of patch size, and importance of ponderosa pine, western larch and large old trees in two story stands.

VRU 6: Cold basins, subalpine fir and grand fir habitat types - 49,831acres

Presettlement Composition and Structure

This VRU is common in the Red River area, at mid elevations. Grand fir and subalpine fir habitat types are dominant. Lodgepole pine was often the dominant seral species. Western larch, Douglas fir, and Engelmann spruce were important. Grand fir was important on mesic sites. Five to 15 percent of stands included at least 10 trees per acre older than 150 years. Stands in mixed fire regimes were often horizontally and vertically patchy. Moderate to large blocks (500 to 1000 acres) of pole to medium fire killed trees were common at any time within 10,000 acres of this VRU. Large patch sizes (100s to 10,000s of acres) and meadow complexes were important elements of this landscape. Relative proportion by size class was 5-10 percent nonforest, 10-30 percent seedling/sapling, 30-45 percent pole, 20-40 percent small and medium tree, and 5-20 percent large tree. VRU 6 was subject to infrequent, often large and lethal fires, so the percent composition might fluctuate widely over time. It is likely VRU 6 showed early seral stages somewhat more often than VRU 1 because it occurs at lower elevations with a slightly drier climate, and so might have been subject to slightly more frequent fire.

Presettlement Process

Medium to large stand replacing and mixed severity fires occurred at infrequent intervals. About 40-80 percent of stands originated from stand replacing fire and 20-60 percent had mixed severity fire. In Red River the proportion of mixed severity fire appears to have been at the high end of this range

This VRU provided important calving and early season forage for ungulates in the moist openings, and could provide denning and rendezvous sites for wolves. This VRU provided summer range, but produced less forage than lower elevation, more productive VRUs. Beargrass, grouse whortleberry, and blue huckleberry were widespread early seral and understory species. Menziesia provided moose browse on lower north slopes.

Changes from presettlement

Because of the fires in the late 1800s, lodgepole dominance was established over large areas, although possibly not much beyond the norm for this VRU. Many harvest units created in the 1970s are now pole sized, while older lodgepole and mixed conifer stands of small trees are greater than the historic norm, and the lodgepole is at an age and size highly susceptible to mountain pine beetle. The typical consequence of extensive lodgepole mortality would be increased risk of fire and reestablishment of lodgepole or other species, depending on fire severity and seed sources. Current estimated old growth is 9.2 percent of the potential forested acres of this VRU, which is within the historic range, but it is more highly fragmented than might have occurred naturally. Tree canopy density has declined. This might be due to natural thinning in lodgepole pine, or increased mortality in mixed conifer or lodgepole pine, or discrepancies in interpretation. Thinning activities have not been extensive. Mixed conifer types have increased, while lodgepole pine dominance has decreased from the 1930s, but is probably still within normal ranges. Harvest within the last 50 years has occurred on 28 percent of the acres of this VRU dispersed over the area and highly dispersed over time. Riparian meadows and shrub communities appear to have declined slightly due to forest encroachment or agricultural development on private land. The ratio of stand replacement harvest to mixed or low severity treatments has been about 61 percent replacement to 39 percent less severe treatments. This is probably within the range of what would have occurred under natural disturbance regimes. Extensive snag patches are no longer present, except for small snags associated with recent lodgepole pine mortality. Large fire resistant trees have been removed from the overstories in many areas.

The current condition appears to be outside the likely presettlement range of disturbance frequency and patch size diversity, canopy density, age class diversity, and dead wood elements. Harvest and fire suppression have produced an uncharacteristic uniform, small tree forest with evenly dispersed, mostly clearcut holes, with little down wood. The total area of recent disturbance is probably within the presettlement range, but its uniform distribution across a large matrix, and its uniform lack of internal complexity, are not within presettlement ranges.

VRU 7: Moist Uplands, grand fir habitat types with Pacific yew – 10,333 acres

Presettlement Composition and Structure

This VRU was found to be more extensive in the Red River area than originally delineated. It is common on protected slopes and swales, dominantly on northerly aspects where numerous wet areas protect it from fire.

Mesic grand fir habitat types are dominant and Pacific yew phases are common. Grand fir, Douglas fir and Pacific yew were the dominant species; Western larch, Engelmann spruce and lodgepole pine were less common. About 30 to 40 percent of stands had 10 or more trees per acre older than 150 years. Two or more age classes were common, and multistoried densely canopied old growth was important in this VRU. Old overstory trees could be grand fir, western larch, Douglas fir, Engelmann spruce or lodgepole pine. Pacific yew and mesic old growth were important elements of this landscape.

Relative proportion by size class was about 1-10 percent nonforest (or nonstocked), 5-20 percent seedling/sapling, 10-25 percent pole, 25-35 percent small and medium tree, and 35-45 percent large tree.

Presettlement Process

About 60 percent of stands originated from stand replacing fire, and 40 percent from mixed severity fire. Western larch, Douglas fir, grand fir and even lodgepole pine sometimes survived one or more fires to form a scattered overstory. Small and scattered blocks of fire-killed medium and large trees occurred occasionally within this VRU. Large areas of fire mortality occurred very infrequently.

This VRU historically provided habitat for sensitive species requiring relatively large home ranges, interior habitat and small mammal prey bases: wolverine, fisher, and boreal owl. It provided a central core of moose winter range and important mesic old growth for pileated woodpecker. This VRU is often adjacent to VRUs 10 and 17 with which it intergrades and the three often comprised large blocks of interior old growth habitat.

Changes from Presettlement

Because of the fires in the late 1800s, lodgepole dominance was established over larger areas than typical of this VRU. General dominance types have changed little from the 1930s, but the early fires produced a lot of early seral communities and subsequent harvest targeted medium and large tree stands, so small trees now dominate the VRU, which is well outside the historic norm. Current estimated old growth is 27 percent, which is somewhat below the historic range, and it has been highly fragmented. Many harvest units were large uniform clear cuts, and slash windrowing and burning further reduced soil wood that is a key component of this VRU. Snags are virtually absent in these harvest units, so their recovery toward a characteristically richly layered and diverse old growth will be more retarded than in response to a stand replacing fire. Harvest has occurred on abut 32 percent of this VRU in the last 40 years, which is probably also outside the historic range. There has been a modest trend toward more multi-layered stand conditions since the 1930s, but the widespread fires of the late 1800s may have reduced stand vertical structure below natural ranges.

Tree canopy density has declined. This might be due to natural thinning in lodgepole pine, or increased mortality in mixed conifer or lodgepole pine, or discrepancies in interpretation. Thinning activities have not been extensive. The ratio of stand replacement harvest to mixed or low severity treatments has been about 58 percent replacement to 42 percent less severe treatments. This is probably within the range of what would have occurred under natural disturbance regimes. However, large fire resistant trees have been removed from the overstories in many areas of less severe treatment. Extensive snag patches are no longer present, except for small snags associated with recent lodgepole pine mortality.

The current condition appears to be outside the likely presettlement range of disturbance frequency and patch size diversity, patch size, and dead wood elements. Fire and harvest and subsequent fire suppression have produced an uncharacteristic uniform forest small tree matrix with evenly dispersed, mostly clear cut holes, with little down wood. The total area of recent disturbance is probably not within the presettlement range, and its uniform distribution across a large matrix, and its uniform lack of internal complexity are not within presettlement ranges.

VRU 10: Moist Uplands, grand fir and subalpine fir habitat types with alder and forb openings – 3,985 acres

Presettlement Composition and Structure

This VRU occurs in moist maritime climatic zones along the Selway River and South Fork Clearwater divide. It is common on moist ridges, swales and north aspects with deep soils. Included wet areas support diverse forb and fern communities. Mesic grand fir, subalpine fir and alder habitat types are dominant. Grand fir, Engelmann spruce, subalpine fir, and Sitka alder were historically important cover types. Douglas fir, western larch, lodgepole pine and Pacific yew were common on ridges. About 15-30 percent of stands had 10 or more trees per acre more than 150 years. Open canopied and multi-aged old growth, tall shrub, and diverse forb communities were important elements of this landscape. Relative proportion by size class was 10-25 percent nonforest, 15-25 percent seedling/sapling, 20-30 percent pole, 25-40 percent small and medium tree, and 15-25 percent large tree.

Presettlement Process

Small fires occurred frequently, but mixed severity infrequent fire was typical, with stand replacement usually confined to ridges. About 40-60 percent of stands experienced mixed severity fire, and 40-60 percent originated from stand replacing fire. Western larch, Douglas fir, grand fir and even lodgepole pine sometimes survived one or more fires to form a scattered overstory. Very small fires created small patches of large tree mortality. Small and scattered blocks of fire-killed medium and large trees occurred occasionally within this VRU. Large areas of fire mortality occurred very infrequently.

This VRU historically provided habitat for sensitive species requiring relatively large home ranges, interior habitat and small mammal prey bases: wolverine, fisher, and boreal owl. It provided important summer range and mesic old growth for pileated woodpecker. This VRU is often adjacent to VRUs 7and 17 with which it intergrades and the three often comprised large blocks of interior old growth habitat.

Changes from Presettlement

This area burned in 1919, generally at mixed severity. Shrub and young forest communities have declined since then, with forest recovery. Harvest has affected only 2.5 percent of this VRU, so it is probably the only one in the watershed where harvest has not kept pace or exceeded natural disturbances frequencies. However, this harvest has been almost all clearcut. This has reduced down wood recruitment much below natural levels and is not suited to the natural disturbance regime. Likewise, there are attendant regeneration problems associated with heavy ground disturbance in areas where pocket gophers and invasive native forbs and ferns become established. General dominance types have changed little from the 1930s, and would not be expected to under natural conditions. Size classes are still dominated by the small trees of the young forest produced in the 1919 and 1898 fires. Current estimated old growth is 17 percent, which is at the low end of the historic range, because of the fires.

4.3.5 Terrestrial Disturbance Regimes and their Alteration

Summary

Fire and insect and disease dynamics are keystone processes affecting basic functions like biomass and nutrient cycling, plant succession, the variety and pattern of plant communities and wildlife habitats, and in turn, the resistance and resilience of plant communities to subsequent disturbances (Hagle et al., 2000).

Exotic insects like the balsam woolly adelgid or plants like spotted knapweed, are not widespread in the watershed, but could in the future alter the course of succession and influence subsequent disturbance events and watershed response. The mountain pine beetle, as distressing as its effects appear to be to the visitor in Red River, is part of a lodgepole pine, beetle, and fire cycle that has been operating for millennia, and to which many species are well adapted. Severe fire in a degraded watershed may have impacts to which some species are not adapted.

Wildfire is a keystone ecological process that has been altered in the landscape, although to a lesser degree than in landscapes historically subject to frequent, low severity fire (Hessburg and Agee, 2002, in press). Extensive harvest has not replicated fire disturbance, but has interrupted the continuity of fuels in the landscape to a degree at least as great as a natural fire regime. Restoration must be about frequency, kind, scale and pattern of vegetation management activity as well as within-stand composition and structure.

Developing a strategy for restoring more natural disturbance regimes to roadless areas where fire suppression policy is in place needs to be part of this strategy.

Insects and Disease

An index of forest health is its capacity for renewing itself (Leopold 1949). This assessment has used the comparison of historic and current pattern and process as the most appropriate measure of ecosystem health. A landscape that retains critical elements (communities, processes, and patterns) is considered to have the most likelihood of being able to renew itself after stress and to retain its productive potential (Hahn and Hagle 1993). The following discussion addresses one aspect of forest health: the changes that have occurred in forest vegetation, and how this is likely to affect susceptibility to some insect and disease organisms. We also discuss the ecological role of insects and pathogens in forest successional processes and fire and fuel dynamics.

Mountain pine beetle

Mountain pine beetle is a native bark beetle with a one- to two-year life cycle that is the prime insect agent affecting lodgepole pine ecosystems. Evidence of lodgepole pine, mountain pine beetle, and fire has been noted in sediment cores for several thousand years (Cathy Whitlock, researcher in paleoclimate, University of Oregon, personal communication, April 2002 and Monnig and Byler, 1992). Adults select green trees of sufficient size and phloem thickness to nourish their larvae. The pitch tubes on the bole and boring dust at the base of the tree are evidence of beetle entry. Beetles are subject to mortality from parasites, predators such as woodpeckers, cold winters, drying of the pine following infection, and resin from the host tree. Infestations tend to occur at 20 to 40 year intervals, depending on the age, size, and density of lodgepole stands (Cole and Amman, 1980). Prior beetle outbreaks occurred in the mid 1980s in Red River, followed by an aggressive salvage and logging program. This approach to beetle treatment favors rapid reestablishment of lodgepole pine and renewal of the cycle. Salvage and thinning, augmented by planting beetle- and fire-resistant species could help interrupt some of the continuity of dense lodgepole pine and slightly reduce susceptibility to this cycle. Thinning can help reduce susceptibility to mountain opine beetle through both physiological response of the remaining trees and changed microclimate within the stand (Mitchell, 1994).

Lodgepole in Red River has become highly susceptible to mountain pine beetle because much of the lodgepole derives from fires from 1870-1898 and it has reached an age and size suitable for beetle reproduction. In the absence of miner-caused fires, and the absence of subsequent fire suppression, landscape patterns may have taken a different course of development and such large contiguous areas of susceptible lodgepole may not have developed, but lodgepole pine is characteristic of interior montane basins like Red River where cold air impoundment also favors their establishment and rolling terrain favors the propagation of fire.

Areas of estimated lodgepole pine mortality are shown in Map 30. This map has a high probability of error because it is based on photo-interpreted vegetation attributes, which were then adjusted to reflect change-detection imagery, while considering aerial insect flight mortality estimates.

Mountain pine beetle infestations may kill 30 to over 90 percent of the trees 5 inches or larger in the stand, but trees six inches or larger are preferred. After each infestation, residual lodgepole pine and more shade tolerant species like grand fir increase their growth and the trend is toward uneven-age stands with multiple canopy layers and more shade tolerant species. This has already been observed in response to the 1980s and current epidemics in Red River. In mixed ponderosa pine and lodgepole, beetle attacks may preferentially thin out the lodgepole, at least until beetle populations rise to such an extent that ponderosa pine is attacked.

Fuel levels increase with each episode and so does the likelihood that, if fires occur, they can become larger and burn more severely. Areas of likely fuel load increases are shown comparing Maps 31, 32 and 33. These predictions have a high probability of spatial error because of the poor quality data, and uncertainty about the trajectory of the beetle outbreak. Where fires do not occur, the stand is likely to move toward a grand fir or subalpine fir stand, although older, long-lived seral species like larch or

Douglas fir may persist in the overstory. If a severe fire does occur, lodgepole reestablishment is likely. This lodgepole-beetle-fire-lodgepole cycle is well known in natural landscapes and has contributed to the persistence of lodgepole pine ecosystems through millennia.

Conversely, many mixed conifer stands on the Nez Perce show a history of prior dominance by lodgepole, and have transitioned to mixed conifer conditions without succumbing to stand replacing fire, but the fuel load is heightened for some years till the down fuels decompose, and fires in such stands are more resistant to control. Natural lodgepole stand and landscape dynamics are a prime example of infrequent pulse disturbance at a relatively broad scale, and sometimes high severity.

Higher elevation stands have been less affected by the pine beetle activity, possibly because they tend to be smaller trees, and because colder winters might limit local beetle reproduction. However, the stand types are susceptible and the areas of highest predicted susceptibility are shown in Map 34. The hazard rating protocol is adapted from Steele et al., 1996. Again, errors in these prediction exercises are likely to be significant. According to these data, areas in the Upper West Fork and Upper Main Red River are potential beetle activity areas in the near future, if insect populations are available and climates are favorable. Uncertainty is high, however, and current mountain pine beetle populations could be curtailed through climatic or other events. Where the stands are in large contiguous blocks, they become more likely candidates for an attack. Some of these stands are in areas recommended for replacement old growth, because they retain some overstory of medium or large trees.

The potential for mountain pine beetle in ponderosa pine has increased because of the high insect populations available to attack them.

To retain lodgepole pine at natural levels will require developing a landscape management strategy that uses this understanding of fire, beetles, and succession, integrated with watershed recovery strategies. Management to achieve areas of high mortality, but retain critical large wood and snag components in large heterogeneous management units, is needed.

Western balsam bark beetle

This beetle is a native wood-boring insect that attacks subalpine fir, and rarely Engelmann spruce (Garbutt, 1992, as cited in Natural Resources of Canada, 2003). They introduce a blue stain fungus, which may actually cause most of the mortality that occurs. In Red River they have been identified in the upper elevation spruce-fir stands of the West Fork, but numbers of affected trees are currently relatively low (1-2 trees per acre). Populations may maintain themselves at endemic levels in old stands or build and spread to less-susceptible stands during periods of drought. Their successional function is to kill old subalpine fir, which favors the establishment of new subalpine fir. This may not change species composition, but can contribute to development of more uneven-age structure, and fuel accumulations. They may be more successful in attacking subalpine fir that has already been attacked by balsam woolly adelgid, and the two species may often co-occur. It is estimated that this beetle is at endemic levels and will remain so unless environmental factors change significantly.

Balsam woolly adelgid

This is a sucking insect introduced from Europe that is now found in the Red River watershed in a few areas, but the extent to which it may increase in population and activity is not known. It feeds on the cell sap of subalpine fir and, to a lesser extent, grand fir (Oregon Department of Forestry, 2000 and Natural Resources of Canada, 2003). Stem attacks can lead to eventual tree mortality. Crown attack can ultimately affect bud formation and upward growth and can also lead to tree mortality. This insect more often attacks young trees so its successional effect is to reduce stand density and reduce vertical canopy layering by affecting understory fir. Adelgid predators have been introduced in Oregon, but it is not known if they have spread to Idaho. Cold winters control populations, while warm summers favor their survival.

Root diseases

Root diseases are fungi that can affect all sizes, ages and species of tree (Hagle et al., 1987, Hagle et al., 2000). Habitat types reflect environmental variables that exert significant influence on root disease severity. Habitat type groups 3, 4, and 7, all common in Red River, typically exhibit more frequent and more severe evidence of root disease. Forest type and structure class may be correlated with root disease severity. In the watershed, grand fir and Douglas fir are most highly susceptible and the prevailing root pathogens affecting them are armillaria and annosus root rots. With the loss of lodgepole pine to mountain pine beetle, grand fir and subalpine fir will increase, and root disease will likely also increase. However, lodgepole pine was probably at or above its historic norm, so this change is not toward conditions that are outside historic ranges. Where Douglas fir has encroached on ponderosa pine stands, these will be more susceptible to root disease.

Fire and root disease appear to have contributed historically to the maintenance of larch in mixed conifer stands. Without fire, root disease is unlikely to sufficiently limit grand fir to keep larch from being eventually eliminated.

Root disease has probably increased a small amount in average severity, as the proportions of stands with moderate or severe ratings have increased since the 1930s, but the 1930s may represent a man-influenced high point of lodgepole dominance in the watershed. The older stands become and the more they shift toward grand fir, the more severe root disease will be. Root disease may recover a more important role if lodgepole dominance is reduced and Douglas fir and grand fir are increased. It will affect the canopy cover, species composition, size, and age distribution of trees, and timber productivity. The effects will be to create forest openings, favoring shrubs and regeneration of more susceptible grand fir or increased dominance by less susceptible species. Levels of inoculum will probably increase in some areas. Over the long term, without fire or harvest to sustain less susceptible species, inoculum may build to the point more tree species will become susceptible.

Douglas fir beetle

This is a native bark beetle that is not typically very aggressive and usually attacks wind thrown, fire-damaged trees or trees weakened by other pathogens or drought (Hagle et al., 1987, Schmitz and Gibson, 1996). They may attack healthy trees when large areas of fire-weakened trees or wind thrown trees allow large populations of beetle to build up. Where Douglas fir occurs with early seral larch or pine, beetle activity will help maintain the early seral species. On grand fir and subalpine fir habitat types, like those that dominate Red River, Douglas fir beetle activity creates openings where more shade-tolerant species like grand fir will grow and push the stand more quickly toward late seral conditions and uneven aged stand structure (Hagle et al., 2000). Observed pockets of Douglas fir beetle in the watershed have been small and occur in areas where past fires were not stand replacing so that large old Douglas fir remain. Many of these pockets are associated with old growth and will provide large Douglas fir snags.

Large patches of post-fire stressed trees used to occur periodically. Because of extensive fire in the late 1800s and subsequent harvest, large Douglas firs in dense stands are not abundant in the watershed so the potential for extensive beetle outbreaks is relatively low.

Blister rust

Virtually no western white pine or whitebark pine has been inventoried in the drainage so the potential for blister rust is low. The historic potential for these tree species appears to have been very low also.

Dwarf mistletoe

Dwarf mistletoes are parasitic plants that extract water and nutrients from living conifer trees (Hagle et al. 2000). They have coevolved with their hosts for millions of years. Lodgepole pine, Douglas fir, and larch dwarf mistletoes occur throughout the range of their host species in north Idaho. Effects on trees and ecosystems are gradual, reducing growth and reproduction, and increasing susceptibility to other pathogens and insects. Lodgepole pine dwarf mistletoe is the species most active in the Red River watershed, because of the importance of this cover type. Initial effects are to reduce stand density and size dominance within the affected species and size class. Successional effects where mistletoe is severe are to accelerate succession toward grand fir or subalpine fir. Fires that kill host species also reduce mistletoe.

Overall, dwarf mistletoes affect a relatively small proportion of the Red River assessment area. They are parasites with limited ability to colonize new areas, so they are slow to spread. The characteristic witch's brooms indicative of mistletoe provide hiding cover and nesting areas for birds and small mammals, but lodgepole pine dwarf mistletoe probably has less utility for wildlife because the brooms are loose and retain needles poorly. Compared to mountain pine beetle, the effects of dwarf mistletoe in lodgepole pine are likely to be minor. The dramatic thinning effect of mountain pine beetle on lodgepole pine will also reduce dwarf mistletoe in the Red River area.

Fire

This section addresses fire history in the Red River watershed, presettlement fire regimes, 1930s and current fuel accumulations, and predicted change in fuel loadings as a consequence of recent lodgepole pine mortality. Fire has been a keystone process of nutrient cycling and plant community dynamics for millions of years. Changes in fire regimes have consequences for both terrestrial and aquatic ecosystems. Severe fires in heavily roaded landscapes may have greater impacts on aquatic systems than in roadless landscapes (Nick Gerhardt, Nez Perce Forest Hydrologist, personal communication, March, 2003). The road system acts as an extension of the drainage system to route sediment more efficiently to streams. Because culverts and bridges may fail, causing roads to wash out, and roads interrupt subsurface downhill flow of water, rerouting it to the surface so it may again detach and transport sediment (Wemple, 1994; Jones et al., 2000). Factors considered in assessing current risk of wildfires compared to presettlement conditions are: existing fuels compared to presettlement fuels, changes in vegetation structure, number of fire intervals missed, and likelihood of ignition.

Fire History

Fire history from 1870 to 1969 is shown in Map 9. Large fires of more than 1,000 acres occurred in the watershed about every six years from 1870 to 1930, based on analysis of fire atlas and tree age data. This is an average of 811 acres per year, or a fire rotation of 127 years, which is probably a slightly higher fire frequency than natural. Leiberg (1898) noted the tendency of miners to light fires to clear land, and accidental man-caused fires were also common, and this is likely to have been the case in Red River. Only 1870, 1889, and 1919 were regional drought years when large fires were most likely to occur. The largest recorded fire was 1878, at over 49,000 acres. Eighteen ninety-one, 1898, and 1919 were other large fire years in the Red River area. Fire incidence dropped substantially after 1930 with effective fire suppression, and only 1,300 acres have burned in the last 72 years, far below natural. This is about 18 acres annually, which would result in a 5,500-year fire rotation for the watershed.

Most of the watershed is within its historic fire interval at the stand level, except for VRUs 3 and 4, but mixed severity fires could have occurred one or more times in most areas, and have not occurred since fire suppression has been aggressive. Some stands now show effects of fire exclusion in increased multi-storied stands and the encroachment of grand fir and subalpine fir on larch and pine. Areas outside typical disturbance intervals are displayed in Map 46 of the SFA (USDA 1998), but this map is out of date since more detailed fire history information has become available, and fewer areas are now considered to be out of their typical disturbance interval.

Fire Regimes

Through time, lightning has ignited fires and changed the pattern and composition of communities and habitats in the landscape. Most native species have evolved in an environment of characteristic frequency, severity, and scale of wildfire. Presettlement fire regimes are described by their characteristic severity (nonlethal, mixed severity, lethal) and frequencies (very frequent: 5-25 years, frequent: 25-75 years, infrequent: 75-150 years, and very infrequent: 150-300 years (Morgan et. al. 1996)). They are inferred from habitat type group and terrain setting. Fire regimes are shown in Map 8. Since fire has been such a prevalent agent of change and pattern in the landscape, understanding fire regimes is useful in interpreting existing condition and in designing activities that provide the array of communities and habitats historically represented. It appears that the repeated fires occurring in the late 1800s burned at lower severities (Table 4-19) than these fire regimes might suggest, possibly because some fires were set by miners in years when fuel moisture was not particularly low, or because of their higher than natural frequency. The pending increase in fuels in Red River as dead lodgepole pine drop is probably within the historic norm, and the mosaic of mixed and severe fires that might follow in some areas would also be within that norm. Because of local social values and degraded watershed conditions, such fire effects may not be acceptable.

Table 4-19 Presettlement Fire Regimes in the Watershed

Fire Regime	Percent of Watershed
Very frequent, nonlethal	1.3
Frequent, mixed	8.4
Infrequent, mixed and lethal	60.7
Infrequent, mixed	28.1
Very infrequent, mixed and lethal	1.3

Fuels

Wildland fuels provide the energy source for fire. Fuels consist of both living and dead vegetation, the latter in various stages of decay. Fuels occur in three fairly distinct strata: ground, surface, and aerial. A fire can burn in one, two, or all three strata at once, or change the layer in which it is burning as fuels and environmental conditions change throughout an area.

Fuels vary across the landscape and over time in their quantity, flammability, vertical distribution and spatial distribution. Quantity increases with increasing biomass or accumulation of dead material on a site. As stands age, they accumulate both living and dead material. Flammability is controlled largely by moisture content and plant phenology. Vertical connection of fuels (ladder fuels) tends to increase with succession as young trees grow up underneath older trees. Spatial distribution changes with time and environments. Landscapes experiencing infrequent large disturbances that are now uniformly old forest will likely have continuous fuel accumulations. Landscapes naturally fragmented by contrasting environments or patchy disturbances will likely have a patchy pattern of fuel conditions.

Patterns of fuels in the 1930s contrast somewhat with those that occur today, and both contrast strongly with those that may occur within a decade when dead lodgepole pine have fallen. Table 4-20 shows how fuel models (described in Appendix F) have changed. Areas of grassland and open forest with grassy understories prone to low severity surface fires have declined (fuel model 2). Areas of shrubs, seedlings, and saplings (fuel model 5) have increased from the 1930s, but will have declined in 2012 if no other disturbance occurs. Areas of pole and mature forest with relatively low fuel accumulations (fuel model 8) have stayed similar to the 1930s, while areas of mature forest with greater fuel accumulations and connection of ground fuels to the tree crowns have increased (fuel model 10) and are expected to increase further where modest lodgepole mortality favors some snag fall and growth of ladder fuels. Areas of fuel model 10 are prone to severe crown fires when conditions are both dry and windy.

Areas predicted to be fuel model 10+ (forest with heavy fuels augmented by abundant down logs) probably occurred naturally in lodgepole ecosystems with high mountain pine beetle activity. They are predicted to occur within the next 10 years in Red River in areas of heavy lodgepole mortality. They are not unnatural in lodgepole ecosystems or other areas affected by windstorms or other pathogen outbreaks. These fuel accumulations could burn at very high severities, depending on fire weather. Fires in these environments may be very difficult to control and social and ecological effects may be unacceptable in a particular context.

Table 4-20 Changes in Fuel Models

Fuels Models	1930s Percent of Watershed	2002 Percent of Watershed	Predicted 2012 Percent of Watershed
Fuel Model 1: grasslands	.2	.8	.8
Fuel Model 2: open pine and grassy understory	.8	.1	.1
Fuel Model 3: moist meadow	1.4	1.0	.9
Fuel Model 4: Continuous flammable shrub or tree canopy	4.1	0.0	0
Fuel Model 5: shrubs and saplings moist during much of the growing season	9.6	16.0	5.0
Fuel Model 8: pole and medium trees with relatively low fuel accumulations	79.1	73.0	55.6
Fuel Model 10: medium and large trees with relatively high fuel accumulations and ladder fuels	4.5	9.0	30.7
Fuel Model 10+: High fuel accumulations with heavy continuous downfall	0	0	6.6

Changes in Fire Regimes

With fire exclusion, the interval between fires has increased in the very frequent and frequent fire regimes in VRUs 3 and 4. VRU 4 has been heavily harvested, and many areas do not show dense canopies, but more fire resistant species are being replaced by less fire tolerant tree species, and vertical canopy layers appear to have increased. Where the disturbance interval has increased, the potential severity of fires has increased because over longer intervals, more fuels accumulate. Areas of infrequent fire are little departed from their presettlement fire intervals, considered stand by stand, and extensive harvest in mature forest has fragmented areas of forest fuels more than in the 1930s. Stands that have not had any harvest may have accumulated more dead and down material that would predispose them to burn more severely, but are still within the natural range. Cumulative effects of localized severe burns might be expected. Dead and down material from lodgepole mortality is likely to predispose some stands to severe fire behavior and effects under appropriate climatic conditions. It was not rare for large beetle outbreaks to result in widespread heavy fuels and severe fires. The extensive harvest in Red River has broken up that fuel mosaic, perhaps as much as a natural fire regime would have done at low- and mid-elevations, but less so at upper elevations. Harvest has reduced fuels on about 30 percent of the watershed, mostly in the last 40 years; this would equate to a 133-year harvest rotation, probably within the natural range for stand replacement.

Ignition Risk

Where missed disturbance intervals or high fuel accumulations coincide with high natural fire ignition rates, actions to reduce fuel quantity or connectivity are appropriate. Ignitions from 1970 to 2001 do not show a strong pattern of local occurrence within the watershed, except for a concentration of lightning-caused fires in Upper Main Red River above Trail Creek (Map 9). There is no reason to believe this local concentration is due to more than chance, according to district fire managers. Eighty-three percent of fires in the watershed were lightning caused; smoking and debris burning were common human factors (Figure 4-22). Ignition risk from human causes tends to follow travel routes and will likely increase, as visitor use increases. Peak ignition rates appear to have increased over the last 15 years, although human ignitions have not. The increase in ignitions since about 1985 may be due to improved detection. Harvest and attendant debris burning pose some risk of ignitions outside burn units, but lightning continues to be the primary ignition source. Number of ignitions is not necessarily highly correlated with number of large fires; numerous ignitions can occur from storms in wet years, but in these conditions fires may be easy to control. Conversely, a few ignitions during drought, followed by severe burning weather, can result in a large fire that is difficult to control.

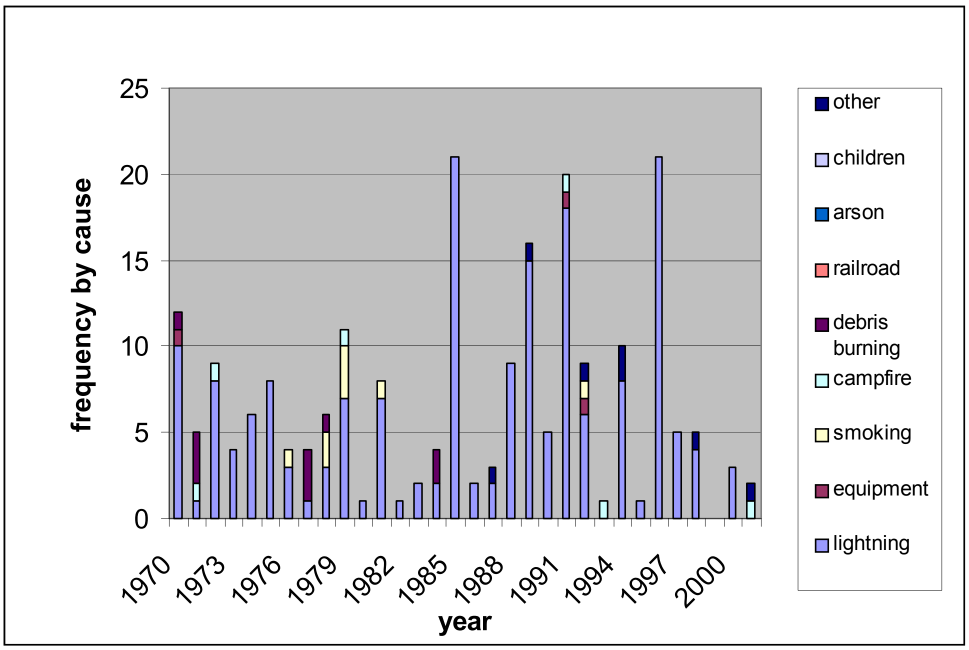

Figure 4-22 Fire Ignitions by Year and Cause

Prescribed and Natural Fire Management

Prescribed fires have been used to reduce fuels or improve forage since 1979. An average of 78 acres has been burned annually, usually in the spring. This is far less than historic levels of fire disturbance, and the season and severity of disturbance have not often simulated presettlement processes.

Roadless areas in the Red River area present a fire use and management dilemma. They are fairly small and near developed landscapes, which makes it difficult to implement a meaningful wildland fire use plan. Some roadless areas include vegetation types that are likely to experience insect and disease related mortality within the next decades, increased fuels, and vegetation change toward more flammable multi-storied canopy layers. Fires starting in these roadless areas have some potential to spread into roaded lands. Timber harvest may not be a viable option because of their roadless character, marginal timber values, and significance as aquatic refugia. Expanded use of prescribed fire might be feasible with attention to existing and potential fuel breaks to help prevent fires from moving into developed portions of the area.

Timber Harvest

Timber harvest is another kind of plant community disturbance that can alter species composition, size class, tree density, pattern of communities in the landscape, successional pathways, and susceptibility to fire and insect and disease activity. This section will address to what degree timber harvest kind, extent, and timing, have simulated natural fire processes that have been suppressed. Documented past timber harvest areas are shown in Map 29. Additional undocumented harvest has been common throughout settlement. About 1,190 acres of estimated harvest on private lands have occurred within the last 50 years. Prior to that, most areas along the main travel routs and on private lands have sustained some level of harvest. Fire and harvest disturbance regimes are shown graphically in Figure 4-4, Figure 4-5, Figure 4-6, and Figure 4-7 in the watershed discussion of water yield (Section 4.2.5) as indexed by Equivalent Clearcut Area. Significant harvest disturbance during the mining era through about 1950-1970, before a systematic records system was developed, is not documented or represented in these graphs.

Severity of Disturbance

Table 4-21 compares typical levels of fire severity to harvest activities by Vegetation Response Unit. Clearcut harvest, seed tree harvest, and overstory removals are considered severe treatments, as are fires that kill more than 70 percent of the stand. Thinning, and preliminary shelterwood are considered of low to moderate severity, as are individual tree selection harvests. It appears that severe harvest treatments in VRU 4 have not simulated the mixed severity fire once typical of these low elevation uplands. In low relief terrain (VRUs 1 and 6) harvest treatments come close to simulating the severity of presettlement fire, although snags and down wood fall far short of historic ranges. VRU 10 has had little harvest, but nearly all of it is clearcut, instead of mixed. Clear cuts do not simulate fire in several ways, including the heterogeneous spatial patterns of mortality caused by fire, the removal of wood as part of harvest, or the ground disturbance associated with harvest. Single-tree selection cuts do not simulate low severity fire, because large, fire resistant trees were usually the ones removed.

Table 4-21 Comparison of Fire Severity and Harvest History

VRU	Fire Ratio of Severe to Intermediate Disturbance	Harvest Ratio of Severe to Intermediate Disturbance
1	70:30	61:39
3	50:50	41:59
4	50:50	67:33
6	75:25	61:39
7	60:40	58:42
10	50:50	98:2

Disturbance Frequency

Disturbance frequency affects watershed dynamics, wildlife sensitive to disturbance, patterns of plant colonization and succession, and species persistence. Table 4-22 compares frequency of fire (1870-1930) and harvest disturbance (1953-2003) by subwatershed in the Red River watershed. Road construction as a disturbance is not included here, nor is harvest on private land, nor poorly documented early harvest, nor small harvest or fire less than one percent of a subwatershed. The fires possibly due to man in 1878, 1891, and 1898 have not been omitted so fire frequency may be higher than natural. It is clear that even in the watersheds once dominated by higher frequency fire, the frequency of management disturbance has been much higher during the period from 1953 to the present than a natural disturbance regime.

Table 4-22 Comparison of Fire and Harvest Frequency

Subwatershed	Fire Frequency per 100 Years	Harvest Frequency Adjusted to 100 Year Basis
Baston	3	6
Blanco	3	14
Bridge	2	0
Campbell	3	12
Dawson	2	16
Deadwood	3	24
Ditch	5	14
French Gulch	5	8
Little Moose	3	18
Lower Main	3	28
Lower South Fork	3	18
Lowest Red	7	12
Main Red River	5	16
Middle Fork Red	3	10
Moose Butte	5	26
Otterson	3	0
Pat Brennan	3	10
Red Horse	7	10
Schooner	5	14
Siegel	7	14
Soda	5	14
Trail	5	4
Trapper	5	16
Upper Main	3	4
Upper South Fork	5	12
West Fork Red	5	4
Mean Frequency	4	11

Disturbance Extent

Disturbance size affects watershed response, landscape pattern, wildlife use of openings, colonization rates and species, and time required for plant community reestablishment. Table 4-23 compares size of fire disturbance as a percent of the subwatershed to size of harvest activities in the same subwatershed. Harvest or fire across less than one percent of the watershed is omitted. These small disturbances are far more common for harvest activities, but small fires burning only a few acres could not be captured in the fire atlas or even stand exam data. Large-scale disturbances were not uncommon under presettlement fire regimes in most settings. These disturbances, although large, often included significant areas of low severity fire, and abundant residual snags and down wood. The other important attribute is the variability of size and severity. The much more frequent, but uniformly small-scale harvest disturbances do not replicate the variation in disturbance patch size that occurred with natural fire, or the longer periods of subwatershed recovery from disturbance.

Table 4-23 Comparison of Fire and Harvest Scale by Subwatershed

Subwatershed	Fire Size as Percent of Subwatershed	Harvest Size as Percent of Subwatershed
Baston	6 – 27	<1-10
Blanco	59-100	<1-12
Bridge	90	2
Campbell	3-100	<1-6
Dawson	94	<1-17
Deadwood	40-53	<1-18
Ditch	6-90	<1-8
French Gulch	2-92	<1-9
Little Moose	11-89	<1-11
Lower Main	2-96	<1-6
Lower South Fork	27-70	<1-5
Lowest Red	2-64	<1-20
Main Red River	8-87	<1-2
Middle Fork Red	35-87	<1-3
Moose Butte	3-58	<1-16
Otterson	6-94	0
Pat Brennan	12-79	<1-10
Red Horse	12-82	<1-4
Schooner	2-67	<1-7
Siegel	2-51	<1-5
Soda	3-21	<1-8
Trail	11-56	<1-10
Trapper	1-38	<1-9
Upper Main	25-40	4-24
Upper South Fork	3-34	<1-22
West Fork	12-67	2-4

Invasive Plant Species

Exotic plant species are an important ecosystem attribute to consider when assessing watershed conditions and vegetation objectives. Invasive exotic plants have the potential to affect native species richness and frequency (Forcella and Harvey 1990, erosion rates (Lacey et al 1989), and ecological processes (Whisenant 1990; Vitousek 1986). Bedunnah (1992) noted that exotic plants may alter ecological equilibrium to a point where the change is permanent. Invasive exotic plants can expand following man caused or natural disturbances and colonize degraded as well as intact habitats (Tausch et al 1994; Watson et al 1989). Many weeds found in the intermountain west were accidentally or intentionally introduced into North America between the 1880s and 1920s. Without their natural predators and pathogens, exotic plants can expand unchecked.

Current Infestations

Currently invasive weeds occupy approximately one percent of the Red River watershed. Five problem weed species have been targeted with the watershed – Canada thistle (*Cirsium arvense*), spotted knapweed (*Centaurea maculosa*), Dalmatian toadflax (*Linaria dalmatica*), butter and eggs (*Linaria vulgaris*), sulphur cinquefoil (*Potentilla recta*) and common tansey (*Tanacetum vulgare*). These species and acres infested are summarized in Table 4-24. Because of the relatively small area infested by noxious weeds, there is not a comprehensive weed management strategy for Red River. Weed management in Red River watershed occurs at the project level. Though there are several known populations, most are limited to roadsides and other disturbed areas (Map 35). It is in these areas that the preferred disturbed conditions occur and dispersal corridors are provided.

Table 4-24 Target Weed Species in the Red River Watershed

Weed Species	Area (ac)	% of Basin
Canada thistle *Cirsium arvense*	356	0.3%
Spotted knapweed *Centaurea maculosa*	799	0.8%
Dalmatian toadflax *Linaria dalmatica*	0.3	–
Butter and eggs *Linaria vulgaris*	0.1	–
Sulphur cinquefoil *Potentilla recta*	0.2	–
Common tansy *Tanacetum vulgare*	0.8	–
Total Acres Infested	1156.4	1.1%

Canada thistle and spotted knapweed are the most prevalent noxious weeds in the watershed, with the former covering 356 acres and the latter 799 acres. These figures come from infestations accounted for in GIS mapping efforts and would not include many of the small, scattered populations of these common weeds. Almost all significant populations of these species occur along the primary road corridors of the main stem of Red River and the South Fork and North Fork. Other high travel areas that aid in the dispersal of these weeds include the Blanco road (1183), Moose Creed road (1150) and the Soda Creek road (1172). These weed corridors include most of the primary source areas that provide seed and propagules for expansion.

<u>*Spotted Knapweed*</u>

Spotted knapweed is most abundant along road 221 from the confluence of Red River and American River upstream to Red River Ranger Station. Most of this road segment supports heavy densities of knapweed. From the road the weed has spread into some adjacent forest openings and grasslands, often with very negative impacts. The mine tailings, especially in the Narrows section support the most severe infestations in the watershed. Knapweed continues up the South Fork (222) and North Fork (234) roads with high densities in the lower elevations, but thins out as elevation increases. Significant knapweed occurrences are also along the Blanco road (1183), Moose Creek road (1150), Soda Creek road (1172) and roads 522 and 1803 in the Deadwood/Wheeler area. Road 9542 is isolated from most of the main dispersal corridors, yet supports heavy knapweed. A final extensive infestation is centered near private land at the confluence of Siegel Creek and Little Siegel Creek and is contributing to weed spread along roads and forest openings throughout that watershed. Scattered light knapweed infestations would be expected throughout most of the Red River watershed wherever open roads occur.

Canada Thistle

Canada thistle also occurs primarily along the major travel routes, but is not as prevalent as spotted knapweed and is more transitory in nature. Though widespread, the largest infestations are mostly limited to the North Fork Red River road (234) and the main roads in the Deadwood/Wheeler (522, 1803) vicinity. Red River Campground also supports a significant infestation, which, due to human travel, provides a significant source for the spread of this weed. Mining activities along road 9516 has resulted in significant surface disturbance that now supports abundant Canada thistle and other weeds. The isolated road 9542 is heavily infested and probably originated with the same dispersal events that brought the knapweed. The final noteworthy infestation occurs on roads 1150A and 1150B in the Trapper Creek drainage. This area is included in a grazing allotment and each road terminates in clearcuts that are frequented by livestock. A corral is also near the confluence of these roads. Thistles are scattered along much of the length of these roads, but the three areas of livestock concentration are heavily infested with both Canada and bull thistle.

Toadflax

Toadflax is a weed of very dry and warm conditions. Such habitats are uncommon in the watershed, but open roadsides along the main roads provide microsites that support this weed. Three small occurrences exist, one in the lower Red River canyon in the northwest part of the drainage and two along the main South Fork road. There is potential, especially in the northern population for this species to expand into the adjacent grasslands. Because this species has tremendous potential to damage native communities and is currently limited to so few occurrences, it should be the focus of aggressive eradication efforts.

Butter and Eggs

Butter and eggs is only found along the upper Blanco road (1189), where it appears to have been brought in with stock feed or possibly an ATV. It is unknown if it will persist, but there is substantial potential for harm to native open plant communities. This weed should also be aggressively eliminated while the infestation is small and manageable.

Sulphur Cinquefoil

Sulphur cinquefoil is another weed of warm exposed areas. Generally it would be expected along the main roadsides, such as the South Fork road near the Red River Ranger Station, where there are two occurrences. This aggressive species has potential to invade the grasslands and dry meadows that are scattered in the main drainages of the watershed. There are probably more occurrences of this species than those noted.

Common Tansy

Common tansy is widespread in much of the west where it aggressively takes over meadows and riparian areas. Often it is considered naturalized and too large of a problem to control. In the Red River watershed there are nine small occurrences of this weed, each consisting of a few stems. All these are located along the South Fork road (222) from the Red River Ranger Station almost to Dixie Summit or along the Moose Creek road (1150). There is potential for this weed to invade the many disturbed riparian areas and meadows throughout the watershed. This weed is difficult to treat, but because it is found in relatively few small populations, an aggressive eradication effort could be successful.

Significant weed sources are indicated on Map 36. These areas include gravel pits, corrals, campgrounds, dispersed campsites, mines, trailheads, administrative sites or any place where there has been long-term ground disturbance. Surveys of most of these sites found infestations in situations that support the active dispersal of the weeds present. Some potential dispersal sites are relatively clean of weeds, but should be monitored for future occurrences. The most problematic source areas in the watershed are the knapweed infested dispersed campsites on tailings along the Narrows section of Red River and the Red River Ranger Station, which is the center of distribution for many weed species in the basin. Controlling weed outbreaks in these source areas and along the dispersal corridors is the key to effective weed management in the Red River watershed.

Many other introduced plant species are found in the watershed and for various reasons are not included in the analysis. Some are not considered major problems and though widespread, do not persist long or do not substantially displace native species or communities. An example of such a weed is bull thistle (*Cirsium vulgare*). Other species are known in the basin that may or may not be a concern, but currently adequate knowledge does not exist for analysis. An example is hound's-tongue (*Cynglossum officinale*), which is found along some roadsides and disturbed sites. Another category of weeds not included would be naturalized weeds that occur over a very large area with no hope of control. These species are not included on formal noxious weed lists. Impacts of these weeds on local species and habitats may be severe to insignificant depending on the species and the site infested. St. Johns-wort (*Hypericum perforatum*) and oxeye daisey (*Chrysanthemum leucanthemum*) are examples. St. Johns-wort is widespread in dry meadows, open forests and roadsides throughout most to the watershed. Some populations can be dense, but generally native communities remain intact in its presence. Oxeye daisy is abundant in some dry meadows, grasslands and roadsides. Pasture areas that are grazed are sometimes dominated by this weed, which in such habitats often will displace most other species. In the Red River watershed, this weed mostly occurs on private land in non-wetland portions of HTG 60. If it were possible to quantify acres covered by these naturalized species, the overall percentage of the watershed infested by alien species would be slightly higher.

Habitat Susceptibility to Weed Colonization

Fortunately, noxious weeds infest only a small area of the Red River watershed. Yet, there is a risk that current infestations will spread or new invasive species will enter the basin. Any plant community can be subject to colonization or invasion of introduced or noxious weed species. But the likelihood of a successful invasion into a plant community differs based upon habitat characteristics and resources of an area and the resource needs of an invading species. Habitat susceptibility to weed invasion from the three weed guilds found in the South Fork of the Clearwater River subbasin has been rated for each of the habitat types groups found in the Red River watershed (Table 4-25).

Weed Guilds are groups of exotic plants or noxious weeds that have common growth requirements and generally colonize and impact similar habitats. Many weed species are capable of growing across a greater range of environmental conditions. However, weeds have been placed in the guild for which they have the greatest potential to impact existing plant communities. Disturbance and the location of current noxious weed populations will also influence the degree and pattern of noxious weed spread in the watershed.

Steppe/Savanna Weeds

This group of in introduced species has the greatest impact on hot and dry steppe grasslands and open dry Ponderosa pine savannas. Habitats tend to be of southerly aspects, relatively open vegetation structure with rocky shallow soils. Weed species include yellow starthistle, scotch thistle, dyers woad, rush skeleton weed, dalmation toadflax, cheatgrass, common crupina, diffuse knapweed and medusahead.

These weed species typically invade grasslands and open forests in warm, low elevations that are rare in the Red River watershed. Due to this affinity for much warmer sites, the dispersal of most of these weeds into the watershed is not expected. Of the species included in this group, only dalmation toadflax and cheatgrass are found in the watershed. The former occurs at a few warm disturbed sites along the major roads. Cheatgrass is naturalized along main road corridors and is found in many of the small dry grasslands.

Montane Weeds

This group of introduced species is capable of colonizing and becoming a member of warm and moist plant communities. Weed species include leafy spurge, sulphur cinquefoil, spotted knapweed, orange hawkweed and Canada thistle. HTG 2 and HTG 3 and drier portions of meadows (HTG 60) are often susceptible to these species.

Most of the weed species in the Red River watershed are members of this weed guild. Spotted knapweed is the most common target weed in the basin and is abundant on almost all of the main road corridors and some of the secondary ones. It also forms large monocultures in some of the dry ruderal sites and disturbed riparian areas. The scattered xeric grasslands are often infested with this weed, especially where these habitats are in contact with a main road. Canada thistle is also common in the basin, but is more limited to road corridors and generally does not invade intact communities with more than scattered individuals.

Wetland/Meadow Weeds

This group of introduced species is capable of affecting meadows, riparian areas and wetlands. Weed species include meadow hawkweed, common tansy, hoary cress, purple loosestrife and matgrass.

Few weeds in this guild are present in the Red River watershed. Common tansy is present at administrative sites and some dispersed campgrounds. It is spreading along the major road corridors and has the ability to expand into meadows and riparian areas where it often entirely displaces the previous plant community. Meadow hawkweed and matgrass are not yet present in the basin, but are spreading in north Idaho. Infestations have been observed to have severe impacts on plant community composition and productivity. The drier portions of large meadows and open riparian areas of Red River would be expected locations of future invasions by these species, however most wetlands would probably remain closed to species that may occur in the watershed.

Table 4-25 Susceptibility of Habitat Type Groups to Invasion by Weed Gilds

Habitat Type Group	Steppe/Savanna	Montane	Wetland/Meadow
1 Dry Ponderosa Pine	High	High	Low
2 Douglas Fir	Moderate	High	Low
3 Dry Grand Fir	Low	Moderate	Low
4 Warm/Moist Grand Fir	Low	Low	Closed
7 Cool/Moist Subalpine Fir	Closed	Closed	Closed
8 Cool/Wet Subalpine Fir	Closed	Closed	Closed
9 Cool/Dry Subalpine Fir	Closed	Closed	Closed
10 Cold/Dry Subalpine Fir	Closed	Closed	Closed
60 Mt. Bottoms and Meadows	Low	Moderate	High

Closed: Habitat is effectively closed to weed colonization due to elevation, climate, substrate, or existing plant community structure.
Low: Habitat is slightly susceptible to weed invasion. Existing community structure and/or site characteristics limit weeds from exhibiting invasive behavior. Species colonize highly disturbed sites and waste places but acts as ruderal species in the plant community.
Moderate: Habitat is moderately susceptible to weed invasion. Sites provide characteristics where species can invade the herbaceous layer and become a common element across the plant community in the absence of intense and frequent disturbance.
High: Habitat is highly susceptible to weed invasion. Site characteristics and plant community structure is such that species can colonize and dominate the herbaceous layer even in the absence of intense and frequent disturbance.

Approximately 54,048 acres (52% of the watershed) are in habitat type groups considered moderately or highly susceptible to weed invasion. Of this area only 1,998 acres (1.9% of the watershed) would be highly susceptible to some weed species. These areas are predominantly in the low to mid-elevations of the watershed where the warmer and drier habitat types occur (Map 37). The coolest and wettest habitats in the watershed make up 26% of the watershed and are effectively closed to weed invasion, while another 21% if the basin has only a low susceptibility.

Despite over half the basin being of habitat type groups that are generally considered moderately to highly susceptible to weed invasion, the situation in the Red River watershed is not considered severe (approximately one percent infested). This is due to a combination of factors including the elevation and coolness of the basin, the closed nature of most forest communities and the lack of presence of most problem weed species. Most significant weed occurrences are limited to administrative sites, roads and dry, open habitats that cover only a small area of the watershed.

Native plant communities that are prone to be invaded by weeds include xeric grasslands and open dry ponderosa pine forests. Only 143 acres (0.1% of the basin) of xeric grassland habitat exist in the basin. The open pine forests are also very uncommon and surveys of this forest type found few weed species in most areas, however the threat of invasion where adjacent roads occur is significant. Both these minor vegetative communities are found predominantly within HTG1, HTG 2 and HTG 3. The dry portion of HTG 60 forms 615 acres (0.5% of the basin) of dry meadows, grasslands and pasturelands. These habitats often support significant weed populations, however the wetland portion of this HTG is largely closed to weeds. The large majority of the remaining watershed does not support significant weed occurrences nor would such be expected to occur without significant disturbances that would open the forest canopy and disturb the soil. However, the occasional occurrence of weed species along edges, roads or other disturbed sites in these low susceptibility habitats may provide a seed/propagule reservoir for future dispersal into more suitable habitats.

Risk of Weed Expansion

Weed expansion in the analysis area is greatly influenced by habitat susceptibility, seed availability, seed or propagule dispersal, and habitat disturbance. The probability that weeds will expand in the analysis area depends on the interaction of these four factors. Weed expansion begins with the dispersal of seed from existing weed infestations adjacent to uninfected areas. Roads and trails are the primary means by which people and their equipment interact with the environment and therefore are an important spread vector. These linear corridors act as dispersal networks for exotic plants. In addition, road and trail management creates sustained levels of soil disturbance that promotes exotic plant densities thereby increasing seed for ongoing dispersal into adjacent areas. The large majority of documented infestations within the analysis area are along the transportation corridors.

Disturbance creates spatial and temporal openings where sites become suitable for plant establishment, where usable light, space, water and nutrients are available to meet the specific growing requirements of the plant. Disturbance may increase the susceptibility of an otherwise intact plant community to weed invasion by increasing the availability of a limited resource. Natural or human caused fires along with timber harvest and grazing are broad scale disturbances that influence the amount of available habitat for weed establishment.

Weed expansion risk in the analysis area was determined by assessing the susceptibility of the habitat type groups, the presence of weed infestations (seed source), the amount of burned and harvested area with less than 40% canopy cover (site disturbance) and the density of roads (spread vector). Table 4-1 summarizes the rating matrix that determined the probability of expansion for invasive weeds.

Table 4-26 Probability of Weed Expansion

	Spread components			
Habitat Susceptibility	**Seed Source**	**Site Disturbance**	**Spread Vector**	**Expansion Probability**
Rating	**Weeds Present or Adjacent**	**Fire/harvest/ Grazing**	**Adjacent Road/trail**	**Rating**
High	Yes	Yes	Yes	Extreme
			No	High
		No	Yes	
			No	
	No	Yes	Yes	
			No	Moderate
		No	Yes	
			No	
Moderate	Yes	Yes	Yes	High
			No	Moderate
		No	Yes	
			No	
	No	Yes	Yes	High
			No	Moderate
		No	Yes	
			No	Low

Table 4-27 summarizes the probability rating that invasive weeds would expand within the analysis area. Approximately 8,927 acres in the Red River watershed were rated as having a high or extreme probability of invasive plant expansion. Map 38 displays the spatial arrangement of the moderate, high and extreme probability zones. These zones contain moderately to highly susceptible habitats, frequent disturbances and high road densities. The interaction of these three factors creates conditions very conducive to weed establishment and dispersal. Areas were rated as Extreme if weed infestation were found within or adjacent to high probability zones. Extreme risk of spread suggests that all factors that contribute to weed expansion (habitats, seed source, disturbance, spread vector) are present over a relatively small area.

Table 4-27 Weed Risk Rating Summary

Expansion Probability (Risk Rating)	Acres within the Analysis Area	% of Basin
Extreme	188	0.2%
High	8,739	8.5%
Moderate	57,149	55.3%
Low	10,007	9.7%

4.3.6 Rare Terrestrial Species

Rare Plant Species

Four federally listed plant species have traditionally been analyzed in Forest projects in the past. In 1999 suitable habitat for three species, Macfarlane's four-o'clock (*Mirabilis macfarlanei*), water howellia (*Howellia aquatilis*) and Ute's ladies'-tresses (*Spiranthes diluvialis*) was modeled for the South Fork of the Clearwater River Biological Assessment (Paradis et al 1999). According to this model the South Fork does not contain suitable habitat, landscape characteristics, community composition or community structure that would suggest suitable habitat for these Federally listed species is present. Furthermore, the most recent U.S. Fish and Wildlife Service list #1-4-02-SP-983 (Sept. 3, 2002) indicates it is no longer necessary to address these species in much of the Nez Perce National Forest, including the Red River watershed.

The fourth federally listed plant species; Spalding's catchfly (*Silene spaldingii*) was not modeled with the South Fork Biological Assessment because it was not formally listed at that time. However, more recent determinations and field surveys have confirmed that the preferred habitat of north-facing, mesic fescue grasslands or other habitat components required by this species are not present in the Red River watershed. The previously mentioned list from the USFWS also excludes this species from analysis in Red River.

Five Region 1 sensitive plant species are known to occur in the Red River basin, while another twelve have suitable habitat. There are five, non-sensitive, but State-listed species known or suspected in the watershed. Table 4-28 lists these species and provides general information for each. Species-specific discussions providing detailed information follow the table. Sensitive or State-listed species that do not have suitable habitat in the Red River watershed are not included.

Table 4-28 Summary of Rare Plant Species Known or Suspected to Occur in the Red River Watershed

Common and Latin Name	Presence	Status FS	Status State	Habitat/Community Type	Elevation (ft)
Tall swamp onion *Allium validum*	Known	–	S3	Wet, cold meadows, seeps and open riparian areas in subalpine fir and spruce forests.	4,300-8,000
Candystick *Allotropa virgata*	Known	S	S3	Lodgepole with beargrass on well-drained infertile soils. Often on or near the ridge top.	4,000-7,000
Payson's milkvetch *Astragalus paysonis*	Known	S	S3	Openings/gaps in mixed grand fir and Douglass fir forests.	4,000-7,000
Lance-leaf moonwort *Botrychium lanceolatum* var. *lanceolatum*	Potential	S	S3	Shaded moist sites under various conifers; dry to moist meadows.	1,500-6,000
Mingan moonwort *Botrychium minganense*	Potential	S	S3	Shaded moist sites under various conifers; dry to moist meadows.	1,500-6,000
Northern moonwort *Botrychium pinnatum*	Potential	S	S2	Shaded moist sites under various conifers; dry to moist meadows.	1,500-6,000
Least moonwort *Botrychium simplex*	Potential	S	S2	Forest openings, dry to moist meadows.	1,500-6,000
Leafless bug-on-a-stick *Buxbaumia aphylla*	Potential	S	S1	Open parklands on moist acidic soil in upper montane to alpine zones	Above 4,500
Green bug-on-a-stick *Buxbaumia viridis*	Known	S	S2	Moist grand fir or cedar forests on large decayed logs and ash soils.	1,500-5,000
California sedge *Carex californica*	Known	–	S3	Primarily open montane grasslands. Also in meadows and grand fir mosaic glades.	4,000-7,000
Icelandmoss *Cetraria subalpine*	Potential	S	S2	Subalpine zone on ericaceous shrubs, at edges of rocky openings.	Above 6,000
Clustered lady's-slipper *Cypripedium fasciculatum*	Potential	S	S3	Partial shade of warm and moist cedar, grand fir or Douglas fir.	1,600-4,800
Blandow's helodium *Helodium blandowii*	Potential	–	S2	Cold bogs and minerotrophic springs with Sphagnum and wet sedges.	4,000-6,000
Oregon bluebells *Mertensia bella*	Potential	–	S3	Forest openings in the grand fir mosaic. Often associated with roads and harvest.	4,000-6,000
Spacious monkeyflower *Mimulus ampliatus*	Potential	S	S1	Seepy areas in open grasslands and dry ponderosa pine habitats.	2,000-5,000
Bank monkeyflower *Mimulus clivicola*	Known	–	S3	Moist mineral soils of shrub/grasslands on south aspects within open dry forest types.	1,000-4,500
Naked rhizomnium Rhizomnium nudum	Potential	S	S2	Moist mineral soils of low elevation, warm grand fir and cedar. Often riparian.	Below 5,000
Mendocino sphagnum *Sphagnum mendocinum*	Potential	S	S1	Headwater sphagnum wetlands or fen meadows in the montane-subalpine zone.	Above 5,500
Evergreen kittentail *Synthyris platycarpa*	Known	S	S3	Forest openings, partial shade of grand fir mosaic. Sometimes in cedar and old growth.	4,200-6,000
Idaho barren strawberry *Waldsteinia idahoensis*	Known	S	S3	Meadow edges and open forests of moist/cool grand fir, subalpine fir and cedar.	3,000-5,000

S: USFS sensitive
S1: Critically imperiled because of extreme rarity or because some factor of its biology makes it especially vulnerable to extinction.
S2: Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction.
S3: Rare or uncommon but not imperiled.

Habitat modeling was completed to learn the potential locations and abundance of suitable habitat for the many of the species. The results would vary in accuracy because some species have strong affinity for easily defined habitat parameters, while others have far more general needs and defining specific criteria is very difficult. For yet other species, useable parameters could not be defined, thus modeling efforts were not attempted. Results of the modeling effort are included in the following species discussions.

It should be stressed that modeling results are general for most species and valuable only in selecting areas that have the greatest likelihood of containing suitable habitat. For many species microsites of desirable habitat may occur in areas of general non-habitat and be too small for detection. Modeling criteria used were adapted to the Red River watershed and in some cases may vary slightly from the general criteria for the species.

Sensitive Plant Species

In addition to those species listed as threatened or endangered under the Endangered Species Act, or that are candidates for such listing; the Forest Service has recognized the need to implement special management direction for other rare species on the lands it administers. Such species may be designated as sensitive by the Regional Forester. Sensitive species are taxa for which viability is a concern, as evidenced by significant current or predicted downward trends in population numbers or density, or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution. The objectives of management for such species are to ensure their continued viability throughout their range on National Forest lands, and to ensure that they do not become threatened or endangered because of Forest Service actions (FSM 2670.22).

Candystick (Allotropa virgata)

According to Idaho Conservation Data Center (CDC), ten populations of candystick are known to occur in the Red River watershed. In addition, surveys located one additional population during the 2002 field season. This species is a coastal disjunct that occurs in Region one in central Idaho and adjacent Montana. On the Nez Perce National Forest, candystick usually inhabits sites with mature lodgepole pine stands over a beargrass/grouse whortleberry or huckleberry understory with little climax conifer regeneration. Physical characteristics are generally well-drained soils on drier, south facing ridges between 4,000 and 7,000 feet elevation (Lichthardt and Mancuso 1991). In addition, candystick has been found in ponderosa pine, Douglas fir, subalpine fir and western red cedar communities in Idaho (CDC 2002). However, these occurrences are not considered typical.

In the Red River watershed, candystick populations are sparsely dispersed throughout, with most being in the west and south part of the basin. Most occurrences are considered to be in typical habitat, however one population along the Soda Creek Road 1172 is found in a grand fir/Pacific yew (*Abies grandis/Taxus brevifolia*) community (CDC 2002). Another occurrence in the Cole Creek drainage is listed as being in a grand fir community. But in both of these populations, the common associates; lodgepole pine (*Pinus contorta*) and beargrass (*Xerophyllum tenax*) are present (CDC 2002). Populations can be very small ranging from one stem to a dozens of clumps spread over several acres. Sometimes occurrences can form large a metapopulation that can spread intermittently over very extensive areas. An example of this is the population in the Siegel/Blanco Creek vicinity.

Habitat modeling for this species focused on selection of habitats that were greater than 4,500 feet in elevation with a lodgepole pine cover type. This exercise indicated 35,488 acres of candystick habitat in the watershed. A second query selected stands from the first set that were greater than 80 years old, which would be considered more likely to hold populations. This query selected 11,577 acres of habitat. Most known occurrences of candystick in the watershed fall within one of the selected sets of stands.

Candystick populations could be threatened by timber harvest, road-building and altered fire regimes. Candystick is most common in 80-100 year old lodgepole pine communities, thus processes that regenerate lodgepole pine on the landscape are necessary to replenish suitable habitat. Fire or harvest practices that emulate fire will be required to maintain a network of suitable habitat over the long term. Consequently, altered fire regimes brought about through fire suppression may pose a threat to candystick populations as succession to climax species represents a move away from optimum habitats (Lichthardt 1995). The current extensive mortality of lodgepole pine forests will also cause a decline in habitat but may contribute to future habitat as the lodgepole regenerates in the opened stands.

Payson's milkvetch (Astragalus paysonis)

Payson's milkvetch occurs throughout much of the Red River watershed. It has an unusual range limited to western Wyoming and north central Idaho, primarily on the Nez Perce National Forest. It is a species that prefers seral habitats, thus it often occurs along roads and in logging units. Lorain (1990) noted that populations are most prevalent in the grand fir habitat types, but which are currently dominated by other seral species. In general the species seems to be very sparsely spread in open forests across the landscape. Upon disturbance that results in significant ground alteration and opening of the canopy, the species blooms profusely from the seed bank. Historically the primary disturbance would have been wild fire, but today is timber management and road construction and maintenance.

According to CDC (2002) records, there are seven occurrences of Payson's milkvetch in the watershed. These are basically in the northwest and central part of the basin and include populations at the Nez Perce Trail/Soda Creek Road, Sharman Creek/Cole-Porter Road, Steckner Creek, Gold Point, French Gulch/Red Horse Creek, Wheeler Creek, West Fork Red River and Trapper Creek. These populations range from just a few plants to extensive metapopulations covering large areas. Most of these occurrences are on open roadsides or in logging units that may occur on any aspect or slope, usually in granitic soils. Most populations in the basin closely match the general habitat expected for this species. The West Fork Red River occurrence and some subpopulations in the Siegel Creek portion of the extensive French Gulch/Red Horse population are exceptions in that they are far from disturbance. Both are in lodgepole pine forests with a beargrass understory on south facing slopes with significant open soil ground coverage.

Payson's milkvetch inhabits seral communities, which means succession can be a threat to its survival. Some researchers state that though the species is adapted to disturbance, it does not seem to inhabit an area until at least 15 years after the most recent major disturbance (Clark and Dorn 1981, cited in Lorain 1990). Species dispersal is probably more controlled by degree of disturbance and nearness and abundance of founder populations and competing species. Some threats to current populations could help develop habitats for future populations. Current populations can be put at risk from introduced species, chemical sprays, recreation impacts, and road construction and maintenance (Lorain 1990). The elimination of disturbances and fire suppression that would result in a decline of early seral communities must also be considered a threat. With the widespread opening of the forest due to the beetle infestation, it is anticipated that populations of Payson's milkvetch will expand.

Moonworts (Botrychium* spp.*)

Due to similarities and the tendency to occur together, the species of *Botrychium* are treated together. Little is known about the moonworts on the Nez Perce National Forest. Five occurrences have been found on the Forest, however none of these are in the Red River Watershed. General habitat for moonworts varies from dry meadows, grass/forb openings, lodgepole pine and Englemann spruce to dry grand fir. In northern Idaho, moonworts are often associated with riparian areas and moist sites under old growth western red cedar (Mark Mousseaux, IPNF, personal communication 1996).

Many habitats in the Red River watershed may be suitable, but old growth moist grand fir (HTG 4) and dry meadows or foothill grasslands (non-wetland HTG 60) are considered the most likely. These grasslands are typically disturbed systems that are often grazed by livestock and wildlife and generally occur in or more commonly around the perimeter of the larger meadows along the main stem and North

Fork of Red River. Smaller areas may be found fringing the smaller wetland meadows that are found primarily in the eastern part of the watershed. In these meadows, wild strawberries often dominate the ground cover. Modeling indicates 2,032 acres of suitable habitat in late successional HTG 4 stands and 615 acres of grassland habitat. The large majority of the selected grassland habitat is on private ground.

All *Botrychium* species are believed to be obligately dependent on mycorrhizal relationships. The subterranean generation depends on fungus for nutrients, while the roots of the above ground generation lack root hairs and probably depend on the fungus for absorption of water and minerals (Chadde and Kudray 2001). Little is known about the mycorrhizal fungi associated with *Botrychium* species other than their presence with the two generations.

The mycotrophic condition is important to the ecology of *Botrychium* species in several ways. Nutrition supplied through a fungal symbiont may allow the ferns to withstand repeated herbivory, prolonged dormancy, or growth in dense shade (Kelly 1994, Montgomery 1990). The fungal/fern relationship has implications for the occurrence of genus communities, the distribution of the species across the landscape, and associations with particular vascular moonworts and strawberries (Herb Wagner, Univ. of MI, personal communication June 1999). Moonworts may exist underground for many years before an above ground plant develops.

Threats to species of *Botrychium* are not well understood. The only well-documented threat resulting in a population decline was drought combined with fire (Johnson-Groh and Farrar 1996). Because these species often occur in disturbed sites, threats may include natural plant succession and potentially the same human activities that have also apparently resulted in creation of suitable habitat. Since these species may also be found in forested areas that have not been recently disturbed, forestry activities may affect existing populations negatively, although no research has been reported (Chadde and Kudray 2001). Some threats will have a direct impact on the above ground sporophyte and may be less serious, since the below ground part of the life cycle is so important. Several years' worth of leaf buds are pre-formed underground, therefore, removal of the current years above ground growth does the plant no permanent harm (Wagner and Lord 1956).

Although simple removal of above ground leaf tissue may be inconsequential to the ability of moonworts to survive, removing sporulating individuals may eventually have an effect (Johnson-Groh 1999). It has been suggested that photosynthesis may be important and that broad scale leaf removal or damage could threaten *Botrychium* populations (Chadde and Kudray 2001). Mycorrhizae are the most limiting factor for Botrychium establishment, distribution and abundance (Johnson-Groh 1999). Therefore adverse impacts to the mycorrhizae may be expected to also have deleterious effects on *Botrychium*.

Even-aged management would have the greatest effect on forested habitats by opening the canopy and disturbing the soil surface. Thinning would maintain enough overstory canopy to sustain suitable habitat, however the skidding of logs and the construction of temporary roads could alter the soil surface. Buffering the draws and riparian areas would protect the moist microsites and forest floor where moonworts are most likely to occur. Livestock and wild life grazing would provide the greatest threat to meadow populations.

Fire may also have some impacts. Low intensity ground fires would not adversely affect established populations and the fungal associates or alter the suitability of the habitat for moonworts so long as the overall stand structure is maintained and the duff layer is not eliminated. The timing of the burn is also important. Research has shown populations are significantly reduced or eliminated if burning coincides with spring emergence of plants (Johnson-Groh and Farrar 1989). The direct effects of burning have been confounded by variability in burning conditions and plant numbers.

Leafless bug-on-a-stick (Buxbaumia aphylla)

Leafless bug-on-a-stick is rare and local, but widely distributed in the northern hemisphere across much of Canada, northern United States and Europe (Crum and Anderson 1981). It has been described as a pioneer species of disturbed, acid, sandy or clayey soils, often on the banks of roads or woodland trails, sometimes on old logs or stumps, exposed or in partial shade in moist forests and also dry, open woods, often successional to fire (Crum and Anderson 1981).

There is a single population known in Idaho, which is on the Nez Perce National Forest. The site is described as being on moist soil at approximately 5,000 feet elevation in an open parkland of lodgepole and subalpine fir. The site is in a sheltered position, shaded by the micro-topography and herbaceous layer, rather than the trees (Leonard Lake, Nez Perce NF, personal communication, 1999). Such habitat conditions occur throughout the Nez Perce National Forest, including the Red River watershed. Suitable habitat may occur anywhere there is open soil in the middle to higher elevations, but most of this potential habitat would be in the mountain parklands, which cover 157 acres in the watershed.

Sporophytes become visible in September and develop rapidly for six weeks. During this time the developing sporophytes are vulnerable to sudden frosts, which often kills them. Other causes of mortality may be wind and rain abrasion and animal movement, especially after the mature setae become brittle. Herbivory of capsules and a black-spored fungus have also been observed (Hancock and Brassard 1974).

Several times, *Buxbaumia aphylla* has been reported to grow in areas that had burned: eighteen months after a fire (Kennedy 1895); after 9, 10, 13 and 14 years in Newfoundland (Hancock and Brassard 1974) and at 17 year intervals after fires in Sweden (Uggla 1958, cited in Hancock and Brassard 1974). It is anticipated that individuals would be impacted by any mechanical activity including timber management and restoration activities. However, since the species is generally found on mineral soil and has been found on disturbed surfaces, it is expected to be somewhat tolerant of, or perhaps even dependent on, some forms of disturbance. With fire suppression, the open subalpine forest where this species is expected to occur has declined.

Green bug-on-a-stick (Buxbaumia viridis)

This moss is found across the Pacific Northwest and Northern Rockies, but is relatively rare to uncommon across its range. In north central Idaho it is found at widely scattered locations on moist sites under mid-to-late seral conifer forests. Occurrences are predominately under a closed canopy on large logs in advanced stages of decay, but may be found on moist mineral soil derived from volcanic ash.

The most common habitat types for this species in the Red River watershed would be grand fir/arrowleaf groundsel (*Abies grandis/Senecio triangularis*), grand fir/bead lily (*A. grandis/Clintonia uniflora*) and grand fir/wild ginger (*A. grandis/Asarum caudatum*) of Habitat Type Group 4 (Warm and Moist Grand Fir) up to an elevation of about 6,000 feet. It also occurs in western red cedar habitat types throughout its range, but this forest type is extremely rare in the Red River basin. Substrate availability and distribution and shade (humidity levels) are important habitat elements (Laaka 1992).

Surveys during the 2002 field season located three occurrences of this species. The Otterson Creek occurrence is found in a moist old growth grand fir/wild ginger habitat. In Bridge Creek it was found in a riparian alder glade in subalpine fir/Englemann spruce forest. A third population is in old growth grand fir off the Soda Creek road. All populations are found on old decaying logs. This species is often overlooked due to its small size and inconspicuous nature, but with an abundance of suitable habitat, other occurrences are expected.

Modeling indicates there are 2,032 acres of primary habitat for this moss in late successional HTG4 stands. However, mosses are especially prone to occur on small suitable microsites in other habitats. The three occurrences of this species in the watershed do not fall in areas selected by the model. All are in typical habitat, but these areas only covered a small part of the stands and thus were not selected by the query.

Processes, natural or man-caused, that open the overstory canopy, remove large organic debris or disturb the soil surface could affect *Buxbaumia viridis* habitat. The species is rare due to inefficient dispersal and by difficulties in becoming established (Laaka 1992). Thus it will not cope well with significant changes to required forest conditions. Timber harvest within suitable habitat that would change the microclimate would adversely affect the moss (Laaka and Syrjanen 1990). Thinning would not significantly alter stand structure, however down log recruitment, a necessary component of *Buxbaumia* habitat would not occur with either thinning or regeneration harvest. When necessary, mitigation activities should include maintaining decaying logs and greater than 70 percent closed canopy for shade (FEMAT 1994). Moist riparian bottoms and toe-slopes have the greatest potential for maintaining large decaying logs within grand fir and western red cedar forests. Buffering the draws and riparian areas would protect the moist microsites where large logs and green bug-on-a-stick are most likely to occur.

Icelandmoss (Cetraria subalpina)

Icelandmoss is typically a coastal species from coastal Alaska southward to Oregon. It also is represented by disjunct inland occurrences in the northern Rocky Mountains. Usually it is found on twigs and bases of ericaceous shrubs (usually *Menziesia*) and other woody plants. Occasionally it is on the bases of conifers or extends to the ground. The habitat is usually semi-open to open subalpine forests on north facing slopes and only occasionally includes middle elevations or ascends above timberline (McCune and Geiser 1997).

Icelandmoss is not currently known to occur on the Nez Perce National Forest, however suitable habitat, which has never been closely surveyed is abundant. Additionally it is present in similar habitat on the adjacent Clearwater National Forest. Modeling the open subalpine forests on north aspects with an understory of ericaceous shrubs selected 1,906 acres of habitat mostly along the east, south and southwest perimeter of the watershed.

Any event affecting the shrub host would impact this lichen. Fire, harvest or other activities could be both beneficial or harmful depending upon the nature of the disturbance. Disturbances that open the forest canopy and increase coverage of the host shrubs, while leaving populations intact to provide for dispersal, would be expected to have positive effects. However, large and intense events that eliminate significant areas of habitat or populations when other occurrences are not in close proximity to provide for dispersal, would likely result in extirpation (Discussion by Region 1 botanist, led by Maria Mantas, Flathead NF, May 18, 1999).

Virtually no work assessing the presence or abundance of this species in the watershed or anywhere on the Nez Perce NF has occurred. In general terms, the population trends can be addressed through trends is species habitat. Historically, an unhindered fire regime would have kept forest more open, which would have resulted in increased shrub densities. The large-scale exclusion of fire has allowed the advancement of succession, which has resulted in increased canopy closure, which has decreased shrub cover and the open forest conditions preferred by Icelandmoss. Thus total area of habitat would have been expected to decline in recent decades.

Clustered lady's-slipper (Cypripedium fasciculatum)

In western North America, clustered lady's-slipper has a wide distribution with three main population clusters: northern California and southwestern Oregon, north-central Colorado and southeastern Wyoming and north Idaho and western Montana. There are a few isolated populations in Washington and Utah (Brownell and Catling 1987). In Idaho, most populations are found in the maritime forests of the Clearwater basin. The Selway drainage holds most occurrences on the Nez Perce National Forest, but some significant populations are found in the South Fork Canyon. It has not yet been located in the Red River watershed.

Typically, clustered lady's-slipper grows below a closed canopy in warm, moist sites under a mid-to-late seral conifer community. Where the overstory is more open, it may be found under a secondary canopy of hardwood shrubs or pole size conifers. Potential habitat for this species varies widely throughout its range. In north Idaho, most occurrences are in western red cedar habitat types, but a significant number of populations are in assorted grand fir habitats (Greenlee 1997). In the Red River watershed, there is ample habitat in many of the warm grand fir forest types (HTG 4). Occasionally it is found in even drier Douglas fir and grand fir (HTG2) forests. Currently, no unique habitat parameter is known that allows biologists to predict future occurrences with more than a very general specificity (Greenlee 1997).

Predicting occurrence of this species can only be done on general terms. Modeling efforts or suitable forest types found 23,384 acres of suitable habitat in the watershed. Cypripedium biology is thought to limit occurrence to forests that have not undergone even-aged management so a second query of these habitats limited results to stands that had not seen significant management activity. This indicated 15,604 acres of habitat.

Clustered lady'-slipper is a long-lived orchid that can remain dormant underground for an extended period of time. Vegetative plants may live for many years before reaching reproductive maturity. Like other orchids it is suspected to develop an association with mycorrhizal fungi. The small seed size and lack of endosperm indicate that fungal association is probably necessary for germination and establishment (Lichthardt 1995). This may be an important factor in controlling local distribution.

Clustered lady's slipper is sensitive to ground disturbance and canopy removal. Apparent population decreases have been observed where the overstory canopy was reduced (Leonard Lake, NPNF, personal communication June 2002). The few plants found growing in full sunlight had yellowed and deformed leaves. Disturbance to the duff layer that results in exposed soil may also be detrimental to established populations. With even-aged management practices, the mycorrhizal fungal relationships believed to be necessary for seedling germination and health would be severed. Nor would the fungus tolerate the direct sunlight that would result from such activities. The species has never been found in clearcut areas and extirpation would be the expected result of this form of management (Greenlee 1997).

Thinning would maintain enough canopy cover to sustain suitable habitat, however the skidding of logs and the construction of temporary roads would alter the soil surface. However, plants have been found persist after some forms of activity that avoid heavy mechanical disturbance and leaves the light, heat and moisture regimes intact. Several populations occur in areas that have undergone low intensity wildfire (Hays, personal observations 1995), and even areas that underwent some form of intermediate or selective harvest (Hays, personal observations 1995; Lichthardt 2002). It is possible that intermediate harvest treatments in grand fir and Douglas fir habitat types may represent a mixture of detrimental and beneficial effects; in the short term, individuals may be impacted by the timber harvest activities or canopy reduction, but in the long term populations may benefit from the reduced threat of stand replacing fire (Greenlee 1997).

A population of clustered lady's slipper in the South Fork Clearwater has been monitored for prescribed fire effects since 1996. The results suggest that plants in the burned area produce fewer capsules than those plants found outside the burn units. It appears that due to increased exposure the plants desiccate before seed capsules mature (Vance and Lake 2001). On the Clearwater National Forest, plants declined for two years following an intense wildfire, before disappearing completely (Andrea Pipp, BLM – Coos Bay, personal communication 1999). Harrod et al (1997) noted that fruit production was significantly decreased in areas opened up by fire and at locations where the duff layer had been eliminated all plants were killed.

Extensive timber harvest over past decades would have caused a decline in suitable habitat for clustered lady's slipper. However, this loss has been offset by decades of fire suppression, which has caused an increase in mid to late successional forest and habitat for the species.

Spacious monkeyflower (Mimulus ampliatus)

Mimulus ampliatus is endemic to Idaho, where it is known only from nine widely scattered locations in the north-central part of the State (CDC 2002). This small annual plant occurs in very specialized habitat of rocky seeps or wet micro-sites, within open grasslands (HTG 17) and dry ponderosa pine (HTG 1) forests. At least one population is reported from a meadow (Lichthardt 1999). Monkeyflower populations can be prolific or absent depending upon seasonal moisture. Thus surveys of suitable habitat may not always locate these plants.

Most occurrences of this species are in the large warm canyon grasslands and forests far to the west of the Red River watershed. While some dry forests and small grasslands exist in Red River, the basin is not considered to have ideal habitat for this species. However, a population is reported to occur just beyond the boundary into the Crooked River watershed. Given this proximity and the fact that so little that is known about this species due to its extreme rarity, the existence of the plant or suitable habitat must be considered.

The nearby Crooked River population is unusual due to its difference in habitat, which is described in CDC records as a "moist meadow; with *Carex, Glyceria, Pinus contorta, Picea engelmannii, Abies lasiocarpa*." The elevation is 6940 feet is significantly higher than the other known populations. The population was reported in 1976 and has never been revisited, however a voucher specimen was collected (CDC 2002).

Modeling of xeric grasslands and open ponderosa pine forests (HTG1) that may contain seeps and springs needed by this species finds only 178 acres of potentially suitable habitat in the Red River watershed. The advancement of succession due to fire suppression has caused a decline in these habitats.

Generally timber harvest would not negatively impact the preferred habitat of this species. Such management activities as thinning or prescribed fire would create or maintain more natural open conditions of grasslands and open forests where most of the preferred habitat for this plant is found. However, an indirect effect of such actions could be weed introduction. Being an annual in open grassy habitats, spacious monkeyflower and its habitat is negatively impacted by weeds and by the herbicides used to treat such infestations. Grazing of livestock can also be detrimental through herbivory, trampling of moist sites the species requires and through increased dispersal of weed species.

Naked Rhizomnium (Rhizomnium nudum)

This large, leafy moss is found from Alaska and Canada to California in the United States where it occurs in mesic forests. Disjunct occurrences are found inland in maritime forests of the northern Rocky Mountains. While fairly common in Washington and British Columbia, it is considered rare in the Columbia River Basin (Christy and Harpel 1997). It is known to occur in scattered populations throughout north Idaho, including the Nez Perce National Forest.

The general habitat can be described as cool and oceanic (Koponen 1973). It has been found in boreal and temperate forests on soil, humus or rotten logs, often along streams or in damp depressions and occasionally among boulders or talus at cliff bases, within conifer forests, from near sea level to subalpine zones. Most populations are riparian, but occasionally it is found on moist slopes and seeps well above the streams.

While the species has not been recorded for the Red River watershed, suitable habitat is not uncommon for the basin. North Idaho occurrences are generally found in moist, maritime western red cedar and grand fir forests below 5,000 feet elevation. Western red cedar is extremely rare in the watershed, however moist grand fir forests (HTG 4) are well represented. Modeling indicates these habitats occupy 9,971 acres, primarily in the northern part of the basin.

Threats to this species include any activity that would open the mesic forests allowing an increase in light or cool temperatures, which are moderated in these mesic forest types. Generally the preferred microsites exist in or very near the riparian areas, which are usually not impacted by management activities. Fire exclusion in recent decades has likely caused an increase in late successional mesic forest preferred by this species. Thus suitable habitat for this species is suspected to have increased over historic levels.

Mendocino sphagnum (Sphagnum mendocinum)

This rare peat forming moss is known from just two occurrences in Idaho. One is a based on a historic collection in Bonner County and the other is on the Nez Perce National Forest near the Red River watershed (Moseley and Pitner 1996). The primary range is the west coast of North America from northern British Columbia to California, with disjunct populations in Idaho.

Habitat is generally minerotrophic headwater sphagnum bogs or poor to rich fens in the montane-subalpine zone. The local occurrence is described as a montane bog community in a perennially wet seepage area. The forest community is formed by a complex of moist to wet, cold subalpine habitat types, which are indicated by the presence of marshmarigold (*Caltha biflora*), Menziesia (*Menziesia ferruginea*), beargrass (*Xerophyllum tenax*) and smooth woodrush (*Luzula hitchcockii*). Other representative species include subalpine fir (*Picea engelmannii*), sphagnum moss (*Sphagnum* spp.), Jeffrey's shooting star (*Dodecatheon jeffreyii*), pleated gentian (*Gentiana affinis*), alpine laurel (*Kalmia polifolia*), mountain Labrador-tea (*Ledum glandulosum*) and sticky tofieldia (*Tofieldia palustris*) (Moseley and Pitner 1996, CDC 2002). Small subalpine bogs that include the habitats and plant association given are scattered throughout much of Red River, especially in the eastern and southern part of the watershed. Modeling located 91 acres of suitable habitat.

Threats to this species include any activity that would impact the water table of the bog or fen habitat. Timber harvest and road construction can alter local water regimes causing habitats to flood or dry up. Historically these bog communities probably existed as small cold pocket inclusions in the large wet meadows of the Red River valley bottom. With drainage and conversion of much of these areas to pasture and other uses, significant areas of potential habitat were probably lost. Small headwater and riparian bogs probably have not been significantly altered and represent most of the remaining habitats.

Evergreen kittentails (Synthyris platycarpa)

Evergreen kittentails has a very narrow range, being endemic to north-central Idaho, where it occurs mostly in moist grand fir forests (HTG 4). It also is found in cooler western red cedar habitats (HTG 5), however these habitats are very rare in the Red River watershed. The range of evergreen kittentails is strongly associated with the occurrence of the grand fir mosaic, which is a zone of mid-elevation forests of mainly grand fir, interspersed with alder and braken fern glades. Occupied sites may be both mature closed-canopy forests and forest openings, such as alder or fern glades, harvest units and roadsides (Lichthardt 1999).

Surveys have located many subpopulations belonging to the extensive Black Hawk Mountain East meta-population in the northeast portion of the watershed, where the species is locally abundant in some areas along the Red River and Sable Creek divide. Populations extend down the ridges from this main divide wherever appropriate moist grand fir forests are found. The higher elevations in the Otterson and Bridge basins seem to be the local centers of distribution. Survey records from 1991 and 1994 indicate there are approximately 3,920 genets in the numerous subpopulations in a total area of about 150 acres (CDC 2002). Field surveys in the 2002 field season suggest the overall population is possibly larger in area. These subpopulations occur on all aspects and slopes in habitat that is considered typical.

Though apparently suitable habitat types for this species occur throughout the Red River watershed, it is known to be limited to habitats in the more humid and maritime regions of the Grand Fir Mosaic. This vegetative zone is limited to 4,112 acres along the north perimeter of the basin.

Evergreen kittentails appears to be somewhat tolerant of disturbance including timber harvest and fire (Crawford 1980). Light surface disturbance that does not greatly affect the shallow roots would have little affect. Thinning that removes a portion of the canopy may improve suitable habitat for evergreen kittentail. Likewise, light surface fires seem to improve suitable habitat and stimulate evergreen kittentail growth. However, complete consumption of the duff layer or prolonged and intense heat that penetrates deeply into the soil may reduce existing populations (Crawford 1980).

Idaho barren strawberry (Waldsteinia idahoensis)

Idaho barren strawberry is endemic to north-central Idaho with populations occurring from the South Fork of the Clearwater River, north to the Coeur d'Alene River. Within this small range it is found in relatively few areas of local distribution. However, some of these areas, including the northwest portion of the Red River watershed, support very large populations.

Idaho barren strawberry has wide ecological amplitude (Crawford 1980) and is found predominately grand fir/wild ginger and grand fir/queencup bead lily habitat types. However, it also may occur in other grand fir habitats (HTG3 and HTG 4) as well as western red cedar (HTG 5). Elevations generally vary from 3,500 to 5,500 feet. Cool, moist micro-sites within these general habitats are most favorable for its development (Crawford 1980). *Waldsteinia* is tolerant of shade but responds favorably to increased light (Crawford 1980). It can be found growing in stands with open canopies, and transition zones between riparian meadows and conifer forests.

Most occurrences are in the northwest portion of the watershed, where the populations are large and loosely defined, often occurring sporadically across the sub-watersheds. CDC records currently recognize five populations. One is west of the Red River Ranger Station, two are in the Deadwood Creek area and two are near French Gulch and the nearby main stem of Red River. It is quite possible that some of these are connected. In the 2002 field season, *Waldsteinia* was found to extend sporadically from lower Siegel Creek upstream for several miles. This extensive occurrence has probably been included in the Gold Point population, which has a centroid in adjacent French Gulch.

All the occurrences in the watershed are considered typical for this species. Habitat modeling was not attempted for *Waldsteinia* because the parameters are simply too broad and often disturbance dependant to be of value. Rather focusing on areas that are transitional between cold riparian areas or meadows into adjacent forests would likely locate additional populations. In these areas, the species seems to be most often found on old roadbeds, homesteads or other disturbed sites.

Population density is greater in open stands with past harvest and in old burns as compared to a more shaded closed conifer community (Crawford 1980). It is capable of colonizing disturbed soils (Lichthardt 1999). Soil disturbance may reduce competition from shrubs and larger plants, providing a temporal window for *Waldsteinia*. Fire also seems to reduce competition and stimulates both seed and rhizome production. However, prolonged and intense heat that penetrates deeply into the soil may kill the plant (Crawford 1980).

It is difficult to determine long-term population trends for this species. Fire suppression has likely caused a decline in disturbance, which would be expected to result in some decline. However, large areas of even-aged management, road construction and development of dispersed campsites along stream and meadow margins have increased habitat.

Other Plants of Concern

Discussion of other rare, but non-sensitive plant species is also included in this document. Justification and direction for this is provided in Sec. 6 of NFMA and NFMA planning regulations, 36 CFR Part 219, which requires the agency to provide for the diversity of plant and animal communities. This is met primarily through the requirement to provide habitat to maintain viable populations of native and desired non-native species. Furthermore Part 219 identifies the need to address Species at Risk, which are defined as not only species falling under the ESA or designated sensitive, but any species for which there is a viability concern throughout the species' range or concerns about species distribution in the planning area.

Botanist and managers should also keep current on such species information, because it is from this group that future additions to the Regional Forester's Sensitive Species list will come. Development and tracking of this information will allow specialist and managers to satisfy policy and effectively manage for these species in the future if necessary.

Tall swamp onion (Allium validum)

This large lily has a main range in the Cascade Mountains from British Columbia south into southern Oregon (Hitchcock 1973). Disjunct populations occur in western Idaho on the Nez Perce, Payette and Boise National Forests. Throughout its range tall swamp onion inhabits mid to high elevation meadows and riparian areas. On the Boise National Forest, three habitat types were identified for this species (Moseley 1989): forested seeps in subalpine fir/marsh marigold (*Abies lasiocarpa/Caltha biflora*) community; Holm's Rocky Mountain sedge (*Carex scopulorum*) wet meadows in glaciated basins; and riparian areas in subalpine fir/twisted stalk (*Abies lasiocarpa/Streptopus amplexifolius*) habitat. Each of these communities is between 6,800 and 8,100 feet elevation.

On the Nez Perce National Forest there are few populations, but most are very large, often covering acres and consisting of thousands of stems. Most are of high elevations in or near the Gospel Hump Wilderness in habitats similar to those noted for the Boise National Forest. A few populations are known from substantially lower elevations where they occur in open riparian meadows in cold subalpine fir and Englemann spruce forests. These populations are small probably because the lower and warmer habitats are not as ideal for the species. Three of these lower elevation occurrences in the North Fork of the Red River watershed. Wetland habitats most suitable for this species include emergent herbaceous meadows and forest or shrub wetland classes with an emergent herbaceous component. Soils are saturated part of the season. Modeling of these wetland types indicates 1,644 acres of tall swamp onion habitat in the watershed.

One occurrence is near the mouth of Soda Creek where it is situated on a perched water table above the stream in an open riparian meadow. The site is dominated by water sedge (*Carex aquatilis*) and bluejoint reedgrass (*Calamagrostis canadensis*). Species typically associated with tall swamp onion, including Jeffery's shooting star (*Dodecatheon jeffreyi*), marsh marigold (*Caltha biflora*) and pink elephant (*Pedicularis groenlandica*) are all present at this site. The population is very small with a few dozen stems covering about 30 square feet. The second occurrence is primarily in an open meadow, but includes some plants scattered through a narrow band of open lodgepole pine to the edge of a stream. This meadow contains mostly water sedge and tufted hairgrass (*Deschampsia cespitosa*). Near the creek the introduced reed canary grass (*Phalaris arundinacea*) dominates the vegetation, but many plants typical of the open riparian meadow can still be found. This population is larger with perhaps 150 stems scattered across ¼ acre. The third population appears to be limited to only a few stems and is on private land. When in flower it can be observed from road 234, but a close survey has not taken place.

This species is quite palatable and along with grasses is often sought out and grazed first by livestock and wildlife. This is because the less desirable sedges are avoided, as long as other forage is present. There are no active grazing allotments in this portion of the watershed; however, stray cattle from private land have frequently been observed to graze public lands of the North Fork Red River meadows and road corridors.

Recreation is another potential threat to tall swamp onion, with several campgrounds, dispersed sites and private cabins in the area. ATV use in moist meadows is potentially a significant problem. This activity harms plants directly through mechanical impacts and alteration of the moisture regime as rutting and trails form. Introduced riparian species such as reed canary grass also are observed to displace these riparian plant species.

Historically, tall swamp onion habitat extended throughout the open meadows in the bottoms of the largest drainages in the Red River watershed. Today most of these areas have been altered through heavy grazing, conversion to pasture and invasion of alien species, resulting in the loss of the riparian plant communities. The large majority of former habitat is on this altered private ground, but intact representations of this flora can still be found in small areas of adjacent public land. While the suitable valley bottom habitat is greatly diminished from historic levels, it is probable that *Allium validum* was never abundant here. The species' core range remains the higher elevation subalpine meadows where most occurrences are large and secure.

California sedge (Carex californica)

Unlike most coastal disjunct species, which occur in hyper-maritime forests, California sedge is generally found on mid to high elevation montane grasslands. The inland range extends through most of the Clearwater basin, north to the Coeur d'Alene/St. Joe divide. The occurrences are not numerous, however the populations are often large in number and area (CDC 2002). These moist grasslands and parklands are found in the subalpine fir or mountain hemlock zone and are often dominated by beargrass (*Xerophyllum tenax*) and green fescue (*Festuca viridula*) and shade intolerant grasses and forbs. This habitat very uncommon and poorly developed in the Red River watershed, where mapping reveals only 157 acres.

Less commonly, California sedge is found in moist meadows and the open glades of the Grand Fir Mosaic. One small occurrence of this sedge was found during the 2002 field season in an alder/forb opening in headwaters of Red Horse Creek. The habitat at this location is considered good, however the small size of the occurrence with a weed presence gives some concern for the population. Also the close proximity to a trail poses some threat with potential traffic and grazing impacts. Additional suitable habitat can be found throughout this forest type in the northern part of the watershed, thus more populations are expected.

Additional threats to this species or suitable habitat would include timber harvest and in some cases, succession. Timber harvest in the Grand Fir Mosaic is well documented to impact the system through loss of forest cover and alteration of the open plant communities (Ferguson 1991). Typically coneflower (*Rudbeckia occidentale*) and bracken fern (*Pteridium aquilinum*) will dominate the managed plant community. Open montane grasslands and parklands are rare in the watershed. Close inspection of most of these openings reveals scattered stumps and forest herbaceous species, indicating the site potential for open forest rather than true grasslands. Such areas could be considered marginal habitat for California sedge or may be intermixed with small areas of suitable grassland habitat. Succession could pose some detrimental impacts in such situations.

Habitat levels for California sedge are probably lower today than historically. This is due to loss of some Grand Fir Mosaic habitat to timber harvest and the progression of succession on the parkland community. The species may have also occurred in the moist meadows of the valley bottoms, but today this habitat is largely converted to pasture and other uses.

Blandow's helodium (Helodium blandowii)

This large, but rare moss species has a broad range in North America extending from Alaska to Greenland and south to much of the western United States including Idaho (Lawton 1971). CDC (2002) records include four occurrences on the Nez Perce National Forest, all of which are inhabit seeps with sphagnum moss and other cold, wet species under or near lodgepole pine.

Blandow's helodium is not known from the Red River watershed, but suitable habitat is present and occurrences are documented for two adjacent drainages, one of which is less than one mile outside of the basin. Thus this moss is expected to occur. Habitat and potential threats would be similar to those of *Sphagnum mendocinum*, which it may be associated with.

Oregon bluebells (Mertensia bella)

Oregon bluebells occurs in three disjunct population centers in the Pacific Northwest: the Siskiyou Mountains of Oregon, the Klamath Range near the California/Oregon border and in north Idaho. Populations are not recorded for the Red River watershed, however quality habitat is well represented, thus the species is expected to be present.

In Idaho, this plant grows in the general range of disjunct plant communities, however it is on middle to high mountain elevations above the typical maritime zones. Here Oregon bluebells occurs within the grand fir zone between 4,000 and 6,000 feet, where it occupies forest openings, Sitka alder (*Alnus sinuata*) glades, clearcuts, and older road cuts primarily on moist, shady slopes (Lichthardt 1992). Perhaps this species is most common in the grand fir/wild ginger (*Abies grandis/Asarum caudatum*) habitat and other types of HTG 4. These habitats are best developed as part of the Grand Fir Mosaic (Ferguson 1991), which is well developed in the northern portion of the watershed. Plants are frequently found where roads intersect the glades or in forb openings (Lichthardt 1992). CDC reports describe sources of increased moisture and light to be typical features of Oregon bluebell habitat (CDC 2002).

No formal modeling has been done for this species in the watershed, however it is expected to inhabit similar sites as evergreen kittentails. And like Synthyris, Oregon bluebells has been observed to increase along roadsides, logging units and with other disturbances to its habitat. Seldom has it been found as isolated populations away from clearcuts or roadsides (Lichthardt 1992). Populations would probably decline as succession of these disturbed habitats proceeds. The proximity of some populations to roadsides makes them susceptible to road maintenance and weed control activities (Lichthardt 1992).

Bank monkeyflower (Mimulus clivicola)

Bank monkeyflower is a regional endemic with a primary range in the Clearwater and St. Joe River basins, with additional occurrences in much of north central Idaho and adjacent Oregon. Some populations occur in the South Fork Clearwater drainage, one of which is recorded for the Red River watershed. Typical habitat parameters are very narrow. Almost all populations occur on steep, south facing grass and shrub openings within mesic forests. Within these sites, areas of seasonal moisture collection on mineral soil are where the plants will be found. Often these conditions are best developed with some shrub cover around the fringe of the openings. Soils are generally metamorphic. Populations have been noted to be prolific or nearly absent from year to year depending on the amount of spring rain.

Lower Red River represents the eastern limit of bank monkeyflower in the South Fork basin. Suitable habitat exists on the south facing slopes in the lower canyon east of the confluence with American River. The Mother Lode Hill population was recorded in 1990 and revisited in 1993. The latter visit found approximately 40 plants scattered over 2 acres (CDC 2002). The habitat is described as rock outcrops beside a road and up slope into a Douglas fir/ninebark (*Pseudotsuga menziesii/Physocarpus malvaceous*) habitat type. The slopes are moderate with a southwest aspect (CDC 2002). Due to the granitic substrate and the drier, cooler climate found in much of the watershed, it is doubtful that significant occurrences of bank monkeyflower are in other parts of Red River, though apparent suitable habitat is found along the major tributaries.

Due to lack of trees in the suitable habitat, logging generally poses little threat to this species. Historically fire would have kept the overstory and forest floor more open, which would have benefited the habitat. In more recent times, increasing canopy closure due to fire suppression and weed invasion has displaced monkeyflower and other members of the specialized plant community in which it occurs. Introduced annual grasses and other weeds deprive these species of needed spring moisture in the open soil habitats. Currently *Mimulus clivicola* habitat in this area is much degraded due to weed invasion, however, suitable habitat is still well represented in the area. The establishment of Road 221 probably eliminated some occupied habitat and has provided a dispersal corridor for weeds into the area. However, the mineral soil of road cuts often provide ideal habitat for bank monkeyflower. Overall the species and suitable habitat would be declining from historic levels.

4.3.7 Terrestrial Communities of Special Concern

Many of the plant communities found within the Red River watershed are of particular management concern due to their rarity, sensitivity to disturbance or for other resource values. These include western redcedar, Pacific yew, grand fir mosaic, wetlands, dry grasslands, aspen and mountain parklands. These communities are shown on Map 39.

Western Redcedar

Western redcedar (*Thuja plicata*) is a climax dominant species on very moist to wet sites. In northern Idaho between the Selway River drainage and the Canadian border, this forest type can be found on any aspect or slope from elevations ranging from 1,500 to 5,500 feet. Although it occurs on all landforms, western redcedar grows best on toeslopes and bottomlands, which have high soil moisture (Cooper et al 1991). Sites are very productive with many tree species in north Idaho having the highest site index in this forest type.

In Red River western redcedar occurs at only a very few isolated locations in the west and northwest portion of the watershed. Occurrences may form small stands with mature trees or be limited to scattered seedlings and saplings. Due to the marginally maritime climate, which is more representative to the north, Red River represents the southern limit of this moist forest type. The western redcedar/bead lily (*Thuja plicata/Clintonia uniflora*) habitat type represents drier conditions of this forest type and tends to occur on warmer southern to western aspects, but can occur on all aspects. It usually is located on side slopes with moderate gradients (10 to 30 degrees) (Cooper et al 1991). An understory of bead lily (*Clintonia uniflora*), goldthread (*Coptis occidentalis*) or coolwort foamflower (*Tiarella trifoliata*) with very scarce representation of wet-site forbs or ferns is diagnostic of this forest habitat. In Red River, the beargrass (*Xerophyllum tenax*) phase is expected to be common because it represents the cold dry environments in this habitat type (Cooper et al 1991).

Much of the western redcedar in the watershed has been harvested. Some sites containing only stumps are lacking regeneration, which may be due to very cold site conditions often found in open draw bottoms. Regeneration is also limited by competition for soil moisture and heavy browsing by snowshoe hares (Mahoney 1981).

Throughout much of north Idaho, western redcedar forest provide habitat for many rare plant species. Most of these are coastal disjuncts that occur elsewhere in the maritime forest of the Clearwater basin. In the Red River watershed these rare plant species would include those finding suitable habitat in HTG 4, especially in relatively moist forest communities such as Pacific yew and the Grand Fir Mosaic.

Pacific Yew

Pacific yew (*Taxus brevifolia*) is a small tree or tall shrub that is best represented in the humid and moist grand fir habitats of HTG 4. It tends to thrive in moist cool soil with high nitrogen levels. Modeling that excludes inappropriate forest types from HTG 4 indicates Pacific yew habitat covers approximately 10,456 acres in the Red River watershed. Most of these acres would be in the northern half of the basin, which is attributed to a more maritime local climate. Across its range Pacific yew may occur in a number of forest types, but achieves its highest abundance in the Pacific yew phase of the grand fir/wild ginger (*Abies grandis/Asarum caudatum*) habitat type on the Nez Perce National Forest in Idaho (Steele et al 1976).

Yew is very susceptible to fire caused mortality and therefore is usually found in older seral habitats. Large conifers in these stands often are over 250 years old and rarely possess fire scars. Through analysis of tree population structure, Crawford (1983) showed that Pacific yew is a climax dominant species that shows a more successful trend toward self-replacement in the absence of major disturbance than grand fir or other conifers. Yew in the watershed appears to be increasing as a result of fire suppression.

Gap-phase replacement of less shade tolerant conifers in Pacific Yew dominated communities maintains a structurally diverse environment. In openings, a rich herbaceous cover of the wild ginger (*Asarum caudatum*) union plants, of which the sensitive evergreen kittentail (*Synthyris platycarpa*) is a member, is indicative of these communities. Conditions are very depauperate under closed Pacific Yew and limited to primarily to goldthread (*Coptis occidentalis*), fairy-slipper (*Calypso bulbosa*) and assorted species of pyrola (*Pyrola* ssp.) (Crawford 1983).

The Pacific yew is a particularly important ecosystem component contributing to habitat diversity in both the terrestrial and aquatic communities of the watershed. The size and growth form of Pacific Yew makes the species an important contributor to forest structural complexity and diversity. The decay resistant wood of the yew makes it a particularly valuable species when providing instream habitat structure or terrestrial snags. There is a tendency for large Pacific yew trees to have hollow boles, which provide dens and nesting spaces for a variety of wildlife species. Yew forests are considered critical winter habitat for moose, which preferentially browse on both the bark and forage of the tree (Pierce and Peek, 1984). Elk, deer, rabbits and other small herbivores also consume yew. The fruit of Pacific yew is consumed by many species of songbirds, woodpeckers, chipmunks and rabbits. Additionally, because the multiple layer canopy and highly diverse nature of the mature yew stands, old growth associated species such as barred owls, woodpeckers, fishers and martens frequent these forests (Crawford 1983).

Native Americans have traditionally used yew wood to make tools, cups, bowls and weapons. Yew wood is particularly prized for making bows and musical instruments. In the early 1990s yew was harvested to obtain the anticancer agent taxol from the bark. Since taxol has been synthesized yew harvest has declined.

Grand Fir Mosaic

Grand fir mosaic is a unique landscape pattern in which grand fir stands are interspersed with non-forested openings in a random patchwork that looks like a mosaic from the air. Plants present are considered warm and mesic species. Elevations are generally between 4,200 and 6,000 feet, with colder site species occurring above and below this zone, which suggests the Grand Fir Mosaic climate is warmer than normal for these elevations (Sommer 1991). This community occupies 4,112 acres in the northern part of the watershed.

Specific forest habitat types present typically include grand fir/arrowleaf groundsel (*Abies grandis /Senecio triangularis*); grand fir/Pacific yew, wild ginger phase (*Abies grandis/Taxus brevifolia/Asarum caudatum*); Sitka alder/miner's lettuce (*Alnus sinuate/Montia cordifolia*); grand fir/wild ginger, wild ginger phase (*Abies grandis/Asarum caudatum, Asarum caudatum*); and grand fir/wild ginger, menziesia phase (*Abies grandis/Asarum caudatum/Menziesia ferruginea*). Non-forest openings are usually dominated by Sitka alder (*Alnus sinuata*) or bracken fern (*Pteridium aquilinum*) and may hold a diverse array of forbs and grasses. Red baneberry (*Actaea rubra*) and evergreen kittentails (*Synthyris platycarpa*) are the two most important indicators of the grand fir mosaic. If evergreen kittentails is present on a site, the site is grand fir mosaic or there is grand fir mosaic nearby (Ferguson and Johnson 1996).

Large populations of evergreen kittentails have been located in the northern part of the watershed, indicating the presence of the grand fir mosaic. In addition to this species, other species tracked by the CDC occur or are expected to occur in the grand fir mosaic communities in the Red River watershed. These are Payson's milkvetch (*Astragalus paysonii*), green bug-on-a-stick (*Buxbaumia viridis*), Califonia sedge (*Carex califonrica*), Oregon bluebells (*Mertensia bella*), and Idaho barren strawberry (*Waldsteinia idahoensis*).

The grand fir mosaic has a slower rate of secondary succession and generally poor conifer regeneration (Ferguson and Johnson 1996). Pocket gophers (*Thomomys talpoides*) inhabit forest openings of the grand fir mosaic in the watershed and slow down the process of secondary succession on the sites they inhabit (Ferguson and Johnson 1996). The slow rate of secondary succession and poor conifer regeneration require special management attention to insure that large disturbances do not eliminate the grand fir mosaic from the watershed.

Wetlands

Wetlands consist of areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Such plants require saturated soils to survive as well as plants that gain a competitive advantage over others because they can tolerate prolonged wet soil conditions and their competitors cannot.

Wetland communities are important because of their botanic diversity, ecosystem function and use by wildlife. Many of the wetlands in the watershed are within riparian zones around streams, but other wetlands can be found anyplace water collects to create anaerobic conditions that prevent tree growth. This may be due to topography, soil conditions, natural or man-caused alteration of the ground or other factors. There are several types of wetlands in the watershed, but those of special importance include wet meadows and sphagnum bogs. Assorted wetland communities cover approximately 2,452 acres in the watershed. Past mining activity in some riparian areas and the conversion of portions of broad meadows to pasture in the lower drainage have resulted in some decline in wetlands from historic levels.

Under Cowardin's (1979) system of wetland classification, sites are defined by systems, classes and water regimes. All wetlands in the Red River watershed are of the Palustrine System. Typically included in this system are vegetated wetlands traditionally referred to as marshes, swamps, bogs, fens and prairies (Cowardin et al 1979).

The wetland class describes the general appearance of the habitat in terms of either the dominant life form of the vegetation or the physiography and composition of the substrate. Life forms are used to define classes because they are easily recognizable, do not change distribution rapidly, and have traditionally been used to classify wetlands (Cowardin et al 1979). The four common classes of wetlands in the Red River watershed are as follows:

Forested Wetlands

Forested wetlands are characterized by woody vegetation that is six meters tall or taller.

Shrub Wetlands

Shrub wetlands include areas dominated by woody vegetation less than 6 meters tall. The species include true shrubs, young trees (saplings), and trees or shrubs that are small or stunted because of environmental conditions.

Emergent Wetlands

Emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. Perennial plants usually dominate these wetlands.

Moss/Lichen Wetlands

Moss/Lichen wetlands include areas where mosses or lichens cover substrates other than rock and where emergents, shrubs or trees make up less then 30% of the area cover. The only water regime is saturated.

The moss/lichen class has not been modeled or identified through GIS for any wetland in the Red River watershed. This is because of the generally small areas these wetlands cover. However, numerous bogs dominated by Sphagnum moss are found throughout much of the basin as small inclusions within other vegetative classes. Where these occur, distinct plant communities are generally found.

Plant Communities

Wetlands often form a mosaic, composed of multiple vegetation classes and varied water regimes. Within these vegetative classes assorted plant communities can occur. These communities are generally distinct and characterized by indicator species and plant assemblages. Wetland communities also provide habitat for several plant species of concern. Following is a brief floristic description of the more common general wetland communities and species of concern that may be present. For discussion purposes wetland communities are separated into forested wetlands, emergent meadows and bogs, all of which may have significant shrub inclusions or components.

Forested Wetland Communities

In the Red River watershed, forested wetlands usually are associated with riparian areas. Sites are generally cold and support such tree species as lodgepole pine, subalpine fir and Englemann spruce. Wetland species found in the forest are generally different from those of the more open communities. Typical representatives would include, arrowleaf groundsel (*Senecio triangularis*), small-fruit bulrush (*Scirpus microcarpus*), big-leaf sedge (*Carex amplifolia*), lady-fern (*Athyrium filix-femina*) and tall bluebells (*Mertensia paniculata*). Open shrub inclusions of mountain alder (*Alnus incana*) and assorted willows (*Salix* spp.) are frequent. Bluejoint reedgrass (*Calamagrostis canadensis*) and tall mannagrass (*Glyceria elata*) often dominate the ground in these inclusions.

Emergent Meadow Communities

A variety of sub-communities can be found in the meadows depending upon the moisture regimes and temperatures present. Almost all the meadows are dominated by water sedge (*Carex aquatilis*), but the supporting or codominant species can vary depending upon site conditions.

Riparian Meadows

Open riparian meadows are often dominated by the common species California false-hellebore (*Veratrum califonicum caudatum*), Canby's licorice-root (*Ligusticum canbyi*), bluejoint reedgrass (*Calamagrostis canadensis*), western polemonium (*Polemonium occidentale*), bigleaf lupine (*Lupinus polyphyllus burkei*) and many others. In colder conditions such species as Labrador tea (*Ledum glandulosum*), marsh marigold (*Caltha biflora*), Jeffrey's shooting star (*Dodecatheon jeffreyi*), and elephant's head (*Pedicularis groenlandica*) are typical. Shrubs including alder, willows and bog birch (*Betula glandulosa*) may be present in these wetlands as scattered individuals or as extensive shrub islands. These riparian wetlands typically form a mosaic of types with bog and tree inclusions. Tall swamp onion (*Allium validum*) is the only species of concern that normally occurs in this meadow type. However, given the mosaic character of these meadows, numerous microsites could be present providing habitat for many species not dependant on the general habitat.

Broad Herbaceous Meadows

These meadows support an array of plant associations that vary depending upon moisture levels. There is significant overlap in the plant communities because the moisture gradient changes are often very gradual. The moist end is generally dominated by water sedge, but large forbs such as camas (*Camassia quamash*), sweet marsh butterweed (*Senecio foetidus*) and globe penstemon (*Penstemon globosus*) may also be abundant. In areas that are slightly drier, sedges and grasses that are more intermediate in moister requirements, such as thick-headed sedge (*Carex pachystachya*), Hood's sedge (*Carex hoodii*) and tufted hairgrass (*Deschampsia cespitosa*) increase in coverage. These meadows are may be wet in the spring and dry by summer's end. Tall swamp onion could occur in these meadows.

<u>*Mesic Grasslands*</u>
As moisture further declines in the mesic meadows, grasses become more common in the species mix including such species as Wolf's trisetum (*Trisetum wolfii*), timber oatgrass (*Danthonia intermedia*), California oatgrass (*Danthonia californica*) and fringed brome (*Bromus ciliatus*). The wetter forbs decline and species such as wild strawberry (*Fragaria virginiana*) and cinquefoil (*Potentilla gracilis*) become common. These mesic grasslands once formed the drier end of the meadow communities and were transitory to upland habitats. Today intact native communities of this type are rare. The adjacent upland slopes that historically supported forest have been cleared to increase pasture for grazing. The resulting grasslands that extend from the mesic grasslands onto the upland slopes are dominated by introduced grasses and sometimes referred to as foothill grasslands. Most of these grasslands are found on private land. These sites are heavily grazed and often support weedy species. Typically such artificial and impacted habitats do not support sensitive plant species, however, *Botrychium simplex* (least moonwort) and sometimes other moonwort species may occur in such open habitats.

Bog Communities

Sphagnum moss and a flora consisting of mostly obligate wetland species dominate these perennially saturated wetlands. The soils are anaerobic and frequently peat forming. Bogs can be large or small and exist in forest openings or mixed in with any of the other wetland communities. Indicator plants of bogs in the Red River watershed include slender cotton grass (*Eriophorum gracile*), woodrush sedge (*Carex luzulina*), alpine-nerved sedge (*Carex neurophora*), Cusick's sedge (*Carex cusickii*), inland sedge (*Carex interior*), few-flowered spike-rush (*Eleocharis pauciflora*), and marsh marigold (*Caltha biflora*). In cold situations, the same species found in colder meadows may increase coverage in bogs. Species of concern that are expected to occur in bog habitats include the mosses Peat moss (*Sphagnum mendocinum*) and Blandow's Helodium (*Helodium blandowii*).

Dry Bunchgrass

In the Red River watershed, most natural grasslands are situated on steep, south-facing slopes in thin, seasonally xeric soils. These grasslands are very small in area ranging from less than an acre to approximately 20 acres. These dry communities are dominated by bunchgrasses and typically would be included in HTG 15. However, this habitat group is very minor in area (143 acres) in the watershed and thus not recognized. Rather these small grassland inclusions are more appropriately treated as dry forest openings.

These communities are sometimes well defined, but often intermix with open pine forests. Drier portions of these grasslands are dominated by blue-bunch wheatgrass (*Agropyron spicatum*), while moister, cooler areas support Idaho fescue (*Festuca idahoensis*) and other fescue species. Often these grass species form mixed communities with elk sedge (*Carex geyeri*), Sandberg's bluegrass (*Poa secunda*) and a wide assortment shade intolerant forbs. Soil moisture can range from very wet in the spring to dry by mid-summer. This temporal change in growing conditions yields a diverse plant community that changes throughout the season. If spring rains are sufficient, annuals may be abundant early, while perennials persist throughout the summer. In areas of increased moisture, shrubs may form a significant component.

The extent of healthy grasslands has declined due to fire suppression, livestock grazing and the increase of invasive species. The fire regime has been altered from high frequency/low intensity to low frequency/high intensity. Conifer canopy cover has increased reducing this habitat from the edges of the openings. Soil disturbance from livestock and big game grazing and vehicle use also impacts these grasslands.

On the Nez Perce National Forest, these grasslands support a number of rare plant species, but the local ranges of most of these species does not extend to Red River, but are limited to grasslands in larger canyons far to the west. However, suitable habitat for spacious monkeyflower may be found in seeps and areas of moisture collection in this generally dry habitat. The related bank monkeyflower occurs in similar habitat, especially around the bases of shrubs that intermix in some of the more mesic grasslands. Bank monkeyflower is documented to occur in the lower reaches of the watershed. Additional suitable habitat extends up both the North Fork and South Fork of Red River. These species are particularly impacted by invasive plants that utilize the critical spring moisture monkeyflowers and other annuals need for germination and maturation. Cheat grass (*Bromus tectorum*), spotted knapweed (*Centaurea maculosa*) and St. John's-wort (*Hypericum perforatum*) are generally the most problematic species in these habitats. Over time, these elements will simplify the plant community by reducing many of the native components.

Aspen

Aspen (*Populus tremuloides*) stands are scarce in the Red River watershed, yet for a number of reasons, these are important communities. Aspen forests provide breeding, foraging, and resting habitat for a variety of animals (USDA Forest Service 2002). Young stands provide browse for large wild ungulates. Many other mammals such as rabbits, porcupines and mice feed on the bark and other parts of the tree. Beavers also consume the leaves, bark and twigs and use the stems for constructing dams and lodges. Aspen communities provide important feeding and nesting sites for a diverse array of birds (DeByle 1981). Livestock also use aspen for browse and can adversely impact growth and regeneration. Almost all species gain some benefit for thermal cover, shade or hiding. Deer also use aspen stands for fawning grounds (Kovalchik 1987).

Due to extensive root sprouts, aspen have ability to stabilize soil and watersheds. Trees also produce abundant litter that contains more nitrogen, phosphorus, potash and calcium than leaf litter of most other hardwoods. The litter decays rapidly, forming nutrient-rich humus, which reduces runoff and aids in percolation and recharge of ground water. Evaporation from the soil surface is also reduced. Compared to conifers, more snow accumulates under aspen and snowmelt begins earlier in the spring. Soil under aspen thaws faster and infiltrates snow more rapidly than soil under conifers (Brinkman et al 1975).

Aspen is valued for its aesthetic qualities at all times of the year. The yellow, orange and red foliage of autumn particularly enhances recreational value of aspen sites.

The understory of most aspen communities is luxuriant when compared with those of associated coniferous forests. The combination of more abundant sunlight and favorable moisture conditions in many stands often leads to a rich forest floor of grasses, forbs and shrubs. Studies in Colorado have found a disproportionately high number of vascular plant species in aspen stands in relation to their coverage (Strohlgren et al 1997). This is also the case in the Red River watershed where surveys and vegetation plots in aspen stands reveal approximately twice the number of plant species that is typical for other forested habitats. Species present generally include representatives from meadows, warm and cold forest and dry grasslands. Several native and some introduced weed species also are well represented. This remarkable array of species is the result of a diverse mix of moisture and light regimes offered by aspen habitats.

Good aspen sites are gentle slopes near valley bottoms, alluvial terraces and along water courses (USDA Forest Service 2002) on well drained, loamy soil that is high in organic matter and nutrients derived from igneous rock (Perala 1990). The poorest stands are on soils derived from granite. This may explain one reason why aspen is poorly represented in the Red River watershed, with only a few small stands found on the lower slopes and bottoms adjacent the larger meadows.

Generally aspen is in decline throughout its range. Reasons for this are probably many including genetics, site quality, environmental variables, grazing or lack of appropriate disturbance. Aspen forms clones connected by a common parent root system, thus impacts to a stand may affect many or all of the stems present. Aspen is not shade tolerant, thus being a seral species, it has been promoted through prescribed burning or clearcutting, which results in a profusion of sprouts for several years after the disturbance (USDA Forest Service 2002). Thus succession may be considered a threat. In parts of its range, localized studies have reported little or no aspen regeneration due to winter elk browsing (Baker et al 1997). However, more extensive studies have found successful regeneration at landscape scales in areas of low elk use (Suzuki et al 1999). The actual picture of aspen forests across the west is highly variable, and the presence of conifers and elk in aspen stands may or may not indicate a progressive loss of aspen.

Another potential harmful effect on aspen stands and the diversity that they support is invasion by nonnative plant species. These invasions may have long-term, negative consequences for native diversity, especially in vegetation types such as aspen that are small, scattered and rare on the landscape in parts of their range (Chong et al 2001).

Mountain Parklands

Mountain parklands is a term used here to describe any open habitat in the higher mountains or subalpine. General communities included are subalpine montane grasslands or forblands, shrub areas and open subalpine forest with very low canopy coverage. Mountain parklands can be associated with a variety of edaphic or topographic conditions such as poorly aerated soils, avalanche tracks, soils with low water-storage capacity, steep slopes subject to abnormal exposure to wind and sun, or to excess snow accumulation (Daubenmire 1981).

Montane grasslands will not close with succession. The dominant species is generally beargrass (*Xerophyllum tenax*), with fescue grasses and a number of forbs occupying mesic areas. Disjunct grassland steppe species from lower elevations may be present in the more xeric areas (Daubenmire 1981). These may include a number of grass species including assorted blue grasses, bromes, and bunch grasses and many shade intolerant forbs and shrubs. Montane grasslands are rare in the Red River watershed, however small inclusions may occur within other open communities.

While some parkland communities exist in the climax condition, historic severe wild fires have created others. Superficially these may appear similar to true grasslands and forblands, but close examination reveals scattered tree seedlings, stumps, charcoal and a flora composed mostly of forest plants that utilize the shade under thick beargrass clumps or pioneer shrubs such as evergreen ceanothus (*Ceanothus velutinus*). Representative species commonly include Piper's anemone (*Anemone piperi*), northwest sedge (*Carex concinnoides*), and big-leaf sandwort (*Arenaria macrophylla*). Soils are also less rocky and generally deeper. Species typically found in the permanent openings will disperse into these open seral habitats, but are far less common. These permanent and transitory open communities often form a mosaic making delineation difficult or impossible.

Upper elevation mountain parklands are rare in the Red River watershed covering only 157 acres, mostly on Moose Butte and in the upper Red Horse Creek drainage. Due to edaphic conditions, the montane grasslands will persist despite fire suppression. But in the absence of fire the more extensive seral communities will continue to decline and will eventually form closed or open forest stands of lodgepole pine and subalpine fir.

These subalpine parkland communities are the preferred habitat for California sedge. It is more common in the mesic montane grasslands that are better represented north of the watershed, but it does occur in the basin in other habitats (CDC 2002). It likely exists in the parklands of the Red River watershed in moist microsites.

4.3.8. Wildlife

Snags and Down Wood, Old Growth Habitat and Landscape Linkages

Sections 4.3.1 through 4.3.3 characterize snags and down wood in the Red River watershed. Sections 4.3.1 through 4.3.3 describe old growth and old growth distribution in the watershed.

Habitats for Big Game Species

Elk are not doing well in the Clearwater Basin. Many factors come together to form an unfavorable situation for elk, including habitat quality, predation and human use. Idaho Department of Fish and Game data show a two-decade downward trend in total population numbers, bull:cow ratios and calf:cow ratios in Unit 15 (Red River covers approximately one-tenth of the unit). Since current data were collected without the influence of the gray wolf, the population trend is expected to continue downward in light of the healthy and expanding wolf population in the Clearwater River Basin and more locally, in the Red River area. Having an influence over one of these three primary habitat/population management conditions, the Nez Perce Forest must coordinate and partnership with the population managers in Idaho Fish and Game in order to gain perspective on the elk population and develop appropriate management actions to maintain a healthy elk population and quality habitat to support it.

Wildlife Security

Roads can directly impact animals and affect populations by displacing individuals, reducing habitat quantity and quality, or altering habitat use patterns. Roads increase human access, which renders some animals more susceptible to disturbance and more vulnerable to harassment and human-induced mortality (i.e. hunting and trapping). Some wildlife species prefer areas isolated from high levels of human activity. Most of these species are either hunted or trapped. Many wildlife species, like the gray wolf, wolverine, lynx, fisher, marten, goshawk and elk tend to favor areas with large or fairly remote/undisturbed tracts of land rather than disturbed ones. The sensitivity of wildlife to roads varies widely between species, among individuals and can depend on seasonal habitat use (i.e. calving/fawning periods or nesting periods). The degree of wildlife species impact to disturbance and displacement depends on where the roads are in relation to key habitats, such as meadows, calving/denning/nesting habitat, drainage headwaters, travel routes such as saddles, low divides, ridges, and streams, and winter/summer habitat. The type, amount, durations, and season of disturbance determine the ultimate impact of human activity on wildlife populations. For example, elk are most sensitive to human disturbance during calving season (mid-May to mid-June), hunting season (late August to late October), and winter (especially January to March). On the other hand, goshawks are most sensitive to human disturbance during the nesting season and wolves are most sensitive during the denning season.

Currently, there are approximately 588 road miles (3.6 miles per square mile) in Red River watershed. Existing access restrictions mitigate the transportation system impact on wildlife populations. The yearlong open road density is about 0.7 miles per square mile (113 miles). There are about 78 miles open seasonally (0.5 miles per square mile). Combined, there are about 191 miles (0.9 miles per square mile) open for public use seasonally or yearlong. Motorized trails are not included in these calculations. About 395 road miles are restricted yearlong (2.5 miles per square mile).

The SFA (1998) identified the enhancement of wildlife security as a moderate priority for the Red River watershed. In general, at least 20% of an area should provide "wildlife security" defined as areas larger than 250 acres that are more than 0.5 miles from an open road (Leege 1984 cited in USDA 1998). In Red River, where OHV use is concentrated/well established, a security area was defined as being further than 0.5 miles from OHV trails. Due to the wide-ranging nature of security area-dependent wildlife, the proximity of security areas inside the watershed to security areas outside the watershed influences their value to wildlife.

Wildlife security is distributed in patches throughout the Red River drainage ranging from the minimum 250 acres to over 5,700 acres. The East Meadow Creek roadless area in the northeast corner of the drainage and the Dixie Summit/Nut Hill roadless area in the southwest corner aid distribution. Wildlife security areas comprise 22% of the Red River watershed, meeting the minimum recommendation of 20%. On a smaller scale, nine of the 14 elk units are under 20% security. The two units with the greatest security (65% and 68%) are predictably associated with the two roadless areas. Map 40 displays areas that are greater than 0.5 miles from an open road or a trail used by motorized vehicles. Currently, there are fourteen security areas providing habitat to the security dependent wildlife.

When timber harvest began in Red River, roading naturally accompanied it. In the 1970s and 1980s the trend to access/road the drainage increased steadily. The current road system is a reflection of those earlier days. In the 1990s and now at the beginning of a new century, roads are being decommissioned; therefore, miles of road influencing wildlife habitats are decreasing. Hence, wildlife security area trends are upward. Table 4-29 and Map 40 show percent security by elk unit.

Table 4-29 displays current elk habitat effectiveness unit values compared to Forest Plan standards. Nine of the units are at or above the minimum Forest Plan standard. Six of the units are within five percent of the Forest Plan standard indicating a need to assess the units more closely to find opportunities to bring them within the standard. One unit (#45111) is well below the Forest Plan standard, indicating an alternative management strategy may be necessary to meet the standard. Recommended road decommissioning will improve elk habitat effectiveness values in the units affected.

Table 4-29 Elk Habitat Effectiveness Units: Current Status, Forest Plan Standard and Percent Security

Elk Unit	Current %	Forest Plan Standard	Security (20% Recommended)
45071	78	75	65%
45072	60	50	20%
45081	54	50	21%
45082	50	50	19%
45091	59	50	37%
45101	67	50	17%
45111	55	75	14%
45112	47	50	13%
45121	49	50	11%
45131	50	50	12%
45141	45	50	2%
45221	67	50	30%
45222	47	50	8%
45231	79	75	68%
48171	47	50	29%
48201	49	50	23%

Size Class and Forest Species Distributions

Wildlife communities are associated with vegetative communities on the landscape. If vegetative communities are managed within an appropriate range of variability, then wildlife communities associated with them will likewise. Consequently, wildlife habitat management must take a close look at vegetative conditions and the processes affecting them. Our target or reference conditions in Red River are defined on a VRU basis. Each VRU has a range of values for each of five size classes: non-forest, seedling/sapling, pole, small trees, medium trees and large trees.

Unique elements across the landscape may be used at a disproportionately higher level by wildlife species than the more abundant habitats. The Rare Plant/Terrestrial Communities of Concern sections (4.3.6 and 4.3.7) discuss unique habitat features occurring in Red River (i.e. wetlands, mountain meadows, lower elevation dry grasslands, old growth, etc.). There are also forest habitats that are not unique, but less represented in the drainage that provide high quality habitats (i.e. ponderosa pine and western larch).

Current conditions have been estimated based on air photos, recent insect and disease data and satellite imagery. Note that lack of current on-the-ground stand exam information limited the accuracy of the current conditions estimates. Lacking better information, Table 4-30 provides an idea of how current conditions compared to target ranges and how much manipulation would be necessary to obtain the target landscape condition.

Table 4-30 VRU Target Ranges by Size Class

VRU (Acres)	1 (31040 ac)	3 (1696 ac.)	4 (7767 ac.)	6 (60192 ac.)	7 (1931 ac.)	10 (667 ac.)
Non-Forest Target	1552-3104	85-339	388-777	3010-6019	19-193	67-167
Current Estimate	683 ac	44	777	5177	73	29
Change Needed	+869	+41	0	0	0	+38
Seed/Sap Target	6208-9312	85-509	388-3884	6019-18058	97-386	100-167
Current Estimate	5991	173	831	4996	230	0.00
Change Needed	+217	0	0	+1023	0	+100
Pole Target	6208-9312	170-339	777-2330	18058-27086	193-483	133-200
Current Estimate	4377	54	1786	10534	249	79
Change Needed	+1831	+116	0	+7524	0	+54
Small Tree Target	6208-12416	170-339	20-2330	12038-18058	290-483	100-167
Current Estimate	18841	1045	3596	29133	908	428
Change Needed	-6425	-706	-1266	-11075	-425	-260
Medium Tree Target	3104-6208	339-509	777-1553	6019-12038	483-676	167-267
Current Estimate	1180	207	753	9992	415	122
Change Needed	+1924	+132	+24	0	+68	+45
Large Tree Target	1552-4656	339-678	777-3884	3010-12038	676-869	100-167
Current Estimate	0.0	0.0	23	482	56	9
Change Needed	+1552	+339	+754	+2528	+620	+90

VRU Acres (+) means the size class is under represented in the current landscape; (-) means these size classes are over represented in the current landscape.

In light of the large area the Red River drainage covers, it is far-fetched to think that the amount of manipulation suggested by the above figures is reasonable to accomplish quickly. In most cases, current management opportunities that would move vegetative conditions within target ranges are defined by current resource conditions and how they have been impacted by past management activities. Looking at a timeline, we see management activities have occurred over the past 50 years. It is reasonable to assume it will take over 50 years of strategic management to bring this landscape to a target condition. Nonetheless, there are immediate opportunities to strongly consider due to the current mountain pine beetle epidemic killing lodgepole pine in the drainage.

VRU Current Conditions

This section discusses VRUs in respect to wildlife and wildlife habitat. For a complete description of the VRUs, see section 4.3.4. See also Map 5 for locations of these VRUs.

VRU 1

Old growth occurs in large patches in the north end of the VRU where it is adjacent to the East Meadow Creek roadless area. Going south along the rim, old habitats become more fragmented and patches become smaller due to past timber harvesting. In the southern portion of the VRU/drainage, old habitat patches increase in size, associated with the Dixie Summit/Nut Hill roadless area. Old growth opportunities exist in the mixed mesic forests that dominate the vegetation in the northern part of this VRU. **Unique Habitats** in this VRU include pacific yew, wetlands and mountain parkland. Of note are patches of Pacific yew in the north end. Small (<1-2 acres) patches of wetlands are scattered throughout the VRU in association with riparian areas, and more importantly, in uplands. There are three notable mountain parkland areas in the drainage. The largest is located in VRU 1 along the southwestern rim of the drainage. **Moose winter range** (Map 43) is in the northern end of the VRU. The pacific yew moose winter range is highly associated with areas where VRUs 7 and 1 are juxtaposed. **Elk winter range** (Map 43) is also in VRU 1. It is associated with adjacent VRU 3. This VRU contains elk security areas throughout.

VRU 3

Old growth opportunities are limited in this VRU. Some stands connect into other VRU patches. However, they are at risk from stand replacement fire due to the heavy fuel loading resulting from dead and dying lodgepole pine being killed by the mountain pine beetle epidemic. **Unique habitats** in this VRU include the largest grassland area in the drainage. The grassland is probably the most unique and significant habitat feature in this Red River VRU. Wetlands are present primarily as linear features along creeks. E**lk winter range** is also an important wildlife feature in this VRU.

VRU 4

VRU **old growth** opportunities have been limited by past harvest activities. Riparian stringers are generally what remain of old forest habitat. **Unique habitats** are limited to Pacific yew (relatively minor in this VRU when compared to VRU 6). There are some wetlands, mostly associated with riparian areas; however, there are relatively few wetlands in VRU 4 when compared to VRU 1. The eastern branch contains grassland habitat adjacent to riparian shrub habitat. These provide important habitat diversity in a landscape dominated by mixed mesic and lodgepole pine forests. This VRU contains a relatively high amount of pole size trees compared to other VRUs. The western branch of VRU 4 provides **critical elk summer/fall habitat** providing a primary travel route used by elk moving west to east using Cole Creek and moving into the Red River meadow complex (critical winter range/critical calving habitat). This is the only portion of the VRU that is currently elk security habitat, aside from two small, narrow and linear security areas in the eastern branch. Hunter density/intensity is very high and access management is a critically important issue in this part of the drainage.

VRU 6

Old growth management opportunities in Red River generally fall outside of this VRU. Since this VRU dominates the drainage, this is an indication of the extent of past management actions in this VRU. This VRU contains the Red River meadow complex as well as two other wet meadow areas. The meadow complex and the wet meadows are a **unique feature** of this VRU. Along with the wet meadows are the few scattered aspen groves noticeable in the drainage. There are also small patches of grasslands scattered throughout the VRU. Predictably, the small grasslands are located primarily on south and west facing slopes. Also of note are three of the five western redcedar sites. All three are strongly associated with VRU 6/7 interface. Pacific yew is an important component of this VRU. **Moose winter range** is primarily associated with VRU 7. There are large patches of moose winter range in the northeastern corner of the VRU. At lower elevation and in the west side of the VRU is **elk winter range**. Critical elk habitat is associated with elk winter range and travel routes in VRU 4 and the Red River meadow complex. The Deadwood area contains elk winter range also.

VRU 7

This VRU is scatter in patches throughout the perimeter of the drainage. It is mostly associated with VRU 6, and to a lesser degree, VRU 1. Relative to its distribution and abundance in Red River, VRU 7 presents favorable **old growth** management opportunities because old forest patches are relatively large. **Unique habitats** include Pacific yew. Of more significance, VRU 7 contains western redcedar. Of the five known western redcedar locations in Red River drainage, VRU 7 contains two sites and is closely associated with the other three. These sites are so small that the presence of these trees is insignificant as wildlife habitat. However, presence of western redcedar indicates growing conditions may be unique in and around these locations. These areas may provide important microsites for wildlife species. The western redcedar provides interesting habitat diversity. Small wetlands found in other VRUs are relatively absent in most parts of VRU 7. Wetlands are more common in the north-central patches; associated with riparian areas and located in uplands. **Moose winter range** is an important component of VRU 7 in the northern and eastern patches. Pacific yew communities are important moose winter range components – they should be maintained in high quality conditions and access management should be restricted in these areas to protect this highly vulnerable animal.

VRU 10

VRU 10 has high potential for managing large patches of **old growth habitat**. The VRU contains grand fir mosaic. This habitat generally has a long fire interval and is difficult to regenerate due to soil conditions and high seedling mortality due to high gopher populations. The grand fir mosaic is a very diverse and unique habitat. **Unique Habitats:** Of the three significant mountain meadow areas in Red River, VRU 10 has one of them. Upland wetlands are scattered throughout this high elevation VRU. Due to roadless status, nearly all of this VRU is in big game **security habitat**. VRU 10 contains some **moose winter range** in association with VRU 7.

Unique Plant Communities

Described in the Rare Plants section of this document, in Section 4.3.6.

Habitats for TES Species

The Red River watershed provides habitat for a variety of wildlife species. Many of these species were identified as a high management concern in the SFA due to: their status as a protected species under the ESA; habitat for the species has undergone significant declines since reference times; or the species is an economically important game species (USDA 1998). Table 4-31 lists species of concern on the Nez Perce National Forest, their status, presence in Red River and habitat potential in Red River.

Table 4-31 Species of Concern and Habitat Potential

Species	Status	Known Present	Potential Habitat
Lynx (Lynx Canadensis)	Threatened	Highly probable	Yes, highly probable
Bald Eagle (Haliaeetus leucocephalus)	Threatened	Yes, on South Fork	Along South Fork
Grizzly Bear (Ursus arctos)	Threatened	No, unlikely to occur	Yes
Gray Wolf (Canis lupus)	Threatened/ Experimental	Yes	Yes
Northern Goshawk (Accipiter gentiles)	Sensitive	Highly probable	Yes
Black-backed Woodpecker (Picoides arcticus)	Sensitive	Yes	Secondary habitat
Fisher (Martes pennanti)	Sensitive	Probable	Yes
Wolverine (Gulo gulo)	Sensitive	Yes	Yes
Rocky Mountain Elk (Cervus elaphus nelsoni)	MIS	Yes	Yes
Pileated Woodpecker (Dryocopus pileatus)	MIS	Yes	Yes
American Marten (Martes Americana)	MIS	Highly Probable	Yes
Shiras Moose (Alces alces shirasi)	MIS	Yes	Yes

Wildlife habitats have been influenced primarily by the road system, past timber management and the current insect epidemic. The current small dead trees benefit small woodpecker species and may provide some foraging opportunities, but are considered short-term because many are expected to fall in five years. Species requiring large snags and forested canopy cover are experiencing declining habitat conditions. Species benefiting from early seral conditions will also benefit as the insect cycle continues. Travel will become difficult as snags fall to the ground. Species favoring down wood will have abundant habitat.

Habitat for three threatened species occurs in the Red River watershed including Canadian lynx, bald eagle and grizzly bear. Habitat also exists for gray wolf, listed under the endangered species act as endangered/experimental. Additionally, four Forest Service Region 1 sensitive species (northern goshawk, black-backed woodpecker, fisher and wolverine) and four Nez Perce National forest management indicator species (elk, pileated woodpecker, moose, and American marten) have habitat in the drainage.

There have been few species-specific wildlife inventories completed in the Red River area. The Idaho Conservation Data Center (CDC) tracks rare species occurrences and (as of March 26, 2003) shows fisher (31 records 1978-2000), lynx (2 records (1909-2001), black-backed woodpecker (1 record 1989-1994), and wolverine (2 records 1979-2000) reported in the Red River watershed. CDC records within a 10 air mile radius of Red River (Map 41) show five uncommon species reports: fisher, flammulated owl, wolverine, lynx, and black-backed woodpecker. Flammulated owls require habitat not found in Red River. They were eliminated from consideration in this assessment. Wolverine, lynx, fisher and goshawk are species that have potential habitat in the watershed.

TES Species

Bald Eagle

Bald eagles are migratory raptors, which concentrate around lakes, rivers, or wetland areas. On the Nez Perce National Forest, all bald eagle use occurs principally during the winter season. No bald eagle nesting has been documented on the forest. Bald eagles have not been reported in the Red River watershed. They do occupy the South Fork Clearwater River in the winter months from about November through March. Bald eagle count data collected since 1984 on the South Fork Clearwater River between Farrens Creek and Crooked River indicate a relatively stable or slightly increasing population trend (USDA 1998).

Maintenance of riparian habitats, perches along large rivers (i.e. South Fork), and healthy fish and big game populations are necessary to continue building bald eagle populations in north central Idaho.

Learning more about eagles and protecting their habitats and populations under the ESA, has been effective in population and habitat restoration concerns. Implementation of ESA has effectively eliminated the risks to species protected by it. Bald eagle trends are stable and slightly up. Nationally and locally, bald eagle is no longer in danger because the factors causing its decline have essentially been eliminated. There are ongoing efforts to delist bald eagle.

Canada lynx

Canada lynx were listed because of a management plan deficiency rather than a biological/population risk or habitat factors. Most of the Nez Perce Forest is marginal lynx habitat and/or at the lower range of suitable lynx habitat. Lynx found on the Nez Perce are likely to be traveling through the area rather than living in it. This is based on knowledge of foraging habitat and availability of snowshoe hares.

The lynx is a very secretive animal and depends on a complex mosaic of forests in different age and structural classes (USDA et al. 1999). A lynx was sighted in Red River watershed in 1995 (CDC 2001). More recently (mid-June 2002), a probable lynx sighting was reported near the Mallard Creek Campground, approximately five air miles from Red River drainage. Additionally, there are old (1978-1982) trapping related lynx locations identified on a map at the Red River Station. The map also shows a few non-trapping sightings.

Den sites are typically located in hollow logs or root wads within mesic, mature or old growth coniferous forest (Koehler and Brittell 1990). Lynx foraging habitat corresponds with snowshoe hare habitat, as the hare is the lynx's favored prey. Snowshoe hare are most abundant in seedling/sapling lodgepole pine, subalpine fir, and Engelmann spruce forest stands (USDA 1998).

There are five lynx analysis units (LAUs) in the Red River watershed. LAUs are 16,000 to 25,000 acre areas above 4,000 feet. Map 42 displays lynx analysis units in the Red River watershed. Each LAU is managed to have less than 30% unsuitable lynx habitat and over 10% denning habitat. All five LAUs meet minimum requirements. See Table 4.32. It is recommended that the Wheeler and Wigwam units be combined in order to meet the 6400-acre minimum potential habitat criteria.

Table 4.32 Habitat condititions of the Red River Lynx Analysis Units

LAU #	Total Acres	Potential Habitat in Unsuitable Condition Objective = <30%		Denning Habitat Objective = >10%		Foraging		Acres w/ No Potential as Habitat	Total Potentially Suitable Acres Objective = >6400 acres
		Acres	%	Acres	%	Acres	%		
Wheeler	8852	282	6%	1687	35%	2830	59%	4031	4800
Wigwam	5857	378	12%	346	11%	2448	77%	2676	3172
Red River	29052	2743	18%	2411	15%	10428	67%	13479	15584
S.F. Red River	16467	1803	17%	4214	40%	4581	43%	5863	10598
French Gulch	32262	1240	13%	3867	40%	4666	48%	22543	9772

It is estimated that in order to provide an adequate prey base, 30% of lynx habitat should be in early seral conditions at one time. Foraging habitats all LAUs are meet this target (USDA 1998). Densely stocked stands, with dense understory cover, and of an age where branches provide lateral cover near the ground provide the best habitat for hares. Potential foraging habitat enhancement would require production of "dog hair" type stand conditions exceeding 4,000-5,000 woody stems per acre where soils and moisture regimes can support such stands. Denning habitat should be maintained above 10%. This would be possible by maintaining appropriate levels of old forest habitats in each VRU. Currently, denning habitat is not a concern in Red River. Due to the insect epidemic that started in the late 1990's, denning habitat is abundant.

When prey is scarce, lynx home range size increases and individuals may become nomadic. The home range of males is larger than that of females. In the western U. S., home range size is usually between nine to 18 square miles. Population density is usually less than 10 lynx per 39 square miles, depending on prey availability. Individuals are usually solitary.

Grizzly Bear

Confirmed reports of grizzly bears have not been reported in the Selway Bitterroot since 1956. Until a confirmed report is documented, it will be assumed that grizzly bears do not occupy the Red River watershed.

Grizzly bear reintroduction has been explored through an Environmental Impact Statement (EIS) written by the U.S. Fish and Wildlife Service. Implementation of an action alternative under the EIS is unknown. Certainly, based on the biology of grizzly bears vs. gray wolves it will take longer to recover the bears than it has the wolf, even with similar recovery strategies (i.e. reintroduction).

Gray Wolf

The situation with the gray wolf is similar to the bald eagle. Under ESA protection and with the reintroduction efforts, the gray wolf has now reached recovery status. Efforts to delist the gray wolf are expected, as are challenges to their delisting and management as a game species.

Gray wolf populations were functionally extirpated from the Red River area in the 1930s. Occasional wolf reports were recorded throughout the 1970s and 1980s although no reproduction or resident populations were documented (USDA 1999). In 1995 and 1996 the U.S. Fish and Wildlife Service reintroduced 35 wolves into Central Idaho. The Central Idaho Wolf Recovery Area (CID) is one of three recovery areas in the Western United States. Wolves inhabiting the CID are classified as a nonessential experimental population, which requires less protection and more flexibility in management than an endangered population. The Nez Perce Tribe manages and monitors the CID wolf population (USDI et al. 2002).

There is confirmed recent (winter/spring 2003) wolf activity in and around Red River drainage. There are known packs to the west (Selway Pack) and east (Gospel Hump Pack) of Red River; both may use Red River occasionally. There is an unconfirmed pack in or near Red River using the meadow complex as well as recent activity to the south of Red River drainage.

The number of wolves and breeding wolf pairs in the CID has increased steadily since the reintroduction program began with 35 individuals. Currently, over 260 wolves, in 22 packs, are known to inhabit the CID (USDI et al. 2002).

Recovery goals for the species set by the U.S. Fish and Wildlife Service call for 10 breeding pairs per Recovery Area, or a total of 30 breeding pair distributed through the three areas, every year for three years. The CID has had 10 or more breeding pairs of wolves every year since 1998. Combined, the three Recovery Areas met the 30 breeding pair requirement in 2000, 2001 and 2002. Once state wolf management plans are completed the gray wolf will be proposed for delisting, possibly in 2003 (USDI et al. 2002).

Black-backed woodpecker

Black-backed woodpeckers are cryptic, are typically quiet, and rarely observed. Black-backed woodpeckers are known to be present on both the Clearwater and Payette National Forests, which border the Nez Perce National Forest to the north and south (USDA 1998).

Sharon Seim, Red River Wildlife Biologist, surveyed for black backed woodpeckers in May 2002. She located one pair and one lone black backed woodpecker. Seim also located several three-toed woodpeckers, Harries woodpeckers and pileated woodpeckers.

Optimal black-backed woodpecker habitat occurs in recently (<5 year old) burned-over forest (Washington Dept. Wildlife 1991, Saab and Dudley 1997). But Black-backed woodpeckers can be found in coniferous forest below 6,000 ft. with numerous beetle-infested snags. Although black-backed woodpeckers use ponderosa pine, Douglas fir, subalpine fir and mixed conifer forests, lodgepole pine provides the highest quality habitat (Goggans et al. 1988, Bull et al. 1986). Large areas of lodgepole pine are dying in the Red River watershed as a result of pine beetle epidemic. Theses conditions provide potentially suitable habitat for black-backed woodpeckers throughout the Red River drainage.

American Marten and Fisher

On the Nez Perce National Forest, fisher and marten both inhabit mesic, coniferous forest. Marten are typically found in high-elevation forests between 4,500 feet and tree line and fisher are generally found between 3,500-6,000 feet. Both species prefer structurally complex habitat, with multiple canopy layers and abundant down woody debris and understory shrubs (Idaho State Conservation Effort 1995). Favored prey items are predominantly small- and medium-sized mammals and birds, and include snowshoe hare, red-backed and meadow voles, Northern flying squirrel, and red squirrel (Idaho State Conservation Effort 1995).

VRUs 5, 7 and 10 are particularly well suited for marten management because they contain relatively high proportions of mature and old growth grand fir and subalpine-fir forests, have long disturbance intervals, contain preferred habitat groups and complex vertical structure (especially VRUs 7 and 10). Of the 103,348 acres in Red River, 2598 acres (2.5%) are in VRUs 5, 7 and 10.

Red River contains temporal barriers that may partially restrict movement. There is a low to moderate trapping risk in Red River. Red River has suitable, but low quality marten habitat due mostly to the extent of lodgepole pine (a suitable but not preferred forest type) and associated lack of large diameter trees (i.e. large saw timber size class). Fisher and marten are both vulnerable to extirpation caused by over trapping. Protection of their populations hinges on providing adequate wildlife security areas.

The South Fork Wildlife Report (1997) recommends that Red River be classified as a primary conservation area for fisher and pine marten. Based on the current habitat conditions and the high probability of higher quality and higher quantity habitat available in the South Fork Subbasin, Red River should be classified as a secondary conservation area (reduced canopy closure, low security, availability of highly suitable habitats and trapping risk).

Based on each VRU large tree component, current suitable habitat was estimated. The reference acres refer to the large tree target acres by VRU. Table 4-32 displays these figures.

Table 4-32 Reference Habitat in Red River

VRU	1	3	4	6	7	10
Suitable (acres)	1180	207	776	10474	471	131
Reference (acres)	4656	678	1554	9019	1159	267

(shaded areas contain the most suitable habitat):

Northern goshawk

The northern goshawk is a raptor that is dependent on old growth closed canopy forests. Snags, downed logs, and vegetative layering are important habitat elements for goshawks, which depend on the prey these features support (Reynolds et al. 1991). Home range for a pair of northern goshawks can approach 6,000 acres in size and typically contain two to four alternative nest sites. Nests tend to be found in large diameter trees, especially those close to water. Nests are often used for more than a year and are sometimes used intermittently for decades (Reynolds et al. 1991).

Maintaining or restoring closed canopy old growth forest should be a priority for goshawk management. The South Fork Clearwater Assessment identifies the Newsome-Leggett ERU as a priority goshawk management area based on the availability of high quality habitat. Preferred stands are dominated by Douglas fir and western larch, have overhead canopy closures greater than 60%, are at least 120 years old, encompass greater than 150 acres, and have less than 45% slope. Optimally, two such stands would be provided for every 10,000 acres (Hayward 1990). Due to harvest history, dominant habitat types and insect epidemic, Red River is considered secondary goshawk habitat. Refer to the old growth section (4.3.3) for specific information regarding this important component of goshawk habitat.

Wolverine

The Wolverine, the largest of the mustelids, is poorly understood primarily as a result of its large home range, low population density and secretive lifestyle. Wolverines occupy a broader range of vegetative zones than other forest carnivores, including forests, alpine and tundra habitats. The most pervasive characteristic of wolverine habitat is its isolation from the presence and influence of humans. Distinct seasonal shifts in elevation use have been observed with high elevation talus/rock cover types preferred during the summer months and montane coniferous forests during winter. The fall movement to lower elevations may be at least partially due to carrion resulting from big game hunting. Ungulate species, consumed primarily as a result of scavenging, make up the majority of the wolverine's diet (Copeland, 1996).

In addition to providing summer habitat, rock talus areas are also used for denning, which occurs in the late winter/early spring. Dens are typically constructed by digging a snow tunnel down into a cavity below a rock. The snow layer is thought to protect the kits from hypothermia in the mother's absence. Human disturbance at dens resulted in almost immediate abandonment of the den, but not the kits (Copeland, 1996).

Wolverines have exceptionally large home ranges. Annual home ranges for resident adults averaged 94,886 acres for females and 390,912 acres for males. Home ranges are segregated by sex, so that a male's home range seldom overlaps with another male's and a female's home range seldom overlaps with another female (Copeland, 1996).

A wolverine from Copeland's (1996) biotelemetry study is thought to have traveled from the Salmon Subbasin study area to the confluence of the Lochsa and Selway Rivers before returning to its home range in the Salmon subbasin. This 173 km dispersal is unconfirmed but could mean that this wolverine traveled through Red River or a surrounding area. Two wolverine sightings have been reported to the CDC in small tributaries to the South Fork just downstream of the Newsome Creek confluence. In 1980 a wolverine was sighted in the headwaters of Santiam Creek, and in 1993, a Wolverine was sighted in Fall Creek (CDC 2001).

A probable wolverine sighting was reported in mid-June 2002 by Forest Service employee Randy Borniger. The wolverine was sighted north of Gold Point near the Motherlode Road/Red River Road junction.

Reduction of wilderness through road access may be the greatest threat to the persistence of wolverines in the area. Human disturbance may have influenced the current distribution and habitat selection of the wolverine. (Copeland, 1996).

Moose

Moose populations have expanded across Idaho since the 1960s, and most populations are currently stable. The availability of moose habitat in the South Fork Clearwater Basin is thought to have doubled since historic times. This increase is primarily due to the expansion of mature forests and Pacific yew as a result of fire suppression. Pacific yew is a highly preferred moose browse species and conservation of old growth grand fir/Pacific yew forests is the most important habitat management strategy for moose in the area (USDA 1998).

Pierce and Peek (1984) conducted a moose habitat use and selection study in the South Fork Clearwater River drainage (near Elk City) from 1978-1981. Based in part on their findings a model to predict moose winter range was developed for the Nez Perce National Forest. These areas are defined as mature subalpine fir or mixed conifer forests <5,900 feet in elevation, on VRU 1, 3, 4, 6, 7, 8, or 10 and Habitat groups 4, 5, 6, and 7. These conditions would encourage the growth of Pacific yew and the presence of two-storied conifer shrub conditions preferred by wintering moose. Refer to the unique plant communities, Section 4.3.7, for more information about the Pacific yew communities in Red River.

4.4 Social Resources

4.4.1 Social

Population Trends and Social Setting

The Red River watershed is located in Idaho County, Idaho. Idaho County is the 19th most populous county in the state and, while it ranks number one in total area, this leads to a relatively overall low population density (U.S. Census Bureau 2000). Population levels show a slow overall increase from 1900 to 2000, with the county currently having its highest recorded population levels (U.S. Census Bureau 2000). The population of Idaho County in 2001 was 15,511 and 3,666 for Grangeville, Idaho (Oregon Economic & Community Development Center). Except for between 1910 and 1930, population levels have fluctuated between increasing and declining on a decadal pattern, with the highest percentages of change occurring during the first half of the 20th century.

Age distribution within the population has remained fairly consistent between 1940 and 1990. The percentage of population in the working adult age class (20-64) has remained the most constant, fluctuating from a peak in 1940 of 56.7 percent to a low of 48.6 percent and back up to 55.6 percent in 1990 (U.S. Census Bureau 2000). The 0-19 age class increased from 36 percent in 1940 to a peak of 43.1 percent in 1960, to a low of 28.8 percent in 1990. A counterbalancing trend occurs in the 65+ age group. This group has increased through the last 50 years from 7.3 percent in 1940 to 15.6 in 1990 (U.S. Census Bureau 2000).

The population in Elk City has also fluctuated. In 1861, when Elk City was established as a mining town, there were as many as 2,000 people in town (Elsensoh 1965). By 1913-14, the population was down to 400, as reported in Polk's Idaho County Directory (Elsensoh 1965). By 1930, the population was again down, at only 300 people (FHA 1975). In 1969 the Potlatch Forest industries sawmill in Elk City closed and the population dropped even more (FHA 1975). Today Elk City has a population approximating 400 and has a number of amenities, including a school that serves grades K-10, an active 4-H club, a post office and two churches. The nearest hospital is in Grangeville, however, Elk City has its own ambulance and a medical clinic, which opened in the fall of 1997 and is serviced by visits from doctors and nurses from Grangeville. There are also a number hotels and restaurants to accommodate tourists in the area.

Over 83% of Idaho County is federally owned and managed. Major employers include the school district, Forest Service, Idaho County and St. Mary's Hospital (USDA 1998). Timber harvest has and continues to be an important economic underpinning of local communities in the area. Grangeville, Elk City and Kooskia were considered timber-dependent communities, along with 26 other communities in the Columbia Basin (USDA 1998). For these communities, primary forest products manufacturing facilities provides ten percent or more of the total employment in the community (USDA 1998).

Within the last decade there were nine mills operating in north central Idaho. Three of these were located in Idaho County: Shearer Lumber, now Bennett Forest Industries (BFI) in Elk City, Idapine in Grangeville and Clearwater Forest Industries (CFI) in Kooskia. Within the last several years three of the nine mills have closed, one in Idaho County (Barney & Worth, Inc. 2001):

- Idapine in Grangeville (Idaho County) closed in 1994, displacing 150 workers.
- Potlatch JP mill in Pierce closed down in September 2000, displacing 215 workers.
- The Gem State mill in Juliaetta-Kendrick closed in 1998, displacing around 24 workers.

In 1995 BFI relocated its planing operations to the Idapine mill in Grangeville. Between its operation in Elk City and Grangeville, BFI employs about 110 people. At the time of the writing of this draft, BFI is in the process of making the decision of possibly closing both operations in Elk City and Grangeville and moving the entire operation to Grangeville, or relocating entirely to Lewiston.

BFI is one of the largest private employers in Idaho County, paying an average wage of $13 per hour plus medical insurance, paid vacation and retirement. Idaho County's unemployment rate is currently at 9.3 percent compared with the state average of 5.6 percent and will go higher if BFI does relocate entirely to Lewiston.

The threat of the mill closing in Elk City, together with the large expanse of dead and dying trees in the Red River watershed (as discussed in Section 4.3.5 of this chapter) has generated high levels of concern. The concern is over the perceived lack of action to not only reduce the fuel hazards, especially in proximity to Elk City, but also to recover economic value of the dead and dying trees to provide lumber for the mill. The Project File includes several months of newspaper articles and letters to the Editor regarding this issue.

There are several active groups in the Elk City Community. Two of these groups, Women in Timber and Save Elk City, have been proactive in bringing the plight of Elk City to local and national attention by holding public forums and meetings with community leaders, and through letter writing campaigns.

Members of Framing Our Community are actively looking to provide a diverse economic base for Elk City. They have several projects in the works, including establishing a Small Timber Business Incubator, which would utilize small diameter trees to make value-added projects; a five year assistance agreement with the Bureau of Land Management to train displaced workers in Forest restoration and fuel reduction skills; and a partnership with the Forest Service to train displaced workers in dry masonry skills.

Economics

Poverty rates in Idaho County have consistently been higher than statewide or national rates. Poverty has increased dramatically during the 1990s in Idaho County, trending in opposite directions from poverty trends at state and national scales (U.S. Census Bureau 2000). Unemployment rates declined sharply in the 1980s (from 12.7 to 9 percent from 1980 to 1990), mirroring statewide patterns. From 1990 to 1994, however, unemployment rates rose sharply (from 9 to 11.5 percent) and then declined slightly in 1997 (from 11.5 to 10.8 percent), countering statewide trends from 1990-1994 and mirroring statewide trends during the last three years of data (U.S. Census Bureau 2000).

Per capita income in Idaho County was nearly identical in the 1970s with the per capita income in Idaho State, but has fallen behind increases in state per capita income levels during the 1980s and 1990s. Current per capita income in Idaho County is approximately 22.4 percent lower than state level averages (U.S. Census Bureau 2000).

4.4.2 Recreation

Recreation Opportunity Spectrum

The Recreation Opportunity Spectrum (ROS) describes recreation settings and opportunities, and is used to evaluate an area's recreation potential. The Nez Perce National Forest ROS inventory is described in the Forest Plan EIS (see Chapter III, pp. 8-9). The Red River watershed has been inventoried and divided into three classes: Semiprimitive nonmotorized, Semiprimitive motorized and Roaded natural.

Semiprimitive Nonmotorized and Semiprimitive Motorized

These areas are greater than 2,500 acres and greater than one-half mile from all roads and trails with motorized use. "Semiprimitive nonmotorized" classified lands lie within the Upper Red River Roadless area in Trail Creek, Otterson Creek and Bridge Creek and within the South Fork Red River area on the upper southeast boundary in Trapper Creek and in the southwest upper boundary in West Fork Red River.

Areas classified as "Semiprimitive motorized" are found in the upper portion of Red Horse Creek and along Trail #504 along Bridge Creek.

Roaded Natural

These are any areas within one-half mile of a road. They are natural appearing settings that may have modifications that range from being easily noticed to strongly dominant to the observers within the area (however, from sensitivity level 1 and 2 travel routes, these alterations would remain unnoticed or visually subordinate). Designed roads or highways may be common. People are frequent.

Recreational use within the Red River watershed is heavily influenced by the presence of the existing transportation system (roads and trails) and long history of resource management. Both roads and an extensive system of motorized trails dominate the watershed. Eighty-five percent of the area is classified as either "Roaded natural" or "Semiprimitive motorized". Appendix G provides a listing of ROS classes by subwatersheds.

Visual Resources

Visual Quality Objectives (VQOs) define a desired level of scenic quality and diversity of natural features. Interim VQOs for the Red River watershed were inventoried and mapped as part of the Forest planning process. VQOs for extremely sensitive areas were adopted with the Forest Plan, and interim VQOs were established for specific management areas (MA) in combination with other resource objectives. The interim VQOs for the Red River watershed range from Preservation to Maximum Modification. A Preservation VQO applies to three small locations: 28 acres in Bridge Creek, 65 acres in Main Red River and 6 acres in Upper South Fork subwatersheds. A retention VQO applies to 10,038 acres along the Upper Red River and the South Fork Red River ERUs. The balance of the watershed is a mosaic of Partial Retention, Modification and Maximum Modification VQOs. Appendix H displays the interim VQOs by subwatershed. This analysis does not make recommendations for adjusting VQOs; this will be done at the project planning level.

Commercial Recreation

Commercial recreation services in the Red River watershed currently are: Outfitting and Guiding services for big game hunting, snowmobiling, a guest ranch and a Hot Springs operating on Forest Service property via a Resort Special Use Permit. At present the forest is unable to process applications for special use permits due to the lack of funds to complete required environmental analysis. Requests for special use permits are constantly being submitted for the following activities: snowmobiling, cross-country skiing, snow shoeing, ski-yurt-to-yurt and interpretive tourism. Some of the commercial recreation services that are expected to be needed include recreation site management and maintenance services, waste management services, commercial tours and guiding, and RV facilities.

Existing Recreation Use, Improvements and Features

Recreational activities within the Red River Watershed include motorized sight-seeing, touring, hiking, horseback riding and packing, camping, mountain biking, photography, berry picking, mushrooming, and State-licensed hunting and fishing activities. Winter snow sports such as cross-country skiing and snowmobiling are increasing in popularity and occur in headwater areas in the watershed. Groomed snowmobile routes follow some of the major upland road corridors including the Nez Perce Trail. Motorized recreation using motorbikes and off-highway vehicles occurs along the ridge routes and primitive roadways in the watershed and along a few streamside trails. Although overall motorized recreation use levels are currently low to moderate, use levels are increasing.

Primary recreation use occurs along Upper Main Red River and the western portion of Lower Red River. These areas are accessible to the public either yearlong or seasonally. Public access is restricted on private lands along the Middle Red River and Upper Main Red River. On the National Forest portions of the watershed, the period of lowest recreational activity is in the spring and early summer. The peak period of recreation use occurs with the fall hunting season, with the highest recreational use of dispersed campsites, trails, and roads occurring at this time.

Recreational access to riparian areas along Red River is available from turnouts on the Red River Road #222 and Upper Red River Road #234.

Developed Recreation Sites

The developed campgrounds within the Red River drainage lie on the Upper Red River portion of Red River.

Ditch Creek Campground

The Ditch Creek Campground is in Upper Main Red River along Road #234, five miles from the Red River Ranger Station. Ditch Creek Campground is used from early June through the fall hunting season. The heaviest use is generally in the spring and fall. The facilities include four campsites with parking spurs, picnic tables, fire rings and an older, wood frame, vault toilet that serves the campground. In addition, the campground serves as the trailhead for Trail #507. In the spring/summer of 2002 the campground was closed most of the season due to numerous hazard trees that were removed late in the season.

Red River Campground

The Red River Campground is located in Upper Main Red River along Road #234, seven miles from the Red River Ranger Station. This is the only fee for use campground on the Red River District. Red River Campground is used from early June through fall hunting season; the heaviest use occurs generally in the summer, especially on holidays. An increasing number of motor home users are using the campground, requiring larger parking spurs than the current sites provide. Potable water is only available through Labor Day and use drops off without potable water. The facilities include 44 sites with parking spurs, picnic tables, fire rings, one group site, eight water spigots and seven outhouses. The site also has a short nature trail. In the spring/summer of 2002 the campground was closed most of the season due to numerous hazard trees that were removed late in the season. The removal of these trees has left the campground with little shade and no visual screen from the main road.

Bridge Creek Campground

The Bridge Creek Campground is located in Upper Main Red River along Road #234, ten miles from the Red River Ranger Station and approximately one-half mile from the Red River Hot Springs. Bridge Creek Campground is used from early June through the fall hunting season, with the heaviest use occurring generally in the spring and fall. Due to the proximity of the Hot Springs, this site is heavily used and receiving resource damage, e.g., the streamside sites are causing considerable soil erosion problems. Two sites have been closed due to fisheries concerns. The facilities include three sites with parking spurs, tables, fire rings and a two-stall outhouse. In 1999 two sites were closed to mitigate resource impacts to fisheries in the Upper Red River watershed.

Special Recreation Features

Johnson Cabin

The forest has become the owner of the Johnson Cabin, located less than one-quarter mile from the Blanco Road, #1183, on the north side just before Steckner Creek. The cabin is in good condition and could be placed on the cabin rental program; current access currently is via a gated road.

Red River Ranger Station

The Red River RV dump is located at the Red River Ranger Station at the junction of Roads #222 and #234. Facilities include an outhouse, interpretive signs, potable water and a pay phone. A fish hatchery and a fishing pond (Carolyn's pond) are located across the road from the Red River Ranger Station. The fish hatchery collects and releases Chinook salmon and steelhead and is open to the public. Idaho Fish and Game stocks Carolyn's Pond and the Forest Service maintains a Chinook Viewing site with a pathway and interpretive signs in this same area.

Red River Ranger District Stock Facilities

The Red River Ranger District maintains about a dozen head of pack and saddle stock that are used in remote and wilderness areas on the district. The current facilities include three small, fenced pastures in the Red River Ranger Station area and two small, fenced pastures in the French Gulch area. All pastures are located adjacent to Red River and all but one have a water gate to the river. The fences of these pastures are currently beyond their normal life expectancy and will need to be replaced in the near future.

Butter Creek, Bridge Creek, Red River Hot Springs, Otterson Creek Trailhead Area

A large dispersed site is located across from the Bridge Creek Campground, at Butter Creek, which is within one-half mile of the Hot Springs. This is a popular family destination spot because of the proximity of the hot springs. It is also popular for horse riders because stock is not allowed in the developed campsites. It is also a trailhead for Trails 504 and 541. The large, flat area south of the Butter Creek road receives high use by horse riders; during the wet season this use is causing considerable damage to the soil and vegetation. Facilities include hitching racks, stock feeders and one unloading ramp. The area is plowed in the winter to provide for a winter trailhead for snowmobile and cross-country skiers. The Otterson Creek Trailhead has two entrances off the main road, forming a loop.

Mobility Impaired Access Program

Several roads on the District are designated for mobility impaired hunters. This program allows these hunters to drive and hunt on gated roads not open to the general public. The following Forest Service roads are part of this program in the Red River watershed:

Hunting Unit 15:
Road 9520 - Off Blanco Road 1183, Siegel Creek Drainage; limit 2 parties at a time on the road.

Road 9542 - Off Soda Creek Road 1172, between Soda Creek Point and Soda Creek; limit 2 parties at a time on the road.

Hunting Unit 20:
Road 9550 - Off 1190 Road, northeast from Jack Creek Summit (the Red Mail Box); limit 2 parties at a time on the road.

Road 9510 - Off 1194 Road, between Pat Brennan Creek and South Fork Red River; limit 2 parties at a time on the road.

These roads have grown back in and have a very limited visibility to hunt from the road.

Dispersed Recreation

Dispersed recreation is defined as recreation use that occurs outside of developed sites in the roaded and unroaded forest environment. This can include camping, fishing, hunting, driving for pleasure and berry picking, to name a few. Dispersed recreation sites are usually situated on flat areas and gentle terrain at trailheads, road closure gate sites, or road ends, adjacent to or accessed by various classes of roads. Sites used for dispersed recreation usually do not have any constructed facilities (picnic tables, fire rings, etc.) and generally do not have hardened surfaces. Improvements are often user-made structures, like campfire circles made with rocks. Restroom facilities are lacking and human waste is normally disposed of in the areas adjacent to the dispersed site. With repeated use of sites, impact zones develop as a result of soil compaction and vegetation loss.

The majority of use within the Red River Watershed is dispersed recreation. High use areas for dispersed recreation are concentrated along roadways and streams. In the past decade, the use of campers/trailers/motor homes has greatly increased. Use of campers has reduced the consumptive use of poles and fuelwood around dispersed sites, but improved turnouts, access lanes, and site-hardening are needed to provide separation of camping activity from travelways and road traffic.

French Gulch

The French Gulch dispersed site offers a flat spot to park trailers and campers; however, the only facility provided is an older outhouse. The site is well used for several reasons: it is located just off Road #222, which is paved; it is snow plowed during the winter months, providing a spot to camp late into the fall and early winter; and an old stamp mill, excellent for exploring, is located within one-half mile of the dispersed site.

The old stamp mill is known as Gold Point and the buildings are owned by the Elk City Alliance. The Alliance is interested in securing a special use permit to open the mill to the public. The bridge across Red River, which accessed this site, was condemned and removed several years ago. The Alliance has proposed a trail along Red River from the Cole Porter bridge to access the site, however, the Forest Service has been unable to complete NEPA on this project.

Blanco Dawson Area

This dispersed use area is located along the main Red River, an important Chinook salmon spawning stream. The site receives substantial use throughout the summer and fall months. No facilities are available for campers and sanitation is an ongoing problem. The Dawson Creek trailhead for trail #507 is also located in this area. There are no stock handling facilities or defined parking areas.

4.4.3 Trails

The Red River watershed contains approximately 121.5 miles of National Forest system trails (Map 49). Of these trails, approximately 60.0 miles serve as the primary transportation system within unroaded areas of the watershed. The remainder of the trail system provides access to smaller unroaded areas and interconnects with the road system.

Ninety-five percent of the trails in the Red River watershed are classified as Class II, III and IV trails (Appendix I). Use levels range from moderate to high (more than 30 users per year). Class III - IV trails are maintained annually and Class II trails are on a three-year maintenance rotation. Annual maintenance includes trail opening, cleaning of drainage structures (water bars and turnpikes) rock and woody debris removal and emergency repairs are needed.

Thirty percent of the trails in the Red River watershed are classified as trails with very low levels of use (less than 30 travelers/yr). These trails provide the only established travel routes for infrequent administrative access to remote or unroaded areas. Low levels of recreational use occur on these trails, especially during the fall hunting season. About 50 percent of the trail system in Red River watershed receives light levels of motorized use.

Five miles of the system class I-II-III-IV trails are located within 300 feet of streams in the Red River watershed. Condition surveys have been completed on these trails and these trail segments will be highlighted for upgrading or relocation to mitigate any adverse effects if they occur.

Motorized recreation

The existing road system in Red River is highly restricted, with 75% of roads having some type of use restriction in place. Traffic flow in Red River was 40-70 vehicles a day during summer from the late 80s and early 90s to present on the main Red River road just off the highway. Average daily traffic of vehicles on Road 468 is 15-20 vehicles during the summer with traffic peaking on weekends (Joe Bonn, USDA Forest Service, personal communication, November 13, 2001). These are 30-day averages; actual usage is concentrated during the weekends.

Off Highway Vehicle (OHV) use throughout the South Fork Clearwater subbasin is increasing and use is not limited to roads and trails (USDA 1998). Red River sees high use by ATVs and was recommended by USDA (1998) to be managed to provide road-orientation recreation, with a management emphasis on reducing adverse effects and overall road densities. OHV use is primarily on roads and trails, with main routes of travel being: Divide Trail 505, Butter Creek road 1166C, Trail Creek road 423, and Nez Perce Trail road 468. Existing trail systems show tread widening from ATV use, especially Hot Springs Trail 504.

No Red River specific, or even South Fork Clearwater specific data on OHVs is available, although USDA (1998) and Forest Service personnel state that OHV use in the watershed is increasing (Randy Borniger and Kevin Martin, Personal Communication, October 2001). In Idaho, 8,812 snowmobiles and 14,022 motorcycles and four-wheelers were registered in the State of Idaho in 2000 (Rosalie Cramer, Idaho Department of Transportation, personal communication, December 6, 2001). In 1999, Honda, the number one ORV company in the United States, showed an increase of 44,743 motorcycles sold for a total of 174,376 motorcycles, or a 27.3% increase in Honda sales. In 2000, Honda increased their sales an additional 29.6% to sell 211,152 motorcycles. The OHV industry as a whole grew 18.8% in the year 2000 (OHV Source.com Magazine 2001). This trend of increasing sales is expected to continue for as long as projected, into 2004, with estimated sales of 7,000,000 motorcycles and OHVs sold by March 2004 (OHV Source.com Magazine 2001). These state and national trends in OHV sales and registrations support local perceptions of increased OHV use.

Motorcycles and ATVs also have to be registered. Last year, 51,000 motorcycles and OHVs were registered in the State of Idaho (Idaho State Parks 2001b). Idaho has one of the largest systems of off road vehicle trail systems in the United States with over 9,000 miles of trails (Idaho State Parks 2001c). Approximately 75% of the registration fee goes to a motorcycle recreation account for use in maintaining the trail system and to secure and purchase lands for recreational activities, for rider education programs, to acquire matching funds, or for the trail ranger program which maintains the funds (Idaho State Parks 2001c).

As ATVs and motorized vehicle use increases, violations of road closures and off road and trail use have also increased, with associated damage. OHV use occurs throughout summer months, and in the fall for hunting. Red River is in the top one third of watersheds on the NPNF with demand for ATV use (Joe Bonn, USDA Forest Service, personal communication, November 13, 2001). In the South Fork Clearwater, Red River was generally rated third in importance for ATV use by interviewees, including ATV clubs. The Red River watershed was considered most important followed by the Crooked River watershed (Saul and Lewis 2002). Those interviewed also preferred to travel large loop trails (Saul and Lewis 2002).

Most of the watershed is inaccessible during the winter to motorized access, except for snowmobiles. Snowmobiling is a popular recreational activity in the winter. Groomed snowmobile routes in the watershed are shown on Map 47. The groomed route between Elk City and Dixie is a popular snowmobile route. (USDA 1998).

Idaho has more groomed snowmobile trails than any other western state, with over 7,200 miles of groomed trails, the majority of which are on public lands (Idaho State Park 2001). Counties in Idaho with a snowmobile program are entitled to 85% of the registration fees designated for that county during the registration period, which can only be used for the county's snowmobile programs to maintain the operation of trail groomers, to develop signs along trails, and to plow parking lots and maintain warming shelters (Idaho State Park 2001). Snowmobilers can designate the county of use when they register their machines to direct funds to their designated county. Idaho County has a snowmobile advisory committee that advises it how to spend its license-generated funds. The committee is made up of active snowmobilers (Idaho State Park 2001).

There are 76.0 miles of groomed snowmobile routes within the Red River watershed (Appendix I). Trails are groomed under a cooperative agreement between the Forest Service, the State of Idaho Department of Parks and Recreation, and the High Country Snowmobile Club. The Forest Service provides the location, the State provides the equipment and funding, and the Club provides the labor to accomplish the grooming. The trails in Red River watershed are part of a network of groomed routes totaling over 261.0 miles locally. Grooming typically occurs between December and April.

Snowmobiles use non-groomed trails incidentally, but do not use them heavily. The groomed system in the watershed receives heavy use, attracting people from outside the area. The groomed trails connect to other watersheds and towns, and involve connected trails between larger scale trails—trails connecting Elk City to Dixie, for example. These trails are important because they provide connectivity in the middle of the groomed system. The snowmobile trails in Red River watershed are part of a network of 261 miles of groomed snowmobile trails in the Elk City area. Snowmobile use normally occurs from November into the latter part of April. Because of restrictions in other areas, the South Fork Clearwater and Red River watershed receive visitors from all over the Inland Northwest.

Nonmotorized Recreation

There are currently 25.0 miles closed to motorized use and 49.6 miles of trail open to motorized with some kind of seasonal restriction. The nonmotorized trails were constructed primarily for pack and saddle stock to access the fire lookouts on Porters Mountain, Blackhawk Mountain and Anderson Butte, and many of the early mining claims in the watershed. These nonmotorized trails are important for hikers and stock users throughout the summer and hunters in the fall.

The main nonmotorized trails in the drainage are Otterson Trail 588, Dawson Creek Trail 506 and a section of Porters Trail 508 from the junction with Red River Road 222 to the junction with Moose Butte Trail 207. These trails see most of their use during the fall hunting season but many people use them for hiking and horseback riding. Some motorized trails are used heavily by hikers and stock users to access nonmotorized trails in roadless areas that are adjacent to the Red River watershed. The Green Mountain Trail, 541, is a motorized trail stock users use to access the roadless area in Meadow Creek.

4.4.4 Cultural Resources

Introduction

There are numerous locations within the Red River EAWS analysis area that have witnessed human presence in the past. These activities began when people first came to the area perhaps as many as 10,000 years ago. There is evidence for use of this area by Native American people for various activities through time. More recently, evidence can be found of Euro American and other non-tribal use of this watershed for mining, habitation, transportation, graves, and governmental activities. The area is rich in history and additional investigation will provide more clues to the life the prior inhabitants lead in this region of the Nez Perce National Forest.

Within the context of this section of the document, "precontact" refers to that time prior to 1861 and "post contact" refers to the time from 1861 to the present. The 1861 date is significant as that is when the first major influx of non-Indian people came into the Red River Watershed. These people consisted of varying lineages of European ancestry and also Chinese who mined and operated businesses in the area.

The National Register of Historic Places (NRHP) uses four criteria for evaluating cultural sites for possible listing within this register. The National Register of Historic Places Criteria for Evaluation (USDI 1995) are as follows:

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and one of the following criteria:

A. That are associated with events that have made a significant contribution to the broad patterns of our history; or

B. That are associated with the lives of persons significant in our past; or

C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. That has yielded, or may be likely to yield, information important in prehistory or history.

4.4.5 Native American (Tribal) Use

The treaty rights of Nez Perce Tribal members are discussed in Chapter 1.

Archaeological and ethnographic sources indicate the prehistoric and historic utilization of the Red River Watershed for camping, hunting, fishing, resource gathering, grazing, and traveling by Native American people from perhaps 10,000 years ago up to the present time. Evidence of these activities can still be seen on the landscape in various locations where they were performed by the native inhabitants of this area.

The Nez Perce and their ancestors have likely inhabited the Red River Analysis Area for hundreds or thousands of years. The Nez Perce territory spanned the Clearwater River and the northern portion of the Salmon River drainage basin. The deep canyons cut by these rivers brought about extensive seasonal migrations for food (Walker 1982:71). Tribal members traveled through this region throughout the year to accumulate resources that became available during different seasons. Many roots, berries, seeds, nuts and other vegetable resources were utilized. Many small and large big game animal species were hunted throughout the year. Anadromous fish were also prominent elements of native diet in the areas drained by the Salmon and Clearwater Rivers (Nez Perce Tribe, personal communication January 14, 2003).

The Nez Perce actively utilized many plants and animal resources, many of which can be found within the Red River Watershed. Some of the significant plants gathered by the Native people include, but are not limited to, the following: huckleberry, camas, cow parsnip, Pacific Yew, serviceberry, western red cedar, strawberry, elderberry, ponderosa pine, beargrass, and mountain Labrador tea. Various plant resources were used for food, medicine, and also utilitarian functions such as for making baskets, bows, arrows, and other objects.

Wildlife important to Native people using the Red River Watershed includes big game animals such as moose, elk, and white tail deer. Smaller mammals and birds were also hunted and utilized for food and/or incorporated into traditional clothing or other regalia. Wildlife was also found to occur in stories and legends passed from one generation to another. Most commonly, the coyote, bear, fox, and magpies appear in these stories (Nez Perce Tribe personal communication, January 14, 2003).

Anadromous fish were, and still are, a significant part of the native diet. The presence or absence of migrating salmon and steelhead greatly influenced the course of cultural development more than any single factor. Tribal members annually harvest fish in the Red River watershed. Significant species include rainbow trout/steelhead, westslope cutthroat, and spring Chinook. Fish were used throughout the year. Villages usually built large fish traps and weirs communally. Weirs and traps were also utilized on smaller lateral streams during the winter months. Other methods of catching fish included gaffing, spearing, netting from canoes and dipping platforms, and by hook. Many of these methods are still in use today (Nez Perce Tribe, personal communication January 14, 2003).

Native Americans also promoted the production for various plant and animal species with the use of fire. Leiberg (1900: 385-387) makes reference to this action that the current stands of timber are second growths because the Indians previously burned them. He goes on to say that it is difficult to state with absolute certainty the reason why the Indians burned the forest. A Nez Perce, with whom I conversed regarding the matter, stated that forest fires were never started through design, but might have accidentally spread from signal fires kindled by different bands or individuals while on the hunt. The probability is that many fires spread from their camps and others were set purposely…and encourage the grass growth.

Other sources indicate the intentional burning of forests and grasslands. There is ample evidence that Native Americans greatly changed the character of the landscape with fire, and that they had major effects on the abundance of some wildlife species through their hunting (as quoted in Williams 2001). There is a growing body of evidence that the American Indians burned parts of the ecosystem in which they lived to promote diversity of habitats…(Williams 2001). Most primary or secondary accounts relate to the purposeful burning to establish or keep mosaics, resource diversity, environmental stability, predictability, and the maintenance of ecotones. For those Indian tribes that used fire in ecosystems tended to burn in the late spring just before new growth appears… Indians burned selected areas yearly, every other year, or intervals as long as five years. Keeping large areas of forest and mountains free of undergrowth and small trees was just one of many reasons for using fire in the ecosystem. Other reasons given include hunting, crop management, to improve growth and yields, and clearing areas for travel (Williams 2001). The Nez Perce used fire for management of various species of plants. The periodic burning promoted the increased production of these resources to help ensure the continued presence of these resources (Nez Perce Tribe, personal communication January 14, 2003).

After the Nez Perce acquired the horse (ca. 1700-1730), long distance travel within the region was more common. Well known leaders and their families commonly had large herds; some families are said to have owned several hundred horses. One estimate states there were from 5 to 7 horses per individual (Walker 1982:71). The acquisition of the horse also provided the Nez Perce the opportunity to travel to the plains of Montana to hunt buffalo. Walker (1982:73) reports that some Nez Perce parties stayed in the Plains for several years at a time. Access to the plains was gained via the Southern Nez Perce Trail, which passes through the Red River Analysis Area.

To date, there are only five locations within the watershed that are documented as Native American cultural sites. These include resource gathering sites, a possible campsite, and travel routes. All of these sites could have been occupied during precontact times with Euro Americans. Four locations were likely also utilized during post contact times as well. Three of these sites have been determined to be eligible for listing in the National Register of Historic Places (NRHP) based on the significant attributes they possess. The other two sites have not yet been formally evaluated regarding their NRHP status (Table 4-33).

Table 4-33 NHRP Eligibility

Site Number	Period of Use/Significance	NRHP Eligibility Status
10-IH-1714	Pre/post contact	Eligible (D)
10-IH-1881	Pre/post contact	Eligible (A & D)
10-IH-2389	Precontact?	Unevaluated
10-IH-2802	Precontact	Unevaluated
LOC-269	Pre/post contact	Eligible (A)

Impacts to Treaty Rights

The following analysis has been submitted by the Nez Perce Tribe in answer to the key question, "Does the Forest Service's current management of the watershed affect the ability of tribal members to exercise their treaty rights, and if so, what are the effects?"

The U.S. Forest Service's policy of fire suppression in the Red River watershed has impacted treaty rights held by the Nez Perce Tribe. Fire is a natural disturbance in a forest ecosystem. Fire suppression has negatively affected certain plants that members of the Nez Perce Tribe gather. Fire suppression has also negatively affected habitat required by some wildlife species that either are hunted by members of the Nez Perce Tribe or are for cultural reasons held in high regard. Fire is needed to rejuvenate and return areas of the forest to early seral plant communities. Without fire, natural succession occurs and mid- and late seral plants replace early seral plants. Please see the plant section of a more detailed explanation of the effects of fire on specific plant species. In addition to fire suppression, the lack of the control of noxious weeds is having a similar impact. Noxious weeds can out compete native plants that are harvested by tribal members and invade habitats needed by wildlife. Spotted knapweed is one example of a noxious weed that is very invasive and is found in many areas of the Red River watershed.

Access has been restricted to certain areas of the Red River watershed. Historically, the Red River Hot springs was a meeting area for the Nez Perce. From there, family groups would disperse and go to their traditional family areas to gather plants, hunt, or fish. When finished with their activities, families would reconvene at the Hot Springs before leaving the area together. The U.S. Forest Service has issued a special use permit for the development of the Hot Springs area. Access to the Hot Springs is restricted to those that agree to pay a fee imposed by the permittee. Because of the commercialization of the Hot Springs and the fee required, tribal member use of this area has greatly diminished. In addition, the U.S. Forest Service has placed certain restrictions on some roads that prevent the public from accessing areas by certain methods of travel. This is done to protect habitat, provide security for big game animals, public safety, and other reasons. These restrictions affect some tribal members from accessing traditional family gathering, hunting and fishing sites. While some tribal members are able to enter these areas by other means (i.e. horseback, walking), elders are often physically unable to do so. Accessing traditional family areas by elders is important because they teach younger tribal members the traditions of the Nez Perce culture.

Roads that have been created to reach areas for timber harvest are negatively affecting the fisheries resources in the Red River watershed by contributing significant amounts of sediment to rivers and streams. These sediment loads are negatively affecting the ability of certain fish species to reproduce and to inhabit certain segments of rivers and streams. Fewer fish in rivers and streams negatively affects tribal members fishing rights.

Mining activity on lands administered by the U.S. Forest service has straightened stream channels, over-steepened stream channels, and subsequently caused the loss of overwintering habitat due to increased cobble embeddedness in many areas. Mining activity also impacts riparian habitat and function, floodplain function, and instream habitats through loss of woody debris. A decrease in fish habitat would potentially decrease the amount of fish available to tribal members.

Southern Nez Perce Trail

The Southern Nez Perce Trail, also known as the camping trail, is located within the Red River Watershed. This trail is part of a longer route used by Native American peoples in the late prehistoric to historic period for travel between the camas fields of north-central Idaho and the bison hunting grounds of Montana. Extensive oral tradition concerning this trail is also prevalent among the Nez Perce. There is a Coyote myth that explains the origin of a series of small waterfalls along the South Fork Clearwater

River as well as other sites along the trail being named for gooseberries, ground squirrels, spawning areas, and hunting locations. River crossings, significant landmarks and hot springs are along the route of this trail (McKay 1999).

The Southern Nez Perce Trail is significant for its role as a major transportation route for both Native American peoples, primarily the Nez Perce, and later for Euro American explorers, miners, settlers, and Forest Service employees. Human use of this trail route probably dates to thousands of years ago. During pre-horse days (ca. 1700), the trail was favored because good campsites were located a day's distance apart. After acquiring the horse (ca. 1700-1730), travel was much faster and groups could venture farther onto the plains of Montana. With this exposure to the northern Great Plains and the native cultures found there, the Nez Perce assumed a Plains culture overlay, which included a greater dependence upon bison for food, clothing, shelter, and trade. Throughout the year, small groups of Nez Perce traveled east to the buffalo country of Montana and Wyoming. Two routes were taken. A northern route, the Lolo Trail, and the southern route were routinely used. This southern route was the southernmost of the Indians' routes across the Bitterroots (Josephy 1979:132). Although the southern trail was a longer route than the northern route, it was considered by many travelers to be the easier of the two, probably because it offered more camping sites (McKay 1999).

During the Nez Perce War of 1877, many of the non-treaty Nez Perce fled over the Lolo Trail. After the end of the war, a small band of refugees returned from Canada over portions of the Southern Nez Perce Trail. About two dozen Indians traveled to the Bitterroot Valley, planning for the men to follow the Lolo Trail back to Idaho while the women took the Southern Nez Perce Trail. The refugees were camped about 90 miles from Elk City when a party of Euro American men captured most of the horses. The entire band then followed this southern route to Idaho (McKay 1999).

Evidence of this trail still exists at the present time. The overall integrity of many sections of the Southern Nez Perce Trail is aided by its location on public lands. The buffer zone provided by relatively difficult access and nearby wilderness areas protect large tracts of the trail. Some portions of the trail are also so overgrown with vegetation that use of the trail is not practical. Some portions of the trail within the Nez Perce National Forest, and also within the Red River EAWS analysis area receive some maintenance. During the summers of 1989 and 1990, portions of the trail on the forest were identified and marked with small signs. Many of these signs have broken and are no longer visible on the trees, but others still remain in place indicating the route of this significant trail through the watershed (McKay 1999).

Sites associated with the Southern Nez Perce Trail

Along the route of the Southern Nez Perce Trail (SNPT) are several known archaeological sites. These sites relate to the utilization of the Red River Watershed by Native American people. There are several peeled trees and what appears to be a possible campsite known to exist along the trail route. There are various ideas as to why the bark was peeled from certain trees. The Nez Perce reportedly did use this resource during the winter months however, the exact use isn't known as it varied between families (Horace Axtell via Jay Lipe, Nez Perce Tribe, personal communication January 14, 2003). Scarred trees also occur on neighboring forests including the Clearwater, Lolo, and Bitterroot. Lewis and Clark observed the peeling of cambium and noted the large number of scarred trees while traveling along the Lolo Trail enroute to the Pacific Ocean in 1805. Some of these peeled trees have been dated through increment boring techniques. Dates on the Bitterroot Forest range from the late 1700s up through the early 1800s (McLeod and Melton 1986).

Two trees at one of the peeled tree sites in the watershed resulted in dates of ca. 1858 and ca. 1908 (Walp 1986a). Two other sites within the watershed possess peeled trees. No dates have been obtained from these trees however.

The Clearwater National Forest has performed studies on peeled trees along the Lolo Trail. Several areas have been investigated and scarred trees have been dated to when the scarring took place. Dates of scarring are arrived using dendrochronology, counting tree rings from a known point in time. All of the trees that have been dated are either lodgepole pine or cedar (Anonymous C). Dates along the Lolo Trail seem to occur in several broad time ranges. Dates cluster around the mid to late 1700s (1750-1796), the early to late 1800s (1801-1897) and then several date to the early 1900s (1913-1934, Dean 1995).

The possible Native American campsite was located in 2002. The location of the site suggests the group who occupied the area was traveling along the SNPT. It is situated in such a fashion where the people could easily access food and other resources in both the lower elevations along water courses and meadows and also higher elevation mountain settings. Other sites in similar settings are likely present within the watershed, however, they have yet to be identified.

Historic Uses of the Southern Nez Perce Trail (non-Tribal)

The Southern Nez Perce Trail was also important during historic times. Euro American explorers, miners, settlers, Forest Service workers, and others used this route prior to the completion of the Montana Road in 1936. The Montana Road connects Elk City, Idaho with Darby, Montana. The construction of this road (Forest Road #468) essentially replaced those segments of the trail that were still in use in the early 1900s. Today, recreationists are the primary users of the maintained sections of the trail (McKay 1999).

There is some evidence that early nineteenth-century explorers Lewis and Clark were aware of the existence of this trail. The first Euro American known to travel portions of the trail was Reverend Samuel Parker, a Presbyterian minister who traveled east to west across this trail in 1835 in order to locate suitable sites for missions in the home country of the Nez Perce. Parker and a small band of Nez Perce took sixteen days to cross from the vicinity of today's Salmon, Idaho, to the Lewiston, Idaho area. His journal describes the terrain much as it is today (McKay 1999).

Other whites using the trail were directed by Governor Isaac Stevens. In 1853, Abiel Tinkham was charged with exploring the SNPT from the Bitterroot Valley in Montana, to Fort Walla Walla in Washington as a possible railroad route. In 1860, a group of miners trespassed onto Nez Perce land and found gold in the vicinity of Pierce, Idaho. The resulting rush of miners to the area led to other gold discoveries in north-central Idaho such as Elk City. Heavy use of the trail by miners during the 1860s soon followed. After other new mining areas had been discovered in southwest Montana in 1862 and 1863, the trail became a heavily used pack trail connecting the mining regions around Lewiston, Idaho, with those to the east in Montana. Because of this activity, the government continued its effort to locate a wagon road in the region. In 1866, Major Sewell Truax, George Nicholson, and others traveled from Fort Owen in the Bitterroot Valley to Elk City along this trail. They concluded, however, that the Lolo Trail would be a much better route for a wagon road connecting Lewiston and Virginia City (McKay 1999).

The initial rush of miners, merchants, and others to the gold camps of north central Idaho in the 1860s was intense but short lived. Many of these people did not remain in the area very long, but some did settle here, pursuing mining or farming for a living. These settlers pushed for better transportation serving their area besides pack strings. In 1895 the beginning of a wagon road was constructed from Harpster to Elk City. The "Elk City Wagon Road" followed the route of the Southern Nez Perce Trail in many places, overlaying and obliterating some segments as well. Later, Forest Service crews improved some of the remaining segments of the trail sporadically as time and other duties allowed, likely relocating sections of the trail to avoid wet areas or to provide switchbacks up steep slopes. One example is from 1907. The Forest Service opened up the "old Nez Perce Trail by way of Elk City" at a cost of $3000. In 1915, the first telephone line was laid across the Bitterroots. Wire and other equipment were packed over the SNPT. The first signing of the trail, by 1935, apparently had been completed in at least one area along the Montana Road. In the 1930s, members of the Civilian Conservation Corps (CCC) began improving segments of the trail into a road. Today, portions of the original trail route are still used, but by recreational users on horseback or on foot (McKay 1999).

4.4.6 Other Cultural Resources

There are a number of other cultural resources present within the Red River EAWS analysis area. Examples of these resources include isolated cabins and other structures, transportation routes, graves, and government or administrative uses. There are undoubtedly, many more locations in the watershed that have not been formally documented by historians or archaeologists. See Appendix J for a table displaying these sites, period of use, significance, and NRHP eligibility status.

Administrative activities associated with the Forest Service date to the early 1900s. The Red River Ranger Station was built in 1925. Several other buildings within the compound were built during the next 20-30 years. This log office and ranger station was open until the fall of 1998 when the decision was made to close this facility and move it's employees to the ranger station in Elk City.

In the early days, the Red River Watershed was included in the Bitterroot Forest Reserve. Then, in June, 1908, President Theodore Roosevelt signed Executive Order No. 854, which went into effect July 1, 1908 establishing the Nez Perce National Forest from lands given up by the Bitter Root and Weiser National Forests (Cochrell 1970). Access into these remote portions of the forest was mainly by trail, although some wagon roads did exist at this time. Many of these trails likely originated as Indian trails, such as the Southern Nez Perce Trail discussed above. As the white population increased, more and improved access was being pursued. Wagon roads were established where some of the earlier foot or horse pack trails had been constructed. When the miners needed improved transportation routes to access their claims and also to bring in larger equipment, the travel ways improved to actual roads, suitable for cars and trucks of the day. Some stamp milling machinery was actually hauled to the mining sites during the winter, over snow.

With the population that lived in and passed through the Red River Watershed, numerous deaths occurred. When this happened while traveling the trails, many times the body was buried where the person died. There are three documented grave locations within the EAWS analysis area and there is little information about them. All are presumed to be historic (post contact) and of non-Indian people.

Historic Use

Civilian Conservation Corps (CCC)

As the country suffered the economic woes of The Great Depression, Franklin Delano Roosevelt extolled the virtues of hard work. In his presidential acceptance speech in July, 1932, FDR began his conservation movement proposing giving city men work to restore the country to its "former beauty." Thus the CCC was born. It was devised to be a massive salvage operation destined to become the most popular experiment of the New Deal (Golden nd).

The Emergency Conservation Work Act created the CCC in 1933. The program was to employ men in areas of reforestation, road construction, prevention of soil erosion, and park and flood control with a goal of employing 250,000 men. By 1942, it had employed over two million (Anonymous A, nd). The boys to be enrolled were unemployed, between the ages of 18 and 25 and unmarried. They frequently came from families on relief. The enrollment period was for six months with the opportunity to re-enlist for another six months for a maximum of two years. Each enrollee was paid $30 a month, of which $25 was automatically sent to his family. The remaining $5 could be used by the enrollee at the camp canteen or for personal expenses of his choice. The government provided room, board, clothing, and tools. The enrollee was expected to work a 40-hour week and to follow camp rules. While serving in these camps, each enrollee was taught a new skill and could also attend classes to better his education (Kline 2001).

The first CCC camp in the nation (Camp Roosevelt) was located near Luray, Virginia, and enrollees began enlisting into the program on April 7, 1933 (Cohen 1980). CCC camps were located in all 50 states and by 1942, more than 4,000 had been established. Rather than establish a new bureaucracy, the president established this program within existing governmental departments (Kline 2001). The camps were under control of the Army and resembled the regimented life on a military base of the time. The physical camp was also laid out in military fashion, consisting of barracks, a kitchen, a mess hall, a recreation hall, supply buildings, garages, storage facilities, etc. (Anonymous B, nd). Each camp was composed of one company of about 200 men. Each company had a commander who was either a regular army or reserve officer plus a junior officer, camp doctor, and an educational advisor. The project superintendent was in charge of all work projects away from camp and had eight to ten foremen under him. These foremen were usually "Local Experienced Men" also known as LEM (Cohen 1980). The Departments of the Interior and Agriculture were responsible for specific work projects and also provided personnel to manage them.

One such camp was established in the Red River Watershed. This was Camp Red River, F-192 under Company 570. Company 570 was organized at Ft. Knox, Kentucky in May, 1933 and was sent to camps in California and several locations in Idaho. This camp was included in the Lewiston District of the CCC, one of the fifteen CCC Districts of the Ninth Army Corps Area. There were fifteen camps in the Lewiston District and each camp averaged 157 members with twenty officers and technical personnel. The District Headquarters were located in Spalding Hall on the Lewiston Normal School campus. The camp was established at Red River in May, 1936. There were seven enrollment periods in this Company. During the past summer (1936), the company gained corps area recognition for the effectiveness of the combined efforts of the enrollees to refrain from the use of profanity. In work project accomplishments, the group has always rated high…with work projects completed weeks ahead of schedule (CCC 1936). According to Cochrell (1970), CCC company 570 reported from Camp Red River in the "Co. 570 Times," June 14, 1936, that they were surfacing the Elk City-Red River Road and that the Big Mallard Road project was under way. A 35-man spike camp was established on Trapper Creek 12 miles from Camp Red River. In October, 1936, Co. 570 moved to Camp Pollock at Riggins to assume road projects on Squaw Creek and Bean Creek.

Little else is known about the camp but it does appear on a 1936 aerial photograph (Walp 1986 b). What is known about this camp is that it was apparently a summer, tent camp and was vacated as of October 31, 1940 (Keating 1983).

By the end of April, 1933, only two CCC camps had been approved on the Nez Perce National Forest and only one camp actually existed (Otis et. al, 1986). Major activities of Region 1 CCC enrollees included Blister rust control (especially in the valuable white pine forests of northern Idaho), control of pine beetles, forest fire control, and fire prevention, such as access roads, fire lanes, and lookouts (Otis et. al, 1986).

Other CCC camps established on the Nez Perce National Forest were located along the Selway River, Meadow Creek, Santiam Creek, Slate Creek, Riggins, and French Creek. CCC labor helped construct steel bridges and roads from these camps (Cochrell 1970).

In Idaho, CCC enrollees were heavily involved with fire protection and insect and blister rust disease control (Cohen 1980). Other activities included construction of roads and trails, building over 3,000 miles of telephone lines, planted an estimated 28.6 million trees, constructed over 230 lookout houses and towers, and also were involved with rodent and predatory animal control on over 4 million acres. Other projects performed in the state include building of bridges, campgrounds, restoration of historical sites, fish planting, mosquito control, and construction of fences. All told, there were 51 camps in the state. These camps served over 28,000 Idaho men and over 58,000 from outside Idaho. The total expenditure in Idaho was over $82.1 million dollars (Idaho Public TV, nd).

Today, there are no physical remains to be seen from the CCC camp that was located within the Red River Analysis Area.

Mining

The major historical influence still visible in the watershed is from various mining activities over the past 100+ years. McKay (1999) notes that after gold was discovered in Nez Perce Territory in 1860, a rush of other Euro American and Chinese miners soon followed into other areas of central Idaho such as Elk City, Orogrande, Florence, and Dixie. Many of these miners utilized existing Indian trails to access these new mining centers, resulting in significant changes to the landscape they exploited in their search for gold and other valuable metals.

Part of the Red River EAWS analysis area is located within the old Elk City mining district. The area roughly bounded on the north by Red Horse Creek, on the south by Ditch Creek, on the west by Red River, and the east by Blackhawk Mountain occupied the southeast portion of the Elk City mining district.

A trapper named Jack Lasier discovered gold in the region in 1857. However, the credit for the discovery of gold in the Clearwater country is ordinarily given to Capt. E.D. Pierce, who with a party of less than 40 men returned in the fall of 1860…and founded Pierce City at the mouth of Canal Gulch on Orofino Creek (Shenon and Reed 1934:3, Reed 1934:4) near present day Pierce, Idaho. The next year, a group of 52 men left Pierce to prospect the South Fork Clearwater River. Twenty-two braved a violation of the Nez Perce Treaty rights and found gold in June of that year. The first cabin in the Elk City area was constructed near the confluence of American and Red River in August 1861 (Cochrell 1970:30). The newly established mining district was named the Union District, a fact that indicated that the majority were northern sympathizers (Elsensohn 1965:159). The Central District was located along the Red and American Rivers (McKay 1996:78). Reed (1934:4) estimates that the production of gold in the Elk City District was $18,500,000. The gold price at that time was $20.67 an ounce. Later, gold was discovered in Dixie Gulch and the mining camp was established there in 1867 (Cochrell 1970:30).

Strikes in the Elk City and Florence areas touched off a stampede by hungry prospectors. By November, 1861, there were 2000 men in Elk City (Cochrell 1970:30, McKay 1996:78)). With the increase in population, infrastructure needs soon sprang up. In the summer of 1862, Elk City had five or six mercantile establishments, five saloons, and two hotels. The wealth came from the earth, but digging wasn't the only means to acquire it (Cochrell 1970:30). The camp's (Elk City) prosperity was at its height at this time, for in the fall of 1862 discoveries in what is now Montana drew upon the population of Elk City…(Elsensohn 1965:159).

The first "gold rush" was short lived in the Elk City area as it had nearly faded out by about 1865. This was the era of placer mining and the remaining creek bottom gravels and other shallowly deposited gold bearing strata were gone, being easily stripped and washed away through the miner's gold pans and sluice boxes. Chinese miners began to arrive and worked these abandoned claims for nearly 20 years. Jim Witt, who came from Pierce City in 1862, …often told how the rush of the Chinese changed the camp (Elk City). They proved to be the best placer miners…they worked day and night, were frugal, kept strictly to themselves, and prospered where many whites failed (Elsensohn 1965:159-160). In the late 1880s, the interest in placer mining was renewed and the interest in quartz mining was beginning. With the renewed interest, white miners began to return to the region and the Chinese moved their operations to the Salmon and Snake Rivers.

Cochrell (1970:32) describes the extent mining companies took to recover placer gold:

"Beginning in 1891, the Idaho Mining Co. mined the gravel to bedrock in an old stream channel of the American River. An elevator was used to raise the gravel to 500 feet of sluices. Most of the gold was coarse, about the size of wheat grains. It had a pit of 200 by 700 feet, and 60 to 80 feet deep."

Cochrell (1970:32) described another mine in this manner:

"…was one and a half miles southwest…of American River. The deposits consisted of about 180 acres of gravel, much of which had been mined by 1900. The available fall was slight and this made disposal of the tailings rather difficult. This operation used a 2,000 foot flume, 4 feet by 4 feet, with a gradient of three inches in 12 feet. These deposits were also in an old river channel. The gold was both coarse and fine. The operations left a 15 acre pit averaging 50 feet deep."

By 1901, there were four placer companies active and producing in the Elk City District. Several of the gulches in the Red River Watershed were sluiced their entire length and yielded rich diggings. Most of the other creeks and gulches were prospected and many showed production at intervals (Cochrell 1970:33).

In the late 1800s, technology and interest progressed to a point where hardrock or quartz mining was taking place in the area. By the early 1930s, quartz mines outnumbered placers in operation by three to one (Cochrell 1970:33). In the nearby Dixie Mining District, early quartz discoveries (from the 1890s) led to an intense search for other lode deposits in this area and beyond. The nationwide financial panic of 1893 slowed down mining activity for two years, but beginning in 1895 placer and lode mining again became active. Quartz mining in Idaho county declined after 1909, reaching its low point in 1920. From 1920-1932 there was very little quartz mining in the county. Development was hampered by poor transportation, short operating seasons, the small size of high-grade veins, and incompetent management. None of the lode mines in north-central Idaho were very extensive, and none reached a depth of more than a few hundred feet. Most were adit mines, but a few were developed from shafts. By far the most common method of ore treatment was crushing in stamp mills followed by plate amalgamation, resulting in the recovery of only about 60% of the gold in the ore. Mine operators tended to build mills before they had blocked out adequate ore reserves, and this contributed to the number of failures (McKay 1996:56).

During the Depression of the 1930s, because of higher gold prices and improved road systems, lode mining in Idaho County experienced a revival. Most of the small veins were owner operated because the veins generally were not rich enough to support the overhead necessary for company operations. The large…mines could not be worked successfully when gold was $20.67 per ounce, but the rise in the gold price in the 1930s led to their commercial development (McKay 1996:56-58).

More recently, the use of dredges to recover placer gold was employed in the Red River area. The era for dredging gold arrived in the Elk City country in 1935. Several dragline and two bucket line dredges had produced nearly three quarter of a million dollars in placer gold (Elsensohn 1965:179-180). One such dredge, the Mount Vernon, operated in various places within the Elk City, Crooked River, Red River area for more than 20 years. This dredge worked in Deadwood Gulch, Red Horse Creek, and later on Crooked River. During this time, the Mount Vernon dredge produced more than 17,000 ounces of gold and silver valued at over $489,000. The dredge also provided jobs for many local people during the depression and following the second world war (Murray nd). Today, a limited amount of recreational mining is performed in the region and there are still some active claims as well.

One interesting item regarding the rush of miners in the region is that they started forest fires. Leiberg (1900) provides several insights into this on the Bitterroot Forest Reserve.

> *The white man came in force into the region thirty-five or forty years ago. Destructive conflagrations have invariably followed in his wake. If an average is struck,…it will be found that during thd Indian occupancy there were fire losses of 11,350 acres per annum, while during the time that the white man has been in possession 35,000 acres per annum have been destroyed…*
>
> *The fires kindled by white men have ravaged the forest area of the reserve in thousands of*

places. Early discoveries of placer diggings at Florence, Elk City, and Pierce had the effect of sending many propsectors to the most remote corners of the Clearwater basins, and wherever they went fires and blackened ruins of the forest were left behind to mark their trails and camps…that the responsibility for fires of modern date lies mostly with the prospectors admits of no doubt…Each summer, as soon as the snow has disappeared sufficiently to allow of travel, prospectors and hunters flock into the region. There can be little doubt that these classes are, in the main, responsible for the fires.

Currently, there are 36 documented mining related sites within the Red River EAWS analysis area. See Appendix J for a listing of these sites, period of use, significance, and NRHP eligibility. These sites include the various methods of extracting minerals from the earth since the 1860s. These sites include placers, underground mines, mill sites, and associated cabins and other structures related to the mining industry. As shown in the table in Appendix J, only one-third (13) of the mining related cultural sites previously documented have been evaluated regarding their NRHP status. One of these sites is listed on the National Register of Historic Places while the remaining twenty-three (23) sites have yet to be formally evaluated using the NRHP criteria as described in the introduction section above.

4.4.7 Mining

Mining Regulation and Direction

Several laws limit the alternatives for exploration or mining on National Forest System lands. Mining claimants have the statutory rights granted by the 1872 General Mining Law (as amended) to search for and extract valuable minerals from their claims. Forest Service regulations, 36 CFR 228, Subpart A, gives the authorized National Forest officer the authority to approve Plans of Operation and to require claimants to take measures to prevent adverse impacts from occurring as a result of their mining activities. Mining claimants are required to conduct operations in an environmentally sound manner in conformance with these regulations and with their approved Plan of Operations. While the Forest Service may influence aspects of an operation that affect surface resources, it may not prevent mining claimants from exercising their statutory right to enter upon their claims to search for and extract minerals. Provided the land in question is open to mineral entry, the Forest Service has no regulatory basis to prohibit legitimate mining activities. Therefore, action alternatives do not restrict or control mining location or methods.

The Forest Plan

The Forest Plan could not predict where, when and what kinds of minerals development might be proposed, nor specific needs for surface resources. Therefore, MA 4 is not site-specific, but applies to any area that consists of active or recently active mining extraction and processing operations. The goal of MA 4 is to "[e]ncourage valid exploration and development of mineral resources, while at the same time minimizing surface impacts from those activities" (Forest Plan, p. III-11). Specific standards for water resources in MA 4 are to meet established fishery/water quality objectives for all "prescription watersheds" (Forest Plan, p. III-11). *Forest Plan Amendment No. 3*, 1989 makes changes and adds the following statements to the Forest Plan:

Page II-23 of the Forest Plan: Approximately 56 percent of the Nez Perce National Forest is open to mineral entry under the general mining laws with no restrictions other than valid existing rights and such surface resource protection measures as may be required under 36 CFR 228.

Page III-11 of the Forest Plan: Management Area 4: The stated goal is to encourage exploration and development of mineral resources, while at the same time minimizing surface impacts from those activities.

Page III-35 of the Forest Plan: Management Area 11, C. Standards: There is a need to provide access for exploration and development of locatable and leasable mineral resources. However, new road construction will only be approved where a road is necessary for the next stage of development of the mineral resource, and where other means of access would be unreasonable. Roads will be constructed to minimum standards "suitable" for the proposed use, and will be obliterated to the extent feasible after completion of activities.

Appendix O-16 of the Forest Plan: Item: 2m

The monitoring plan will be a tracking mechanism to make sure that operating plans and bonds accurately reflect the current level of activity, that reclamation work is properly completed and the bond returned upon cessation of mining, and that a reasonable degree of uniformity is maintained.

Current Mining

There are about 130 unpatented mining claims in the RR watershed as of 2001. Most of the claims are staked for a gold "discovery". The number of claims will vary each year as a few old claims are dropped and a few new ones are recorded. Generally the number is fairly constant, especially when gold prices are down as they were in the mid to late 1990s and 2000 to 2002. Of the 130 claims, about 30 are placer claims. Eighty-four percent of the claims are in T28N, R8E and R9E, 15% are in T29N, R8E and R9E and only one percent in T27N, R8E. This means most of the claims are in the mainstem of the watershed below the Red River Ranger Station.

The Forest Service has mineral authority for deposal of common variety (mineral material, low value commodities like sand, gravel and building stone) only. The Bureau of Land Management has mineral authority for locatable (high value, gold, silver etc.) and leasable minerals (general energy and agricultural minerals). Individuals or companies stake claims and record them with the BLM and state. The Forest Service responsibility is to minimize or protect, mitigate and repair adverse environmental impacts to surface and cultural resources. A claimant or their agent must file a Notice Of Intent (NOI) with the Forest Service if they wish to conduct surface disturbing activities on National Forest System lands. If the reviewing official determines that significant disturbance would occur then the claimant or agent must file a Plan of Operations. The Forest Service is responsible for conducting any environmental review of potential effects.

Currently there are no Department of Interior mineral leases, permits or licenses within the Red River watershed.

Currently there are no contracts, free use permits or in-Service use of mineral materials within the Red River watershed. There are several unreclaimed quarries.

Placer Claims

Placer claims are located on Red River, Red Horse, Siegel, Little Siegel, French Gulch, Little Moose, Deadwood and Wheeler Creeks. These claims have evidence of historical mining activity. There has been little or no reclamation at these placer claims. Effects include but are not limited to: altered stream courses, changed topography, abnormal streambed gravel stratification, and impaired riparian function including vegetation changes from natural.

Load Claims

Load claims distribution includes scattered individual claims and claims groups in block of 40 claims or more. Attributes of historical mining include waste rock dumps, milling waste, tailings, adits, shafts, buildings and other facilities. Concerns may include, but are not limited to, leachates, heavy metals, toxic chemicals, unstable waste piles, cut slopes or embankments, hazardous mine openings and buildings. Toxic materials are not only those produced from weather of waste rock or tailing but imported chemical used for processing, including mercury, cyanide,

4.4.8 Transportation

Management Setting

The Red River watershed is approximately 103,348 acres in size and is located approximately 34 air miles southeast of Grangeville, Idaho and approximately five air miles southeast of Elk City, Idaho in Idaho County. Please see Map 2.

It is situated in a rolling upland topography largely of metamorphic and granitic parent materials. Mixed conifer and lodge pole pine vegetation types dominate the vegetation in the watershed.

National Forest System land makes up the majority of Red River. Private land, primarily situated along the meadows of the mainstem, accounts for approximately 950 acres.

There are approximately 15,613 acres located within two inventoried roadless areas. The 9535 road system (West Fork) extends into the Dixie Summit- Nut Hill Inventoried roadless area. Portions of West Meadow Creek inventoried roadless area extend into the Red River watershed. These portions of the West Meadow inventoried roadless area remain unroaded. Please refer to the watershed assessment for locations of these.

Red River is part of the lands ceded to the United States by the Nez Perce Nation. Rights and uses retained by the Nez Perce Nation are important considerations in the management of lands in Red River.

Transportation Overview

The transportation system of roads and trails in the Red River drainage is extensive (Map 48), with approximately 588 miles of system roads. Primary access to and through the drainage is provided via the Dixie road (Forest Service inventory #222). This road, along with the Red River road (Forest Service inventory #234) is managed and maintained by Idaho County. With the exception of the Nez Perce Trail road (468) that provides slow and limited access across the Bitterroot Mountains to Montana, roads in the Red River drainage are primarily terminal systems. That is to say that egress from the Red River drainage and areas south of Red River is almost completely via road #222 to State highway 14. Forest Service system roads are extensive throughout most of the Red River drainage. Transportation planning efforts associated with the South Fork Landscape Assessment indicate that reductions in the amount of road in the Red River drainage may be appropriate (SFA page 145).

History of Development

The first access into Red River was by the Nez Perce Tribe who used the Southern Nez Perce Trail to cross the mountains into Montana to trade and hunt Bison. They accessed the drainage itself to hunt, fish, gather vegetation and to enjoy the Hot Springs. In the latter part of the nineteenth century and into the twentieth century settlers and miners began to build wagon roads to access locations such as Dixie, Orogrande, Red River Hot Springs and into various mining claims.

Further development of both roads and trails likely occurred during the 1930s, utilizing civilian conservation corps crews to develop access for fire detection purposes.

During the 1960s and 1970s the road system expanded as the Forest Service constructed road systems to provide access for timber harvest and silvicultural treatment. Some of these systems resulted in high localized road densities as a result of limitations related to logging technology of the time. By the 1980s logging technology evolved to include greater reach skyline systems. Also, in keeping with the treatments of the time temporary roads were water barred and seeded against erosion rather than recontoured. Because of this, some roadways that are currently inventoried may be excess to the future access needs. There are some roads in the area where original drainage provisions, such as log culverts, have deteriorated through time and have become problematic maintenance items. Also, beginning in the 1980s greater consideration to soil and water issues were incorporated into road construction and development designs. Consequently, increased provisions for roadway drainage through increased cross drains and providing for reductions in potentials for surface erosion by applying surfacing aggregate, were incorporated into road development activities. Since the 1990s very few new roads have been built in the Red River drainage. Most of the roadwork consists of reconstruction, maintenance, and road repairs.

The existing transportation system is comprised of a road and trail network, which has been developed through time. This network is best viewed as an integrated network since many uses are interrelated. An example is the groomed snow trail system that is composed of both trail and road segments.

Road Management Objectives Strategy

The Red River drainage rolling upland topography lends itself well to an ephemeral road management system where the density of roads increase and decrease with current needs. This management system allows for the minimization of long-term negative impacts of roads while maximizing the social, administrative, and recreational needs.

The travel management on the road system is highly restrictive in response to resource, recreational, and administrative concerns. Approximately 85% of the roads in Red River have some seasonal or yearlong access restrictions. Some of these route restrictions may need to be adjusted to improve constancy in travel prescriptions, restriction enforcement, and recreational continuity.

Road Maintenance Levels

The Nez Perce Forest is responsible for maintaining 579 miles of road in the analysis area. The county maintains the other 41 miles under a cooperative agreement. Each road on the Forest is assigned a level of maintenance described below.

Maintenance Level 0: Maintenance not applicable. Road has been decommissioned.

Maintenance Level I (ML1): Basic custodial care. Closed yearlong. Brush has grown in on many of these roads.

Maintenance Level II (ML2): Suitable for high clearance vehicles. Open to highway vehicles seasonally or generally requiring a high clearance vehicle to negotiate.

Maintenance Level III (ML3): Suitable for passenger vehicles. Usually gravel surface, single lane with turnouts.

Maintenance Level V (ML5): High degree of user comfort. Generally have an asphalt surface.

Table 4-34 Mileages by Maintenance level in Red River

OPERATIONAL MAINTENANCE LEVEL	Miles	Miles of County Maintenance
0 - NOT APPLICABLE (DECOMMISSION)	8.89	
1 - BASIC CUSTODIAL CARE (CLOSED)	407.124	
2 - HIGH CLEARANCE VEHICLES	87.06	
3 - SUITABLE FOR PASSENGER CARS	74.533	14.61
5 - HIGH DEGREE OF USER COMFORT	1.29	26.1

Maintenance Costs

In recent years national protocols to consistently identify and assess maintenance needs for national forest road systems have been developed. These protocols provide for systematic and comprehensive assessment of needs. These needs are inventoried by task and costs are calculated by task item. Costs and tasks can readily be accumulated and displayed by classification of tasks, either Annual or Deferred maintenance. Annual maintenance is defined as recurrent tasks necessary each year to maintain a road to the identified objectives. An example of this is road grading. Deferred maintenance are those tasks that for whatever reason have not been done on an annual basis or are necessary to bring the facility into compliance with current management guidance. An example of this would be a culvert designed to pass 50-year flow events. Forest Plan amendment 20 established the 100-year flow event as the reference to be considered for flow passage, so upgrading the culvert would constitute a deferred maintenance need.

The cost for maintaining these roads (as assessed utilizing the national protocol) is $1,600,000. This compares to the available funds (prorated from the Forest-wide road system and the current road budget available for maintenance) of approximately $120,000 for the Red River Drainage. This comparison highlights the limited nature of current available road maintenance funds. Priority is therefore given to maintaining health and safety on the higher used (usually maintenance level 3) roads. Because of this, deferred maintenance needs on the road system (particularly maintenance level 1 and 2 portions of the system) are thought to be increasing as a result of weather and aging. Current estimates of the backlog of deferred maintenance needs (utilizing the national protocol) for the road system in the Red River drainage is 10.5 million dollars.

Right-of-way

Eight Forest Service Roads cross private land; five of these have right-of-way needs. All of these roads are currently open to public use, two of then are collectors, which access several miles of Forest Service Roads, Table 4-35.

Table 4-35 Right of Way Easments

Route	Right - of - Way Status	Location
222	Easement Granted to Department of Agriculture	T28N, R8&9E
1182	No Easement	T28N, R9E
1182A	No Easement	T28N, R9E 4,5,9
TR507A	No Easement	T28N, R9E
234	Easement Granted to Department of Agriculture	T28N, R10E
423	No Easement	T28N, R10E Sec 17
222	Easement Granted to Department of Agriculture	T29N, R8E
1150 0.1-0.2	Recorded Easement with no Title	T27N, R9E Sec 4
1150 0.0-0.1	No Recorded Easement	T27N, R9E Sec 4

Bridges

There are nine Forest Service bridges in the Red River drainage. Most are in good functional condition. The Bridge recommendations are as follows:

The foot bridge between the Red River Ranger Station and the Red River bunkhouses will need work in the future to remain open. This bridge is no longer a high need due to the closing of the Ranger Station and the alternate route across the road bridge, 100 feet down stream of the foot bridge. It is recommended that this bridge be removed rather than replaced.

The Moose Butte bridge is currently adequate to meet the road needs. However, due to age and continuing scour problems, this bridge should be replaced during the next 10 years. Projects in the Moose Butte area should consider adding bridge replacement issues to their analysis.

The Bridge from road 234 to the Ranger Station should be considered for removal and replacement. A diesel spill in the summer of 2002 may have contaminated the fill of one abutment. Engineering recommends the removal, clean up, and replacement of this fill. To do this work the bridge would have to be removed, Engineering recommends replacing this road bridge with a foot bridge (Table 4-36).

Table 4-36 Bridge Summary

STR_NO	Route	MP	Name	MAINT_LEVEL	Traffic Service Level	Built	Str Material	Deck Type	Comments
01170500000 1010	222E	0.1	ADMIN. SITE	3 – Suitable for passenger cars	B – Congested During Heavy Traffic	1965	Timber, sawn, treated	Timber – Treated	Remove-replace with foot bridge
01170500000 0032	1800	0.1	COLE 66	1 – Basic custodial care (closed)	D – Slow Flow or may be blocked	1960	Timber, glulam, treated	Timber – Treated	
01170800000 0108	1803	0	RED RIVER	3 – Suitable for passenger cars	C – Flow interrupted – use limited	1967	Concrete, prestressed	Concrete cast-in-place	
01170500000 0073	1194	0	PFI BRIDGE	3 – Suitable for passenger cars	D – Slow Flow or may be blocked	1969	Timber, sawn, treated	Timber – Treated	
01170500000 0072	1190	0.9	TRAPPER CREEK	3 – Suitable for passenger cars	C – Flow interrupted – use limited	1958	Timber, sawn, treated	Timber – Treated	
01170500000 0069	1150	0.2	MOOSE BUTTE	3 – Suitable for passenger cars	D – Slow Flow or may be blocked	1959	Timber, sawn, treated	Timber – Treated	Scour Problem Replace 2005-2010
01170500000 0071	1172	0.1	SODA CREEK	3 – Suitable for passenger cars	D – Slow Flow or may be blocked	1961	Timber, sawn, treated	Timber – Treated	
01170500000 0057	222E	0.5	ADMIN SITE	3 – Suitable for passenger cars	B – Congested During Heavy Traffic	1971	Timber, sawn, treated	Timber – Treated	
	222E		ADMIN SITE	Trail	Foot Traffic		Timber, sawn, treated	Timber – Treated	Remove
** Additional Bridges exist on the 222 and 234 roads and are under County Jurisdiction.									

Special Uses

There are currently 14 Special Use permits in the Red River area. Some of these may require NEPA to be renewed. Four have already expired and three will expire in the next three years. To better serve the public these permits should be a NEPA priority (Table 4-37).

Table 4-37 Special Uses in Red River

	Township	Range	Section	Use Code	Uses	Auth ID	Auth Expiration Date	Need re-issue
1	28N	8E	1	934	WILDLIFE WATER SUPPLY	ELK-195608	12/31/1999	X
2	28N	9E	7	821	TELEPHONE AND TELEGRAPH LINES	ELK-510101	12/31/2000	X
3	28N	9E	7	642	OTHER UTILITY IMPROVEMENT REA FINANCED	ELK-510202	none	
4	27N	9E	4	923	WATER DIVERSION, WEIR	RED-095201	4/1/2006	
5	28N	9E	7	522	STOCKPILE SITE	RED-100403	none	
6	27N	9E	4	511	CONSTRUCTION CAMPS AND RESIDENCES	RED-195602	none	
7	27N	9E	4	219	MARICULTURE	RED-195605	none	
8	28N	9E	19	915	WATER TRANS. PIPE. LESS THAN 12" DIAM.	RED-195607	12/31/2004	S
9	28N	9E	30	915	WATER TRANS. PIPE. LESS THAN 12" DIAM.	RED-503201	12/31/2000	X
10	28N	9E	33	915	WATER TRANS. PIPE. LESS THAN 12" DIAM.	RED-507801	12/31/2000	X
11	28N	10E	3	133	RESORT	RED-511701	12/31/2008	
12	28N	9E	19	914	WATER TRANS. PIPE. 12" DIAMETER OR MORE	RED-512401	none	
13	28N	10E	17	931	WELL, SPRING, WINDMILL	RED-515301	12/31/2005	S
14	27N	9E	4	158	VENDOR, PEDDLER	RED-520101	12/31/2003	S

4.4.9 Grazing

Historically, grazing varied with wild animal populations and forage levels that changed with plant communities, climate, and predator populations. Presettlement grazing could be locally high, but seldom of long duration. Livestock grazing in the Red River watershed probably began with the Nez Perce Tribe horse herds as early as the 17th century, but there are no records of the actual duration or extent of this activity.

Changes in the management of domestic livestock have occurred on National Forest lands with major reductions in livestock use occurring in the past several decades. Meadows on private land (approximately 2300 acres or less than 3% of the watershed) have been and are currently generally hayed or grazed spring through fall with some feeding of livestock through he winter. In the past, cattle and sheep have dominated livestock numbers, with recently horse and mule numbers sharing a greater part of the use by domestic livestock. Early records show Moose Butte and Otterson Creek Allotments were heavily grazed by livestock. As a result of livestock grazing, changes to plant community composition have occurred on streamside meadows and bunchgrass habitats.

The earliest known record for livestock grazing on National Forest lands within the watershed is for 100 head of cattle in 1922. By the mid 1940s about 185 head of livestock (cattle) were permitted to graze on National Forest lands within the watershed. Previous to the 1950s, grazing occurred in an unregulated manor, with reliable records not available. The mid 1950s say the creation of six allotments on Forest Service managed lands. From the 1950s to mid 1980s records indicate livestock numbers ranged from about 185 to 330 head, with a variable grazing season from mid-June to mid-October. Starting in the 1980s, grazing declined steadily as permits were not renewed.

Currently, on Forest Service managed lands, the Deadwood, Siegel Creek, Red River and Moose Butte Allotments are vacant. Kirk's Fork Allotment is active with one permittee permitted to graze 30 cow/calf pairs from July 1st to September 30th (about 120 Animal Unit Months (AUMs)). The Mallard Creek

Allotment is also active with 100 cow/calf pairs permitted to graze from July 1st to September 30th (about 396 AUMs). To facilitate administration of livestock grazing, allotments for horses and mules were created during the 1950s and 1960s at the Red River corrals and pastures near the Red River Ranger Station.

In recent years, the level of grazing has declined due to loss of forage. This is primarily due to fire suppression and the advancement of succession, which causes a decline in undergrowth and forage. This has shifted grazing out of early seral habitat and into road corridors, seeps and native meadows. In addition to the changes in the forage base, operational expenses have increased as the cost of public land grazing increased. With the rising land values and decreasing beef prices many of the historic grazing areas became uneconomical. Other reasons for decreasing stocking include tighter grazing management requirements, and increasing sensitivity and concerns for the effects of livestock grazing on other resources.

Grazing Capability

Capable grazing lands are areas within the Red River drainage with physical and biological characteristics conducive to livestock grazing. Capability is related to the potential of an area to produce adequate forage and exhibits physical features that will allow livestock grazing. Examples of areas that are not capable include; excessively steep slopes, rock outcrops, habitats with inherently low potential for forage production, and fragile, highly erodible soils.

Forest lands that have a canopy cover of less than 40% (mainly resulting from timber harvest or fire) are considered capable. These areas are considered transitory range that last 20 to 40 years after the disturbance until the canopy becomes reestablished. Today, transitory range is a major source of suitable grazing land in the Red River watershed. In the late 1800s and early 1900s fire created several thousand acres of suitable openings for grazing. These fire scars eventually recovered and reforested, however, by the time they were replaced by mature stands, harvest activity was occurring throughout the watershed. Harvest activity created most of the transitory range that exists in the watershed to date. Most of the harvest activity occurred in the 1960s to the 1980s and little activity has occurred since then. Thus transitory range capable of supporting grazing is declining.

Grazing Suitability

Suitability suggests that forage is not only available and accessible, but that grazing is compatible with other resource values including maintenance of native plant diversity and stability, soil and water resource protection, recovery of aquatic habitats and recreation or other human uses. Grazing suitability varies between management alternatives and changes as a result of emphasis and direction. The suitable acres within Red River watershed reflect the general extent of lands that could be grazed without serious conflict with management emphasis and resource sensitivity. The amount of suitable grazing lands may vary through time due to the scale of future analysis or the development of management alternatives.

Impacts of Grazing

Data on the impacts of grazing in the watershed is limited. Implementation monitoring, driven by the Interagency Implementation Team (IIT) has only been conducted for a few years in active allotments. Current implementation monitoring looks at: livestock distribution patterns, specifically in riparian area; current season impacts of livestock to stream banks; and whether livestock impacts to stream banks are point sources or extend as reaches. Data from this monitoring is used to adapt current and future livestock management. Due to the short time of monitoring and the fact that only minor parts of two allotments are active in the Red River watershed, there is virtually no data available at the present time to examine the long-term impacts of grazing on the watershed.

Though impacts of grazing are not well documented in the watershed, pieces of information exist as portions of other monitoring and surveying efforts. For an understanding of grazing impacts, these pieces of information coupled with professional knowledge and changes in stand structure were examined. Generally grazing impacts are spot-specific, but larger areas of potential grazing impacts may occur.

Surveys and observations have noted livestock from the Mallard Allotment utilizing some areas of transitory range in the Trapper Creek drainage, particularly on road 1150. Some cows frequently leave the allotment and migrate north and west further into the South Fork Red River basin. Specific areas outside of the allotment that have been impacted are the riparian areas of the South Fork, Schooner Creek and portions of the Soda Creek road (1172) and Montana road (468). Livestock from the Kirk's Fork Allotment have been observed to have aquatic impacts on Red Horse Creek. Most of the grazing in the watershed takes place on private land with various undocumented impacts to other resources. Livestock from private land on Trail Creek frequently move onto public land where they have been noted along the North Fork of Red River, Red River Campground, on the Trail Creek/Blackhawk road (423) and on the north end of the Soda Creek road (1172).

Livestock movements in streams, particularly on private ground, may have a harmful impact on spawning or rearing habitat for anadromous fish. Spawning redds may be damaged and sediment from trampled banks may cause a decline habitat quality. Trespassing livestock in the upper tributaries could likewise negatively impact bull trout and other resident fish species.

Livestock also act as dispersal agents for weed species. In addition to physically transporting propagules, ground disturbance caused by livestock provides suitable substrates for the successful establishment and movement of weeds. This disturbance typically follows riparian areas or other natural paths connecting open habitats that may be suitable for the occurrence of significant infestations.