Chapter 3 - Current Conditions

Hillslope Processes

Key Question #1 - What are the dominant climatic and hydrologic characteristics and processes of this analysis area?

Climatic Characteristics

The Horse Watershed Analysis Area encompasses an area of relatively steep mountain topography with high relief in the central and eastern Klamath Mountains. Climate in this area is a mixture of effects from the Pacific Ocean and interior climatic processes. Climate is characterized by a warm, dry season from May to October and a wet winter dominated by rainfall from cyclonic storms off the Pacific Ocean. The large storms that have produced major flooding and landslide damage have occurred early in the winter, from November to early January. Interpolating from precipitation and temperature data from Yreka, CA and Happy Camp, CA, the data for Horse Creek, CA is derived as displayed in **Table 3-1**.

Table 3-1. Precipitation and Temperature Data

Month	Mean			Wet Days
	Max. Temp	Min. Temp	Precip.	
January	45.7	29.5	6.52	12.25
February	52.8	31.6	4.82	10.35
March	59.6	33	4.14	11.4
April	68	35.7	1.73	7.5
May	76.5	40.9	1.26	6.45
June	84.1	46.3	0.80	4.2
July	93.2	50.2	0.37	1.9
August	92.5	49	0.54	2.5
September	85.6	44	0.80	3.2
October	71	39	2.54	6.55
November	54.9	34.8	5.22	10.9
December	46.2	31.4	7.02	13.05

Horse Creek, CA lies at about 41.80^0 North latitude, 123.00 West longitude at an elevation of 1600 feet, along the Klamath River. The mean annual precipitation at that point is 35.74 inches. The higher elevations in the project area, near Condrey Mountain, on the Siskiyou Crest receive nearly 75 inches of precipitation, mainly as snowfall during the winter and early spring months.

The upper elevations of the analysis area receive snowfall during the winter. The zone of snowfall can be divided into two areas that have implications for erosional processes: an upper elevation area, generally covered with snow pack the entire winter, and a lower zone, generally 4,500 to 5,500 feet, that alternately experiences snowfall and rainfall. The higher elevation snow-covered zone generally does not have severe erosion problems. The lower transitional zone, or rain-on-snow zone, can experience intense erosion. When warm rain falls on a pre-existing snow pack, the rain melts some of the snow and produces a greater volume of runoff than rainfall alone could produce. All of the major floods in recorded history: 1861, 1955, 1964, 1974, and 1997, and the accompanying damage, have resulted from rain-on-snow events to some degree.

Summer precipitation may be locally intense, stemming from short duration, high intensity thunderstorm events. These thundershowers can also cause erosional effects; however, to a lesser degree. Summer thundershowers are generally isolated cells over the higher mountains. They are sometimes intense enough to create erosion effects and damage is usually localized. In general, the mobilized sediment enters the channel system during seasonal low-flow regimes, and the effects are in place until the winter high-flow regime is commenced. All areas of the Klamath National Forest have been experienced impacts from these types of events. Early season thunderstorms in May and June, of years with a heavy antecedent snowfall, can result in a heavy rain-on-snow event.

Hydrologic Characteristics

There are eight sub-watersheds within the Horse Watershed Analysis area. Upper Horse, Lower Horse, Middle Creek, and Buckhorn Creek, are all tributaries to Horse Creek. Doggett Creek, and the Kohl/Dona watershed area flow directly into the Klamath River, the Quigley, Blue Heron and Collins/Lime watershed areas are face drainages that contribute to the Klamath River. Stream density data is displayed in **Table 3-2**.

Table 3-2. Stream Density Data			
Watershed	**Acres**	**Stream Miles / mile^2**	**Stream Segments / mile^2**
Upper Horse	11383	4.03	10.01
Lower Horse	10375	1.98	5.00
Middle Creek	8030	1.91	5.90
Buckhorn	9153	2.88	5.73
Kohl/Dona	8452	1.29	1.89
Doggett	7727	2.17	5.96
Blue Heron	6372	2.17	5.42
Collins/Lime	7191	2.71	4.09
Quigley's	6236	2.17	3.49

Upper Horse has its headwall area above 6000 feet, in the Copper Butte and Reeves Ranch area on the Siskiyou Crest. Upper Horse is an Order V Stream from the confluence of the East and West Forks of Horse Creek down to the confluence with Salt Gulch.

Lower Horse is an Order V tributary to the Klamath River. Buckhorn and Middle Creek watersheds have their headwall areas at about 6400 feet, below Condrey Mountain and Alex Hole. Both are III Order tributaries to Horse Creek.

The **Kohl/Dona** watershed area is drained by Kohl Creek, with its headwall below Deer Camp, at about 6000 feet in elevation. Kohl Creek is an Order IV tributary to the Klamath River.

The **Doggett Creek** watershed is an Order IV tributary to the Klamath River. The headwall area is below Dry Lake Mountain and Round Mountain.

The **Quigley** watershed area is a series of face drainages on the north flank of the Klamath River. Quigley Cove Gulch and Smith Gulch are both Order II channels into the Klamath River.

The **Blue Heron** watershed area is a face drainage on the southern portion of the analysis area. It is drained by Howard's Gulch, an Order IV tributary on the northeasterly flank of the Klamath River, and Kinsman Creek, a II Order stream, on the southeasterly flank.

The **Collins/Lime** watershed area is drained by Collins Creek, an Order III tributary, on the south flank of the Klamath River. The headwall is about 4400' in elevation, below Collins-Baldy Lookout.

Key Question #2 - What are the dominant erosional and mass wasting characteristics and processes in this analysis area?

Overall, landsliding and surface erosion are the dominant erosional processes. Landslides and surface erosion in steep mountainous terrain delivers large volumes of coarse and fine sediment to stream systems during episodes of intense rainfall. Intense storms with a return period of 10 to 20 years (or more) can produce huge increments of sediment in pulses over a period of hours, to several days. Large sediment inputs into streams from flood events change the structure of channels and stream habitat. These processes were most recently evidenced by the flood of 1997, but have occurred over many thousands of years.

Mass wasting and erosion processes are influenced by rock types and geomorphic landforms. The geology and geomorphology of the watershed is complex, like the rest of the Klamath Mountains. Bedrock comprising the Condrey Moutnain Schist Terrane, comprises the expansive, domed shaped landform of the area. The domed rock is fault bounded by metavolcanic, metasedimentary, and ultramafic rocks of the Eastern Hayfork and Rattlesnake Creek Terranes. These bedrock units have been intruded by younger granitic rocks of the Slinkard Peak and Vesa Bluffs Plutons. See **Figure 3-1**, *Simplified Lithology* in the map packet for locations and descriptions of the major bedrock types. The rocks have been uplifted as part of the regional uplift of the Klamath Mountains, and subsequently eroded. The various bedrock units produce unique slope features, topography and geomorphic expression. The graphitic schist of the Condrey Mountain Terrane makes up the basement of the extremely large, dormant landslide blocks that extend from the headwater ridges down to the stream channels of Doggett, Buckhorn and Middle Creeks. The landslide deposits are comprised of deep weathered soil deposits and rock fragments which developed hundreds to thousands of years ago when the climate was much wetter than it is now. Massive earthquakes related to ocean and continental plate convergence and subduction zone processes may have triggered these massive landslides.

Ancient landslide deposits occur throughout the watershed. The largest areas of continuous landslide deposits are found in Middle, Buckhorn, Kohl, and Doggett Creek subwatersheds. These ancient landslide deposits are dormant (inactive) and are a complex of deep-seated slump and earthflow-type landslides that have been intermittently active over the last few thousand years. The landforms are characterized by irregular slopes, hummocky topography, and a sequence of head scarp areas, benches and toe zone slopes. Stream courses have incised into the deep unconsolidated soils of the

landslide deposit. Portions of the large old landslides can be activated during heavy rainfall years or during a wet climatic period. Unstable toe zone areas often contain shallow debris slides and debris flows that deliver large quantities of sediment into adjacent streams. Sediment delivery from active landslides within these ancient landslide features can be high, even if the area is fully vegetated. Natural landslide rates can be accelerated greatly following disturbances such as wildfire, timber harvest, or road construction. Human influenced watershed disturbances that create the highest risk of landsliding are road construction, timber regeneration harvest, and moderate to severe burn intensity on steep or unstable slopes. The most severe risk of slope failures occurs when all three disturbances exist together in an unstable area or on slopes with a high landslide risk.

Active landslides are scattered throughout the watershed and range in size from a few hundred square feet to several acres. Active landslides can be one of two basic forms: shallow debris slides and flows, or deep-seated slump or earthflows. Though generally smaller in size, debris slides and flows can move extremely fast, mobilizing and depositing large volumes of sediment into streams, with significant downstream effects. The deep-seated slump-earthflow deposits are larger and move slower, on a scale of inches to several feet during wetter years. Examples of these two types of landslides are common in the analysis area.

Geomorphic Terranes

Within the Horse Creek Watershed Analysis area there are several different terrane types that respond to management differently as discussed below and summarized in **Table 3-3**.

Table 3-3. Acres of Geomorphic Terrane Type

Terrane	Uppe Horse	Lowe Horse	Middl Creek	Buckho Creek	Kohl/ Dona	Dogge Creek	Blue Hero	Collins Lime	Quigle
Active Slides	100	137	52	119	8	4	19	19	2
Toe Zones, Dormant	612	264	472	1064	311	466	55	94	141
Dormant Slide Deposits	5844	3148	5081	5612	3452	4868	1116	1886	2043
Granitic Slope >60%	0	22	0	0	0	0	3	63	0
Granitic Slope <60%	0	284	0	0	0	0	172	363	0
Non-Granitic >60%	207	473	76	7	8	27	572	399	15
Non-Granitic <60%	3759	4392	1783	1480	1494	1621	3412	3574	1524
Inner Gorge, Unconsol	496	364	294	773	390	545	138	131	73
Inner Gorge, Granitic	0	105	0	0	74	0	13	73	0
Inner Gorge, Other	314	893	0	31	0	196	843	387	112
Glacial Deposits	39	264	0	55	0	0	27	202	57

Active Land Slides, Dormant Landslide Deposits, and Toe Zones are all sub-sets of a Slump-Earthflow Terrane: The geomorphic character of the Horse Creek analysis area is defined by this terrane type. The presence of thick, residual soils and saprolite on a landscape being rapidly uplifted by the Condrey Mountain Dome resulted in the formation of slump earthflow deposits. Long, relatively shallow-seated dormant landslide features typify the Upper Horse, Middle Creek, Buckhorn Creek, and Doggett Creek subwatersheds. These features are shallow-seated relative to their longitudinal dimension. Any one of these features may be a complex of several, discrete, coalescing features.

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Active Slides are areas that show visible signs of movement or displacement. These signs may take the form of leaning trees indicating soil creep, springs indicating the surface expression of groundwater on the failure plane, and even raw scarps delineating displacement. Active landslides can be one of two basic forms; shallow debris flows or deep-seated slumps or earthflows. Shallow debris flows are characterized by exposed soil on steep slopes, slumps or earthflows are more difficult to recognize, characterized by cracks in the ground and leaning trees rather than areas of exposed soil. 0.7% of the Horse analysis area is this terrane.

Dormant Landslide Deposits are areas of thick soil that have been uplifted and deeply incised by streams. The landform is characterized by irregular but generally gentle slopes with small, indistinct stream courses. Active earthflows are found almost exclusively in dormant landslide terranes. These earthflows may be activated, or reactivated, during heavy rainfall years or a wet period of years. 47% of the Horse analysis area is this terrane.

Toe Zones are the most unstable portion of dormant landslide terranes. They are typically, though not always, found adjacent to channels, and are the oversteepened zone below the gently sloping portions of the dormant landslide deposits. Toe Zones are often coincident with inner gorge terranes. Sediment delivery from this terrane type can be high, even if fully vegetated, and can be increased following a wildfire, timber management, or road construction. 5% of the Horse analysis area is this terrane.

Inner Gorges are found along stream channels in all areas of the analysis area. Three categories of inner gorge are recognized: inner gorges in unconsolidated soils, in granitic soils, and in other, more competent soils. All

inner gorges have naturally high debris sliding rates, but unconsolidated inner gorges are the most susceptible to debris sliding, second only to active landslides in debris sliding rates. Granitic inner gorges are those underlain by granitic soils. They are very sensitive to disturbance with very high management associated failure rates. About 8.4% of the Horse analysis area is this terrane.

Granitic Mountain Slopes are very sensitive to disturbances that remove soil cover, decrease binding root strength, or increase runoff. Debris sliding and erosion are greatly increased following disturbance, such as fire, timber harvest, or road construction. Steep granitic slopes are generally more prone to landsliding than their low to moderate counterparts, however low to moderate granitic slopes can be deeply weathered, highly dissected, and more prone to failure than steeply sloping areas. In project analysis, highly dissected granitic slopes are sometimes considered as part of the geo-component of the riparian reserve system. 1.4% of the Horse analysis area is this terrane.

Non-Granitic Slopes are much less sensitive to disturbance than granitic mountain slopes and less susceptible to landsliding than dormant landslide terrane. They occur in areas that have not formed deep-seated landslide complexes, due to rock competence, slope position, or some other geomorphic factor. 35.5% of the Horse Creek analysis area is this terrane.

Key Question #3 - What effects have recent extreme floods had on watershed conditions and erosional processes in this analysis area?

Review of aerial photos taken over the last half - century (photo years 1944, 1955, 1964, 1965, 1971, 1975, 1986, 1995, 1999) show that storms and floods occurred in 1955, 1964, 1970, 1974, and 1997. Visible effects of the storms and floods are stream channel scour and deposition, removal of riparian vegetation, and landslides.

Within historic times, there have been a number of large, damaging storms in this landscape. The years 1955, 1964, 1974, and 1997 were all winters with large rainstorms that produced damaging landslides. December 1964 was the largest of these storms. The intensity of this storm was due to a rain-on-snow event. Other storms, including 1997, had rain-on snow components, but 1964 had a large snow pack in early December, followed by several weeks of warm, tropical rain that produced a large volume of runoff. The 1964 storm had a profound effect on upslope and channel conditions in this landscape. Many stream channels are still recovering from 1964 debris flows. **Table 3-4** displays miles of scoured channel by "photoyear".

Table 3-4. Miles of Scoured Channel

Watersheds	Photo Year				
	1964	1965	1971	1975	1999
Upper Horse	0.41	1.28	3.64	1.24	0.3
Lower Horse	0.72	5.19	2.14	0	0
Middle Creek	1.96	2.99	0	0.25	0
Buckhorn	0	7.66	2.50	0.26	0.58
Kohl/Dona	0	3.80	0	0	0
Doggett	0	0	0	5.07	0
Blue Heron	0	7.28	0	0	0
Collins/Lime	0	3.74	0	0.34	0
Quigley	0	6.16	0	0	0

There are several large active landslides that have been active in recent years. The Horse-Maple Landslide is located along the 46N50 road. This landslide is on a section of road that is under Siskiyou County jurisdiction and maintenance. It is about 250 wide on the road and extends more than 360 feet above the road, and toes out below the road 35 feet above Horse Creek. Horse Creek does not appear to be undercutting the landslide. The active landslide is a smaller area with a much larger dormant landslide deposit. The landslide was active in the winter of 1999, and Siskiyou County roads department ramped over the slide in 1999 and 2000. Stabilization of this landslide will be costly with some uncertainty as to the success of landslide mitigation. Stabilization will require extensive investigation. In its current condition, the landslide could fail catastrophically in any wet winter and deliver a large amount of sediment into Horse Creek. There are several other similar landslides that have been intermittently active and are of a similar nature along this road.

The East Fork Horse Earthflow is located on the 47N05Y and 47N05Ya roads above the creek. It has been active in 1997 and 1998. In 1997, a 200 foot section of the 47N05Y road failed and was impassable. Landslide debris was deposited in East Fork Horse Creek in both years, turning the creek muddy and turbid.

Key Question #4a - What parts of the analysis area are considered Areas with Watershed Concerns (AWWCs) in the Forest Plan?

The Record of Decision for the Forest Plan identifies AWWCs across the KNF. In the Horse Creek watershed analysis area these AWWC's include all of the Middle, Buckhorn, Kohl/Dona, Doggett, and Quigley watershed areas. In addition, the Lower Horse watershed from the mouth of Middle Creek to Seiad Low Gap, and the portion of the Collins/Lime watershed area, north of the Klamath River are considered as AWWC's. See **Figure 3-2**, *Subwatersheds and Forest Plan Areas With Watershed Concerns* contained in the Map Packet at the end of this document.

AWWCs represent drainages where cumulative watershed effects (CWE) are a special concern due to a combination of high disturbance levels (roads, harvest, fire, etc.), potential for landsliding, surface erosion, and degraded aquatic conditions. An AWWCs determination puts restrictions on additional land-disturbing activities, specifically timber harvest, on the NFS 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.

Key Question #4b - What parameters are used to make this determination?

Cumulative Watershed Effects (CWE)

The Klamath National Forest CWE model uses the Forest Service Pacific Soutwest Region (R-5) Regional (Equivalent Road Acre) ERA Model as a component of the CWE analysis. **Table 3- 5** below provides a summary of impacts by watershed.

Table 3-5. Equivalent Road Acre (ERA) Impacts

Watersheds	Acres	ERA Roads	ERA Harvest	ERA Fire	ERA Total	ERA Percent	Threshold of Concern	Risk Ratio
Upper Horse	11383	292.5	229.4	12.8	534.7	4.7	10.5	0.59
Lower Horse	10375	299.1	241.5	30.5	571.1	5.5	8	0.69
Middle	8030	297.7	188.6	0	486.3	6.1	8	0.76
Buckhorn	9153	265.8	274.6	0	540.4	5.9	9	0.79
Kohl/Dona	8452	260.9	98.6	0	359.5	4.3	7.5	0.48
Doggett	7727	320.6	113.4	148.6	582.6	7.5	8	0.94
Blue Heron	6372	124.6	51.8	0	176.4	2.8	10	0.28
Collins/Lime	7191	206.1	63.7	0	269.8	3.8	10.5	0.36
Quigley	6236	137.2	21	0	158.2	2.5	11	0.23
Watershed Area	74919	137.2	1282.6	191.9	3679	4.9	9.64	0.51

Other components are a modified Universal Soil Loss Equation (USLE) analysis, and a mass wasting analysis. See **Tables 3- 6,** and **3- 7.** These two components derive sediment loss figures, while the ERA Model uses management related compaction as an indicator tool. **Appendix B** contains the methodology for deriving the empirical CWE Analysis, with the combined index scores displayed in **Table 3-8**.

Table 3-6. Universal Soil Loss Equation (USLE) Index Scores								
Watersheds	**Acres**	**Back-ground Sediment**	**Harvest Sediment**	**Fire Sediment**	**Roads Sediment**	**Undisturbed Sediment**	**% Back-ground**	**Rds % Back-ground**
Upper Horse	11383	210.63	43.3	0	1304.39	198.94	634	619
Lower Horse	10375	118.16	98.91	0	983.83	98.34	900	833
Middle	8030	89.09	14.26	0	936.24	83.5	1061	1051
Buckhorn	9153	95.98	19.88	0	761.28	90.04	808	793
Kohl/Dona	8452	71.01	3.96	0	613.35	68.21	865	864
Doggett	7727	67.63	5.44	0	594.25	64.69	882	879
Blue Heron	6372	68.7	3.77	0	315.69	66.98	462	460
Collins/Lime	7191	53.48	0	0	397.27	52.13	741	743
Quigley	6236	31.25	1.04	0	151.2	30.56	485	484

Table 3-7. Mass Wasting Index Scores					
Water-sheds	**Acres**	**Back-ground Yds^3/Ac**	**Current Yds^3/Ac**	**% Back-ground**	**Rds% Back-ground**
Upper Horse	11383	3.202	7.476	133.5	132
Lower Horse	10375	3.18	7.498	135.8	122
Middle	8030	3.283	9.816	199	200
Buckhorn	9153	4.568	10.293	125.3	118
Kohl/Dona	8452	3.365	9.051	168.9	165
Doggett	7727	4.035	10.27	148.5	149
Blue Heron	6372	2.472	5.32	115.2	112
Collins/Lime	7191	2.138	5.224	144.3	144
Quigley	6236	4.035	5.046	113.7	115

Table 3-8. Combined Index Scores		
Watershed	**ERA/TOC**	**Combined Index**
Upper Horse	0.59	0.66
Lower Horse	0.61	0.73
Middle Creek	0.76	0.97
Buckhorn	0.79	0.74
Kohl/Dona	0.48	0.76
Doggett	0.94	0.72
Blue Heron	0.28	0.48
Collins/Lime	0.36	0.64
Quigley	0.23	0.46

Riparian and Stream Areas

Key Question #1 - What are the current vegetative conditions of riparian and stream areas?

Vegetative types found in the riparian and stream areas include Douglas fir and mixed confier forest, riparian shrub/hardwood and riparian meadow.

The White Mountain Botanical Area covers 121 acres of high elevation wet meadow and diverse upland

vegetation along the Siskiyou Crest within the Horse Creek watershed. The riparian area within this Special Interest Area supports the only known population of Saussurea americana (American sawwort) found within California. The species has a wide range north of the Siskiyou Mountains.

Horse Creek Botanical Special Interest Area covers 185 acres of large, mature riparian forest within the Horse Creek Watershed. This riparian area is characterized by a dense four layered forest dominated by Douglas fir, big-leaf maple, Oregon ash, and white alder. The Understory includes dense stands of raspberry, hazlenut, and dogwood. This site occurs along the lower end of Horse Creek where the stream gradient is low and past flooding has created a large floodplain occupied by this riparian forest. This riparian forest is in excellent condition and has a low potential for adverse effects from livestock grazing.

Livestock utilization levels within riparian areas, on the average, have not exceeded *Forest Plan* Standards and Guidelines and the communities are classified as satisfactory or better. Localized impacts, such as trampling and removal of vegetative cover, in riparian or wet meadow habitats occurs in localized areas.

There are many areas along Horse Creek and its tributaries that have healthy riparian communities. However there are also areas of degradation that are recovering slowly. The main impacts to the riparian and aquatic environment are historic mining, logging, roads and the 1964 flood.

Extensive mining also had a major effect on riparian and aquatic conditions in the analysis area. Horse Creek was dredged extensively at the turn of the century. The entire mouth of the drainage was impacted and the stream channel was rerouted outside of the pastures in the private land closer to the hillslope. In addition there are several diversions for irrigation water and a recently constructed dam in the lower reaches of Horse Creek to limit the amount of disturbance in the channel that was caused by the longtime practice of building and removing an earthen dam each year.

The 1964 flood greatly impacted the area, particularly the aquatic environment. It is unknown in what stage of evolution the streams were in after the 1964 flood and what the trend of succession is.

Comparison of aerial photographs from 1944 to 1990 show a dramatic increase in riparian shrub vegetation along the lower reaches of Horse Creek, Buckhorn Creek and Middle Creek following the extensive mining along these drainages. Little, if any, change in the amount of available meadow shrub was detected.

Key Question #2 - What are the current stream channel characteristics and aquatic species habitat conditions?

The physical structure of streams plays a critical role in determining the suitability of aquatic habitats. Structural elements are created through interactions between natural geomorphic features, sediments, woody material, and the power of flowing water.

These elements give rise to a variety of habitat attributes that are used by various life stages of aquatic species. Habitat attributes include substrate composition, amount of shade, pool size, and frequency, and other parameters that are measured or visually estimated. The condition of some of the primary attributes of aquatic habitats in Horse Creek area streams are discussed below and compared to reference values in **Step 5**.

Stream habitat and riparian surveys have been widely used to describe and quantify the physical characteristics of streams. Stream surveys in the Horse Creek Analysis area began as spot checks in the 1930's and became more comprehensive and quantitative over time. Horse Creek was surveyed in 1989-90 using the Region 5 Stream Condition Inventory (SCI) Protocol. This information has been used for assessing the existing condition of aquatic species habitat. Smaller (first to second) order streams have not been surveyed. See **Table 3–9** below.

Table 3-9. Stream Channel Habitat Parameters

Stream Reach	Avg Width	Avg Depth	W/D Ratio	Channel Widths per Pool	
				SCI	Primary
Horse 1	23.0	0.96	23.90	36.3	52.8
Horse 2	18.0	0.98	18.40	156.6	0.0
Horse 3	22.0	1.25	17.60	10.0	25.1
Horse 4	18.0	1.16	15.50	22.7	91.1
Horse 5	18.7	1.03	18.15	16.45	31.1
Horse 6	17.2	0.95	18.10	14.90	59.5
Horse 7	17.5	0.90	19.44	16.90	231.0
Horse 8	17.4	0.85	20.47	23.20	232.5

Low gradient areas are depositional areas, and are often some of the most productive areas in regards to aquatic habitat. The Horse Creek area contains very little low gradient habitat (less than 15%). Sections of low gradient habitat are found in the lower three miles of Horse Creek beginning downstream of the Horse Creek Botanical Area, but virtually none in the tributaries. Most channel types are Rosgen A and B.

For the purpose of comparison, Horse Creek is compared to reference stream conditions on Scott River Ranger District. Reference stream information for Scott River Ranger District, taken from unmanaged, unroaded, and wilderness streams, is presented in **Table 5-11** *Reference Habitat Components* in Step 5. Primary components of aquatic habitats included in this analysis are pool frequency - the ratio of pools (slow water) to runs and riffles (fast water); maximum pool depth; canopy cover (shade); large woody debris; and substrate composition. **Table 3-10**, *Stream Habitat Parameters*, displays values of primary habitat components for surveyed managed streams within the analysis area. The flood of January 1997 caused high flows in most streams in the analysis area. These flows may have changed some of the stream habitat parameters recorded in earlier surveys.

Table 3-10. Stream Habitat Parameters												
Reach	Reach Length (mtrs)	% Substrate Composition					% Fines in Pool Tails	Ave Max Pool Depth (feet)	Rosgen Channel Type	Pool Frequency (pools per mile)		% Shade
		Fines	Gravel	Cobble	Boulder	Bedrock				SCI	Primary	
Horse 1	4112.6	18	30	46	3	3	21	2.36	C3	6.32	4.35	38
Horse 2	867.7	31	46	21	1	1	35	2.0	B4	1.87	0.0	80
Horse 3	339.7	17	26	18	24	14	40	2.97	A4	23.80	9.52	47.5
Horse 4	1513.8	12	26	32	26	4	19	1.98	A3	12.90	3.22	58.5
Horse 5	3220.0	24	21	31	21	3	28	2.17	B3	17.17	9.1	56.1
Horse 6	945.4	12	16	34	28	10	10	2.44	A3	20.68	5.17	71.3
Horse 7	3732.3	22	21	30	25	2	26	1.96	B3	17.82	1.3	51.1
Horse 8	1245.2	17	25	31	27	0	18	1.82	A3	13.05	1.3	54

In-channel coarse woody material (CWM) data was gathered throughout Horse Creek, based on the Forest Service Region 5 SCI protocol. To be recorded, CWM had to be greater than 10 cm in diameter and longer than one-half of the bankfull width for the stream surveyed. The latter qualification indicates that minimum lengths recorded varied with stream size. "In-channel" CWM indicates that some portion of the wood recorded extended within the vertical boundaries of the bankfull margins of the stream surveyed. These data were combined, regardless of channel type, geology, and stream size. **Table 3-11** summarizes wood frequencies for Horse Creek.

Table 3-11. Managed Stream Wood Frequency.			
Stream	Average Pieces per Mile 1/	LWM> 30"X>50'/mile 2/	SWM>12" X >26'/mile 3/
Horse Creek R1	20	<5	6
Horse Creek R2	28	6	8
Horse Creek R3	18	3	7
Horse Creek R4	38	7	21
Horse Creek R5	46	6	22
Horse Creek R6	37	5	20
Horse Creek R7	50	6	24
Horse Creek R8	47	5	22
Avg over all reaches	35.5	4.7	10

1/ Includes all pieces longer than 6 feet.
2/ The LMP criteria for "key wood"
3/ Approximates the criteria for NMFS large woody material LWM on the "East-side."

Key Question #3a. What are the water quality, quantity, and beneficial use conditions of streams within the analysis area?

Table 3-12 shows the indices for Beneficial Uses, Channel Conditions, Erodibility and Stability indices, as well as the Hydrologic Response index for the sub-watersheds in the analysis area. It differs in the risk level slightly from the figures in **Table 3-5** in that some of the indices were changed after field investigation. The risk levels only reflect minor changes resulting from the modification.

Table 3-12. Beneficial Use Conditions									
Watersheds	**Beneficial Uses**	**Channel Condition**	**Erodibility Index**	**Hydrologic Response**	**Stability Index**	**Sensitivity Level**	**TOC**	**ERA**	**Risk**
Upper Horse	3	3	3	3	4	25	9	4.7	0.52
Lower Horse	4	3	3	2	4	26	8.5	5.5	0.65
Middle	4	3	3	3	4	27	8	6.1	0.76
Buckhorn	4	3	3	3	4	27	8	5.9	0.74
Kohl/Dona	4	3	3	3	4	27	8	4.3	0.54
Doggett	4	3	3	3	4	27	8	7.5	0.94
Blue Heron	2	3	3	2	3	21	11	2.8	0.25
Collins/Lime	3	3	3	3	3	24	9.5	3.8	0.40
Quigley	3	3	3	2	3	23	10	2.5	0.25

Key Question #3b. What are the water quality contributions of analysis area streams to the Horse Creek analysis area?

There are two areas that have different water quality conditions: the tributary streams (Hamburg Gulch, Crawfish Gulch, Robinson Gulch, Fish Gulch, etc.), and the main stem of Horse Creek. Overall, water quality within the analysis area is good, especially in the tributary watersheds. However, increased runoff during intense storms in the winter can produce turbid water. To a large degree, this storm turbidity is a natural phenomenon due to erosion and landsliding, but to some degree, it can be increased by erosion from human activities, especially roads.

Key Question #3c. What are the water quality contributions of analysis area streams to the Klamath River Basin?

Overall, water quality within the analysis area is good, especially in the tributary watersheds. However, increased runoff during intense storms in the winter can produce turbid water. To a large degree, this storm turbidity is a natural phenomenon due to erosion and landsliding, but to some degree, it can be increased by erosion from human activities, especially roads.

The tributary watersheds all serve as cold-water sources to the fisheries habitat in the Klamath River. Several of the sub-watersheds, Upper and Lower Horse, Middle Creek, Buckhorn Creek, and Doggett Creek, are all habitats for winter and summer Steelhead runs. Lower Horse also hosts winter Coho Salmon runs up to Crawfish Gulch.

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 down-stream 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 tributaries 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.

Key Question #4 - What is the extent of interim Riparian Reserves, and how are they defined?

Riparian Reserves are a land allocation, applicable to NFS lands and defined in the Forest Plan. See **Table 3- 13,** *Riparian Reserves with ROD Buffers* below. 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 mapped on the geomorphic terranes coverage, update version November 1999. 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 the geologic component of Riparian Reserves, are displayed in **Table 3- 14** below. **Figure 3 - 3** *Riparian Reserve Components* is contained in the Map Packet located at the end of this document.

Table 3-13. Riparian Reserves (RR) with ROD Buffers[1]

Watersheds	Acres of RR
Upper Horse	3516
Lower Horse	3024
Middle Creek	2366
Buckhorn	3309
Kohl/Dona	1890
Doggett	2421
Blue Heron	1691
Collins/Lime	1892
Quigley	1195

[1]ROD Buffers are as follows: 170 ft. on either side of perennial fish-bearing streams, and 85 ft. on either side of other perennial and intermittent streams.

Table 3-14. Geologic Component of Riparian Reserve Land Allocation

Watersheds	Active Slides	Toe Zones	Inner Gorge Unconsolidated	Inner Gorge Granitic	Inner Gorge Other	Total
Upper Horse	100	612	496	0	314	1522
Lower Horse	137	264	364	105	894	2832
Middle Creek	52	472	294	0	0	818
Buckhorn	114	129	775	0	31	1049
Kohl/Dona	8	311	390	0	71	780
Doggett	4	466	545	0	196	1211
Blue Heron	19	55	138	13	844	1069
Collins/Lime	19	94	131	73	387	704
Quigley	2	141	73	0	116	332

Aquatic Dependant Species

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

Distribution:

The analysis area provides approximately 10.75 miles of anadromous habitat for fall run chinook salmon, 23.75 miles for winter run steelhead, and 13.50 miles for winter coho salmon. Stable and significant populations of spring chinook and summer steelhead are largely extirpated from the analysis area and the Horse Creek sub-basin. There are approximately 46.70 additional miles of habitat provided for other native fish species, including rainbow trout, Pacific brook lamprey, speckled dace, Klamath small-scale sucker, and marbled sculpin. The latter three species in the analysis area are located in the mainstem Horse Creek and the Klamath River. See **Table 3- 15** for a display of total miles of habitat by species. See **Figure 3-4** *Anadromous/Resident Fish Range*, contained in the Map Packet located at the end of this document.

Table 3-15 Fish Species Distribution in the Horse Creek Watershed Analysis Area

Species	Status	Miles of Occupied Habitat	Miles of Potential Habitat	Total Miles of Available Habitat
Pacific Brook Lamprey	Present	14.35	9.40	23.75
Coho Salmon	Present	14.35	9.40	23.75
Chinook Salmon Fall-Run	Present	11.00	0.00	11.00
Chinook Salmon Spring-Run	Extirpated	0.00	11.00	11.00
Steelhead Summer-Run	Extirpated	0.00	23.75	23.75
Steelhead Winter-Run	Present	23.75	23.75	23.75
Rainbow Tout - Resident	Present	46.70	0.00	46.70
Tui Chub	Present	12.25	1.25	13.50
Speckled Dace	Present	13.50	0.00	13.50
Marbled Sculpin	Present	23.75	0.00	23.75
Klamath River Smallscale Sucker	Present	13.50	0.00	13.50
Brown Bullhead	Present	12.25	12.25	12.25
Green Sunfish	Present	9.25	0.00	9.25
Yellow Perch	Present	9.25	9.25	9.25
Sculpin sp	Present	46.70	0.00	0.00

The fish bearing streams of the analysis area are illustrated in **Table 3-16.** Winter run steelhead and Resident Fish Range portrays the estimated extent of anadromous and resident fish in each stream. The upper extent of the anadromous reach is estimated, based on local knowledge of flows and physical barriers. The entire anadromous reach may not be accessible for spawning all years in all streams because of the complexity of flow/barrier interactions. The anadromous reach may be overestimated during most years for Horse and Middle Creeks. The length of the anadromous reach for Buckhorn and Doggett Creeks may also be overestimated for most flow years.

Table 3-16. Information Regarding Fish Bearing Streams in the Horse Creek Analysis Area						
Stream Name	**Watershed Name and Acres**	**# Miles Coho Habitat**	**# Miles Chinook Habitat**	**# Miles Steelhead Habitat**	**# Miles Resident Fish Habitat**	**Total Stream Miles**
Horse Creek	Lower Horse 10,375	5.10	1.50	6.50	8.50	8.50
Unnamed tributaries to Horse Creek	Lower Horse 10,375	0.00	0.00	0.00	2.00	6.50
Horse Creek East Fork	Upper Horse 11,383	0.00	0.00	0.00	4.00	4.00
Unnamed tributary to East Fork of Horse Creek	Upper Horse 11,383	0.00	0.00	0.00	0.60	2.25
Horse Creek West Fork	Upper Horse 11,383	0.00	0.00	0.00	2.30	2.30
Salt Gulch Creek	Upper Horse 11,383	0.00	0.00	1.00	2.25	2.25
Unnamed tributary to Salt Gulch Creek	Upper Horse 11,383	0.00	0.00	0.00	0.30	3.20
Middle Creek	Middle Creek 8,030	0.00	0.00	1.75	3.50	6.75
Buckhorn Creek	Buckhorn 9,153	0.00	0.00	2.00	5.75	6.50
Kohl Creek	Kohl/Donna 8,452	0.00	0.00	0.75	2.25	2.25
Doggett Creek	Doggett 7,727	0.00	0.00	1.80	3.80	4.50
Collins Creek	Collins/Lime 7,191	0.00	0.00	0.70	0.70	3.75
Dona Creek	Kohl/Donna 8,452	0.00	0.00	0.00	1.50	4.75
Klamath River (Portion of river within analysis area)		9.25	9.25	9.25	9.25	9.25

In Table **3-16**, the watershed area is included to indicate relative stream size. This information, coupled with the miles of anadromous or resident stream present, indicates the relative quantity of habitat available in each stream. The # Miles Habitat Columns indicate the uppermost extent of fish distribution for each species listed. Within the analysis area, Chinook and coho salmon are only present in the Klamath River and Horse Creek. The remaining streams in the analysis area have steep gradients and are either not accessible to Chinook or coho salmon or do not contain suitable habitat. Adult fall chinook will spawn almost annually in Horse Creek. Access by fall chinook to Horse Creek is often restricted by low fall stream flows.

Population Size:

General: A direct estimate of the number of spawning adult fall Chinook salmon is determined annually for the Upper Klamath River Basin. Population data for all other salmonid populations (juvenile steelhead, coho and chinook, and adult steelhead and coho) is much less precise, much more localized, less regular, and usually obtained by more indirect methods (redd counts, out-migrant trapping, etc.) than data obtained for adult chinook population. Specific population numbers and life history patterns for all other non-salmonid species within the analysis area is virtually non-existent.

Fall Spawn Survey: The annual cooperative fall chinook spawning surveys yields the best available information for an adult salmonid species within the analysis area. The survey estimates the entire Upper Klamath River fall chinook population (Peterson mark & recapture methodology). However, a redd survey by river reach is also conducted at the same time, and can also provide an estimate of population size. Chinook redd surveys were last conducted in the Horse Creek watershed in 1998. Results are summarized in **Table 3-17.**

Table 3-17 Chinook Spawning Survey Data for Horse Creek (11/04/98)					
Stream	**Reach**	**Reach Boundaries**	**Redds**	**Lives**	**Carcasses**
Horse	1A	Middle to Buckhorn Creek	20	5	3
Horse	1B	Buckhorn Creek to	12	2	0

		Mouth			
		Totals	32	7	3

Steelhead Redd Surveys: Steelhead redd surveys were undertaken in the analysis area in 2002. It should be noted that steelhead redd surveys are conducted during periods of elevated flow and often elevated turbidity. Successful observation of redds is dependent not only spawning adults being present, but also on the proper stream and weather conditions to view constructed redds. It is possible that redds could be constructed and be immediately obscured by the effects of elevated flows (tailings smoothed out, pots filled, etc.). Results are summarized in **Table 3-18**.

Table 3-18 Steelhead Spawning Survey Data for Horse Creek Watershed (2002)

Stream	Reach	Reach Boundaries	Redds	#Redds w/Live Fish	# fish
Horse Cr	1	Lower end of Botanical Area to bridge at 47N77 Road	30	5	3
Horse Cr	2	Bridge at 47N77 Road to 2 miles upstream	12	2	0
Middle Cr	1	Mouth to 1 mile upstream	0	0	0
Barkhouse Cr	1	Mouth to 2nd Country Bridge (0.75 miles)	16	0	6
		Totals	58	7	9

Rearing assessments: The density of juvenile salmonids in Horse Creek was determined in 1998 by snorkel diving. Again, results need to be considered primarily as indexes or trend indicators rather than absolute densities due to differences among individual divers in observations and, more importantly, not all fish in a given area will be observed due to their ability to hide or flee the area. Double counting of fish may also be a problem in some situations. All salmonids observed were steelhead/rainbows.

Life History Patterns:

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 below in **Table 3-19**, *Anadromous Adult Fish Species*.

Table 3-19. Anadromous Adult Fish Species

ADULT SPECIES	MONTHS PRESENT
Fall Chinook Salmon	From October through early December
Coho Salmon	From December through January
Winter Steelhead	From November through May
Pacific Lamprey	From April through June

Anadromous young are found within the watershed year-round. Steelhead juveniles remain in the system up to three years and lamprey young (*ammocoetes*) remain up to seven years before out-migrating 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.

Local anglers report catching significant numbers of small steelhead/rainbows (steelhead halfpounders) during the fall chinook spawning period. Most of these fish are 12 to 18 inches in length, and seem to appear along with the spawning Chinook salmon and actively feed on roe as the chinook redds are constructed. Based on local input and observance of these fish during the annual fall spawn survey, it is felt that this population has increased significantly since the 1998 and 1999 seasons.

Presence/Status of non-salmonid aquatic-dependent species in the analysis area:

As discussed in Step One, freshwater sculpins, dace, and other non-salmonid fish species, are present in the Horse Creek Analysis Area. A small amount of indirect information is available on the District regarding some of these species, primarily as a result of notes made during other activities (e.g., summer steelhead dives).

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 are Regional Forester-designated Sensitive species. The Southern Oregon/Northern California Province ESU of coho salmon has been designated threatened under the ESA. Spring chinook are Regional Forester-designated sensitive species. Pacific lamprey and western pond turtles are both State of California species of special concern. Western pond turtles are also Regional Forester-designated Sensitive species.

Aquatic Survey and Manage (SM) mollusks are not known to occur in the Horse Creek Analysis Area; however, no formal surveys have been conducted to date (05/29/02). *Fluminicola n. sp. 1*, the nearest known SM aquatic mollusk species, occurs above the confluence of the Shasta and the Klamath River.

Key Question #3 - What areas are critical for maintenance, protection, and recovery for at-risk species?

Key spots for fall chinook spawning (several years of record) are illustrated on maps at the District Office. It is probable that coho, spring chinook, and steelhead would also utilize some of these same areas. Steelhead, which spawn during the higher flows of spring, also often use spawning gravels associated with channel margins in the main river and tributaries higher up in the watershed. These areas may actually be dry or near dry during the time of fall chinook spawning. Areas of steelhead spawning are not identified in the main river, but some information for steelhead spawning by reach in the tributaries is available on the District. Little is known about location and timing of coho spawning. Information from snorkel dives discussed earlier indicate coho rearing streams (and probably also coho spawning streams.) Large, deep holding pools are available for early run fish (summer steelhead and spring chinook) in the Klamath River within and downstream of the analysis area, but water quality factors, especially water temperature, is often unfavorable for these fish.

The mainstem Klamath River in the analysis area is a funnel for all anadromous activity (escapement, out migration, rearing) in the analysis area. Analysis area tributaries, such as Horse, McKinney, Barkhouse, and Doggett Creeks, provide the only consistent perennial connection with the Klamath River. Other tributaries, such as Kohl, Collins, and Donna Creek go intermittent during summer months. Due to low flow conditions and elevated water temperatures, it is felt that many of the fish, resulting from spawning activity in the analysis area, flee to the lower Klamath River and lower Scott River areas to rear. Access into several cooler tributaries (Seiad, Thompson, Indian, Grider, and Elk Creeks) located just downstream of the analysis area is also possible for rearing purposes. As a result, the Horse Creek Analysis Area is viewed as vital to sustaining existing anadromous processes within the Upper Klamath River Basin.

Key Question # 4 - To what extent does the Horse Creek anadromous fish populations contribute to Klamath River basin fisheries?

Again, fall chinook populations are the most accurately (easily) tracked salmonid population in the Upper Klamath River Basin. Fall chinook redd counts by reach for Horse Creek are portrayed in **Table 3-17**. Recognizing the fact that Horse Creek is an important contributor of wild stock production for the Upper Klamath River system, it is an important stream for sustaining wild chinook populations in the upper-Klamath River area.

Prime coho salmon production areas were probably historically located in the lower 4 miles of the Horse Creek system, while prime steelhead production probably occurred in the this area, as well as in other streams in the analysis area. However, as discussed, water flows and water quality issues are felt to have contributed to significant declines in the populations of these two species. Similar conditions exist in the mainstem Klamath flowing out of Irongate Reservoir and the Shasta River. As a result, the entire Upper Klamath River system, including the analysis area (and the Shasta River), does not contribute to the larger mid-Klamath meta-population for coho salmon and steelhead, as it did historically.

Forest Health and Fire Disturbance Risk and Hazard

Key Question #1 - Where do high levels of mortality exist that are contributing to high hazard (fuels) in the analysis area?

a. What are the causes of this mortality and what species are most affected?

Using Region 5 tree mortality flight survey protocol, flights completed in 1993 to 2000 have identified 21,562 acres of high conifer mortality in the analysis area, 13,735 acres of moderate conifer mortality, and 11,419 acres of low conifer mortality on all lands in the analysis area. See **Figure 3-5** *Timber Mortality*, contained in the Map Packet located at the end of this document, for the 1993 through 2000 survey results. Mortality areas identified vary in size, with the smallest being pockets of approximately 20 acres. **Table 3-20** *Acreage of Mortality by Existing Vegetation Type*, identifies the acres of mortality by vegetation type. These areas need further site investigation to field-verify actual mortality and conditions on the ground.

Table 3-20. Acreage of Mortality by Existing Vegetation.				
Vegetation Type	**Total acres**	**Low**	**Mod-erate**	**High**
Mixed Chaparral	2,193	36	240	1,917
Montane Hardwood	869	46	469	354
MontaneHardwood/ Conifer	5,684	482	1,283	3,919
Ponderosa Pine/ Mixed Conifer	22,425	2,888	6,771	12,766
Douglas Fire/ Mixed Conifer	8,606	4,082	2,953	1,571
True Fir	3,652	2,702	795	155
Sub alpine	385	112	273	0
Montane Meadow	1,015	660	328	27
Montane Riparian	998	294	407	297
Agricultural	471	49	8	414
Barren	366	20	202	144
Total	**46,664**	**11,371**	**13,729**	**21,564**

Table 3-20 indicates that vegetation types that have large areas of mortality may be found in the ponderosa pine mixed conifer, Douglas fir mixed conifer, montane hardwood conifer, and true fir vegetation types. Causes for increased mortality in these areas include overstocking (which weakens trees), weak root systems (which allows for increases in blow down during wind events), openings in stands caused by blowdown (which allows for more wind), and diseases, including dwarf mistletoe and *Cytospora abietta*. **NOTE:** High mortality areas are defined as greater than 10% of tree stems recently dead; moderate mortality with 5 to 9% stems recently dead, and low at 1 to 4% recently dead.

Table 3-21 *Percentage of Existing Vegetation Community Identified as Having Some Mortality*, may be a good indicator of how widespread over-dense stands and poor forest health conditions are within the analysis area.

Table 3-21. Percentage of Existing Vegetation Community Identified as Having Some Mortality.	
Vegetation Type	**% mortality***
Mixed Chaparral	**76**
Montane Hardwood	**42**
Montane Hardwood/Conifer	**76**
Ponderosa Pine/Mixed Conifer	**70**
Douglas Fire/Mixed Conifer	**52**
True Fir	**80**
Subalpine	**92**
Montane Meadow	**90**
Montane Riparian	**83**
Agricultural	**55**
Barren	**73**
*Includes areas of low, moderate, and high mortality.	

Table 3-22 *Acreage of Mortality by Management Area,* identifies the acres of mortality by management area. Levels of mortality are identified by examining conifer stands with similar size and density characteristics and determining the percent of mortality within each stand. The percent of recent mortality in conifers determines the rating of high, moderate, or low.

Table 3-22 indicates that management areas with significant amounts of mortality include LSR and Partial Retention. The latest Mortality Survey Flight was done in the spring of 2000. The recent mortality found within the analysis area, is a result of insect, disease, and disturbances other than fire. The area impacted by the Bark fire of July 2000 was not included since it occurred after the survey.

Table 3-22. Acreage of Mortality by Management Area.				
Management Area	**Total** acres	**Low**	**Mod-erate**	**High**
LSR	17,999	5,993	6,846	5,160
Special Interest Area	109	101	8	0
RR	3,393	526	1,247	1,620
Retention VQO	925	121	481	323
Recreational River	190	95	0	95
Partial Retention VQO	6,664	1,010	2,022	3,632
General Forest	3,595	673	1,136	1,786
TOTAL	**32,875**	**8,519**	**11,740**	**12,616**

Key Question #2 - Are there conifer stands at risk of catastrophic loss from mortality and wildfire and, if so, where are they located?

For this analysis, healthy forest conditions are defined as a forest containing a variety of plant and animal species with genetic diversity, a forest that is resilient to large-scale disturbance, and where these conditions are sustainable over time. The Forest vegetation data that is available for this analysis is what was developed for the *Forest Plan*. This data has been updated for changes (harvest and silvicultural treatments) on National Forest System lands and land owned by Fruit Growers Supply Company, but is not current for changes that have occurred on other private lands. Timber harvest has occurred throughout the analysis area. Much of the harvest data will be utilized along with mortality flight data to determine forest health.

Factors affecting forest health are interrelated, and often work in combination with one another. Some of these factors are tree species, seral stage, stocking density, insects and disease, and fire behavior potential.

A variety of insects and diseases are found in the analysis area. The most prevalent include: white pine blister rust, dwarf mistletoe, western pine beetle, pine engraver beetle, and fir engraver beetle. These pathogens are found throughout the watershed and are part of the natural processes of healthy forest stands. They become a problem when a combination of factors (e.g. drought, fire exclusion) provide a catalyst for epidemic out-breaks, resulting in high levels of tree mortality.

Overstocking can be defined as a condition of the vegetation that is or will exceed the site capabilities over time, leading to stagnation, reduced growth and vigor, and eventually mortality. Stands of varying densities occur throughout the analysis area. Stands considered over-dense (over-stocked stands) are those stands in which the vegetative biomass is greater than that which can be sustained over time. Without the natural disturbance regime (primarily fire, but also insects and diseases) or management, almost all stands will achieve this state. White fir encroachment in the understory in many of the mixed conifer stands is a major factor contributing to development of stand densities beyond site capacity.

Conditions that could lead to high intensity fire.

High Intensity burn within the Bark fire area.

Key Question #3 - What are the current vegetation communities in the analysis area?

Table 3-23 *Horse Creek Vegetation Communities*, displays the vegetation communities and acreages that were identified utilizing the Forest Timber Type Vegetation Coverage. See **Figure 3-6** *Existing Vegetation* in the Map Packet in the back of this document.

Table 3-23. Horse Creek Vegetation Communities

Vegetation Communities	Acres
Mixed Chaparral	2,875
Montane Hardwood	2,085
Montane Hardwood/Conifer	7,482
Ponderosa Pine/Mixed Conifer	32,111
Douglas Fire/Mixed Conifer	16,586
True Fir	4,569
Subalpine	417
Montane Meadow	1,124
Montane Riparian	1,199
Agricultural	856
Barren or Water	504
Total	**69,884**

Mixed Chaparral

Mixed Chaparral

Mixed Chaparral is typically found on poor sites that will not support conifer stands. Mixed chaparral found in the analysis area consists mostly of species mixes dominated by wedgeleaf ceanothus (*Ceanothus cuneatus*) with inclusions of greenleaf manzanita (*Arctostaphylos patula*) and mountain mahogany (*Cercocarpus betuloides*). Within the analysis area this community is found mostly on dry southern aspects below 3,500 feet.

Montane Hardwood

Montane Hardwood

Montane Hardwood is found in close proximity to the mixed chaparral community. Oregon white oak (*Quercus garryana*) is the most abundant hardwood species found in this community. Canyon live oak (*Quercus chrysolepis*) is also found on harsher sites. These species, found without much intermix of conifers, define the community

Montane Hardwood/Conifer

Montane Hardwood/Conifer

These hardwood dominated areas tend to be found at lower elevations within the analysis area, mostly on the lower one-third of south aspects. This community is often a transition zone between hardwood and mixed conifer communities. Hardwoods occurring are the same as earlier discussed in the Montane Hardwood Community. Oregon white oak, California black oak and Pacific madrone are the most common hardwoods in this community, with big leaf maple and red alder found in riparian areas. Ponderosa pine is the main conifer, with Douglas fir, incense cedar, and sugar pine also associated with the community.

Ponderosa Pine/ Mixed Conifer

Ponderosa Pine/Mixed Conifer

The Ponderosa Pine/ Mixed Conifer community accounts for 46% of the analysis area. It is found mostly in the low to mid elevations (mostly below 5,000'). Douglas fir, white fir, sugar pine, and incense cedar can all be found in the overstory. Understories tend to be dominated by Douglas fir, and incense cedar. Overstory trees tend to be widely spaced, i.e. greater than 20 feet. On better sites, such as in

drainages, low slope positions, and higher elevations with better moisture regimes, Douglas fir will tend to be the dominant species.

This community has had the most change as a result of human activities in the analysis area. The area occupied by this community has changed little, but species composition has changed dramatically, due to fire effects, harvest activities, plantation management and fire suppression. Ponderosa pine and sugar pine were more common. Ponderosa pine and sugar pine comprised up to sixty percent of the conifers in stands on south and west aspects. Douglas-fir was found mostly on the lower one-third of these south and west aspects, and dominated the north and east aspects along with white fir. This community was adapted to frequent low to moderate intensity fires.

This community provided the commercially valuable conifers that drew loggers to the area; sugar and ponderosa pine being the most sought-after species in the early years of logging. After the harvestable pine species were depleted, Douglas-fir and true fir were harvested.

Two regimes of partial cutting contributed significantly to changes in species mix and stand structure. Unit area control in the 1950s through early '60s and Klamath partial cuts of the '70's altered the species composition, overall stand structure, health, and vigor. Similar to railroad logging, generally the largest trees were removed; however, all species were cut as opposed to primarily pine species. Some cut areas were planted, but the majority were left to naturally reseed. These areas are currently stocked with trees that seeded in from the suppressed and intermediate size-classes. Overall stand vigor is deteriorating, due in part to logging damage of the residual trees and mistletoe infection of the in-growth. In general, most logging slash was left untreated.

The fire suppression era, beginning about the same time as the first commercial harvest activities, allowed dense conifer stands to develop. The lack of fire favored regeneration of Douglas fir and white fir over pine species. The introduction of white pine blister rust has hampered the reestablishment of sugar pine. Currently dense stands of Douglas fir and white fir are found in areas that were historically open, pine dominated stands. With eighty years of fire suppression, stands are denser, and litter and downed woody material accumulations are greater than that maintained under the historic fire regime.

Douglas fir/ Mixed Conifer

Douglas-fir/Mixed Conifer

Douglas-fir/Mixed Conifer is the second largest community in the analysis area taking up 23% of the area. It is typically found in the mid to high elevations of the analysis area, but can also be identified in patches on good site at any elevation. In some places, it is a transition from the true fir to the Ponderosa pine/mixed conifer; in other places, it is primarily Douglas fir and deciduous hardwoods (black oak and Oregon white oak). The overstory typically consists of a mixture of conifers. Dominant conifers on moister north and east aspects are Douglas fir and white fir, with small numbers of ponderosa pine, sugar pine and incense cedar. On drier south and west aspects, ponderosa pine becomes the dominant conifer, with fewer other conifers. California black oak is found mixed in both the overstory and understory, more commonly on south and west aspects. Canyon live oak and pacific madrone are found on harsher rocky sites within the community. North and east aspects and the lower one-third of all aspects support dense stands of conifers. These areas often have higher accumulations of snags, litter, and downed woody material than drier south and west aspects.

True fir

True fir

This high elevation conifer community is dominated by red fir. The elevational band varies with aspect; widest on north aspects. White fir dominates the lower edge of the elevational band. The presence of red fir defines the community. True fir communities are typified by even-aged appearing stands of trees that can cover hundreds of acres. The cause of this pattern is probably a history of recurrent lightning fires, windthrows, and insect outbreaks acting to kill groups of trees. The understory often consists of fir seedlings and saplings with sparsely scattered grasses, forbs and shrubs. At higher elevations, where the true fir is dominated by red fir, heavy shade and a thick layer of duff tends to inhibit understory vegetation, especially in dense stands. These normally dense stands often have high numbers of snags and large accumulations of litter and downed woody material.

Subalpine

Sub alpine

Red Fir Barrens (Sub Alpine Community)

The sub alpine 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, and white fir. The understory can consist of ocean spray, Drummond pasque flower, pinemat manzanita, and quill-leaved lewisia.

Montane Meadow Community

Montane Meadow Community

The Montane Meadow community is found at the highest elevations of the analysis area mostly along the Siskiyou Crest between Dry Lake Mountain and Condrey Mountain. This meadow complex has been referred to as the Red Fir Forest-Barrens Mosaic (Laurent, Graham and Tice 1993). This study investigated forest-barrens associations to determine if soil differences could help explain the cause of the barrens. While the soils (Xerumbrepts) are morphologically similar in many respects, burrowing by abundant pocket gophers (species in the genus *Thomomys*) in the barrens produced thicker umbric epipedons than in the forests, where pocket gophers are absent. The only significant soil chemical differences detected between sites were lower concentrations of calcium and magnesium in the barrens surface soils. In contrast, base cations accumulate in the forest "A" horizons as a result of biocycling. While the origin of the barrens remains unknown, herbivory by pocket gophers is a major factor in maintaining the barren conditions and their activity ultimately accounts for most soil chemical and morphological differences.

Montane Riparian

Montane Riparian (Riverine)

Montane Riparian close-up

The Montane Riparian community is found along the Klamath River, major tributaries, including Horse, Buckhorn, and Middle Creek drainages, wet seeps and slumps, and high elevation wet meadow complexes. This community is a remnant of the once common deciduous tree community that was found all along the Klamath River and the lower reaches of its major tributaries. Along the Klamath River, the primary plant species is willow, while in other areas alder, cottonwood, 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 primarily due to disturbances from floods.

Agricultural Lands

Agricultural Lands

Key Question #4 – How does the current fire regime impact vegetation in the analysis area?

The fire regime is the most widespread and dynamic disturbance regime affecting the analysis area. Lightning fires have occurred within the analysis area 78 of the last 79 years. Fires occurring in the area affect the vegetation communities with a variety of severities. The more infrequent fire returns to the landscape, the greater the potential severity of the resulting fire effects. Effects found within large fires include areas of high, moderate, and low severity. The amounts of each depend on conditions existing at the time of the fire occurrence. Weather conditions, available fuels, and topography are the deciding conditions for the severity of fire.

An aggressive fire suppression response has been effective for the most part since approximately 1920. Fire suppression efforts since 1922 have kept 92% of the fire starts to less than ten acres. **Table 3-24** displays the number of fires occurring at each size class within the analysis area. On occasion, the number of starts overwhelms the suppression forces and large fires are the result. The most recent example of this occurred in 1987. Human caused fires of note are the Bark fire (2000), which was ignited next to Highway 96 near the mouth of Doggett Creek and burned over 1,700 acres before being contained and the Buckhorn Fire (1977) which burned nearly 2,900 acres in April of 1977.

Table 3-24 Fires by Size Class

Fire Size Class	Number of Fires	% of Fires
Class A (<0.25 acres)	424	67%
Class B (0.25 - 9.9 acres)	158	25%
Class C (10 - 99 acres)	27	4%
Class D (100 - 299 acres)	11	2%
Class E (300 - 999 acres)	9	1%
Class F (>1,000 acres)	5	<1%

With a successful fire suppression record, (92% of all fires being contained at <10 acres) a lack of fire has allowed the development of overly dense vegetation communities with high fuel loadings. Under the current fire regime (suppression), the influence of fire as a fuels reduction process has been dramatically reduced. As the time since the last fire lengthens in this fire-prone area, surface fuels and live ladder fuels **will** accumulate. Accordingly, the probability of large, severe fires **will** likely increase (Taylor and Skinner, 1998). In general, these conditions will increase fire severity throughout the analysis area. This will be discussed more in **Chapter 5**.

Key Question #5 - What are the current fuels and fire behavior potential in the analysis area?

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 the severest 10% of the historical fire weather; i.e., hot, dry, windy conditions occurring on mid-afternoons during the fire season.

This modeling incorporates fuel condition, slope class, and 90th percentile weather conditions in calculating projections on flame lengths and rates of spread. To identify fuel conditions, a crosswalk is developed from the existing vegetation layer to fuel models (**see Figure 3-7** *Fuel Models*, contained in the Map Packet located at the end of this document).

Three slope classes are utilized in the fire behavior potential modeling: less than 35%, 35-65%, and greater than 65% slope. The 90th percentile weather data is based on 20 years of data collected at Oak Knoll Ranger Station and Collins Baldy Lookout, which are the representative weather stations for the analysis area.

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 firelines and will be limited to burning in understory vegetation. A **moderate** rating indicates that hand-built firelines alone will not be sufficient in controlling fires, and that heavy equipment and retardant drops would be needed for crews to be effective. Areas rated as **high** represent the most hazardous conditions in which serious control problems would occur. Control lines would be established well in advance of flaming fronts, and heavy equipment and backfiring might be necessary to widen control lines.

For more information on fuel modeling and the development of fire behavior potential for this analysis, refer to **Appendix D** *Fire and Fuels*. The fire behavior modeling indicates that 33% of the analysis area has a low fire behavior potential, 56% moderate, and 10% high. See **Figure 3-8,** *Fire Behavior Potential*, for mapped fire behavior potential ratings. **Table 3-25,** *Acreage by Fire Behavior Potential*, identifies the acres of high, moderate, and low fire behavior potential and the percent of each found within the analysis area.

Table 3-25. Acreage by Fire Behavior Potential

Fire Behavior Potential	Acreage	% of Watershed
High	6,926	10
Moderate	39,049	56
Low	22,886	33
Non-Flammable	975	1
TOTAL	**69,836**	**100**

Table 3-26, *Fire Behavior Potential Acreage by Vegetation Community*, identifies the acreage of high, moderate, and low fire behavior potential within each vegetation community.

Table 3-26. Fire Behavior Potential Acreage by Vegetation Community.

Existing Vegetation Type	Non-flammable	Low	Mod-erate	High
Mixed Chaparral	0	152	1,520	1,201
Montane Hardwood	0	326	1,140	615
Montane Hardwood Conifer	1	3,212	2,702	1,561
Ponderosa Pine/Mixed Conifer	0	14,235	15,760	2,165
Douglas-fir/Mixed Conifer	27	1,572	13,705	1,276
True Fir	116	578	3,794	76
Subalpine	2	58	350	5
Montane Meadow	359	687	53	26
Montane Riparian	0	1,180	18	1
Agricultural	0	850	6	0
Barren	466	36	1	0
Totals	971	22,886	39,049	6,926

Key Question #6 - What are public concerns related to fuels and fuels treatment activities?

Based on responses received at the public meeting and information collected from the questionnaires, fire risk, fuels reduction and fire suppression access are the publics highest concerns. There were also many of the questionnaires that identified fuels reduction projects as opportunities to implement in the analysis area. High fuel loading appears to be the highest concern for local area residents.

Key Question #7 - What agreements are currently in place and/or is there interest in developing strategies or methods to allow joint ventures with private landowners to reduce fuels adjacent to and possibly within their properties (in the best interest of both parties)?

A Memorandum of Understanding (MOU.5.99.20.101) between Federal and State Agencies for burning was updated and signed in year 2000 and is in effect through December 2002. This agreement concerns the Cooperative Use of Prescribed Fire and is made and entered into, by the State of California, through its Director of the Department of Forestry and Fire Protection (CDF); Director of California Department of Parks and Recreation; U.S. Department of Agriculture-Forest Service; U.S. Department of Interior-National Park Service; Bureau of Land

Management; Bureau of Indian Affairs; U.S. Fish and Wildlife Service; and U.S. Army Corps of Engineers.

This agreement is intended to provide for the conduct of joint prescribed burning operations, site preparation, and necessary follow-up activities for specific prescribed burn units, on non-federal wildlands and federal wildlands, where these operations serve the public interest and are beneficial to the State.

Key Question #8 – How does the current road system contribute to fire suppression and fuels treatment activities?

See **Figure 6-2**, for a display of important roads for fire suppression and fuels treatment, located in the Map Packet in the rear of this document.

Late-Successional Habitat

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

Within the Horse Creek Analysis Area, there are a variety of different vegetation types and stages of development (successional stages) as described in the *Forest Health and Fire Disturbance Risk and Hazard* section. The amount, distribution and condition of late-successional forest (defined as late mature and old-growth in the Forest Plan database) in the landscape has been identified as an issue due to fire suppression effects (refer to previous section) and loss of older forest through timber harvest, road building, and wildfire. The condition of forested stands, as influenced by fire suppression and increased fuel levels, has lead to increased risk of loss from catastrophic fire. Loss of late-successional forest habitat, and the less obvious isolation of existing habitat patches, are aspects of late-successional forest fragmentation that may threaten the viability of wildlife species dependent on older forests.

Within the range of the northern spotted owl (Washington, Oregon and northern California), the loss and fragmentation of habitat for late-successional forest related species has been addressed through Standards and Guidelines (USDA, 1995, *Forest Plan*) including late-successional reserves (LSRs). This section addresses the distribution and condition of late-successional forest habitat within LSRs and addresses the distribution and amount of late-successional forest outside of LSRs that is important for connectivity between LSRs, see Standards and Guidelines for Matrix lands in the *Forest Plan*).

The analysis area contains approximately 56,000 acres of mixed conifer and true fir forest habitat, with a wide variety of crown closures and diameter classes. Of that, approximately 22% (12,329 acres) is currently in a late-successional forest condition (refer to **Figure 3-9,** *Seral Stages*). Forested vegetation types range from sub alpine conifer and true fir at higher elevations to mixed conifer stands dominated by Douglas-fir/white fir from 3,500 to 5,500 feet, and ponderosa pine mixed conifer at mid- and lower elevations.

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 found today. Most timber harvest on Forest Service managed lands focused on late-successional stands or focused on burned areas as part of a fire salvage program. Roughly 6,211 acres (16% of Forest Service managed lands within the analysis area) of forested land have been clear-cut or partial cut through timber harvest and fire

salvage since the 1930s. In addition, there are approximately 459 miles of roads (Forest Service, private, State, County, and unclassified) in this analysis area. Clearing through timber harvest and road building on National Forest System lands has reduced the amount of late-successional habitat by roughly 25% and fragmented larger blocks of habitat.

Timber harvest on private land has also reduced the amount of late-successional forest. Private lands occupy 46% of the analysis area (32,120 acres). The majority of the private land base (69%) is commercial timberland; management of these lands focuses on maximum production of forest products. It can be expected that the majority of private commercial timber ground will be in an early to mid-successional stage of development, with pockets of older forest throughout. On private land within the analysis area, roughly 5,400 acres (17% of private commercial timber land) of forested land have been clear-cut or shelterwood harvested. For the most part, the remainder of the private commercial ground has been harvested to some extent using partial cut, sanitation, salvage, or thinning prescriptions (complete timber harvest data for private forest lands was not available, acres of harvest were estimated from Fruit Growers Supply Company managed stand data, aerial photography, and Geographic Information System (GIS) vegetation types).

Large wildfires have also reduced and fragmented late-successional habitat (over 13,000 acres have burned at varying degrees of intensity since 1935). The largest, and most recent, impacts on late-successional forest as a result of wildfires occurred in 1977 (2,900 acres in the Buckhorn Fire), 1987 (1329 acres in the Fort/Copper Complex), and 2000 (1700 acres in the Bark Fire). 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 (refer to the *Forest Health and Fire Disturbance Risk and Hazard* discussion in the previous section). The results of these changed conditions include increases in dead and live fuel, development of ladder fuels, and a more dense forest with a closed canopy that can sustain a crown fire.

Large LSRs cover approximately 28% of the analysis area (20,000 acres); two LSRs overlap the analysis area, Johnny-O'Neil and Collins-Baldy. The Johnny-O'Neil LSR (#354) occupies 16,200 acres of Large LSRs cover approximately 28% of the analysis area (20,000 acres); two LSRs overlap the analysis area, Johnny-O'Neil and Collins-Baldy. The Johnny-O'Neil LSR (#354) occupies 16,200 acres of the analysis area (23%), and is located in the western third of the area. It takes in the upper portion of the Horse Creek drainage, the East and West Forks of Horse Creek, Salt Gulch, Robinson Gulch, Crawfish Gulch, Fish Gulch, and Hamburg Gulch. The Collins-Baldy LSR (#355) occupies 3,800 acres of the analysis area (5%) in the Kinsman, Everill, Collins and Lime Gulch drainages. The amount of late-successional habitat within the two LSRs is displayed in **Table 3-27**. LSRs were designated in 1994 to maintain functional, interactive, late-successional and old-growth forest ecosystems (USDA, 1994).

In addition to the large LSRs, there are five 100-acre LSRs within the analysis area. These small LSRs were designated in 1994 around all known northern spotted owl (spotted owl) activity centers located outside of the large LSRs (within Matrix). The small LSRs consist of approximately 100 acres of the best habitat (not necessarily late-successional) around known sites.

Currently, within the analysis area, there are 12,329 acres of late-successional habitat within the Forest boundary. Distribution of late-successional habitat by Management Area is displayed below in **Table 3-27** (refer to **Figure 1-2** *Forest Plan Management Areas* and **Figure 3-9** *Seral Stages*).

Table 3-27. Late-Successional Habitat by Management Area.

Management Area	Acres of Late-Successional Habitat
Late-Successional Reserves	5,679
Riparian Reserves	558
Recreational River	12
Retention	4
Partial Retention	736
General Forest	466
Private land	4,874
Total:	**12,329**

Site Capability

Based on existing vegetation and areas identified as harsh sites in the Forest Plan, it is roughly estimated that 76% of the Horse Creek Analysis Area, within the Forest boundary, is capable of supporting late-successional coniferous habitat. The remaining acres within the analysis area contain harsh sites, hardwood vegetation, montane shrub communities, meadow complexes, and non-vegetated areas (rock outcrops and water). Currently, 23% of the capable land is in a late-successional condition.

Vegetative Condition

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 has also 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 and 55 year photo comparison).

As mentioned earlier, timber harvest, road building, fire suppression, and natural disturbance events have affected late-successional habitat within the analysis area. Early and mid-successional forests occupy approximately 53% of the land base, much of which is a result of wildfire and timber harvest. Early and mid-successional stands (pole and early mature stands)

are important for developing into future late-successional characteristics; reducing stand densities is important if continued development of late-successional habitat is desired in the future. Stand density (overstocking) has been shown to be an important factor within LSRs in this analysis area because of high and moderate levels of tree mortality that are occurring due to insect epidemics and due to the potential for large wildfires (USDA, 1999).

Within LSRs, drainages that contain a high proportion of dense, early, and mid-successional habitat include Salt Gulch, upper Horse Creek, East Fork Horse Creek, West Fork Horse Creek, Hamburg Gulch, upper Collins Creek, and Robinson Gulch (refer to **Figure 3-9**, *Seral Stages*). Early and mid-successional stands, documented as having two or more years of moderate to high levels of insect related mortality, occur in the following drainages: upper Collins Creek, Salt Gulch, Robinson Gulch, Hamburg Gulch, and Horse Creek in the vicinity Rainey Saddle.

The existing late-successional forest habitats are fairly well distributed across the analysis area in the mixed conifer and true fir vegetation types (see **Figures 3-9**, *Seral Stages* and **3-6**, *Existing Vegetation*), with the exception of naturally drier sites, such as the montane hardwood-conifer, montane hardwood, and chaparral types (Doggett Creek drainage, Smith Gulch, Quigley Cove Gulch, and south-facing slopes at lower elevations along the Klamath River). 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, mainly fire salvage and timber harvest, has increased the patchiness (fragmentation) of the forested habitats. As mentioned above, approximately 17% (11,600 acres) of the analysis area has been cleared (clear cut, shelter wood, heavy partial cut) and 459 miles of road have been constructed on both public and private lands in the watershed. In addition, it is estimated that an additional 30,000 to 40,000 acres (40-50%) within the area have been cut over using a light partial cut, thinning, salvage or sanitation prescription (C. Varak, pers. com.).

Conditions within the Johnny-O'Neil LSR

The entire Johnny-O'Neil LSR is approximately 46,840 acres in size, 16,200 acres (35%) of which are located within the Horse Creek Analysis Area. The major drainages in the LSR include: Horse Creek, Seiad Creek, Cook and Green Creek, Joe Creek, and Dutch Creek.

Late-successional and mid-successional conditions account for 70% of the capable land base in the entire Johnny-O'Neil LSR. Within the Horse Creek Analysis Area, late and mid-successional conditions account for 63% of the capable land base; plantations account for 10% of the land base within the analysis area (refer to **Figure 3-9,** *Seral Stages***, and Figure 1-2,** *Forest Plan Management Areas*).

The portion of the LSR within the analysis area has estimated high levels of insect and disease related mortality on 2,673 acres and moderate levels of mortality on 5,552 acres (refer to **Figure 3-5**). High levels of mortality are related to high-density stands, often a result of fire exclusion (refer to *Forest Health* sections and USDA 1999).

Thirty-two percent of the LSR has burned in the recent past, with 27% having been burned during the 1987 fire siege. Of the 16,200 acres of LSR within the horse Creek Analysis Areas, 9% (1,330 acres) burned in 1987; 811 acres at high to moderate intensity. Burned areas within the LSR were salvage logged prior to LSR designation and those areas are included within the acres of plantations mentioned above. The fire risk for this LSR is rated as high on the Klamath portion of the LSR, meaning that 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 during the next 10 years.

Conditions within the Collins-Baldy LSR

The entire Collins-Baldy LSR is approximately 14,670 acres in size, 3,800 acres (26%) of which are located within the Horse Creek Analysis Area. The LSR includes portions of the following drainages: Collins Creek, Kinsman Creek, Dona Creek, Everill Creek, Lime Gulch, Mill Creek, South Fork Mill Creek, Singleton Creek, Picnic Creek, Coats Creek, and Gumboot Creek. The LSR is located on National Forest System lands, but is situated in checkerboard ownership. Every other sections of land is in private ownership; the majority of private land is commercial timberland. The LSR covers a large amount of land but it is not contiguous.

Late-successional and mid-successional conditions account for 71% of the capable land base in the entire Collins-Baldy LSR. Within the Horse Creek Analysis Area, late and mid-successional conditions account for 64% of the capable land base; plantations account for 4% of the land base within the analysis area (refer to **Figure 3-9**, *Seral Stages*).

The portion of the LSR within the analysis area has estimated high levels of insect and disease related

mortality on 2,312 acres and moderate levels of mortality on 1,314 acres (refer to **Figure 3-5**). High levels of mortality are related to high-density stands, often a result of fire exclusion (refer to *Forest Health and Fire Disturbance Risk and Hazard* section and USDA 1999).

This LSR has one of the highest fire risks of all the LSRs on the Forest (USDA 1999). The risk is high, but the majority of the area has good access and fires can be contained relatively easily. A primary concern for fire risk is the adjacent private lands. The checkerboard ownership pattern makes managing for fuels across the landscape more complicated. Given the stand density and mortality in the LSR, continued build-up of fuels, and difficulty in managing fuels across the landscape, the risk of a wildfire is compounded.

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

The major vegetative types currently found within the analysis area that provide, or have the potential to provide, dense, late-successional forest habitat are true fir, Douglas-fir mixed conifer, and ponderosa pine mixed conifer (refer to descriptions in the Forest Health and Fire Disturbance Risk and Hazard section, refer to **Figure 3-6** *Existing Vegetation*).

Other plant communities that occur in the analysis area, but that generally do not contribute to the amount of dense, late-successional forest habitat, include sub alpine conifer, montane chaparral, mixed chaparral, montane hardwood-conifer, montane hardwood forest, montane riparian, and montane meadow. All of these types may include scattered conifers consisting of ponderosa pine, red fir, white fir, mountain hemlock, sugar pine, and Douglas fir.

Key Question #1b - Which vegetative communities are capable of providing late-successional habitat in the future?

Mid-Successional Stands

Mid-successional forest occupies 24,384 acres (35%) 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 future (refer to **Figure 3-9,** *Seral Stages*). Currently, mid-successional stands are scattered throughout the watershed. Field review of mid-successional forest stands has determined that many stands, especially those in the mid-elevation ponderosa pine/mixed conifer type are overstocked (Varak, pers. com.). Overstocked stands stagnate and prevent the further development of late-successional conditions, especially within the ponderosa pine/mixed conifer type. In addition, overstocked stands pose a greater fire risk than more open stands.

Early Successional Stands and Plantations

Early successional stands and plantations account for approximately 28% (19,405 acres) of the analysis area. Early successional stands occur in all forest types, with the majority of plantations less than 30 years old occurring in the mixed conifer vegetative type. Plantations tend to be mostly even-aged with very little structural diversity; most trees within plantations are vigorous and healthy. As the stands mature, they tend to become very dense with a slowing of growth. Plantations greater than 30 years old become very dense and show signs of 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 like the northern spotted owl. 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: RRs, administratively withdrawn areas, management prescriptions, retention of old-growth fragments in Matrix, and 100-acre LSRs.

As defined in the Environmental Impact Statement (EIS) for the Forest Plan (USDA, 1994a), 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 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 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 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 Horse Creek Analysis Area, connectivity between LSRs is also very strong, with less than six miles between Johnny-O'Neil and Collins-Baldy, and less than six miles between Johnny-O'Neil and Ashland LSR to the east.

In the Forest-wide LSR Assessment, the assessment of the amount of dispersal habitat between LSRs 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 that 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- and late-successional coniferous forest stands (stands with greater than or equal to 11 inches average DBH 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 (USFWS) for any projects that propose the removal of habitat.

From the dispersal habitat assessment, **Table 3-28** displays the amount of dispersal habitat (as a percent of capable ground) connecting the LSRs that overlap the analysis area to each other.

Table 3-28. Dispersal Habitat Between LSRs and Wilderness within the Horse Creek Analysis Area.

Analysis Watershed	Total Capable Acres Between LSRs	Acres of Dispersal Habitat In Other Reserves	Acres of dispersal habitat in Matrix	Total acres of dispersal habitat (% Of capable)
Horse Creek	5,640	640	4,520	5,160 (91%)

As displayed above in **Table 3-28**, the Horse Creek Watershed provides a high level (91% out of 100%) of dispersal habitat overall as assessed in the Forest-wide LSR Assessment. However, the majority of dispersal habitat in the Matrix is in a mid-successional stage and is at the low end of the 11-inch diameter at breast height (DBH) criteria as described above. Dispersal habitat is also limited in areas that were affected by the 1977 and 1987 wildfires and subsequent salvage logging. The quality of connectivity habitat in the Matrix portion of the Horse Creek Analysis Area, therefore, is limited due to fragmentation of the landscape and a preponderance of early and mid-successional forest conditions. Enhancement of early and mid-successional habitats, and maintenance of remaining patches of late mature and old-growth forest in the upper portions of the analysis area will be important for maintaining connectivity eastward from the Johnny O'Neil LSR.

Barriers to Dispersal

Within the Horse Creek 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 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: Fort/ Copper Fire area; Buckhorn Fire area; Bark Fire area; large areas that are not capable of supporting conifer forest, such as the Siskiyou Crest and brush/hardwood vegetation types on south slopes above the Klamath River; and the Klamath River corridor including Highway 96.

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.

Forman (1995) showed how various species are affected by the width of roads. Surface arthropods, such as Wolf spiders and beetles, almost never cross a lightly traveled, six meter (20 feet) wide paved road. Small animals cross lightly traveled roads of 6-15 meters (20-49 feet) width, less than 10% of what is normal for movements within the adjacent habitat. Mid-sized animals crossed road corridors up to 15 meters (49 feet) wide, but not 15-30 meters (49-98 feet). Large animals crossed most roads, but the rate of crossing is typically lower than movement rates in unroaded habitat. Habitat patterns are, therefore, critical to species movements and appropriate management of the landscape must consider how changing habitats will affect the ability of species to operate in ways necessary for their survival (Gosz, et al., 1997).

The current total road density within the Horse Creek Analysis Area is displayed on **Figure 3-10** *Road Density*, and varies from zero miles per square mile to greater than four miles per square mile. The overall average density for the analysis area is 4.2 mi/mi^2, with 53% of the area having over 4 mi/mi^2. Average total road density within the entire Johnny-O'Neil LSR is 3.1 mi/mi^2; average total road density within the Collins-Baldy LSR is 3.3 mi/mi^2. 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. It is not known how adaptable most populations are to habitat alterations. Also, it is not known 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). Conversely, a recent study of mule deer and road effects (R. Wielgus, unpublished data presented at Natural Resource Institute, April 2001) suggests that female mule deer do not distinguish between open and closed roads in a homerange where both occur and disturbance or mortality have occurred on open roads (roads in general are avoided). In areas where roads were restricted or closed, mule deer appeared to have no concern over roads.

It is difficult to determine thresholds for what acceptable road densities may be. Some investigations into effects of roads on deer and elk suggest that general use of habitat decreases from moderate to low at between 2 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 3 miles per square mile.

In the Horse Creek 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**, *Roads Analysis Process*).

Key Question #4 - What is the current management emphasis on private lands adjacent to LSRs?

Private commercial timberland occupies 32% of the Horse Creek Watershed. The majority of the private commercial timberland is located in a checkerboard pattern, intermixed with sections of National Forest System land (refer to **Figure 1-2,** *Forest Plan Management Areas*). Land management emphasis on privately owned land is long-term management of timber lands, using even and uneven-age management, for maximum production of high quality forest products while maintaining and enhancing other forest resources such as water quality and wildlife habitats (C. Brown and S. Farber, personal communication, 1999).

Currently, on private lands within the Forest boundary, there are approximately 13,200 acres of early successional forest and 10,980 acres of mid- and late successional forest (34% of private land). Continued timber harvest on private land is expected to reduce late-successional habitats and promote early and mid-successional stages of forest habitat. Harvest techniques generally consist of uneven-aged management; therefore, pockets of late-successional forest will remain intermixed with younger seral stages. Other important elements of late-successional habitat are also maintained, such as coarse woody debris (CWM) and large snags.

Terrestrial Wildlife and Plants

The Horse Creek analysis area is biologically diverse as measured by the number of different vegetative communities, or habitats, identified in the landscape. The variation in elevation, precipitation, parent material, geomorphology, disturbance, and land-use history contribute to the significant diversity. The area

contains unique habitats, such as high elevation sub alpine and true fir forest surrounding open meadows, montane riparian habitats, and montane hardwood stands dominated by white oak, to name a few. These habitats represent occupied and potential habitat for rare or uncommon species of wildlife and plants (special emphasis species). The diversity of unique habitats and associated special emphasis species, has been identified as an issue due to the effects of fire suppression, timber harvest, roading and other human activities on the distribution and condition of unique habitats within the analysis area. *Forest Plan* direction emphasizes managing for a distribution and abundance of plant and animal populations that contribute to healthy, viable populations of all existing native and desirable non-native species and calls for maintaining populations of native species throughout their historic range.

Wildlife and plant species habitats were identified and described using the *Forest Plan* Timber Type database (Klamath LMP Timber Type Database) cross-walked with habitat descriptions from *Wildlife Habitat Relationships* and *A Guide to Wildlife Habitats of California* (Mayer and Laudenslayer Eds. 1988). Habitat types within the Horse Creek Analysis Area include: sub alpine conifer, red fir, white fir, Klamath mixed conifer, Douglas-fir, ponderosa pine, montane hardwood-conifer, montane hardwood, mixed chaparral, montane chaparral, montane riparian, riverine and grassland (refer to **Figure 3-6,** *Existing Vegetation*). Special emphasis species within these habitats were identified 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.

Key Question #1 – What are the general habitat types found in the analysis area and what species are associated with them?

Key Question #1a – Where are the different habitats located and how much is in the analysis area?

Key Question #1b - What is our current knowledge of special emphasis species populations in this analysis area (e.g. Threatened and Endangered, Forest Service R-5 Sensitive, Survey and Manage, Forest Emphasis Species)?

For discussion purposes, *Wildlife Habitat Relationships* habitat types are combined where general habitat attributes and associated species are similar. For example, all higher elevation forest types are combined and all middle elevation forest types are combined.

Subalpine Conifer, Red Fir and White Fir

The subalpine conifer, red fir and white fir vegetation types constitute the high elevation forest habitat types in the analysis area (above 5000 feet in elevation) as described previously in the Forest Health and Late-Successional Habitat sections. The high elevation forest in the analysis area, especially the red fir type, is associated with small openings, meadows, and "red fir barrens" (sparsely vegetated, irregularly shaped openings ranging from .25 to 125 acres in size) (Laurent et. al. 1994). Species associated with higher elevation forest habitat include the following: great gray owl, pileated woodpecker, marten, wolverine, goshawk, blue grouse, snag and cavity dependent species, and several species of insect gleaning birds. Common plant associates include Shasta red fir, sadler oak, mountain alder, and alpine circea.

Currently, there are approximately 4,986 acres of this habitat type in the analysis area (**Figure 3-6,** *Existing Vegetation*). The amount and distribution of high elevation forest in the Horse Creek Analysis Area has been influenced somewhat by wildfire (1955, 1971, and 1977) (refer to **Figure 4-2,** *Historic Large Fires*), by timber harvest, road construction, grazing, and by fire suppression (refer to *Forest Health and Fire Disturbance Risk and Hazard discussion*).

Special emphasis species that occur, or have the potential to occur, in higher elevation forest habitat within the planning area include great gray owls, American marten, wolverine, Henderson's horkelia, Howell's lousewort, and Pacific fuzzwort (refer to the *Special Emphasis Plant Species* section, below, for description of plant habitats).

Great Gray Owl: Forest Service R-5 Sensitive

The great gray owl *(Strix nebulosa)* is the largest North American owl. Dependant on meadows for foraging, it also requires old growth red fir, mixed conifer, or lodgepole pine for nesting (CDFG, 1990). Most commonly seen in wet meadows of the Sierra Nevada and the Cascades, it has also been recorded in low numbers in northwestern California (McCaskie, et. al., 1988). Important habitat components in forested areas used by great gray owls include snags, high canopy closure (40-60%) surrounding nests for shading, and open understories to allow for flight through the stand (Winter, 1985; Beck and Smith, 1987; Bull and Henjum. 1990).

Though not abundant, there have been confirmed sightings along the northern slopes of the Siskiyou

Crest in the Dutchman Creek area (Oregon) and one sighting in the analysis area in the vicinity of Reeves Ranch (S.Cuenca, pers. comm.). Surveys for great gray owls have not been conducted in the Horse Creek analysis area to date, but potential habitat exists in the higher elevation forest habitat adjacent to meadows (grasslands) and red fir barrens.

American Marten: Forest Service R-5 Sensitive

Generally, this species uses 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 coarse woody material (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.

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 sightings or survey data. Protocol surveys using methods described by Zielinski and Kucera (draft 1994, final 1995) were conducted in the entire Collins-Baldy LSR (in the south portion of the analysis area) during the following seasons: October 1994 through March 1995, and November 1995 through February 1996. Survey of the LSR included over 40 camera and track box stations; surveys did not detect marten in the LSR. In addition, Trailmaster camera stations were placed in Reeves Ranch, Alex Hole and Windy Camp areas between 1994 and 1996 following guidelines from Zielinski and Kucera. No detections of marten occurred. There have been two incidental sightings of marten recorded on the Scott River District, one on Boulder Peak in 1990 and one at Little Elk Lake Creek, both in the Marble Mountain Wilderness over 15 miles to the southwest.

Wolverine: Forest Service R-5 Sensitive

Distribution of wolverine *(Gulo gulo)* in California includes the North Coast Mountains and Sierra Nevada. A scarce resident in California, known habitat distribution occurs from Del Norte and Trinity Counties east through Siskiyou and Shasta Counties, and south through the Sierra Nevada to Tulare County. In the north coast region, wolverines have been observed in Douglas fir and mixed conifer habitats, red fir, lodgepole, wet meadow, and montane riparian habitats (Schempf and White, 1977). Habitats used in the northern Sierra Nevada include mixed conifer, red fir, and lodgepole pine. The species probably also uses subalpine conifer, alpine dwarf-shrub, wet meadows, and montane riparian (White and Barrett 1979). White and Barrett (1979) stated that wolverines are highly dependent upon mature coniferous forests for survival in winter.

There are several reliable sightings of wolverines on the Scott River Ranger District (Scott River/Oak Knoll District wildlife files). The nearest sighting was on the north side of the crest in Alex Hole in 1994. Other sightings have occurred on Scott Bar Mountain approximately ten miles south of the analysis area. There are no historic records of this species in the vicinity of Horse Creek, although, potential habitat occurs in the subalpine, red fir, and mixed conifer forest types in the area.

Klamath Mixed Conifer, Douglas-fir, Ponderosa Pine

The Klamath mixed conifer, Douglas-fir, and ponderosa pine vegetation types constitute the mid-elevation forest habitat types in the analysis area (from 1,500 to about 5,000 feet in elevation) as described in the *Forest Health and Fire Disturbance Risk and Hazard* and *Late-Successional Habitat* sections. Mid-elevation forest habitats vary in structure and composition from open pine stands to dense, multi-storied, mixed conifer stands. Species commonly associated with mid-elevation forest habitat include the following: great horned owl, northern pygmy owl, northern spotted owl, red-tailed hawk, goshawk, quail, ensatina, northern alligator lizard, fisher, mountian lion, bats, and a variety of small mammals and migratory birds. Common plant associates include Douglas fir, white fir, ponderosa pine, big-leaf maple, Pacific dogwood, California hazel, and northern twinflower.

Currently, there are approximately 48,773 acres of these habitat types in the analysis area. The amount and distribution of mid-elevation forest in the Horse Creek Analysis Area is described in detail in the *Late-Successional Habitat* section. Special emphasis species that occur, or have the potential to occur, in mid-elevation forest habitats within the planning area include spotted owls, goshawks, fisher, red tree voles, a variety of mollusk species, mountain lady's slipper, clustered lady's slipper, and Pacific fuzzwort (refer to the *Special Emphasis Plant Species* section, below, for description of plant habitats). These species may also occur in other vegetation types, but are generally associated with mixed conifer forest.

Northern Spotted Owls: Federally Threatened

Spotted owls are associated with late-successional coniferous forest. Suitable nesting and roosting habitat generally consists of mixed conifer, Douglas-fir, and true fir stands below 6,000 feet in elevation, averaging at or above 18 inches in diameter, and with a total crown closure greater than 60%. Suitable foraging and dispersal habitat includes the above plus forested stands averaging between 11 and 18 inches diameter with greater than 40% crown closure. For this analysis, suitable habitat was defined using the Klamath LMP Timber Type Database.

Currently, there are a total of 29,175 acres of suitable spotted owl habitat (nesting, roosting, foraging and dispersal) within the analysis area (refer to **Figure 3-11,** *Wildife Features*). **Table 3-29** displays acres of suitable habitat by management area within the Horse Creek Analysis Area.

Table 3-29. Suitable Spotted Owl Habitat by Management Area.

Management Area	Acres of Suitable Owl Habitat
Large LSRs	12,513
100-Acre LSRs	320
Riparian Reserves	1,631
Recreational River	42
Retention	253
Partial Retention	2,157
General Forest	1,533
Private land	10,726
Total	**29,175**

Spotted Owl Activity Centers

Early Surveys - Prior to the 1987 wildfires, which burned in the western portion of 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, surveys took place in proposed areas of salvage (Upper Copper, Lower Copper, Copper Heli Timber Sales).

Protocol Surveys - Protocol surveys (surveys conducted adhering to the March 12, 1991 Regional survey protocol) have been limited to four efforts in this analysis area. These areas are Middle Creek area ("26 Timber Sale", 1992), Kohl Creek area ("Rhombus Fire Salvage", 1994), Collins Creek area ("5 Point Timber Sale", 1992) and Doggett Creek Area ("Doggett Owl Survey Contract", 1992).

Historical visits to activity centers have been conducted in the planning area from 1992-1998. Historic visits are not complete protocol visits. They also have not been conducted to cover each activity center annually. There have been no current surveys (within the last two years) conducted by Forest Service personnel in the analysis area since 1998 to update the spotted owl database. There have been recent surveys on private timberlands within the area, but data is not yet available. When survey information is obtained from private landowners, the spotted owl activity center data layer will be updated.

Past surveys in the analysis area have identified 24 spotted owl activity centers. The activity centers are listed below in **Table 3-30**, 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.

At the project-level, suitable habitat is often assessed using more site-specific information, and therefore, suitable habitat figures reported in project-specific documents may differ from Forest-scale based results as displayed here in **Table 3-30.**

Table 3-30. Acres Of Suitable NSO Habitat and Forest Management Area For Owl Activity Centers.

Activity Center	Habitat within Core Area (0.7mile)	Habitat within Homerange (1.3 mile)	Management Area
KL-0148	659	2301	LSR
KL-1150	787	2237	LSR
KL-1151	668	1457	LSR
KL-1152	598	2379	LSR
KL-1153	851	2564	LSR
KL-1154	916	2528	LSR
KL-1155	682	1904	LSR
KL-2125	739	2470	LSR
KL-2126	676	2445	LSR
KL-4128	690	1866	LSR
KL-4129	323	1413	LSR
KL-4145	404	929	Matrix
KL-4146	708	1879	Matrix
KL-4149	777	2300	Matrix
KL-4131	817	2186	LSR
KL-4132	787	2519	LSR
KL-0237	790	2706	LSR
KL-0346	449	1561	Matrix
KL-0239	591	1828	Matrix
KL-0283	440	1432	Matrix
KL0314	376	789	Matrix
KL-0274	462	1337	Matrix
KL-0352	454	1455	Matrix
KL-0147	270	776	Matrix

Analysis of the amount of suitable habitat within spotted owl core areas and homeranges is important when consulting with the USFWS on individual projects that may affect spotted owl habitat. In order to minimize or avoid incidental take of spotted owl through removal of habitat, as defined in the Endangered Species Act, timber harvest projects occurring in the vicinity of owl activity centers should maintain 50% (500 acres) of the core area in suitable habitat (approximately 0.7-mile radius) and 40% (1,360 acres) of the homerange (1.3-mile radius) in suitable habitat. Projects that are occurring in homeranges that are below this threshold, or that will take the core area or homerange below this threshold, are in a situation where take may occur and must undergo formal consultation with USFWS.

Spotted Owl Critical Habitat

Two USFWS designated Northern Spotted Owl Critical Habitat Units (CHUs) occur within the analysis area, CHU CA-15 and CHU CA-16. The portion of CA-15 that occurs within the analysis area overlaps 100% with the Johnny O'Neil LSR. The objective of CA 15 is to link habitats in California and Oregon and to provide habitat for 22 pairs of spotted owls (combined with OR 73). The portion of CA-16 that occurs within the analysis area overlaps 100% with the Collins Baldy LSR. This unit has two primary objectives: first, to extend habitat eastward as far as possible toward CA-1 on the Goosenest Ranger District (connectivity); and second, to provide habitat for five nesting pairs of spotted owl. Included in the designation of CA-16 is an acknowledgment of the discontinuous nature of habitat conditions presented by the intermingled private and federal ownership of land.

Northern Spotted Owl Baseline Analysis

Recently, an interagency team, including USFWS and Forest Service, reviewed the status of northern spotted owls from a provincial perspective in the document "Predicting Northern Spotted Owl Occurrence in Northern Califrornia: Application to Management" (March 14, 2000 Draft). This analysis, also known as the Northern Spotted Owl Baseline Analysis, was conducted to evaluate the current ability of the Northwest Forest Plan's (USDA, 1994a) system of LSRs to conserve and recover populations

of northern spotted owls within the Klamath Province. The analysis focused largely on the abundance and distribution of owl habitat within the LSRs, but also incorporated LSR spacing and threats to habitat such as wildfire. The Baseline Analysis concluded that, although the majority of the LSRs in the Province are in good condition in terms of the amount of suitable habitat for owls, a few LSRs are not in good condition and require support from habitat in the adjacent Matrix to maintain owl populations while LSR habitat recovers.

There are approximately 20,000 acres of LSR in the Horse Creek Analysis Area. Roughly 16,200 acres are included in the Johnny O'Neil LSR and 3800 acres are within the Collins-Baldy LSR. The Collins-Baldy LSR is considered insufficient in providing for spotted owls in the Baseline Analysis due to the amount and condition (seral stage or age) of forest habitat in the LSR. The Johnny-O'Neil LSR was not rated due to lack of habitat information; however, preliminary analysis for Baseline suggests that this LSR is also insufficient in providing for owls (Laura Finley, USFWS, Personal Communication 2000).

For projects proposed in Matrix lands surrounding LSRs categorized as insufficiently providing for owls, consultation guidelines (July 5, 2000 Draft) focus on protection of occupied owl habitat. These LSRs require support from owl territories in the surrounding Matirx to maintain their populations as LSR habitat recovers (e.g. from wildfire, road building or timber harvest). To ensure support from owl territories in surrounding Matrix, the Baseline Analysis recommends that occupied owl home ranges within a 7-mile buffer (7 miles outside and adjacent to the LSR) surrounding these LSRs are maintained at their current level of suitable habitat. The distance of 7 miles was determined from the average dispersal distance of adult male spotted owls (refer to Baseline Analysis for more information). The entire Horse Creek Analysis Area outside of LSRs is located within a 7-mile buffer of either Johnny O'Neil or Collins Baldy.

Northern Goshawks: *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).

Table 3-31. Goshawk Survey History For The Horse Creek Analysis Area.

Activity Center	ID #	Activity History
Middle Creek	**OK 09**	Based on multiple incidental sightings prior to 1991. Not surveyed.
East Fork	**OK10**	Based on multiple incidental sightings prior to 1991. Not surveyed.
Salt Gulch	**OK 11**	Based on multiple incidental sightings prior to 1991. Not surveyed.
Dona Creek	**OK 16**	Based on multiple incidental sightings prior to 1991. Not surveyed.
Kohl Creek	**OK 17**	Historic Nest Site 1994, confirmed inactive between 1995-1999. Not surveyed since 1999.
Buckhorn Creek	**OK 18**	Based on multiple incidental sightings prior to 1991 Not surveyed.
Windy Camp	**OK 19**	Based on multiple incidental sightings prior to 1991. Surveys conducted to protocol in 1998 – no birds found. Not surveyed since 1998. .

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 Forest, suitable goshawk habitat is similar to spotted owl habitat. For this analysis, it will be described as the same. Approximately 29,175 acres of suitable habitat currently exist in the analysis area. For a display of suitable goshawk habitat, see **Figure 3-11**, *Wildlife Features*. For the amount of suitable goshawk habitat in the watershed by Management Area, see **Table 3-29**, *Suitable Spotted Owl Habitat by Management Area*.

There are seven goshawk activity centers within the analysis area. Four of the seven sites are associated with spotted owl nest sites. Known goshawk sites were detected incidentally during spotted owl surveys or during timber sale reconnaissance. All seven of the goshawk sites were designated as Goshawk Management Areas (GMAs) in the *Forest Plan*. Survey histories for all sites are summarized below in **Table 3-31**, *Goshawk Survey History for the Horse Creek 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 that can be very large (up to 11,000 acres in low quality habitat) (Region 5 Draft Furbearer Management Guidelines; CDFG, 1990). 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 Scott River District) 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, and foraging habitat for fisher can be found in the Horse Creek analysis area. Incidental sightings have occurred along the Klamath River and Highway 96 in the vicinity of O'Neil Creek, Blue Heron, and near Doggett Creek. There have been many incidental sightings of fisher in the adjacent watershed (Lower Scott), including within the Collins-Baldy LSR in Singleton Creek, Coats Creek, and Picnic Creek. Protocol surveys using methods described by Zielinski and Kucera (draft 1994, final 1995) were conducted in the entire Collins-Baldy LSR during the following seasons: October 1994 through March 1995, and November 1995 through February 1996. Survey of the LSR included over 40 camera and track box stations; detections of fisher occurred at 14 of the stations, including Singleton, Gumboot and Mill Creek drainages within the Lower Scott watershed (southeast of Horse Creek).

Red Tree Vole: Survey and Manage

There is some indication that the Oregon red tree vole *(Arborimus longicaudus*) may be found in northern California. Without adequate survey information (historic survey information was used), the Red Tree Vole Taxa Team (ROD 2001) has identified a "known and suspected geographic range" for the species (Red Tree Vole Survey Protocol, 2000, Version 2.0). At this time, the Horse Creek Analysis Area is within the suspected geographic range of *A. longicaudus*; and surveys for this species are required for projects. Strategic surveys for red tree voles are currently underway and are expected to provide clarification on the actual occurrence of this species.

Red tree voles are restricted to forests west of the crest of the Cascade Mountains. 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). Recent surveys in Oregon have found red tree voles in the Applegate River Watershed, north of the analysis area over the Siskiyou Crest (M. Broyles, personal communication, 1999). In addition, recent surveys on the Westside of the Forest have found red tree voles on the Happy Camp Ranger District in the vicinity of Bear Creek and Dillon Creek (more than 30 miles southwest).

In addition, a spotted owl pellet analysis, being conducted as part of a spotted owl radio telemetry monitoring study (Timber Products, 1998), found *Arborimus longicaudus* as far inland as the North Fork of Clear Creek, seven miles north of Fort Jones (southeast of the analysis area) (S. Farber, personal communication, 1999). The detection in Clear Creek is recent, and it has not been confirmed whether the animal was actually *A. longicaudus* or *A. pomo* (California red tree vole). A review of files on Scott River Ranger District located an analysis of 105 spotted owl pellets found at Gumboot Creek, Russell Peak, and Jackson Creek. The pellet analysis recorded *A. longicaudus* at all three sites (unconfirmed). Gumboot Creek is within the adjacent Lower Scott Watershed.

Survey and Manage Mollusks: Strategies 1 and 2 (1994) and Categories A and C (2001)

Several mollusk species that are related to mature forest habitats have been identified as "Survey and Manage" in the NFP (citation) and in the more recent Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (January 2001). Very little is known about mollusks in the Horse Creek Analysis Area. No formal surveys have been conducted in the analysis area using the available protocols, however, strategic surveys have been conducted on the four northern forests in California and six survey plots occur within the analysis area. Results of strategic surveys in the Horse Creek area are included below by species. Management direction varies by species, with either protection of known sites or surveys required for most species expected to occur on the Forest (USDA and USDI, January 2001). The following species have the potential to occur in the analysis area (habitat descriptions are from the Field Guide to Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan, June 1999 [USDI, 1999]).

Chace sideband – The Chace sideband *(Monadenia chaceana*) occupies lower reaches of major drainages, in talus and rockslides, under rocks and woody debris in moist conifer forests, in caves, and in shrubby areas in riparian corridors. Rocks and large woody debris serve as refugia during the summer and winter seasons. Management of known sites and pre-disturbance surveys are required for this species.

The Chace sideband has been identified at the mouth of the Shasta River (approximately 20 miles east of the watershed) during a survey training class in 1999. This species was also located in one of the strategic survey plots in Horse Creek. It is likely that this species occurs throughout the Analysis Area.

Yellow-based sideband and Klamath sideband – The Yellow-based sideband and Klamath sideband (*Monadenia fidelis ochromphalus and Monadenia fidelis klamithica)* occupy stable riparian zones within semi-dry mixed deciduous and conifer forests, but not necessarily restricted to riparian zones. Late-successional forest with high canopy closure, a mixed conifer and hardwood component, and the presence of large, down woody debris or rock talus is considered optimum habitat. These species have been found under logs, in rocky areas, and on pine needle and oak leaf litter. Management of known sites and pre-disturbance surveys are required for these species.

Surveys for timber sales have found *M. fidelis ochromphalus* near the Salmon River (more than 25 miles southwest of the analysis area). The nearest locations of *M. fidelis klamithica* were found on the Happy Camp Ranger District.

Oregon shoulderband – Oregon shoulderbands *(Helminthoglypta hertleini)* are generally associated with, though not restricted to, talus and other rocky substrates. It is expected to be found within its range wherever permanent ground cover and/or moisture is

available. This may include rock fissures or large woody debris sites. This species is also adapted to somewhat dry conditions during a portion of the year. Management of known sites and pre-disturbance surveys are required for this species.

Recent surveys have found this species at the mouth of the Shasta River (during a training class) and at Skeahan's Bar along the Klamath River (more than 5 miles east of the analysis area). It is likely that this species occurs in the Horse Creek Analysis Area.

Tehama chaparral - Tehama chaparral (*Trilobopsis tehamana*) is usually associated with rocky talus. This species has also been found under leaf litter and woody debris on the ground within 10 meters of limestone outcrops. Management of known sites and pre-disturbance surveys are required for this species.

One specimen of Tehama chaparral was located in the Beaver Creek drainage (near Deer Creek) in the adjacent watershed (east of Doggett Creek). The specimen was not found in or near limestone.

Hooded lancetooth – Hooded lancetooth *(Ancotrema voyanum)* is found near streams of intermittent stream channels where substrate is permanently damp. Late-successional conditions such as coarse woody debris, riparian hardwood trees, deep leaf mold, and a relatively closed forest canopy provide suitable habitat conditions.

Nearest detections of hooded lancetooth have been found on the Happy Camp and Ukonom Ranger Districts west of the analysis area.

Blue-gray taildropper - The blue-gray taildropper (*Prophysaon coeruleum)* is found in a wide range of moist and mixed conifer forests. Blue-gray taildroppers have been found in several locations on the Happy Camp Ranger District, west of the analysis area. This species may occur in the analysis area.

Shasta chaparral – The Shasta chaparral *(Trilobopsis roperi)* may be found within 100 meters of lightly to deeply shaded limestone rockslides, draws, or caves with a cover of shrubs or oaks. The nearest locations of this species are on the Shasta-Trinity National Forest.

Montane Hardwood-Conifer, Montane Hardwood

Montane hardwood-conifer habitat includes both conifers and hardwoods, often as a closed forest. The habitat often occurs in a mosaic-like pattern with small pure stands of conifers interspersed with small stands of broad leaved trees. Common associates in montane hardwood-conifer are ponderosa pine, Douglas-fir, incense-cedar, California black oak, Pacific madrone, Oregon white oak, chinquapin, and other localized species. Montane hardwood-conifer habitat in the analysis area is found, for the most part, below 4000 feet in elevation on the south slope north of the Klamath River, and in patches on the south side of the River in Kinsman, Everill, Sambo, and Fish Gulch drainages.

Typical montane hardwood habitat is composed of a pronounced hardwood tree layer, with an infrequent and poorly developed shrub layer, and a sparse herbaceous layer. Composition usually includes canyon live oak and/or Oregon white oak, associates include Pacific madrone, California black oak, Dougas-fir, ponderosa pine and silver-leaved lupine. In the analysis area, montane hardwood habitat occurs in patches intermixed with montane hardwood-conifer type below 4000 feet in elevation. In addition, there are large patches of Oregon white oak in the eastern portion of the analysis area in the Doggett Creek drainage.

Currently, there are approximately 9,567 combined acres of these habitat types in the analysis area. Hardwood stands, especially oak woodlands such as those in the eastern portion of the analysis area, provide a unique habitat component. Loss of hardwood stands throughout California has been identified as a concern, and oak woodlands (Oregon white oak, *Quercus garryana*) have been identified as a community at risk (Scott, 1999). Species commonly associated with montane hardwood-conifer and/or montane hardwood include the following: Ensatina, western fence lizard, red-tailed hawk, Cooper's hawk, bats, cavity nesting birds, species that utilize acorns as a major food source (wild turkey, mountain quail, band-tailed pigeon, acorn woodpecker, woodrats, deer, bears), and litter dwellers. The amount and distribution of hardwood and hardwood-conifer habitats in the Horse Creek Analysis Area has been influenced by fire exclusion, homesteading, mining, road building, and wildfire.

Wild turkeys occur in the hardwood or hardwood-conifer habitat within the planning area and are a special emphasis species.

Turkey: Species of Local Interest

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 a species of local interest, both as a game species and aesthetically. Turkeys were introduced in the watershed in the early 1980s near Quigley Cove Gulch and have been increasing in numbers. Sightings of turkeys by local residents or Forest personnel have occurred in the low and mid elevation hardwood-conifer and montane hardwood vegetation types from Seiad Creek to Empire Creek on the north side of the Klamath and in Collins, Dona and McKinney Creek on the south side of the River. Sightings of turkeys have become quite common in the area.

Montane Chaparral, Mixed Chaparral

Chaparral species vary markedly throughout California. Species composition changes with elevational and geographical range, soil type, and aspect. The growth form of chaparral species can vary from treelike (up to 10 feet) to prostrate. When mature, chaparral is often impenetrable to large mammals. Its structure is affected by site quality, history of disturbance (e.g. fire, logging) and the influence of browsing animals.

Montane chaparral within the Horse Creek Analysis Area occurs at higher elevations (above 5000 feet) and is characterized by evergreen species; however, deciduous or partially deciduous species may also be present. One or more of the following species usually characterize this community type: snowbrush ceanothus, greenleaf manzanita, pinemat manzanita, bush chinqapin, fremont siltassel, and curleaf mountain mahogany. Montane chaparral in the Horse Creek analysis area is closely associated with montane meadows.

Mixed chaparral is scattered thoughout the analysis area, but is generally found below 4000 feet. Mixed chaparral grades into oak woodland, ponderosa pine or mixed conifer types and frequently forms the understory of these habitats. Dominant species in the mixed chaparral type include: canyon live oak, birchleaf mountain mahogany, silk-tassel, several species of ceanothus and manzanita, and a very diverse but sparse annual herbaceous species layer.

Currently, there are approximately 2,875 acres of chaparral habitat type in the analysis area. Species commonly associated with chaparral habitats in the area include seed, fruit and insect gleaning birds, small mammals, deer and elk (refer to deer and elk discussion below).

Henderson's horkelia is a special emphasis plant species found within montane chaparral. There are no special emphasis plant species that occur primarily in mixed chaparral (refer to *Special Emphasis Plant* section).

Montane Riparian

Montane riparian vegetation provides exceptionally high value wildlife habitat. It provides water, thermal cover, migration corridors and diverse nesting and feeding opportunities. The linear nature of streams maximizes the development of edge which is so highly productive for wildlife (Thomas, 1979). There are a wide variety of wildlife species associated with montane riparian habitats, including species that are described for other habitat types but that use riparian areas for water, feeding or migration. Plant associates in montane riparian habitats include white alder, thinleaf alder, Oregon ash, mock-orange, western raspberry, and western coltsfoot.

Currently, there are approximately 1199 acres of this habitat type in the analysis area. The amount and distribution of montane riparian habitat in the Horse Creek Analysis Area has been influenced by mining, grazing, timber harvest, road construction, flood events, and by fire suppression (refer to *Forest Health and Fire discussion*).

Special emphasis species that occur primarily in montane riparian habitat within the planning area include willow flycatchers, western pond turtle, foothill yellow-legged frog, and cascade frog. There are no special emphasis plant species that occur primarily in montane riparian habitat.

Willow Flycatcher: Forest Service R-5 Sensitive

As a Neotropical migratory species, the willow flycatcher (*Empidonax trailii*) 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 Horse Creek Analysis Area consists of riparian strips with willow or alder thickets, small patches of willows or alders in higher elevation montane meadows, and lower gradient reaches of Horse Creek, Middle Creek, and the Klamath River (mostly on private land). Habitats in the analysis area have been impacted by mining, grazing, homesteading, and to some extent by road building. Hydrologic events, such as floods, remove willow habitat for short periods of time, but willows quickly re-colonize suitable disturbed sites. The effects of cattle grazing on willow flycatcher habitat in the analysis area are more thoroughly discussed in the *Horse Creek/Dry Lake Allotments, Horse Creek/Beaver Creek/ Haystack Watershed Analysis* (Klamath NF, 1996).

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 portion of the Scott River Ranger District. Annually since 1994, a constant effort mist netting station has been run at the mouth of Seiad Creek (west of the analysis area) from mid-May through mid October. Since 1994, 186 willow flycatchers have been banded. 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 within the year, which indicates that breeding does take place nearby, possibly in the Marble Mountains, or in suitable habitat within the Horse Creek Analysis Area. In addition, willow flycatcher surveys were conducted in Horse Creek from the mouth to Reeves Ranch from 1994 to 1996. During this survey effort, willow flycatchers were documented in the lower reaches of Horse Creek on private land.

Western Pond Turtle: Forest Service R-5 Sensitive

Western pond turtles have a wide geographic range and use a variety of habitats. In California, the current range is similar to the historical range; however, the range has been fragmented by human activities (grazing, agriculture, and urbanization) and some populations have been extirpated (Holland, 1991). Pond turtles are uncommon to common in suitable aquatic habitat throughout California. They are associated with permanent or nearly permanent water in a wide variety of habitat types, such as streams, pools, ponds, and lakes (CDFG, 1988). Pond turtles have been documented up to 6,600 feet in elevation, but the majority of populations are found below 4,500 feet (Holland, 1991). Habitat for pond turtles includes basking sites, such as partially submerged logs, rocks, mats of floating vegetation, or open mud banks. Food sources include aquatic plant material, aquatic invertebrates, fishes, frogs, and even carrion (CDFG, 1988).

Western pond turtles have been documented in the Klamath and Scott Rivers. Habitats that could support western pond turtles, within the Horse Creek Analysis Area, include intermittent streams, perennial streams, meadows, lower elevation ponds and pools, and slow moving riverine habitat along the Klamath River (described below). Western pond turtle occurance has been documented in man-made, spring fed ponds in the Middle Creek drainage at 3,800 feet on private lands.

Foothill Yellow-Legged Frog: Forest Service R-5 Sensitive

This species is found in or near rocky streams in a variety of habitats, including valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, mixed chaparral, and wet meadow types. This species is rarely encountered far from permanent water. Bullfrogs have been implicated in the observed reduction in yellow-legged frog populations, at least in the Sierras (CDFG, 1988).

It is expected that foothill yellow-legged frogs occur in the lower gradient, permanent streams in the analysis area, including Horse Creek and Middle Creek. There have been no recorded observations of this species in the analysis area, but there have been recorded observations in the adjacent Beaver Creek watershed. Foothill yellow-legged frogs coexist with the Cascades frog at some localities, but different microhabitat preferences probably diminish competition.

Cascades Frog: Forest Service R-5 Sensitive

This species can be found in water and surrounding vegetation in mountain lakes, small streams, and ponds in meadows up to timber line. It is closely restricted to water (CDFG, 1988). Although this species has not been recorded in the Horse Creek Analysis Area, it has been documented in permanent and ephemeral streams on the Scott and Salmon River Districts. It is expected that this species occurs in the analysis area.

Riverine

Riverine habitats can occur in association with many terrestrial habitats and are found adjacent to rivers and steams. The open water zones of large rivers provide resting and escape cover for many species of waterfowl. Osprey and bald eagles hunt in open

water along rivers. Near-shore waters provide food for bats, western pond turtles, bullfrogs, waterfowl, herons, shorebirds, belted-kingfisher and American dipper. Many species of insectivorous birds hawk their prey over water. Some of the more common mammals found in riverine habitats include river otter, mink, muskrat and beaver. Plant species include bigleaf maple, white alder, black cottonwood, sandbar willow, and blue-joint reedgrass.

Within the analysis area, riverine habitat occurs along the Klamath River. The condition of riverine habitat in the area has been influenced by mining, grazing, homesteading, timber harvest, road construction, and flood events.

Bald eagles are a special emphasis species that occur primarily in riverine habitat within the planning area. There are no special emphasis plant species that occur primarily in riverine habitats.

Bald Eagle: Federally Threatened

Bald eagle nesting habitat is identified as mature and older coniferous forest stands with large, emergent ponderosa pine (preferred) or Douglas-fir as nest sites. Nesting sites are commonly near lakes, reservoirs, and rivers, but may be located near agricultural areas or other sites of high prey density. Nest areas are typically remote from sources of human disturbance, but occasionally pairs will habituate to road or waterborne traffic. During the breeding season, bald eagles forage on diverse prey sources, but are most often associated with areas of high fish and waterfowl availability. On river systems, foraging sites are typically large open-limbed trees or rocky cliffs overlooking shallow riffles or pools of still water where fish are more readily caught, and where disturbance by humans is minimal.

Bald eagles are somewhat rare along the Klamath River during all times of the year. Nesting by bald eagles have been documented at only five sites on the Klamath River (three on the National Forest System lands) between Interstate 5 and the Pacific Coast (Woodbridge, unpublished Crawford Land Exchange BA, 1999). A traditional nest territory (Caroline Creek) is located along the River at Seiad Valley, about 5 miles to the west of the Horse Creek Analysis Area.

Migrating bald eagles can be found along the Klamath River during winter months. Wintering habitat is associated with open bodies of water that can be found along the River. Within the analysis area, wintering bald eagles have often been seen roosting and foraging along the Klamath River from the mouth of the Scott River to the mouth of Horse Creek (S. Cuenca, pers. comm.).

Montane Meadow

Higher elevation grasslands or meadows, such as those found in the Horse Creek Analysis Area, generally have a simple structure consisting of a layer of herbaceous plants. Shrub or tree layers are usually absent or sparse; they are, however, an imporant feature of the meadow edge. At montane and subalpine elevations, succession to coniferous forest is frequent. At lower elevations, succession to broadleaf trees or shrubs is occurring. In the red fir zone along the Siskiyou Crest, there are openings known as red fir barrens (refer to *Forest Health and Fire Disturbance Risk and Hazard* section), where herbaceous cover is sparse. The lack of vegetation has been attributed to several factors, including effects of fire, overgrazing, harsh microclimate conditions, and unfavorable soil conditions (Laurent et. al. 1994). A wide variety of birds, small mammals, deer, and elk forage in grasslands and herbaceous openings. Common plant associates include redtop, alpine timothy, several sedge species, and arrowleaf groundsel.

Currently, there are approximately 1124 acres of this habitat type in the analysis area. This acreage does not include small grassy or herbaceous openings in the mixed conifer zone that are also important forage areas. The amount and distribution of grasslands or meadows in the Horse Creek Analysis Area has been influenced by grazing, fire suppression, timber harvest, road construction and recreation.

American sawwort is a special emphasis species that occurs primarily in grassland habitat within the planning area (refer to Special Emphasis Plant Species section).

Caves, Cliffs and Talus

Within the forested habitat types described above are specific habitat components that support special emphasis species. These habitat components are often limited in size and amount and are unique characteristics within the analysis area. Special emphasis species associated with cliffs, caves, and talus habitats include peregrine falcons, listed bats, and survey and manage salamanders.

Peregrine Falcon: Forest Service R-5 Sensitive

Peregrine falcons (*Falco peregrinus)* were removed from the Federally Endangered species list recently, on August 25, 1999. Recommendations for managing de-listed peregrine falcons include monitoring of known sites for at least the next five years.

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 defense, and reproductive behavior.

There are no known peregrine eyries, or typical habitat, in the Horse Creek Analysis Area. The nearest known sites are located at Indian Scotty (10 miles southwest) and Grider Creek (more than 10 miles west).

Bats: Forest Service R-5 Sensitive and/or Survey and Manage

Forest Service Sensitive or Survey and Mange bat species that may be found in the analysis area include: 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. Potential roost habitat for bats in the analysis area includes: abandoned mine shafts scattered throughout the analysis area (especially in Horse Creek), large trees and snags, abandoned buildings and, potentially, higher elevation bedrock formations that may have caves or crevices.

Fringed Myotis, Silver-Haired Bat, Long-Eared Myotis, Long-Legged Myotis - The colonial roosting fringed myotis require the relatively roomy roosts found in caves, mineshafts, 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 echolocation to forage on insects. All forage over forest openings and bodies of water (USDA, April 1997).

Pallid Bats - Pallid bats use a variety of habitats, including grasslands, shrub lands, 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 daytime roost surveys have been conducted in the Horse Creek Analysis Area. It is expected that this species occurs within the analysis area due to positive identification of Townsend's big-eared bats in abandoned mine adits 10 miles southeast of the area (Shasta View Mine) and roosting under a bridge at the confluence of the Scott and Klamath Rivers in 1999. Townsend's have also been detected in several abandoned mine adits on the south end of the Scott River District (Hathaway Mine near Cedar Gulch and Facey Mine in Kangaroo Creek).

Del Norte Salamander and Siskiyou Mountain Salamander: Protection Buffer Species and Survey and Manage

According to the literature, these two 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 (hot and dry, or freezing temperatures), the salamanders retreat below the forest surface, utilizing interstitial 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 Mountain salamander (*Plethodon stormi - PLST*) and Del Norte salamander (*Plethodon elongatus - PLEL),* are similar in appearance with slight differences in physical characteristics that can be determined in adults only. Both salamanders were identified by the Northwesst Forest Plan (USDA, 1994a) as Survey and Manage species, and are Category C and D (respectively) in the recent Record of Decision and

Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA/ USDI, 2001). The Siskiyou Mountain salamander is listed as Threatened by the State of California.

These species are known to occur on the west side of the Forest. The Del Norte salamander is more widely distributed of the two, occurring primarily west of Grider Ridge (roughly eight miles west of the Horse Creek Watershed), along the western perimeter of the Forest (Happy Camp, Ukonom, and Salmon River Districts), to Cecil Creek on the South Fork of the Salmon River. The range of the Siskiyou Mountain salamander appears to be east of Grider Ridge, centered generally around Seiad Valley, with detections along the Klamath and Scott Rivers.

The Seiad-Grider area is considered a range contact zone between these two plethodonids (S. Cuenca, personal communication, 1999). Historically, Siskiyou Mountain salamanders were known only within the Seiad and Bittenbender Creek watersheds. In the 1970s, surveys conducted by Nussbaum found Siskiyou Mountain salamanders in the Horse Creek drainage, surveys in 1992-1994 confirmed those locations (Oak Knoll District files). In 1995, surveys were conducted and new detections expanded the range across the Klamath River into the lower reaches of Grider Creek, then eastward into Mill (1997), Collins Creeks (1998), and on the south side of the Klamath River near Blue Heron River Access. Del Norte salamanders have recently been found in a wide variety of habitats and canopy conditions on the Six Rivers and western Klamath National Forests (K. Nickell, personal communication, 1999), but have not been documented in the Horse Creek Anaysis Area.

Suitable talus habitat for Siskiyou Mountain salamanders can be found throughout the analysis area. 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.

The Klamath Province is a fire-adapted ecosystem that was historically characterized as having frequent (occurring every 8-15 years), light surface fires of predominately low and moderate intensity. It is expected that salamanders have evolved in this frequent fire ecosystem. 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. Stand-replacing fires have occurred in the watershed in the recent past (1977, 1987, 1994, and 2000); stand-replacing wildfires can extirpate isolated populations of salamanders. Reintroducing fire is an important component of ecosystem management. Adverse affects to individuals from light to moderate underburning will be offset by long-term habitat protection.

Wide-Ranging Species in the Analysis Area

Deer: Species of Local Interest

Columbian black-tailed deer (*Odocoileus hemionus columbianus*) are common and abundant in the Horse Creek Analysis Area. Deer populations in the area are part of the Klamath Deer Herd (Doggett Creek Subherd). The herd contains both migratory and resident Columbian black-tailed deer; the herd range area covers roughly 4,400 square miles (CDFG, 1986). The habitat within the analysis area is both summer and winter range, and migratory deer move elevationally from winter range at lower elevations to higher elevation meadows for fawning. Deer use a wide variety of habitat types throughout the year, including lower elevation hardwood-conifer, hardwood, and chaparral in winter, mixed conifer forest and openings during migration, and higher elevation meadows during spring and summer (refer to **Figure 3-6**).

Winter range for the Doggett Creek Subherd includes the lower elevation woodlands and chaparral from the Klamath River to approximately 3000 feet in elevation, including the lower portions of Horse, Middle, Buckhorn, and Doggett Creeks. Deer spend up to five months on winter ranges. During the fall and spring deer migrate through transitory ranges at mid-elevations on their way to winter and summer ranges. Summer range for migratory deer includes higher elevation forested stands and montane meadows, such as those along the Siskiyou Crest. Deer spend approximately 4 to 5 months on summer ranges at higher elevations. Overall population size for deer in the area is unknown, however, the California Department of Fish and Game (CDFG) estimates that the population is stable to declining (M. Crew, pers. comm.).

Migratory deer fawning areas include moderately dense shrublands intermixed with forest, dense herbaceous stands, higher elevation riparian, and mountain shrub habitats with available water and forage (CDFG, 1990). Tall forbs, grasses, and shrubs, typical of upland habitats, provide forage and hiding cover for fawns. Fawning areas within the watershed, which have been identified by the California Department of Fish and Game (CDFG),

include Salt Gulch springs, Reeves Ranch, Windy Camp, Dry Lake, Deer Camp and many unnamed springs and wet meadows at higher elevations.

Fire has played an important role in influencing the vegetation patterns within the analysis area. It is largely responsible for the mosaic of brush fields 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 occurrence and acreage affected by natural lower intensity fire.

Wildfire and subsequent salvage logging has been a more recent influence on the habitats within the analysis area (1970s and 1980s). The conversion of older forest to young plantations has been an important factor influencing deer and other wildlife habitats in the area.

Impacts from cattle could occur on deer summer range with overgrazing, including competition for forage and loss of fawning and hiding cover. Competition for forage between deer and cattle is expected to be minimal due to selection of different plant species, deer preferring green leafage from woody plants and cattle preferring grasses and forbs. Some competition may occur for forbs during the growing season, and for forbs and grasses in late summer and fall as green foliage becomes less available. For a more complete analysis and discussion of effects related to the impacts from grazing refer to the *Horse Creek/Beaver Creek/Haystack Watershed Analysis for Horse Creek and Dry Lake Allotments* (March 26, 1996).

The local office of the CDFG has developed a draft predictive model for deer habitat on the Forest. 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 Horse Creek Analysis Area, a map was made to predict where the high quality forage and cover habitat may occur (available in the Horse Creek 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 high *cover* value occur over 39% of the analysis area (roughly 27,442 acres). The areas identified as high *forage* value habitat occur over roughly 18% of the analysis area (roughly 12,221 acres). Forage quality and availability can be improved by introducing an underburning regime in suitable forage areas relatively close to cover. Burning should be conducted during the most ecologically appropriate time of year (i.e. fall burns for most species).

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. Habitat capability for deer is reduced to moderate when open road density exceeds 1.5 mi/mi^2 and is low when open road density exceeds 3 mi/mi^2 (*Forest Plan*, Appendix I, 1994). In the analysis area, over 53% of the area has a total road density greater than 4 mi/mi^2 and 79% is over 2.5 mi/mi^2. The analysis area is popular for road hunting, deer hunting camps and road hunters are common in the fall. Hunters have consistently been noted by District personnel along roads in the analysis area and hunting camps are commonly located at Reeves Ranch, Alex Hole, Windy Gap, Dry Lake, Deer Camp, Mud Springs and Bearground Springs. Opportunities for road closures, seasonal closures or decommissioning will improve habitat for deer and reduce disturbance in these high road density areas.

Elk: Species of Local Interest

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 draft "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. Using the model, a map was made to predict where high quality elk habitat might occur (available in Horse Creek Ecosystem Analysis 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, high quality forage is scattered throughout the analysis area, with larger blocks of habitat occurring along the north side of the Klamath River, along Middle Creek Ridge, in the vicinity of Dry Lake, in plantations, and in areas burned in 1977 and 1987. Although the model identifies high value forage scattered through much of the analysis area, field review indicates a declining trend in forage quality (palatability) due to aging of plantations and chaparral habitats. A change in distribution of age classes from mixed to older classes, and a shift from open stands to stands more densely stocked with fire intolerant species, has occurred due in large part to fire exclusion (refer to Fire and Forest Health section).

Sightings of elk, and signs of elk use, in the analysis area have been on the increase. Sightings of individual animals or clusters of several animals have been seen at all elevations on the north side of the Klamath River from Johnny O'Neil Ridge to Doggett Creek. Large herds of elk, from 10 to 40 animals at a time, have been seen during the summer months at Dry Lake, Upper Horse Creek, Upper Middle Creek and Middle Creek Ridge. Wintering elk in large groups (10-40) have been seen on Johnny O'Neil Ridge, Lower Horse Creek, Lower Middle Creek, and along the north side of the Klamath River. It is expected that the elk in Horse Creek originated from reintroduced herds in Happy Camp and animals from herds in the Applegate drainage (Oregon) and the Hilt (California) 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, but it is expected to occur in higher elevation forest and montane chaparral associated with meadows and grasslands. 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).

Competition for food and cover may occur between elk and livestock, although elk appear to avoid areas where cattle are present if other options exist. When no other options exist, elk will tolerate some cattle use (Christensen et al. 1993). Points of conflict are wet sites and gentle terrain with succulent vegetation. For a more complete analysis and discussion of effects related to the impacts from grazing refer to the *Horse Creek/ Beaver Creek/ Haystack Watershed Analysis for Horse Creek and Dry Lake Allotments* (March 26, 1996). At this time it is expected that summer range forage is adequate to support both elk and cattle at present population levels (Melissa Crew, CDFG, pers. comm.).

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). Total road density exceeds 2.5 mi/mi^2 on 79% of the analysis area. Current *total road density* in the analysis area is displayed on **Figure 3-10**. 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.

Special Emphasis Plant Species

The Horse Creek Analysis Area contains known populations and habitat for six plant species of concern. **Table 3-32**, *Plant Species of Concern in the Horse Creek Analysis Area*, lists the plant species and their special management categories.

Table 3-32. Plant species of concern in the Horse Creek Analysis Area

Species	Common Name	Management Category
Cypripedium fasciculatum	clustered lady's slipper orchid	Survey & Manage, R5 Sensitive
Cypripedium montanum	mountain lady's slipper orchid	Survey & Manage, R5 Sensitive
Horkelia hendersonii	Henderson's horkelia	R5 Sensitive
Pedicularis howellii	Howell's lousewort	Survey & Manage, R5 Sensitive
Ptilidium californicum	Pacific fuzzwort	Survey & Manage
Saussurea americana	American sawwort	KNF watchlist

Mountain and Clustered Lady's Slipper Orchids: R-5 Sensitive and Survey and Manage

Mountain lady's slipper orchid (*Cypripedium montanum)* and clustered lady's slipper orchid *(Cypripedium fasciculatum) ,* Forest Service R-5 Sensitive and Survey and Manage 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 mid to 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 mid to late-seral forests and younger stands with sufficient shading provide moderately abundant, well-distributed habitat for this species. Conifer plantations and areas where stand-replacing fires have occurred recently do not support habitat for this species. Older plantations and areas of natural regeneration probably do not support populations, but have the potential to develop into suitable habitat, as the young conifer stands mature. Numerous past surveys in portions of the analysis area have located only one population of one of the species. Mountain lady's slipper is currently known to occur near the upper end of the main stem of Horse Creek.

Mt. Ashland Horkelia: Forest Service R-5 Sensitive

Mt. Ashland horkelia (*Horkelia hendersonii*) a Forest Service R-5 Sensitive species, is found only in the Siskiyou Mtns. of northern California and southern Oregon near Mt. Ashland. Ten populations of this species are known to occur within its range. The species occurs on decomposed granitic barren gravel soils in open areas within montane chaparral and red fir forests at elevations above 6,500 ft. The soils in the habitat of this species are very fragile, shallow, high elevation soils that are very sensitive to disturbance.

Potential habitat for horkelia exists in the analysis area scattered along the highest elevations of the Siskiyou Crest. Although surveys have been conducted in a large portion of the suitable habitat, only one population is currently known to exist within the planning area in the dry bed of Dry Lake. Large portions of suitable habitat have been impacted in the past by overgrazing and road construction along the crest, both inside and outside of the planning area.

Howell's Lousewort: Forest Service R-5 Sensitive and Survey and Manage

Howell's lousewort *(Pedicularis howellii)*, a Sensitive and Survey and Manage 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/Southern Oregon along the Siskiyou Crest at 4,000 - 6,500 feet elevation. It ranges from within the Siskiyou Wilderness along the Siskiyou Co./Humboldt Co. line, northest to White Mtn., located within the planning area. 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 1984).

Two known populations and additional suitable habitat are located within the analysis area along the Siskiyou Crest at the head of the East Fork and West Fork of Horse Creek, below White Mtn. Most of this area is within an unroaded area. Abundant natural openings along the Crest provide unaltered habitat conditions for this species.

Pacific Fuzzwort: Survey and Manage

Pacific fuzzwort *(Ptilidium californicum)* is a Survey and Manage liverwort that grows on bark at the base of medium to large sized white fir and Douglas fir trees at elevations of 3,000 ft. to 6,000 ft. The range extends from the Pacific Northwest to Northern California. Moist sites with high relative humidity favor the species. It is most often found in closed canopy forests on the north aspect of tree boles where there is less evapo-transpiration stress. North aspect slopes and the bottom one-third of slopes tend to have more favorable habitat conditions than mid to upper slopes. Collections to date indicate the species is most common in the white fir and white fir/Douglas fir zones, in late-seral forests. Populations have been found within partial cut timber stands wherever adequate cover percent and/or natural ambient moisture levels support the species. The species is thought to be sensitive to fire, even those of low intensity. Propagation is by wind-borne spores, so there is potential for long distance dispersal.

Potential habitat for fuzzwort exists throughout the analysis area wherever late-seral timber stands with a significant white fir/Douglas fir component occur, and where local microsite conditions favor the species.

Conifer plantations and open partial-cuts within the planning area do not contain suitable habitat for the species. No surveys have been conducted within the analysis area for the species, and no populations are currently known to occur.

American Sawwort: Klamath NF Watchlist

American sawwort (*Saussurea americana)*, a Klamath National Forest watchlist species, is a rhizomatous member of the sunflower family. The Siskiyou Crest populations represent the southern most extension of the species, which is more common in the Pacific Northwest. American sawwort is found in open sunny or partially shaded wet meadows, springs, and creeksides at elevations above 5,000 ft. The plants form dense thickets alongside of cold flowing streams and springs.

Within the analysis area, high-quality undisturbed habitat is located along the Siskiyou Crest at the upper end of the Horse Creek, Middle Creek, and Buckhorn Creek drainages. Two populations are known from the head of the East Fork of Horse Creek, immediately below White Mtn., and within the White Mountain Botanical Special Interest Area.

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

Botanical Special Interest Area

White Mountain Botanical Area

This botanical area covers 100 acres of high elevation wet meadow and diverse upland vegetation along the Siskiyou Crest within the Horse Creek drainage. Varying in elevation from 5400-6460 ft., this Botanical Area contains diverse vegetation on schist and ultramafic parent material. White Mountain is composed of light colored ultramafic rock with a subalpine peridotite flora that includes a number of species with restricted ranges including *Erigeron petrophilus, Epilobium siskiyouense, Polystichum lemmonii, Lewisia leana,* and *Galium grayanum*. In addition, the area contains the only known populations of American sawwort (*Saussurea Americana)* in California.

Horse Creek Botanical Special Interest Area

This area includes 200 acres of large, mature riparian forest within the Horse Creek drainage. This riparian area is characterized by a dense four-layered forest dominated by Douglas fir, big-leaf maple, Oregon ash, and white alder. The understory includes dense stands of raspberry, hazelnut, and dogwood. This site occurs along the lower end of the creek where the stream gradient is low and past flooding has created a large floodplain occupied by this riparian forest. The dense, multi-layered vegetation at this site provides a high degree of biological diversity and serves as good habitat for many species of fish, aquatic invertebrates and insects, as well as birds and other wildlife species. This section of stream has had only minimal disturbance and is a good example of the late seral stage natural riparian vegetation in the Klamath River drainage. A well-maintained road runs along one side of the creek providing access and interpretation opportunities.

Key Question #3 - What exotic plants or animals occur within the analysis area (distribution/habitat)?

Some species currently inhabiting the analysis 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, streams and the Klamath River. Shoreline cover and shallow water are important habitats for adults and tadpoles (CDFG May 2, 1988). Adult bullfrogs are opportunistic feeders, taking both aquatic and terrestrial prey items. Invertebrates are the primary food of bullfrogs, but they also take fish, 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 co-exist. 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). Holland, 1991, suggests that bullfrogs are the most significant predator of western pond turtles.

Bullfrogs are common within the Horse Creek Analysis Area in slow-moving water along the Klamath River, in natural ponds, and in agricultural or livestock ponds.

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, and are increasing in numbers, in the analysis area.

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 resource 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). Few formal inventories for these species within Forestlands have not been conducted.

Within the Horse Creek Analysis Area, five species of noxious weeds are known to occur, Dyer's woad, Scotch broom, Scotch thistle, squarrose knapweed and yellow starthistle.

Dyer's Woad: Class C Weed

Dyer's woad *(Isatis esula)*, or Marlahan mustard, is a native of Southeastern Russia and an herb of the mustard family, which has been cultivated as a blue dye and medicine since the 13th century. It has the ability to aggressively colonize large areas through the production of large quantities of seed containing allelopathic compounds and vegetative propagules. Seeds of Dyer's woad do not remain viable in the soil for long periods of time. Biennial growth is most common in our area, although it can grow as a winter annual also. This species is common at lower elevations along the Klamath River, along roads, and in fields within the analysis area. This species has a pest rating of "C" by the State of California, which requires "eradication, containment, rejection, or other holding action at the discretion of the County Agriculture Commissioner".

Scotch Broom: Class C Weed

Scotch broom *(Cytisus scoparius)* is located along the main stem of Horse Creek and Middle Creek. Scotch broom is a widespread pest of the Pacific coast. The seeds remain viable in the soil for many years. The infestation has most likely spread from adjacent private land and old mining claims, where it was originally introduced as an ornamental landscaping plant. This large flowering shrub spreads along roadsides and into adjacent shrub and timberlands. This species is rated "C" by the State of California, which requires "eradication, containment, rejection, or other holding action at the discretion of the County Agriculture Commissioner". Forest Service hand-eradication has been conducted for several years on the 2 populations that occur along Horse Creek on USFS lands.

Scotch Thistle: Class A Weed

Scotch Thistle *(Onopordum acanthium L.)* is native to Eurasia and Mediterranean. It invades most habitats: waste areas, roadsides, dry meadows, rangelands, pastures, and sometimes waterways. It reproduces by seed which are viable for 30+ years. Cut or chopped plants may still flower and set seed. It forms dense patches which are impenetrable to livestock, wildlife, and humans and is extermely aggressive.

Within the analysis area this species is known to occur in the vicinity of the Rainey Ranch in lower Horse Creek where it has been treated in the past by the County. This species is rated "A" by the State of California, which requires "eradication, containment, rejection, or other holding action at the state-county level".

Squarrose Knapweed: Class A Weed

Squarrose knapweed (*Centaurea triumfettii* All.) is a long-lived perennial plant that comes from the eastern Mediterrnean area. It aggressively grows in dry disturbed areas, particularly in sand or cinders such as roadsides or cinderpits. It invades and replaces native vegetation on rangelands. Squarrose knapweed occurs in the analysis area in the vicinity of the Klamath River School on private land (Lime Gulch). It's occurrence at Klamath River School was recently discovered, it has not be found in Horse or Middle Creek to date. This species is rated "A" by the State of California, which requires "eradication, containment, rejection, or other holding action at the state-county level".

Yellow Starthistle: Class C Weed

Native to southern Europe, yellow starthistle *(Centaurea solstitialis)* invades various soil types on waste areas, roadsides, pastures, and dry rangelands. It is toxic to horses, as it causes "chewing disease". Once plants invade a site it may sit without increasing for several years. It becomes genetically adapted to that site and then the population explodes; it spreads rapidly. Yellow starthistle is widespread in the analysis area and has been identified in most of the major drainages, including Horse Creek, Buckhorn Creek, Doggett Creek and along the Klamath River. This species is rated "C" by the State of California, which requires "eradication, containment, rejection, or other holding action at the discretion of the County Agriculture Commissioner".

Current vectors of noxious weeds include natural spread by seed, roadside maintenance activities, and human transplantation. Natural spread by seed is the primary means by which many species spreads along roadsides and into adjacent timber stands and brush fields. Another common method of spread is roadside maintenance activities that move seed containing soil from infested areas to other un-infested areas. Scotch broom is an attractive flowering shrub that is also vulnerable to spread by private individuals who want to transplant the shrub into their local yards. High road density in the analysis area facilitates human use and contributes to the spread of noxious weeds.

A formal noxious weed control strategy is being developed on the Forest. It is scheduled for completion in the summer of 2001. The Forest strategy will closely follow strategies that have been developed at the Regional and Washington Office levels. Noxious 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 (NEPA) documents, and to fund and implement noxious weed control strategies.

Roads

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

The analysis area contains approximately 459 miles of road. Under Forest Service jurisdiction, there are 279 miles of system road and 24 miles of non-system road, 5 miles of road under Siskiyou County jurisdiction, 134 miles of private road, and the State of California has 17 miles under its jurisdiction. See **Figure 3-12** *Transportation System*, contained in the Map Packet located at the end of this document.

State Highway 96 provides primary access to the watershed and community of Horse Creek. Within the analysis area, this paved highway parallels the Klamath River for approximately 21 miles.

The storms of 1997 and heavy rainfall in 1998 created significant impacts to the existing road system. All but one site on the 47N05Y road have been repaired. This site will not be fixed because of the extensive nature of the damage and the high cost of the repairs. The Forest Service will pursue a co-op agreement with Fruit Growers Supply Company access to National Forest System lands in this area.

The 134 miles of road under private jurisdiction provide access to residences and industrial forestlands. These roads are not maintained by the Forest Service.

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 such as pickup trucks. Level 1 roads are intermittent service roads not maintained for use.

Temporary non-system roads are those roads on National Forest System lands which were constructed to provide access for a single use, such as to a mining claim, water source, disposal site, harvest unit, landing, etc. These roads are closed after use and are not listed or identified as part of the transportation system.

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

The following **Table 3-33** *Road Maintenance Level Mileage*, displays miles of Forest Service Jurisdiction roads by Maintenance Level.

Table 3 - 33 Road Maintenance Level Mileage	
Maintenance Level	**Miles**
1 - Intermittent Service	42
2 - High Clearance Vehicles	166
3 - Passenger Car	71
4 - All Weather surface	3
5 - Paved, Double Lane	0
Temporary Non-System	24
TOTAL	306

Through the years many of the roads within the watershed 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., 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.

Forest Service system roads within the watershed area were constructed for administration of National Forest System 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 66% of the roads in the watershed area provide year round access, although snow frequently limits winter travel. Seasonal access is provided by 16% of the roads, and 18% of the roads have permanent closures.

The following **Table 3-34** *Travel Access Management Mileage*, displays miles of Forest Service jurisdiction roads by travel access management strategy.

Table 3–34. Travel Access Management Mileage	
Management Strategy	**Miles**
Year-Round Access	187
Seasonal Access	45
Permanent Closure 1/	51
TOTAL	281
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 (includes both National Forest System and private lands) is 4.2 miles/ square mile. The average overall road density (all roads) for National Forest System lands only in the analysis area is 3.6 miles/ square mile; average road density (all roads) for private lands is 5 mi/square mile. See **Figure 3-10** *Road Density*, contained in the Map Packet located at the end of this document.) The road densities for individual sub watersheds are discussed and displayed in the *Hillslope Processes* section.

The following **Table 3-35** *Mileage and Road Density Acreage by Land Allocation*, lists the miles of road and acres of road density by land allocation type.

Table 3-35 Road Mileage and Road Density Acreage by Land Allocation

Land Allocation	Miles of Road	Road Density Acres 1/ (road miles/ sq.mi.)				
		0	0.1-1.0	1.0-2.5	2.5-4.0	>4.0
Private Lands	250	30	670	3,520	7,080	20,730
Late-Successional Reserve	110	40	1,590	4,080	5,000	9,100
Special Interest Area	2	0	0	70	40	0
Riparian Reserve	20	10	120	800	1,220	1,710
Retention	3	0	10	620	410	80
Recreational River	<1	0	30	130	30	0
Partial Retention	40	10	410	1,420	2,630	2,830
General Forest	30	20	80	530	1,360	2,410
TOTAL/2	**456**	**110**	**2,910**	**11,170**	**17,770**	**36,860**
1/ Rounded to the nearest 10 acres						
2/ Total includes County roads						

A roads analysis for the analysis area will be completed and included in this Ecosystem Analysis. The analysis will evaluate each road for potential resource impacts to wildlife, streams, and fish and also determine the human need for access in terms of administrative, resource, and public use. The analysis will make recommendations for roads, which are candidates for maintaining existing management, decommissioning, seasonal or year-round closure, or restoration opportunities. These recommendations are preliminary and not final decisions until site-specific environmental analysis has been completed.

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 flooding of 1997 closed Hwy 96 for several weeks making it impassable, thereby blocking primary access 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.

Highway 96

Highway 96.is the major transportation route, which cuts the analysis area in half. It provides year round access to Horse Creek and is the primary transportation route into and out of the area. For residents living within the watershed, it provides a critical link to the outside world for this somewhat isolated area.

46N50 Seiad Creek Road

46N50 Seiad Creek Road is both a County and Forest road, which receives moderate local use. It provides access to the residences located in the Horse Creek drainage. It has also been used as an emergency route into and out of the Seiad Valley area when Highway 96 was flooded. It is used by recreationists (hunters, etc.)

12 Road Doggett Creek

12 Road Doggett Creek is a Forest collector road, which receives moderate local use, but heavy commercial use. The road is a primary haul route for timber products in the private sector. It provides access from the Hwy 96 to the Horse Creek area. It is used by recreationists (hunters, etc.).

40S01 Siskiyou Summit

40S01 Siskiyou Summit is a Forest collector road, which receives moderate local traffic. This road provides access to the Siskiyou Crest and is important in the recreational area of the watershed.

46N53 Collins Creek

46N53 Collins Creek is a Forest collector road, which receives moderate local use. It provides access to the residences located in the lower portion of the drainage and recreational access during the summer months to the Collins Baldy Lookout. It also is an alternative fire emergency route for the residences of Scott Bar. It is used by recreationists (hunters, etc.)

County Road 8F001

County road 8F001 is the main road for the residents of Horse Creek. It was the main access route in and out of the north portion of the watershed in the flood of 1997 when the Forest Service bridge washed out.

County Road 8G004

County Road 8G004 is a road that parallels Hwy 96. The road provides access to the local elementary

school and residences on that side of the watershed. This road will provide an alterative access to people down river should anything happen to Hwy 96 between Ash Creek Butte Bridge and Horse Creek Bridge.

Human Uses

Key Question #1 - What are the recreational uses in the watershed?

Developed Recreation

The only developed site is the Brown Bear Picnic Area/River Access. This is a small scale, free use site.

Dispersed Recreation

Dispersed recreation is divided between the general forest and the river corridor and primarily consists of hunting, wood gathering, hiking on the Pacific Crest National Scenic Trail (PCT), and river activities. Overall recreation use is low compared to other areas of the Klamath National Forest.

The general forest area is heavily roaded mountain land frequently interspersed with private land. It includes the mountain crest zone between Condrey Mountain and Copper Butte.

Hunting, primarily for deer and elk is the biggest recreational use in the general forest. This includes associated activities of camping and off-highway vehicle (OHV) use. Some campsites are traditional hunting camps that have been used for many years.

General Forest

Within the general forest of this watershed there are three system trails totaling about eighteen miles. Trail use is mostly recreational hiking and some horse riding. Roads provide access needed for administration. One trail is a ten mile portion of the PCT, a National Recreational Trail, which follows the mountain crest on the north boundary of the watershed. This is a high standard trail maintained annually. It receives moderate use by both PCT "segment" and "through" hikers. The other two are secondary trails receiving low use and maintained about every three years. There are two segments of the Horse Creek Trail, totalling about five miles, and about three miles of the Johnson's Dairy Trail which parrallels the PCT. These are high elevation trails and use occurs mostly from about May to October. The trailhead for the PCT off of the 47N81 Road is the only designated trailhead in the analysis area.

The River Corridor

The river corridor includes about 18 miles of the Klamath River. It is paralleled by the Klamath River Highway, State Highway 96, which crosses the river near Cherry Flat. The bulk of the river use consists of fishing, rafting, kayaking, driftboating and river play. The entire length of the river is a component of the National Wild and Scenic Rivers System; designated in 1981 for its outstandingly remarkable anadromous fisheries values. The river is classified as "recreational." Boating use generally occurs from early spring to late fall. Use is both public and commercial. There are two designated river accesses for boat launching, Blue Heron and Brown Bear.

Scenery

Recreationists view the scenery while doing such things as hunting, fishing, driving, photography, biking, etc. These activities occur throughout the analysis area, generally from spring through fall. Winter recreational use is limited. The road system is an integral part of these uses. There are about five miles of system trails outside of Wilderness that receive low use. Scenery as viewed from roads and trails is important to the recreationists' enjoyment of the area.

The relatively natural-appearing scenery of the area is a primary attraction to local residents and visitors to the Forest. Sightseeing occurs along the Klamath River road (designated as "State of Jefferson Scenic Byway") 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 the PCT.

From a visual management standpoint, sensitive travel routes have been identified. The level of sensitivity assigned to a travel route is an indicator of the level of interest people are likely to have in the surrounding landscape. The viewpoints (travel routes) are useful in assessing visual impacts of potential projects. The viewpoints and their visual sensitivity are listed in **Table 3-36** *Visual Sensitivity of Select Travel Routes, Roads, Trails, or Rivers*.

TABLE 3-36. Visual Sensitivity of Select Travel Routes, Roads, Trails, or Rivers.	
Travel Route	Visual Sensitivity
Klamath River National Wild & Scenic River	HIGH
Klamath River Highway (State of Jefferson National Scenic Byway)	HIGH
Pacific Crest National Scenic Trail	HIGH
Siskiyou Crest	HIGH
Blue Heron River Access	HIGH
Brown Bear Day Use site	HIGH
Community of Horse Creek	HIGH
Dry Lake Mountain Lookout	HIGH
Collins Baldy Lookout	MEDIUM
High = primary or secondary travelway or use area where at least ¼ of the users have a major concerns for scenery.	
Source: 1998 Visual Sensitivity Levels map on file at the Forest Supervisors Office.	

The analysis 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 1985, 1986, and 1988 aerial photos. Based on the broad scale of the analysis, large areas were identified, thus requiring further refinement at the project scale. The acres of EVC levels are displayed in **Table 3-37** *Acreage and Percentage by Existing Visual Condition Levels* and also see **Figure 3-13** *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 3-37 Acreage and Percentage by Existing Visual Condition (EVC) Levels.*		
Visual Condition Level 1/	**Acres**	**% Of NF lands in Analysis Area**
NATURAL APPEARING		
Untouched	7,250	19
Unnoticed	13,220	35
Subtotal	**20,470**	**54**
MODIFIED APPEARANCE		
Minor Disturbance	7,420	20
Moderate Disturbance	4,690	12
Major Disturbance	3,240	9
Drastic Disturbance	1,990	5
Subtotal	**17,340**	**46**
TOTAL	**37,810**	**100**
*NFS lands only - excludes private lands. **1/** Source - Forest Plan EVC data layer **NOTE:** This information is general in nature and requires further refinement at the project scale.		

The information on **Table 3-37** *Acreage and Percentage by Existing Visual Condition (EVC) Levels* could be interpreted that 54% of the watershed is natural appearing to the average Forest visitor. On the other hand, 45% of the watershed has a modified appearance from past management activities, including timber harvest, roads, and mining.

The Forest completed an Accessibility Action Plan for recreation facilities in September 1999. The purpose of this Plan is to provide accessible recreation facilities. The Action Plan identifies long-term access needs, costs, and priorities for all sites. Both Brown Bear and Blue Heron River Accesses have been identified as lowest priority sites.

Key Question #2 - What are the private land uses?

Private land uses in the watershed consist of private residences, timber harvest from industrial forest lands as well as small timberland owners, small scale placer mining operations, a community cemetery, commercial gravel pit, church, public school, farming and agriculture.

Key Question #3 - What are the public and local community concerns and interests about this watershed?

Local community concerns and interest are based on local knowledge of Forest Service personnel living and working in this area, as well as comments received at public meetings and conversations with local residents and land users.

Local community concerns and interests include maintaining access to public and private land for access to private residences, recreation (hunting, fishing, camping, driving, hiking) timber harvest and the collection of forest products (firewood, Christmas trees etc). See **Table 3-38** *Roads of Public Interest* and **Table 3-39** *Summary of Public Meeting Comments - Horse Creek WA Meeting 2/27/01.*

Mining for locatable minerals (gold) has been an ongoing activity in the watershed since it was first discovered in the mid 1800's. Much of the National Forest lands in this watershed are under grazing permits to local ranchers. Vegetation and fire management (mainly suppression and fuel reduction)

are of interest to landowners as they are concerned about continual water quality in streams and water supplies to their homes.

Table 3-38. Roads of Public Interest	
Road Name or Number:	**Interest or Concern:**
40S01, 12, 46N50, 47N63, 46N52	Basic Access
47N89 & 47N26	Access
47N69, 47N62	Firewood cutting
Road to PCT and Dry Lake	Recreation access
46N50	Repair road at MP6
W. Horse Ck, Low Gap, Fish Gulch., Johnny O'Neil Ridge, Buckhorn, Middle Ck., Doggett, E. Fork Horse Ck, Hamburg Gulch., Sambo Gulch.	None stated (assume access)
County/FS BF001, 12 (loop), 46N50, Horse Ck. to Seiad	Fire escape routes
47N05Y	Abandon at slide

Table 3- 39. Summary of Public Meeting Comments - Horse Creek WA Meeting 2/27/01	
Concerns and interests:	**Number of similar comments:**
Historic and cultural values maintained	2
No clear cutting in Doggett Creek	1
Recreation access and opportunities (ATVs, hunting, fishing, hiking)	6
Mining access and opportunities	3
Cattle grazing/grazing access	4
Fire risk/fuels reduction/suppression access	9
Public access in general	5
Water quality/flow (incl. Irrigation)	6
Water rights	4
Private property rights	1
Maintenance of high elevation meadows/habitat	1
Firewood cutting/access	4
Dead and dying trees	2
Communication/keep Public informed	2
Hamburg Creek – map = resident>> report as intermittent/ephemeral>> check data base to verify	1
Howards Gulch - fingerlings known	1

Key Question #4 - What commodities are produced in the watershed?

Commodities produced in the analysis area include: timber from both public and private lands; beef production from private and range forage; water for domestic and agricultural use; commercial outfitters and guides for whitewater and fishing trips; suction dredging for gold within the stream channels; crushed rock; and forest products, such as firewood, posts, and Christmas trees.

Grazing

There is one grazing allotment (Horse Creek Allotment) located entirely within the watershed and portions of a second grazing allotment (Dry Lake Allotment) partially within the watershed. Grazing allotments encompass 39,267 acres. Forage areas include oak woodland and annual grassland spring range, transitory rangeland within early seral stage plantations and meadows along the Siskiyou Crest at the higher elevations. Livestock grazing permits are currently issued for these allotments to four ranching families whose bases of operations are out of Horse Creek, Shasta Valley and Scott Valley. Cattle are maintained on the home ranches during winter and early spring. Two term grazing permits are associated with the Horse Creek Allotment that include 101 cow/calves for a 6-month season. Three grazing permits are associated with the Dry Lake allotment for 195 cow/calves. Cattle from ranches in Horse Creek are released from the home ranch in April and disperse in the lower elevation spring range, passing through mid-elevation transitory range throughout the landscape and ending up in higher elevation meadows mid to late summer. Cattle on the Dry Lake allotment are trucked into the allotment in early and late spring and disperse to the mid and upper-elevations by summer. In October, cattle are gathered up and returned to the home ranches. See the 1996 Watershed Analysis that was completed for the Horse Creek and Dry Lake Allotments for more details.

Mining

Current gold mining activity in the watershed is confined to the stream channel and consists of recreational suction dredging. The Lost Dutchman Mining Association and the New 49er's, are private mining clubs whose members suction dredge within the stream channel (Klamath River) located in the watershed. Also, there are several active small scale (suction dredge) placer mining operations on Horse Creek.

Timber

Approximately 13,030 acres or 34% of all NFS in the analysis area are available for timber management (also called Matrix lands). This is higher than the Forest average of 21% matrix lands. There are five 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*.

Table 3-40. Existing Acres of Matrix Lands By Management Area 1/

Management Area	Acres	% Of Matrix Lands	% Of Analysis Area	Harsh Sites Acres	% Of Harsh Sites
Retention	1,110	8	3	220	20
Recreational River	190	1	<1	100	52
Partial Retention	7,320	57	19	2,510	34
General Forest	4,410	34	12	1,110	25
TOTAL	**13,030**	**100**	**34**	**3,940**	**30**

1/ Source: *Forest Plan* timber type data layer

Partial Retention, General Forest, Recreational River comprise Regulation Class 2 lands, and Retention is Regulation Class 3. (See **Table 3-40** *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 *Forest Plan* estimates a Probable Sale Quantity of less than one million board feet (MMBF) from the Horse Creek watershed. This watershed analysis will refine the matrix land allocation acres and the estimated timber volume from available lands in **Chapter 5**.

Table 3-41 *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 3-41. Acreage of Vegetation Types for Matrix Lands By Management Area 1/

Management Area	Planta-tion	Small SSPS >40% crown closure 3/	Small SSPS <40% crown closure 3/	Medium Saw timber <40% crown closure 4/	Large Saw timber >40% crown closure 5/
Retention	60	460	430	0	<10
Recreational River	60	40	40	0	10
Partial Retention	1,650	2,030	2,030	140	610
General Forest	910	1,550	1,280	30	440
TOTAL	2,680	4,080	3,780	170	1,060

1/ Source: 1976 Timber Type map data sort
2/ Trees (if present) <6" dbh or trees not present
3/ Seedlings, Saplings, Poles, and Small Sawtimber; Trees from 6-11" dbh
4/ Trees from 11-21" dbh
5/ Trees from 21-36" dbh
6/ Trees > 36" dbh
Note: The remaining matrix acres are identified as barren areas, shrub, noncommercial forest, or water.

Key Question #5 – What are the heritage resources (prehistoric, historic, and contemporary uses) of the watershed?

Little is known of contemporary Native American use patterns in the analysis area. However contemporary uses include hunting, fishing, and hiking.

The Shasta, from prehistoric times to the present, continue to have cultural ties to the landscape within the Horse Creek Analysis Area. Villages were present along the Klamath River. Seasonal hunting and gathering took place at higher elevations. A wide variety of plants including roots and bulbs were gathered for use in foods, housing, clothing, basketry materials, for medicinal purposes, and for spiritual use. When killing game, the entire body was efficiently used or preserved. Likewise, certain of these or other resources were used for spiritual use. Higher elevation areas may have been visited to fulfill certain aspects of spiritual and/or ceremonial traditions.

In 1983, the Shasta people became federally recognized as part of the Quartz Valley Reservation, which also includes the Karuk and Upper Klamath Indians. In 1994, the Klamath National Forest signed a Memorandum of Understanding (MOU) with the Quartz Valley Reservation to formalize processes of communication and improving relationships toward the common goal of wise land and resource management. As a separate entity, the Shasta Nation is also consulted as part of ongoing dialogues.

There are 31 recorded sites within the watershed, 12

sites are American Indian village sites, and 19 sites reveal evidence of historic use. Most of the historical sites are associated with mining activities such as ditches, sawmills, structures, adits, tunnels, arastas, tailing piles, and cabins.

Land use within the analysis area, from early historic times to the present, includes grazing, timber management, fire management, mining, and recreational activities. The high mountainous areas of the Siskiyou Crest continue to play an important role for people who like camping, hiking, hunting, fishing, and horseback riding.

Key Question #6 - What is the current status of land adjustments within the watershed?

The arrangement of private, commercial and public lands in the analysis area makes land ownership adjustments a viable option in some instances to resolve land management problems or take advantage of opportunities. Currently there are no land exchanges or acquisitions planned. The purchase of a PCT right-of-way on Copper Butte is being pursued.

Key Question #7 - What are the special uses on NFS lands?

There are 17 permitted Special Uses on National Forest System lands within the analysis area. These include: nine waterlines; three roads/ driveways; one orchard; two ditches; one antenna; and one pasture. Additional Special Uses are permitted within the analysis area, but extend beyond: several river outfitters/guides and several utility lines, including power and telephone.