Step 3 - Current Conditions

INTRODUCTION - This step describes the current range, distribution and condition of ecosystem elements. It is organized by Issue as presented in Step 2 and answers Key Questions identified for each issue of this step.

AQUATICS

HILLSLOPE PROCESSES

Key Question 1- What are the dominant hydrologic and erosional characteristics and processes within these watersheds, including impacts of the 1997 flood?

Landslides introduce large volumes of coarse sediment to streams during episodes of intense precipitation. This results in changes in the structure of stream channels and the quality of instream habitat. Episodes of large amounts of sediment production are followed by about 10 years of rapid adjustment of channel geometry. This results in prolonged periods of instability of instream habitat. Erosion of roads and harvested surfaces during typical rain storms contributes to the supply of fine sediment that infiltrates into spawning gravels and increases the turbidity of stream water. Precipitation, stream flow, landslides, rock, and soil qualities are the important elements of slope processes and sediment budgets.

Hydrology

In the central Klamath Mountains, the coastal climatic influence is moderated by the mountains to the west. The annual precipitation during the period of record (1914 to present) at Happy Camp (immediately west of the project area) ranges from 23 to 88 inches, with average annual precipitation of about 51 inches. The precipitation record is from a low-elevation measuring station. There is significant variability in precipitation due to topography, elevation, and proximity to the coast, however there is no record to describe it. The trend of annual precipitation is generally lower to the east, although there may be portions of the analysis area, particularly at higher elevation, that receive more precipitation than Happy Camp. Approximately 90% of the precipitation occurs from October through May from north Pacific cyclonic storms. The remainder occurs during summer thunderstorms. Winter precipitation occurs mainly as snow above 4,000 feet elevation, and mainly as rain below that elevation. Fluctuation of the snow level occasionally results in rain causing rapid snow melt.

PRECIPITATION

The precipitation record is characterized by two distinct climate trends (**Table 3-1**). These alternating periods of wet and dry conditions lasted for a few decades. The short duration of the record and irregular nature of climatic change preclude forecasting of these periods. The drier periods are of approximately 40 inches average annual precipitation, the wetter are of approximately 60 inches. The Happy Camp record, along with longer records from Eureka and other stations in northwestern California, indicate that the period 1870 to 1910 was a wet time; 1911 to 1937 dry; 1938 to 1975 wet; 1976 to 1994 dry and 1995 to present wet. Intense precipitation of 1982-83 and 1997 are related to strong El Niño effects. The probability of occurrence of rare, intense storms is higher during the wet periods.

Table 3-1 Number of Years in Annual Precipitation Ranges Showing Climatic Trends, 1915-1999, Happy Camp, California

INCHES	1915-1937	1938-1975	1976-1994	1995-1999*	TOTAL
20-30	3	0	1	0	4
30-40	10	5	8	0	23
40-50	6	6	3	0	15
50-60	3	12	4	0	19
60-70	1	7	1	4	13
70-80	0	3	0	1	4
80-90	0	4	2	0	6
Avg. Precipitation In Inches	40.6	57.6	48.8	67.0	51.2

Range of Observations: 23.3-88.5 40.6 inches.
*Data for water year 1999 are incomplete.

The occurrence of landslides is strongly influenced by climate and weather. The scale of precipitation intensity associated with landslide activity ranges from hours to decades. Most of the landslide activity of the last 75 years occurred with the close of the 1938 to 1975 wet period. Many landslides were reactivated by intense precipitation during 1982 and 1983. Debris slides and debris flow landslides may also be activated by intense summer thunderstorms. Numerous landslides, some inactive since 1974, were again active in association with the New Year's flood of 1996-97. Most of the active earthflow

landslides move in years of above average (51 inches) annual precipitation; that is they are active about one out of two years. There are a few prolonged periods of little earthflow landslide movement, the last being from 1987 to 1994.

STREAM FLOW

Water quality of streams in the analysis area is very good. Turbidity is very low, except during times of intense precipitation when surface erosion and landslide activity is high. Damage to riparian vegetation by 1987 wildfires was limited and has recovered. The water quality data available includes a 42 year record of average daily discharge for Indian Creek, a 30 year record of daily turbidity in Elk Creek, and undocumented observations of turbid flow**.** Both Indian and Elk Creeks are located adjacent to and west of the analysis area, but are roughly representative of stream conditions in the analysis area.

Streams in the project area are high-gradient, coarse-bedded and, due to uplift of the region, erosion dominated. Channels typically run in steep, narrow gorges. Although influenced by large landslides and bedrock structure and composition, channel patterns are dendritic. Except for broad, coarse alluvial deposits in the vicinity of the mouth of Seiad and Grider Creeks, relatively little sediment is stored in stream channels. Channels are typically cut in bedrock. In the Old Landslide Terrane, channel banks are commonly of earthflow landslide deposits, so there is very little mechanical resistance of bedrock. Stream channels in the assessment area are similar to those described by Grant (1986) and Grant and others (1990) in west-central Oregon. Most of the coarse sediment generated to stream channels is delivered by landsliding. Fine sediment is generated by surface erosion of disturbed areas, as well as landsliding.

In Indian Creek, summer low flows are about 40 cubic feet per second (CFS). The average flow (exceeded 50% of the time) is about 400 CFS. Storm flow (with a return probability of once in a few years) is about 4,000 CFS. The peak discharge during the flood of 1964 is estimated to be 40,000 CFS. Roughly half of the total discharge of the streams occurs in close association with storms. The remainder is delayed by movement through soil and bedrock, emerging at springs. Poorly integrated drainage networks and thick soil in Old Landslide Terrane result in less efficient drainage. The steep slopes, thin soils, and well integrated drainage of the Metasedimentary Terrane result in more efficient drainage. Since flood data has been collected only in the last few decades, statistical analyses have a high degree of uncertainty. Several floods in the past few hundred years have been of a magnitude similar to the 1964 flood. These events have been documented from the study of flood deposits in the Klamath River and other nearby basins. The Indian Creek stream gage recorded peak flood discharge in the range of 10,000 to 20,000 CFS in 1971, 1972 (three events), 1974, 1980, and 1982. Such events are substantially more frequent during wet trends (as described in the Precipitation section above). Coghlan (1984) concluded that the return probability of a 1964-style precipitation event, and thus flooding, would occur once in 45-50 years. He estimated a return probability of once every 25-30 years for 1955 and 1997-style flood events (about 20,000 CFS peak discharge in Indian Creek) during wet trends.

In the long-term, stream discharge, driven by average annual rainfall of 51 inches, provides erosional power that exceeds that necessary to transport the sediment delivered to channels. Sediment is generated and transported primarily during peak stream-discharge events. There are two important aspects of this general behavior that are most relevant to the assessment of effects: 1) Infiltration of fine sediment (either in traction or suspension) into spaces in the coarse framework of the channel bed, and 2) deposition of coarse sediment and included fine sediment delivered by landslides. Fine sediment generation and transport events are seen a number times every year in the Elk Creek record. Turbid storm-flow occurs about 5% of the time. Storm-flow turbidity typically lasts a few hours to a few days after cessation of rainfall. The coarse fraction is less easily transported and may be temporarily stored in stream channels as bars, terraces and debris jams (Lisle 1987) and local alluvial plains. Madej (1987) found the residence time of coarse sediment in Redwood Creek to be on the order of decades for active alluvium and hundreds to thousands of years for alluvium stored in older stream terrace deposits. In a study of stream bed elevation from U.S. Geological Survey stream gages, Lisle (1981) found a decade of high rate of channel bed adjustment to the large input of sediment from the 1964 flood event.

One of the delivery mechanisms of coarse woody debris (tree stems, roots, and branches) to stream channels is by debris flow from adjacent slopes. Such material often accumulates as debris jams that form in first through fifth order streams. Temporary dams formed by landslide deposits or debris jams in channels have occurred at Murder's Bar (circa 1955), Nordheimer Flat (1964), North Russian Creek (circa 1974) of the Salmon River (Klamath Mountains) (Juan de la Fuente, personal communication 1989) and at Happy Camp (1964). Such dams occur on a variety of scales and may fail suddenly, resulting in floods.

THE FLOOD OF NEW YEARS DAY, 1997

September and October 1996 had slightly less precipitation than average at stations across southwestern Oregon and northwestern California. As the end of the year approached, temperatures were warmer than average and the water equivalent in the snow pack was less than average. Preparation for flood conditions commenced during the second week of December, when 13 inches of precipitation occurred at Happy Camp. This storm series soaked the soil, setting up the area for rapid run-off. After a break in the third week of December, 14 inches of warm rain, out of the west, fell in a series of storms culminating on January 1, 1997.

The U.S. Geological Survey, Water Resources Division maintains a stream gauge about 4 miles upstream of the mouth of Indian Creek. Their preliminary estimate of the peak discharge, which came in the early evening of January 1, 1997, is 17,000 CFS. This is about 50% of the discharge of the flood of 1964, 80% of the flood of 1955, and about the same as the flood of 1974. The difference between the flood of 1997 and that of 1964 is largely explained by the smaller amount of snow on the ground in 1997.

The pattern of landslides from intense precipitation associated with the 1997 flood is consistent with previous hazard assessments. Many earthflow landslides and attending debris slides in Dormant Landslide Terrane were activated, some which had not been active since 1974. Deeply weathered and dissected soils in Granitic Terrane were prolific producers of debris slides and debris flows (mudflows). Road fill failure and landslides associated with road cuts and road drainage make up a substantial portion of sediment production in the Indian Creek basin. Stream channels were extensively altered. Large amounts of sediment was delivered to channels. The finer portion of the sediment flux continues to be reworked and is expected to do so for the following ten years. Riparian vegetation was extensively damaged.

Large amounts of coarse sediment was deposited at the mouth of Thompson, Seiad and Walker Creeks. These deposits occur as a result of channel widening where the streams enter the broad Klamath River channel. Such deposits cause wandering of the stream channels and channel-bank erosion.

Geology

Bedrock in the analysis area consists of complex, metamorphosed, marine volcanic, and sedimentary rocks that were deposited on mafic and ultramafic igneous, oceanic basement. The rocks were strongly deformed, rapidly uplifted, and deeply eroded. The processes of uplift and erosion continue today.

The topography consists of steep slopes (greater than 55%), and dispersed flats up to about 500 acres in size on moderate slope gradients (less than 55%). Soils on the steep slopes are thin in comparison with the thick soils on the benches. Differences in the effects of gravity and hydrology between these two slope classes result in strong contrasts in landslide and erosion processes.

GEOMORPHIC TERRANES

Geomorphic Terranes are identified by differences in bedrock composition, topography and geomorphic history (see **Figure 3-1** Geomorphic Terranes). Geomorphic Terranes are the units used in describing and analyzing landslide risks. There are strong patterns in the response of how different geomorphic terranes respond to different management activities.

DORMANT LANDSLIDE AND RESIDUAL SOIL TERRANE (Qols)

This Terrane occupies about 20% of the project area. This terrane is composed of very thick (greater than 10 feet), typically red, fine-grained, cohesive soils. The soils of this terrane formed more than 50,000 years ago. Due to recent (within the last 10,000 years) incision by the river system, this terrane has been under-cut and is presently rapidly wasting by landslides and erosion. Much of the area of this terrane has been involved in very large (up to a square mile) earthflow-slump landslides. Bedrock is extensively covered by these deposits. Blocks of rock in soil are composed of mafic, ultramafic igneous rocks and, less commonly, metasedimentary and granitic rocks. Slope gradients range from 5% to 85%. The average slope gradient is about 45%. Small portions of this terrane are involved in earthflow landslides, typically active during wetter years.

Active earthflows in the analysis area are recognizable by stands where trees are tilted from vertical and there are distinctive, hummocky land forms. Soil moisture in active landslides is typically high. Road construction can locally activate or accelerate activity of these landslides by altering drainage and/or the distribution of mass on the slope. The potential for this type of landslide is readily recognizable during project planning and assessment. In general, earthflows found in this terrane are not feasibly stabilized. Cohesive soils of this terrane generally make good road fill. The risk of landslides of fill associated with roads can be

substantially reduced by controlled compaction of fill and drainage design.

METAMORPHIC TERRANE (msv)

This Terrane occupies about 45% of the project area. It consists of metamorphosed marine sedimentary, volcanic, and plutonic rocks with thin (less than three feet) cohesive and granular "rocky" soils. Landslides in this terrane typically involve thin, coarse soil mantles. Slope gradients range from 60% to 85%, with the average about 70%. Also found are debris slides and slumps that originate in old landslide deposits, that are too small to be mapped as Old Landslide Terrane. Although there are patterns to the occurrence of landslides, the large number of potential sites and the low short-term probability of occurrence at any given site make them difficult to predict. Natural landslides often occur in soil accumulated at the head of draws (also known as zero-order basins) and along stream channels in soil accumulated from up-slope. Road-associated landslides occur in fill and cut slopes.

Cohesive soils of this terrane generally make good road fill. The risk of landslides involving fill can be substantially reduced by controlled compaction of fill and drainage design. Locally, coarse soil formed of fractured metasedimentary rock is associated with instability of road cuts and fill. Landslides associated with regeneration harvest may occur at sites subject to natural landslides and where surface drainage has been altered or soil structure disturbed.

GRANITIC TERRANE (gr)

This terrane occupies about 13% of the project area. It consists of silicic (granodiorite, diorite) granitic rock. Soils are thin to thick. Slope gradients range from 45% to 85%, and average about 60%. Thick, soft, cohesive, and loose granular residual soils occur in elevational belts that are genetically related with the deep, red soils of Old Landslide Terrane. Portions of the Grider and Walker basins have thick granular soils on granodiorite that are very susceptible to debris sliding. Some of the soils found in this terrane do not make good fill, but may be stabilized by mixing with cohesive soil, designed drainage, and structural stabilization measures.

ULTRAMAFIC TERRANE (um)

This terrane occupies about 10% of the project area. The bedrock of this terrane consists of peridotite and serpentinite. Serpentinite is locally intensely fractured, thus susceptible to debris sliding. Slumps occur in the deep, cohesive soils that form as a result of increased susceptibility to chemical weathering of the bedrock. Cohesive soils of this terrane generally make good road fill. The risk of landslides involving fill can be substantially reduced by controlled compaction of fill and drainage design. Locally, intensely fractured serpentine rock is associated with instability of road cuts and fill. These may be stabilized with designed drainage and structural measures.

ACTIVE LANDSLIDES

Landslides include a continuous variety of discrete movements of bodies of soil, rock, and organic debris under the influence of gravity. Most commonly, movement is initiated as a result of reduction in strength and increase in stress by water saturation. Most landslides occur in response to drainage, intense rainfall, or melting snow, but are always of multiple causes. Typical causes include soil strength reduced by water saturation and pore pressure, redistribution of mass by natural processes or management activities, the existence of dormant natural landslides, and earthquakes. Landslides are distinguished by mechanical style of movement (**Table 3-2** Description and Comparison of Common Landslides) and as being natural, natural influenced by management activities, and management-related. Earthflow landslides are readily recognizable by leaning and deformed trees in moist, low-lying soil. Fill failure is the common management-related landslide. Fill failure is readily controlled by soil compaction and drainage design.

Table 3-2 Description and Comparison of Common Landslides

LANDSLIDE TYPE	VOLUME (Cubic Yards)	MOVEMENT RATE (Distance/Time)	TOPOGRAPHIC POSITION
Debris Slide	Ten to Tens of Thousands	Feet Per Minute to Feet Per Day	Topographic Hollows on Slopes, Foot of Slump, or Earthflow
Debris Flow	Tens to Thousands	Feet Per Second	Topographic Draws and Channels
Slump	Tens to Tens of Thousands	Feet Per Day to Feet Per Year	Channel Margin and in Earthflows
Earthflow	Thousands to Millions	Feet Per Year	Old Landslide Deposits, in Colluvium of Canyon Bottoms

Figure 3-1 Geomorphic Terranes and Geologic Hazards, shows many of the most recently active landslides in the assessment area. Most are the result of storm-related landslide events of the years 1955 to 1975, 1982 to 1986, and 1997. Many of the landslides mapped are debris slides of shallow soil on steep slopes. Such shallow slides are less likely to be reactivated at the same site. Although there are patterns in occurrence of debris slides, prediction at a site is not feasible. Similar landslides occur at new sites under similar precipitation conditions, at rates that may be approximated by past experience under similar conditions. Some of the landslides are

debris slides that occurred on earthflow landslides reactivated at the same site. Earthflow landslides are the smallest number of all the mapped landslides, but are large and reactivated by more intense precipitation, typically in one out of two years. Earthflow landslides are significant contributors of landslide material to streams. These landslides are located on Old Landslide Terrane. The known earthflows are monitored for activity, abatement opportunities, and for potential adverse effects of proposed activities.

In the Thompson Creek, China Creek, and upper Walker Creek basins, extensive deposits of the Dormant Landslide and Residual Soil Terrane are found. Many large, active earthflow landslides are found in this terrane. Movement of some of the landslides that produced large quantities of sediment to these streams in the Flood of 1997 is associated with roads. Extensive Granitic Terrane is found in Grider and Walker Creek basins. Some of the sandy, low cohesion soils that form on granitic rocks make road fill that is difficult to stabilize.

Cave Resources

Caves exist in marble within the Thompson, Grider, and upper Seiad watersheds. Additional caves occur on private lands near the mouth of China Creek. The marble bodies range from a few acres in size, up to several hundred acres in Grider Creek. Caves provide unique habitat, and frequently harbor endemic species of flora and fauna. They often contain sediments which provide the opportunity to study past climate. Such studies are underway in Oregon Caves National Monument, a few miles to the north of the project area. Significant paleontologic resources have been discovered there, including remains of jaguars and bears.

Caves are subject to damage from vandalism and ground-disturbing activities. Road construction, timber harvest, and grazing can introduce sediment directly into caves. The Federal Cave Resources Protection Act of 1988 directs Federal agencies to protect cave resources on public land and maintain the confidentiality of information on cave locations.

Grider Creek**-** Extensive marble outcrops (some of the largest on the Forest) occur in the Grider Creek watershed on the east flank of Grider Ridge, and dip to the west. They also cross Grider Creek and may affect late summer flows and temperatures. A few small caves have been identified, however, detailed geologic mapping of the marble has not been conducted in this area, and it has not been systematically inventoried for cave resources. The small caves identified to date have not been assessed to determine if they meet significance criteria of the Federal Cave Resources Protection Act.

Thompson Creek**-** Scorpion Cave lies within the Thompson Creek watershed, and has been determined "significant" under the criteria of the Federal Cave Resources Protection Act. This cave has had an operating plan in effect since the late 1970s. The cave is very sensitive to disturbance and recreational visits are not allowed. Visits are designed with specific objectives to monitor, inventory. The Southern Oregon Grotto, an affiliate of the National Speleological Society, recently completed a photo monitoring project where they took a number of photos at the same locations of those taken in the early 1970s.

China Creek Area**-** Caves occur on private land near the mouth of China Creek. The marble extends on to National Forest lands, but no caves are known to exist there. The area has not been systematically inventoried for cave resources.

Seiad Creek**-** The Red Buttes Karst contains numerous significant caves on the Rogue River side of the drainage divide near the headwaters of Seiad and Portuguese Creeks. The marble crops out in the project area as a dip slope in the glaciated valleys to the north. A small sinkhole is known, but it has not been evaluated for significance. Grazing has been identified as having a potential adverse effect on caves to the north. This is due to the presence of cattle in the meadows which drain directly into the caves. A letter was received by the Forest Cave Coordinator and the Happy Camp District in 1999 raising this issue once more. It has been raised numerous times in the past. The area has not been systematically inventoried for cave resources.

Key Question 2- What parts of the watershed are considered Areas with Watershed Concerns (AWWCs) in the *Forest Plan* and what additional areas will be evaluated in the process? What parameters are used to make this determination?

The *Record of Decision* for the *Forest Plan* identifies Areas with Watershed Concerns (AWWCs) across the Klamath National Forest. Areas with Watershed Concerns represent drainages where cumulative watershed effects are a special concern due to a combination of high disturbance levels (roads, harvest, fire), potential for landsliding, surface erosion, and degraded aquatic conditions. An AWWCs determination puts restrictions on additional land-disturbing activities, specifically timber harvest, on the National Forest lands until an analysis of the watershed is completed. *Forest Plan* AWWCs were determined along compartment boundaries which do

not correspond well with the seventh field subwatershed delineations used for this watershed analysis. AWWCs within the Thompson/Seiad/Grider seventh field subwatersheds include all of the Fort Goff, Portuguese, China, and Walker subwatersheds, and parts of the Cedar/Morgan, Mill/Slide, Ladds/Tims, West Grider/Bittenbender, Seattle/Joe Miles, Caroline, and Horse/Cade subwatersheds (see **Figure 3-2**).

The strategy for a watershed-scale review of AWWCs is to re-evaluate all subwatersheds including those that overlap *Forest Plan* AWWCs. Watershed conditions, processes, and functions are examined for all subwatersheds, and recommendations are made for future management. Determination through watershed analysis that an area has watershed concerns is not a planning decision. The determination advises managers that a subwatershed may not meet *Aquatic Conservation Strategy* (*ACS*) objectives if additional land disturbance occurs. Future analyses will determine the state of recovery for those areas with cumulative watershed effects concerns.

Acres of timber harvest, acres of wildfire, and roaded acres are displayed in **Table 3-3** Watershed Disturbance Summary, for each analysis subwatershed. Watershed disturbances are also displayed in **Figure 3-3** Watershed Disturbances, contained in the map packet located at the end of this document.

The timber harvest acreages reported consist of intensive harvest areas derived from the Forest's Existing Vegetation Layer using plantations from regeneration harvest. In **Table 3-3**, harvest is grouped into five categories, based on the year harvested. Harvest acreages include National Forest lands only, and do not include timber harvest that may have occurred on private lands. Generally, harvest recovery becomes significant after about twenty years and nearly recovered after forty years. In the analysis area, the oldest plantations originated in 1958.

Wildfire acreage reported in **Table 3-3** is from the burn intensity mapping of the 1987 fires. Only moderate and high burn intensity acreage is counted. Older fires, previous to 1987, are considered recovered in this analysis. Fire burn intensity mapping occurs across land ownership patterns.

Roaded acres are based on a road prism width of 12 meters, or 39.17 feet. This width was chosen based on average road widths by slope class and engineering standard schematic road prism profiles. It is also similar to the 40-foot width used in the Salmon Sediment Analysis (de la Fuente and Haessig 1994), on which mass-wasting coefficients were based. Roads acreages displayed in **Table 3-3** encompass all roads in the analysis area. Included are roads extending into private lands and roads under County, State and private jurisdiction.

Watershed disturbance acreages were calculated chronologically, with the most recent disturbance "masking" older disturbances in the same area. In addition, roaded acres mask all other disturbances, therefore, areas are not double-counted. For example, areas burned in the 1987 fires, then salvaged and planted, are not counted as wildfire acreage but are counted as 1988 to 1994 intensive timber harvest.

Table 3-3 Watershed Disturbance Summary

Subwatershed Name	Total Acres	Acres Undisturbed	Ac Harvested 1958-1967	Ac Harvested 1968-1977	Ac Harvested 1978-1987	Ac Burned 1987 Fires	Ac Harvested 1988-1994	Ac Harvest 1995-1998	Ac of Roads
Canyon Creek	4,289	2,053	0	0	0	2,235	0	0	1
Caroline	1,989	1,918	14	0	0	0	0	5	52
Cedar/Morgan	9,200	7,110	90	304	1	1,080	228	300	88
China Creek	6,190	3,122	634	114	0	161	863	43	254
Cliff Valley	5,043	4,206	342	14	0	390	5	8	78
Fort Goff Creek	8,281	3,485	0	0	0	4,786	10	1	1
Horse/Cade	12,923	7,768	207	185	11	1,351	2,289	669	443
Ladds/Tims	4,743	3,233	25	288	1	916	174	39	67
Lower Grider Creek	9,613	7,206	67	251	0	1,753	227	13	96
Lower Seiad Creek	3,540	1,788	0	0	0	1,709	0	18	26
Mill/Slide	5,575	984	953	1,838	26	1,306	90	232	146
O'Neil/Schutts	8,224	7,484	192	30	147	2	155	37	177
Panther	3,734	2,628	0	0	0	568	424	23	90
Portuguese Creek	5,605	2,476	0	0	0	3,022	0	103	4
Rancheria Creek	4,398	1,961	5	86	69	1,505	572	154	46
Seattle/Joe Miles	6,270	4,299	70	800	0	524	318	145	113
Tom Martin/Kuntz	13,788	12,842	304	241	1,019	9	102	13	169
Upper Grider Creek	8,493	8,139	1	157	18	44	90	6	37
Upper Seiad Creek	6,896	2,934	15	0	99	2,015	1,742	0	91
Upper Thompson Creek	8,401	8,063	0	0	3	123	143	43	26
Walker Creek	7,623	5,122	778	44	12	325	813	314	215
West Grider/Bittenbender	4,145	2,946	390	29	95	261	302	3	120

RIPARIAN AREAS

1- What are the current stream channel characteristics and aquatic species habitat conditions?

Much of the Thompson/Seiad/Grider analysis area is rainfall dominated. Streamflows and the maintenance of cool water during the hot dry season are sustained primarily by groundwater inputs. Large areas of dormant landslide terrain, typically composed of deep red soils, function as a sponge in storing and slowly releasing large quantities of water. Most of the subwatersheds in the analysis area generally have streams that flow dependably all year long, with relatively high baseflows and good to excellent water quality. Most named creeks in the analysis area support fish in their lower reaches before the channel gradient gets too high and upstream passage becomes restricted by waterfalls or debris jams in constricted channels. More detailed analysis area stream information is presented in **Table 3-4** Fish Habitat Parameters.

Table 3-4 Fish Habitat Parameters 1/

Stream Name	Pool Frequency (pools/mile) 1/	Average Max Pool Depth (ft.) 2/	% Canopy Closure 3/	% Total Instream Cover 4/	LWM (pieces/mi.) 5/	% Substrate Composition 6/					% Embeddedness
						Bedrock	Boulder	Cobble	Gravel	Fines	
China Creek	27	2.4	86	30	6.0	9	26	22	32	11	23
Seiad Creek	19	3.1	62	22	3.3	11	24	27	27	11	19
Thompson Creek	13	3.7	66	27	13.0	4	26	12	41	17	36
Walker Creek	7	2.8	27	54	3.8	6	14	26	37	17	18
Grider Creek	9	3.8	40	24	6.0	8	26	14	35	17	31
Horse Creek	-	0.6	93	-	-	0	2	86	7	5	-
Portuguese Creek	20	3.4	54	39	-	11	34	20	24	11	51
Fort Goff Creek	36	2.9	55	48	-	6	34	34	18	8	53

- = No Data

1/ Pool Frequency: Pool frequency is the number of pools per mile of stream. Bankfull channel widths were not measured in some of the creeks which precluded calculation of this metric as pools per multiples of channel width. Pool frequencies in Thompson/Seiad/Grider streams are generally in line with Wooley and Dillon reference pool frequencies of 12 pools per mile, with the exception of Walker and Grider Creeks. Average pool frequencies ranged from as high as 36 per mile to as low as seven per mile.

2/ Maximum Pool Depth: Maximum pool depth is the deepest point measured in each pool. Average maximum pool depths in assessment area streams varied from 0.6 in Horse Creek to 3.8 in Grider Creek.

3/ Canopy Cover: Canopy closure is a measure of the amount of stream shading provided by riparian vegetation (and to a lesser extent - topographic features). Canopy closure is high (>80% - *Forest Plan*) in China and Horse Creeks. Perhaps an explanation for the overall low stream shading in the other streams is due to channel impacts from the 1997 flood.

4/ Instream Cover: Instream cover is used by fish for shelter and hiding. Instream cover was estimated in pool habitats and was found to be provided primarily by boulders, white water, and larger pieces of wood. Terrestrial and aquatic vegetation, small woody material, and undercut banks made up only a small proportion of the instream cover in most assessment area streams.

5/ Large Woody Material (LWM): For this assessment, large woody material (LWM) is defined as pieces of wood at least 24" in diameter and at least 50' long. The Thompson/Seiad/Grider streams had between 3.3 pieces of LWM per mile in Seiad Creek and 13.0 pieces of LWM per mile in Thompson Creek. Amounts of LWM in all streams was well below the *Forest Plan* criteria of at least 100/mile.

6/ Substrate Composition: Percent fines and percent cobble embeddedness are standard metrics of substrate quality that were estimated during stream surveys. Fines in spawning gravels of assessment area streams varied moderately from 5 - 17%. Embeddedness ranged from 18- 53%. The amount of fines and degree of embeddedness in some of the Thompson/Seiad/Grider streams is high and generally exceeds the *Forest Plan* criteria maximum of <15% fines and<20% embeddedness.

Klamath River Water Quality

In most rivers, water quality decreases steadily as it flows downstream. Many parameters of water quality in the Klamath River are maintained or actually improved as the river flows downstream of Seiad Valley and is diluted by cool high quality water from numerous tributaries.

Water originating from the upper Klamath Basin and the Shasta and Scott Valleys is often of poor quality in summer because of agricultural water diversions, pollution from agricultural runoff (animal wastes, fertilizers, pesticides, herbicides), impoundment behind dams, and industrial discharge. This sometimes results in increased water temperature, depletion of dissolved oxygen, increases in toxic substances (such as ammonia and phosphorus), and other factors that can make the river environment intolerable for salmon, steelhead, and other species. Pure cool water from Thompson/Seiad/Grider subwatersheds is important, and may be critical, in maintaining water quality in the Klamath River and providing thermal refugia for fish.

Water temperatures in the mid- and lower-Klamath River approach 80°F in some summers, and occasional fish kills are reported. For salmonids, temperatures above 72°F begin to cause stress, cessation of growth, and increased susceptibility to diseases. In the summer of 1997, the Klamath River was very warm. A maximum temperature of 81°F

was recorded in the Klamath River approximately five miles downriver of Happy Camp. Widespread fish kills occurred concurrently with high water temperatures from Seiad Valley to Weitchpec. The epizootic die-off that occurred involved Chinook salmon, steelhead trout, suckers, and sculpins. The pathogens were several species of parasitic snails and/or various bacteria. The commonality between pathogens was that all were commonly found organisms in freshwater that are normally benign except when water quality is poor, particularly when water temperatures are high. Fish pathologist Gary Hendrickson of Oregon State University examined fish mortalities from the Klamath River in the summer of 1997 and had these comments in his report:

"Based on my experience, I would **speculate** (and it is only speculation) that fish in the Klamath River are being stressed, probably by poor water quality. The most likely problems are high temperatures, low flows, low dissolved oxygen, and high ammonia. Fish of course try to maintain homeostasis [internal balance]. More stress means that more energy is required to maintain homeostasis. This energy is attained by shorting' other requirements, including the immune system. Consequently, ubiquitous bugs can become a problem. Unfortunately, these water quality parameters also favor completion of certain parasite life cycles which only exacerbates the problem."

Key Question 2- What is the extent of interim Riparian Reserves, and how are they defined?

Riparian Reserves are a land allocation, applicable to National Forest lands and defined in the *Forest Plan.* As mapped in this stage of the analysis, Riparian Reserves include the geomorphic types of active landslides, inner gorges, and toe zones of dormant slides. They also include the extent of water bodies and wetlands, 340 foot buffers (two site potential tree heights for this area) on each side of fish-bearing streams and around lakes and natural ponds, 170 foot buffers (one site potential tree height) on each side of non fish-bearing perennial streams, around wetlands greater than one acre, and on each side of intermittent streams. The geomorphic types are as mapped on the geomorphic terranes coverage, update version December, 1997. The lakes, ponds, and wetlands used for Riparian Reserve boundaries include those mapped on USGS 1:24,000 quadrangle maps. The streams include those on 1:24,000 maps with additional streams added based on computer modeling, assuming a stream begins with twenty acres of accumulation.

The Riparian Reserve mapping used at this stage of the analysis depends on the interim Riparian Reserve guidelines in the *Forest Plan* and the unstable land and water feature mapping available when this analysis began. The geomorphic and stream mapping is not perfect; updates are required for project level analysis. Step 5 of this analysis will discuss the probable extent of Riparian Reserves, including more refined components, not yet mapped at this stage.

The extent of lands currently mapped as Riparian Reserves, including all land allocations and private lands, are displayed in **Figure 3-4** Pre-Analysis Riparian Reserves, contained in the Map Packet located at the end of this document. In total, about 38,523 acres are mapped as Riparian Reserves in the watershed. Of these, 4,673 acres of Riparian Reserves are mapped within Matrix lands which includes Retention, Partial Retention, Recreational River, and General Forest (excluding those riparian areas on private lands or within National Forest Wilderness, LSR, Special Habitat, or Special Management land allocations). Riparian Reserve types are displayed in order of precedence with active slides masking inner gorges which mask toe zones. All unstable land types mask buffers on streams, lakes, or wetlands. Using this order of precedence, about 3% (1,197 acres) of the interim Riparian Reserve is active landslides, 5% (21,089 acres) is inner gorge, 1% (409 acres) is toe zone, and 41% (15,828 acres) is buffers on water bodies.

Aquatic Dependent Species

Key Question 1- What is the distribution and population size of anadromous and resident salmonid species? What is the status and role of non-salmonid aquatic dependent species?

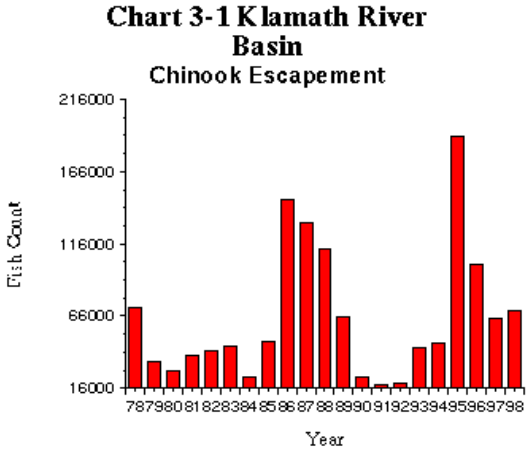
The analysis area provides approximately 80 miles of anadromous habitat for fall and spring-run Chinook salmon, winter and summer run steelhead, winter coho salmon, and Pacific lamprey. There are approximately 36 additional miles of habitat provided for other native fish species including rainbow trout, speckled dace, Klamath small scaled sucker, marbled sculpin, and Pacific brook lamprey. Non-native species including brown bullhead, green sunfish, and yellow perch have been observed in portions of the Klamath River (see **Figure 3-5** Fish Species Range, contained in the Map Packet located at the end of this document).

The analysis area provides critical spawning, rearing and holding habitat for both adult and juvenile fish. The presence and timing of the anadromous fish species in the watershed are listed in **Table 3-5** Adult Fish Species.

Table 3-5 Adult Fish Species	
ADULT SPECIES	**MONTHS PRESENT**
Spring chinook salmon	From July through October
Fall chinook salmon	From October through early December
Coho salmon	From December through January
Summer steelhead	From July through May
Winter steelhead	From November through May
Pacific lamprey	From April through June

Anadromous young are found within the landscape year-round. Steelhead juveniles remain in the system up to three years and lamprey young (*ammocoetes*) remain up to seven years before outmigrating to the ocean. Most coho juveniles prefer to remain within freshwater for about one year before moving into the ocean; apparently a very low percentage of Chinook juveniles will do likewise (Olson 1996). Most Chinook juveniles appear to move out of Klamath River tributaries the first summer after emerging as fry from gravels.

Within the last five years, the spawning population of Chinook salmon has ranged from 47,100 to 190,700 fish (Pacific Fisheries Management Council 1999). Severe fluctuations in populations have been occurring since 1955. Overall, coho and steelhead populations are believed to be following the same trends (CH2MHill 1985). **Chart 3-1** Klamath River Basin Chinook Escapement, shown below, displays the population trend of Chinook salmon in the Klamath River basin from 1978 to the present.



Key Question 2- What aquatic dependent species are threatened, endangered, proposed, petitioned, or sensitive?

The Klamath Mountain Province Evolutionarily Significant Unit (ESU) of Steelhead, including both the summer and winter run, has been given candidate status under the *Endangered Species Act* (ESA). Summer steelhead and spring chinook are Regional Forester-designated sensitive species. The Southern Oregon/Northern California Province ESU of coho salmon has been designated threatened under the ESA. The Southern Oregon and California Coastal ESU has been proposed for Threatened status under the ESA. Pacific lamprey and Western pond turtles are both State of California species of special concern. Northwestern pond turtles are also Regional Forester-designated sensitive species.

Key Question 3- To what extent does Thompson/Seiad/Grider anadromous fish populations contribute to Klamath River basin fisheries?

From information gathered during stream surveys anadromous populations are found only in the lowest reaches of Cade, Canyon, China, Fort Goff, Grider, Horse, Macks, O'Neil, Panther, Portuguese, Seiad, Thompson, Tom Martin, Walker, and West Grider Creeks.

The smaller, steep, bedrock-dominated, stream systems found within the analysis area are generally more suited to resident trout populations than to anadromous species. However, these streams are important to anadromous populations because of the high quality, cool water they provide to the Klamath River system.

TERRESTRIAL

FIRE

Key Question 1a- What are the current vegetation communities found in the analysis area and what is their distribution?

For this analysis area, The Forest Vegetation Layer provides information on seral stage, tree size, tree cover, primary species, and secondary species.

From the Forest Vegetation Layer, the Analysis Team derived nineteen vegetation communities to represent the existing vegetation patterns within the analysis area (see **Figure 3-6** Existing Vegetation, contained in the Map Packet located at the end of this document). **Table 3-6** Acreage and Percentage by Vegetation Community, identifies the acreage within each of these communities and the percentage of the analysis area occupied by each.

Table 3-6 Acreage and Percentage by Vegetation Community		
Vegetation Community	**Acres**	**% of Watershed**
Sub-Alpine Conifer	620	<1
True Fir	6,325	4
White Fir/Mixed Conifer	8,920	6
Douglas-Fir/Mixed Conifer	77,365	52
Douglas-Fir/Tanoak/Mixed Conifer	110	<1
Douglas-Fir/Canyon Live Oak	110	<1
Sugar Pine Overstory/Mixed Conifer	3,220	2
Ponderosa Pine/Mixed Conifer	14,390	10
Ponderosa Pine/ Canyon Live Oak	900	<1
Ultramafic Mixed Conifer	325	<1
Oak Woodland	2,780	2
Canyon Live Oak	11,895	8
Montane Chaparral	10,650	7
Pacific Madrone/Mixed Conifer	1,215	1
Under-Stocked Plantations	1,615	1
Knobcone Pine/Mixed Conifer	2,470	2
Riparian Shrub	1,820	1
Montane Meadow	1,225	1
Barren Area	175	<1
Water	1,360	1
Non-Forest	840	<1
Total	**148,330**	**100**

The **Subalpine Conifer Community** is found at the highest elevations of the analysis area, with most found at the headwaters of Grider Creek. The largest blocks are found within the Marble Mountain Wilderness Area. The subalpine forest is characterized by glaciated slopes with thin soils and abundant moisture. Nearly barren slopes are common, although a variety of high elevation species are found scattered in the community. The harsh sites and short growing season often limit conifer size and density. The principal overstory species are red fir, mountain hemlock, western white pine, foxtail pine, and white fir. The understory can consist of oceanspray, Drummond pasque flower, pinemat manzanita, and quill-leaved *lewisia*. **Table 3-7** Subalpine Conifer Seral Stages, displays acres and percentage of community for each seral stage.

Table 3-7 Subalpine Conifer Seral Stages		
Seral Stage	**Acres**	**% of Community**
Shrub/Forb	0	0
Pole	35	6
Early-Mature	82	13
Mid-Mature	298	48
Late-Mature/Old-Growth	205	33

The **True Fir Community** is found on good sites at high elevations (typically above 5,500 feet) in the analysis area. The largest band of true fir is found from Tom Martin Peak, in the southeast, to the west into the Marble Mountain Wilderness. Some patches are found on the northern edge of the analysis area near Kangaroo Mountain, Goff Butte, and the headwaters of Thompson Creek. White fir and red fir dominate and are maintained with high densities. Small amounts of Brewer spruce, mountain hemlock, Douglas-fir, western white pine and incense-cedar are also found in this type. **Table 3-8** True Fir Seral Stages, displays acres and percentage of community for each seral stage.

Table 3-8 True Fir Seral Stages		
Seral Stage	**Acres**	**% of Community**
Shrub/Forb	1,238	19
Pole	0	0
Early-Mature	949	15
Mid-Mature	2,729	43
Late-Mature/Old-Growth	1,407	22

The **White Fir/Mixed Conifer Community** tends to be a transition zone between the true fir and the Douglas-Fir/Mixed Conifer communities. This community is typically found between the elevations of 4,000 and 5,000 feet. It is found both in the north and south ends of the analysis area. White fir and Douglas-fir are the most common conifer species, with ponderosa pine, incense-cedar, and sugar pine also present. Some hardwoods, including black oak, Pacific madrone, and giant chinquapin are also found. Stands in the mid-mature and late-mature/old-growth seral stages are moderately dense with 54% (greater than 40% canopy closure). **Table 3-9** White Fir Mixed Conifer Seral Stages, displays acres and percent of community for each seral stage.

Table 3-9 White Fir/Mixed Conifer Seral Stages		
Seral Stage	**Acres**	**% of Community**
Shrub/Forb	0	0
Pole	18	<1
Early-Mature	1,973	22
Mid-Mature	3,065	34
Late/Mature/Old-Growth	3,863	43

The **Douglas-Fir/Mixed Conifer Community** is one of the most varied communities. In some places it is a transition from the true fir to the oak woodlands, and in other places it is primarily Douglas-fir and deciduous hardwoods (black oak and Oregon white oak). The one constant is that Douglas-fir is the dominant tree species. The community consists of 67% mid-mature and late-mature/old-growth seral stages, and 24% of this is at 80-100% crown closure. Table 3-10 Douglas-Fir/Mixed Conifer Seral Stages, displays acres and percent of community for each seral stage.

Table 3-10 Douglas-Fir Mixed Conifer Seral Stages		
Seral Stage	**Acres**	**% of Community**
Shrub/Forb	19,036	25
Pole	590	<1

Seral Stage	Acres	% of Community
`Early-Mature	5,585	7
Mid-Mature	31,327	40
Late-Mature/Old-Growth	20,829	27

The **Douglas-Fir/Tanoak/Mixed Conifer Community** is found in small patches in this analysis area. It is very prevalent further to the west, but almost nonexistent here. Douglas-fir usually dominates the overstory, with tanoak found in the understory and filling gaps in the fir-dominated overstory. The relative amounts of Douglas-fir and tanoak are variable, depending on past management, fire history, and aspect, with Douglas-fir being more dominant on north slopes. There is a wide variety of species that occur in this community. Associated conifer species include; ponderosa pine, sugar pine, white fir, and incense cedar. Hardwoods associated with this community include alder, bigleaf maple, black oak, white oak, California laurel, giant chinquapin, and Pacific madrone. **Table 3-11** Douglas-Fir/Tanoak/Mixed Conifer Seral Stages, displays acres and percentage of community for each seral stage.

Table 3-11 Douglas-Fir/Tanoak/Mixed Conifer Seral Stages

Seral Stage	Acres	% of Community
Shrub/Forb	0	0
Pole	17	15
Early-Mature	78	70
Mid-Mature	0	0
Late-Mature/Old-Growth	16	15

The **Douglas-Fir/Canyon Live Oak Community** is found on steep, warm rocky sites. It is characterized by a high cover of canyon live oak both in the overstory and the understory. On slightly better sites Pacific madrone occurs, with scattered conifers (usually Douglas-fir). **Table 3-12** Douglas-Fir/Live Oak Seral Stages, displays acres and percentage of community for each seral stage.

Table 3-12 Douglas-Fir/Canyon Live Oak Seral Stages

Seral Stage	Acres	% of Community
Shrub/Forb	0	0
Pole	0	0
Early-Mature	33	30
Mid-Mature	78	70
Late-Mature/Old-Growth	0	0

The **Sugar Pine Overstory/Mixed Conifer Community** is found scattered throughout the analysis area. Sugar pine is the dominate species in the overstory. The overstory is usually shared with Douglas-fir, ponderosa pine, incense cedar, and white fir. The understory is usually dominated by Douglas-fir and white fir. The overstory is found mostly in older, larger size classes, as shown in **Table 3-13** Sugar Pine Overstory/Mixed Conifer.

Table 3-13 Sugar Pine Overstory/Mixed Conifer Seral Stages

Seral Stage	Acres	% of Community
Shrub/Forb	0	0
Pole	0	0
Early-Mature	913	28
Mid-Mature	950	29
Late-Mature/Old-Growth	1,358	42

The **Ponderosa Pine/Mixed Conifer Community** is found scattered throughout the analysis area. Ponderosa pine is, of coarse, the dominant overstory species. Douglas-fir, white fir, sugar pine, and incense cedar can all be found in the overstory. Understories tend to be dominated by white fir, Douglas-fir, and incense cedar. Overstory trees tend to be widely spaced >20'. **Table 3-14** Ponderosa Pine/Mixed Conifer Seral Stages, displays acres and percentage of community for each seral stage.

Table 3-14 Ponderosa Pine/Mixed Conifer Seral Stages

Seral Stage	Acres	% of Community
Shrub/Forb	220	2
Pole	1,138	8
Early-Mature	4,652	32
Mid-Mature	6,894	48
Late-Mature/Old-Growth	1,487	10

The **Ponderosa Pine/Canyon Live Oak/Mixed Conifer Community** is typically found as a transition community between Ponderosa Pine/Mixed Conifer and Canyon Live Oak communities. Ponderosa pine and Douglas-fir can be found scattered over these harsh sites. Canyon live oak dominates both the overstory and understory. **Table 3-15** Ponderosa Pine/Canyon Live Oak/Mixed Conifer Seral Stages, displays acres and percent of community for each seral stage.

Table 3-15 Ponderosa Pine/Canyon Live Oak/Mixed Conifer Seral Stages

Seral Stage	Acres	% of Community
Shrub/Forb	0	0
Pole	0	0
Early-Mature	725	80
Mid-Mature	177	20
Late-Mature/Old-Growth	0	0

The **Ultramafic/Mixed Conifer Community** consists of vegetation adapted to Ultramafic soils. In the analysis area, much of this community is found in the Tom Martin Creek drainage. This is a mid-elevation community, found on warm open sites on serpentine soils. These soil conditions limit growth density and plant species. Among the conifers Jeffrey Pine is the most adaptable, with Douglas-fir and incense-cedar also found here. The understory is often dominated by grass, primarily California fescue. Ceanothus species are the most common shrubs. Many rare plants are endemic to these ultramafic soil types. **Table 3-16** Ultramafic/Mixed Conifer Seral Stages, displays acres and percentage of community by seral stage.

Table 3-16 Ultramafic/Mixed Conifer Seral Stages

Seral Stage	Acres	% of Community
Shrub/Forb	0	0
Pole	0	0
Early-Mature	34	11
Mid-Mature	281	87
Late-Mature/Old-Growth	8	2

The **Oak Woodland Community** consists mostly of Oregon white oak as primary species. When compared to soils that support mixed conifer communities, these sites are drier and tend to have shallower soils. This community tends to be a transition zone between the mixed conifer communities and harsher sites which support montane chaparral or canyon live oak. **Table 3-17** Oak Woodland Seral Stages, displays acres and percentage of community for each seral stage.

Table 3-17 Oak Woodland Seral Stages

Seral Stage	Acres	% of Community
Shrub/Forb	710	26
Pole	0	0
Early-Mature	1,034	37
Mid-Mature	781	28
Late-Mature/Old-Growth	255	9

The **Canyon Live Oak Community** is found mostly on lower elevation south aspects with rocky or shallow soils. These are harsh sites, and will not support mixed conifers. **Table 3-18** Canyon Live Oak Seral Stages, displays acres and percentage of community for each seral stage.

Table 3-18 Canyon Live Oak Seral Stages

Seral Stage	Acres	% of Community
Shrub/Forb	3,415	29
Pole	0	0
Early-Mature	3,955	33
Mid-Mature	3,968	33
Late-Mature/Old-Growth	557	5

The **Montane Chaparral Community** is the result of high intensity fire or other disturbance, and shallow soils. Much of this community burned in the fires of 1987. Whiteleaf manzanita, deerbrush, snowbrush, and greenleaf manzanita comprise the dominant shrubs. Much of this community is found on the southern aspects of the northern part of the analysis area. **Table 3-19** Montane Chaparral Seral Stages, displays acres and percentage of community for each seral stage.

Table 3-19 Montane Chaparral Seral Stages

Seral Stage	Acres	% of Community
Shrub/Forb	7,147	67
Pole	8	<1
Early-Mature	1,291	12
Mid-Mature	1,784	17
Late-Mature/Old-Growth	421	4

The **Pacific Madrone/Mixed Conifer Community** is found scattered mostly in the Thompson Creek drainage. This community tends to be a sub-set of the Douglas-fir/Mixed Conifer Communities that is found on sites with rocky shallower soils. These sites are transition areas from Douglas-fir/Mixed Conifer Communities to Canyon Live Oak and/or Montane Chaparral Communities. **Table 3-20** Pacific Madrone/Mixed Conifer Seral Stages indicates that large conifers are found in most of the community.

Table 3-20 Pacific Madrone/Mixed Conifer Seral Stages

Seral Stage	Acres	% of Community
Shrub/Forb	222	18
Pole	0	0
Early-Mature	0	0
Mid-Mature	679	56
Late-Mature/Old-Growth	314	26

Under-stocked Plantations is not a good title for this vegetation community. Currently, these areas fall into the definition of a montane chaparral community. Through a disturbance (regeneration harvest), the shrub species inherent to these sites have been able to establish dominance. As shown in **Table 3-21** Under-Stocked Plantation Seral Stages, this community consists of completely of shrub/forbs.

Table 3-21 Under-Stocked Plantation Seral Stages

Seral Stage	Acres	% of Community
Shrub/Forb	1,613	100
Pole	0	0
Early-Mature	0	0
Mid-Mature	0	0
Late-Mature/Old-Growth	0	0

The **Knobcone Pine/Mixed Conifer Community** is found typically on warm sites in ultramafic soils. Knobcone pine is an indicator of a historical occurrence of high severity fires. Within this community, Baker cypress can be found, a rare relic cypress endemic to Northern California and Southern Oregon. This community is maintained mostly in younger age classes, as is shown in **Table 3-22** Knobcone Pine/Mixed Conifer Seral Stages.

Table 3-22 Knobcone Pine/Mixed Conifer Seral Stages

Seral Stage	Acres	% of Community
Shrub/Forb	1,388	56
Pole	23	1
Early-Mature	888	36
Mid-Mature	172	7
Late-Mature/Old-Growth	0	0

The **Riparian Shrub Community** is found along the Klamath River, major tributaries, including Seiad Creek and Grider Creek drainages, and wet seeps and slumps. Along the Klamath River the primary plant species is willow, while in other areas alder and big leaf maple dominate. Conifers are not common, with Douglas-fir the most prevalent of those present. Most of this community is in younger seral stages, which is mostly due to past floods and landslides. **Table 3-23** Riparian Shrub Seral Stages, displays acres and percentage of community for each seral stage.

Table 3-23 Riparian Shrub Seral Stages

Seral Stage	Acres	% of Community
Shrub/Forb	1,310	72
Pole	0	0
Early-Mature	36	2
Mid-Mature	54	3
Late-Mature/Old-Growth	421	23

The **Montane Meadow Community** is found at higher elevations on gentle slopes and depressions containing wet areas. Typical herbaceous species include mountain heather, Labrador tea, California pitcher plant, swamp onion, meadow lotus, trillium, monks hood, lady slipper, bog rein orchid, and yampah. Sedges, rushes, and wet-loving grasses are also characteristic. Many of the meadows in this watershed have a large component of shrubs, often alder, willow or bitter cherry. Aspen can be found at the head of Grider Creek. **Table 3-24** Montane Meadow Seral Stages, displays acres and percentage of community for each seral stage.

Table 3-24 Montane Meadow Seral Stages

Seral Stage	Acres	% of Community
Shrub/Forb	999	82
Pole	0	0
Early-Mature	14	1
Mid-Mature	34	3
Late-Mature/Old-Growth	176	14

Key Question 1b- What are the vegetation and fuels conditions within 1987 fire areas?

The fires of 1987 burned through approximately 42% of the analysis area. Fire effects varied throughout the landscape. **Table 3-25** 1987 Fire Intensity by Vegetation Community helps to clarify which communities were affected and how severe the effects were. Of the burned area, 12% experienced high severity fire (greater than 70% crown kill), 39% experienced moderate severity fire (30-70% crown kill), and 49% experienced low severity fire (less than 30% crown kill).

In the twelve years since these fires, ground fuels have increased. The amounts of dead and down fuels have increased the most in timbered stands that experienced high and moderate severity fire. These stands now have fuel accumulations ranging from 30 to 100 tons per acre. In timbered stands that burned with low severity, understories are filling in and dead and down fuels have increased from post-fire conditions. Areas with montane chaparral are revegetated.

Table 3-25 1987 Fire Intensity by Vegetation Community

Vegetation Community	Total Acres	Acres of High Intensity (%of Community)		Acres of Moderate Intensity (%of Community)		Acres of Low Intensity (%of Community)	
Sub-Alpine Conifer	620	3	(<1)	153	(25)	29	(5)
True Fir	6,325	693	(11)	899	(14)	1,528	(24)
White Fir/Mixed Conifer	8,920	472	(5)	1,114	(12)	2,315	(26)
Douglas-Fir/Mixed Conifer	77,365	3,022	(4)	12,457	(16)	18,494	(24)
Douglas-Fir/Tanoak/Mixed Conifer	110	0		0		25	(23)
Douglas-Fir/Canyon Live Oak	110	0		9	(8)	38	(35)
Sugar Pine Overstory/Mixed Conifer	3,220	52	(2)	502	(16)	701	(22)
Ponderosa Pine/Mixed Conifer	14,390	226	(2)	3,133	(22)	2,171	(15)
Ponderosa Pine/ Canyon Live Oak	900	0		268	(30)	173	(19)
Ultramafic Mixed Conifer	325	0		0		0	
Oak Woodland	2,780	65	(2)	449	(16)	440	(16)
Canyon Live Oak	11,895	132	(1)	2,358	(20)	1,950	(16)
Montane Chaparral	10,650	2,145	(20)	1,314	(12)	1,626	(15)

Vegetation Community	Total Acres	Acres of High Intensity (%of Community)		Acres of Moderate Intensity (%of Community)		Acres of Low Intensity (%of Community)	
Madrone/Mixed Conifer	1,215	2	(<1)	303	(25)	135	(11)
Under-Stocked Plantations	1,615	407	(25)	601	(37)	185	(11)
Knobcone Pine/Mixed Conifer	2,470	421	(17)	552	(22)	219	(9)
Riparian Shrub	1,820	6	(<1)	5	(<1)	176	(10)
Montane Meadow	1,225	0		29	(2)	105	(9)
Barren Area	175	13	(7)	0		6	(3)
Water	1,360	0		0		0	
Non-Forest	840	0		70	(8)	0	
Total Acres	148,330	7,691		24,226		30,322	

Key Question 2- What are the current seral stage distributions and stand densities found in the analysis area?

The distribution of seral stages by vegetation community has been answered in Key Question 1 (Pages 3-9 through 3-13. **Table 3-26** Seral Stage and Stand Density, identifies the total seral stage and stand density for all conifer communities capable of providing late-seral habitat found in the analysis area.

Table 3-26 Seral Stage and Stand Density

VEGETATION COMMUNITY --Seral Stage	Acres	% of Community	>69% Crown Cover	40-69 % Crown Cover	20-39 % Crown Cover	<20% Crown Cover
TRUE FIR						
--Shrub	1,238	19	0	0	0	0
--Pole	0	0	0	0	0	0
--Early-Mature	949	15	16%	22%	33%	28%
--Mid-Mature	2,729	43	20%	21%	51%	8%
-Late-Mature/Old-Growth	1,407	22	18%	39%	32%	11%
TOTAL	**6,323**					
WHITE FIR/MIXED CONIFER						
--Shrub	0	0	0	0	0	0
--Pole	18	<1	0	100	0	0
--Early-Mature	1,973	22	33%	30%	19%	17%
--Mid-Mature	3,065	34	40%	38%	19%	3%
-Late-Mature/Old-Growth	3,863	43	9%	53%	30%	4%
TOTAL	**8,920**					
DOUGLAS-FIR/MIXED CONIFER						
--Shrub	19,036	25	0	0	0	0
--Pole	590	<1	39%	21%	33%	7%
--Early-Mature	5,585	7	24%	50%	22%	4%
--Mid-Mature	31,327	40	27%	55%	16%	2%
--Late-Mature/Old-Growth	20,829	27	23%	55%	20%	2%
TOTAL	**77,365**					
DOUGLAS-FIR/TANOAK/MIXED CONIFER						
--Shrub	0	0	0	0	0	0
--Pole	17	15	0	0	100%	0
--Early-Mature	78	71	0	0	100%	0
--Mid-Mature	0	0	0	0	0	100%
--Late-Mature/Old-Growth	16	15	0	0	100%	0
TOTAL	**110**					
SUGAR PINE OVERSTORY/MIXED CONIFER						
--Shrub	0	0	0	0	0	0
--Pole	0	0	0	0	0	0
--Early-Mature	913	28	0	18%	74%	8%
--Mid-Mature	950	30	5%	15%	76%	3%
--Late-Mature/Old-Growth	1,358	42	13%	51%	36%	0
TOTAL	**3,220**					
PONDEROSA PINE/MIXED CONIFER						
--Shrub	220	2	0	0	0	0
--Pole	1,138	8	32%	68%	<1%	0
--Early-Mature	4,652	32	8%	41%	26%	24%
--Mid-Mature	6,894	48	3%	52%	40%	5%
--Late-Mature/Old-Growth	1,487	10	29%	13%	43%	15%
TOTAL	**14,390**					

Key Question 3a- What are the disturbance regimes impacting the vegetation in the analysis area?

Vegetation communities within the analysis area are influenced by soils, aspect, elevation, climate, and disturbance regimes. These regimes include flooding, landslides, insects and disease, windthrow, and fire. Separately, these regimes can have varying degrees of impact. Working together, they can have severe impacts. Occasional drought and dense stands help to increase the severity of insect and disease outbreaks. Higher fuels accumulations resulting from these outbreaks help to increase fire severity. Frequent flood events keeps riparian vegetation in early seral stages. Areas impacted by high severity fire become prone to increased erosion and the detrimental effects of runoff from winter storms and floods.

Key Question 3b- What are the current risks (potential ignition sources) found in the analysis area?

The fire history database, which covers 76 years of fire starts (1922-1997), has a total of 1,026 fires that occurred within the analysis area. Of these, 67% were started by lightning. The database shows that the analysis area has had multiple fire starts every year of this documented history. Thunderstorms producing lightning usually ignite multiple fires. A storm in August of 1977 ignited 18 fires within the analysis area. The database shows that the August 30, 1987 dry lightning storm ignited 8 fires.

The remainder of the fires in the database were started with human help. **Table 3-27** Human-Ignited Fires, gives a summary of the causes of these human-ignited fires.

Table 3-27 Human-Ignited Fires	
Fire Cause	**Percent of Fire Starts**
Careless Smoker	25%
Miscellaneous (unspecific)	25%
Escape Debris Burning	16%
Arson	13%
Equipment Use	9%
Escape Campfire	7%
Children Playing With Fire	6%

Key Question 3c- What are the current fuel models and the fire behavior potential in the analysis area?

Fuel models were derived using the Forest Vegetation Layer (see **Figure 3-7** Fuel Models, contained in the Map Packet located at the end of this document). **Table 3-28** Fuel Models, identifies the amount (acres) of each fuel model and a brief description of the conditions being modeled.

Table 3-28 Fuel Models		
Fuel Model	**Acres**	**Fuel Model Description**
1	1,000	Grass, dry meadow or pasture
Fuel Model	**Acres**	**Fuel Model Description**
5B	12,490	Montane chapparal, i.e., manzanita, or deer brush
5C	17,690	Conifer plantations >35 years old and dense natural conifer stands in smaller size classes
8	30,635 *	Mature conifer and deciduous stands with open understories and low fuel accumulations
9	6,715	Typically these are pine dominated stands with open understories
10	55,100	Typically these are Douglas-Fir dominated stands with dense understories and high fuel accumulations
12	20,495	These are stands that burned with moderate and high intensities in 1987 and have high fuel accumulations.
14	1,820	These are riparian and montane meadow vegetation types that are virtually non-flammable except in drought conditions
98	2,375	Non-flammable material, i.e., gravel bars
*Due to the age of the vegetation layer and how quickly fuels can be generated, fuel model 8 has been over-estimated in this analysis.		

Fire behavior potential modeling is done in order to estimate the severity and resistance to control that can be expected when a fire occurs during what is considered the worse-case weather conditions. Late summer weather conditions are referred to as the 90th percentile weather data, which is a standard used when calculating fire behavior (90th percentile weather is defined as the severest ten percent of the historical fire weather, i.e., hot, dry, windy conditions occurring on mid afternoons during the fire season). Fire behavior modeling incorporates fuel model, slope class, and 90th percentile weather conditions in calculating projections on flame lengths and rates of spread.

Three slope classes are utilized in the fire behavior potential modeling: less than 35% slope, 35-65% slope and greater than 65% slope. Aspect is also incorporated by varying one hour fuel moisture content by aspect. The 90th percentile weather data is based on twenty years of data collected at Oak Knoll for elevations less than 4,000 feet and Collins Baldy for elevations greater than 4,000 feet. These are the closest weather stations to the analysis area with at least 20 years of weather data.

Fire behavior potential ratings of low, moderate, and high are identified from the fire behavior modeling (see **Figure 3-8** Fire Behavior Potential, contained in the Map Packet located at the end of this document). A low rating indicates that fires can be attacked and controlled directly by ground crews building fireline, and will be limited to burning in understory vegetation. A moderate rating indicates that hand-built firelines alone would not be sufficient in controlling fires, and that heavy equipment and retardant drops would be more effective. Areas with a moderate rating can expect 30-70% overstory mortality. Areas rated as high represent the most hazardous conditions in which serious control problems would occur, i.e., torching, crowning, and spotting. Control lines are established well in advance of flaming fronts with heavy equipment, and backfiring may be necessary to widen control lines. Areas with a high rating can expect greater than 70% overstory mortality. For more information on fuel modeling and the development of fire behavior potential for this analysis, refer to **Appendix D** - Fire and Fuels.

Within the analysis area, fire behavior potential modeling has identified 43,620 acres as having a rating of high, 47,850 acres as having a rating of moderate, and 54,490 as having a low fire behavior potential. Approximately 3,000 acres within the analysis area are identified as non-flammable.

LATE-SUCCESSIONAL HABITAT

Key Question 1a- What is the current distribution and condition of late-successional habitat within the analysis area and within LSRs?

Key Question 1b - Which vegetative communities provide late-successional habitat?

Key Question 1c - Which vegetative communities are capable of, or have the potential of providing late-successional habitat in the future?

Distribution

The structure and composition of late-successional coniferous forest in the Thompson/Grider/Seiad Analysis Area is variable due to diverse biological and physical conditions and natural disturbance events (fire, floods, wind and insects). Climate and topography have strong influences, spatially and temporally, on vegetative characteristics within the area. The strong influences of topography, aspect, and natural disturbance events result in naturally diverse, fragmented vegetative patterns on the landscape.

Forest management activities have influenced late-successional forest habitats in the analysis area. Timber harvest and road building have accounted for most of the management that has impacted vegetation and influenced the amount of late-successional habitat currently found today. Most timber harvest focused on late-successional stands that were thought decadent and in need of treatment, or focused on burned areas as part of a fire salvage program. Roughly 22,000 acres (15% of the analysis area) of forested land have been cleared through timber harvest and fire salvage since the 1930s; in addition, there are approximately 530 miles of roads (Forest Service, private, State, County, and non-system) within the analysis area. Clearing through timber harvest and road building has reduced the amount of late-successional habitat and fragmented larger blocks of habitat.

Large landscape-level fires, burning with varying degrees of intensity, have also reduced and fragmented late-successional habitat. Conversely, the successful exclusion of fire in portions of the analysis area has resulted in changes to forest structure and species composition. Fire suppression has changed the fire regime from frequent low intensity surface fires, to infrequent, but devastating, stand-replacing fires. Prior to settlement by Europeans, the analysis area was characterized as having frequent (occurring every 8-15 years), light surface fires of predominately low and moderate intensity. The current fire regime is characterized as having infrequent (every 50-100 years), severe crown and surface fires. The results of these changed conditions include increases in dead and live fuel, development of ladder fuels, and a closed canopy that can sustain a crown fire. At the 90th percentile weather (historical weather associated with typical late summer daytime conditions), the ground fuels easily burn with flame lengths greater than four feet. These flame lengths could cause torching of the understory vegetation, leading to preheating and torching of the larger trees that otherwise would be fairly resistant to fire.

Currently, within the analysis area, there are 31,176 acres of late-successional habitat (defined as late-mature/old-growth in the *Forest Plan* timber type database), excluding private land. Distribution of late-successional habitat by Management Area is displayed below in **Table 3-29** (refer to **Figure 1-2** for *Forest Plan* Management Areas and **Figure 3-9** for Seral Stages).

Table 3-29 Late-Successional Habitat by Management Area.

Management Area	Acres of Late-Successional Habitat
Late-Successional Reserve -Seiad	21,893
Late-Successional Reserve -Johnny O'Neil	1,173
Wilderness	2,197
Special Management	226
Backcountry	383
Riparian Reserve	773
Recreational River	230
Retention	952
Partial Retention	2,563
General Forest	786

Late-Successional Reserves cover more of the analysis area than any other Management Area (55%); there are two LSRs that overlap the analysis area, Seiad and Johnny O'Neil. The Seiad LSR (#353) occupies 72,635 acres of the analysis area (49%) and runs down the middle of the area, taking in the majority of the Thompson and Grider drainages (see Figure 1-2, Management Areas). The Johnny O'Neil LSR (#354) occupies 9,636 acres of the analysis area (6%) in upper Seiad Creek and in the headwaters of Negro Creek. The amount of late-successional habitat within the two LSRs is displayed previously in **Table 3-29**.

Site Capability

Based on existing vegetation and areas identified as harsh sites in the *Forest Plan*, it is roughly estimated that 78% of the Thompson/Seiad/Grider Analysis Area is capable of supporting late-successional coniferous and coniferous-hardwood forest habitat. The remaining acres within the analysis area contain hardwood vegetation, montane shrub communities, meadow complexes, and non-vegetated areas (rock outcrops and water bodies).

Vegetative Condition

Current vegetative condition was evaluated using the Forest vegetation layer (timber type). Components used to classify vegetative types included primary and secondary species component, size class, and density class.

The total amount of late-successional forested habitat within the analysis area is approximately 31,176 acres; the amount of late-successional forest within the two LSRs in this analysis area is 23,070 acres (28% of the LSRs). Additionally, there are approximately 56,129 acres of mid-successional forest which may provide habitat for late-successional forest-related species.

The relatively wet climatic conditions for the majority of this century, combined with fire exclusion have created changes in vegetative composition, structure, and pattern across the landscape. The vegetative composition in the mixed conifer zone has shifted from fire-adapted, shade-intolerant conifers and hardwoods to more shade tolerant non-fire-adapted conifers. Stand structure within the mixed conifer zone has changed with a more dense, shade-tolerant understory not only found on cooler north and east aspects, but also on normally more sparse south and west aspects (USDA 1999).

As mentioned earlier, late-successional habitat within the analysis area has been affected by timber harvesting, road building, fire suppression and natural disturbance events. Late-successional habitat currently occupies 21% of the land base. Mid-successional stands need to be assessed for continued development since they occupy an additional 40% of the land base. Early successional stands are also important for developing into future late-successional characteristics. Stand densities in the mid- and early seral component are important if continued development of late-successional habitat is desired in the future. Density has been shown to be an important factor within LSRs in this analysis area because of the high and moderate levels of mortality that occurred during insect epidemics and due to the potential for large wildfires (USDA 1999).

The existing late-successional and mid-successional forest habitats are fairly well-distributed across the analysis area (see **Figure 3-9** Seral Stages), with the exception of harsher sites in the Devil's Peaks area and large areas that burned in the late 1980s. Although late-successional habitats are well-distributed, they are naturally patchy due to the strong influences of aspect and topography. The more dense forest habitat is found on north and east aspects and in drainage bottoms. Past management has increased the patchiness (fragmentation) of the forested habitats. As mentioned above, approximately 14% of the analysis area has been harvested and over 500 miles of road have been constructed.

Vegetative Communities

The following is a general description of the major vegetative types currently found within the analysis area that provide, or have the potential to provide, late-successional habitat (see **Figure 3-6** Existing Vegetation) (adapted from USDA 1999).

WHITE FIR

This type generally occurs between 5,000 and 6,500 feet in elevation. This vegetation type can be found on all aspects but is more common on north and east facing slopes. This type occurs on approximately 4% (this is the percent of "true fir") of the analysis area. These stands are dominated by white fir with common associates of ponderosa pine, sugar pine, and Douglas-fir at the lower elevations. Common associates at the upper elevation zone include red fir and western white pine. More open stands often contain shrubs such as manzanita, snowbrush, huckleberry oak, squaw carpet, Oregon grape, and Sadler oak. Natural gaps in these stands most often form from wind, lightning, insects, or disease. Many stands are densely stocked and stagnation and mortality can become a severe problem.

RED FIR

Red fir occurs in minor amounts at high elevations in the analysis area. It is found in relatively pure stands at elevations above 6,000 feet and is included in the 4% mentioned above for white fir. Sugar pine, white fir, and Douglas-fir are common overstory associates of red fir at its lower elevations or on southerly slopes. Mountain hemlock, Brewer's spruce, and/or western white pine commonly occur in this type at higher elevations or on northwest to east facing slopes. Shrubs, especially in dense red fir stands, rarely occur in this type. Wet meadows on glacial cirques commonly associate with the red fir type and mountain alder thickets dominate moist talus slopes, often mixed with other shrubs such as Rocky Mountain maple, mountain ash, and Oregon boxwood.

The true fir stands, red and white fir, vary from old, slow growing to young, vigorously growing. Some true fir stands are naturally very open. This is usually due to site characteristics associated with shallow, rocky soils or the occurrence of a high water table.

Reestablishment after major disturbance may be slow and may persist in a shrub stage for a long period. Generally, lower intensity fires allow for the conifers to better compete with shrub seedlings. High intensity fires tend to shift the vegetation toward shrub type, such as snow brush or manzanita.

MIXED CONIFER

Mixed conifer stands make up 73% of the analysis area. There is usually no one dominant conifer species within most stands, however three associations can usually be found: pine/mixed conifer, Douglas-fir/mixed conifer, and white fir/mixed conifer. Conifer associates in all types are usually Douglas-fir, ponderosa pine, sugar pine, Jeffrey pine, knobcone pine, incense cedar and white fir. Hardwood components include canyon live oak, tanoak and madrone. Multilayered stands containing a mixture of fire-tolerant and fire-intolerant species are common and are caused by a host of factors, including fire suppression and site conditions.

The pine/mixed conifer type generally occurs below 5,000 feet and is found on the xeric and drier mesic slopes. Douglas-fir and white fir increase in dominance on north facing, mesic slopes, and higher elevations. This plant type has been most affected by fire suppression activities. Stands that were once dominated by shade-intolerant species, such as pine, have been encroached by shade-tolerant species over the last 80 to 100 years. The pine/mixed conifer type is associated with hardwoods such as dogwood, black oak, white oak, big leaf maple, and madrone. Chaparral species may occur in the understory layer.

The Douglas-fir/mixed conifer type can be found from the Klamath River (about 1500 feet) up to 6,000 feet in elevation. This is the most common vegetation type. White fir/mixed conifer types generally range from 4,500 to 6,000 feet. White fir is currently more prevalent than it was in the past, due to fire suppression activities. Hardwood associates with these vegetative types include canyon live oak on the poorer sites and black oak, giant chinquapin, and Pacific madrone on the better sites.

OTHER COMMUNITIES

Other plant communities that occur in the analysis area, but that do not contribute to the amount of late-successional forest habitat, include montane chaparral, montane meadows, upland hardwood forest, canyon live oak, Oregon white oak, and riparian vegetation. Meadow and riparian shrub occur on wetter sites. Natural meadows are more common at the higher elevations. Large stands of manzanita occur in the upper Thompson Creek watershed as a result of the Indian Ridge Burn. All of these types include scattered conifers consisting of ponderosa pine, red fir, white fir, mountain hemlock, sugar pine, and Douglas-fir.

SNAGS AND LOGS

Large (greater than 20 inches in diameter) coarse woody debris (CWD) and snags are important and distinguishing features within late-successional forests. Many late-successional forest-related wildlife species are recognized as having strong associations with snags and CWD. The occurrence of CWD and snags in forest ecosystems is quite variable and can happen in a number of ways. Recruitment can occur slowly, resulting from mortality of individual, scattered trees or it can happen in waves from disturbance events such as windthrow, fire, or insect and disease outbreaks. Retention of CWD is dependant upon fire frequency and intensity and on decomposition rates.

Table 3-30 (USDA 1999) displays the average number of snags and CWD, per acre, taken from Forest inventory data. The figures are representative of the amounts that may be found in typical stands of late and mid-successional forest (dense or open stands) on the Klamath National Forest. The numbers in parentheses represent the range of snags found during the inventory. The greatest occurrence of CWD and snags tends to be in true fir stands. This is primarily due to the fact that true fir stands, in general, are more dense (number of trees per acre) than mixed conifer stands and that the more frequent, less intense fire regime in the mixed conifer zones tend to consume more snags and CWD. The true fir forests tend to have less frequent stand-replacing fires which would carry higher levels of snags and CWD for a longer time period.

Table 3-30 Average Number of Snags and CWD Per Acre by Forest Type and Seral Stage.

Vegetation Type and Seral Classification	No. of Pts.	Snags 10-15"*	Snags 5-20"*	Snags >20"*	CWD 5-20"	CWD 20"
WF/RF mid-dense	67	8.6 (1.6-19.2)	2.6 (0.4-6.0)	3.7 (0.9-11.0)	4.8	6.2
WF/RF late-dense	69	7.0 (0.0-13.0)	3.8 (0.0-8.0)	7.3 (1.5-17.6)	6.1	9.0
WF/RF mid/late-open	122	4.7 (0.0-23.2)	2.4 (0.0-8.8)	4.3 (0.5-12.0)	3.4	4.9
DF mid-dense	133	3.1 (0.0-9.0)	1.4 (0.0-6.0)	2.4 (0.0-6.2)	3.7	4.9
DF Late-Dense	133	3.6 (0.0-19.1)	0.6 (0.0-3.6)	3.3 (0.0-6.0)	3.4	8.3
DF Mid/Late-Open	315	2.5 (0.0-18.8)	0.8 (0.0-8.0)	2.2 (0.0-15.0)	2.7	5.0
MC Mid-Dense	140	5.2 (0.6-12.4)	2.1 (0.0-6.2)	3.1 (0.5-15.0)	2.7	3.4
MC Late-Dense	138	5.8 (0.0-20.9)	2.0 (0.0-5.3)	4.3 (0.0-12.4)	3.4	6.5
MC Mid/Late-Open	273	3.2 (0.0-20.7)	1.5 (0.0-17.3)	2.9 (0.0-9.5)	2.6	5.7

WF=White Fir, RF=Red fir, DF=Douglas-Fir, Mid=Mid-Successional, Late=Late-Successional.

LSR - 353 Seiad (USDA 1999)

The Seiad LSR is approximately 101,200 acres in size, 72,635 acres (72%) of which are located within the Thompson/Seiad/Grider Analysis Area. This discussion will include the entire LSR. The LSR is located on three Ranger Districts and encompasses several large drainages. Major drainages include: Tompkins Creek, Walker Creek, Grider Creek, the eastern portion of Elk Creek, Fort Goff Creek, lower portion of Portuguese Creek, Thompson Creek, and the eastern portion of the Indian Creek drainage. Prominent points include: Jackson Peak, Evans Mountain, Fourmile Butte, Pyramid Peak, Blue Mountain, Lake Mountain, and Tom Martin Peak. Elevations range from 1,500 to about 7,000 feet. The terrain is steep, and is dissected by sharp ridges and streams.

The LSR has small parcels of private land located throughout, most of the parcels are located in the northern portion of this LSR along the Klamath River. Only one small parcel is located in the southern half. **Table 3-31**, below, includes general information about the current condition of the Seiad LSR. Percent subject to lethal fire effects (see fire discussion) and acres of plantation are important for identifying potential treatments to develop or protect late-successional habitat in the LSR (refer to Steps 5 and 6).

Table 3-31 Status Sheet for LSR-353 Seiad.

DESCRIPTION	DATA
Total Acres	**101,200**
Acres Capable of Supporting Late-successional Forest Habitat	82,620
Acres Currently Supporting Late-successional Forest Habitat	28,480
Percent of LSR Subject to Lethal Fire Effects	25
Acres of Plantation	14,610
Acres of Riparian Reserve	13,955
Suitable Owl Habitat as a Percent of Capable Owl Habitat	66%
Miles of Road	292.6
Average Road Density	1.9

Table 3-32 highlights the general vegetative conditions for the Seiad LSR. Late-successional and mid-successional conditions account for 72% of the capable landbase. Plantations account for 14% of the current landbase (refer to **Figure 3-9** Seral Stages).

Table 3-32 Vegetative Condition for Seiad LSR.

VEGETATIVE CONDITION	ACRES
Late-successional forest	28,480
Mid-successional forest	31,040
Early-successional-pole	14,640
Early-successional-sapling/seedling	8,460
Other	18,580
TOTAL	**101,200**

The dominant plant community in the LSR is pine/mixed conifer. It accounts for approximately 42% of the landbase. The Douglas-fir/mixed conifer, white fir/mixed conifer, and true fir types are also major components within the LSR. The other plant communities (oak woodlands, montane chaparral, meadows, etc.) account for minor percentages of the landbase.

Insects and Disease

Observation flights have identified insect and disease related mortality in the LSR during the years 1993-1995. High levels of mortality were observed in 1993 and 1994 affecting approximately 790 and 1,700 acres respectively. Moderate levels of mortality were observed from 1993-1995 affecting 21,890 acres during this time period. During 1994, 17,690 acres were observed with moderate mortality. Reduced levels of mortality have been observed over the last two years, returning to more of an endemic situation.

Of all the acreage that has been affected by insect mortality, 940 acres had at least two consecutive years of moderate to high mortality. The remainder of the acreage recorded mortality for just one year.

Mortality was generally confined to southern portion of the LSR during the observations. High elevation true fir and mixed conifer stands on south slopes appeared to be the most vulnerable. At the upper elevations, white and red fir were the primary species affected, with the fir engraver beetle as the primary agent. At the lower elevations, ponderosa pine and Douglas-fir were the primary species affected. The western pine beetle and pine engraver beetle have been the primary insects responsible for the various levels of mortality at the lower elevations.

Fire and Fuels

Approximately half of the LSR consists of pine/mixed conifer typically located at the lower elevations. These areas primarily are more open with lower fuel loadings. Douglas-fir and white fir/mixed conifer stands are generally located in the mid- and higher elevations and north slopes. These stands are more dense and fuel loadings are heavier.

Forty-three percent of the LSR has burned in the past, with 41% being burned during the 1987 fire siege. The fire risk is rated as moderate, meaning that it can be projected that at least one fire will occur

in 11-20 years per thousand acres. With a risk rating of moderate, the potential exists for 100 fire starts in the LSR during the next 20 years.

One particular area of concern for potential wildfire effects in this LSR are the acres in plantations. Plantations account for 14% of the land base within the LSR (see Figures 3-6 and 6-5). The highest percentage of the plantations lie in the southern portion of the LSR and are scattered on each side of Grider Creek. The northern section has plantations along the western portion, both inside and outside of the LSR. These pose a threat to the LSR and surrounding area due to the overstocking and high fuel hazard.

Spotted Owl Critical Habitat

Seiad LSR overlaps considerably with Critical Habitat Unit CA 17 and with a portion of Critical Habitat Unit CA 15 (**Figure 3-10**). The other portion of CA 15 has overlap with the Klamath administered portion of Johnny O'Neil LSR. Critical habitat units CA 15 and 17 have connectivity objectives. Unit CA 15 acts as a link between California and Oregon. Unit CA 17 functionally connects Critical Habitat Units CA 21, 22, 23, and 25 by the Marble Mountain Wilderness.

LSR - 354 Johnny O'Neil (USDA 1999)

The Johnny O'Neil LSR is approximately 46,840 acres in size, 9,636 acres of which are located within the Thompson/Seiad/Grider Analysis Area. This discussion will include the entire LSR. The LSR is located on two National Forests; approximately 27,900 acres are located on the Klamath National Forest, with the remainder on the Rogue River National Forest to the north. Major drainages include the upper portions of Horse Creek and Seiad Creek, Cook and Green Creek, Joe Creek, and Dutch Creek. The drainages on the Rogue River portion drain into Elliott Creek and the Applegate River. Drainages on the Klamath portion drain into the Klamath River. Prominent points include Cooper Butte, White Mountain, and Cook and Green Pass. Elevations range from 2,000 feet to about 6,200 feet. The terrain is steep, and is dissected by sharp ridges and streams. There are several small parcels of private land scattered throughout the LSR. **Table 3-33**, below, includes general information about the current condition of the Johnny O'Neil LSR. Percent subject to lethal fire effects (see fire discussion) and acres of plantations are important for identifying potential treatments to develop or protect late-successional habitat in the LSR (refer to **Steps 5 and 6**).

Table 3-33 Status Sheet for Johnny O'Neil LSR.

DESCRIPTION	DATA
Total Acres	**46,840**
Acres Capable of Supporting Late-successional Habitat	42,490
Acres Currently Supporting Late-successional Habitat	14,580
Percent of LSR Subject to Lethal Effects	20
Acres of Plantation	6,366
Acres of Riparian Reserve	4,307
Suitable Owl Habitat as a Percent of Capable Owl Habitat	76%
Miles of Road	136.2
Average Road Density	2.4

Table 3-34 highlights the general vegetative conditions for the Johnny O'Neil LSR. Late-successional and mid-successional conditions account for 77% of the capable land base. Plantations account for 13% of the current land base (refer to **Figure 3-9** Seral Stages).

Table 3-34 Vegetative condition for Johnny O'Neil LSR.

VEGETATIVE CONDITION	ACRES
Late-Successional Forest	14,580
Mid-Successional Forest	18,120
Early-Successional-Pole	4,890
Early-Successional-Sapling/Seedling	4,900
Other	4,350
TOTAL	**46,840**

The dominant plant community in this LSR is also pine/mixed conifer. It accounts for approximately 69% of the landbase. The Douglas-fir/mixed conifer, white fir/mixed conifer, and true fir types are also major components within the LSR. The other plant communities (oak woodlands, montane chaparral, meadows, etc.) account for minor percentages of the landbase.

Insects and Disease

Observation flights have identified insect and disease related mortality in the LSR during the years 1993-1995. High levels of mortality were observed in 1994 and 1995 affecting approximately 2,640 and 1,310 acres respectively. Moderate levels of mortality were observed from 1993-1995, affecting 9,150 acres during this time period. During 1994, 8,090 acres were observed with moderate mortality. Reduced levels of mortality have been observed over the last two years, returning to more of an endemic situation.

Of all the acreage that has been affected by insect mortality, 1,730 acres had at least two consecutive years of moderate to high mortality and 560 acres of overlapping mortality for three years. The remainder of the acreage recorded morality for just one year.

Mortality was generally confined to the southern portion of the LSR during the observations (outside of this analysis area). High elevation true fir and mixed conifer stands on south slopes appeared to be the most vulnerable. At the lower elevations, ponderosa pine and Douglas-fir were the primary species affected. The fir engraver beetle, western pine beetle, and pine engraver beetle have been the primary insects responsible for the various levels of mortality throughout this LSR.

Fire and Fuels

Thirty-two percent of the LSR burned in the past and during the fire siege of 1987, 27% burned in the northwest corner of the LSR within the Thompson/Seiad/Grider Analysis Area. Twenty-one percent of the historical fire occurrence has been human-caused, high for this area, and the lightning occurrence is rated as moderate. Fire access is good, allowing for a timely response.

On the Klamath side of the LSR the fire risk is rated as a high, meaning it can be projected that at least one fire will occur in 10 years per thousand acres. With a risk rating of high, the potential exists for 27 fire starts in the LSR within the next 10 years. On the Rogue River side of the LSR, the fire risk is rated as low, meaning it can be projected that at least one fire will occur in 20 years or more per thousand acres. With a risk rating of low, the potential exists for nineteen fire starts in the LSR within the next 20 years.

As with the Seiad LSR, the acres in plantations are of particular concern due to the potential wildfire effects in this LSR. Past harvesting and fire salvage have created plantations scattered throughout the LSR. Thirteen percent of the LSR land base consists of plantations. East of East Fork and south of Copper Butte is where the majority of the younger plantations are located. Plantations that have not been thinned or thinned and not treated increases the potential of loss not only to the plantation but also to the surrounding area.

Spotted Owl Critical Habitat

Portions of critical habitat units CA 15 and OR 73 overlap with the Johnny O'Neil LSR. The objectives of these units are to provide a link between California and Oregon and to provide habitat for 22 pairs of spotted owls over time. Critical Habitat unit CA 15 and the Johnny O'Neil LSR cross over the ridge below Copper Butte, connecting late-successional habitat in the Seiad watershed with habitat in the Horse Creek watershed to the east of the analysis area.

Vegetative Communities Capable of Providing Late-Successional Habitat in the Future

MID-SUCCESSIONAL STANDS

Mid-successional forest occupies 56,129 acres (38%) within the analysis area. These stands may currently provide habitat for late-successional forest-related species, and will be important in maintaining late-successional habitat for the near future (refer to **Figure 3-9** Seral Stages).

PLANTATIONS

Well-stocked plantations account for approximately 14% (20,500 acres) of the analysis area. Of that, approximately 7,600 acres are less than 15 years of age, 2,900 acres are between 15 and 30 years, and 10,000 are over 30 years of age (refer to Figure 3-6, Existing Vegetation). The majority of plantations less than 30 years old consist of the mixed conifer vegetative type.

PLANTATIONS LESS THAN 30 YEARS

These mixed species stands range from 5-40 acres in size. Trees generally have crowns full to the ground and range in height from 1-15 feet. A grass/forb component exists between trees, with scattered shrubs, and hardwood sprouts. Scattered snags and hardwoods are present from the previous stands.

This vegetative type currently makes up a very minor component within the analysis area. These stands tend to be mostly even-aged with very little structural diversity and most trees within these stands are vigorous and healthy. As the stands reach the upper limits of this class, they tend to become very dense with a slowing of growth.

Most plantations within the mixed conifer zone, especially the older plantations, were planted with ponderosa pine. Plantations on the western portions of the Forest were planted with a mixture of ponderosa pine and Douglas-fir. Over the years many of the plantations have had Douglas-fir, white fir, and incense cedar establish naturally. Shrubs are prevalent in many of the plantations. Most of these plantations are very dense, with declining growth rates.

Key Question 2 - Where does connectivity of late-successional habitats occur within and between LSRs? Where are the barriers to dispersal?

The ability to move across the landscape may be important to the long-term persistence and viability of some wildlife species. It may be particularly important to late-successional habitat associated species. The movement or dispersal of these species across the landscape is provided by large blocks of late-successional habitat in the LSRs and through management objectives and various land allocations between LSRs. Those management objectives and land allocations include: Riparian Reserves, administratively withdrawn areas, management prescriptions, retention of old-growth fragments in Matrix, and 100-acre LSRs.

As defined in the FSEIS (USDA 1994), connectivity is a measure of the extent of which the landscape pattern of the late-successional and old-growth ecosystem provides for biological and ecological flows that sustain late-successional and old-growth associated animal and plant species across the range of the northern spotted owl. Connectivity does not necessarily mean that late-successional and old-growth areas have to be physically joined in space, because many late-successional species can move (or be carried) across areas that are not in late-successional ecosystem conditions. In their conservation strategy for the northern spotted owl, the Interagency Scientific Committee (ISC) did not designate discrete habitat corridors (Thomas 1990). It was determined that entire landscape mosaics rather than the size or shape of individual habitat patches are important to owls. As a result, the ISC's conservation proposal included guidelines for maintaining a "well managed landscape matrix" surrounding habitat conservation areas.

Connectivity

In the Forest-Wide LSR Assessment (USDA 1999), connectivity between LSRs and LSR/wilderness complexes was assessed based on two considerations, the distance between LSRs and LSR/wilderness complexes, and the amount of dispersal habitat between LSRs and/or LSRs/wilderness complexes.

Using the distance criteria, connectivity between LSRs across the entire Forest rates "very strong" (less than six miles on the average between LSRs). Within the Thompson/Seiad/Grider Analysis Area, connectivity between LSRs is also very strong, with less than six miles between Seiad LSR, Johnny O'Neil LSR, and the wilderness.

In the Forest-Wide LSR Assessment, the assessment of dispersal habitat between LSRs/wilderness included several steps. The Forest was stratified by analysis watersheds. Forest analysis watersheds were chosen over quarter townships because they are the basis for other Forest analyses (such as this ecosystem analysis). In addition, they are partially defined by prominent landscape features which may have some relationship to how dispersing animals move through a landscape. Only those areas that are capable of providing dispersal habitat were included in the assessment. Capability was determined from Order 3 soil survey information. Dispersal habitat was defined as dense, mid-successional and late-successional coniferous forested stands (greater than or equal to 11 inches diameter at breast height and greater than or equal to 40% canopy closure). A distinction was made between "other reserves" and "Matrix lands". Although Matrix lands are those from which scheduled timber harvest is derived, they do provide and will continue to provide dispersal habitat. Analysis watersheds having less than 50% in dispersal habitat may trigger formal consultation with US Fish and Wildlife Service for any projects that propose the removal of habitat.

From the dispersal habitat assessment, **Table 3-35** displays the amount of dispersal habitat (as a percent of capable ground) connecting the LSRs that overlap the analysis area to each other, to the Marble Mountain Wilderness Area and to the Red Buttes Wilderness.

Table 3-35 Dispersal Habitat Between LSRs and Wilderness Within the TSG Analysis Area.

Analysis Watershed	Total Capable Acres Between LSRs and Wilderness	Acres of Dispersal Habitat in Other Reserves	Acres of Dispersal Habitat in Matrix	Total Dispersal Habitat Acres (% of Capable)
Grider Creek	410	250	50	300 (73%)
Seiad Creek	16,930	4,620	7,490	12,110 (72%)
Thompson Ck.	18,090	2,720	6,760	9,480 (52%)

As displayed above in **Table 3-35**, Grider Creek and Seiad Creek watersheds provide high levels of dispersal habitat. Thompson Creek, while still providing adequate dispersal, is close to threshold due to past wildfires and salvage logging.

Seiad LSR-353

The distribution of late-successional habitat throughout this LSR is fairly good (refer to **Figure 3-9** Seral Stages). There are relatively large (one thousand to several thousand acres), contiguous stands of late-successional habitat in most of the major drainages, including upper Thompson Creek,

Fort Goff Creek, Grider Creek, and O'Neil Creek. Within the analysis area, these drainages provide important connectivity within the LSR. Regeneration harvest has resulted in interruptions in late seral forest in many areas of the LSR, including the area west of Grider Ridge, Walker Creek, and lower Thompson Creek. The largest disruption in forested habitat, in the LSR, occurs along the ridge which separates Thompson Creek from Fort Goff Creek. This area contains a mix of pine/mixed conifer, montane chaparral, canyon live oak, oak woodland and understocked plantations, which may not be capable of supporting dense late-successional forest. In addition, the area burned at moderate intensity during the 1987 fires and in the Indian Ridge burn in the 1960s.

Stands of late-successional habitat are fairly well-connected, except in the heavily managed areas described previously. Stands of late-successional habitat are patchy in heavily managed areas. There are extensive areas of dense, mid-successional habitat south of West Grider Creek, and east of Grider Creek to Walker Creek. These mid-successional stands are important in providing connectivity between the northern and southern portion of this large LSR.

Given its size and juxtaposition to the Marble Mountain Wilderness, the Seiad LSR plays an important role in providing a large refugia for late-successional associated species. Habitats within the LSR are well-connected with the Marble Mountain Wilderness through Cliff and Grider Valleys. The LSR borders the Marble Mountain Wilderness at its southern boundary. An estimate of spotted owl habitat within the Marble Mountain Wilderness (USDA 1999) indicates that 50,220 acres of nesting/roosting habitat and 26,830 acres of foraging habitat occur there. The combined habitat within the LSR and the adjacent wilderness area enable this area to function as a large refugia for multiple pairs of spotted owls. Overall, distribution and connectivity of late-successional habitat within the LSR was rated as moderate in the Klamath Late-Successional Reserve Assessment (USDA 1999).

Johnny O'Neil LSR-354

Although much of this LSR falls outside of the analysis area, this discussion of habitat distribution in the entire LSR is important in describing connectivity across the landscape. The distribution of late-successional habitat is good through most portions of Johnny O'Neil LSR. The Horse Creek drainage (outside of the analysis area), which is the primary drainage in the southeast portion of the LSR, and much of the northeast portion of the LSR have large, continuous parcels of late-successional habitat. The northwest portion has fairly good distribution of late-successional habitat, particularly within a two-mile-wide band that runs along the Siskiyou Crest and to the north. The connectivity of late-successional patches throughout these three portions (southeast, northeast, and northwest) is good. The occurrence of dense, mid-successional stands helps to provide connectivity. However, within the Thompson/Seiad/ Grider Analysis Area, the southwest portion of the LSR in the Seiad Creek drainage, is severely lacking in the distribution of late-successional habitat (refer to Figure 3-9, Seral Stages). The lack of late-successional forest habitat is due to a combination of lower site capability, south and west aspects and the fact that much of the Seiad portion of the LSR burned in the 1987 wildfires.

Overall, the distribution and connectivity of late-successional habitat, relative to other Forest LSRs, is rated moderate in the *Klamath National Forest LSR Assessment* (USDA 1999).

Riparian Reserves

Riparian Reserves (RRs) generally include aquatic ecosystems and the adjacent upland areas. Riparian Reserves have been established for the following purposes: to maintain and restore riparian structure and function to benefit riparian-dependent and associated species other than fish; to enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas; to improve travel and dispersal corridors for many terrestrial plants and animals; and to provide for greater connectivity of the watershed. The RRs will also serve as connectivity corridors between the LSRs.

Riparian areas provide a diversity of vegetative communities and conditions that are important to a wide variety of mammals, birds, amphibians, fungi, mollusks, reptiles, insects and fish. The adjacent forested upland is also important for many species, including late-successional forest species such as spotted owls, goshawks, fisher and marten. The riparian shrub, conifer forest, and accumulations of downed material within RRs provide travel and dispersal corridors for late-successional forest-related species between blocks of suitable habitat and between LSRs.

Within the Thompson/Seiad/Grider Analysis Area, approximately 32% (48,000 acres) of the Forest Service administered landbase is designated as Riparian Reserve using the *Forest Plan* database and the updated RR layer (refer to Aquatics Step 3). Over half of the acres designated as RR fall within, and are masked by, the LSR Management Area (roughly 27,500 acres). Roughly 5,000 acres of RR

fall within Congressionally or administratively withdrawn land allocations (e.g. wilderness and backcountry). Of the remaining RR acres in the matrix, some areas have been degraded by management activities, prior to Riparian Reserve designation, or by wildfire. Past timber harvest has resulted in early seral conditions on approximately 2,650 acres of RR. This is roughly 17% of the landbase within RRs. Development of plantations through thinning and stand maintenance would increase the amount of RR acreage available for dispersal of organisms for the long-term.

Connectivity between large LSRs is facilitated by RRs that are currently in a late- or mid-successional forest condition. The following creeks and drainages currently support some percentage of late-successional or mid-successional forest and are important for connectivity laterally across slopes to other blocks of late-successional habitat (stepping stones of habitat): 1) connectivity between the Seiad LSR and Johnny O'Neil LSR is provided north of the Klamath River by upper Canyon Creek and upper Portuguese Creek; 2) connectivity between Seiad LSR and Collins-Baldy LSR (to the east) is provided by smaller tributaries to the Klamath River such as Kuntz, Mill, Jim, Mack, and Tom Martin Creeks; and 3) connectivity is provided from the Seiad LSR to other LSRs west of the analysis area by smaller tributaries of the Klamath River such as Horse Creek, Fryingpan Creek, Ottley Gulch, and Wood Creek.

Barriers to Dispersal

Within the Thompson/Seiad/Grider Analysis Area, the potential barriers to dispersal for late-successional forest-related species would include areas that currently do not support late-successional or mid-successional forest. Non-forested patches on the landscape would not, however, pose absolute barriers for highly mobile species such as owls, goshawks, fisher or marten. For smaller species with limited mobility; such as salamanders, mollusks or even plants; non-forested areas can pose barriers to dispersal, as can roads, Highway 96, and the Klamath River. Areas in the landscape that may pose barriers to dispersal, or that may discourage movement of more mobile species, include the following: large areas burned in the 1987 fires; large areas of harsh, ultramafic soils in the Devil's Peak area; areas that have been heavily harvested over the years, such as the area east of Grider Ridge; and the high, exposed ridges between major drainages (e.g. Buckhorn Mountain/King's Castle, Copper Butte/Red Butte/Kangaroo Mountain, and Lake Mountain/Brown's Knob).

Key Question 3 - What is the current density of roads in the Analysis Area and within LSRs?

The effects of roading on the landscape are similar to those of timber harvest. Roading contributes to increased fragmentation of vegetation by dividing patches into smaller fragments. The location of roads on the landscape has a significant effect on landscape continuity and connectivity. Roads can function as both barriers to dispersal and corridors for movement; roads may restrict landscape movement of fire and some wildlife species, while at the same time providing travel corridors for predators and humans.

Current total road density within the Thompson/Seiad/Grider Analysis Area is displayed on **Figure 3-13** (Road Density), and varies from zero to greater than four miles per square mile. Average total road density within the Seiad LSR is 1.9 miles per square mile; average total road density within the Johnny O'Neil LSR is 2.4 miles per square mile. Roads can affect ecosystems in several ways. Road construction removes and fragments habitat, affects wildlife distribution and movements, and increases the potential for outside disturbance factors. Knowledge regarding specific effects of roads is limited, however. We do not know how adaptable most populations are to habitat alterations. Also, we do not know how adaptable most populations are to disturbance, although regular ongoing use of roads for forest management activities seems to be less disruptive than intermittent use (USDA 1999).

It is difficult to determine thresholds for what acceptable road densities may be. Some investigations into effects of roads on deer and elk suggests that general use of habitat decreases from moderate to low at between two to 3.5 miles of open road per section (Brown 1985). Habitat models in the *Forest Plan* (*Appendix I*) suggest that habitat capability for marten and fisher is reduced to low when open road densities exceed three miles per square mile.

In the Thompson/Seiad/Grider analysis area, areas with total road density (including closed roads) greater than four miles per square mile are of highest concern for habitat fragmentation and disturbance to wildlife. These areas should be identified as priority areas for road treatments and decommissioning (refer to Appendix E, Access and Travel Analysis).

TERRESTRIAL WILDLIFE

Species identified for analysis in these watersheds include: bald eagles, spotted owls, marbled murrelets, northern goshawks, fisher, marten, willow flycatchers, red tree voles, bats, salamanders, mollusks, peregrine falcons, deer, elk, bear, turkeys, Forest Service Sensitive plants, and Survey and Manage plants.

Key Question 1a - For the species identified in this analysis, what are the habitat needs?

Key Question 1b - Where is the habitat for these species and how much habitat is in the analysis area?

Key Question 1c - What is our current knowledge of the populations in this watershed?

The analysis area contains potential habitat for a variety of vertebrate wildlife and plants. Many of these habitats have been altered by management activities or major disturbance events on public and private land. For this analysis, the focus will be on the species listed above. These species were selected for analysis because of their status as protected by the Endangered Species Act, their status as Forest Service sensitive, their status as Survey and Manage species, their inclusion in the *Forest Plan* as Forest Emphasis Species, or their inclusion due to local interest. Some of these species are also included as part of the Species Associations identified in the *Forest Plan*.

Species Associations from the *Forest Plan*, that are found in the analysis area but that are not being specifically addressed in this document, include the following: snag habitats, hardwood associations, riparian habitats, down woody material, cliffs, caves, talus and meadows. Information developed and tracked in the analysis, including late-successional habitats and habitats associated with species being specifically addressed, should cover habitat concerns for the Species Associations.

THREATENED AND ENDANGERED SPECIES

BALD EAGLE: Federal Threatened

Bald eagles in inland northern California are found in close association with lakes, reservoirs, and rivers that provide prey and suitable nesting and roosting habitat. Nests are usually located in multistoried forest stands with large trees and generally the largest ponderosa pine, sugar pine, or Douglas-fir are used for nests and roosts. Bald eagles feed primarily on fish during the spring and summer but often shift to waterfowl and carrion in the winter.

Habitat for bald eagles exists along the Klamath River and within approximately two miles of the Klamath River in its larger tributaries. Habitat for foraging occurs along the Klamath where there is adequate prey and large, easily approached perch trees and snags. Bald eagle nests are usually located in uneven-aged, multistoried stands with old-growth components (Anthony et al. 1982). Most nests in California are located in ponderosa pine/mixed conifer stands and nest trees are most often ponderosa pine (Jurek 1988). In California, Thelander found that 75% of all nest trees surveyed in 35 nest territories were within 1/4 mile of a water body (USFS 1977). In Alaska it was found that all bald eagle nests were located within 200 yards of salt water or along the course of major mainland rivers (USFS 1977). Hehnke found that all nests studied on the Alaskan Peninsula were within 50 yards of water (USFS 1977). It can be assumed, from the above information, that ponderosa pine/mixed conifer stands within at least 1/4 mile of water may be used for bald eagle nesting. There is a lower likelihood of nests occurring up to two miles from large bodies of water with adequate food supply.

There are two bald eagle nest sites within the analysis area; one near Caroline Creek and the other over-looking the Klamath River near Gordon's Ferry. The Caroline Creek Bald Eagle pair has been a known active pair since the early 1970s. This nesting area was designated as a Management Unit in the *Klamath National Forest Bald Eagle Habitat Management Plan* in 1975 and was designated as a Management Area in the *Forest Plan*. Reproduction has been recorded nearly every year since the early 1970s. In 1993, a lightning strike hit the nest tree and it has since fallen. In 1994, the eagles relocated to the west ridge of Caroline Creek watershed where they have produced one young per year for the past six years. Currently (as of 5/10/99), there is one, recently hatched, young eagle.

The Gordon's Ferry bald eagles have been known to use two nest sites since the site was first located in 1991. The first nest used was blown out of the tree in 1993 and the second nest was used in subsequent years. The birds reproduced in 1991, 1994, and 1995. They have apparently abandoned this second nest and have not been located either in 1998 or 1999. Nest searches continued into mid-summer of 1999.

NORTHERN SPOTTED OWL: Federal Threatened

Northern spotted owls (NSO) are associated with late-successional coniferous forest. Local suitable nesting and roosting habitat is defined as: Klamath mixed conifer, Douglas-fir and true fir stands below 6000 feet in elevation; with an overstory of Douglas-fir, ponderosa pine, sugar pine, incense cedar, white fir and/or Shasta red fir, averaging or above 18 inches in diameter; an understory composed of the same conifer species with hardwoods; a total canopy cover of 60-100%; a minimum of two to five snags per acre (18 inches or greater in diameter) and two to five down logs per acre (18 inches diameter at large end); the presence of deformed trees (mistletoe,

heart rot, etc.); and sufficient open spaces below the canopy for owls to fly (KNF, unpublished report 1993).

In 1997, this definition was translated into a model for use with the *Forest Plan* timber type vegetation data layer (**Figure 3-11** Suitable Habitat for Northern Spotted Owls). Variables, such as elevation, aspect and primary conifer species were used to refine the model for suitable habitat. Some foraging habitat is included in the model. Those stands modeled as foraging habitat reflect a conservative estimate, and include dense conifer and conifer/hardwood stands. Foraging habitat included here differs from nesting/roosting habitat in a few ways. It includes stands with a greater occurrence of midsized trees, and a lesser occurrence of large trees than nesting/roosting habitat. Stands labeled "foraging" are dense stands (greater than 60% canopy cover), and in some cases, are more dense than nesting/roosting stands.

At the project level, suitable habitat is often assessed using other site-specific information, and therefore, suitable habitat figures reported in project-specific documents may differ from *Forest Plan* based results as displayed here. In cases where site-specific home range data is currently available, it has been substituted for *Forest Plan* based data reported in the home range table (discussed below). Unless otherwise noted, all suitable spotted owl habitat figures reported in this assessment are derived from the *Forest Plan* based layer.

Currently, there are a total of 64,676 acres of suitable spotted owl habitat within the analysis area (refer to **Figure 3-11** Suitable Habitat for Northern Spotted Owls). Table 3-36, below, displays acres of suitable habitat by Management Area within the Thompson/Seiad/Grider Analysis Area.

Table 3-36 Suitable Spotted Owl Habitat by Management Area.

MANAGEMENT AREA	ACRES OF SUITABLE OWL HABITAT	
	Nesting/Roosting	Foraging
Seiad LSR	19,635	18,045
Johnny O'Neil LSR	1,386	1,802
Wilderness	541	125
Special Management	230	1,202
Backcountry	836	1,832
Riparian Reserve	974	2,237
Recreational River	463	709
Retention	1,382	2,873
Partial Retention	2,744	5,078
General Forest	665	1,917
Total	**28,856**	**35,820**

Spotted Owl Activity Centers

Early Surveys. Prior to the 1987 wildfires, which burned many acres within the analysis area, northern spotted owl surveys were restricted to Research, Development, and Analysis (RD&A) Sites, Spotted Owl Habitat Area (SOHA) verifications and a few scattered timber sales. Subsequent to the 1987 wildfires, many surveys took place in proposed areas of salvage. (Grider Fire Salvage, Kangaroo Salvage, Upper and Lower Copper Salvage, Walker Heli, and Louie Salvage). This effort built the strongest set of data for spotted owls but only focused on areas of proposed salvage.

Protocol Surveys. Protocol surveys (surveys conducted according to the March 12, 1991 Regional survey protocol) have been limited to four efforts in this analysis area. These areas are Lew Timber Sale (West Grider), Last Heli Timber Sale (Walker Creek), Seiad Salvage Timber Sale (lower Seiad Creek), and historical visits in Morgan Creek and upper Thompson Creek.

Surveys in the analysis area have identified 26 spotted owl activity centers. The activity centers are listed below in **Table 3-37**, along with the total amount of suitable habitat in each core area (0.7 mile radius), the amount of habitat within each homerange (1.3 mile radius), and the Management Area in which the activity center falls.

Table 3-37 Acres of Suitable Spotted Owl Habitat and Management Areas for Owl Activity Centers

ACTIVITY CENTER	HABITAT WITHIN CORE AREA (0.7)	HABITAT WITHIN HOMERANGE (1.3)	LAND ALLOCATION
KL-1101	480	1,580	Seiad LSR
KL-1112	525	1,945	Seiad LSR
KL-1114	700	2,255	Seiad LSR
KL-1116	450	1,700	Seiad LSR
KL-1117	610	1,460	Seiad LSR
KL-1119	765	2,405	Seiad LSR
KL-1121	705	2,085	Seiad LSR
KL-1122	770	2,160	Seiad LSR
KL-1130	730	2,455	Seiad LSR
KL-1162	730	2,205	Seiad LSR
KL-1164	355	1,585	Seiad LSR
KL-1212	505	1,810	Seiad LSR
KL-1231	620	1,670	Seiad LSR
KL-1232	670	1,970	Seiad LSR
KL-1265	715	2,475	Seiad LSR
KL-1266	760	2,455	Seiad LSR
KL-4133	775	2,480	Seiad LSR
KL-0241	612	2030	Seiad LSR
KL-1202	258	749	Seiad LSR
KL-252	550	1,320	J.O'Neil LSR
KL-1159	260	550	J.O'Neil LSR
KL-1160	240	1,325	J.O'Neil LSR
KL-1161	665	1,875	J.O'Neil LSR
KL-253	655	2,400	Gen.Forest
KL-275	700	1,979	Gen.Forest
KL-272	764	2,358	Gen.Forest

Seiad LSR

The entire Seiad LSR provides approximately 26,240 acres of nesting/roosting habitat and 23,490 acres of foraging habitat, for a total of 49,730 acres of suitable spotted owl habitat. An additional 24,910 acres have the potential of providing suitable spotted owl habitat in the future (e.g., plantations). **Table 3-36** Suitable Spotted Owl Habitat by Management Area, displays the amount of habitat in the Seiad LSR that falls within the Thompson/Seiad/Grider Analysis Area.

Much of Seiad LSR has never been adequately surveyed for spotted owls (at least 40%). To date a total of 25 spotted owl activity centers have been located within the boundary of the LSR, 19 of which are located within the analysis area. **Table 3-37** Acres of Suitable Spotted Owl Habitat and Management Areas for Owl Activity Centers, summarizes habitat within core areas and homeranges for all of the owl activity centers within the analysis area.

Johnny O'Neil LSR

The entire Johnny O'Neil LSR provides approximately 20,420 acres of nesting/roosting habitat and 7,370 acres of foraging habitat for a total of 27,790 acres of suitable spotted owl habitat. An additional 8,850 acres could potentially provide spotted owl habitat in the future (e.g. plantations). **Table 3-36** Suitable Spotted Owl Habitat by Management Area, displays the amount of habitat in the Johnny O'Neil LSR that falls within the Thompson/Seiad/Grider Analysis Area.

There are 21 spotted owl activity centers that have been located within the boundary of Johnny O'Neil LSR, four of which are located within the analysis area. Approximately 20% of the Klamath portion of the LSR has never been surveyed for spotted owls. **Table 3-37** Acres of Suitable Spotted Owl Habitat and Management Areas for Owl Activity Centers, summarizes habitat within core areas and homeranges for all of the owl activity centers within the Thompson/Seiad/Grider Analysis Area.

Spotted Owl Critical Habitat

Two spotted owl Critical Habitat Units, as identified by the U.S. Fish and Wildlife Service, overlap with the Thompson/Seiad/Grider Analysis Area; CA-15 and CA-17. The majority of Critical Habitat in the analysis area is contained within the Seiad and Johnny O'Neil LSRs. Small amounts of Critical Habitat occur outside of LSRs, in the Matrix, in the following locations (refer to Figure 3-10, Critical Habitat for Northern Spotted Owls, and **Figure 1-2** *Forest Plan* Management Areas): along the ridge between Canyon Creek and Seiad Creek in the Seiad sub-watershed; in the headwaters of Kuntz Creek in Section 4; and in the headwaters of Mack's Creek on the eastern edge of the analysis area.

MARBLED MURRELET: Federal Threatened

Marbled murrelets forage almost exclusively in the marine environment but nest inland in mature conifers, as far as 50 miles from the coastline. They use forest stands with old-growth forest characteristics including large trees (>32 inches dbh), multistoried canopies, and moderate to high canopy closure. They are known to use mature forests with an old-growth component (large trees). Trees must have large branches or deformities with moss or lichen substrate for nest platforms (USDI 1997).

The Forest Ecosystem Management Assessment Team (FEMAT) report (USDA/USDI, July 1993) described recommendations from its marbled murrelet working team. Those recommendations included identification of two marbled murrelet zones based on observed use and expected occupancy by marbled murrelets. Zone 1, on the Forest, extends to 35 miles inland to a point of intersection with the Klamath River. Zone 2 includes areas further inland from the eastern boundary of Zone 1 and is characterized by relatively low numbers of murrelet sightings, partially a function of few inventories. In California, Zone 2 extends to about 45 miles inland from the marine environment, at its most easterly point.

Limited surveys have occurred on the Forest in relation to specific timber sales on the Happy Camp and Ukonom Ranger Districts. By the spring of 1997, it was estimated that 20,000 acres had been surveyed to protocol on the Forest. During surveys in 1994, there were four detections of murrelets on the Happy Camp District, approximately 35 miles inland, in the Indian Creek Watershed (west of the Thompson Creek Watershed). There was one detection in the same area in 1995. No occupied behavior has been witnessed, and no other detections have occurred. Monitoring continued at this site through 1997 and no further detections were made.

Critical habitat for marbled murrelets was designated by the U.S. Fish and Wildlife Service in May, 1996. It includes mapped LSRs within the marbled murrelet Zone 1 and some LSRs in Zone 2. A small portion of the Seiad LSR, which includes the upper portion of the Thompson Creek Watershed, is included in marbled murrelet Critical Habitat. The critical habitat is, approximately, the portion of the LSR west of the dividing line between the Humboldt and Mount Diablo

Meridians (west of the ridge between Fourmile Butte and Goff Butte) (see **Figure 3-10** Critical Habitat for Northern Spotted Owls and Marbled Murrelets).

For this document, suitable NSO nesting/roosting habitat is used to approximate the occurrence of marbled murrelet habitat. Final determination of the suitability of habitat, however, must be made on the ground as it is judged by attributes that are not described in the Forest vegetation data base (large trees with stout limbs that include moss platforms). Suitable habitat occurs in marbled murrelet Zone 2, which overlaps approximately 1/2 of the analysis area (see **Figure 3-11** Suitable Habitat for Northern Spotted Owls). Roughly 17,000 acres of suitable habitat for murrelets occurs in the analysis area. No detections of murrelets have occurred in the analysis area, and no formal surveys have been conducted.

Forest Service Sensitive Species

NORTHERN GOSHAWK: Forest Service R-5 Sensitive

Goshawks can be found in middle and higher elevation mature coniferous forests; usually with little understory vegetation and flat or moderately sloping terrain. Moderate and high quality habitats contain abundant large snags and large logs for prey habitat and plucking posts (Hall 1984). Goshawks generally breed in older-age coniferous, mixed, and deciduous forest habitats. This habitat provides large trees for nesting, a closed canopy for protection and thermal cover, and open spaces allowing maneuverability below the canopy (Hall 1984).

Within the analysis area, habitat consists of mid- and late-successional mixed conifer forest with scattered harvested and natural openings. On the west side of the Klamath, suitable goshawk habitat is similar to NSO habitat and for this analysis it will be described the same. Approximately 64,676 acres of suitable habitat currently exists in the analysis area. For a display of suitable goshawk habitat, see **Figure 3-11** (Suitable Habitat for Northern Spotted Owls). For the amount of suitable goshawk habitat in the watershed by Management Area see the table of suitable NSO habitat (**Table 3-36** Suitable Spotted Owl Habitat by Management Area).

There are ten goshawk activity centers within the analysis area. Six of the ten sites are associated with NSO nest sites. Known goshawk sites were detected incidentally during NSO surveys or other field reconnaissance. No formal surveys for goshawks have occurred in the analysis area.

PACIFIC FISHER: Forest Service R-5 Sensitive

This furbearer occupies late seral stage habitat in mature and old-growth mixed conifer stands with a home range which can be very large (up to 11,000 acres in low quality habitat) (Region 5 Draft Furbearer Management Guidelines; CDFG 1990). Fisher are generalized predators; they eat any animal they can catch and overpower, generally small- to medium-sized mammals and birds. They readily eat carrion and fruits. Fisher show a preference toward old-growth for denning.

Fishers do not appear to occur as frequently in early successional forests as they do in late-successional forests in the Pacific Northwest. While some recent work in northern California (including on the Klamath National Forest) indicates that fishers are detected in second-growth forests and in areas with sparse overhead canopy, it is not known whether these habitats are used transiently or are the basis of stable homeranges. It is unlikely that early and mid-successional forests, especially those that have resulted from timber harvest, will provide the same prey resources, rest sites, and den sites as more mature forests (Ruggiero et al. 1994)

Large physical structures (live trees, snags, and logs) are the most frequent fisher rest sites, and these structures occur most commonly in late-successional forests. The maintenance of late-successional forests, and especially the habitat elements listed above, is important to the conservation of fishers.

Suitable denning/resting/foraging habitat for fisher can be found in the analysis area. During the fall and winter of 1994-95, the Trailmaster Camera protocol was run in three locations within the analysis area; Caroline Creek, Grider Campground, and O'Neil Campground. Track plate surveys were done west of Grider Ridge. No fishers were detected.

AMERICAN MARTEN: Forest Service R-5 Sensitive

This species also uses mature and old-growth habitat, but is considered to use habitat at a higher elevation than fisher. Generally, mature and over-mature true fir/hemlock/pine habitat occurring above 5,000 feet in elevation with a dense canopy (greater than 40%) and adequate large, CWD is considered marten habitat (Jameson et al. 1988; CDFG 1990). However, they are not restricted to this habitat; mixed conifer at lower elevations is also considered suitable for marten.

American martens are limited to conifer-dominated forests and vegetation types nearby. In most studies of habitat use, martens were found to prefer late-successional stands of mesic coniferous forest,

especially those with complex physical structure near the ground (Buskirk and Powell 1994). Xeric forest types and those with a lack of structure near the ground are used little or not at all. The preference and apparent need for structure near the ground, especially in winter, appears universal (Ruggiero et al. 1994).

In northwestern California, a subspecies, Martes americana humboldtensis, may be Threatened or Endangered. The most likely cause of this hypothesized status is loss of habitat due to timber cutting in late-successional forests. The marten is predisposed by several attributes to impacts from human activities, including: its habitat specialization for mesic, structurally complex forests; its low population densities; and its low reproductive rate for a mammal of its size (Ruggiero et al. 1994).

The distribution of marten in the analysis area is not well known due to the lack of survey data. Mid- and high elevation mixed conifer habitat, considered suitable for marten, can be found in the area. Surveys during the fall and winter of 1994-95, using the Trailmaster Camera protocol, were run in three locations within the analysis area; Caroline Creek, Grider Campground and O'Neil Campground. Track plate surveys were done west of Grider Ridge. No marten were detected.

WILLOW FLYCATCHER: Forest Service R-5 Sensitive

As a Neotropical migratory species, the willow flycatcher breeds in riparian and mesic upland thickets in the United States and Canada, wintering from Veracruz and Oaxaca, Mexico south to Panama (AOU 1983). Breeding habitat in California is typically moist meadows with perennial streams, lowland riparian woodlands dominated by willows, cottonwoods, or in smaller spring fed boggy areas with willow or alders (Serena 1982, Harris et al. 1987; Whitfield 1990). The presence of water during the breeding season appears to be an important habitat component (Fowler et al. 1991). Willow flycatchers have also been found in riparian habitats of various types and sizes, ranging from small willow surrounded lakes or ponds with a fringe of meadow, to grasslands, to willow lined streams or boggy areas.

Habitat in the analysis area consists of willow thickets along the Klamath River and its tributaries, higher elevation streamside alders/willows, and high elevation meadows with willows and alders. Habitats in the analysis area have been impacted by mining and homesteading along the Klamath River and to some extent by road building higher in the watershed. Hydrologic events, such as floods, remove willow habitat for short periods of time, but willows quickly recolonize suitable disturbed sites.

Historical information on this species occurring in the Klamath Mountains is practically non-existent. Systematic surveys have only recently been conducted to determine local distribution of willow flycatchers on the Oak Knoll and Goosenest Ranger Districts of the Klamath National Forest. Annually since 1994, a constant effort mist netting station has been run at the mouth of Seiad Creek from mid-May through Mid October. This station has documented some preliminary sketches of use by willow flycatchers in the Seiad Valley area. One hundred eighty-six willow flycatchers have been banded since 1994. There is a pattern of seasonal fluctuations at the banding station throughout the breeding season with the peak numbers being caught in the early summer and again in the late summer. Many of the late summer individuals are birds that hatched this year, which indicates that breeding does take place (possibly at higher elevations or in adjacent watersheds) but not necessarily at Seiad. One known willow flycatcher nest has been recorded at Seiad and has been confirmed for three years in row (1996-1998). It is evident that the riparian habitat surrounding Seiad Valley does provide important habitat for willow flycatchers during the early breeding and dispersal periods.

Survey and Manage Species

RED TREE VOLE

There is some indication that the Oregon red tree vole (Arbormus longicaudus) may be found in northern California. This preliminary information needs further analysis before applying Survey and Manage Component 2 standards and guidelines for this species in California (Forest Service Memorandum 4 November 1996). At this time no surveys are required in California.

Red tree voles are restricted to forests west of the crest of the Cascade Mountains in Oregon. They inhabit primarily mesic, old-growth Douglas-fir forests and sometimes can be found in sapling/pole, closed canopy forests and in trees or stands composed of grand fir, Sitka spruce, white fir, or western hemlock (Biology and Interim Survey Protocol for the Red Tree Vole, September 1996).

There is no data confirming or disputing whether this species occurs on the Forest. According to Jameson and Peeters (1988), red tree voles are confined to a narrow region of humid coastal forests near the ocean. They do not venture into less humid areas of the interior, even where Douglas-fir may abound.

This information would suggest that it is unlikely that red tree voles occur on the Forest or in the Thompson/Seiad/Grider Analysis Area. However, recent surveys in Oregon have found red tree voles in the Applegate River Watershed, approximately 15 miles north of the analysis area (M. Broyles, pers. comm.). The recent detections were roughly the same distance inland as the town of Seiad (within the analysis area).

BATS

The following bat species may be found in the analysis area: fringed myotis, silver-haired bat, long-eared myotis, long-legged myotis, pallid bat and Townsend's big-eared bat. While these bat species are associated with coniferous forests, they differ somewhat in their preferred roosting habitats. These preferences are based on whether they are colonial and to what degree.

The colonial roosting fringed myotis require the relatively roomy roosts found in caves, mine shafts, buildings, and crevices. The semi-colonial, silver-haired bat roosts and forms nursery colonies in caves, hollow trees, snags, buildings, crevices and under bark. The long-eared and long-legged myotis also form nursery colonies, but tend to roost individually or in small colonies in crevices in buildings or rock, in snags and under bark. Caves and mine shafts are used primarily for night roosts, with trees probably being the most important day roosts. All these bats use echo-location to forage on insects. All forage over forest openings and bodies of water (USDA April, 1997).

Pallid bats use a variety of habitats, including grasslands, shrublands, woodlands, and coniferous forests (Philpott 1997). Pallid bats are most common in open, dry habitats that contain rocky areas for roosting. They are a yearlong resident in most of their range and hibernate in winter near their summer roosts (Zeiner et al. 1990). No surveys for bats have been conducted in the analysis area, it is unknown if pallid bats occur here.

Townsend's big-eared bats are typically found in low desert to mid-elevation montane habitats, although sightings have been reported up to 10,800 feet (Philpott 1997, Sherwin 1998). Habitat associations include desert, native prairies, coniferous forests, mid-elevation mixed conifer, mixed hardwood-conifer forests, riparian communities, active agricultural areas and coastal habitat types (Kunz and Martin 1982, Brown 1996, Sherwin 1998). Distribution of this species is strongly correlated with the availability of caves and cave-like roosting habitat (Sherwin 1998). No surveys for bats have been conducted in the analysis area, it is unknown if Townsend's big-eared bats occur here.

Potential roost habitat for bats in the analysis area includes: abandoned mine shafts, large trees and snags, caves, buildings and unsurveyed limestone formations that may have caves. Known caves in the area are being included in a Forest-Wide cave management plan currently being prepared on the Klamath National Forest.

DEL NORTE SALAMANDER (Protection Buffer Species/ Survey and Manage Strategy 2);
SISKIYOU MOUNTAINS SALAMANDER (Protection Buffer Species/ Survey and Manage Strategies 1 and 2)

According to the literature, these closely related amphibians are associated with deep, rocky substrates. They are terrestrial salamanders, having no aquatic life stage. Given that these species are not highly mobile, they tend to occur as isolated populations with little genetic interchange. Habitat relationships are not well understood and investigations are currently underway. The salamanders are dependent on cool, moist environments. They are found at or near the forest surface during rainy periods in the fall and spring. The presence of dense canopy closure may help to maintain optimum surface conditions. During periods of inhospitable environmental conditions, the salamanders retreat below the forest surface, utilizing intersticial spaces provided by deep layers of rock and talus. Although populations have been located in young forested stands, increased abundance is associated with older forests (Welsh and Lind 1995).

These two plethodon salamanders, Siskiyou Mountains salamander (*Plethodon stormi - PLST*) and Del Norte salamander (*Plethodon elongatus - PLEL),* are similar in appearance with slight differences in physical characteristics which can be determined in adults only. Genetically they are considered distinct species but samples from the Seiad area are limited. Both salamanders are Record of Decision Survey and Manage species. The Siskiyou Mountains salamander is listed as threatened with the State of California.

These species are known to occur on the west side of the Klamath National Forest. The Del Norte salamander is more widely distributed of the two, occurring primarily from the Grider Ridge area in the analysis area, to Idlewild Campground on the North Fork Salmon River in the southeast, and to Cecil Creek on the south fork of the Salmon River. The range of the Siskiyou Mountain salamander is centered generally around Seiad Valley.

Survey efforts for both species have increased since the spring of 1996 with the release of a draft survey protocol. Numerous new locations have been identified on the Forest. Ongoing efforts will include further delineation of the species' range and investigation of habitat relationships. Extensive surveys on both the Klamath National Forest and the Six Rivers National Forest have found Del Norte salamanders in a wide variety of habitats and canopy conditions (K.Nickell, pers. com.). This survey information and habitat data has yet to be fully analyzed.

Management activities in the analysis area that may have affected suitable habitats for salamanders include mining, road building, rock quarry development, and timber harvest. These types of activities have affected habitats by directly disturbing talus habitats or by altering the microclimate surrounding the talus substrate.

Siskiyou Mountains Salamander (PLST)

The Seiad-Grider area is considered a range contact zone between these two plethodonids. Historically PLST were known only within the Seiad and Bittenbender Creek watersheds. In 1995, the range was expanded for PLST across the Klamath River on the lower ridges of Grider Creek. Presently the western range of PLST is from lower Thompson and Seiad Creek watersheds, the lower ridges of Grider and west Grider Creeks, Walker Creek watershed and along Highway 96 to the Scott River.

Del Norte salamander (PLEL)

In the vicinity of the analysis area, PLEL have been documented in Thompson Creek, Indian Creek, Clear Creek, Benjamin Creek and Elk Creek watersheds. There is a need to better define these two species ranges by conducting a comprehensive survey effort. There is also a further need to conduct genetic analysis to determine if genetically distinct or mixed populations exist.

MOLLUSKS (Survey and Manage strategies 1 and 2)

The following habitat descriptions are from the Terrestrial Mollusk Survey Protocol DRAFT, Version 2.0 (October 29, 1997). Very little is known about mollusks in the Thompson/Seiad/Grider Analysis Area. No formal surveys using the available *draft* protocols have been conducted to date. Surveys will be required in the future for ground disturbing activities according to Management Recommendations which are yet to be finalized.

Chace sideband - Monadenia chaceana

Little is known about habitat for this species. Generally, it can occupy old-growth forest and open talus or rocky areas.

Klamath (Church's) sideband - Monadenia churchi

This species is mainly found in limestone outcrops, caves and talus slides, but also in lava rockslides, especially in riparian areas, and under nearby forest debris in heavy shade.

Klamath shoulderband - Helminthoglypta talmadgei

This species inhabits areas within 200 meters of limestone rock talus especially near springs or streams. The species prefers partial shading.

Oregon shoulderband - Helminthoglypta hertlieni

Oregon shoulderbands have been found in rocky areas including talus, but are not restricted to those areas. They are suspected to be found in areas of permanent ground cover and moisture. Rock fissures or large woody debris can be important habitat factors.

Tehama chaparral - Trilobopsis tehamana

Tehama chaparral is usually associated with limestone rockslides, but can be found under leaf litter and woody debris on the ground near limestone outcrops.

Papillose Taildropper - Prophysaon dubium

The papillose taildropper appears to be strongly associated with hardwood logs and leaf litter on sites with relatively higher shade and moisture levels.

Klamath Forest Emphasis Species, Species Of Local Concern

PEREGRINE FALCON

Peregrine falcons primarily nest on large cliffs, usually near water. Peregrines begin nesting in February and the young fledge in early summer. Peregrines hunt for birds over large areas and many different habitat types. Perches in prominent locations (high rocks, cliffs, and snags) are important to peregrines as observation posts in foraging, territorial defence, and reproductive behavior. There are two known peregrine eyries within the analysis area, Grider Creek and China Bluffs.

The Grider eyrie is located in upper Grider Creek near Fish Gulch. It has been monitored sporadically since 1991. Between 1991 and 1996 reproduction was confirmed for three years. This eyrie was not monitored in 1997 due to landslides on the access roads from the 1997 winter floods. In 1998, this eyries was monitored by helicopter with at least one fledgling determined.

The China Bluffs eyrie is located on the bluffs on the east side and overlooking the Klamath River about 3/4 of a mile south of China Creek. The eyrie was monitored annually from 1982 through 1999. Reproduction was known to occur at this site every year from 1982 to 1990, then again in 1992, 1998 and 1999. Surveys concluded that the cliff was occupied from 1992 through 1997, but reproduction could not be determined.

Potential habitat for peregrines, that is currently not occupied (S.Cuenca, pers. com.), occurs on Lower Devils Peak north of the Klamath River. In addition, potential habitat, that has not been surveyed, exists in the Red Buttes just outside of the analysis area. Birds potentially occupying this site may forage within the Thompson Creek watershed.

DEER

Two deer herds, as identified by the California Department of Fish and Game (CDFG), are found in the analysis area: the Happy Camp deer herd occupies habitats in Thompson Creek, Grider Creek, and in the western portion of the Seiad Creek drainage; and the Klamath deer herd occupies habitats east of Seiad Creek. The Happy Camp and Klamath deer herds contain migratory and resident Columbian black-tailed deer (Odocoileus hemionus columbianus).

Black-tailed deer are common and abundant in the analysis area (S.Stresser, personal observations 1999; discussions with local residents and Forest employees). Migratory deer make up the majority of the deer population in the analysis area, they inhabit areas at higher elevations during the summer and move to lower elevations along the Klamath river in the winter (refer to **Figure 6-6**). Some migrations may only be several miles in distance to the lower reaches of a drainage. Often the move is just far enough below snow-line to obtain a suitable food source. Other deer migrate as much as 60 miles, moving across the mountains and into the adjacent river drainages. Resident deer herds are found at lower elevations below the influence of deep snow. They utilize the streamside riparian habitat, normally at the lower reaches of stream drainages and along the Klamath River.

Habitats occupied by deer in the analysis area consist of steep and rugged terrain associated with the Klamath River and its tributaries. Fire has played an important role in influencing the vegetation patterns within the analysis area. It is largely responsible for the mosaic of brushfields and hardwoods within the dominant coniferous forest zone. Deer populations have probably been influenced more by low and moderate intensity fire than any other factor since 1900 (CDFG 1989). More intensive and efficient fire suppression techniques have reduced the acreage of natural lower intensity fire.

Timber harvest has been a more recent influence on the habitats within the analysis area. Logging was a minor activity until 1950. Since that time, timber harvest operations have increased dramatically and have been an important factor influencing deer and other wildlife habitats in western Siskiyou County.

Black-tailed deer are both browsers and grazers. They prefer tender new growth of various shrubs (e.g. ceanothus and mountain mahogany), many forbs, and a few grasses (Wallmo 1978, 1981) Deer will forage from the ground surface into bushes and trees as high as they can reach. Deer will also dig out subterranean mushrooms (CDFG April, 1990). Food preferences vary with season, forage quality, and availability. Forbs and grasses are important in spring and acorns are important in autumn where available. Various shrubs are critical in summer and winter.

Deer summer range is usually located above 4,000 feet in elevation and includes a variety of habitat types, including riparian, brushfields, meadows, grassy areas, and forests. Winter ranges are associated with lower elevations along the Klamath River and south-facing slopes (refer to **Figure 6-6**).

Important escape cover for deer includes brushy areas and tree thickets. Vegetative cover is critical for thermal regulation in winter and summer. Deer frequent various aspects of habitat during the year to aid in thermal regulation (e.g., they use south-facing slopes more in cold weather, and north-facing slopes more in hot weather) (CDFG April 1990).

The local office of the CDFG has developed a draft predictive model for deer habitat on the Klamath. Although the model is draft, it is currently the only model available to predict where high quality deer habitat occurs in the analysis area. The source data used in modeling the habitat was derived from Fox, et al. 1997. Although the model has not been tested on the ground in the Thompson/Seiad/Grider Analysis Area, a map was made to predict where the high quality forage and cover habitat may occur (available

in the Thompson/Seiad/Grider Analysis Area files located at the Forest Supervisor's Office).

Habitat polygons that were interpreted as potentially "high value" for the area include the following: *high forage value - high index forage areas between 0 and 210 meters from high value cover; and high cover value - high index cover between 0 and 390 meters of high value forage*. Using this interpretation, the high value habitat areas are very scattered across the analysis area, with few obvious concentrations of "high value" habitat pixels. The areas identified as having the largest concentration of high *cover* value occur over roughly 10% of the analysis area (14,317 acres), and include: upper Grider Creek, upper Thompson Creek, and the area west of Grider Ridge.

The areas identified as having the largest concentration of high *forage* value habitat occur over roughly 10% of the analysis area (14,503 acres), and include: upper Walker Creek, upper Grider Creek, the area between Thompson and Fort Goff Creeks, the Evans Mountain (China Fire) area, and a large area containing the Devil's Peaks and the western portion of the Seiad watershed. The area in the Seiad Creek watershed and the Devil's Peaks typed out as *high forage value*, but the local biologist (S.Cuenca, pers. com.) verified that this area actually offers low forage value due to low productivity ultra mafic soils. Although the areas above can be identified as potential habitat, overall, the analysis area provides minimal high quality forage (S.Cuenca, pers. com.). Forage quality and availability can be improved by introducing an underburning regime in suitable forage areas relatively close to cover.

In addition to available forage and cover, potential disturbance effects can be important in determining the quality of habitat for deer. Deer are sensitive to disturbance in areas of high road density. In the analysis area, this condition is most prevalent in Walker Creek, in the area west of Grider Ridge, and in the Cade Mountain area. The analysis area is popular for road hunting, deer hunting camps are common in the fall and a high number of hunters have consistently been noted by District personnel in Upper Seiad Creek watershed, Thompson Ridge, and Joe Miles Creek. More moderate hunting activity occurs in Walker Creek, Tim's Peak area, Cade Mountain area, Evan's Mountain/China Peak, and Faulkstein Camp. Road closures or decommissioning will improve habitat for deer and reduce disturbance in these high road density areas.

ELK

Roosevelt elk breed in open, brushy stands of many deciduous and conifer habitats with abundant water. They feed in riparian areas, meadows, and herbaceous and brush stages of forest habitats. Feeding consists of both grazing and browsing; they eat grasses, forbs, tender twigs and leaves of shrubs and trees, fungi, some mast, and aquatic vegetation. Roosevelt elk require mature stands of deciduous and conifer forest habitats for cover. Dense brush understory is used for escape and thermal cover. These habitats are particularly important on south-facing slopes for cover in winter. Roosevelt elk use uneven-aged forest stands that include old-growth, herbaceous openings, and water. These elk do not travel far from the cover of forest.

Elk habitat on the Forest has been modeled using the "Southern Oregon-Northern California Bioregional Domain Elk Habitat Index (Dr. L. Fox, T. Burton, and R. Callas). The source data used in modeling the habitat was derived from Fox, et al. 1997. Although the model has not been verified on the ground in the Thompson/Seiad/Grider Analysis Area, a map was made to predict where high quality elk habitat may occur (available in T/S/G AA file). Habitat polygons that were interpreted as potentially "high quality" habitat for elk in the area included: *high forage value areas very close to cover, high forage value areas moderately close to cover, and moderate cover very close to high value forage.* Using this interpretation, the larger patches of habitat occur in upper Seiad Creek watershed near Copper Mountain, Upper Walker Creek, Upper Grider Creek and below Cade Mountain in the lower Thompson Creek watershed. Although these areas can be identified as potential habitat, overall, the analysis area provides minimal high quality forage. One area in the Seiad Creek watershed, the Devil's Peaks area, typed out as *high forage value*, but the local biologist (S.Cuenca, pers. com.) verified that this area actually offers low forage value due to low productivity of ultramafic soils.

Anecdotal information on elk use in the watershed is minimal, but several sightings of elk have occurred in the upper portions of the Seiad Creek watershed, including seven bull elk in Walker Gulch. These are likely animals from the Horse/Middle Creek Herd or possibly recruits from Oregon. Elk have also been sighted west of Grider Ridge just outside of the analysis area. Elk use in the analysis area is predominantly within the 1987 wildfire area or within previously harvested areas. No mapping of calving areas or winter range has been completed in this area. The limiting factor for elk use in the area appears to be high quality forage availability; forage quality and availability can be improved by introducing an underburning regime in suitable forage areas and by managing to maintain meadows, natural brush stands and aspen stands.

The has been tracking a reintroduced herds of elk in the Elk Creek watershed and in Independence Creek

with radio telemetry equipment; tracking of the animals has been ongoing since 1986. A map of telemetry points (mapped from the air) shows heavy use of habitat in Elk Creek. However, several detections have occurred in the Grider Creek watershed in Stones Valley and Cliff Valley, within the Thompson/Seiad/Grider Analysis Area.

An important factor in maintaining a healthy elk population in the analysis area is providing adequate calving habitat. Good calving habitat is found on gentle slopes with dense cover, down woody material, close to forage and away from roads or other disturbance sources (USDA, July 1998). Calving habitat has not been specifically identified for this analysis area. Determination of important calving habitat should be made on the ground as it is judged by attributes that are not described in the vegetation data base (i.e., dense cover, down woody material).

In addition to available forage and cover, potential disturbance effects can be important in determining the quality of habitat for elk. Studies have shown elk to be extremely sensitive to roads; this is mostly related to hunting pressure and high traffic. In areas where elk are hunted, open road densities greater than 2.5 miles per square mile can reduce habitat effectiveness by half (USDA, July 1998). In the analysis area, high road density is of concern in Walker Creek, in the area west of Grider Ridge, and in the Cade Mountain area. Current *total road density* in the analysis area is displayed on **Figure 3-13**. On the map road density is grouped as 0 mi/mi², .1-1 mi/mi², 1-2.5 mi/mi², 2.5-4 mi/mi², and >4 mi/mi². Road closures or decommissioning will improve potential habitat for elk in high road density areas.

BEAR

Suitable habitat for bear can be characterized as forest areas with a mixture of vegetation types or seral stages providing both cover and a variety of food in good abundance. Where the mixture of vegetative types is sufficient to provide food year-round within relatively small area, bear densities tend to be greater. Individual black bear will make movements of relatively long distances to take advantage of seasonally abundant foods such as acorns or manzanita berries (CDFG 1992).

Major habitat types used by black bear in California, and in the analysis area, include coniferous forest types, montane hardwoods and mixed and montane chaparral. Forested types, such as the mixed conifer forest which provide mixtures of vegetative types such as chaparral, hardwoods and conifers, tend to support greater numbers of bear than do less diverse coniferous types such as pure stands of true fir. Mixed conifer forests also provide year-round habitat and are preferred denning areas, recent research has shown large snags and hollow trees to be preferred den sites (F.Schmalenberger, pers. com.).

Sightings of this species are common in the area, with the largest numbers seen in the area west of Grider Ridge, upper Seiad Creek and lower Grider Creek. Local residents report seeing up to 20 bears at one time in large oak patches in the fall.

Although no data on bears has been collected specifically in the Thompson/Seiad/Grider Analysis Area, radio telemetry data has been collected in similar habitat on the Ukonom Ranger District for a joint study being conducted by CDFG and the Forest Service (Klamath Black Bear Study). Biologists working on the study have recorded black bear densities up to 9-12 bears per square mile. It is expected that densities are similar throughout this portion of the Klamath Mountains (F. Schmalenberger, pers. com.).

TURKEY

Turkeys have been introduced on the Klamath National Forest and are uncommon permanent residents. They occur in local, scattered populations in Siskiyou County. Two subspecies have been introduced on the Forest, the Rio Grande and the Merriam's. Turkeys are found mostly in deciduous riparian, oak, and conifer-oak woodlands. They prefer large-tree stages with low to intermediate canopy, interspersed with numerous grass/forb openings, near water.

Turkeys are rare within the analysis area, with a few sightings in the Seiad Creek watershed and near O'Neil Creek. Turkeys seen in the analysis area are expected to come from birds introduced in the Horse Creek watershed to the east.

Habitat for turkeys in the analysis area includes riparian areas, oak woodlands, canyon live oak and agricultural or pasture lands along the Klamath River and Seiad Creek.

The Pacific Giant Salamander is commonly found within the watershed. These salamanders require streams for breeding, and occur in perennial channels. Larvae are generally found in areas with coarse substrates (Blaustein 1995). Metamorphosed adults can be found in streamside areas, riparian zones, and upland. Terrestrial micro-habitats include surface debris (logs, etc.) and talus (Vesely 1996).

The tailed frog is commonly found within the watershed in scattered populations. This frog is highly specialized for life in cold, clear mountain streams. The larvae are found only on boulders in cascading

rapids, their mouths being modified to cling by suction and to scrape diatoms from the boulder surfaces. The tailed frog has evolved a strategy of internal fertilization, rare among the world's frogs, that enables the adults to breed in fast-flowing water (Nussbaum 1983).

PLANTS

The analysis area contains known populations and habitat for seven plant species of concern. **Table 3-38** lists the plant species and their special management categories.

Table 3-38 Plant Species Of Concern in the Thompson/Seiad/Grider Analysis Area.

SPECIES	COMMON NAME	MANAGEMENT CATEGORIES
Allotropa virgata	sugarstick	Survey & Manage Strategy 1&2
Cupressus bakeri	Baker cypress	KNF special interest species
Cypripedium fasciculatum	clustered lady-slipper orchid	Survey & Manage Strategy 1&2; R5 Sensitive
Cypripedium montanum	mountain lady-slipper orchid	Survey & Manage Strategy 1&2; R5 Sensitive
Eriogonum hirtellum	Klamath Mtn. buckwheat	KNF Watchlist
Lewisia cotyledon var. howellii	Siskiyou lewisia	KNF Watchlist
Pedicularis howellii	Howell's lousewort	Survey & Manage Strategy 1&2; R5 Sensitive

Allotropa Virgata - Sugarstick

Allotropa virgata occurs in closed canopy, hardwood, pole, mature, and old-growth seral stages in forests ranging in elevation from 1,500 to 5,600 feet. *Allotropa virgata* is a clonal species that spreads by rhizomes. It is a non-chlorophyllous mycotroph - a plant that obtains necessary nutrients from a fungus associated with its roots. Buried, rotten wood, and a rich humus layer are important aspects of the habitat, probably because of the moisture retention and nutrients that these elements supply that maintain the associated fungi.

Within the analysis area, habitat is located wherever sufficient decaying wood and host trees are present. Remnant stands of late-seral forests and younger stands with sufficient large woody debris are present within Grider and Seiad watersheds and provide moderately abundant, well-distributed habitat for this species. Conifer plantations and areas where stand-replacing fires occurred in 1987 do not support habitat for this species. Older plantations and areas of natural regeneration within the Thompson Creek watershed fire area probably do not support populations, but have the potential to develop into suitable habitat as the young conifer stands mature.

Cupressus Bakeri - Baker Cypress

Cupressus bakeri is a rare relictual cypress that is endemic to northern California and southern Oregon. The Seiad Creek stands of Baker cypress are one of the largest and healthiest stands of this species. These trees occur on ultramafic soils at an elevation of approximately 2,800 to 5,400 feet, predominately on south and west exposures. The cypress forms pure stands that are interspersed with stands of knobcone pine and scattered Jeffrey and ponderosa pine and Douglas-fir. The cypress is reported to have regenerated following a 1951 wildfire. This area burned, at least partially, during the fires of 1987, and appears to have improved habitat for the species and regenerated the stand (Knorr 1991). There are no other locations of this species within the watersheds, although suitable habitat occurs elsewhere in the Seiad watershed along Johnny O'Neill ridge.

Cypripedium Montanum - Mountain Lady'S Slipper Orchid and *Cypripedium Fasciculatum* - Clustered Lady'S Slipper Orchid

These species inhabit generally shady sites within mature conifer forests. Habitat ranges from dry, rocky sites to moist seeps and streamsides on a variety of soil types and plant associations, at elevations of 1,500 to 5,500 feet. These species are distributed across all of the western states, but are not common within their range. Populations tend to be very small with relatively few plants. These sites occur most frequently within late-successional forests. This type of habitat is found scattered throughout the analysis area, primarily on more moist and shadier north slopes. Plants in this genus have a complex ecology in which they have underground fungal relationships with other plant species, and frequently obligate single-species insect pollinators. These biological and ecological factors are believed to account for their rarity and are the limiting factors in their reproductive success. Forest data indicates that these species may be found in stands that have been thinned or selectively cut, or near roads or trails (Barker, 1984). Other data suggests that populations in Oregon and Washington show decline when canopy removal and soil disturbance occur (Urban 1981). The ecological relationship of this species with fire is not clearly understood. Some populations have been noted to survive low intensity fire, while other populations do not.

Within the analysis area, habitat is located wherever sufficient shade and host trees are present. Remnant stands of late-seral forests and younger stands with sufficient shading are present within Grider and Seiad watersheds and provide

moderately abundant, well-distributed habitat for this species. Conifer plantations and areas where stand-replacing fires occurred in 1987 do not support habitat for this species. Older plantations and areas of natural regeneration within the Thompson watershed fire area probably do not support populations, but have the potential to develop into suitable habitat as the young conifer stands mature.

Eriogonum Hirtellum - Klamath Mountain Buckwheat

Klamath Mountain buckwheat is endemic to northwestern Siskiyou County and southwest Oregon. It is restricted to bald serpentine and ultramafic outcrops or gravelly slopes and ridges from 2,000 to 5,500 feet in elevation. These areas occur on sites with little soil development in open areas within mixed conifer forests. Known populations and suitable habitat for this species is located within the Seiad watershed along Johnny O'Neil ridge. Road construction and mining have altered habitat and destroyed populations in a small portion of the species' habitat within the watersheds. Additional populations and habitat that are undisturbed within the Seiad watershed are critical to the continued viability of the species.

Lewisia Cotyledon var. Howellii - Siskiyou Lewisia

This species ranges from the Siskiyou Mountains in southwest Oregon south to the Trinity Alps in Trinity County, and from the Marble Mountains west to the Siskiyou Mountains along the Humboldt/Del Norte county lines. It occurs at elevations from 1,500 to 6,000 feet and on all parent materials. The species is restricted to rock outcrops and associated talus slopes in openings within many different vegetation types. The species occurs in open, dry areas, and is not dependent upon shading from adjacent trees or shrubs.

Within the three analysis watersheds, road construction has altered habitat or destroyed populations in a few locations. Numerous additional populations are known to occur, and extensive habitat exists which may support additional populations and ensures viability of the species.

Pedicularis Howellii - Howell's Lousewort

This species is found in partial shade or along the edges of forest openings in a variety of conifer/shrub plant associations. It is endemic to northern California and southern Oregon along the Siskiyou Crest at 4,000 to 6,500 feet in elevation. It occurs from east of the Red Buttes Wilderness, southwest to the Siskiyou Wilderness. Populations are most commonly found along natural or man-made forest edges such as streams, lakes, wet meadows, trails, roads, or timber harvest canopy openings (Barker and Maerklein 1988).

Known populations and suitable habitat are located along the Siskiyou Crest at the head of the Thompson and Seiad watersheds. Most of this area is within Wilderness or in an unroaded area. Abundant natural openings along the Crest provide unaltered habitat conditions for this species.

Key Question 2 - What unique plant species or communities are found in the watershed (either natural or human introduced)?

Botanical Special Interest Areas

COOK AND GREEN PASS BOTANICAL AREA

This 700 acre site, located within the Siskiyou Crest Zone, contains a mosaic of plant communities and is considered to be the dividing line between the eastern and western Siskiyous. This area has a phenomenal concentration of native plant species, one of the richest areas in California, with possibly as many as 300 species present. The area also contains a large stand of Baker cypress. Rare or sensitive plants present include Howell's lousewort, Siskiyou lewisia, *Antennaria racemosa*, and *Lilium wigginsii*. Botanists and plant enthusiasts from around the country have considered the Cook and Green Pass area significant for years.

SEIAD BAKER CYPRESS BOTANICAL AREA

Located approximately four miles northeast of the town of Seiad, this area contains a stand of the rare Baker cypress. Part of the area was burned in the 1987 fires which triggered the germination of cypress seeds lying in the soil for years. The hundreds of seedlings now growing there make this the healthiest stand of Baker cypress on the Forest. The ultramafic soils in the area also support a number of other rare plant species including two species of ladyslipper orchid, *Cypripedium californicum* and *Cypripedium fasciculatum*, a rare lily, *Lilium wigginsii*, and the Siskiyou lewisia.

Key Question 3 - What exotic (non-native or range expanding) plants or animals occur within the watershed (distribution/habitat)?

Some species currently inhabiting the analysis area were not present in the area a few decades ago. These non-native or range expanding species include bullfrogs, brown-headed cowbirds, European starlings, Virginia opossums, and noxious weeds. These species were either introduced or have encroached on available habitat.

Bullfrogs

Native to the eastern United States, bullfrogs were introduced in California early in this century. Bullfrogs are now widespread and common. They occur in quiet waters of ponds, irrigation ditches, , salamanders, frogs, toads, snakes, turtles, birds, and mice.

Bullfrogs are the largest frogs in California and they may prey on, or compete for food and space with, native amphibians with which they coexist. It has been suggested that bullfrogs are responsible for the elimination of red-legged frogs from the floor of the Central Valley and adjacent Sierra foothills, and for the reduction in the range of the yellow-legged frogs (CDFG, May 2, 1988).

Bullfrogs are common within the analysis area in slow-moving water along the Klamath River, in natural ponds, and in agricultural or livestock ponds.

Brown-Headed Cowbirds

Although the brown-headed cowbird is native, its range has expanded markedly in California and it has become common in recent decades by following agriculture and other human activities (Zeiner et al., 1990). Brown-headed cowbirds lay their eggs in the nests of other birds and their young are raised by host parents at the expense of the other nestlings. They are most common in riparian areas and have been linked with the decline of the willow flycatcher (Serena 1982). Mist netting operations in Seiad Creek have detected very few brown-headed cowbirds in the analysis area over the past six years. It is expected that cowbird parasitism is not a major influence on songbirds in this area.

European Starlings

European starlings were introduced into the eastern United States at the turn of the century and had become common in northern California by the 1950s (Harris 1991). These birds aggressively compete with native cavity nesting birds such as bluebirds, nuthatches, swallows and wrens for nest holes and may be affecting population potential for the native species.

Opossums

Opossums were brought into Oregon as pets between 1910 and 1921 (Maser et al. 1981). They have recently expanded their range into most of California, Oregon and parts of Washington. Where they are found, opossums are often densely settled. Little is known about opossum distribution or density in the analysis area. Incidental sightings and road-killed animals indicate that opossums occur, but are uncommon, in the Seiad area and have been seen along Highway 96 in the eastern portion of the analysis area at lower elevations.

Opossums are essentially nocturnal and will seldom be found in daylight unless disturbed. Opossums occupy riparian, moist woodlands, brushy habitats, wetlands, and agricultural and residential areas that provide abundant food and cover; they are less common in dense conifer forests and grasslands (CDFG 1990). Opossums lie up during the day in rocky crevices, hollow trees, logs, burrow or brush pile (Caras 1967). They are scavengers and eat just about everything, such as: insects, birds' eggs, mice, moles, lizards, snakes, nestling birds, fruits, and vegetable matter (Caras 1967).

It is unknown what the effects of this introduced species are in this analysis area; whether they displace other, native species, or whether they have an effect on native bird or amphibian populations.

Noxious Weeds

Noxious weeds and invasive exotic plants are an increasing threat to native ecosystems and the function of plant communities. Noxious weeds have traditionally been considered a range and agricultural problem in the western United States, but exotic plants are also a serious biodiversity issue, which is of significant importance to our resources values on the Forest. All ecosystems are vulnerable to invasion by non-native weed species, including rangelands, forests, grasslands, riparian areas and wetlands.

Aggressive weed species out-compete native plants for water, nutrients, sunlight and space, which in turn alters the composition, structure and function of the entire ecological community. Many weed species contain chemical compounds that prevent any other plant seed from germinating at the same site. Weed infestations can impact wildlife by reducing important food plants and modifying habitat characteristics.

The Forest Service currently has no process for designating plants as noxious weeds. Use of State and County noxious weed lists is the current practice. The State of California and the County of Siskiyou manage weeds by use of the same list (State of CA 1996). The Forest has developed a draft noxious weed list based on preliminary information available from Siskiyou County and Forest sources (Klamath

National Forest 1998). Formal inventories for these species within Forest lands have not been conducted.

Within the Thompson/Grider/Seiad Analysis Area, one noxious weed is known to occur. Scotch broom (*Cytisus scoparius)* is located along Highway 96 in the vicinity of Cade Mtn. Scotch broom was originally introduced into the United States as an ornamental plant, it was widely planted along highway road cuts as a soil stabilizer (Coombs and Turner November 1995). The infestation is extensive along long stretches of roadside. This species is rated "C" by the state of California, which requires "control or eradication as local conditions warrant, at the county level."

No formal weed control strategy has been developed on the Forest. Weed treatment has been accomplished by Siskiyou County in the past. With the issuance of the recent Invasive Species Executive Order, March 2, 1999, Federal Agencies are directed to address noxious weeds in all National Environmental Policy Act documents, and to fund and implement noxious weed control strategies.

HUMAN DIMENSION

ROADS

Key Question 1 - What are the current conditions and uses of roads within the watershed?

The analysis area contains approximately 532 miles of road. Under Forest Service jurisdiction, there are 430 miles of system road and 22 miles of non-system road, 30 miles of road are under State jurisdiction, 25 miles under County jurisdiction, and there are 25 miles of private road. Refer to **Appendix F** Numerical Listing of Roads and Their Status, and see **Figure 1-1** Base Map, contained in the Map Packet located at the end of this document.

State Highway 96 provides primary access to the watershed and communities along the Klamath River from I-5 to State Route 299 at Willow Creek. Within the analysis area, the double lane, paved highway parallels the Klamath River for approximately 30 miles.

The storms of 1997 and heavy rainfall in 1998 created significant impacts to the existing road system. Two hundred forty-one sites within the analysis area were identified from 1997 storm damage, with damage ranging from complete washouts, major landslides, culvert replacements, to heavy maintenance projects. At the present time, there are approximately 100 miles of system roads that are inaccessible due to storm damage. Because of the extensive nature of the damage, emergency funding (ERFO) was applied for and approved. Repairs are expected to be completed in approximately six years. However all national forest system roads in the watershed will be evaluated in this watershed analysis, for improvement, maintenance, or decommissioning. The outcome of this evaluation could affect how some of these ERFO funds are spent. See **Figure 3-12**, which identifies the 1997 storm damage road sites and inaccessible areas. An Access and Travel Analysis (ATA) for the analysis area has been completed and included in this analysis. The ATA identifies roads which are candidates for decommissioning, seasonal or year-round closure, or restoration opportunities (refer to **Appendix E**).

The 25 miles of road under private jurisdiction provide access to residences and are maintained by those individuals. They were generally constructed as low standard, native surface roads.

Forest Service road maintenance is grouped into five maintenance levels. Level 5 roads are double lane pavement, maintained to provide a high degree of user comfort. Level 4 roads have paved or aggregate surface, and are maintained to provide a moderate degree of user comfort and convenience at moderate travel speeds. Level 3 roads have an aggregate surface, and are maintained for travel by a prudent driver in a standard passenger car. Level 2 roads are those roads maintained for use by high clearance vehicles. Level 1 roads are intermittent service roads not maintained for use. Temporary non-system roads are those roads on National Forest land which were constructed to provide access for a single use, such as to a mining claim, water source, disposal site, harvest unit, landing, etc.

Road maintenance is accomplished through timber sale contract requirements, Forest Service road maintenance crews, and service contracts.

Table 3-39 displays miles of Forest Service Jurisdiction roads by Maintenance Level.

Table 3-39 Road Maintenance Level Mileage

LEVEL	MILES
1 - Intermittent Service	115.30
2 - High Clearance Vehicles	198.85
3 - Passenger Car	113.90
4 - All Weather surface	1.05
5 - Paved, Double Lane	0.50
Temporary Non-System	22.00
TOTAL	**451.60**

Through the years many of the roads within the analysis area have stabilized and both cut slopes and fill slopes are vegetated. Often erosion is triggered by intense seasonal thunderstorms, however severe erosion problems associated with roads may be chronic, and generally can be traced to one or more causes (e.g. geometric design of the road, road grades, surface type, soil type, road location, steepness of terrain, inadequate drainage structures, road location, lack of maintenance, or vehicle use during wet weather conditions.) See the "Hillslope Processes" section for more information on roads and their affect on watershed processes. Road surfaces in the watershed area vary with considerations of soil type, slope stability, steepness of grades, proximity to the stream courses, and patterns of use.

Table 3-40 Road Miles by Surface Type, displays miles of Forest Service jurisdiction roads by their surface type.

Table 3-40 Road Miles by Surface Type

SURFACE TYPE	MILES
Pavement	1.25
Chipseal	20.75
Crushed Aggregate	70.05
Pitrun Aggregate	55.10
Native Surface System Roads	282.45
Native Surface Non-System Roads	22.00
TOTAL	**451.60**

Forest Service system roads within the analysis area were constructed for administration of National Forest lands. Public use has been allowed by the Secretary of Agriculture on most roads. Various travel and access management strategies are used within the watershed area to minimize resource use conflicts. These conflicts may include special wildlife considerations, erosion related water quality concerns, or public safety. Approximately 38% of the roads in the watershed area provide year round access, although snow frequently limits winter travel. Seasonal access is provided by 38% of the roads, and 24% of the roads have permanent closures.

The following **Table 3-41** Travel Access Management Mileage, displays miles of Forest Service jurisdiction roads by access strategy.

Table 3-41 Travel Access Management Mileage

MANAGEMENT STRATEGY	MILES
Year-Round Access	162.15
Seasonal Access	164.10
Permanent Closure **1/**	125.35
TOTAL	**451.60**
1/ Includes Non-System Roads	

Road density in the analysis area varies from zero to greater than four miles of road per square mile. The average overall road density (all roads) for the entire analysis area is 2.2 miles/square mile which includes Wilderness and 2.3 miles/square mile excluding Wilderness. The highest densities are located in Walker, West Grider, and China Creeks, Lightening Gulch, and the headwaters of Frying Pan, Horse Creeks and Three Biscuit Gulch watersheds (see **Figure 3-13** Road Density, contained in the Map Packet located at the end of this document). The road densities for individual subwatersheds are discussed and displayed in the "Hillslope Processes" section (Page 3-24).

Table 3-42 Road Mileage and Road Density Acreage by Land Allocation, lists the miles of road and acres of road density by land allocation type.

Table 3-42 Road Mileage and Road Density Acreage by Land Allocation

Land Allocation	Miles Of Road	ROAD DENSITY ACRES 1/ (miles/sq.mi.)			
		0.1-1.0	1.0-2.5	2.5-4.0	>4.0
Wilderness	N/A	320	80	N/A	N/A
LSRs	252	8,010	14,370	15,820	14,800
Special Habitat	7	90	780	820	540
Back Country	0	560	560	210	10
Riparian Reserve	24	730	1,720	1,490	1,710
Retention	29	490	2,770	2,330	1,580
Partial Retention	99	2,410	2,840	4,060	7,740
Rec. River	3	910	1,500	240	10
General Forest	27	640	1,120	1,520	1,770
TOTAL /2	441	14,160	25,740	26,490	28,160

1/ Rounded to the nearest ten acres
2/ Total includes only National Forest system roads

A Forest-Scale roads analysis (*Westside Roads Analysis*) was completed in November, 1997 by the Forest to provide a coarse filter or starting point for road projects such as improvement, decommissioning, maintenance, etc.. The analysis identified the potential resource costs of roads versus the need for human access. However additional site specific knowledge and information will be applied during this ecosystem analysis process to refine the resource costs and human access needs. This revised information will be displayed in the ATA, as well as preliminary recommendations for improvement, maintenance, closure or decommissioning of individual roads. Recommendations for proposed actions or projects on the road system will later be analyzed during the NEPA process before final road-related decisions are made. The preliminary results for each road or road segment are identified in **Appendix E**.

Key Question 2 - How does the current road system provide access outside the watershed?

Portions of the road system, which include State, County and Forest roads, provide critical access for local residents. The recent flooding of 1997 blocked primary access - State Highway 96 for several days, necessitating the use of alternate routes. Several Forest roads provided emergency access into and out of the area. Listed below are brief descriptions of the roads that provide access in/out of the analysis area.

State Highway 96 is the major transportation route which bisects the analysis area in a northeasterly and southwesterly direction. It provides year round access linking north central California to the coast and is the primary transportation route in this part of northern California. For residents living within the watershed, it provides a critical link to the outside world for this somewhat isolated area.

48N20 Seiad Creek (Cook and Green Pass) is a Forest collector road which receives moderate local use. It provides recreational access during the summer months to the PCT, Siskiyou Crest area, and the Applegate Lake on the Rogue River NF. It is generally closed by snow during winter months.

46N50 Seiad Creek Road (Low Gap) is a Forest collector road which connects the Seiad Creek drainage to the Horse Creek Drainage. The most common locations for flood waters to close Highway 96 are between Seiad Valley and Horse Creek. This road serves as an emergency alternate route.

46N60 Johnny O'Neil Road also connects the Seiad Creek drainage to the Horse Creek drainage. Although considerably longer, it also serves as an emergency alternate route to Highway 96.

19N01 Thompson Ridge Road is a Forest collector road which snakes in and out of the watershed along the western boundary (northern half of watershed). It accesses the Red Buttes Wilderness and Bolan Lake on the Siskiyou NF, and receives primarily local use. It is generally closed by snow during winter months.

46N77 Grider Ridge Road is a Forest collector road which snakes in and out of the western boundary of the watershed (southern half). It provides primary access to the Cold Springs Trailhead which accesses the Marble Mountain Wilderness and provides secondary access to upper East Fork Elk Creek and Frying Pan Ridge.

46N66 Grider Creek Road is a Forest collector road which begins on County Road 8D001 in Seiad Valley, connects to road 46N03 at Grider Ridge, and continues into Happy Camp. It serves as an alternate route to Highway 96 between Seiad and Happy Camp.

46N64 Walker Creek Road is a Forest collector road which begins on County Road 8D006 near the mouth of Walker Creek and ends on the Scott River Road near Tompkins Creek. The 1997 storm event severely damaged portions of the road leaving a large part of the system unpassable. Alternate access outside the watershed is possible by traveling a combination of roads 46N64, 46N65, 45N71, 45N05Y, 45N65, and 46N64.

HUMAN USES

Key Question 1- What are the recreational facilities and uses in the analysis area?

The analysis area includes portions of a Scenic Byway, a National Wild & Scenic River, a National Recreation Trail, two Wildernesses, four Forest campgrounds, and numerous dispersed campsites. These facilities provide for a variety of recreation uses including: sight-seeing, camping, hiking, rafting, swimming, hunting, fishing, mining, and horseback riding. See **Figure 1-1** Base Map.

Recreational Facilities

Recreational facilities within the Klamath National Wild & Scenic River corridor include three developed campgrounds and nine river access points. The campgrounds are Sarah Totten, Fort Goff, and O'Neil Creek. The river access points are Sarah Totten, Rocky Point, Sluice Box, Portuguese Creek, Fort Goff, Savage Rapids, Seattle Creek, China Point, and Gordon's Ferry.

The Pacific Crest Trail (PCT) is one of the key recreational features found within the analysis area. The PCT is classified as a National Scenic Trail and provides long distance hikers with a trail link between Canada and Mexico. The PCT basically spans the entire length of the analysis area from the headwaters of Seiad Creek in the north, to the headwaters of Grider Creek in the south. Approximately 35 miles of the PCT are located within the watershed.

There is currently a five mile section of the PCT (from Grider Creek Campground to the town of Seiad Valley) where the route follows Forest Service roads and then crosses the Klamath River on the State Highway 96 bridge and continues west on Highway 96 to an undeveloped trailhead located about one-half mile west of Seiad. The Pacific Crest Trail

Association has recently encouraged the Forest Service to explore the possibility of constructing a new section of trail and a trail bridge across the Klamath River so that hikers and stock users would not be exposed to the dangers of automobile traffic that the current route along Highway 96 exposes them to. The New Year's flood of 1997 totally destroyed two major stock bridges and severely damaged a third bridge on the Grider Creek section of the PCT. Work is currently in progress to replace the bridges during the Fiscal Year 99 and Fiscal Year 2000 field seasons. Recreational use on the portion of the PCT located within the watershed would be considered low to moderate.

The only major developed recreation facility not located within the Klamath River corridor is the Grider Creek Campground. This campground is located about four miles up FS Road 46N66 and serves both as a campground and a trailhead for the PCT. Facilities available at the Grider Creek Campground include eight developed campsites, two stock corrals, and two toilet facilities. Several tables and fire rings need to be replaced, and accessible toilets installed. The 1997 floods inflicted major damage to several campsites and to the interior road system. The campsites and road have been completely restored and are currently in excellent condition. This campground normally receives moderate use, except during deer hunting season when the campground is often full.

Most of the dispersed camping which occurs in the analysis area is located along the Klamath River corridor and is associated with either mining or rafting. Outside the Klamath River corridor, the main concentration of dispersed camping occurs along Seiad Creek, and in the upper Seiad Creek drainage. One favorite dispersed site is called Bee Camp, located in the high country at the end of FS Road 47N80. Several small undeveloped campsites serve both PCT hikers and campers who are visiting nearby Lily Pad Lake. Bee Camp also serves as a convenient access point for the nearby Red Buttes Wilderness. Bee Camp receives moderate use during the summer season and heavy use during deer hunting season.

Another dispersed campsite is located at Cook and Green Pass, in the headwaters of Seiad Creek and located where the PCT crosses FS Road 48N20. This dispersed site also accesses both the PCT and the Red Buttes Wilderness, and is popular with both hikers and hunters.

Approximately 4,000 acres of the Marble Mountain Wilderness are located in the extreme southern tip of the analysis area. This Wilderness is managed in accordance with the *Forest Plan*, and also in accordance with an approved Wilderness Management Plan. The area of Wilderness located within the analysis area is basically the uppermost headwaters of Grider, Cliff, and Stones Valleys. These beautiful valleys are accessible by stock users via the PCT, and are favorite destinations during deer hunting season. These valleys are also heavily grazed by cattle under grazing permits administered by the Scott River Ranger District. This area also offers excellent habitat for Roosevelt elk which are frequently seen here.

The following three campgrounds are found along the Klamath River corridor in the analysis area.

Sarah Totten Campground is located east of the town of Hamburg. Along Highway 96 and on the banks of the Klamath River, it is at an elevation of 1400 feet. There are two group sites and eight campsites. Campground facilities include picnic tables and fire rings in all campsites. Some of the fire rings are in deteriorating condition and need to be replaced. There are barrier-free vault toilets in the campground, one of which should be modified to become a toilet/ changing room. Water is available throughout the campground via a recently installed new system. Sarah Totten is extremely popular with both commercial and non commercial rafting groups due to its riverside location, large group sites and on-site vehicle access to the river for raft put-in and take-out. Use at Sarah Totten is moderate to high, with the heaviest use during the peak rafting season especially during weekends and holidays.

O'Neil Creek Campground is located 4.7 miles east of the town of Seiad Valley along Highway 96. This campground lies in old-growth forest at the 1,500 foot elevation. There are 18 campsites, with most parking spurs too short to accommodate today's RVs. Facilities include picnic tables, barbecue grills, fire rings, and vault toilets. Some of these facilities are in deteriorating condition and need to be replaced. Water is available throughout the campground. O'Neil Creek Campground is not located on the Klamath River, and consequently is not favored by rafters. Use at O'Neil would be considered low.

Fort Goff Campground is located 4.7 miles west of the town of Seiad Valley. The campground lies along the banks of the Klamath River . There are five sites and a barrier free toilet. Access trails lead to bedrock and beach areas along the river. Overall the campground is in good condition. Fort Goff is most often used as a picnic site and a bathroom stop; however, during the peak rafting season large rafting groups often fill the campground to capacity. Normal use would be considered low to moderate, with occasional periods of high use.

Facilities at river access points are limited. Information boards are located at Sarah Totten, Portuguese Creek, Seattle Creek, and China Point. Portable toilets are set out during the summer months at Seattle Creek and Gordon's Ferry to accommodate mining campsites. Depending on use, other sites may eventually need toilets.

Recreational Uses

Recreational uses are centered around seasonal activities. During the summer months; rafting, tubing, swimming, camping, hiking, horseback riding and recreational mining all take place. During the fall, hunting, steelhead and salmon fishing, woodcutting, and mushroom picking take center stage. During the winter, snowshoeing, cross-country skiing, and snowmobiling are the primary recreational uses. During the spring, rafting, hiking, woodcutting, wildflower viewing, and camping uses start to increase as the weather becomes nicer.

Hikers can choose from several trails in the analysis area. The PCT runs through the middle of the analysis area in a north-south direction, connecting the Marble Mountain Wilderness to the south with the Boundary National Recreation Trail and the Red Buttes Wilderness to the north. Road access to the PCT via the Cold Springs Trailhead was eliminated by flood damage from the 1997 storm. The Fort Goff Creek and Portuguese Creek Trails both provide alternate routes from the Klamath River corridor to the Boundary Trail and the Red Buttes Wilderness. Both of these trails would be considered low use trails, with the Portuguese trail needing to be brushed. A trail from the Baker Cypress botanical area intersects with the PCT. The Boundary Trail enters the watershed near the north-west corner and follows along the watershed boundary to the east until it meets with the PCT approximately 1.5 miles west of Lily Pad Lake. This trail provides access to the Red Buttes Wilderness and to a large unroaded area in the northwest corner of the watershed. The Boundary Trail receives low use due to its remote location.

River users can now float through Seiad Valley by using public river accesses for the first time in several years. A new river access at Rocky Point has opened up this six-mile float through Seiad Valley. Older access points at Sluice Box have been recently been improved. Access points like Portuguese Creek and Seattle Creek receive moderate use during the summer months. These accesses provide for better driftboat fishing opportunities during the fall.

Hunting is quite popular during the respective seasons in the fall and probably ranks second in importance for recreation use, with rafting being considered the highest use. Roosevelt elk, blacktail deer, black bear, turkey, quail, grouse, and waterfowl are species that are hunted in the fall.

Winter sports may be limited to locals using the existing road system to snowmobile and/or cross country ski. Backcountry skiing opportunities exist in the Red Buttes Wilderness.

There are some cave resources in the watershed. The Federal Cave Protection Act forbids disclosure of the location of significant caves. There are several known mine shafts within the analysis area also. Recreational caving is non-existent in the watershed except for people exploring the occasional mining tunnel.

The relatively natural-appearing scenery of the area is a primary attraction to local residents and what lures visitors to the Forest. Sight-seeing occurs along the State of Jefferson Scenic Byway (Highway 96) by both residents of the area and tourists. River recreationists also view the area while fishing or floating the river. Hikers view the area from hiking trails and from the Wilderness'. From a visual management standpoint, sensitive travel routes have been identified. These viewpoints are useful in assessing visual impacts from potential projects and include:

HIGH: Klamath River National Wild & Scenic River
Highway 96
Grider Creek Road (Highway 96 to Grider Creek Campground)
Seiad Creek Road (up to edge of private lands near Sawmill Gulch)
Pacific Crest National Scenic Trail
Boundary National Recreation Trail
Red Butte Wilderness
Marble Mountain Wilderness
Grider Creek Campground
Ft. Goff Campground
O'Neil Campground
Sarah Totten Campground
Community of Hamburg
Community of Seiad Valley

MEDIUM: Cook and Green Pass Road (above private lands)

The area was inventoried for existing visual condition (EVC) levels in 1988 as part of the *Forest Plan*. The noticeability of management activities such as timber harvest, roads, and mining were interpreted using aerial photos. Based on the broad scale of the analysis, large areas were identified, thus requiring further refinement at the project scale. This ecosystem analysis will refine this information in Step 5 of this process. The acres of EVC levels are displayed in **Table 3-43** Acreage and Percentage by Existing Visual Condition Levels below and also see **Figure 5-3** Existing Visual Condition, contained in the Map Packet located at the end of this document. This information is useful in comparing the existing visual condition to desired visual conditions (Visual Quality

Objectives from the *Forest Plan*) to determine how close or far apart the watershed is from desired conditions. Opportunities for visual improvements can then be identified.

Table 3-43 Acreage and Percentage by Existing Visual Condition Levels

Visual Condition Level 1/	Acres	% of Watershed 2/
Untouched	81,500	58
Unnoticed	12,800	9
Minor Disturbance	9,900	7
Disturbance	11,300	8
Major Disturbance	4,500	3
Drastic Disturbance	21,400	15
TOTAL	**141,400**	**100**

1/ Source - LMP EVC data layer
2/ Does not include private property
NOTE: This information is general in nature and requires further refinement at the project scale.

The information in this table could be interpreted that 65% of the watershed is natural appearing to the average Forest visitor. On the other hand, 35% of the watershed has a modified appearance from past management activities, including timber harvest, roads, and mining.

Key Question 2 - What are private land uses and local community concerns and interests about this analysis area?

The watershed is comprised of 148,965 acres. The vast majority of these acres (95%) are public lands administered by the Klamath National Forest. Private lands are clustered in the watershed primarily along the Klamath River/Highway 96 corridor and Seiad, Grider, and Walker Creeks. These in-holdings of private property total 6,943 acres (5%) with some scattered parcels located several miles upslope from the Klamath River.

The communities of Seiad Valley (population 350) and Hamburg (population 80) lie within the watershed boundaries. Seiad Valley lies in the approximate center of the watershed with Hamburg on the eastern edge of the watershed. The adjacent communities of Scott Bar, Horse Creek and Klamath River are located east of the watershed with the western boundary being situated at the edge of the community of Happy Camp.

Generally, the major use of the private property located within the watershed is for the rural residential life-style. There are also commercial uses, with some ranching and agricultural parcels, mining and smaller tracts of timberlands mixed in. Most residences are occupied year-round, while a few are visited by the property owners seasonally.

Other commercial uses of private property include two stores, cabin rentals, a gas station, a chestnut orchard (recently planted trees that are not in production), a small winery, a small sawmill, and some home businesses. Mining activity is at a fairly low level currently with most interest related to recreational use along the Klamath River; however, any rise in gold prices could influence activity. Timber harvest has occurred on many of the undeveloped private tracts and some of the residential sites.

Special-use authorizations include the following activities and their approximate numbers: 40 water transmission lines, 30 private land accesses, 16 utility transmission and relay facilities (which includes a buried fiber-optic cable line which traverses through the watershed), various mineral materials (sand, gravel, cobble), a waste disposal site, and an archery range . Applications for Small Tracts Act land adjustments occasionally occur in the watershed.

Many see and use the watershed as a means of employment, such as in logging where there are four to five local independent companies that are based in or adjacent to the assessment area. Commercial guiding provides a source of income to at least one local fishing guide living in the area. Numerous businesses derive income from tourist related activities such as white water rafting (both commercial and private use), hiking, hunting, fishing etc., that use the variety of resources the analysis area has to offer.

Concerns and interests of the local community about this watershed include a wide-range of topics in addition to the economic base mentioned above. Water quality for domestic residential use is an issue of concern for many in the local community along with the threat of wildfire. Access via the established transportation network of roads and trails is also a common theme, as this infrastructure is highly valued as part of the life-style. It allows access to their public lands for a wide range of activities that, in large part, provide the cultural identity for the individuals living in this area. Activities include sight-seeing, recreating of all sorts, gathering activities (firewood, mushrooms, memories, and other special forest products) and just getting in touch with the land. Local residents form a unique interest group that want a healthy and sustainable watershed in what they consider, their back yard.

Key Question 3- What commodities are produced in the analysis area?

A variety of commodities are produced in and utilized from this analysis area: firewood, mushrooms, water, poles, Christmas trees, boughs, minerals (such as

gold, asbestos, chromium, manganese, copper, and graphite), and timber products.

Timber Management

Approximately 36,000 acres or 24% of the analysis area are available for timber management (also called Matrix lands). This is slightly higher than the Forest average of 21% matrix lands. There are four land allocations from the *Forest Plan* which provide for a long-term sustained yield of timber harvest: Retention, Partial Retention, General Forest, and Recreational River. See **Figure 1-2** *Forest Plan* Management Areas. Partial Retention, General Forest, and Recreational River comprise Regulation Class 2 lands, and Retention is Regulation Class 3. (See **Table 3-44** Existing Acres of Matrix Lands By Management Area.) Regulation Class 2 lands provide for moderate timber yields and are lands which co-emphasize timber management and other resources relatively equally. Regulation Class 3 lands provide for minimal timber yields and emphasize non-timber resources. The Klamath *Forest Plan* estimates a Probable Sale Quantity of .2 MMBF/decade and 1.25 MMBF/decade from the Thompson and Seiad watersheds respectively. This watershed analysis will refine the matrix land allocation acres and the estimated timber volume from available lands in Step 5.

Table 3-44 Existing Acres of Matrix Lands By Management Area 1/

Management Area	Acres	% of Analysis Area	Non-Capable	% Non-Capable
Retention	7,200	5	1,100	15
Partial Retention	19,400	13	1,700	9
General Forest	6,500	4	1,300	20
Recreational River	3,100	2	200	6
TOTAL	**36,200**	**148,400**	**4,300**	**3**

1/ Source: *Forest Plan* data layer

The following **Table 3-45** Acreage of Seral Stage for Matrix Lands By Management Area, shows existing acres by seral stage by management area for matrix lands in the analysis area.

Table 3-45 Acreage of Seral Stage for Matrix Lands By Management Area 1/

Management Area	Shrub/ Forb 2/	Pole/Early-Mature 3/	Mid-Mature 4/	Late-Mature/ Old- Growth 5/
Retention	180	1,490	3,940	950
Partial Retention	110	1,760	7,600	2,560
General Forest	100	520	3,030	790
Recreational River	00	1,580	1,230	230
TOTAL	**390**	**5,350**	**15,800**	**4,530**

See next column for footnotes.

1/ Source: *Forest Plan* data sort; 5,350 ac.

2/ Trees (if present) <5" dbh or trees not present
3/ Trees from 5-11" dbh
4/ Trees from 11-21" dbh
5/ Trees from 21-36" dbh
Note: The remaining matrix acres are identified as plantations, barren areas, or water.

The following **Table 3-46** Existing Acres of Plantations for Matrix Lands By Management Area, displays acreage of plantations by management area and their respective percentage of the total management area acreage.

Table 3-46 Existing Acres of Plantations for Matrix Lands By Management Area 1/

Management Area	Plantation Acres 2/	Total Management Area Acres	Percent of Management Area Total
Retention	380	7,200	5
Partial Retention	7,230	19,400	37
General Forest	1,920	6,500	30
Recreational River	40	3,100	1
TOTAL	**9,570**	**36,200**	**27**

1/ Source: LMP Vegetation Layer
2/ includes all plantations 1930-1993, as well as non-stocked plantations

Mining

Over the years, a variety of minerals such as gold, asbestos, chromium, manganese, copper, talc, and graphite have been mined in the watershed. The Bureau of Mines currently lists 146 mines, prospects, or locations in the analysis area.

Currently, recreational gold mining is a popular use in this watershed. Organized mining clubs, such as the New 49ers lay claim to large stretches of river. Members of these mining clubs camp in designated campsites. These areas become areas of concentrated use during the summer months, with some members camping for several months.

Recreational soapstone collection is occurring in the analysis area. A small surface deposit located northeast of Hamburg is accessible by road. Several people collect material and use it to carve sculptures which are sold locally.

Other Wood Products

Commercial permits are issued for tanoak mushrooms, firewood, poles, and occasionally (during holiday season) for floral greens such as huckleberry, salal, conifer boughs, and Christmas trees.

Woodcutting is a concern of local residents in this analysis area because of the large amount of Late-

Successional Reserve (LSR) lands - where traditionally snag cutting was prohibited. Currently the Klamath is allowing snag cutting in these LSR lands.

Special Forest Products

Recent years have shown an increased interest in quality basketry materials and some other materials needed for ceremonial and/or spiritual use.

Mushroom picking may be limited to morels, shaggy manes, and some boletes. The tanoak mushroom does not seem to be very prevalent in this watershed.

Key Question 4 - What are the heritage resources of the analysis area?

Existing Management of Heritage Resources

Management of heritage resources includes preserving antiquities, as provided by the Archaeological Resources Protection Act (ARPA) and the National Historic Preservation Act. One important goal of Federal Heritage Resource management is to preserve sites that are eligible or may be eligible for the National Register of Historic Places which are protected by the Archaeological Protection Act. Heritage Resources are managed as an integral feature of Forest ecosystems and National Forest Management through Federal Heritage and Archaeological Resource Programs.

Physical Historic Archaeological Resources

Numerous prehistoric archaeological remains, with a wide degree of complexity, have been identified within the analysis area. These include Native American village sites, temporary campsites, and isolated artifacts. Village sites were common along the Klamath River.

Historic mining features are the most numerous archaeological resources located in the watershed. These historic remains were established after 1850, and include ditch alignments, hydraulic tailings, and mining sites and settlements. Historic era settlement sites also include homestead and cabin remains, graveyards, trails, rock structures, and other remains associated with logging activity and National Forest development including lookouts, and construction of roads, trails, fire lookouts, campgrounds and other Forest administration facilities.

Contemporary Native American Use

The United States Government has developed a Government-to-Government relationship with the Karuk Tribe of California and the Shasta/Quartz Valley Tribe. The Forest has developed a Memorandum of Understanding with The Karuk and Shasta Tribes to enhance Tribal relationships. The Government-to-Government relationship helps identify past or current contemporary uses and Native American values as well as federal trust responsibilities. While Federal/Tribal land management issues can be controversial, collaboration and partnerships with Tribes strengthens working relationships and encourages the shared stewardship of our national heritage.

Contemporary uses by Native Americans in the watershed area include gathering traditional resources such as artisan and basketry materials and Native American religious freedom uses. Artisan and basketry gathering sites have been identified by Native Americans within the watershed area.