Chapter 4 – Reference Conditions

Historic Overview

Prehistoric and Ethnographic Background

Initial exploration within the Horse Creek Analysis Area may have occurred with the movement of fur trappers over the Siskiyous and into Scott Valley (also known as Beaver Valley and Beaver River). The fur trappers of the 1820s and 1830s made early contacts with the Shasta Indians. Included in early exploration was Lieutenant Emmons, who passed through leading a contingent of the Wilkes Expedition (United States Exploring Expedition). This was in 1841, prior to the discovery of gold at Scott Bar. Lt. Emmons is reported to be the first to give an account of the Shasta. They met one of four distinguishable tribal groups in northern California and southern Oregon, the Kammatwa (or "Gumutwa" and "Watido" Shasta – a possible derivation of an early Shasta group). Their territory may have included the area from Scott River to Horse Creek. There are at least 12 documented village sites along the Klamath River within the analysis area. The village inhabitants were rapidly displaced as early hordes of miners filtered into the area. Although there is no exact recorded number of American Indians that were affected by early miners, undoubtedly there was a significant impact to the Indians and the natural resources. By the 1860s, there were over 2,000 non-Native American inhabitants in the general area.

Shasta village sites along the Scott and Klamath Rivers and their tributaries were integral to riverine resource exploitation. Shasta families occupied a rectangular dwelling house in winter, moved in to brush shelters in spring, and lived there through the summer. Dwelling houses were approximately 16x20x3-feet deep with a "steeply sloping roof, dirt sidewalls and board end walls. Bedding included elk hide o deerskin blankets or imported buffalo hides." Bark houses were used during acorn season but people generally camped out in the mountains during the fall hunt.

Shasta territory was abundant in food resources. Important vegetal and non-vegetal foods include deer meat, bear, small mammals, fowl, trout, salmon, eels, crawfish, suckers, turtles, and mussels. There is some discrepancy as to whether mountain lion and wildcat were eaten. However, they were sought for their fur. Fishing methods included spearing, hook-and-line, netting, and the use of weirs. A major weir was constructed at the mouth of Scott River. "anyone… could come and spear fish at such a dam, and the owners were obliged to give to anyone who asked them as many fish as he could carry." Vegetal foods may include acorns, seeds, fruits, nuts, bulbs, greens, berries, and roots. Plants that were eaten or used medicinally included *Helianthus cusickii*, *Clematis lasiantha*, the berries of *Osmaronia cerasiformis*, Oregon grape, wild currant, wild celery, *Achillea millefolium* var. *lanulosa*, *Artemisia vulgaris* var. *discolor*, white oak, and black fir. When the *Ranunculus occidentalis* bloomed, it was the indication to fish for steelheads. Salmon was an essential part of the diet. To ensure continued harvesting of salmon, each spring ceremonies marked the running of the salmon.

The surrounding mountains were seasonally exploited for deer, grizzly bear, mountain lion, wildcat, acorns, and vegetal materials. It has been noted that the very young children and old people stayed behind in the villages while the more able individuals were gone for periods of time.

The Shasta used fire for better tobacco, wild seed crops, and to drive deer. Fall fires were set on the hills when oak leaves began to drop. Fire was set in circles with an opening used for women to stand and rattle deer bones while men, hidden in the brush, shot the deer as they rushed out. Deer as well as elk were also run down on snowshoes and clubbed or shot; however, elk were hunted in the same manner but killed primarily in winter. One method used for hunting deer was used "on the more open hills of the north side of the river, where the oak trees grew. Brown and black bears were hunted mainly in winter while they were in their dens and to a lesser extent in the fall while people were gathering pine nuts. Hunting for grizzly bear, on the other hand, took place in the spring when they were coming out of their dens.

A variety of beads, shells, and feathers were part of Shasta clothing and ceremonial regalia. Shamans wore yellowhammer feather bands while the other men wore headbands of woodpecker scalps (bills included). Women also wore feathers and woodpecker scalps for ornamentation (bills removed). (Dentalia shell as well as woodpecker scalps were also used as money.) Items used for doctoring may have included ten each of the following items: silver gray fox, wolf, coyote, fisher, and otter skins, eagle wing and tail feathers, and yellowhammer and

woodpecker tails. There were also doctors that specialized in rattlesnake and grizzly bear bites. Men's dress included buckskin moccasins with a heavy outer sole of bear or elk hide. During winter, bear hide moccasins were worn with the fur inside. In other instances, the moccasins were made larger for winter with the feet wrapped with squirrel or wildcat skins or stuffed the moccasin with long black moss. Nets were made from wild hemp; deer snares were made from iris. Grapevine and willow were also used. Shasta residing along the Klamath River purchased canoes from the Yurok or Karuk or made dugouts from sugar pine logs. The Shasta made both elk hide and stick armor to be used in times of war.

Extensive trail systems linked the Shasta with mountain resources and facilitated communication and trade primarily with the Karuk, Yurok, and Hoopa. The Shasta gave pine nuts, juniper beads, and obsidian blades for acorns, baskets, *dentalia, haliotis*, and other shells. The Shasta also delivered wolf skins, woodpecker scalps, and white deerskins to the Karuk in return for pepperwood gourds.

Historic Background

When John Scott discovered gold at Scott Bar in 1850, communities were quickly established as prospective miners rushed to make their fortune. The Oak Bar townsite was one such community. It was not long before Oak Bar "was connected with Yreka, Happy Camp, and Del Norte County by a wagon road, and enjoyed "a good local trade with miners of Hamburg … and Virginia Bar." In 1874, the Yreka Journal described Oak Bar as one of the most prosperous placer mining camps in the United States. The town consisted of two general stores, two hotels, four saloons, a number of homes, and a cemetery. Between 1875 and 1880 mail was delivered from Yreka twice a week by pack train. On Wednesdays and Saturdays round trips were made to Scott Bar; however, there was an extra charge. It has been stated that the first government mail contract for mail delivery between Yreka and Oak Bar townsite was in 1880 to the newly established post office. "By 1888, much of the gold had been mined, and the State Mineralogist reported that while the area had been a generous producer of gold, it was "nearly cleaned up" by then.

Mining claims were established along the Klamath River. These claims were categorized into river, bank, gulch, and hillside claims. Through extensive systems of wingdams, ditches, sluices, and long toms, early miners were able to divert the river to extract gold from the old gravel beds and benches. Resources such as lumber and water, was an integral part of mining. Many sawmills were dispersed throughout the watershed to supply lumber, not only for mining operations, but for early ranching as well. There were several sawmills in the area of Doggett Creek. Two sawmills in the area were known as the Horse Creek Lumber Company and Jenson's Mill. Numerous arrastras for processing ore, either water or horse-powered, have been noted along Horse Creek and up Howard, McCoy, and Rider Gulches. This technique ground the rock from which the gold was extracted. Extensive ditches, some of which are still evident on the landscape, supplied water to the mines, arrastras, and to the ranches.

Of the 19 recorded historic sites within the watershed, approximately half are associated with mining activities. Gold mining within the watershed was the primary resource for extraction from the mid-1850s through the 1930s. By the late 1930s, the United States' massive steel industry had consumed almost half of the world's known chromite reserves. By 1939 the demand for chromite increased dramatically as impacts of the war spread worldwide. Chromite was needed for making lighter and stronger steel alloys for airplanes, military tanks, oil refining tanks, projectiles and automobile engines. It was also known that the Klamath Mountains in California had large low grade chromite deposits as well as manganese. In 1942, the War Production Board Order Limitation L-208 shut down non-essential gold mines and shifted to the extraction of strategic metals. By late 1944, however, the federal government terminated price subsidies.

The initial and cheapest method to recover gold was through placer mining and the use of wingdams. These wingdams were constructed by making cribs of willow, small trees, and milled lumber. After filling the cribs with rock, it was sunk into the river. This process was repeated until an area was secured for mining. The remaining portion of the river powered the water wheels and china pumps that kept water out of the mined area. Wingdams were placed at the mouth of the Scott River and Oak Bar. The only prerequisites for placer mining were a pan, shovel, and a strong back. Early placer mining could be performed by one individual or several men and did not require a large expenditure of capital especially when compared to later mining technologies. Hydraulic mining techniques followed as giant monitors washed away entire hillsides.

Along with hydraulic mining, dredge mining probably proved to be the most destructive in terms of ground alterations. Through the activities of the Distlehorst and Barton Klamath River Dredging Company, Horse Creek was diverted to the base of the eastern-facing slopes. The Distelhorst dredge operated

approximately three miles below Oak Bar, along the Klamath River. In 1915, the Klamath Dredging Company began operations approximately two and a half miles above Oak Bar. Dredging in the vicinity of the mouth of Horse Creek continued into the 1930s.

Early Forest Service management within the Horse Creek watershed began after the turn of the century; however, early documented use of the watershed by livestock dates back to the late 1800s. Cattle were moved seasonally to the more mountainous areas of the Siskiyou Crest where they were kept all summer. By fall, they were returned to the lower elevations until the following spring. To address the continued high use of mountain rangelands and subsequent degraded conditions in some areas, and the need to regulate use of public lands, the Forest Service published a "Use Book." Printed in July 1905, it states "Every effort will be made to assist the stock owner to a satisfactory distribution of stock on the range. Grazing permits for the 1906 season would be given preference in the following order; small nearby owners and then persons living in or close to the reserve whose stock have regularly grazed upon the reserve range and are dependent upon its use. The protection of settlers and homebuilders against unfair competition in the use of the range is a prime requisite. Priority in occupancy and use of the range and the ownership of improved farming land in or near the reserve will be considered, and preference will be given to those who have continuously used the range for the longest period." Range allotments were established giving a schedule of the number of livestock to be grazed and the length of season. "Since 1947 overall numbers have declined. Allotment boundaries were reduced and improvements including fencing were implemented to regulate livestock and improve management."

Forest Service management of the watershed took on an early physical presence through the purchase of existing buildings and structures from private landowners. A wave of construction occurred in the depression era of the 1930s through the CCCs. This era found many able-bodied men involved in a variety of work projects on national forests. A CCC camp was constructed in the area of the present Oak Knoll Work Center to work on a variety of national forest projects that included construction of roads as well as the Oak Knoll Administrative site, Dry Lake Mountain Lookout, and Collins Creek Baldy Lookout.

Historic patterns of timber harvesting within the watershed reveal that the decades of the 1970s, 1980s, and 1990s were the highest in timber production. Road construction primarily falls within these decades also.

Recreation along the Klamath River, during the 1920s, was nationally renown for great fishing. The Steelhead Resort, located near the mouth of the Scott River, was constructed during this period. More recently recreational dredge mining has taken on a contemporary role. Activities such as camping, hiking, and fishing remain and integral part of the landscape.

Hillslope Processes

Key Question #1 - What were the historical (pre-Euro-American settlement) and reference erosion rates, and what natural processes and post-Euro-American activities affected them?

The Klamath Mountains Geologic Province is comprised of four rock belts made up of Mesozoic and Paleozoic rocks that form an eastward dipping structure. These belts are progressively younger from west-to-east, ranging in age from 150 to 400 million years. From west-to-east, these belts are the Western Jurassic belt, the Western Triassic and Paleozoic belt, the Central Metamorphic belt, and the Eastern Klamath belt. Each belt is a complex collection of collapsed back-arc and fore-arc-basins and island arcs attached to the North American Continent during a subduction event that drove the material below the continental rocks.

The material making up the island-arc complexes, carried by crustal movement, were sediments such as limestone, shale, mudstone, and chert. The subduction process caused the descending rock to melt, forming large bodies of granite. The motion of crustal plates that thrust each belt over one another brought peridotite, a rock rich in iron and magnesium, from deep within the mantle of the earth to the surface. Motion from the thrust faulting increased temperatures and pressures, metamorphosing the peridotite into talc-rich serpentine. The edges of each plate are separated from one another by serpentenite. This array of geologic processes also allowed fluids from the mantle to rise toward the surface along fractures in the overlying rock. These fluids often carried gold and other precious metals, depositing them in rocks near the surface. These processes, ongoing throughout the mid-to-late Paleozoic Era, were complete by the end of the Mesozoic Era, about 70 million years before the present.

During the early Cenozoic Era, the Klamath Mountains area emerged from the sea to a tropical climate. Over the next 68 million years the climate fluctuated, but in general grew cooler and drier. During this time the area experienced

several periods of uplift resulting in the formation of oversteepened mountains drained by rapidly flowing rivers and streams. Extended periods of erosion reduced these mountains to a more subdued topography. This subdued landscape, in conjunction with the warm, drier climate facilitated weathering of the bedrock, forming lateritic soils such as those found today in the Amazon basin.

Recent studies indicate that by the middle of the Eocene Epoch (about 50 million years ago) the ancestral Klamath River had established its westward flow across the Klamath Mountains to the Pacific Ocean. In the early Miocene (about 20 million years ago) a domal structure started to form in the Condrey Mountain area. The dome has given the Condrey Mountain area its modern day character, more as a result of erosional processes than structural expression. It is likely that the Salmon River developed its direction of flow at the same time.

Events of the Pleistocene and Holocene Epochs, beginning about 2 million years ago, had a pronounced effect on the landscape within the Klamath Mountains. The subdued terrain existing at that time was uplifted about 3,000 feet, forming the modern mountain range. During this uplift, streams and rivers cut deeply into the gentle terrain underlain by bedrock made soft by previous weathering, with inner gorge topography forming at the bottom of the stream and river valleys. Slump and earthflow landslides developed in the western portion of the of analysis area. The landslide formation was facilitated by the humid conditions, deeply weathered and sheared bedrock, oversteepening of hill slopes, and periodic earthquakes from continued crustal movement on the coast. Sediment generated from these landslides typically had a high silt and clay content. Periodic influxes of sediment were introduced to the stream system and temporarily deposited in streams throughout the area, causing the streams to become choked with sediment. Subsequent flooding moved the sediment through the system to the Pacific Ocean. Evidence of the downcutting and rapid uplift may be observed on the valley walls where ancient river terraces have been preserved. These terraces occur up to 600 feet above the present river level.

Slump and earthflow landslides developed in the western portion of the Horse Creek area. This landslide formation was facilitated by the humid conditions, deeply weathered and sheared bedrock, oversteepening of hill slopes and associated downcutting of streams brought about the rapid uplift rates, and periodic earthquakes from continued crustal motion on the coast. Though generally inactive under present climatic conditions, these landslides often exhibit local active areas. The domal uplift of Condrey Mountain is evidenced by the formation of long, shallow-seated (relative to length), rotational-translational, slump/earthflow complexes, radiating from Condrey Mountain.

During the Pleistocene Epoch, the climate fluctuated wildly, relative to the previous 68 million years. The colder temperatures resulted in several glacial episodes, while the intervals between the glaciations experienced a climate similar to todays. At higher elevations near the headwaters of tributaries to both the Salmon River and Klamath Rivers, the bedrock was scoured and soil redeposited by the glaciers. This scouring produced the geomorphic features of cirques, U-shaped valleys, and moraines found in the headwaters of Horse Creek.

In historic time, man has greatly increased the rate of landsliding and erosion by hydraulic mining of old river deposits, dredging of younger river deposits and road construction. Road construction and maintenance have also increased the rate of erosion, landsliding, and sediment production. Man-made dams influence river channel form by retaining sediment and reducing stream power in flood flows. In theory, clear water flows below the dams make up their sediment load by transporting channel deposits at an accelerated rate.

Recent Climate and Flooding

Weather records from Orleans, California date back to 1904. Annual precipitation at Orleans has ranged from 26 to 84 inches with the mean annual precipitation of about 50 inches. Approximately 90 percent of the precipitation occurs between October and May, the remainder occurs during summer thunderstorms.

The precipitation records indicate various dry and wet periods. The time period from 1911 to 1937 was much drier than the long-term average with an average precipitation of 43 inches. From 1938 to 1975 the average precipitation was 54 inches. The following years were very dry with the total precipitation for calendar year 1976 of 26 inches but then 1982 and 1983 were very wet with total precipitation of 84 inches for 1983. From 1985 to the present the analysis area experienced less than average precipitation each year except 1986 and 1993 with very dry years (less than 35 inches precipitation) in 1985, 1991, and 1992.

Floods have been a major influence on the condition of streams and rivers in the Klamath River basin. Large floods are documented for parts of the Klamath River in 1861, 1864, and 1875. Early explorers documented floods in the 1700's.

Study of the stream flow data from the mouth of the Salmon River ranging from 1912 to 1997 indicates that major floods occurred in 1953, 1955, 1964, 1970, 1971, 1972, 1974, and 1997, with the largest peak flow coming during the 1964 event. In the 1964 flood the daily mean flow reached 100 thousand CFS. The daily mean flow in the 1953 event was about 43 thousand CFS and the 1955 event was 64 thousand CFS. In 1970, 1971, 1972 and 1974 the highest daily mean flows were 41, 55, 44 and 54 thousand CFS, respectively. The second highest peak flow on the Salmon River occurred in 1997, reaching a peak of about 70 thousand CFS.

The floods of 1955, 1964, 1970 to 1974, and 1997 are associated with landslide episodes on the Klamath National Forest. Studies of the 1944 air photos show only minor disruptions of the hill slopes, and riparian vegetation. Air photos from 1955 (taken prior to the winter flood) show little change. The effects of the 1955 flood are shown on the 1964 air photo flight, flown the summer before the Christmas floods of 1964. The photos show considerable disturbance along the channel of the Lower Horse Creek sub-watershed. An air photo flight showing the aftermath of the 1964 flood shows extensive disruption of riparian vegetation along virtually all stream courses in the analysis area.

Riparian and Stream Areas

Key Question #1 - What are the reference riparian and stream conditions in the watershed?

A review of 1944 air photos shows that in general, many upland areas were relatively open compared to current conditions, especially in areas not impacted by timber harvest. By contrast, the riparian areas along larger, upland area streams appear mostly dominated by dense stands of timber. Apparently, the frequent fires that periodically reduced tree densities in the mid to upper slope areas had relatively minor effects on riparian areas. Most riparian areas probably had older conifers trees at densities near site potential. Infrequent severe flooding and debris torrents would decimate vegetation within the flood zones and create areas of early seral vegetation. Overall, about 70-80% of upland riparian areas were fully stocked mid to late-seral stages.

Little is known about riparian and stream channel characteristics and aquatic habitat conditions in the analysis area prior to the onset of activities such as mining, road building, and timber harvesting that began in the mid 1850s. It is assumed the habitat was in good condition to support the salmon and steelhead populations that were said to exist by miners and R.D. Hume in Snyder's (1931) report. The extent of change resulting from removing beaver, mining, and other human activities had on the physical characteristics of the streams, including pools, fine sediments, riparian vegetation, and stream channels, is unknown, however, it can probably be considered extensive since streams were moved across their valleys as gravels were mined for gold. In 1934, streams were lower than they had been during the previous decade and hydraulic mining was still occurring in areas of the Klamath Basin. Water quality conditions were considered fair and had "improved over 1933 when the Klamath River was at times very badly polluted" (Taft and Shapovalov 1935). Moffett and Smith (1950) state that the Klamath River and many of its tributaries “ran silty.”

Factors affecting riparian habitat quality may vary from stream to stream, however, the physical and biological components that create and maintain riparian habitat are similar. These components are important within the aquatic, semi-aquatic, and surrounding riparian and upslope area and are able to sustain the character of a stream corridor. They are also continually changing as ecological processes within the watershed modify and reshape the habitat. Together, these components maintain and restore productivity and resilience. The following describes how these components contribute to a fully functioning aquatic ecosystem.

Upslope processes are critical in providing and maintaining suitable amounts and intensities of water flow, and natural delivery mechanisms of sediment without accelerated rates of erosion and sediment yield. Headwater areas are important for exchange of water, sediment, and nutrients. The timing, magnitude, and duration of peak and low flows are critical to sustaining aquatic habitat and patterns of sediment, nutrient, and wood routing.

Riparian areas are essential in maintaining stream temperatures, dissolved oxygen levels, and other elements of water quality. They also ensure large wood recruitment, stabilize the channel, provide for filtration of sediment, and increase habitat diversity.

Forested riparian ecosystems should have a diversity of plant communities. Late-seral stages in a community should predominate and consist of endemic conifer and hardwood species, with intermingled areas of early-seral stages such as grasses and forbs. Ideally, this should be a multi-layered canopy including signs of decadence such as standing and fallen dead trees. An overstory of

conifers should provide future recruitment of large wood, shade and thermal cover of the streams. An intermediate layer of mixed deciduous and coniferous vegetation should provide thermal buffering, nutrient cycling, bank stability, and recruitment of terrestrial insects as an aquatic food source. The vegetative canopy should provide stream surface shading during the summer and should be at site potential.

Wet meadow areas should have stable overhanging banks with herbaceous vegetation and/or woody vegetation providing canopy cover, bank stability, and sediment filtration. The water table should be near the meadow surface, with the stream meandering through the meadow. Few signs of gullying or compaction should be apparent.

Diverse and complex instream habitats are essential for all life stages of aquatic species and should include large, deep pools for holding and rearing. Large woody material is critical for maintenance of these diverse habitats as it maintains stream channels and provides a source of cover through a range of flows and seasonal conditions. A diverse substrate is necessary with small percentages of fines and embeddedness for successful egg and alevin development. Sub-surface interstitial areas are also critical for invertebrates and juvenile fishes. An abundance of cool, well-oxygenated water, free of excessive suspended sediment is important for aquatic species production and survival.

Aquatic Dependant Species

Key Question #1 - What were the distributions and population sizes of aquatic dependent species?

It is difficult to determine the historical population size of salmon and steelhead in the Horse Creek analysis area. However, fish numbers were sufficient to supply the primary subsistence food and be the basis for the economy of the indigenous people prior to the mid 1800s. Starting in the 1850s, after the discovery of gold in the area, fish populations were subject to additional human impact including mining, commercial timber harvest, water diversions and dams, artificial propagation, and other historical activities. This likely affected tributaries as well.

Stocks and species of salmonids that existed at the time of cannery development on the Klamath in 1912 included spring and fall run chinook salmon, coho salmon, and steelhead trout. Three fish canneries were operating at the mouth of the Klamath River, which was heavily fished for salmon with no limits. Steelhead trout were an incidental catch since migration times coincide with salmon. Both Snyder and R. D. Hume in Snyder's (1931) report state that historically the spring run of chinook salmon was the "main run" of salmon and the population was very pronounced in the Klamath River basin. "These spring salmon have now come to be limited" and "practically extinct" while the fall run was reduced to "very small proportions" (Snyder 1931). By the mid 1930s it was reported that anadromous fish populations within the Klamath Basin were already significantly jeopardized (Taft and Shapovalov 1935). They reported, "Unfortunately no exact recorded facts exist concerning the size of the present and past runs of steelhead in the Klamath River. It would, nevertheless, be perfectly safe to say that the general consensus of opinion of fishermen and residents on the river is that these runs have decreased alarmingly, particularly during the past few years." Suggestions during the early 1930s to determine the decline of the spring run chinook included mining operations, over fishing both in the river and ocean, irrigation, and the building of Copco Dam.

Mining had other impacts to the Klamath fishery. "During the period of placer mining, large numbers of salmon were speared or otherwise captured on or near their spawning beds, and if credence is given to the reports of old miners, there then appeared the first and perhaps major cause of early depletion" (Snyder 1931). Taft and Shapovalov (1935) studied occurrence of benthic invertebrates in Klamath River tributaries and found mined areas had consistently fewer organisms than non-mined areas.

Many dams were built in the Klamath system to divert water for mining, agriculture, and domestic use. These dams and diversions blocked salmon and steelhead from more than 200 miles of spawning and rearing habitat along Klamath River tributaries (CDWR 1960 from CH2MHill). Unscreened or poorly screened water diversions and ditches resulted in a significant loss of juvenile fish in which Taft and Shapovalov (1935) reported as the "most serious present loss of trout and salmon". During their review of Klamath River ditches most were found to contain juvenile fish. The vast majority of screened diversions needed repair.

Artificial propagation began within the Klamath River Basin in 1896 when eggs taken from a tributary to the Sacramento were raised to fry and introduced into the upper Klamath. Eggs from the Sacramento River were also taken in 1907, 1911, 1913 and 1917 for a total of 4,950,000; these were released in the Klamath River. A small hatchery was established at the mouth of the Klamath River in the 1890s that released fry originating from the Rogue River, and after Copco Dam was established, a hatchery was

developed at Fall Creek (Snyder 1931). The affect these historic hatcheries and resulting fish had on the Horse Creek Analysis Area is unknown. A hatchery was also built to mitigate the effects Iron Gate Dam would have on the salmonid fishery.

In general, numbers and the variety of life history patterns for all anadromous fish populations (steelhead, coho and chinook salmon) within the Klamath system and the analysis area are assumed to be substantially reduced from historical numbers and patterns. Historically, sustainable populations of spring chinook and summer steelhead, existed within the analysis area but these stocks are either no longer present or occur very infrequently in low numbers. Fall chinook were able to access historical spawning grounds in the upper mainstem Klamath and in Horse Creek with regularity. Now, as a result, it is assumed that proportionately more fall chinook spawning occurs today in the analysis area than historically, due to lack of access to upstream areas. Annually, stream and river flow usually return to near historical levels by the time coho salmon and winter-run steelhead seek to access historical spawning grounds. An exception may be infrequent years when fall rains are substantially delayed, not allowing the water table, depleted from a season of ground water pumping, to rise in timely fashion.

Historically, it is assumed that tributaries throughout the basin generally illustrated higher juvenile salmonid densities than at present due to better seeding of the habitat by more numerous adult, anadromous fish. Tributaries and the mainstem river generally displayed a greater diversity in species and size classes than at present due to past robust populations of steelhead, coho, and fall chinook.

Historical anadromous processes (upstream migration, egg development, rearing, downstream migration) on the average functioned more efficiently than at present due to better habitat connectivity and stream conditions. Rearing conditions were more favorable for juvenile fish staying in the sub basin during the summer and the winter, hence there was less selection against coho and steelhead populations. Low stream flows and abnormally high stream temperatures historically impacted juvenile salmonid out migration less frequently.

There are no high mountain lakes within the analysis area. Sections of streams in the analysis area located above long term and significant barriers that are presently barren of fish are also assumed to have been historically barren of fish.

Historically, no stocked fish of any type existed within the analysis area and no genetic intermixing occurred between hatchery and wild stocks. Today, the CDFG produces an annual report of all high mountain lake and other stocking occurring in Siskiyou County, including the analysis area. Undoubtedly, fish transfer and stocking from unknown sources, by pioneer families, also occurred. The impact of these operations and hatchery planted stocks, if any, on the wild fish within the analysis area is unassessed. Stocked fish, such as bass, catfish, and sunfish, are present in farm ponds located on private land in the analysis area. High water periodically releases some of these fish into the mainstem Klamath River where they are infrequently observed during snorkel dives and out migrant trapping operations. (The impact of these fish in unknown but it is assumed to be not significant).

The historical numbers and viability of other non-salmonid aquatic populations within the Klamath system are unknown. Lamprey numbers are assumed to have been much larger in the past. One individual from Scott Bar observed that mussel beds in the lower Scott River were much more numerous, and the individual mussels themselves, were much larger before the 1964 flood, than currently. They also observed that the mussel beds today may be recovering, but the individual size of each mussel is still small.

Forest Health and Fire Disturbance Risk and Hazard

Key Question #1 - Based on the historic disturbance regimes, what were the vegetation communities, stand densities of the conifer communities, and fuel loadings?

The dominant disturbance regime affecting vegetation communities, densities and fuel conditions has been the fire regime. **Table 4-1** *Horse Creek Fire Starts 1922-2000* displays the number of fires recorded during the last 79 years. It is remarkable to note that during this period of time, only in one year, 1957, did the analysis area not have any fire occurrence. Without the influence of fire suppression efforts, lightning caused fires, which average 6 per year in the analysis area, could burn freely throughout the summer months and in many years much of the early fall. Looking at all causes of fire starts, the average number of fires that occur each year in this analysis is 8.

In late October of 1863, the journal of William H. Brewer recounts hiking from Seiad (then Seiad) Valley to the Three Devils, about a 4,000-foot

elevation climb on a south aspect. "The hills are covered with scattered timber, not dense enough to be called forests, or in places with shrubby chaparral. The whole of this wide landscape was bathed in a smoky vapor, and the mountains faded in it at no great distance (Farquhar 1930)." Brewer mentions the smoke in the air twice more during his short stay in Seiad Valley.

Table 4-1. Horse Creek Fire Starts 1922- 2000

Cause of Ignition	Number of Starts	Percentage of Starts
Lightning	443	70%
Equipment Use	16	3%
Smoking	33	5%
Escape Campfire	12	2%
Debris Burning	37	6%
Railroad	1	<1%
Incendiary	45	7%
Children	5	<1%
Miscellaneous	42	7%
Total	634	100

In the Thompson Ridge area on the Happy Camp Ranger District (15 miles west of the Horse Creek Watershed), Taylor and Skinner (1994) did an intensive fire history study and have estimated pre-suppression fire return intervals for Douglas-fir/mixed conifer to be between 15 and 25 years.

Few forested regions have experienced fires as frequently and with such high variability in fire severity as those in the Klamath Mountains (Taylor and Skinner 1998). Historic fire return intervals were frequent on south aspects, averaging 8 years, and less frequent on east aspects, averaging 16 years. These frequent fires would remove damage caused by insects and disease, clean up the forest floor, and reduce the amount of decay available for short-term insect and disease habitation. The presettlement period (1627-1849) had an average of 14.5 years between fire returns. American Indians living in the analysis area are also known to have ignited fires. Fire spread and severity was and is dependant on fuel accumulations. With frequent fire, fuel accumulations over most of the area were maintained at low levels. Frequent fire and low fuel accumulations ensured mostly low to moderate fire severity. The settlement period (1850-1904) had an average fire return of 12.5 years. During this period there were more human caused fires, due to the influx of miners and settlers. The suppression period (1905-1992) had an average fire return of 21.8 years. During this period fire suppression is not determined to have been successful until 1948 when men and modern equipment were available and the National focus on utilizing timber resources forced protection of timber stands.

It is important to note that the number of fires occurring within the analysis area has probably not changed significantly between pre-historic, historic, and the present. What has changed is the size of the fires. Prior to what has been determined as the fire suppression era, starting in the 1930's for this area and continuing to the present, fires spread typically without any human intervention. This allowed fires to annually spread over large expanses. Within a period of 8 – 25 years the whole analysis area was on average completely burned through. **Figure 4-1** *Percentage of Fires by Size Class* displays by decade, starting in the 1920's, the percentage of fires occurring in three size classes. Fire suppression efforts took place in the 1920's, but limited personnel and equipment were available to fight fire, which accounts for 20% of the fires getting to larger size classes. The graph displays a pattern of increasing effectiveness of the fire suppression resources, with the increased percentage of small fires and decreased percentage of large fires. This pattern appears to top out in the 1960's decade and then stays close to level to present. Small variations between decades could be due to changes in available suppression resources, and/or storm events that ignited multiple fires, overwhelming the suppression resources. Another possibility in recent decades is that fuels conditions have developed that once a fire has been established in them it is extremely difficult for the available fire suppression resources to contain the fire or fires.

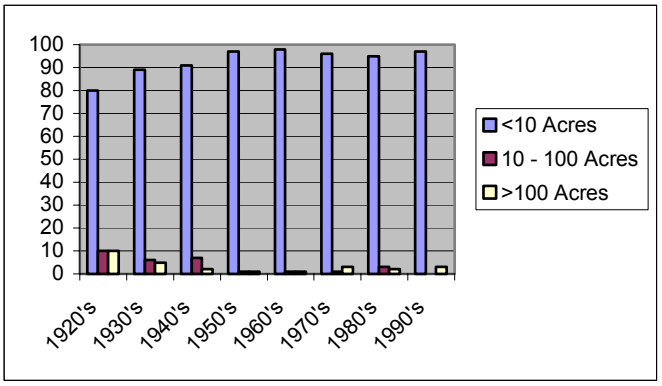

Figure 4-1 Percentage of Fires by Size Class.

Historic Fire Regime

The fire regime prior to European settlement (1850), within the analysis area can be described as having frequent fires; 1-25 year intervals. Lightning and American Indian burning were causes of ignition. This pre-settlement fire regime can be described as having mostly low to moderate intensity fires, with small areas burning at high intensity. Fire return intervals averaged less than twenty years in this

area; shorter on exposed sites and longer on sheltered sites. Fire worked as both a thinning agent and an agent of decomposition.

The steepness of the slopes and vegetation that had adapted to a history of frequent fires, contributed to the varying intensities. Stand replacing events occurred in some areas, although most vegetation (mixed conifers) promoted lower intensities when burned at frequent intervals.

Higher intensities occurred when vegetative conditions were susceptible, and ignition and weather conditions were favorable. These stand replacing events, or runs of high severity, were usually limited to the susceptible vegetation during conducive weather conditions. The southern exposures and drier sites tended to burn with higher frequency. Fire would burn into the crowns in some locations and burn only in ground fuels in others. This created a mosaic of vegetation types, sizes and age classes within the analysis area. During this fire regime, south slopes were maintained in a more open condition. Fire-created openings were larger on south slopes than on north slopes. Also, the lower on the slope the fire started, the larger the opening was created. Fires generally burned with low intensities in riparian areas. Frequencies were similar to upslope areas, but fires tended to back into the riparian areas and smolder or creep, unless drought conditions were present in which case fires would remove most if not all available fuels in the riparian area.

Sources of Ignitions

Lightning fires have been a source of disturbance since the development of vegetative biomass. Being influenced by weather, vegetation, and topography, lightning fires burned uninterrupted by humans until early in this century.

American Indians used fire to influence vegetative conditions within watersheds on the Klamath for possibly thousands of years. Until the early part of this century, they ignited fires to enhance landscape values that were important to their culture. American Indian burning from around camps near the mouths of Beaver and Horse Creeks kept the lower elevations in an open condition (Blackburn and Anderson 1993). With frequent burning, the majority of the lower elevations were probably maintained as grass/forbs, young shrubs, and hardwood communities.

Early Euro-American settlers to this area used fire to improve grazing, expose rock and soil for mining, and improve travel routes.

Historic Vegetative Condition

Prior to European settlement, the majority of the analysis area was maintained in an open mixed conifer forest. Ponderosa pine was the dominant conifer species found in open lower elevation stands on south and west aspects. Douglas-fir was most prevalent on moister sites, especially on north and east aspects. Due to the historic fire regime, north and east aspects supported denser stands than south and west, but were less dense than current stands. True fir was found on frigid sites above 5,000 feet elevation and the mixed conifer forest blended into hardwoods on drier sites below 3,000 feet.

Endemic levels of insect/disease infestations have always been present in the analysis area. The types and scale of these infestations probably were different prior to active fire suppression. Insects/diseases that attacked oak, pine, and Douglas-fir were present in the area. In the higher elevation true fir, dwarf mistletoe and *Cytospora abietta* were present, but with cleaner more open conditions these diseases would impact small portions of the stands. White pine blister rust was introduced around 1900 and tends to be fatal for sugar pine seedlings/saplings, and just damage limbs on mature trees, it was probably not an issue until recently. With lower stocking levels, and less inter-tree competition for moisture/nutrients, vegetation remained more vigorous overall and less susceptible to large scale insect/disease epidemics.

Vegetation Communities

Mixed Chaparral

Historically this community occupied less area than it does currently. This is due to the effects of frequent fire on these chaparral species. Areas occupied by mixed chaparral had a fire return interval that averged 8 years. This frequent fire return limited establishment of these species and promoted open grass/forb coniditions. Once allowed to establish on a site, chaparral will persist, but studies indicate that fire return intervals less than 20 years will significantly reduce the amount of ceanothus.

Montane Hardwood

Historically, this community was found in about the same areas as today. These hardwood species have adapted to harsh sites and frequent fires. With frequent fires, this community was maintained with an open large tree, high limb character; it was kept more open than current conditions, with understory vegetation of scattered shrubs, grasses and forbs

Montane Hardwood Conifer

Historically, more of this community may have been put into the montane hardwood community with better sites being transition zones from the hardwood to the mixed conifer communities. Species mixes were the same as is found currently. These hardwoods resprout and grow quickly following disturbance.

Ponderosa Pine Mixed Conifer

The area occupied by this community has changed little, but vegetation densities and species composition has changed dramatically, due to the loss of frequent fire effects. Ponderosa pine dominated these open stands. Sugar pine was much more common. Ponderosa pine and sugar pine comprised up to sixty percent of the conifers in stands on south and west aspects (based on Fruit Growers Supply Co. 1925 cruise data in the Beaver Creek watershed). Douglas-fir was found mostly on the lower one-third of these south and west aspects. This community was adapted to frequent low to moderate intensity fires. Understories were maintained free of litter and promoted open grass/forb and scattered shrub conditions.

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 that much of the in-growth is mistletoe infected. 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

The area occupied by this community has changed little, but vegetation densities and species composition has changed dramatically, due to the loss of frequent fire effects (sound familiar). Much of what occurred in the ponderosa pine mixed conifer also occurred in this community. The two regimes of partial cutting and effective fire suppression have changed conditions from what was maintained historically.

This community found on good sites mostly in the mid-elevations of the analysis area, grew big trees at wide spacing (average 20' on north and east aspects, 30' on south and west aspects).

True Fir

This community is adapted to high elevation, frigid soils, and short growing seasons. The area occupied by true fir has not significantly changed from historic times. The natural patterns and stand structure of even-aged appearing groups of trees maintained by lightning fires, windthrow, and insect outbreaks has been replaced by logging as the most common source of disturbance.

Partial cutting occurred during the same period as the mixed conifer community, resulting in similar stand conditions, however, fewer acres were entered as species value was not as great. Conversely, damage to residual trees was more severe as true fir species are more prone to rot when injured than those of the mixed conifer community. Larger openings created by logging reduced structural diversity in these stands.

With eighty years of fire suppression, true fir stands are denser. Litter and downed woody material accumulations are greater, and openings between patches of trees have become smaller than what was maintained with the historic fire regime.

Sub alpine

This community is probably very similar to what it was historically. It is more dependent on site conditions than any other community. Due to slow growing conditions and a fire regime that was naturally less frequent than the lower elevation vegetation communities, this community is the not as far away from conditions that were maintained

historically. Changes that have occurred include; the development of understories where little existed historically, higher accumulations of snags, litter and large debris, fewer openings and a more closed forest condition than was historically maintained.

Montane Meadow

This community consisted of riparian meadows, dry meadows or glades, and harsh sites with little vegetation. The meadows and glades along the Siskiyou Crest were believed by some to have been heavily impacted by livestock grazing from the late 1800's to early 1900's. Species composition is believed to have changed, but no record of the original species composition for these areas exist. With over-grazing, some areas that were dry meadows have become barren (red-fir barrens). With fire suppression, red fir is denser than historically. Meadow complexes have been reduced by encroaching shrubs and red fir. Rocky outcrops and areas of thin droughty soil have not changed.

Montane Riparian

This community was more expansive prior to the mining era. This community was a 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. Beavers helped to increase the size and maintain this community. Frequent flood events and use by beavers maintained much of vegetation in an early-seral condition. Fur trappers removed the beavers and hydraulic and dredge mining and channeling of streams removed most of this vegetation community. Recovery has occurred in some areas since mining stopped in most areas by World War II (1941).

See **Figure 4-2** *Historic Large Fires*, which displays large fire perimeters that have occurred in the analysis area between 1932 and the present.

Key Question #2 - What were the endemic levels of mortality in conifer stands?

Endemic levels of insect/disease infestations have probably always been present in the landscape. However the types and amounts of these infestations probably were different prior to active fire suppression activities than today. Insects/diseases, which were dependant upon oak, pine, and Douglas fir were probably more prevalent, while those favoring white fir as host were less prevalent (dwarf mistletoe and *Cytospora*). Also because there were fewer incidences of high stocking levels, and resultant competition for moisture/ nutrients, conifer stands remained more vigorous overall and less susceptible to insect attacks. Outbreaks of insect and disease were much less widespread than they are currently. Isolated small-scale outbreaks were typical in older stands.

Key Question #3 - What is the history of fire suppression and fuels treatment in the analysis area?

Prior to the establishment of the Klamath National Forest in 1905, fire fighting was done primarily to keep wildfires from spreading to homes and improvements. These efforts usually would not result in suppressing wildfire. In many cases, fires were encouraged to spread to improve grazing conditions. Fire suppression activities were initiated after the establishment of the National Forest. In the early years of the Forest Service, very few personnel were available for fire suppression efforts. During the 1930s with the establishment of the CCC camps in and near the analysis area, fire suppression was much more successful than it had been in years past. With this influx of manpower and equipment, suppression of more fires could be achieved. With advances in fire fighting equipment (engines, air tankers, helicopters, etc.) and in fire fighting techniques and training, successful fire suppression efforts has been the norm. Discussions with men that fought wildfire in the 1930s, 40s, and 50s describe firefighting as having been for the most part much easier, with less vegetation and fuels to impede fire line construction. They describe fires mostly as having less intensity and less severity due to the lesser amount of fuels. With successful fire suppression, fuels have increased and fires have become more intense and difficult to control. Occasionally events such as the 1987 dry lightning storm will occur and overwhelm the fire suppression forces.

The Klamath National Forest working with the Pacific Southwest. Experiment Station began a project to develop guidelines for control burning of logging slash in the early 1950's. By 1956 some slash was being burned under the guidelines. The Bogus Fire of 1957 (an escape slash burn) set the program back a few years (Morford 1981). Fuels treatment following timber harvest has been practiced since the 1960s. Burning of harvest units to remove slash and prepare the units for planting has been done on approximately 6,000 acres within the analysis area. In addition to slash removal, burning to improve wildlife habitat and reduce fuel hazard has been implemented in recent years. Much of the analysis

area has or will receive some application of prescribed fire.

Late Successional Habitat

Key Question #1 - What was the historic distribution of late-successional forest habitat and what was its condition?

Late-successional Forest

The Horse Creek Analysis Area is very diverse, it is characterized by complex species and plant community distributions resulting from the variable climate; steep, rugged terrain; and diverse soil parent material. Vegetative characteristics across the landscape are constantly changing. Therefore, several sources of information are needed, in addition to the existing condition, to understand the historic range of variability and the disturbance regimes that have shaped the landscape. The best available information on past vegetative conditions in the analysis area comes from the journals of early explorers, literature dealing with past fire regimes, old growth studies, and review of the 1944 aerial photographs (the oldest, complete set of aerial photographs on the Forest). The interpretation of literature, vegetative conditions, and the photographs are designed to set a framework for historical conditions.

Accounts from early European settlers that came to the area in the 1850s describe very open conditions with ample grass to sustain livestock. Much of the area was described as a hardwood/conifer savanna. It was described as mostly grass covered with scattered hardwoods and conifers. Conifers were found mostly near drainage bottoms and the lower half of north slopes. Douglas fir was the dominant conifer, but higher proportions of ponderosa pine and sugar pine were present when compared to today.

As part of this analysis, a comparison was made between 1944 photographs and those taken in 1999. The comparison shows a trend toward denser conifer stands with smaller trees. In the relatively short period of time between 1944 and 1999, natural openings and forest stand size appear similar; the main differences seem to be increased density of conifers on south and west aspects, overall increased density in tree canopy, recovery of burned areas evident on the 1944 photographs, and increased fragmentation due to timber harvest and road building. It is expected that historically, dense, late-successional forest habitat was found mostly near drainage bottoms and on the lower third of north aspects. Dense late-successional habitat was limited to sites, which experienced fire less frequently. These were found mostly on cooler, moister north and east aspects of the hardwood/conifer communities and the higher elevation true fir community. More open, late-successional forest was found throughout the analysis area on south and west aspects, and on upper slopes of north aspects. Scattered hardwoods and conifers with open understories were found through much of the low to mid elevations.

Review of research conducted over the past several years can provide additional information on the historical vegetative patterns that existed within the analysis area. Skinner (1995) measured and compared vegetative patterns in aerial photos taken 41 years apart in areas of the Happy Camp Ranger District (west of the analysis area). Significant changes were noted in the spatial characteristics of the openings, meadows and brush in the landscape studied between 1944 and 1985. The pattern of change suggests a more continuous cover of forest has developed over the last half-century, with less variation in the pattern of forest openings. Additionally, it has been noted that snag and log densities were likely lower than at present because of frequent fires (Taylor and Skinner 1995; Agee and Edmonds 1992).

A study of historical fire frequency was recently conducted on the west side of the Forest. This study concluded that prior to European settlement, fires occurred at 4 to 24 year intervals (Skinner 1994). It is very apparent when looking at forest stand conditions from photographs taken in 1935 (Collins-Baldy Lookout photographs) and 1944 (aerial) that large fires were a common occurrence in the area. Fire scars are visible and vegetative patterns indicate the occurrence of large disturbances, commonly along the Klamath River where fires were probably human caused. These fires were of varying severity, but severity was obviously higher on exposed south aspects and ridges.

Fires within the analysis area appear to have been the most frequent disturbance event to shape the historical landscape. Fires occurred much more frequently in most areas than they do today. At lower and mid-elevations, historic occurrence has changed from frequent, low intensity ground fires to infrequent, high intensity stand replacing fires. At higher elevations, historic occurrence has changed from infrequent, low and moderate intensity ground fires to infrequent, low, moderate and high intensity surface or stand replacing fires. The lower severity fires of the past maintained open understories and kept levels of woody debris low. Fire severity varied depending upon the weather, fuels conditions, and

local topography. Native Americans may have had an influence on early fire regimes through the use of seasonal burning as described in the Historic Overview.

Human influences on the distribution and pattern of late-successional forest in the area increased in the mid and late 1800s as mining communities quickly grew up after the discovery of gold at Scott Bar in 1850. As towns, ranches and mining claims were established along the Klamath River the need for timber grew and sawmills were built. Most timber harvest in the late 1800s and early 1900s was concentrated in the more accessible, lower elevation pine and mixed conifer forests. As discussed in the Historic Overview, it wasn't until the 1970s that timber production (clearing of large areas) in the Horse Creek Analysis Area became prevalent and had significant effects on the amount and distribution of late-successional forest.

Terrestrial Wildlife and Plants

Wildlife and plant habitats depend upon vegetation communities and disturbance regimes that determine the characteristics of the vegetation. This discussion of historic habitat conditions (condition of vegetative communities) is based on the descriptions of the historic vegetation patterns from the literature, comparisons between photographs from 1944 and 1999, accounts of early explorers and naturalists, and the known habitat needs of wildlife species.

Key Question #1 - What was the historic distribution of habitats and populations for the identified species?

Subalpine Conifer and True Fir

Stands of true fir and sub alpine conifer forest in the analysis area have not changed significantly from historic times. These forest types occupy cool sites with substantial winter snow; summers are fairly dry, with precipitation from occasional thunderstorms. Fire interval is longer for true fir and subalpine conifer forest types than for mixed conifer types. Fires burning in the true fir forests, both historically and today, span a wide range of intensities, resulting in variable fire severity in space and time. Spatial variation in fire severity, combined with the effects of wind, insects and disease, resulted in a mosaic of older forest ages throughout these higher elevation forests. Due to the longer fire interval (40-65 years) in these forest types, they have not been as heavily impacted by fire suppression, and are only now approaching twice the average fire-return interval found in several studies (Agee, 1993). Because of these minor alterations to the natural fire regime, we still have the ability to perpetuate the mosaic of age classes through the use of fire and other management techniques.

Great Gray Owl

Very little historic information exists on great gray owls. Historic records from *Life Histories of American Birds of Prey* (Bent 1938, reprinted 1961) show great gray owls in Medford, Oregon and McCloud, California (1913). From those historic locations, and more recent sighting information, it can be assumed that great gray owls historically occurred in the higher elevation fir habitats in the Horse Creek Analysis Area. They are uncommon throughout their range in North America and are thought to be declining. Declines have been linked to habitat loss.

American Marten

American martens have been trapped for fur since aboriginal times and are primarily known as furbearers over much of their range. The distribution of martens has undergone regional contractions and expansions, some of them dramatic. The American marten has a smaller distribution now than in pre-settlement historical times; the total area of its geographic range appears similar to that early in this century, when it was at its historical low (Ruggiero et al. 1994).

American marten occupy a narrow range of habitat types, living in or near coniferous forests. More specifically, they associate closely with late-successional stands of mesic conifers, especially those with complex physical structure near the ground. Habitat for marten, prior to European influence, would have been similar to what occurs now in the analysis area; however, it is expected that the upper true fir and subalpine conifer stands were generally more open with numerous, natural, openings that were larger compared to what currently exists within the analysis area. Human activities, such as logging, mining, agricultural practices, roads and homesteading, have reduced the amount of late-successional forest habitat and increased the potential for disturbance in the watersheds.

Wolverine

The wolverine has been characterized as one of North America's rarest mammals and least known large carnivore. Information on wolverines is largely anecdotal. The historic range of the wolverine in California is thought to have included much of the Sierra Nevada province and the mountainous areas of northwestern California. The wolverine's

importance to humans began with the fur trade; they were trapped for their fur along with marten, fisher and other fur bearing mammals. Wolverines were believed to be near extinction by the 1920s. The wolverine's reputation as vicious, and conflicts with trappers, resulted in wolverine being considered as vermin by European-North Americans, an attitude that persisted into the 1960s (Ruggiero, et. al., 1994). Their propensity to raid trap lines and cabins lead to the use of strychnine as a means of trapping. The shrinking range of wolverines coincided with that of wolves in the late 1800s and the early 1900s (ibid.). In some areas, predator control was coupled with the decimation of large mammal populations reducing food availability to wolverines (ibid.). After termination of widespread predator control wolverines did not recover. Low numbers of animals, combined with habitat fragmentation and access that resulted from land-use activities, appear to be having the greatest impacts on wolverine populations.

Klamath Mixed Conifer (Douglas Fir/Mixed Conifer and Ponderosa Pine/Mixed Conifer)

Historically, landscape patterns in the mixed conifer forest type were driven primarily by fire and other natural disturbances (insect and disease related mortality, windthrow, landslides), which varied in frequency and intensity along regional moisture gradients and in response to variable climatic trends. Frequent fires were ignited by lightning, usually in the late summer and early fall. The intensity of presettlement fires encompassed a wide range of fire severity with many fires, or large portions of them, burning at low to moderate severity. Evidence of low severity burns is seen in the predominance of live older trees with fire scars (many of which are healed over) or basal char in these forests; moderate severity burns are indicated by the coincidence of fire dates and regeneration cohorts, suggesting creation of some growing space by post-fire tree mortality (Agee, 1993). It is expected that, at the time of settlement, old-growth forest may have covered half of the forest land base (Garman et. al., 1999). Old-growth forest would have been more open, with patches of early seral forest created by more intense fire, mortality, or other natural disturbance events. Ponderosa pine/mixed conifer forest dominated the south and west aspects and were quite open with a grass/forb understory. Douglas-fir/mixed conifer stands dominated the north and east aspects, and lower portions of drainages on most aspects. Over the past 150 years, settlement activities and timber harvesting have resulted in increased and more predictable fragmentation of the pre-settlement old-growth forest. In addition, the suppression of low and moderate intensity fires for the past 60 years has resulted in an in-growth of white fir and Douglas-fir in the understory, creating stands that are more dense than what is expected to have occurred historically.

Northern Spotted Owl

Historically, spotted owl nesting habitat probably occurred low on north and east aspects and in cool, moist drainage bottoms where historic fire regimes had the least affect on stand structure. More open stands that burned more frequently, stands suitable for foraging and dispersal, occurred on south and west slopes and higher in the drainages. Habitat for owls within the analysis area was well distributed and could be found in all major drainages. Suitable nesting/roosting habitat was likely found across most of the analysis area. Suitable nesting/roosting habitat in these vegetation types would have been somewhat linear, following the north and east aspects of the drainages, with foraging/dispersal habitat covering most of the area in between.

Historic distribution of spotted owls in the analysis area was probably similar to what is found today, with a somewhat higher density. Areas impacted by timber harvest, roads, wildfire, and subsequent fire salvage logging would have supported spotted owls in drainages where little suitable habitat exists now (e.g. upper Salt Gulch, Buckhorn Creek, and upper Doggett Creek. In addition, current fragmentation in the home ranges of individual birds may be exposing owls to greater risks of predation and competition, leading to decreased reproduction and survival from historical times.

Northern Goshawk

Goshawks prefer mature coniferous forests with moderately dense canopy closure and an open understory for foraging through the forest. Their preferred nesting sites are in large trees located at middle and higher elevations on north slopes near water (CDFG, 1990). Suitable habitat in the analysis area is similar to that used by spotted owls. Historically, the more open stands created by a frequent fire interval, would have provided good habitat for goshawks. The higher diversity of habitat types, such as conifer forest interspersed with oak woodlands, meadows, and riparian areas, would have provided a diverse and abundant prey base for goshawks. It is expected that much of the analysis area below the true fir zone would have been good goshawk habitat. The effect of past and present land use activities on goshawk habitat is poorly understood. Activities such as timber harvest, road building, recreational uses, and mining have reduced the available habitat and increased disturbance potential in the analysis area since historic times. Fire suppression activities have lead to forested stands that are denser than in the past. These

stands are more susceptible to catastrophic fires; insect epidemics and disease, resulting in higher tree mortality in the older age classes important to goshawks. Very dense conifer stands currently found in the analysis area may limit the northern goshawks access to prey. These changes to stand structure and habitat availability suggest that current reproductive success and survival of goshawks may be lower than in historic times.

Pacific Fisher

At the time of European settlement, fishers were found throughout the northern forests of North American and Pacific Coast Mountains. Between 1800 and 1940, fisher populations declined or were extirpated in most of the United States and in much of Canada due to over trapping and habitat destruction by logging (Ruggiero et al. 1994). Closed trapping seasons, habitat recovery programs, and reintroduction programs allowed fishers to return to some of their former range. Populations are still extremely low in Oregon and Washington (the Pacific Northwest) and parts of the northern Rocky Mountains (Ruggiero et al. 1994).

Fishers have been categorized as "closely-associated" with late-successional forests (Ruggiero et al. 1991; Thomas et al. 1993). Riparian areas are also considered important for fishers in California and Idaho. Habitat for fisher within the analysis area, prior to European influence, was most likely similar to what currently exists. However, human activities, such as logging, mining, agricultural practices, roads and homesteading, have reduced the amount of late-successional forest habitat and increased the potential for disturbance in the watersheds.

Red Tree Vole

There is no historical information on red tree voles within the analysis area. Recent surveys with positive detections of Oregon red tree voles in the Applegate Watershed of Oregon, and potentially on the Scott River Ranger District, indicate that further surveys are needed to determine if this species of red tree vole occurs in northern California. Habitat for red tree voles is similar to that described above for northern spotted owls, the historical perspective of suitable habitat for spotted owls would apply here for red tree voles.

Mollusks

Reference conditions prior to European influence are difficult to determine for the mollusk species of concern in this analysis. It wasn't until recently that scientists began to conduct surveys and identify the various species locally. Based on the current condition of the species' habitat, reference conditions were most likely very similar to what exists now, except that the forested stands were more open as a result of a more frequent fire regime. Human activities, such as logging, mining, agricultural practices, roads and homesteading, have reduced the amount of late-successional forest habitat where these species are thought to occur.

Montane Hardwood-Conifer, Montane Hardwood

As discussed in the Forest Health section, the montane hardwood-conifer and montane hardwood types have a spatial arrangement and patch size similar to what occurred historically, especially on soil types that favor hardwoods over conifer tree species. However, on suitable soils, it is expected that there is less of the montane hardwood habitat type and an increase in conifer encroachment in both montane hardwood and montane hardwood-conifer types due to the effects of fire exclusion over the last 60 years. Hardwood habitats in the analysis area were adapted to frequent fires and were more open and vigorous than what is found there today.

Turkeys

The wild turkey was not a part of the fauna when the first settlers arrived in California. Turkey-like birds are known from the Pleistocene or Ice Age but those species disappeared during more recent times for unknown reasons. It is believed that ecological or geographic barriers, in the form of the deserts of the southwestern United States and the high north-south mountain ranges, prevented the spread of wild turkeys to the westernmost states. These western states, formerly devoid of wild turkeys, evidently possessed the prerequisites for good turkey habitat, as evidenced by the recent successful introductions (starting in the late 1800s to the present) (Sanderson and Schultz, eds., 1973), including introductions within the analysis area.

Mixed Chaparral and Montane Chaparral

In the analysis area, mixed chaparral habitat types historically occurred on harsh soils, and on south and west facing aspects at low and mid-elevations. Montane chaparral occurs at higher elevations associated with the true fire and subalpine forest types. Chaparral habitats are fire adapted and burned frequently. The frequent fire return interval promoted a mosaic of age classes from patches of older, senescent stands (at approximately 25 to 35 years post fire), to young, vigorous stands with inclusions of grasses and forbs in the understory. It is difficult to determine if there is more or less of the chaparral habitat types in the analysis area due to

several opposing factors that have influenced this type. Comparison of 1944 and 1999 aerial photographs shows that chaparral types have invaded meadows and grassy openings due to the suppression of fire in the area. Conversely, conifers have made significant advances on patches of chaparral when using the 55-year photo comparison. In both situations, it is evident that individual plants have become larger and chaparral habitats in general have become more decadent

Montane Riparian and Riverine

Little is known about riverine and riparian habitats in the analysis area prior to the onset of activities such as livestock grazing, mining, road building, and timber harvesting that began in the early 1800s. As described in the Forest Health Section, these habitat types historically occurred in the same general area as they do today, but riparian vegetation (grasses, sedges, forbs, young willows and alders) adjacent to streams was probably more abundant and vigorous due to the renewing effects of fire, flooding, grazing and activities of beavers. Over the past several decades, there has been an increase of alder habitat that is older, larger, and more decadent, probably due to the effects of fire exclusion and the reduction in grazing (comparison of 1944 and 1999 aerial photographs). There has also been an increase in encroachment of conifers in riparian areas. Overgrazing in the 1800 and 1900s may have successfully limited the encroachment of alders into streamside habitats, but eventually resulted in degradation of riparian habitats, including changes in species composition. As mentioned in previous sections, mining, farming, ranching, and timber harvest had significant effects on the extent and condition of montane riparian and riverine habitats.

Bald Eagle

Historically, the nesting and foraging habitat along the Klamath River and its tributaries was probably similar in distribution to what it is today. The historic anadromous fish runs would have provided a good food source and the old-growth forests near the river would have provided nesting habitat. The amount of nesting habitat along the Klamath River, in lower Horse Creek, and in lower Middle Creek (large old-growth pines) has been reduced in the last century through timber harvest and clearing (especially during the mining era as communities developed, sawmills were established, and roads were built along the River). Bald eagles are commonly seen wintering along the Klamath River and it is likely that they wintered there in historic times. Bald eagles currently are not known to nest along the Klamath River within the Horse Creek Watershed; the reasons for this have not been determined but may be related to the shape of the canyon, the lack of wide pools with slow water, or to the high number of osprey that are known to nest along the Klamath. The territoriality of bald eagles and competing osprey may be a limiting factor for population density. In addition pesticide contaminants, human disturbance and reduced salmon fisheries may impact the number of bald eagles along the Klamath River.

Willow Flycatcher

Willow flycatchers use extensive thickets of low, dense willows along the Klamath River and in wet meadows or near ponds. It is expected that willow flycatchers were historically common in willow thickets along the Klamath River, in lower Horse Creek, in lower Middle Creek, and in montane meadows where willows occurred. It is expected that numbers have declined since historic times due to habitat loss, grazing, fire exclusion which allowed conifers to encroach on meadows, and possibly cowbird parasitism. Extensive mining in the watershed during the gold rush era altered riparian habitats considerably, especially wing dam, dredge, and hydraulic activities. Hydraulic mines required vast systems of reservoirs, ditches, flumes, and pipelines and at one time altered many major tributaries, which flowed in the watershed area. Homesteading and clearing for agricultural purposes along the Klamath River and Horse Creek has also removed riparian willow habitat early in this century.

Historic information on willow flycatcher numbers or pre-grazing habitat quality within the Horse Creek Analysis Area is practically non-existent. Comparison of aerial photographs from 1944 and 1999 show little change in the amount of available habitat. The only changes apparent on the photographs were increased encroachment of conifers into meadows and an apparent increase in size in alder patches. Long-time permittees of allotments in the analysis area suggest that there has been a conversion from open grass/forb meadows to brush/alder thickets since the cessation of seasonal burning and reductions in number of permitted livestock (V. Van Sickle, pers. comm.).

Western Pond Turtle

Documentation on historic western pond turtle populations or habitat quality does not exist for the Horse Creek Watershed. There is mention in historical literature (refer to historical overview) that Indians included turtles as a food source. It is expected that, prior to extensive mining and associated human populations, western pond turtles were common and abundant in the Klamath River. Alterations of aquatic habitats began with the advent

of hydraulic mining in the 1850s. These activities resulted in localized flooding, siltation, and some alteration of habitat in the Klamath River and its tributaries. Fossil records of western pond turtles are known from Pleistocene deposits just outside the current range of the species, indicating that the distribution of the species was once more widespread. The current range of the western pond turtle is similar to its range prior to the arrival of European man on the west coast; however, the range has been fragmented by human activities. In many areas, only isolated small groups or individuals remain within significant portions of the range (Holland 1991).

Logging and cattle grazing, which began in support of the miners in the mid-1800s, also impacted aquatic habitats through increasing erosion, siltation and direct and indirect alteration of the habitat. The most notable declines in western pond turtle populations have occurred outside of the analysis area, in lower elevation riparian habitats (such as warm shallow lakes, ponds, and riverine habitats) that have been converted to agricultural lands and urban developments.

Foothill Yellow-legged Frog

Little historic information exists for foothill yellow-legged frogs. Populations are thought to be declining from historic numbers. Reference conditions for streams in the analysis area have been described above and are the same for frogs. Bullfrogs have been implicated in declines in the Sierra foothills (CDFG, 1988).

Cascades Frog

Little historic information exists for cascade frogs. Populations are thought to be declining from historic numbers. Reference conditions are similar to those described above for western pond turtles, foothill yellow-legged frogs, and willow flycatchers.

Montane Meadow

Montane meadows were historically similar in spatial location, but were larger than what is found today. Frequent lightning fires, and potentially Native American burning, may have contributed to the size of montane meadows and species composition. Conifer, alder and brush encroachment have reduced the size of meadow openings (based on comparison of 1944 and 1999 aerial photographs and anecdotal information from local residents). Historic information from Forest Service grazing allotment files indicates that barren areas and sparsely vegetated meadows on the Siskiyou Crest, in the red fir zone, were once covered with native grasses and forbs adequate to feed large numbers of livestock (Horse Creek and Dry Lake Allotments Watershed Analysis, 1996). Heavy grazing by sheep and cattle in the mid to late 1800s and early 1900s is expected to have changed the species composition and adversely affected soil fertility on the Siskiyou Crest (ibid.).

Caves, Cliffs and Talus

It is expected that there has been little change in these unique habitat features over time. The spatial configuration for caves, cliffs and talus habitat is the same as it was historically, although there have been changes to adjacent vegetative communities and potentially to the microclimates surrounding these sites. With the advent of hard rock mining, there has been an increase in mine tunnels and “cave-like” habitat since historic times.

Peregrine Falcon

Peregrine falcons are limited by suitable cliffs and ledges for nest sites. There are no known peregrine eyries within the analysis area and no typical cliff habitat. Large rock outcrops along the Siskiyou Crest may provide habitat but have not been surveyed, this type of habitat has not been altered since historic times. Peregrine may forage in the analysis area; the amount and distribution of foraging habitats, including oak woodlands, riparian areas, conifer forest, and meadows, was probably similar to what currently exists in the analysis area. Although habitat for peregrines has not changed appreciably, numbers of animals may be down from historic populations due to drastic declines in the last several decades from pesticide contamination. Through recovery efforts, peregrine numbers are increasing.

Bats

Although little is known about the historical occurrence of bat species, it is reasonable to assume that they have always occurred within the analysis area. Changes in harvest methods, the amount of timber harvest, and the effects of fire suppression over the last 50 years have likely affected bat populations in positive and negative ways. Mining activities during the last century, where deep mine shafts were carved into hillsides, may have had beneficial effects on bat species by providing roosting habitat.

Terrestrial Salamanders

There is little or no historic information on Del Norte and Siskiyou Mountain Salamanders. Recent surveys have suggested that these species' ranges are much broader than previously thought. Within

the analysis area it is expected that the abundance and distribution of salamanders was historically similar to what exists now. However, changes in forest structure may have affected local abundance, for example: fire suppression activities have created more dense forest stands which may have lead to better conditions, an increase in abundance, and wider distribution locally (e.g. south slopes); conversely, forest practices, such as timber harvest, road building and mining, may have reduced suitable habitat in patches, leading to extirpation of small populations. It stands to reason that salamanders were adapted to the historic fire regime and, due to fires occurring during the hot, dry time of year, they were below the surface and protected from flame and excessive heat. The abundance and distribution of individual populations would have changed through time depending on the intensity and distribution of the fires.

Wide-Ranging Species in the Analysis Area

Deer

Prior to settlement by European man (before the 1700s), deer in California appear to have been abundant, but less so than in modern times because of the lack of large-scale habitat disturbance (wildfire, clear cutting). Deer are well known to be a "seral" species that thrive on disturbed (early successional) habitat dominated by shrubs and herbaceous plant species that are succulent and nutritious (Leopold, 1950). Deer are less abundant in densely forested areas.

Before the arrival of European man, the Shasta Indians occupied the area in which the Klamath deer herd occurs. These Native Americans utilized deer extensively for food, clothing, and utensils. According to Indian history, the Marble Mountains abounded in deer, elk, and bear (CDFG, 1989).

The descriptions of early 1800s explorers and settlers provide the closest estimate of what deer and other wildlife populations may have been like before European settlers. From these accounts, it appears that deer were originally numerous in the coastal mountains from San Diego to the Klamath River in foothills and valleys, but were apparently scarce in the dense forests in the northwest.

Jedediah Smith traveled over much of California in 1827-1828. He indicated that deer were abundant along the Trinity and Klamath Rivers, but when his party explored the mountains north of the Klamath, they saw no deer.

The Gold Rush Era saw a dramatic decline in deer numbers due to high levels of unregulated market hunting to supply venison and hides for the mining camps. From 1850 until about 1903, commercial deer hunting camps and market hunters operated throughout the State of California.

By 1892, when the first National Forests were established, most of the timber areas of California were being exploited, and tremendous areas had been slashed and burned. In subsequent years, the clearings developed into brush fields, which supported many more deer than the original forest; hence the process of timber clearing, while it might have been enormously destructive of resources as a whole, was only temporarily deleterious to deer. In addition, the elimination of unrestricted hunting, combined with increasingly effective enforcement, contributed substantially to the increase of deer first noticed in the period 1910 to 1920 (CDFG, 1993). Predator control apparently contributed to the rapid increase of deer in the period 1910-1930 and may have contributed to local overpopulation of deer in the 1950s (Longhurst et al., 1952). By the 1960s and 1970s deer numbers declined. The current deer population trend is lower than it was from 1950 through the early 1970s, but greater than most estimated historical levels prior to 1940.

Domestic livestock were brought to northern California over 150 years ago. Miners and homesteaders raised livestock to supply food for local residents and for transportation. As the Scott Valley area became settled and ranches were established, cattle and sheep were moved into the adjacent mountains to forage. In the early 1900s, grazing was largely unregulated and livestock numbers were as much as five times higher than what is currently permitted on the Forest today. The longer grazing seasons of February through December allowed animals to graze plants in the more phenologically sensitive times of early summer and early winter. The continued high use of the mountain rangelands created degraded conditions in some areas; forage production was reduced. The land affected by grazing today is a much smaller portion of the watershed.

The historical effects of livestock grazing may have ultimately increased the numbers of deer in the State, as perennial grasslands were converted to a diverse array of shrub or annual grass/forb types. Many of the shrubs and other plant species that invaded or increased on disturbed rangeland were more palatable and digestible for deer than were the perennial forage species (Wallmo 1981). In addition, seasonal burning of the range maintained early seral or open conditions in many areas of the watershed.

Elk

Elk are grazers that move up and down the slope, depending on the season. Historically, the more open oak woodlands and conifer forests with grassy understories provided excellent elk habitat. Native Americans utilized elk extensively for food, clothing, and utensils. Roosevelt elk were once abundant in the Klamath Mountains, but were extirpated at the turn of the century due to high levels of unregulated market hunting and habitat loss.

Elk became a major food source for thousands of immigrants moving into the gold fields of the Salmon Mountains (Klamath Mountains) after 1850. Accounts of meat hunting by the miners are numerous. The demand for meat brought such high prices that many miners abandoned their claims to make a good living market hunting. The effect of such uninhibited shooting decreased elk numbers in many areas. Market hunting prospered for over half a century. Records show hide, meat, and jerky camps existed in Happy Camp and Cecilville from 1850 to about 1903.

Extensive cattle, sheep, horse and mule grazing in the analysis area in the late 1800s and early 1900s may have had negative effects on elk in the area. Elk and livestock compete for the same forage; competition is known to be especially critical when rangeland conditions are poor (Chapman and Feldhamer, Eds. 1982). Often, the reason for range deterioration is heavy livestock grazing, such as took place in the analysis area in the late 1800s. Competition for forage may have been a factor in the decline of elk populations in the area.

The Forest began a reintroduction program on the Happy Camp and Oak Knoll Districts in the 1980s in cooperation with the California Department of Fish & Game. The populations in Elk Creek (west of the analysis area) and Horse Creek have grown steadily through successful reproduction and immigration of elk from herds in the Applegate drainage in Oregon and in Hilt, California.

Special Interest Plant Species

Clustered Lady's Slipper Orchid, Mountain Lady's Slipper Orchid, and Pacific Fuzzwort

For the clustered lady's slipper orchid, mountain lady's slipper orchid, and Pacific fuzzwort, reference conditions are difficult to determine. In some areas, species habitat has been reduced by large timber harvest operations and stand-replacing catastrophic fires, magnified by years of fire suppression. In other areas, fire suppression and cessation of Native American burning has resulted in maturation of younger stands, creating closed-canopy forests that may have created additional favorable habitat. Overall, habitat for these species was likely more abundant prior to the advent of commercial logging in the 1940s.

Henderson's Horkelia

Reference conditions for Howell's horkelia are likely to have been considerably better prior to the construction of roads along the Siskiyou Crest, and the over-grazing of the 1800's that occurred on the sensitive soils on which this species occurs. It is unknown if there were more populations of this species within the analysis area, but the one known population at Dry Lake is bisected by a road that was most likely constructed through the population.

Howell's Lousewort and American Sawwort

Reference conditions prior to European influence are difficult to determine for these species of concern. Based on the current site occupancy, reference habitat conditions were most likely very similar for Howell's lousewort and for the American sawwort. The habitat conditions for these species (high-elevation forest openings and wet meadows) have been altered very little since the introduction of European influence. Within the analysis area, the habitat is found within an unroaded area that has had very little impact. The over-grazing of the Siskiyou Crest that occurred during the 1800's may have degraded some habitat, but it appears to have recovered within the analysis area. The rarity of these species is primarily a reflection of the natural rarity of the habitat, and not the result of man-caused impacts.

Botanical Special Interest Areas

White Mtn. Botanical Special Interest Area

White Mtn. Botanical Special Interest Area (SIA) has most likely not changed since the introduction of European influence. The area is located within an unroaded portion of the Siskiyou Crest and the subalpine flora has probably not been affected by grazing. The wet meadows within the SIA appear to have not been impacted by grazing significantly.

Horse Creek Botanical Special Interest Area

Reference conditions for the Horse Creek SIA are difficult to determine. The area occurs along a wide portion of low-gradient floodplain that has probably been subject to repeated flood events in the past. These naturally occurring events have created a

vegetation type that is in constant flux. The area is currently occupied by later seral conifer and riparian hardwood stands, but at one time may have been occupied by early seral stands. The only man-caused change to this area is a road that was built along the creek. The natural processes that maintain this dynamic riparian forest are probably unchanged from reference conditions.

Key Question #2 – How were exotic species introduced and spread in the Analysis Area?

Bullfrogs

Native to the eastern United States, the bullfrog was introduced into California several times early in the 20th century. They are now common and widespread in the State.

Opossums

First introduced in San Jose, California in 1910, opossums now occur widely in cultivated areas at lower elevations (Jameson and Peeters, 1988). The occurrence of opossums in the Klamath River region is probably fairly recent (last several decades) based on increasing number of sightings over the years.

Dyer's Woad

Dyer's woad (Marlahan mustard) is a noxious weed that was likely introduced into the area in the first half of the 1900s. It was first introduced into the United States during the Colonial period in Virginia where it was cultivated as a blue dye (Farrah 1987). Near the beginning of the 20th century it arrived in northern California in contaminated alfalfa seed.

Scotch Broom

Scotch broom, a native to Europe and Asia, was probably introduced into the analysis area in the later 1800's or early 1900's. The shrub produces fragrant bright yellow flowers, and it was originally brought into the United States as a landscaping plant. Within the analysis area, many sites along the main stem of Horse Creek, Middle Creek, and the Klamath River were homesteaded, and Scotch broom was a common landscaping plant that was brought into the area with the settlers. It has subsequently spread along roadsides within the analysis area.

Scotch Thistle

Scotch thistle is a native of Eurasia and the Mediterranean. It is now sparsely naturalized over much of the United States.

Squarrose Knapweed

The infestation of squarrose knapweed started at the Jesse Knight silo, about 3 miles west of Eureka, Utah. In 1954 the infestation covered a few hundred acres over a 5-square-mile area. From that introduction, knapweed has spread over much of the western United States.

Yellow Starthistle

Yellow starthistle was introduced from southern Europe and the Mediterranean region in the mid-1800s, it is a serious rangeland weed throughout the western United States.

Problems with invasive plants have increased dramatically in recent decades, due in part to increasing use of public lands. Greater disturbance of the land (agriculture, grazing, timber harvest, road building, and human access from roads) encourages the introduction, establishment, and spread of invasive plants. The high road density in the Horse Creek Analysis Area (on average greater than 4 miles per square mile) contributes to the establishment and spread of invasive plants.

Roads

Key Question #1 - Why and how was the road system developed?

Pre 1930

Prior to inception of the Federal Aid Road Act in 1916, the Federal Highway Act in 1921, the Forest Road Development Program in 1925, and the Works Progress Administration, the normal method of travel in the analysis area was by foot, mule, or horse over early historic trails with a few rough wagon roads. The transportation system in the landscape has developed over the years primarily in association with resource development and/or extraction.

When the Klamath Forest Reserve was established in May of 1905, transportation in the western half of Siskiyou County was primitive, with roads established only to Happy Camp on the Klamath River and to Forks of Salmon on the Salmon River. Travel was by horse drawn wheeled vehicles or horseback. Early road construction followed old trail alignments and centered around providing access for workers and equipment to mines. In 1916 under the Federal Aid Road Act work began on the Klamath River Highway and in 1923 the highway was complete. All districts could be visited by automobile and the area opened

to tourism. In 1925 the Forest Road Development fund financed the start of the Horse Creek and Oak Knoll – Dry Lake Road projects.

1930-1950

Road development continued in this era with the CCC taking the lead. The primary objective was developing a transportation system to meet the requirements for adequate fire protection.

In 1935 a Klamath Transportation study was developed. The primary objective was to enhance the fire protection in Forest Service Region 5. In 1942 emphasis was redirected to mineral access roads in support of war related activities.

1950-Present

Most of the remaining roads in the area were constructed to access timber harvest beginning in the late 1950's. In 1984 the Condrey Mountain area (3100 acres) became Released Roadless. Maps and information can be found in the Klamath Forest Plan. Examination of early Klamath Forest Maps (1911 - present) shows the progression of road building within the analysis area.

Human Uses

Key Question #1 - What were the prehistoric and historic human uses in the analysis area?

For a description of the prehistoric and historic human uses of the analysis area, see the Historic Overview write-up at the beginning of this Step. As a supplement to the write-up, additional detail on commercial timber harvest is described below.

Commercial Timber Harvest

Commercial timber harvest on National Forest lands has occurred in the watershed since the 1900s, with single tree selection being the primary silvicultural prescription (personal communication Varak, 2001). Regeneration cutting was used intensively in the watershed starting in the 1950's. Regeneration cutting requires re-planting and is mapped and tracked in our silvicultural database. However single tree selection does not require replanting and has not tracked. Between our mapping discrepancy and the loss of records, an accurate estimate of total acres harvested cannot be given.

Using the acres of plantations as a proxy for harvest acres, a minimum total of 6,210 acres (16%) of the analysis area has had some level of timber harvest. (The highest level of harvest occurred in the 1980-1989 decade, which includes the catastrophic fires of 1987 (Ft. Copper). The 1990s had the second highest harvest level and included completing the salvage logging from the 1987 fires. For the locations of areas harvested, see **Figure 4–3** *Timber Harvest By Decade*, contained in the Map Packet located at the end of this document.

The acres harvested by decade are identified in **Table 4-2** *Acres of Plantations by Decade.*

Table 4 – 2. Acres of Plantations by Decade.

Decade	Acres of Plant-ations	% of Total Plantation Acres	% of Total NF Lands in Analysis Area
1990-Present	1,650	24	2
1980-1989	2,550	48	4
1970-1979	1,560	7	<1
1960-1969	140	18	1
1950-1959	310	3	<1
TOTAL	**6,210**	**100**	**16**

* Source: *Forest Plan* Managed Stands Layer & Stand Record System Database