# CHAPTER 2 – AFFECTED ENVIRONMENT

This chapter contains descriptions of existing physical, biological, cultural, social, and economic resources, processes and characteristics of the Cascade-Siskiyou National Monument (CSNM). Descriptions of these resources and processes will serve as the baseline for the analysis and determination of the effects of the proposed alternatives on the existing environment. These resource descriptions are discussed only in the detail needed to analyze the known effects of the plan implementation. The affected environment is described according to the various resources, processes, and uses in the Monument.

# Monument Setting

The Cascade-Siskiyou National Monument (CSNM) consists of 52,947 acres of federal land located in southern Jackson County, Oregon (map 1). The CSNM is located in the Klamath and Rogue River basins and four watersheds that have a combined total of approximately 780 miles of streams. The topography of the CSNM is variable with the area around Agate Flat being nearly level to slopes in excess of seventy percent along the headwalls of creeks in the Klamath River-Iron Gate watershed. Elevation ranges from 2,400 feet along Emigrant Creek to 6,134 feet at the top of Chinquapin Mountain. Average annual precipitation for this area ranges from 24 to 46 inches with most coming in the form of rain below 3,500 feet and snow above that level.

The CSNM is noted for its biological and ecological diversity because of its location at the confluence of the Siskiyou range of the Klamath Mountains, Cascade Mountains and the Great Basin Geological Provinces. Each geological province providing its own special assemblage of organisms and ecological processes known as ecoregions which are based on geology, climate, soils, flora and fauna, elevation, and land use. There are three ecoregions identified in the CSNM having particular biological significance in terms of species richness, endemism, and unique evolutionary/ecological phenomenon (map 3).

Archaeological evidence indicates that people have lived in the region for at least 10,000 years. Human populations were very low in numbers and highly mobile until about 7,000 years ago. Various native peoples inhabited or used the CSNM area including the Shasta, the Klamath and Modoc tribes. Euro-American settlement in the Rogue and Shasta valleys from the 1850s on spurred the development of a new way of life in the region. Farmers and ranchers began to transform the land. Cattle and sheep ranching became a significant use in the CSNM during the latter half of the nineteenth century. Livestock grazing of cattle on an allotment basis continues today across the Monument with authorized active use of approximately 3,754 animal unit months (AUMs).

Logging became more important in the area now identified as the CSNM after the development of transportation routes, such as the railroad in the 1880s. Large scale salvage logging, partial harvests, and selective logging began in the 1940s. Logging continued through the 1980s with clearcutting being the preferred harvest method. In the 1990s, timber harvest levels significantly decreased in the area now designated as the CSNM although approximately 83 percent of the coniferous forest has a timber harvest history.

There are approximately 470 miles of road on approximately 85,173 acres of land across all ownerships associated with the CSNM. Of this total, the BLM controls approximately 251 miles of road that accesses the 52,947 acres of public land designated as the Monument. These roads provide access for recreation, private property and management activities such as wildfire suppression.

The majority of the CSNM is in a moderate to high fire hazard as a result of past vegetation management and suppression activities. Fire has played an important role in influencing historical ecological processes and continues to be recognized as playing an important role in the development and maintenance of vegetative diversity in fire prone ecosystems found throughout the CSNM. Prescribed fire is a tool which could be used to lower fire hazards and meet objectives for vegetative communities within the CSNM.

# Land Ownership

The Cascade-Siskiyou National Monument covers 52,947 acres of federal land in southwest Oregon (map 1). These federal lands are managed by the Bureau of Land Management's Medford District Office. Although there are approximately 32,222 acres of non-federal lands interspersed among the federal land within the Presidential Proclamation boundary (map 1), the Cascade-Siskiyou National Monument is comprised of only federal land (map 2). The description of the affected environment may include non-federal land because natural resources such as soil, water, and vegetation are often evaluated on a landscape basis. This does not infer that non-federal lands would be managed according to this Plan. This Cascade-Siskiyou National Monument Resource Management Plan only affects the 52,947 acres of federal land.

# Ecological Processes and Landscape Health

The ecological and biological importance of the Cascade-Siskiyou National Monument has long been recognized (Carroll and others 1998, Detling 1961, Nelson 1997, Prevost and others 1990). The establishment of the CSNM recognizes the high biological species and plant community richness of the area.

Much of this richness is due to the Monument's geographical location at the meeting of the Cascade, Klamath and Eastern Cascade Slope Ecoregions (Pater and others 1997a) and their subdivisions, the Klamath River Ridges and Siskiyou Foothills (Klamath Ecoregion), Southern Cascades (Cascade Ecoregion), and the Southern Cascade Slope (Eastern Cascade Slope Ecoregion) (map 3). Ecoregions should not be confused with Geological Provinces which are based strictly on geological criteria. Ecoregions are delineated on the basis of geology, climate, soils, flora and fauna, elevation, and land use. Each ecoregion brings its own special assemblage of organisms and ecological processes to the Monument landscape. Of major importance is the role that the CSNM plays in contributing to the biological and ecological significance of the Klamath Ecoregion.

Several recent papers describe unique aspects of the Klamath-Siskiyou region of northwestern California and southwestern Oregon to the west of the CSNM. DellaSala and others (1999) describe the Klamath Siskiyou Bioregion (similar to an Ecoregion) as being of particular biological significance in terms of species richness, endemism, and unique evolutionary/ecological phenomenon, as compared to other temperate coniferous forests.

Coleman and Kruckeberg (1999) describe the dynamic plate tectonics of the Klamath-Siskiyous, and the mixing of igneous, metamorphic, and sedimentary geological formations that resulted in the diverse lithologies and soils of the Bioregion. Coupled with periods of geological isolation and a range of environmental conditions, the

complex history of the area has resulted in a rich array of plant communities which has attracted the interest of ecologists of the caliber of Robert Whittaker, Richard Waring, Leroy Detling, Frank Lang, and Arthur Kruckeberg as well as local nature lovers.

## Landscape Criteria

Evolution, long term climatic change, and geological phenomena (vulcanism, mass wasting, erosion) operating across geological time continue to contribute to the high biological and ecological richness of the area. However, the emerging science of landscape ecology identifies several landscape criteria, such as connectivity and habitat fragmentation, that strongly effect the biological integrity of the CSNM in the short-term.

Many have commented (Carroll and others 1998, DellaSala and others 1999, Noss and Cooperrider 1994) of 'connectivity', implying the need to preserve and facilitate the habitat continuity necessary for the dissemination and longer term migration of rare plants, plant communities and wildlife dependent on late seral conifer communities. This section uses late seral conifer continuity as a substitute for the concept of connectivity. Spatial habitat requirement information for all organisms (rare or otherwise) across the landscape (implied by the definition of connectivity) is lacking. Conifer continuity implies present and potential habitat for conifer community dwelling organisms not adapted for long range dispersal (measured in miles), as coarsely identified by satellite imagery or potential vegetation based on USDA (1993) soil types. Regional satellite imagery shows the area of conifer continuity between the Cascade and Klamath mountains (and ecoregions) across the Siskiyou range north of the Rogue/Klamath Divide (map 4). However, the I-5 corridor, numerous roads, and timber harvest within and beyond the bounds of the CSNM all represent disruptions in the late-seral conifer continuity. Dispersal habitat for Northern Spotted Owls reflect this pattern (map 28).

Habitat Fragmentation - "the breakup of extensive habitats into small, isolated patches that are too limited to maintain their species stocks into the indefinite future" are an associated form of landscape degradation which could lead to species loss and favor weed invasion (Meffe and others, 1997). Surveys of rare plants have identified threatened and endangered species within the CSNM. Halpern and Spies (1995) studied species diversity in natural and managed forests of the Pacific Northwest. They found that few understory species were restricted to, or absent from, a particular seral stage. However, a majority of plant species showed greatest abundance in old-growth. Conversely, Jules and others (1999) found some plant and wildlife species more closely associated with particular seral stages, including clearcut areas and old-growth remnants. However, both groups favored the maintenance of spatial and temporal diversity for maintaining plant species diversity.

Ecosystem processes and interaction, such as frequency, severity and size of disturbances, are all important criteria in characterizing disturbance. The altered nature of the CSNM landscape is clearly indicated by recognizing that timber harvest, rather than fire, has become the dominant landscape-level disturbance process. High elevation white fir forest communities where root rots are the historical disturbance factor is the exception. The present frequency and size of timber harvest units could be postulated to be similar to historical conditions caused by fire. Patterning and severity (except for white fir plant communities) are substantially changed. Present patterning follows landownership boundaries and remains rigid through time. Timber harvest units tend to disregard topography and often are of similar size (Sections). Past timber harvest on private and public land was frequently stand replacement clearcuts with the removal of the larger, older trees, while historical underburns left larger, older trees.

Current management objectives within the coniferous forest of the CSNM include facilitating and maintaining late-successional (late seral) and old-growth habitat. However, the existing checkerboard pattern of federal land ownership of the CSNM coupled with short harvest rotations on private land have interrupted late seral conifer continuity. Timber harvest on private lands frequently approximates a stand replacement event. Such events were probably not uncommon in mixed conifer communities in the recent historical past. During pre-European times, however, stand replacement by fire usually occurred as isolated patches within a larger area of underburns. At present, where fire escapes suppression, deforested patch size is larger than during historical times, and fires are characterized as stand replacement rather than an underburn (Agee 1998). Fragmentation is greater now than during recent historical times. A greater portion of the landscape is currently acutely disturbed and edge effects and recovery times to attain mature trees have increased due to increased stand replacement events (clearcutting, and intense wildfire).

While little is known of the genetic variability within and between populations of isolated organisms, further fragmentation could be a threat to the continued persistence of isolated late-successional conifer organisms (Jules and others 1999). Climatic edge effects may also impact the persistence of high canopy conifer community associated plants and wildlife if patch size is too small. Ecologists commonly buffer disturbed areas by tens to hundreds of feet to correct disturbance edge effects on habitat availability of organisms adapted to conditions within the stand.

Map 5 illustrates the cumulative acute surface impacts on the landscape (woody overstory removal and altered ecosystem functioning by processes other than fire) derived from aerial photos (1939, 1953, 1974, 1996), known roads and OHV trail locations, and other areas altered relative to historical condition. All roads, OHV trails, areas of tree overstory removal, pasture creation, and known weed impact were buffered by 100 meters, as an average impact distance for the range of organisms found in our landscape. Table 2-1 indicates that all coarse plant communities have been severely impacted in the past 50 years.

Semi-wet meadows show the highest percent acute disturbance, while grasslands, shrublands, and woodlands show low acute disturbance (CSNM plant communities are described in the Vegetation Section). The percentages in Table 2-1 are conservative estimates. Many conifer areas not showing acute disturbance in the past 50 years have been selectively logged. Also, the effects of long-term grazing and fire suppression were not included as acute disturbance. Note that the more highly fire-dependent

**Table 2-1. Percentage Acute Disturbance for Plant Communities with Analysis Area**

| Plant Community | Percent Acute Disturbance |
|---|---|
| Grassland | 50.8 |
| Shrubland | 41.7 |
| Woodland | 45.2 |
| Mixed Conifers | 80.3 |
| White Fir | 81.6 |
| Semi-wet meadows | 90.5 |
| Wet meadows | 82.8 |

grasslands, shrublands, and woodlands plant communities, are considered endangered and at highest risk of loss due to fire exclusion. This discussion and Table 2-1 indicates that the CSNM landscape is considerably altered when compared to historical conditions.

Calculations of the area covered by different plant communities across the CSNM landscape indicate the relative importance of plant communities as refugia for plants and animals (see Table 2-18). Some of the rarest plant communities (semi-wetlands and wetlands) have been particularly impacted by historical livestock management within the CSNM landscape. Wetlands and semi-wetlands are also of particular importance as specialized habitat and as a wildlife water source.

While much of this discussion implicates the spatial integrity of conifer plant communities, isolated stands of conifers embedded within other plant communities also serve an important ecological function across the landscape as stepping stones for more widely dispersed species. Such island habitats may also constitute areas of speciation, and contribute to the genetic diversity of organisms across the landscape. The CSNM contains several such conifer islands on the southerly facing slopes south of Keene Creek Ridge and the Rogue/Klamath Divide moving from high elevation downwards towards the California border. While several of these stands have been impacted by timber harvest, all contribute to habitat diversity. These stands frequently have distinct tree assemblages, such as the old-growth mixed conifer stands with dominant sugar pine within the Oregon Gulch RNA. However, most of these isolated stands bear the consequences of fire exclusion in the form of dense understories of Douglas-fir and white fir.

Other ecological processes that could be considered at the landscape scale, but are described at the community level of biological organization within this chapter, include changes in dominant species, species range extension/contraction, weed invasion, and tree pathogen proliferation.

# Cultural Resources

## Historical Use

Cultural resources include the physical remains of an area's past human use, as well as those areas which are significant for traditional cultural uses or spiritual practices. A region's cultural history is essential to understanding and predicting the cultural resources within it, and to define the human interactions with the land which have contributed to the condition of the current environment. Cultural resources in the CSNM are managed under various federal laws and regulations, and by those management plans or actions that apply within it. Cultural resource laws also define the importance of tribal consultation when developing management plans that involve areas in which tribes have an interest. This section provides a brief cultural history as a background for the discussion of the cultural resources found within the CSNM, and discusses existing management concerns specifically pertinent to cultural resources.

Archaeological evidence indicates that people have lived in the region for at least 10,000 years. During that time people derived their material needs from the physical environment by hunting, gathering and fishing.

Human populations were very low in numbers and highly mobile until about 7,000 years ago. After that time populations increased in size, and regular camps appeared in the archaeological record. For the next 5,000 years the people of this region lived in small bands, moving seasonally across the landscape in search of resources, in

increasingly well-defined group territories. By 2,000 years ago, however, a new way of life was well-established.

The new way of life was characterized by larger populations, well-defined group territories, and a higher degree of sedentism than existed previously. Permanent villages, occupied annually for at least part of the year, appeared along the Klamath and along major tributaries to the Rogue River. Inhabitants of these villages still followed a seasonal regime, hunting and gathering in the uplands as game and resources became available. Populations continued to grow, and group interactions intensified, as indicated by an increase in regional trade and warfare. Social hierarchies developed, with wealth items representing higher status among individuals of families. This way of life continued until contact with Euro-Americans in the nineteenth century.

Various native peoples inhabited or used the CSNM area at the time of contact. The Shasta had numerous villages along the Klamath River north of the Shasta Valley, and also occupied the southern end of Bear Creek Valley in the Rogue River Basin. Members of the Klamath and Modoc tribes, situated mainly to the east in the Klamath Basin, may have used the eastern part of the CSNM (Agate Flat, Jenny Creek) for various purposes. The Takelma of the Rogue Valley may also have used the uplands in the northern part of the CSNM. All of these groups followed a traditional way of life in which relations to the natural world and to each other were encoded in myth and maintained by rituals. For these tribes, certain plants, animals, and places on the land had inherent spiritual qualities.

There were numerous resources upon which these native peoples depended. Roots and bulbs, such as camas (*Camassia*) and various forms of *Perideridia* (e.g. ipos, yampa) provided starchy staples as did acorns from oak trees. Fish, deer, elk, and small mammals provided staple proteins, augmented by a wide variety of berries, nuts, seeds (e.g. tarweed seeds, *Madia* spp.). Other plants and animals were used for fiber, tools, clothing, and medicines. Within the CSNM, these resources were abundant along major streams, in the upland meadows, and especially in the flatter, more open areas in the east along Skookum Creek, Jenny Creek, and in Agate Flat.

Native peoples employed a number of techniques to enhance those resources useful to them. Fire was probably the most significant tool. Fire assisted in promoting and maintaining staple crops, such as acorns and tarweed, and maintained open meadows and prairies, which were crucial locations for subsistence resources including game, roots, bulbs, berry patches, and grass seeds. Fire also promoted habitat important to large game. Burning took place at specific intervals during the spring or fall. This burning contributed to the development and maintenance of prairies and savannahs, oak and oak/pine woodlands, and upland meadows.

This native way of life was severely disrupted with the advent of Euro-Americans, beginning with Peter Skene Ogden's exploration in 1827. Ogden came from the east, following the Klamath River, then headed north over the Siskiyou mountains following an Indian trail into the Bear Creek valley. Ogden's trip, for the British Hudson's Bay Company, was the first of many to follow the north-south route over the Siskiyous. Known as the Oregon-California (O&C) or the Siskiyou Trail, this route was a major conduit of change to the region. Between about 1830 - 1850 numerous trappers, explorers, and others traveled along this route. They brought new people, practices, diseases, plants and animals through and to the region, as well as spreading fear and animosity among the area's current inhabitants.

Severe conflicts broke out in the 1850s between the Indians and the newcomers, with the discovery of gold and advent of thousands of miners and settlers to the region. During the 1850s and 1860s native peoples were largely removed from the CSNM area. Many

died from the warfare, disease, and starvation; others were captured and taken to reservations in the northern part of Oregon. The Klamath and Modoc Indians were confined to the Klamath Reservation east of the Cascades. Some Shasta families, however, managed to remain in the Shasta Valley and along the Klamath River, or escaped from the northern reservations to find their way home.

Euro-American settlement in the Rogue and Shasta valleys from the 1850s on spurred the development of a new way of life in the region. Farmers and ranchers began to transform the land. Newcomers built roads following the Siskiyou Trail and the Klamath River, and the Applegate trail east of Ashland. Irrigation works began to move water across the landscape. Hunters severely depleted local game, and brought local extinction to grizzlies, wolves, antelope, and mountain sheep. Recreational use of the area for hiking, hunting, and fishing also began around the turn of the century.

Cattle and sheep ranching became a significant use in the CSNM during the latter half of the nineteenth century. Ranches were established along the Klamath River corridor and its major tributaries, especially along Jenny Creek and Camp Creek, and along Bear Creek in Bear Valley. Like the native peoples before them, ranchers frequently burned the land to promote browse, and used the uplands seasonally for pasture. Grazing was unregulated, and by the early twentieth century many of the pastures and rangelands had been badly damaged from overgrazing. Indiscriminate burning, unlike the careful regime of the native peoples, had damaged timber resources as well.

The memoirs of George Wright provide a fascinating insight to past livestock management and plant community changes within the CSNM. Two excerpts follow (for more refer to Appendix C).

> During the spring of 1889 and 1890 ... hundreds of cattle had just been loosed on the rangeland to graze the southward slopes of hillsides between Hornbrook and the Pilot Rock area ... (George F. Wright, The truth about Reelfoot p.4 ).

> Years ago there was a sheep camp during the summer months on the west side of Bald [Soda] Mountain ... The Bald Mountain area was a wonderful place for grass but the sheep men would herd their sheep there year after year until the grass was killed out. Weeds of different kinds have taken the place of the grass. About 1923 after the sheep had ruined the range, the cattlemen banded together and bought the sheep camp and the land, probably 160 acres. They also leased more land around there in order to keep the sheep men away. (Memoirs of George Wright, Bald Mountain, February 6, 1954 #614).

Logging became more important in the CSNM after the development of transportation routes, such as the railroad in the 1880s, and with the development of the orchard industry and its demand for wooden packing boxes. Small mills existed in the Ashland area and in the area around Lincoln east of Ashland. Major railroad logging operations existed east of the CSNM, with logs from the pine forests of the flat plateau chuted down to the Klamath River and floated to a mill at Klamathon. These early years of logging focused on the most accessible stands of timber, at lower elevations and on the high plateaus in the east, and on sugar pine. It was not until the middle of the twentieth century that developments in logging and transportation technology made logging of high elevation timber stands more feasible.

The advent of government management in the early decades of the twentieth century brought significant land management policies to the area now recognized as the CSNM. Game laws and regulations helped local game populations. Federal grazing regulations eventually helped slow the degradation of some upland areas, and begin the slow,

gradual process of recovery. Fire suppression became a mission, and fire suppression policies began to transform the local vegetation patterns. A fire lookout was established on Soda Mountain in 1933.

Recreation continued to be important in the CSNM throughout the twentieth century. Today, the Pacific Crest National Scenic Trail runs north-south through the area, bringing many hikers through the area and passing by Pilot Rock. People still use the area seasonally to hunt and fish. More recent recreational use includes the use of off-highway vehicles (OHV), which allow individuals access to the area with a minimum of improved roads.

For more cultural history of the CSNM, refer to the cultural sections of the watershed analyses for the Klamath-Iron Gate and Upper Bear Creek areas.

## Archaeological Sites

Cultural resources include archaeological sites relating to the period of Native American habitation, historic era remains, and areas of traditional cultural importance such as spiritual sites or root gathering areas. There are numerous archaeological and historical sites in the CSNM area.

Specific traditional use areas for Native Americans are as yet undefined. However, according to the traditional Klamath way of life, the value of various resources were integrated with each other and not seen as distinct. That is, the places where people lived or worked or camped--today's archaeological sites--were intimately connected with the distribution of plants and animals and vistas which gave sustenance and often spiritual meaning to the people who used the area. Hence, for the Klamath, the notion of "cultural resources" incorporates significant native plants, animals and viewsheds, as well as the remains of camps or task areas.

Traditional cultural plants and spiritual places, such as Pilot Rock, are also important to the Shasta tribe, today.

### *Native American Sites*

Systematic archaeological surveys in the eastern half of the Monument (east of Soda Mountain) have located close to one hundred sites relating to native peoples' use of the area. Native peoples came to these areas to hunt and gather. None of these sites have been excavated or formally evaluated. Surface remains, however, suggest that most of these sites were related to seasonal use. These are areas where open meadows, oaks, and game still exist. The Agate Flat area also has an abundance of naturally occurring chert (cryptocrystalline silicate) which was an important stone used for tools. Many of the sites show signs of assaying and quarrying toolstone. Several Native American burial sites are also reported for this area (MDO cultural resource files).

Few systematic archaeological surveys have been done in the western part of the CSNM. Nonetheless, several known sites are associated with the extensive system of upland meadows and springs west of Soda Mountain. Sites would also be expected to occur up the major drainage and along the major ridgelines.

### *Historic Sites*

Perhaps the most significant historic site in the CSNM is the remains of the Siskiyou Trail, which is still extant west of Interstate 5 just north of the California border. Rock alignments, blazed trees, and a scatter of artifacts such as cast-off ox shoes document this historic route. A project to further study, document, and retrieve historic materials along this route occurred in the spring of 2000.

The Applegate Trail, a portion of the California National Historic Trail designated in 1992, traverses the area from Greensprings summit to Grouse Butte following much of

what is now Highway 66 (see Plate 1). Interpretive markers erected along the trail route by the Southern Oregon Historical Society provide brief messages about the area.

Important issues associated with the Applegate Trail include its preservation and interpretation. Existing and potential conflicts include surface disturbing activities which might disturb archaeological sites associated with the trail.

Historic remains in the CSNM include a complex of structures at the former Box-O Ranch, dating from the late nineteenth and early twentieth century, including barns, sheds, a ranch house, irrigation ditches and a wagon road. Elsewhere in the Monument there are historic cabins that relate to the early ranching days, such as the Bean Cabin just west of Soda Mountain. Though no longer extant, the cabin's remains were studied to determine the original construction. Other historic remains include ditches, dumps, and structural remains generally related to the ranching history of this area.

# Geology

The Cascade-Siskiyou National Monument (CSNM) is primarily within the Cascade Mountain Range. The western edge of the CSNM is a part of the much older Klamath Mountain geologic province. The Cascade Mountain Range is comprised of a wide variety of continental volcanic rocks. This volcanic province is divided into two distinct north-south belts: the older Western Cascades and the younger High Cascades (map 6).

The rocks of the Western Cascade Range began erupting around 40 million years ago, and stopped about 10 million years ago (Orr, Orr and Baldwin,1992). During this time the coast line in Oregon ran northwest through the region of the Willamette Valley. The volcanoes of the Western Cascade Range were created by the subduction of the Farallon plate beneath the North American crustal plate. This movement of enormous crustal plates triggered intense volcanic activity.

The Western Cascades in this area are primarily composed of the Colestine and Little Butte Creek Formations. They are approximately 16,500 feet thick and form a stratigraphically complex sequence of continental volcanic, volcaniclastic and sedimentary rocks (Smith and others 1982). They vary from basalt, to basaltic andesite, to andesite. There are numerous tuffaceous, pyroclastic, and sedimentary interbeds. During this volcanism the region was subjected to many intrusions of mafic to felsic dikes, sills, plugs, and stocks. The Colestine Formation is at the base of the Western Cascades. This formation contains ash flow tuff, some of which contain fossil leaves, cones, and plant fragments. Some of these fossiliferous out crops are near Pilot Rock. When this rock was being deposited the region was lower in elevation than it is today and considerably warmer. The beautifully preserved Oligocene plant fossils of metasequoia, sycamore, ferns and more are found within this fine grained, white tuff (Orr 1981).

One of the most striking features of the Western Cascades in this area is Pilot Rock, located near the southern boundary of the study area. It is a volcanic plug - the feeder vent to a now eroded volcano. It is an outstanding example of the "inside" of a volcano. Pilot Rock has sheer, vertical faces up to four hundred feet above its base on a talus slope. It has classic columnar jointing caused by cooling of the hornblende andesite that makes up Pilot Rock (Purdom n.d.).

Other notable geologic features within the Western Cascades include Soda Mountain, Hobart Bluff, and Parsnip Lakes. Agate Flat is a unique flat table land toward the southeastern portion of the study area. This area has been a popular area for rock hounders to collect agate, jasper and petrified wood.

There was a period of no volcanic activity in the region from about 4 to 5 million years ago. It was during this time that the Western Cascade Range was uplifted, tilted eastward, and further eroded. These rocks form an east to northeast dipping homoclinal sequence with dips ranging from 5 to 30 degrees (Smith, 1982). Erosion, assisted by subtropical climates, stripped the material from the volcanoes and redeposited it (Orr, Orr and Baldwin,1992). The drainage patterns in the area are deeply dissected and well-developed in response to landsliding and surface erosion.

The CSNM area north of Highway 66 and extending to the eastern boundary are made up mostly of the High Cascade Range. This range, which started erupting about 4 million years ago and continues at present, virtually buried the severely eroded Western Cascades. The first eruptions of the High Cascades were shield volcanoes and cinder cones. Later, the High Cascades produced a variety of lavas and tuffs, dominated by basalts, which were erupted from a number of composite cones (Orr, Orr and Baldwin,1992).

Jenny Creek roughly follows the contact of the High Cascades and the Western Cascades. Chinquapin Mountain and Little Chinquapin Mountain are a part of the High Cascades. These younger High Cascade shield volcanoes are responsible for the present day topography of the northern portion of the Monument.

A unique feature of the CSNM is the proximity of the Klamath Mountains to the Cascade Range. The geology of the southwestern area of the CSNM is a part of these much older rocks. The Klamath Mountains are made up of seven different exotic terranes that were once parts of the ocean crust or island archipelago environments. Formed in an ocean setting, these tectonic slices were carried toward the North American land mass via plate tectonics. Upon arrival they were accreted to the existing continent, folded and faulted.

The Klamath Mountains were later intruded by granitic rocks (Orr, Orr and Baldwin,1992). One of these intrusions is the granitoid Ashland Pluton, which is age dated at 167 to 148 million years old (D'Allura 1997). Mt. Ashland Pluton is overlain non-conformably by the late Cretaceous Hornbrook Formation. The Cretaceous Hornbrook Formation (135 to 65 million years) is one of the youngest formations within the Klamath Mountains. It is sedimentary sands, muds, silts and volcanic material. Well preserved bottom dwelling clams, snails and cephalopods can be found as fossils. They represent shallow water continental shelf conditions.

The much older Klamath Mountains are adjacent to the Cascade Range near the Siskiyou Summit area. At one time, the Bear Creek Valley and the Colestine Valley were joined but, over time, the Siskiyou Summit fault was uplifted and created a pass where the valley once was. The Siskiyou Summit fault is one of the most significant faults in Oregon and has moved thousands of feet (M. Elliot, Geology, Southern Oregon Univ., pers communication, 1991). At the Siskiyou Pass area these two geologically distinct mountain ranges meet.

# Soils

Soils vary in the Cascade-Siskiyou National Monument (CSNM) with land form and source material. The topography is variable in the CSNM with the area around Agate Flat being nearly level to slopes in excess of seventy percent along the head walls of Scotch Creek, Camp Creek and Dutch Oven Creek. Elevation ranges from 2,400 feet along Emigrant Creek to 6,134 feet at the top of Chinquapin Mountain.

Most of the soils were formed in alluvium or colluvium from hard volcanic rocks and, as a result, are often shallow or have a high rock content that affects their water holding capacity (map 7). The volcanic parent material has also influenced the mineralogy of the soil as a large proportion (approximately 50%) of the soils in the CSNM have montmorillonitic clay mineralogy. Soils with montmorillonitic clays have a high shrink/swell ratio which results in large cracks in the soil when it is dry and swelling upon wetting. These soils are very sticky and slippery when wet and have potential for movement at steeper slopes. Mechanical damage to soils containing montmorillonitic clays are difficult to repair, especially the soils with high rock content. Refer to map 8 for location of soils with montmorillonitic mineralogy in the CSNM.

Soils on wet alluvial margins and meadows are typically Klamath (99) and Sibannic (167). These very deep, poorly drained, fragile soils are frequently flooded for long periods between March and May. As a result, rooting depth is usually limited by a water table from March through June. The location of these and other fragile soils in the CSNM are shown on map 9.

The major soils series on the hill slopes of the Western Cascades are typically McMullin (113), McNull (114), Skookum (173), and Tatouche (190). These are well drained, moderately deep to deep soils with clayey subsoils (with varying amounts of coarse fragments), except for McMullin, which is a shallow and loamy soil. Soil patterns and landscape in this part of the Monument are very complex due to differing degrees of weathering of the mixed basalt/tuff/breccia of the Western Cascade material. Soils with clayey subsoils have low strength when wet, while sediment derived from these soils is very fine and becomes suspended in solution (water) for extended periods of time. As a result, these soil types are also susceptible to cutbank failures and turbid runoff.

Soil series in the Agate flat area are Carney (27) and Randcore/Shoat complex (152). The Carney soil series is moderately deep and consist of montmorillonitic clay. The Randcore/Shoat complex consists of a shallow, extremely stony loam soil in association with a moderately deep, loamy soil. This complex occurs as patterned land on the landscape. Soils in the Agate Flat area on alluvial fans ranging in slopes from 12 to 20 percent are the Farva (58), which is a moderately deep, cobbly loam soil, and Tatouche (190) which is a deep, gravelly clay loam over a clay. All of these soils except for Tatouche have soil moisture limitations as a result of depth, rock content, or heavy clay. Refer to the General Soils map (map 10) for location of these soils on the landscape and see Appendix D for characteristics of the identified soils. Also refer to the *Soil Survey of Jackson County* (USDA 1993) for soil descriptions, interpretations and more detailed mapping.

Most of the soils in this area exhibit erosion rates near natural levels except where recent harvesting has occurred or roads have been built. Generally, these areas will have erosion rates noticeably above natural levels for the first three to five years after a disturbance. Natural surface roads and/or roads not maintained often erode above natural rates as a result of being poorly drained or rutted from use during the wet season. Refer to the transportation section for the amount and condition of roads in the CSNM.

Most of the soils in the CSNM are productive but many have limitations of high rock content and/or a perched water table (in the spring time). Soils along ridge lines tend to be shallow which limits water holding capacity. Tree species and grass compete for water and minerals in disturbed forest stands. When stands are opened during tree harvest more sunlight reaches the ground and, as a result, grass species can invade the site. This often affects the types and numbers of soil microbial populations and their ability to synthesize organic material into nutrients available for plant growth. The microbial population of a grass dominated soil is predominantly of bacteria, while an old-growth forest is predominantly of fungi. A fungal dominated soil is more conducive

to tree growth, as ectomycorrhizal fungi aid trees by mediating nutrients and water uptake, protecting against pathogens and maintaining soil structure.

### Coarse Woody Debris and Soil Health

Large materials (e.g., coarse woody debris, stems, large branches) are important for healthy soil biology. Woody materials influence soil nutrient availability, soil moisture, and soil organism population levels. Soil organisms play a fundamental role in many site processes because they interact with each other and their environment. Soil organisms promote carbon cycling, nutrient transfer, water availability, vegetation vigor, and maintain soil structure. Most biological nitrogen fixation in ecosystems occurs because of soil organism activity. Mycorrhizal fungi increase the absorbing surface area of roots, which directly increases the total soil volume that can be utilized for nutrients and water. Mycorrhizal fungi and other microbes effect soil structure by helping bind soil particles into water-stable aggregates which create soil volume with stable and adequate pore space. Soil pore space is essential for adequate water and air movement required by plants and soil organisms. Many forest dwelling plant and animal species depend on soil organisms and/or fungi for food sources.

Coarse woody debris (CWD) information was collected in four ecoregions of the CSNM. These sampling sites were located in Northern Spotted Owl core areas which represent undisturbed or lightly disturbed old-growth/mature timber stands. This information provides current status of coarse woody debris in these mature stands and was used in determining future coarse woody debris target levels in the Monument Coarse Woody Debris Standards and Guidelines (Appendix JJ).

## Climate

The climate in the Cascade-Siskiyou National Monument is influenced largely by the Pacific Ocean, which produces hot, dry summers and mild, wet winters. During the winter months, the moist, westerly flow of air from the Pacific Ocean results in frequent storms of varied intensities. The isohyetal map produced by Oregon Climate Services (Map 11) shows average annual precipitation in the Monument ranging from a low of approximately 24 inches where Jenny Creek crosses the Oregon/California border to a high of approximately 46 inches at Hyatt Lake. Average annual precipitation is also low at the southwest corner of the Monument (less than 26 inches) and where the western edge of the Monument boundary intersects Emigrant Creek (approximately 27 inches). Winter precipitation in the higher elevations usually occurs as snow, which ordinarily melts during the spring runoff season from March through June. Rain predominates in the lower elevations with the majority occurring in the late fall, winter, and early spring. The area where a mixture of snow and rain occurs is referred to as either the rain-on-snow zone or transient snow zone. The snow level in this zone fluctuates throughout the winter in response to alternating warm and cold fronts. Rain-on-snow events originate in the transient snow zone. The rain-on-snow zone in the Bear Creek and Cottonwood Creek Watersheds and the Scotch Creek Subwatershed ranges from approximately 3,500 feet to 5,000 feet. The rain-on-snow zone for Jenny Creek Watershed and Camp Creek and Fall Creek Subwatersheds is estimated to occur from 3,000 to 4,000 feet (Squyres 2000). Table 2-2 shows the acres and percent of each precipitation zone by subwatershed (see Hydrology) and the zones are displayed on Map 12.

**Table 2-2. Precipitation Zone Distribution within the CSNM**

| Hydrologic Units | Hydrologic Unit Code (HUC) | Rainfall Zone[1] (acres/%) | Rain-on-Snow Zone[2] (acres/%) | Snow Zone[3] (acres/%) |
|---|---|---|---|---|
| Bear Creek Watershed | 1710030801 | 2,947 (21%) | 9,267 (68%) | 1,482 (11%) |
| Upper Emigrant Creek Subwatershed | 171003080101 | 2,947 (21%) | 9,267 (68%) | 1,482 (11%) |
| Jenny Creek Watershed | 1801020603 | 0 | 20,305 (42%) | 27,594 (58%) |
| Upper Jenny Creek Subwatershed | 180102060301 | 0 | 204 (7%) | 2,866 (93%) |
| Johnson Creek Subwatershed | 180102060303 | 0 | 403 (91%) | 42 (9%) |
| Middle Jenny Creek Subwatershed | 180102060304 | 0 | 5,580 (39%) | 8,775 (61%) |
| Keene Creek Subwatershed | 180102060305 | 0 | 3,532 (21%) | 13,059 (79%) |
| Lower Jenny Creek Subwatershed | 180102060306 | 0 | 10,586 (79%) | 2,852 (21%) |
| Klamath River-Iron Gate Watershed | 1801020604 | 382 (3%) | 8,057 (60%) | 5,078 (37%) |
| Fall Creek Subwatershed | 180102060401 | 0 | 575 (100%) | 0 |
| Camp Creek Subwatershed | 180102060402 | 123 (1%) | 3,665 (43%) | 4,804 (56%) |
| Scotch Creek Subwatershed | 180102060403 | 259 (6%) | 3,817 (88%) | 274 (6%) |
| Cottonwood Creek Watershed | 1801020606 | 2,363 (24%) | 7,390 (73%) | 312 (3%) |
| Upper Cottonwood Creek Subwatershed | 180102060601 | 1,780 (26%) | 4,834 (72%) | 105 (2%) |
| Lower Cottonwood Creek Subwatershed | 180102060602 | 583 (18%) | 2,556 (76%) | 207 (6%) |

1/ Rainfall Zone is less than 3,500 feet for Bear Creek Watershed, Cottonwood Creek Watershed, and Scotch Creek Subwatershed. Rainfall Zone is less than 3,000 feet for Jenny Creek Watershed and Camp Creek and Fall Creek Subwatersheds.

2/ Rain-on-Snow Zone is 3,500 to 5,000 feet for Bear Creek Watershed, Cottonwood Creek Watershed, and Scotch Creek Subwatershed. Rain-on-Snow Zone is 3,000 to 4,000 feet for Jenny Creek Watershed and Camp Creek and Fall Creek Subwatersheds.

3/ Snow Zone is greater than 5,000 feet for Bear Creek Watershed, Cottonwood Creek Watershed, and Scotch Creek Subwatershed. Snow Zone is greater than 4,000 feet for Jenny Creek Watershed and Camp Creek and Fall Creek Subwatersheds.

There are three National Oceanic and Atmospheric Administration (NOAA) weather stations adjacent to the CSNM: Green Springs Power Plant (elevation 2,435 ft.) along Emigrant Creek on the western CSNM boundary, Howard Prairie Dam (elevation 4,567 ft.) in upper Jenny Creek on the northern boundary, and Copco Dam (elevation 2,700 ft.) on the Klamath River approximately 2.5 miles from the southeast CSNM boundary. Precipitation distribution by monthly average for these three stations is shown in Table 2-3.

The majority of precipitation falls during November through March (66-69 percent of the yearly total). Annual precipitation can fluctuate widely from year-to-year. The 30-year average (normal) annual precipitation at the Green Springs Power Plant station is 22.44 inches (Western Regional Climate Center 2000), at the Howard Prairie Dam station it is 32.79 inches (Western Regional Climate Center 2000), and at the Copco Dam station it is 19.8 inches (WorldClimate 2000). It is noted that average annual precipitation values from the Green Springs Power Plant and Howard Prairie Dam NOAA Stations are approximately four inches lower than values shown on the isohyetal map (Map 11). The isohyetal lines are generated by the PRISM model that uses point data from NOAA weather stations and a digital elevation model (Oregon Climate Services 2000).

**Table 2-3. Precipitation at NOAA Stations - Monthly Means for 1961-1990**

| NOAA Station | Precipitation (inches) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Green Springs[1] | 2.97 | 2.42 | 2.41 | 1.85 | 1.45 | 0.87 | 0.36 | 0.54 | 0.95 | 1.56 | 3.36 | 3.70 |
| Howard Prairie[1] | 4.78 | 3.84 | 3.50 | 2.40 | 1.78 | 1.22 | 0.51 | 0.69 | 1.09 | 2.20 | 5.04 | 5.72 |
| Copco[2] | 2.8 | 2.1 | 2.1 | 1.3 | 1.2 | 0.8 | 0.3 | 0.6 | 0.7 | 1.5 | 3.1 | 3.3 |

1/ Source: Western Regional Climate Center 2000
2/ Source: WorldClimate 2000

During the summer months, the area is dominated by the Pacific High pressure system, which results in hot, dry summers. Summer rainstorms occur occasionally and are usually of short duration and limited area coverage. Summer thunderstorms occur in the CSNM with the frequency increasing from the western boundary to the eastern boundary.

The nearest NOAA weather stations with air temperature data are Ashland, Howard Prairie Dam, and Yreka, California. Average monthly maximum, mean, and minimum air temperatures for these three stations are displayed in Tables 2-4, 2-5, and 2-6.

**Table 2-4. Average Monthly Max, Min, and Mean Air Temperatures at Ashland NOAA Station (1948-2000)**

| | Air Temperature (ºF) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
| Max | 46.4 | 52.2 | 56.2 | 62.5 | 69.9 | 78.0 | 86.7 | 85.4 | 78.9 | 66.5 | 52.7 | 45.8 | 65.1 |
| Min | 29.7 | 31.8 | 33.4 | 36.3 | 41.6 | 47.4 | 51.5 | 50.9 | 45.5 | 38.6 | 33.9 | 30.1 | 39.2 |
| Mean | 38.0 | 42.0 | 44.8 | 49.4 | 55.8 | 62.7 | 69.1 | 68.1 | 62.2 | 52.6 | 43.3 | 37.9 | 52.2 |

Source: Western Regional Climate Center 2000

**Table 2-5. Average Monthly Max, Min, and Mean Air Temperatures at Howard Prairie NOAA Station (1960-2000)**

| | Air Temperature (°F) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Year** |
| Max | 37.3 | 42.2 | 46.1 | 52.2 | 61.1 | 69.9 | 78.8 | 78.7 | 72.5 | 60.9 | 43.5 | 36.4 | 56.6 |
| Min | 20.0 | 22.0 | 24.5 | 28.2 | 33.8 | 40.0 | 44.2 | 43.6 | 38.1 | 32.5 | 26.8 | 21.4 | 31.3 |
| Mean | 28.6 | 32.1 | 35.3 | 40.2 | 47.4 | 54.9 | 61.5 | 61.1 | 55.3 | 46.7 | 35.2 | 28.9 | 44.0 |

Source: Western Regional Climate Center 2000

**Table 2-6. Average Monthly Max, Min, and Mean Air Temperatures at Yreka, CA NOAA Station (1948-2000)**

| | Air Temperature (°F) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** | **Year** |
| Max | 44.1 | 50.8 | 56.0 | 63.2 | 72.4 | 80.8 | 90.5 | 89.4 | 82.1 | 69.4 | 53.3 | 44.2 | 66.3 |
| Min | 24.3 | 27.3 | 30.2 | 34.4 | 40.4 | 47.0 | 52.3 | 51.2 | 45.0 | 36.4 | 29.9 | 25.3 | 37.0 |
| Mean | 34.2 | 39.0 | 43.1 | 48.8 | 56.4 | 63.9 | 71.4 | 70.3 | 63.6 | 52.9 | 41.6 | 34.8 | 51.7 |

Source: Western Regional Climate Center 2000

Real-time weather information and road conditions for I-5 just north of the Monument boundary are available from the Oregon Department of Transportation web site:

- http://www.TripCheck.com/RoadCond/izone7.htm.

The web site features two live cameras: one located at the Mt. Ashland exit and the other near Siskiyou Summit. It also displays a weather station that provides up-to-date weather information for Siskiyou Summit.

Current climatic patterns need to be viewed with a long-term perspective. Based on tree-ring growth rates and recorded meteorological data, the past 200 to 300 years have been marked by cycles of hot, dry spells and temperate-to-cool weather that have lasted varying periods of time (LaLande 1995).

# Hydrology

The CSNM is located in the Klamath and Rogue River basins and four watersheds: Jenny Creek, Klamath River-Iron Gate, Cottonwood Creek, and Bear Creek. Table 2-7 and Map 13 display the hydrologic units that fall partially or completely within the CSNM.

**Table 2-7. Hydrologic Units within the CSNM**

| Hydrologic Units | Hydrologic Unit Code[1] (HUC) | Acres within CSNM | | Stream Miles within CSNM[2] | |
|---|---|---|---|---|---|
| | | BLM | Total | BLM | Total |
| Rogue River Basin[3] | | | | | |
| Middle Rogue Sub-basin | 17100308 | 6,181 | 13,694 | 40.4 | 104.4 |
| Bear Creek Watershed | 1710030801 | 6,181 | 13,694 | 40.4 | 104.4 |
| Upper Emigrant Creek Subwatershed | 171003080101 | 6,181 | 13,694 | 40.4 | 104.4 |
| Klamath River Basin | 180102 | | | | |
| Upper Klamath Sub-basin | 18010206 | 46,766 | 71,479 | 324.4 | 477.5 |
| Jenny Creek Watershed | 1801020603 | 29,067 | 47,899 | 161.4 | 277.9 |
| Upper Jenny Creek Subwatershed | 180102060301 | 2,425 | 3,071 | 11.4 | 13.6 |
| Johnson Creek Subwatershed | 180102060303 | 440 | 445 | 2.7 | 2.7 |
| Middle Jenny Creek Subwatershed | 180102060304 | 6,283 | 14,355 | 27.6 | 77.9 |
| Keene Creek Subwatershed | 180102060305 | 9,305 | 16,591 | 51.4 | 100.0 |
| Lower Jenny Creek Subwatershed | 180102060306 | 10,615 | 13,438 | 68.3 | 83.7 |
| Klamath River-Iron Gate Watershed | 1801020604 | 12,502 | 13,516 | 121.8 | 126.2 |
| Fall Creek Subwatershed | 180102060401 | 292 | 575 | 0.9 | 1.1 |
| Camp Creek Subwatershed | 180102060402 | 7,991 | 8,592 | 75.8 | 79.3 |
| Scotch Creek Subwatershed | 180102060403 | 4,220 | 4,349 | 45.1 | 45.8 |

**Table 2-7. Hydrologic Units within the CSNM**

| Hydrologic Units | Hydrologic Unit Code[1] (HUC) | Acres within CSNM | | Stream Miles within CSNM[2] | |
|---|---|---|---|---|---|
| | | BLM | Total | BLM | Total |
| Cottonwood Creek Watershed | 1801020606 | 5,197 | 10,063 | 41.2 | 73.4 |
| Upper Cottonwood Creek Subwatershed | 180102060601 | 2,377 | 6,719 | 16.0 | 43.7 |
| Lower Cottonwood Creek Subwatershed | 180102060602 | 2,821 | 3,345 | 25.2 | 29.7 |

1/ Hydrologic Unit Code is a unique identifier for each hydrologic unit. The first eight digits are designated by the U.S. Geological Society.
2/ Stream miles are from the BLM GIS Hydrography Theme prior to completion of the spatial densification.
3/ Rogue River Basin does not have its own HUC as it is within the Southern Oregon Coastal HUC 171003.

Natural lakes in the Monument area include Hobart Lake in the Upper Emigrant Creek Subwatershed and Parsnip Lakes in the Keene Creek Subwatershed. Portions of Parsnip Lakes are on BLM-administered land while Hobart Lake is not in the CSNM. Large reservoirs within the CSNM Proclamation boundary include the southern portion of Hyatt Lake Reservoir and Keene Creek Reservoir, both in the Keene Creek Subwatershed. There are three other major reservoirs just outside the Monument boundary: Howard Prairie Lake, in the Upper Jenny Creek Subwatershed, Emigrant Lake in the Lower Emigrant Creek Subwatershed, and Iron Gate Reservoir on the Klamath River in the Iron Gate Subwatershed (California). Hyatt, Keene Creek, Howard Prairie, and Emigrant reservoirs are managed and operated by the Bureau of Reclamation and the Talent Irrigation District. Hyatt, Howard Prairie, and Emigrant reservoirs are operated primarily for irrigation in the Bear Creek Watershed, with additional benefits of hydroelectric production and recreational opportunities. Keene Creek Reservoir provides temporary storage for releases from Howard Prairie Lake (via canal) and Hyatt Lake (via Keene Creek). Water is diverted from the Keene Creek Reservoir via canal and penstock to the Green Springs Power Plant located on Emigrant Creek approximately two miles above Emigrant Lake. Iron Gate Reservoir is owned and operated by PacifiCorp as a re-regulating reservoir to offset peak flows that are discharged from two hydroelectric projects upstream of Iron Gate. It also produces electricity, but has no flood control benefits. Many small reservoirs used for livestock watering, irrigation, and forest management activities are located throughout the Monument.

There are numerous springs in the CSNM. Some springs are shown on U.S. Geological Survey (USGS) 7.5 minute topographic maps. The largest spring in the Monument is probably Shoat Spring in the Lower Jenny Creek Subwatershed. This spring forms Spring Creek, a tributary to Jenny Creek, from which 10 cfs of water is diverted and transported to Fall Creek to operate a PacifiCorp hydroelectric plant. The municipal water rights for 15 cfs from Fall Creek are held by the City of Yreka which diverts the water into a pipeline before it reaches Iron Gate Reservoir. Wetlands inventoried by the U.S. Fish and Wildlife Service (USFWS) are displayed on the USFWS wetland maps available on the USFWS Internet site. Mapped wetland locations in the CSNM portions of Klamath River-Iron Gate Watershed and Bear Creek Watershed may be found in the corresponding watershed analysis documents (USDI 2000a and 2000b).

Stream miles in the Monument are shown in Table 2-7. Three types of stream categories are defined in the Medford District Resource Management Plan (USDI 1995a) for riparian reserve protection: fish-bearing, perennial nonfish-bearing, and intermittent. Only a portion of the streams in the CSNM have been inventoried to determine their

stream category. Perennial and intermittent stream classification was determined from aerial photos for the Klamath-Iron Gate and Upper Bear Creek Watershed Analyses (USDI 2000a and USDI 2000b). The majority of stream miles within the Monument are intermittent.

There are no continuous streamflow-monitoring stations on non-flow regulated (natural flowing) streams within the CSNM. Unregulated streamflows in the Monument fluctuate with seasonal variation of precipitation. Moderate to high flows generally occur from mid-November through May. Streamflows during the months of March, April, May, and part of June are augmented by melting snowpack in the high elevations. Low flows normally coincide with the period of low precipitation from July through October. The BLM installed a streamflow gaging station on Jenny Creek (regulated by Hyatt and Howard Prairie Reservoirs) downstream of the former Box-O Ranch in the fall of 1997 and it became fully operational in the fall of 1999. At this time, no streamflow data is available from this station.

Peak streamflows in the CSNM are the result of a combination of natural and human-caused factors. Natural factors contributing to peak flows include high intensity storms, snow melt, rain-on-snow events, and severe, extensive wildfires. Human influences having the potential to increase peak flow magnitudes above natural conditions include road construction, timber harvest, land clearing, fire suppression, and reservoirs. High road densities that may contribute to increased peak flow magnitudes are a concern in portions of the Monument within Jenny Creek and Bear Creek Watersheds and the Fall Creek Subwatershed within the Klamath River-Iron Gate Watershed. Timber harvest and land clearing in the Jenny Creek and Bear Creek Watersheds have decreased canopy closure and increased transient snow zone openings to an extent that they are likely to contribute to increased peak flow magnitudes in some drainages. The fire suppression policy of the past century has resulted in a build-up of unnatural fuel loadings, high vegetation density, and a change to fire-prone vegetative conditions. These conditions contribute to the Monument being highly susceptible to a catastrophic wildfire. The high intensity fire produced by a catastrophic wildfire would severely damage soils over large areas and destroy the vegetative cover, including riparian vegetation. Vegetative and soil conditions resulting from a catastrophic wildfire would likely cause a substantial increase in peak flow magnitudes and decrease the time to peak. Direct interception of precipitation by the reservoir surfaces in the Jenny Creek Watershed result in instant delivery of precipitation into the stream system which affects the timing and magnitude of peak flows.

Augmentation and diversion of flows in the Jenny Creek Watershed for purposes of irrigation and hydroelectric production in the Bear Creek Watershed greatly complicate the instream flow regime for Jenny and Keene Creeks within the Monument. Howard Prairie Lake receives water that is diverted from South Fork Little Butte Creek and its tributaries (in the Little Butte Creek Watershed to the north of Jenny Creek Watershed). Water diversions from Hyatt and Howard Prairie reservoirs, from Soda and Beaver Creeks by Talent Irrigation District (TID), and from Spring Creek by PacifiCorp export approximately 30,000 acre feet of water annually from the Jenny Creek Watershed (USDI-BLM 1995b). This quantity represents 28 percent of the estimated total runoff that would otherwise be available to support the basin's aquatic organism populations (USDI-BLM 1995b). Stream systems that have significant increases in summer flows due to augmentation include Fall, upper Keene, Tyler, and Emigrant Creeks. Reservoirs in the Jenny Creek Watershed are not managed for flood control and consequently, the reservoirs may reach full pool early in the water year. When this occurs, peak flows may approximate pre-dam conditions as surplus reservoir water enters the stream system.

The lowest streamflows in the Monument occur during the summer due to both natural and human-caused factors. Natural factors affecting summer flows include low summer

rainfall and sustained high evapotranspiration. Summer streamflows in Jenny Creek Watershed are highly influenced by human-caused factors such as water withdrawals, reservoir storage, and interbasin transfers. Low summer flows in the other areas of the CSNM are also affected by water withdrawals, but to a lesser extent. Potential indirect human-caused factors affecting low summer flows include riparian vegetation removal resulting from timber harvest, improper livestock grazing, or residential/agricultural clearing. Loss of riparian vegetation can lead to channel widening, channel agradation, or lowering of the water table (Platts 1991). Channels that become wider and shallower have an increased stream surface area that can be heated up and lost to evaporation and more efficiently drain the adjacent floodplains. Lower water tables signify that less water is moving into the stream channel and thus there would be a subsequent reduction in low flows.

The only existing instream water rights within the Monument were filed by the Oregon Department of Fish and Wildlife (ODFW) for Jenny Creek from Johnson Creek to Keene Creek (Table 2-8). The instream water rights have a priority date of October 26, 1990 and were created to benefit anadromous and resident fish rearing. BLM, in cooperation with Oregon Water Trust, applied to the Oregon Water Resources Department in 2000 for a water right transfer from irrigation water rights for the Box-O Ranch to instream use for the enhancement of aquatic and fish life and water quality.

**Table 2-8. Instream Water Rights in CSNM**

| Stream Name | Instream Water Rights (cfs) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Jenny Creek[1] | 8.0 | 12.0 | 16.0 | 16.0 | 16.0 | 10.0 | 6.8 | 4.6 | 4.0 | 5.0 | 5.0 | 8.0 |

Source: OWRD 2000 1/ From Johnson Creek to Keene Creek

The Oregon Water Resources Department (OWRD) is currently conducting an Oregon general stream adjudication in the Klamath River Basin. An adjudication is the Oregon statutory process for quantification and determination of all rights to water, the use of which was initiated before February 24, 1909, and federal reserved water rights, including the rights of Indian tribes and their members. The Klamath Adjudication is the first Oregon general stream adjudication in which complex federal claims have been filed. The BLM filed claims in 1997 for federal reserved water rights under Public Water Reserve 107 for 33 springs in the geographic area of the CSNM, prior to its designation. However, since the period for filing claims ended before the designation, water rights for purposes of the CSNM are not included in the ongoing adjudication. The OWRD completed the claim review in August 1999 and conducted an open inspection of claims from October 1999 through March 2000. The contest filing period was held from April to May 2000. All the BLM Public Water Reserve 107 claims for federal reserved water rights within the CSNM geographic area were contested. The next step in the adjudication process will be for OWRD to refer groups of contests to a hearings officer panel.

The June 9, 2000 proclamation that established the Cascade-Siskiyou National Monument "reserved, as of the date of this proclamation and subject to valid existing rights, a quantity of water sufficient to fulfill the purposes for which this monument is established." This statement in the CSNM proclamation signifies that BLM has a federal reserved water right with a priority date of June 9, 2000 for an amount of water that is necessary to support the plant and animal species identified in the proclamation (i.e., a variety of plant communities including wet meadows and riparian vegetation, rare and endemic plants, fresh water snails, three endemic fish species, butterflies, important populations of small mammals, reptile and amphibian species, ungulates, and numerous bird species including the threatened Northern Spotted Owl). The federal

reserved water rights would include all water sources necessary to meet monument purposes, such as springs and instream flows. The amount of water reserved would be based on requirements of the species involved. Quantification of the federal reserved water rights for the CSNM will need to be determined. The BLM reserves the right to assert its federal reserved water rights established by the CSNM proclamation.

# Water Quality

The Clean Water Act requires states to identify designated uses of water bodies as a component of the water quality standards. The designated uses are important because they determine the water quality criteria that will be applied to that water body. The Oregon Department of Environmental Quality (ODEQ) has designated the following uses for the Bear Creek Watershed: domestic water supply (municipal and private), industrial water supply, irrigation, livestock watering, anadromous fish passage, salmonid fish rearing, salmonid fish spawning, resident fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetics quality, and hydropower (ODEQ 1992). The upper portion of the Klamath River Basin crosses from Oregon into California. The 1957 Klamath River Basin Compact between Oregon and California recognizes the following designated uses for the Jenny Creek, Klamath River-Iron Gate, and Cottonwood Creek Watersheds: domestic water supply; livestock watering; irrigation; protection and enhancement of fish, wildlife and recreational resources; industrial; hydroelectric power production; navigation; and flood prevention (OWRD 1997). Water quality standards are typically designed to protect the most sensitive designated uses within a water body. The most sensitive designated uses for the Monument are the protection and enhancement of fish resources, salmonid fish rearing and spawning, aquatic life, and domestic water supply. Temperature, dissolved oxygen, bacteria/pathogens, turbidity, and sedimentation are the key water quality indicators most critical to these sensitive beneficial uses.

Section 303(d) of the Clean Water Act requires each state to identify streams, rivers, and lakes that do not meet water quality standards even after the implementation of technology-based controls. These waters are referred to as "water quality limited" and states are required to submit 303(d) lists to the Environmental Protection Agency every four years. Water quality limited waters require the application of total maximum daily loads (TMDLs) which are a strategy for improving water quality to the point where recognized designated uses of the waters are fully supported. A TMDL addresses pollution problems by identifying those problems, linking them to watershed characteristics and management practices, establishing objectives for water quality improvement, and identifying and implementing new or altered management measures designed to achieve those objectives (ODEQ 1997). Water Quality Management Plans (WQMPs) to address nonpoint sources and TMDLs will be prepared for each watershed in the Monument with listed streams starting in 1999 and scheduled for completion in 2007.

The Oregon DEQ's 1998 list of water quality limited streams includes streams within the CSNM as shown on map 14 and listed in Table 2-9. No streams in the Klamath River-Iron Gate Watershed or Cottonwood Creek Watershed portions of the Monument are on the 303(d) lists. There are 14 parameters considered by ODEQ in the 303(d) listing process. Only a small percentage of these 14 parameters have been assessed in the CSNM to determine compliance with the State's criteria. No water quality monitoring has occurred in the Monument portion of Cottonwood Watershed and only a limited

**Table 2-9. Water Quality Limited Streams on the 303(d) List**

| Watershed | Stream Name | Description | Parameter |
|---|---|---|---|
| **Jenny Creek** | Beaver Creek | Mouth to Talent Irrigation District Ditch | Temperature - summer |
| | Corral Creek | Mouth to Talent Irrigation District Ditch | Temperature - summer |
| | Jenny Creek | Mouth to Grizzly Creek | Temperature - summer |
| | Johnson Creek | Mouth to headwaters | Temperature - summer |
| | Keene Creek | Mouth to Little Hyatt Reservoir | Temperature - summer |
| | South Fork Keene Creek | Mouth to headwaters | Temperature - summer |
| | Lincoln Creek | Mouth to headwaters | Temperature - summer |
| | Mill Creek | Mouth to headwaters | Temperature - summer |
| **Bear Creek** | Baldy Creek | Mouth to headwaters | Temperature - summer |
| | Carter Creek | Mouth to headwaters | Temperature - summer |
| | Emigrant Creek | Emigrant Reservoir to Green Mountain Creek | Temperature - summer |
| | Hobart Creek | Mouth to headwaters | Temperature - summer |
| | Tyler Creek | Mouth to headwaters | Temperature - summer |

Source: ODEQ 1998

amount of monitoring has been done in the CSNM within Klamath River-Iron Gate Watershed.

The DEQ's 1988 Oregon Statewide Assessment of Nonpoint Sources of Water Pollution (NPS Assessment) identifies two stream segments and one reservoir in the CSNM that are impacted by nonpoint source pollution. Table 2-10 identifies affected water-body segments and Table 2-11 lists the probable causes and associated land uses. These water-bodies were not included on Oregon's 1998 303(d) list based on the lack of supporting data, but they are considered Water-bodies of Potential Concern by DEQ (ODEQ 1998:5).

**Table 2-10. Water bodies included in DEQ's NPS Assessment**

| Watershed | Stream Name | DEQ Segment ID | Segment Location | Parameter of Concern |
|---|---|---|---|---|
| Jenny Creek | Hyatt Lake | 337 | Reservoir | Nutrients<br>Excessive plant growth |
| | Jenny Creek | 11 | Oregon/California border to Howard Prairie Reservoir | Temperature<br>Sedimentation |
| Bear Creek | Emigrant Creek | 286 | Emigrant Reservoir to headwaters | Temperature<br>Streambank erosion<br>Low streamflow<br>Sedimentation |

Source: ODEQ 1988

**Table 2-11. Probable Causes and Land Use Associated with Nonpoint Source Pollution**

| DEQ Segment ID[1] | Probable Cause of Nonpoint Source Pollution | Land Use Associated with Nonpoint Source Pollution |
|---|---|---|
| 337 | None identified | None identified |
| 11 | Surface erosion and elimination of thermal cover | Timber harvesting and road construction |
| 286 | Surface erosion and water withdrawal | Irrigated cropland/pastureland |

Source: ODEQ 1988 1/ See Table 2-10 for segment location.

# Water Temperature

The Oregon State water quality criteria for temperature is established to protect resident fish and aquatic life, and salmonid fish spawning and rearing. The temperature standard for summer temperatures in the Rogue and Klamath Basins was revised in January 1996. The standard now states that the seven day moving average of the daily maximum shall not exceed 64°F. Streams in the CSNM that are known to exceed the temperature standard are listed in Table 2-9 as water quality limited for temperature.

Both natural and human-caused factors contribute to elevated stream temperatures in the Monument. Natural factors that can affect stream temperature in the CSNM include: below normal precipitation and subsequent low summer streamflows, hot summer air temperatures, stream orientation, low gradient valley bottoms, and wildfires and floods that result in the loss of riparian vegetation. Human-caused disturbances that are likely to increase summer stream temperatures include water withdrawals, channel alterations that increase the width-to-depth ratio, and riparian vegetation removal through logging, road building, improper livestock grazing, or residential clearing.

Available stream temperature monitoring data for the Monument may be found in Appendix U.

## Dissolved Oxygen

Dissolved oxygen concentration refers to the amount of oxygen dissolved in water. Dissolved oxygen is critical to the biological community in the stream and to the breakdown of organic material (MacDonald and others 1991). Dissolved oxygen concentrations are primarily related to water temperature; when water temperatures increase, oxygen concentrations decrease. (MacDonald and others 1991).

Oregon's dissolved oxygen standard was revised in January 1996. The new standard describes the minimum amount of dissolved oxygen required for different water bodies (i.e., waters that support salmonid spawning until fry emergence from the gravels, waters providing cold water aquatic resources, waters providing cool-water aquatic resources, etc.) (ODEQ, 1998).

Dissolved oxygen data is not available for the Monument, although it is likely to be a concern in streams with high temperatures.

## Water Bacteria/Pathogens

Waterborne pathogens include bacteria, viruses, protozoa, and other microbes that can cause skin and respiratory ailments, gastroenteritis, and other illnesses. Most drinking and recreational waters are routinely tested for certain bacteria that have been correlated with human health risk. If the average concentration of these bacteria falls below the designated standard, it is assumed that the water is safe for that use and that there are no other pathogenic bacteria that represent a significant hazard to human health (MacDonald and others 1991). The four groups of bacteria most commonly monitored are total coliforms, fecal coliforms, fecal streptococci, and enterococci. Fecal coliform bacteria are mostly those coliform bacteria that are present in the gut and feces of warm-blooded animals. They can be directly linked to sanitary water quality and human health risks.

Oregon's water quality criterion for bacteria states that for a 30-day log mean of 126 *Escherichia coli* (a species of fecal coliform) organisms per 100 ml, based on a minimum of five samples, no single sample shall exceed 406 *E. coli* organisms per 100 ml (ODEQ, 1998). The purpose of the bacterial water quality standard is to protect the most sensitive designated uses, which are domestic water and water contact recreation.

Bacterial contamination has little effect on aquatic organisms, but is very significant to human use (MacDonald and others 1991). Bacterial contamination of water bodies in the Monument could result from inadequate waste disposal by recreational users, and the presence of livestock or wild animals in springs/wetlands, stream channels, or riparian zones.

No bacteria/pathogen data is available for water bodies within the Monument.

## Water Turbidity and Sedimentation

Sedimentation is the natural process of sediment entering a stream channel. However, excessive fine sediments (sand-size and smaller) can cause problems such as turbidity (the presence of suspended solids) or embeddedness (buried gravels and cobbles). Sedimentation is generally associated with storm runoff and is highest during fall and winter.

Oregon's standard for sedimentation states that "the formation of appreciable bottom or sludge deposits or the formation of any organic or inorganic deposits deleterious to fish or other aquatic life or injurious to public health, reaction, or industry shall not be allowed" (ODEQ 1998). Oregon's standard for turbidity states that "no more than ten

percent cumulative increase in natural stream turbidity shall be allowed, as measured relative to a control point immediately upstream of the turbidity causing activities" (ODEQ 1998).

No streams in the CSNM are on the 303(d) list for sedimentation, however, Jenny Creek and Emigrant Creek are identified by Oregon DEQ as having sedimentation as a parameter of concern (Table 2-10).

Natural processes that contribute to sedimentation in the Monument include surface erosion, mass wasting, wildfire, and flood events. Natural landslides and slumps are common features in the Upper Emigrant Subwatershed due to unstable soils (see Geology and Soils sections). There have not been any recent major wildfires in the Monument and the most recent flood event occurred on January 1, 1997.

Accelerated rates of upland erosion in the CSNM are primarily caused by road building and logging. Older roads with poor locations, inadequate drainage control and maintenance, and no surfacing are more likely to erode and cause the sedimentation of stream habitats. The Schoheim Road (41-2E-10.1) in the Klamath River-Iron Gate Watershed was inventoried during 1996 and 1997 by Salix Earthcare, Inc. to determine the hydrologic impacts of the road (Salix Applied Earthcare, 1998). The inventory noted that the Schoheim Road caused accelerated erosion and sedimentation and altered hydrology resulting in detrimental effects on downstream water quality and quantity. The erosion problems noted in the Salix Applied Earthcare report (1998) were attributed to inadequate drainage and maintenance and exacerbated by vehicle and OHV use. Road maintenance was conducted on the Schoheim Road in the fall of 1998 to address some of the concerns highlighted in the Salix Applied Earthcare report (1998). The road work consisted of drainage improvements on approximately 12 miles of the Schoheim road, from the western end below Pilot Rock to the intersection with the Lone Pine Ridge Road. The remainder of the Schoheim road received drainage improvements consisting of water bars and dips in the fall of 2000. Road access was blocked in section 10 east of Camp Creek and a gate installed just west of Jenny Creek.

Logging practices such as clearcut logging, logging in unstable areas, and using tractors on steep slopes contribute to increases over natural sedimentation rates. The effects of logging practices on stream sedimentation are primarily a concern in the Jenny Creek, Bear Creek, and the east fork of Camp Creek Watersheds of the CSNM, where logging has been most prevalent. Logging in unstable areas has likely accelerated several hillslope failures in the Bear Creek Watershed portion of the CSNM. The Friends of the Greensprings' (FOG) *Tyler Creek Monitoring Report* (2000) notes a large, active landslide that occurred on private forest land adjacent to Hobart Creek (in the Tyler Creek drainage of Upper Emigrant Creek Subwatershed) in 1998. The FOG report attributes the landslide to harvesting conducted in 1990 and estimates that the landslide moved 150,000 cubic yards of material into Hobart Creek.

Stream bank erosion in the Monument is accelerated by human-caused disturbances such as stream channelization and stream-adjacent land clearing, concentrated livestock grazing, road building, and tractor skid roads. Past stream channelization and stream-adjacent land clearing are major factors contributing to stream bank erosion in portions of Jenny Creek. Poorly managed livestock grazing in the late 1800s and early 1900s throughout the CSNM was likely a significant cause of stream bank damage and subsequent sedimentation. Stream bank damage resulting from concentrated livestock grazing continues to be a concern for some stream reaches in the Bear Creek, Jenny Creek, and Klamath River-Iron Gate Watersheds (USDI 2000b, USDI 1995b, and USDI 2000a). There are many stream-adjacent roads throughout the Monument that confine stream channels and restrict the natural tendency of streams to move laterally. This can lead to downcutting of the stream bed or erosion of the stream banks. Stream-adjacent roads are also a direct source of sediment to adjacent stream reaches. Skid roads that are

across, in, or parallel to stream channels are a source of sediment, damage stream banks, concentrate runoff, and divert flows.

The amount of large wood in many stream channels within the Monument is inadequate for dissipating the energy of high velocity streamflows. The result is stream banks that are unprotected and susceptible to erosion. Large wood is discussed in the Stream Channel and Riparian Habitat sections.

Irrigation ditch failures and streamflow diversions also result in increased human-caused stream sedimentation. The Talent Irrigation District's delivery canal in the Jenny Creek Watershed has had several failures that resulted in large amounts of sediment going directly into Jenny Creek (USDI 1995b, p 36). An unnamed tributary to Schoolhouse Creek in the Tyler Creek drainage of Upper Emigrant Creek Subwatershed has been used as an alternate diversion channel for water transported from Howard Prairie Reservoir to Emigrant Lake for hydroelectric power and irrigation. The water is normally routed through the Bureau of Reclamation's Green Springs Power Plant, however, the flow is re-routed down Schoolhouse Creek when the generator is undergoing repair. Approximately 60 cfs was released into Schoolhouse Creek in 1993 to bypass the power plant (Friends of the Greensprings 2000). This amount of water exceeded the stream's carrying capacity and resulted in a debris torrent that moved 200,000 cubic yards of material downstream (Friends of the Greensprings 2000). The portion of the unnamed Schoolhouse tributary on BLM-administered land has been scoured to bedrock and there are actively eroding stream banks (USDI 2000f).

Off-highway vehicle use that results in stream sedimentation has been a concern in localized areas throughout the Monument.

Turbidity data for water monitoring sites in the CSNM are shown in Appendix U.

**Table 2-12. Hydrology/Water Quality Monitoring in the CSNM**

| Subwatershed | Water Temp (1-2 season assessment) | Water Temp (3+ season assessment) | Aquatic Macro-invertebrates | Stream/ Riparian Survey[1] | Channel Cross Sections | Streamflow /Turbidity[2] |
|---|---|---|---|---|---|---|
| **Upper Jenny Creek** | 3 sites | 1 site | 3 sites | 0 | 2 sites | 3 sites |
| **Johnson Creek** | 1 site | 1 site | 0 | 0 | 1 site | 1 site |
| **Middle Jenny Creek** | 3 sites | 3 sites | 3 sites | 15% initial assessment | 3 sites | 3 sites |
| **Keene Creek** | 8 sites | 1 site | 2 sites | 100% initial assessment | 3 sites | 3 sites |
| **Lower Jenny Creek** | 0 | 15 sites | 3 sites | 0 | 11 sites | 2 sites |
| **Camp Creek** | 2 sites | 1 site | 1 site | 0 | 0 | 0 |
| **Scotch Creek** | 0 | 0 | 0 | 0 | 0 | 0 |
| **Fall Creek** | 0 | 0 | 0 | 0 | 0 | 0 |
| **Upper Cottonwood Creek** | 0 | 0 | 0 | 0 | 0 | 0 |
| **Lower Cottonwood Creek** | 0 | 0 | 0 | 0 | 0 | 0 |
| **Upper Emigrant Creek** | 13 sites | 0 | 0 | 93% initial assessment | 0 | 0 |
| **TOTALS** | 30 sites | 22 sites | 12 sites | | 20 sites | 12 sites |

1/ Proper Functioning Condition (PFC), large wood, flow regime, channel morphology for streams on BLM-administered lands.
2/ Staff Gages/Gaging Station and turbidity samples.

# Aquatic Species and Habitats

Portions of Jenny Creek, Bear Creek, Klamath River-Iron Gate and Cottonwood Creek watersheds are included in the CSNM planning area (Table 2-7). Aquatic species and physical habitat for fish are described by watershed, and information on aquatic mollusks is included at the end of this section. Refer to Table 2-7 for data concerning stream miles and acres included for each watershed, Appendix Y for data on aquatic macroinvertebrates, Map 15 for CSNM stream systems and riparian reserves areas, and Map 16 for known fish presence .

## Jenny Creek Watershed

In the Jenny Creek watershed, portions of the Upper Jenny Creek, Middle Jenny Creek, Lower Jenny Creek and Keene Creek Subwatersheds fall within the CSNM boundary (see Hydrology section). Major streams within these watersheds include Jenny Creek, Keene Creek, Corral Creek and Beaver Creek.

### Aquatic Fauna

The Jenny Creek Watershed is host to a number of aquatic species listed as "peripheral or naturally rare," "vulnerable," or a "species of concern" by both state and federal agencies. Aquatic organisms and their habitats within the CSNM have been the subject of on-going studies as a result of interest in riparian habitat and the streams' unusual fish populations (e.g. Frest 2000, Rossa 1999). There are also a number of introduced fish in this watershed, primarily in headwater reservoirs.

*Native Fish*

Jenny Creek supports three native fishes: redband trout (*Onchorhynchus mykiss ssp*.), Jenny Creek sucker (*Catostomus rimiculus*), and speckled dace (*Rhinichthys osculus*). These fish species are isolated above an impassable waterfall located south of the California border. Both the Jenny Creek suckers and redband trout are presumed to date back only to the end of the ice age when extensive flooding may have allowed native fish populations in some headwater streams to transfer to others. This "headwater capturing" may be responsible for the presence of Klamath small-scale suckers (*C. rimiculus*) in both Jenny Creek and the Rogue River. The Jenny Creek sucker and redband trout are believed to be genetically distinct because of this geographic isolation. The Klamath speckled dace (*R. osculus*) is widely distributed throughout much of the Klamath River Basin.

The Jenny Creek redband trout (*O. mykiss ssp*.), a subspecies of rainbow trout, is classified as "vulnerable" by both the Oregon Department of Fish and Wildlife (ODFW) sensitive species list and the BLM special status species list. The U.S. Fish and Wildlife Service (USFWS) classifies the Jenny Creek redband trout as a "species of concern." Each population of redband trout is believed to be genetically distinct from rainbow trout (*O. mykiss*) because of geographical isolation. The Jenny Creek redband trout is at risk of dilution by hybridization with rainbow trout introduced to Jenny Creek by state agencies, private sources, and from Howard Prairie Reservoir overflow. Dilution of the redband trout gene pool by hybridization with hatchery fish from upstream reservoirs may eventually mean the loss of this subspecies. However, genetic studies (Currens 1990) indicate that some or all of the redband stock remains intact in parts of the watershed. "Redband genes" are important for Jenny Creek trout because redband trout seem to handle low water levels and high water temperatures beyond the normal range of other salmonids such as rainbow trout.

The Jenny Creek redband trout is distributed throughout the Jenny Creek Watershed in the mainstem and major tributaries (Map 16). Keene Creek, a tributary to Jenny Creek, is an especially important nursery stream for Jenny Creek redband trout (Rossa, unpublished data).

The Jenny Creek sucker is classified as "peripheral or naturally rare" by the BLM Special Status Species list and the ODFW's Sensitive Species list. The federal list, compiled by USFWS, classifies the Jenny Creek sucker as a "species of concern". The Jenny Creek sucker is the same species as the Klamath smallscale sucker found in the Rogue and Klamath Rivers. However, due to its genetic isolation, it receives special designation. The Jenny Creek sucker may also be a dwarf form of the Klamath smallscale sucker. The suckers in Jenny Creek never reach the large sizes of their river-dwelling relatives. However, growth rates appear to be similar (Hohler 1981) so it is unclear whether the Jenny Creek suckers are actually smaller than the Klamath-Rogue fish at a given age, or simply mature earlier and die sooner. The answer to this question is important to ensure the long-term viability of Jenny Creek suckers.

In the CSNM, Jenny Creek suckers are found primarily in mainstem Jenny Creek and Corral Creek. Only a few have been observed in Keene Creek (Rossa 1999). However, the suckers use the entire watershed (including Johnson Creek) throughout the year. They migrate upstream to spawn in smaller tributaries and headwater areas in the spring (Hohler 1981), and disperse throughout the mainstem in the summer. Different areas or, "reaches" of the creek appear to be important for different life stages. Rossa (1999) found that newly-hatched fry, adults, and juveniles were each found in completely different reaches, sometimes miles apart. These distribution patterns may be related to water temperature, spawning locations, irrigation diversions, and food availability. Water releases over Howard Prairie dam may also be affecting sucker habitat (see section on "Stream Channels" below.)

Speckled dace (*R. osculus*) are the most common native fish in Jenny Creek (Rossa, unpublished data). They can be found throughout mainstem Jenny Creek and in its larger, slower tributaries. They are most numerous in low-gradient meadow reaches. Although speckled dace currently do not have any special status, preliminary results from a genetic study (Pfrender and Lynch 1998) indicate the Jenny Creek dace could be genetically distinct. Speckled dace are wide spread throughout the west, but have not been reported in other CSNM watersheds.

<u>*Non-native Fish*</u>
Rainbow trout (*O. mykiss*), are regularly stocked in Hyatt and Howard Prairie Lakes by ODFW. Howard Prairie Reservoir is not in the planning area, but fish occasionally escape from the lake downstream into the planning area, especially in good water years when water flows over the spillway at the dam. Rainbow trout were also introduced into Jenny Creek by ODFW and private sources in the 1960s and 1980s. The affects of hybridization between introduced rainbow trout and native redband trout were previously discussed.

Golden shiner (*Notemigonous crysoleucas*), an exotic fish, was introduced into Howard Prairie and Little Hyatt Reservoirs as bait fish and occasionally escapes downstream with overflow water. Its distribution, survival, and impact on the Jenny Creek ecosystem is not known however, it has been reported 2 miles downstream of the Howard Prairie Dam (Rossa 1999).

Brown bullhead (*Ictalurus nebulosus*) are also found in the headwater reservoirs of Jenny Creek and has negatively impacted the Hyatt Lake trout fishery. These fish occasionally escape downstream into the Jenny Creek Watershed. Brown bullhead distribution, survival, and impact on the Jenny Creek ecosystem is not known.

Black Crappie (*Pomoxis nigromaculatus*) and largemouth bass (*Micropterus salmoides*) have become established in Hyatt Lake in recent years, and will most likely escape downstream into Little Hyatt Reservoir and Keene Creek Reservoir. The Bureau of Reclamation allows water to bypass Keene Creek Reservoir in high water years, so these fish may reach lower Keene Creek and Jenny Creek. Green sunfish (*Lepomis cyanellus*), and pumpkinseed (*Lepomis gibbosus*) are found in Howard Prairie Reservoir and the Keene Creek Reservoir.

*Amphibians and Reptiles*

Jenny Creek is host to several amphibians that are dependent on the aquatic environment for their survival. The more common ones are Pacific tree frog (*Psuedacris regilla),* foothill yellow-legged frog (*Rana boylii)*, bullfrog *(Rana catesbeiana)*, Pacific giant salamander (*Dicamptodon tenebrosus),* and rough-skinned newt (*Taricha granulosa)*. All are native with the exception of the bullfrog. Still water areas and ponds in the mid and lower elevations in the Jenny Creek Watershed are home to a viable population of northwestern pond turtles *(Clemmys marmorata).* This animal is in trouble throughout most of its range in Oregon, Washington and California due to habitat destruction and predation by introduced species, primarily bullfrogs and largemouth bass.

*Aquatic Insects*

The Jenny Creek aquatic insect community reflects a mixture of montane and basin stream fauna: species found in northwest mountain streams and in drier basins to the south and east (Appendix Y, Tables AY-5 through 8). Since Jenny Creek is located at the crossroads of several mountain ranges and is adjacent to the Great Basin, widespread, common species from these areas would be expected. However, Jenny Creek's aquatic insect community also lacks many species that would be expected to occur, especially those adapted to year-round cold-water (Aquatic Biology Associates 1991, 1992, 1995).

The aquatic insect community in Keene Creek appears to be typical for streams of its size and location (Aquatic Biology Associates 1993). However, sampling in 1993 (a normal water year) did not find many genera and species ordinarily expected, and found others that were unexpected (Appendix Y, Table AY-2). Missing species included those needing year-round cold water and some of the microhabitat specialists. Unexpected macroinvertebrates included *Pseudostenophylax edwardsi*, a caddisfly typical of very small streams and usually found in more maritime, lower elevation areas, and Hydrobiid snails. The shredder community (insects that feed primarily on fallen leaves) was also surprisingly well-developed.

The insect community reflects the habitat in Keene Creek. The stream does not get large flushing events because half of the water is diverted to the Rogue Valley through the Talent Irrigation District diversion system (see Hydrology section). Water only flows over Keene Creek dam when Hyatt, Little Hyatt, Keene Creek, and Emigrant Lake Reservoirs are full. Hence, leaves and detritus that feed the shredder community are not flushed out as regularly as in a normal stream. Cold-water taxa are missing because water temperatures in Keene Creek are warmer than many streams of the same size in the Pacific northwest. Water diversion and past land management practices are probably contributing to warm water temperatures. Finally, it seems that all the streams in the CSNM area have a slightly different insect community. For example, *Psuedostenophylax edwardsi* is usually found in coastal streams, not in southern Oregon. Such an unusual distribution further indicates the ecological significance of the CSNM area.

Corral Creek's insect community reflects a high level of disturbance in the watershed (Aquatic Biology Associates 1993). There are many insects, but few species (Appendix Y, Table AY-5) and those present are the most tolerant and common insects in western

North America. This differs even from Beaver Creek, a stream just over the ridge from Corral Creek. Normally, aquatic insect communities on adjacent streams are very similar, because adult insects migrate over ridges to colonize new areas.

Beaver Creek's aquatic insect community appears to be typical for streams of its size and location (Aquatic Biology Associates 1993), although water diversions are altering habitat for aquatic insects. Sampling in 1993 (a normal water year) did not find many cool-water genera and species ordinarily expected (Appendix Y, Table AY-3). Instead, the presence of two damselflies, *Argia sp.* and *Enallagma/Ischnura sp.*, indicate that Beaver Creek does not experience typical spring flows that would ordinarily flush these species downstream to warm, slow pool areas. Sampling did find an unexpected, rare caddisfly (*Rhyacophila iranda).*

*Crustaceans*

Crayfish are common in this watershed. The genus *Pacifasticus* has been identified in the watershed but not to species (Aquatic Biology Associates 1995).

## Physical Habitat

*Stream Channels*

Beaver trapping, ranching, flood control, water diversion, and timber harvest have significantly altered the floodplains and stream channels in the Jenny Creek watershed in the last 150 years. Beaver dams maintained high water tables and wide riparian zones by adding structure to the flood plains, dissipating stream energy, and capturing sediment. As beaver were trapped and removed from the area, these beneficial hydrologic functions were diminished. Floodplains were cleared to provide more pastureland as ranchers became established in the area and efforts were made to control the stream. Eventually, much of the stream through ranch lands was straightened out, berms were constructed to prevent the stream from exceeding its banks, and stream-side shrubs and trees were removed to prevent debris jams from forming or channels from migrating. Grazing along the streams increased bank instability in some areas and, reduced riparian vegetation. Regeneration of large riparian vegetation, which typically occurred following vegetation removal by flood flows or beaver activity, was retarded or prevented by grazing pressure. The combined effect of these actions decreased infiltration rates, increased runoff, and simplified the stream channel.

Flows have been altered in Jenny Creek and its tributaries by both small and large-scale water diversions. Small diversions for agricultural purposes along Jenny, Keene, Beaver and Corral Creeks cumulatively reduce stream flows during summer months. More importantly, Talent Irrigation District diverts water from Hyatt Lake, Little Hyatt Lake, Keene Creek Reservoir, Howard Prairie Reservoir, Soda Creek, and Beaver Creek to the Rogue Valley. Pacificorp diverts water from Shoat Springs Creek. Combined, these exports total approximately 300,000 acre feet of water per year–28 percent of the estimated total runoff that would otherwise be available to support Jenny Creek's aquatic organism populations (see Hydrology Section).

Reduced stream flows decrease a stream's sediment transport capacity (Kondolf and Wilcock 1996). As a result, fine sediments can accumulate on the rocks and in the gravels, reducing food supply and cover for aquatic organisms, and facilitating the proliferation of aquatic plants like *Elodea candensis* (Kondolf and others 1987, Kondolf and Wilcock 1996). As fish habitat becomes degraded over the years, fish may be pushed into marginal habitat (Rossa 1999). This is always a danger in a small, isolated watershed like Jenny Creek because fish cannot repopulate the watershed from the Klamath River, downstream.

The lack of bankfull flows may also be altering the aquatic macroinvertebrate community in ways that negatively impact fish. Ongoing research by Parker and Rossa (unpublished), indicates that abnormally high caddisfly densities may be stripping the rocks of algae important for Jenny Creek suckers. Caddisfly densities may be abnormally high because the rocks on the streambed are not regularly tumbled by spring flushing flows.

High summer water temperature is another factor affecting sensitive fish species in Jenny Creek and its tributaries (see Water Quality section). Ideal summer water temperatures for trout and other cool-water fishes are in the 60 degree range. Once they exceed this range, the fish begin to experience stress and increased metabolic rates. More and more of their food must be used just to maintain their bodily functions, so growth is reduced (Bjornn and Reiser 1991). Higher water temperatures also incubate diseases which readily attack the already stressed fish. Summer water temperatures in excess of 80 degrees Fahrenheit have been recorded during July and August in the lower reaches of the watershed (Appendix U).

*Riparian Habitat*
Riparian areas differ between the upper and lower halves of the watershed. Riparian areas in the northern half are wider and wetter, dominated by Douglas-fir (*Psuedotsuga mensezii*), alder (*Alnus*), and willow (*Salix spp.*). Riparian areas in the southern, drier half are narrow and dominated by willow, ponderosa pine (*Pinus ponderosa*), and Oregon ash (*Fraxinus latifolia*).

In general, riparian condition appears to be slowly improving in the watershed. Changes in grazing strategy, recovery of previously logged riparian areas, riparian fencing, and streamside plantings are all contributing factors. However, some areas continue to be heavily impacted by land use activities.

Extensive riparian logging along tributaries and the northern half of Jenny Creek in the 1960s has limited the amount of large-diameter wood available to mainstem Jenny Creek. The distribution of this large-diameter wood is very clumped (Rossa 1999). Wood is concentrated primarily in the upstream canyon reaches that still retain large-diameter trees. Flood-deposited wood is rare in the lower meadow reaches because upstream sources are in short supply. Meadow-deposited wood is nonexistent, as riparian trees were removed to facilitate plowing of pasture land. In-channel debris jams are present, but not as extensive as expected in the lower canyon reaches. High water in the winter of 1997 and 1998 moved some wood into downstream canyons and meadow reaches, but overall, it will take some time for wood to become well-distributed throughout the system again.

# Bear Creek Watershed

In the Bear Creek Watershed, a portion of the Emigrant Creek Subwatershed falls within the CSNM boundary (see Hydrology section). This area is upstream of Emigrant Reservoir. The primary stream in this area is Emigrant Creek.

## Aquatic Fauna

*Native Fish*
Both resident rainbow trout (*O. mykiss*) and cutthroat trout (*O. clarki*) reside in the portion of the Bear Creek watershed included in the CSNM, but prior to 1999 species distribution was not well known. Electrofishing surveys were conducted by ODFW in 1999 to determine the upstream distribution of fish in Emigrant Creek. Cutthroat and rainbow trout presence was confirmed in eight miles of stream within the CSNM boundary in the Emigrant Creek watershed.

The reticulate sculpin *(Cottus perplexus)* is the only native non-salmonid known to reside in the upper Bear Creek watershed. ODFW sampling efforts (1999) found this species in Porcupine Creek, a tributary to Emigrant Creek.

*Non-native Fish*
ODFW annually releases hatchery-reared rainbow trout into Emigrant Reservoir, and has released steelhead and coho in the past. In the spring, these salmonids accumulate at the inflow of Emigrant Creek, and some fish move into the stream above the lake. A fishery has developed around this activity. It is unknown how far upstream these non-native fish go but it is assumed that they have altered the genetic integrity of at least some native fish in Emigrant Creek.

Other non-native species residing in Emigrant Reservoir include large mouth bass, small mouth bass, golden shiners, bluegill sunfish, pumpkinseed sunfish, yellow perch, black crappie, and brown bullhead. A channel catfish was netted in Emigrant Reservoir by ODFW in 1996. These non-native fish have access to streams in the Emigrant Creek portion of the CSNM as do hatchery trout but their extent in these systems is unknown.

*Amphibians and Reptiles*

There is little information available about amphibians in the Emigrant Creek Watershed. Pacific tree frog (*Psuedacris regilla)* and Pacific giant salamander (*Dicamptodon tenebrosus),* are present, and rough-skinned newt (*Taricha granulosa)* and foothill yellow-legged frog (*Rana boylii)* are suspected residents because of the close proximity to populations known to exist in the Jenny Creek and the Klamath River-Iron Gate Watersheds. Northwestern pond turtles *(Clemmys marmorata)* are common residents in Emigrant Reservoir, but upper portions of Emigrant Creek and its tributaries are too steep and lacking of pool habitat to attract and support this species.

*Aquatic Insects*

BLM has not conducted formal surveys of macroinvertebrate populations and distribution in the Monument portion of this watershed.

*Crustaceans*

Crustacean populations in the Bear Creek Watershed have not been studied therefore, there is no information on species composition and population dynamics in this system. Crayfish are known to occur throughout this drainage. *Pacifastacus liniusculus* are known to occur in Emigrant Reservoir.

## Physical Habitat

*Stream Channel*

In Emigrant Creek, fish habitat appears to be in moderate condition. Flooding events have scoured the channel, leaving high percentages of bedrock–up to 40 percent of some reaches (ODFW 1997). Substrate material is 20 to 30 percent silt, probably higher than normal for this drainage, and probably due to soil erosion from roads and scoured banks. There are very few fallen trees ("large woody material"). Even in the best reaches it does not exceed eight pieces per 100 meters, and most of it is small-diameter material. As a result, there are few pools in Emigrant Creek to provide rearing habitat for juvenile fish, spawning habitat for adults, and nutrient storage to fuel the aquatic food chain. However, the upper portion of Emigrant Creek is well-shaded (75-80 percent), keeping water temperatures cool, and providing important fish cover and aquatic insect food sources.

The other major tributaries in the Upper Emigrant Creek sub-basin have gradients that are steep, usually greater than 10 percent, and channels are entrenched with steep hillslopes. Transported material is quickly moved through these reaches, and what is not deposited in upper Emigrant Creek or along its limited flood plain ends up in Emigrant Reservoir. Substrate in these upper tributaries is mostly bedrock and cobble. There is little woody material in most of these streams, but shading is fairly good.

Human activities such as logging, road building, removal of riparian vegetation, channelization, trapping, improper grazing, water diversion, and agricultural and residential development have fragmented riparian habitat, destabilized stream banks, increased sedimentation, decreased stream shading, and reduced large wood in streams. Landslides (both natural and human-caused) are more common in the Emigrant Basin than in other areas of the CSNM, and have increased sedimentation in these streams. In the lower reaches, riparian agriculture and water withdrawals have contributed to increased stream temperatures that physiologically stress aquatic organisms.

*Riparian Habitat*

Stream side vegetation varies considerably in the Emigrant Creek Watershed depending on aspect and elevation. California black oak, Oregon white oak, and Oregon ash are common components of overstory riparian vegetation in southwest-facing drainages. Big-leaf maple, black cottonwood, Ponderosa pine, Douglas-fir and incense cedar, while not common, are also present. North-facing slopes are covered with a mixture of coniferous and deciduous vegetation. Douglas-fir and white alder provide good stream shading along Emigrant Creek above the mouth of Tyler Creek. This combination gives way to a white fir-dominated plant community near the highest elevations in the watershed. Common understory plants are poison oak, manzanita, wedgeleaf ceanothus, and willow.

# Klamath River-Iron Gate Watershed

The Klamath-Iron Gate Watershed includes three subwatersheds that partially fall within the CSNM: Camp Creek, Scotch Creek and Fall Creek. The Monument includes the upper third of Camp and Scotch Creeks, those portions north of the Oregon/California border. An estimated 575 acres of Fall Creek Subwatershed is within the Monument.

## Aquatic Fauna

*Native Fish*

Within the Monument, there are several trout populations isolated above waterfalls. These fish may be rainbow trout or redband trout. It is difficult to tell the two apart visually; only genetic analysis can ascertain the difference. At this time, we refer to these fish as rainbow trout; however, we anticipate that some populations will be identified as redband trout in the future. Trout have been confirmed in East Fork Camp Creek through section 34 (T.41S., R.3E.) (ODFW 1997). Rainbow trout have also been confirmed in Dutch Oven Creek.

Very little was known of resident fish populations in Scotch and Slide Creeks prior to 1999, when BLM fisheries biologists undertook presence and absence surveys in an effort to fill this data gap. Resident rainbow trout were observed in Scotch Creek from the mouth upstream to a rock barrier a short distance above the Oregon/California border in T.41S., R.3E., Section 8, SW 1/4. Rainbow trout were also found to be plentiful in Slide Creek from its confluence with Scotch Creek upstream to the Oregon/California border.

*Non-native Fish*

Hatchery produced rainbow have been released into Iron Gate Reservoir. Their different genetic makeup may have affected the genetic integrity of native trout below barriers in lower Scotch and Camp Creeks.

*Amphibians and Reptiles*

Parker (1999) surveyed creeks in the Klamath River-Iron Gate Watershed for vertebrates. No stream dwelling amphibians were found although all habitat requirements were present for Pacific giant salamanders (*Dicamptodon tenebrosus*) and tailed frogs (*Ascaphus truei*). Rough-skinned newts (*Taricha granulosa*) were found in upper Scotch Creek, and are also known from small excavated ponds near Bean Cabin in the headwaters of Camp Creek (BLM). It is assumed that the Pacific giant salamander(*Dicamptodon tenebrosus*) is in the perennial portions of streams, although the species was not found by Parker (1999).

*Aquatic Insects*

In October of 1993 (a normal water year), BLM contracted aquatic macroinvertebrates community sampling (primarily insects) in Dutch Oven Creek (see Appendix Y, Table AY-1). The aquatic insect community was very rich in taxa, with many species indicative of a healthy stream. The aquatic insect community was also "atypical and unusual" for the location (Aquatic Biology Associates 1993). Dutch Oven Creek is a medium-elevation, south-facing stream surrounded by plant communities adapted to dry climates; however, its aquatic insects are more typical of moist, coastal, higher-elevation streams in the western Cascades. In other words, this insect community is out of place. It is an "island" in the midst of insect communities more typical of southern Oregon (Aquatic Biology Associates 1993). It is possible that this insect community remains as a relict after the last glaciation.

Due to this island-like situation, there is high probability that some of the aquatic insects are endemic to the streams on the south-facing slope of the Klamath River-Iron Gate area. Only Dutch Oven Creek was sampled in 1993, but Camp Creek and Scotch Creek are similarly isolated from neighboring streams. Further sampling may provide answers in the next few years.

*Crustaceans*

Crayfish (*Pacifastacus ssp.)* are a common inhabitant of Jenny Creek and the Klamath River system. They are most likely well established in Iron Gate Reservoir, but there is no evidence yet from stream surveys or other recorded observations that crayfish reside in Scotch or Camp Creeks.

## Physical Habitat

*Stream Channel*

The CSNM portion of the Scotch Creek Subwatershed includes Slide Creek, a primary tributary of Scotch Creek. Within the CSNM, Scotch Creek flows through a narrow valley near the confluence with Slide Creek, then it is confined in a narrow V-shaped valley with steep hillslopes to its headwaters.

In Camp Creek and its major tributaries, Dutch Oven and Salt Creeks stream gradients are steep. In Camp Creek, much of the channel is entrenched within a V-shaped valley with steep hillslopes. Rapids predominate–not surprising, since woody debris is scarce, averaging only five pieces per 100 meters of stream channel (ODFW 1997). Pools are shallow, averaging about 0.5 meters deep. There are no pools with a depth of >1.0 meters. Three bedrock falls occur within the first three miles, and create impasses to upstream migration of fish. Habitat in the two forks of Camp Creek is in very different condition (Parker 2000). In East Fork Camp Creek, over 50 percent of the bank area showed active erosion in 1997, some of it because of cattle activity (ODFW 1997). Parker (1999) attributed large amounts of fine sediment deposition to human-caused impacts (road building, timber harvest, grazing). Off-highway vehicle use in the watershed may also be responsible for some upslope erosion and subsequent siltation in the subwatershed.

*Riparian Habitat*

Riparian vegetation at lower elevations in Camp and Scotch Creeks is confined to narrow corridors on either side of the perennial streams, especially in areas characterized by narrow V-shaped valleys and steep hillslopes. Tree and shrub growth in these corridors is fairly thick and provides good shade. At the highest elevation, headwater drainages are encompassed in fairly continuous coniferous forest dominated by white fir. Douglas-fir, intermixed with ponderosa and sugar pine, is common throughout the lower elevations. Mock orange is a common understory species.

# Cottonwood Creek Watershed

The CSNM planning area covers a small portion of the Cottonwood Creek Watershed, including short segments of the East Fork Cottonwood Creek, Hutton Creek, Chocolate Falls Creek, and Bear Gulch.

## Aquatic Fauna

In Hutton Creek, steelhead reportedly spawn in the lower two miles (Maria 1999). However, this area is in California, outside of the CSNM. Local ODFW and California Fish and Game (CF&G) fisheries biologists have no record or knowledge of steelhead or resident trout in Hutton Creek north of the Oregon State line (Maria 1999, Haight 1999).

In East Fork Cottonwood Creek, ODFW found adult steelhead and rainbow trout north of the Oregon/California border in April 1999 (Volpe 1999). Fish presence stopped at an impassable concrete box culvert under the railroad track crossing (T.40S.,R.2E.,Sec.31) approximately three miles upstream of the state border. Only adult fish were observed for some distance below this culvert. The East Fork was involved in a chemical spill from a train wreck in 1998 which resulted in a fish kill. This possibly explains why no young fish were seen in the upper portion of the East Fork. Juvenile salmonids, possibly steelhead, were also found in two un-named tributaries to East Fork Cottonwood Creek, also in section 31. Fish use in one of the two tributaries extended at least to the railroad track crossing. Fish use in the second tributary extended only 400' above the confluence with the East Fork where a debris jam appears to block upstream fish passage.

Very little is known of other aquatic resources in the Oregon portion of this watershed. Volpe (1999) recorded one unidentified frog in one tributary to East Fork Cottonwood Creek.

## Physical Habitat

There is very little data or information on stream habitat and riparian condition in the Cottonwood Creek Watershed. Cursory surveys indicate that roads, the railroad, agriculture, and other human practices have negatively impacted both instream and riparian habitat. A local citizen's group is beginning to implement small restoration projects on Cottonwood Creek.

*Stream Channel and Riparian Habitat*

Information available for East Fork Cottonwood Creek indicates that fish habitat conditions are generally poor (Volpe 1999). Just north of the Oregon/California state border, stream conditions provide some spawning habitat for rainbow trout and steelhead. However, upstream of two un-named tributaries in Section 31, the stream channel is deeply entrenched channel, most of the substrate is covered with silt, riparian vegetation is sparse, and very few fallen trees create pools. Cover along the stream was limited with very little shade, and spawning habitat is nonexistent.

Fish habitat within the un-named tributaries is poor to moderate (Volpe 1999). The larger of the two streams flows through a pasture in a deeply entrenched channel with large amounts of silt. Lacking fallen trees, the channel has little complexity and few good pools. This stream has some riparian cover that consists mostly of willows. The second tributary has some good habitat initially, but further upstream it flows through a pasture and is deeply entrenched.

# Aquatic Mollusks

The CSNM is home to at least thirteen species of pebblesnails (*Fluminicola sp.),* five species of *Juga*, and four species of freshwater bivalves. An additional seven species of pebblesnails are believed to be present, as well as one species of *Lanx* (Table 2-13). Many of these snails have not been taxonomically described, and additional investigation may reveal new species (Frest 2000).

**Table 2-13. Aquatic Mollusk in the CSNM**

| Scientific Name | Common Name |
|---|---|
| **Confirmed Presence** | |
| Fluminicola n. sp.1 | Klamath pebblesnail |
| Fluminicola n. sp.3 | Klamath Rim pebblesnail |
| Fluminicola n. sp.10 | nerite pebblesnail |
| Fluminicola n. sp.11 | toothed pebblesnail |
| Fluminicola n. sp.12 | diminutive pebblesnail |
| Fluminicola n. sp.14 | Fall Creek peeblesnail |
| Fluminicola n. sp.15 | contrary pebblesnail |
| Fluminicola n. sp.16 | Keene Creek pebblesnail |
| Fluminicola n. sp.17 | Fredenburg pebblesnail |
| Fluminicola n. sp.38 | Little Butte pebblesnail |
| Fluminicola n. sp.39 | Chinquapin pebblesnail |
| Fluminicola n. sp.40 | Pilot Rock pebblesnail |
| Fluminicola n. unassigned | unassigned pebblesnail |
| Juga (Calibasis) acutifilosa | scalloped juga |
| Juga (Oreobasis) n. sp. unassigned | unassigned smooth jugas |
| Juga (Juga) n. sp. unassigned | unassigned plicate juga |
| Juga (Oreobasis) nigrina | black juga |
| **Freshwater Bivalves Present** | |
| Anodonta oregonensis | Oregon floater |
| Gonidea angulata | western ridgemussel |
| Pisidium casertanum | fingernail clam |
| Margaritifera falcata | western pearlshell |

**Table 2-13. Aquatic Mollusk in the CSNM**

| Scientific Name | Common Name |
|---|---|
| **Suspected Presence** | |
| Fluminicola n. sp.32 | Rogue pebblesnail |
| Fluminicola n. sp.33 | Stewart pebblesnail |
| Fluminicola n. sp.34 | Evergreen pebblesnail |
| Fluminicola n. sp.35 | Camp Creek pebblesnail |
| Fluminicola n. sp.36 | Clarke pebblesnail |
| Fluminicola n. sp.37 | Beaverdam pebblesnail |
| Pristinicola hemphilli | pristine peeblesnail |
| Lanx alta | highcap lanx |

Pebblesnails are associated primarily with cold springs and headwaters of streams. The CSNM has a large number of springs, especially in the Jenny Creek Watershed, making it a unique area for pebblesnails. Currently, 41 springs in the CSNM are known to contain aquatic mollusks, 22 of which are on BLM land. Shoat Springs, Schoolhouse Meadow Spring Complex, and Spring Creek are particularly important habitats. They are large springs with healthy populations housing at least six species of aquatic mollusks.

Only the Fredenberg pebblesnail (*Fluminicola n. sp. 17*) has status under the Northwest Forest Plan (USDA 1994a) as a survey and manage species. However, all populations of pebblesnails are considered at risk because of their endemism, their sensitivity to habitat disturbance, and their life history trait of breeding only once in their lifetime. Threats to the species include eutrophication caused by excessive nitrogen and phosphorus levels, reduced dissolved oxygen, elevated water temperatures, water diversions, and excessive sedimentation. Management activities that can threaten mollusk habitat include grazing, logging, mining, irrigation and livestock watering (including pump chances), and road construction (USDI 1998b). Four springs containing mollusks required immediate protection from grazing impacts and have been fenced. The effects of grazing on CSNM aquatic mollusk habitat will be studied as part of the livestock impact study described in Draft Study of Livestock Impacts on the Objects of Biological Interest in the Cascade-Siskiyou National Monument (USDI 2001).

Surveys for freshwater bivalves have been confined to the Jenny Creek Watershed, where the fresh water mussel *Margaritifera falcata* and the fingernail clam (*Pisidium casertanum*) are common. The fingernail clam has also been found in many springs within the CSNM, particularly in systems with heavy sediments.

# Terrestrial Wildlife

The area that is now the Cascade-Siskiyou National Monument is becoming increasingly well known for it's biological diversity. Estimates of known and suspected numbers of vertebrate species present vary depending on the source. There are 138 species of birds confirmed (Trail 1999a). Nelson (1997) lists seven species of amphibians, 16 species of reptiles and 61 species of mammals as known or suspected to occur in the area. These

numbers pale in comparison to the invertebrate diversity present in the area. The CSNM hosts one of the richest butterfly faunas in the western U.S. with 107 documented species (Runquist 2000). This species richness, across taxa, results in unusual assemblages of species. This area is a mixing zone where "eastside" or great basin species such as pygmy nuthatch and kangaroo rats share habitats with "westside species such as rough skinned newts and Northern Spotted Owls. Here is also a "California" influence reflected in the reptile community. This species richness reflects the diversity of habitats found in the area. For a more detailed description of the vegetative diversity of the analysis area refer to the Vegetation section.

Twenty-four "special status" vertebrate species, three "special status" terrestrial invertebrate wildlife species (all mollusks) are known or suspected to occur in the area and will be discussed below. The CSNM provides important habitat for deer and elk. These game animals will be addressed in this section as well.

## Special Status Species

For the purposes of this document, Special Status Species (SSS) include those species that are listed as threatened or endangered, are proposed for listing as threatened or endangered, or are candidates for listing as threatened or endangered by the U.S. Fish and Wildlife Service, under the Endangered Species Act (ESA) of 1973, as amended. Also included are those species listed by the BLM as sensitive and assessment species. For this analysis, those species identified in the *Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl (FSEIS) Record of Decision* (USDA 1994b) for protection by Protection Buffers and Survey and Manage strategies will also be addressed as SSS. The Survey and Manage and Protection buffer designations in the NWFP ROD (USDA 1994b) have no legal relevance in this area due to the Monument designation. However, these species were on their respective lists due to concerns over low numbers and/or possible human caused impacts to their habitats. The concerns for these species are still relevant and they will be affected by whatever management approach is followed in the Monument. By definition, these species are in a "red flag" category. Range-wide inventory and monitoring is needed to better assess habitat needs and population status of many of these species; particularly those that are not presently listed under the ESA. Special management may be necessary at the local level to ensure long-term population viability.

## Birds

### Bald Eagle *(Haliaeetus leucocephalus)*

Bald eagles nest adjacent to Hyatt Lake and Howard Prairie Reservoirs. There is one nest inside the Monument in the Hyatt Lake area. Surveys for new nests and reproductive success at known nests occur annually at Hyatt Lake and Howard Prairie Reservoir. This species is currently listed as threatened under the Endangered Species Act, but is currently being considered for de-listing by the USFWS. Bald eagles can occasionally be seen in other parts of the Monument particularly in the northern areas by the above mentioned water bodies. Bald eagles have also been seen in the lower Jenny Creek area. The fish populations in Jenny Creek are probably too small to support a bald eagle nest down stream from the lakes but there has been an unsubstantiated report of a nest near the California Jenny Creek Falls segment.

### Peregrine Falcon *(Falco peregrinus)*

The Peregrine falcon has recently been de-listed by the USFWS. However, protection of known nesting sites is still required. There is one known nest sites in the Monument and a maintenance plan is being developed for this site.

Several reported sightings of Peregrines have been recorded around prominent rocks and cliffs in the Monument. There have been reported sightings of peregrine falcons in the Jenny Creek canyon. The cliffs along the rim of lower Jenny Creek canyon, Hobart Bluff, Pilot Rock and "Cathedral Cliffs" provide potential nesting habitat. Lower Jenny Creek canyon was inventoried for peregrine falcons in 1992 and 1994. No Peregrines were observed. Hobart Bluff, Pilot Rock, and the "Cathedral Cliffs" have all been checked for occupancy over the years using various methods and intensities of observation.

Hobart Bluff has a high traffic road running past the base of the cliff and there is a branch trail off of the PCNST that goes to the top of the cliff; both of these attributes detract from the suitability of the site. Pilot Rock is subject to substantial recreational use both for sight seeing and rock climbing. The disturbance resulting from this recreational use detracts from the suitability of the site for nesting. Cathedral Cliffs and the lower Jenny Creek canyon receives much less human disturbance due to their remote locations and difficult access.

### Lewis' Woodpecker (*Asyndesmus lewis*)

Lewis' woodpecker is a Bureau assessment species. This species is found most commonly in the Interior Valley Zone plant communities. This species is closely associated with mature oak woodlands and oak savannah habitat. Lewis' woodpeckers in the Monument are believed to represent a wintering population. There may be some nesting by this species, but there is no data to indicate breeding in the Monument. They were not found by Alexander (1999) during his breeding bird surveys.

### Greater Sandhill Crane (*Grus canadensis*)

The greater sandhill crane is a Bureau assessment species. Primary habitat for both nesting and foraging is wet meadows. There have been a number of sightings of this species in the meadows and grasslands near Hyatt Lake, Howard Prairie reservoir, also at Johnson Prairie (just outside the monument) and Fredenberg Springs (inside the Monument), but there has not been confirmed nesting within the Monument. There has not been any systematic inventory for greater sandhill cranes in the Monument.

### Western Meadowlark (*Stunella neglecta*)

The western meadowlark is a Bureau assessment species which is occasionally observed in the Monument. Primary habitat in southwest Oregon is large natural meadows and grasslands. Little is known about population trends in the Monument. Population trend range-wide is decreasing. This is believed to be mostly due to habitat loss resulting from suburban development.

### Western Bluebird (*Sialia mexicana*)

The western bluebird is a Bureau assessment species found throughout the Monument. Primary habitat is naturally occurring open areas or early-seral conifer forest. Little is known about population trends within the Monument. This species is impacted throughout its range by introduced competitors such as the European starling and English Sparrow. Both of these introduced species are known to be attracted to and thrive in the presence of humans and human developments such as ranches, feed lots, restaurants, picnic and camping areas and other places where food (grains, insects and garbage) is readily available. After the introduced species are established around human use areas, they can spread to the surrounding wildlands. Natural nest sites for bluebirds are cavities in trees and snags occurring in open areas. The introduced competitors can out compete the bluebirds for nesting sites, and to some degree food. A number of nest boxes to encourage western bluebirds nesting have been erected in the Jenny Creek Watershed particularly near the former Box-O Ranch over the last few years. Surveys to establish their effectiveness have not been conducted.

### White Pelican (*Pelicanus erythrorhynchos*)

The white pelican is a Bureau assessment species. It has been observed in various sized groups on Hyatt Reservoir (just outside the Monument) for approximately the past six summers. Little is known about this summer population other than that it is non-breeding and assumed to be from the Klamath basin which lies to the east of the Monument. The pelicans remain for a relatively short time, several weeks to a couple of months.

### Northern Spotted Owl *(Strix occidentalis caurina)*

The Northern Spotted Owl is listed as a threatened species under the ESA. Much more is known about this species and its habitat than most others present in the Monument. Most of the northern part of the Monument was identified as the Jenny Creek Late-Successional Reserve, designated under the Northwest Forest Plan (USDA1994a), prior to Monument designation. The Monument contains twenty-one known spotted owl pair sites as defined by the Interagency Spotted Owl Protocol. Seventeen of these sites are in what was formerly known as the Jenny Creek LSR.

Since the late 1980s, almost all of the adult spotted owls on the Ashland Resource Area of the Medford district BLM have been captured and individually marked with a plastic leg band of a site-specific color and/or pattern. These birds are also marked with unique numbered USFWS aluminum leg bands. Most of the juvenile owls produced have also been captured and marked with a standard color "juvenile band" and a USFWS band. Many birds were banded prior to 1990 although there was no effort to catch and band every spotted owl at every site. Since 1990, the policy of banding adults and juveniles was in effect until approximately 1995 across the resource area and has largely been applied to the Monument to date. This has allowed BLM to track movements of individual adults and juvenile owls.

Northern Spotted Owls are generally associated with late-successional coniferous forests, which are characterized by large trees, multi-layered canopies, and a high degree of canopy closure. It is largely due to concerns about the long-term viability of the Northern Spotted Owl that the late-successional reserve (LSR) land allocation was created.

The NWFP ROD (USDA 1994b) directed that 100 acres of the best, most contiguous Northern Spotted Owl habitat on BLM lands be identified and managed as a "core area" of habitat. The area around each of the spotted owl pair sites known as of January 1, 1994 in the Matrix land allocation were established as "core area" of habitat. These cores were given the designation "Unmapped Late-Successional Reserve" in the NWFP ROD. These core areas were to retain this designation into perpetuity regardless of the presence or absence of spotted owls in the future. As these areas were being identified in the Matrix, 100 acres was also identified for each known pair site in the Jenny Creek LSR. As a result of the Monument designation, the old land use allocations of Matrix, Late-Successional Reserve, and Unmapped late-successional reserve no longer apply to the Monument lands. However, the potential late-successional habitat and 100 acre cores established under the NWFP ROD are still ecologically valuable, and are useful in planning management in the Monument landscape.

### Current and Potential Spotted Owl Habitat within the Monument

*Federal Lands*

In 1992, the Ashland Resource Area completed a 100 percent inventory and classification of all resource area lands as to their current suitability and potential for future suitability for use by spotted owls. The information sources for this classification were:

- Operations Inventory data from the BLM Micro*storms system;
- aerial photographs;

- biologists' personal knowledge of the stands;
- field checks of questionable stands

The Medford District BLM uses a modified the McKelvie Habitat rating system to identify Northern Spotted Owl habitat. As the Northern Spotted Owl is closely associated with late-successional and old-growth (LSOG) habitat, it is assumed that habitat suitable for Northern Spotted Owl nesting, roosting, and foraging is also suitable for most old-growth associated species. Every acre of the CSNM was placed into one of the six possible habitat categories (Table 2-14). These are now referred to as LSOG habitat types and the descriptions are listed below Table 2-14.

Private lands were not included in the habitat classification because inventory data on those lands was not available. Map 28 shows LSOG habitat types within the Monument.

Habitat type definitions for Table 2-14:

**Table 2-14. Current LSOG Habitat Types in the CSNM**

| | Type 1 | Type 2 | Type 3 | Type 4 | Type 5 | Type 6 |
|---|---|---|---|---|---|---|
| Acres in Monument | 3,426 | 9,392 | 3,865 | 26,218 | 8,654 | 1,392 |
| Percent of Monument | 6.5 | 17.7 | 7.3 | 49.6 | 16.3 | 2.6 |

- **Type 1**: Nesting: (optimal-meets all spotted owl life requirements). Canopy closure greater than 60 percent and canopy structure multi-layered. Overstory trees greater than 21" dbh. Deformed, diseased, and broken top trees present. Large snags and down logs present. This is the best approximate we have for "old-growth" for planning purposes. This category is considered late-successional.

- **Type 2**: Roosting/Foraging: (meets requirements for spotted owl roosting, foraging and dispersal). Canopy closure usually greater than 60 percent, with generally single layer structure. Overstory trees greater than 16" dbh. Snags and down wood less prevalent than #1; may be very little. This is the best approximate we have for "mature"stands for planning purposes. This category is considered late- successional.

- **Type 3**: Potential Habitat Only: (meets no known spotted owl needs currently). Canopy closure less than 40 percent due to disturbance (logging, fire, etc.), but the area has the potential to become (grow into) habitat #1 or #2 as described above if given enough time and appropriate management. No attempt was made to estimate the time until the stands would reach a habitat type 1 or type 2 condition. Some residual stands in this category might require only a few decades. Others stands, such as recovering clearcuts, might take a century or more.

- **Type 4**: No Potential: (meets no known spotted owl needs currently). Canopy closure less than 40 percent. Natural limitations of the site will not allow the area to develop into habitat type #1 or #2 as described above. Examples include: chaparral, natural meadows, rocky scablands, and oak woodlands.

- **Type 5**: Dispersal with potential: (currently provides structure believed to be important for spotted owl dispersal). Canopy closure greater than 40 percent. Disturbance (fire, logging, etc.) has created this condition, but the area has the potential to become (grow into) habitat #1 or #2 as described above if given sufficient time and appropriate management.

- **Type 6**: Dispersal with no potential: (currently provides structure believed to be important for spotted owl dispersal. Canopy closure greater than 40 percent. Natural conditions limit the canopy closure and forest development potential (tree size and stocking) to the point that the stand will most likely never reach habitat conditions consistent with habitat #1 or #2 as described above.

Currently there are 12,818 acres of habitat suitable for spotted owl nesting, roosting, or foraging (Type 1 + Type 2) within the Monument. This represents approximately 24 percent of the Monument federal land base. Another 12,519 acres (24 percent of the Monument) has the potential to become suitable habitat at some point in the future. Only an estimated 48 percent of the Monument lands have the potential to become late-successional conifer habitat and these federal acres are intermixed with adjoining private lands. As a result, the Monument landscape as a whole will never approach the appearance of a contiguous block of late-successional habitat regardless of the management on federal land.

### *Private Lands*

It is assumed for the purpose of this analysis, that private lands intermingled with the Monument will not provide substantial amounts of suitable Northern Spotted Owl habitat over time. Current and past land management practices employed on private lands in the area support this assumption.

## ***Northern Spotted Owl designated Critical Habitat***

The USFWS designated Critical Habitat Unit (CHUs) on federal lands throughout the range of the Northern Spotted Owl after the species was listed as threatened. There are 41,985 acres of CHU #OR-38 in the Monument. Approximately fifty percent of these acres are suitable or potentially suitable habitat for the Northern Spotted Owl. The purpose of the CHUs was to provide essential nesting, roosting, foraging, and dispersal habitat for the species to ensure its long term viability. The specific purpose of CHU OR-38 was to provide linkage between the Western Cascades and Klamath Provinces through the I-5 Area of Concern. The Monument lies on the eastern flank of the I-5 Area of Concern. The habitat types for the lands in common between the Monument and CHU OR-38 is described in Table 2-14.

## ***Northern Spotted Owl reproduction***

Several attempts were made to develop regional conservation plans for the Northern Spotted Owl and other late-successional associated species prior to the development of the Northwest Forest Plan (USDA 1994a). These plans attempted to provide a conservation strategy that would ensure the viability of the Northern Spotted Owl. Common to all of these plans was a system of reserves along the Cascades. Although different plans had different reserve boundaries, they all showed a reserve in the general area that is now the Monument. The Monument designation superceded the LSR designation in this area. However, the area that is now the CSNM still has a role to play in the conservation of the Northern Spotted Owl. At one point there was a stated conservation goal of seventeen to twenty reproducing pairs of spotted owls in the general area that is now the Monument. As stated previously, there are twenty-one known spotted owl sites in the Monument. However, not all of the sites in the Monument contribute to recruitment into the region's spotted owl population on a regular basis.

Table 2-15 shows the results of spotted owl site monitoring in the Monument from 1990 through 2000. The BLM has never observed more than 17 pairs in the Monument in any one year. In that year, 1993, there were no young observed at any sites in the Monument. Four of the twenty-one sites have no documented production of young in any year. Consequently, the Monument's Northern Spotted Owl population is not providing the regional population support that was intended to come from this area in the conservation efforts prior to the Monument designation.

There are only four ways to increase spotted owl productivity of the monument:

1) Increase the quality of existing suitable habitat.
2) Increase the amount of suitable habitat.
3) Rearrange the same amount of suitable habitat on the landscape so that it becomes more useful to the owls.

**Table 2-15. NSO Reproduction:Fledglings with Pair (#), Nesting (N), Pair (P), or Single (S)**

| Site # | 1990 | '91 | '92 | '93 | '94 | '95 | '96 | '97 | '98 | '99 | '00 | # of confirmed fledglings produced since 1990 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0977 | 2 | 2 | 1 | P | 2 | S | P | 1 | P | S | 00 | 8 |
| 2285 | S | P | N | P | N | P | P | P | 2 | P | P | 2 |
| 2404 | S | 1 | 1 | P | 1 | S | N | P | P | 00 | 00 | 3 |
| 3272 | 00 | 00 | 2 | N | 2 | 1 | 1 | S | N | 1 | S | 7 |
| 2270 | 1 | 1 | 00 | S | 00 | P | N | P | 1 | 2 | 2 | 7 |
| 0061 | 2 | P | 1 | N | N | N | S | P | N | 00 | 00 | 3 |
| 2078 | 2 | 2 | 1 | P | P | P | N | 1 | P | P | 00 | 6 |
| 1305 | P | S | 2 | P | 2 | P | P | S | P | 00 | 00 | 4 |
| 2020 | 00 | P | S | S | S | S | NS | 00 | 00 | 00 | 00 | 0 |
| 0092 | 00 | S | S | P | 3 | P | 3 | 00 | 00 | S | S | 6 |
| 0891 | N | P | P | P | 1 | P | 1 | P | 00 | 00 | P | 2 |
| 3273 | NS | NS | N | N | 2 | P | N | 1 | N | P | 00 | 3 |
| 0966 | 00 | S | P | P | NS | 00 | 00 | 00 | NS | S | 00 | 0 |
| 4043 | 00 | 00 | P | P | P | P | 2 | 2 | 1 | P | P | 5 |
| 0962 | P | 2 | 2 | P | 2 | S | 2 | S | 1 | P | 2 | 11 |
| 4063 | 00 | 00 | 00 | P | 2 | P | N | P | 1 | P | P | 3 |
| 3274 | 00 | 00 | P | S | 00 | 00 | 00 | 00 | S | P | 00 | 0 |
| *3278* | NS | S | 1 | P | 1 | 00 | 00 | 00 | 00 | S | 1 | 3 |
| 4536 | S* | NS | NS | NS | NS | NS | NS | NS | NS | 1 | P | 1 |
| *0930* | S | P | 1 | P | 2 | 1 | P | S | S | 00 | S | 4 |
| *4061* | NS | NS | NS | P | S | NS | NS | NS | NS | NS | NS | 0 |

N: Nesting pair present, no fledglings observed.
S: Single bird present;
1: Nesting pair present, 1 fledgling observed.
2: Nesting pair present, 2 fledglings observed.
3: Nesting pair present, 3 fledglings observed.
P: Pair present
00: Surveys performed, no birds detected
NS: Site was not surveyed this year.

* Single male heard during surveys as part of Rosebud timber sale. Units in area dropped from sale with ACEC nomination. No further surveys until CSNM planning effort.

4) Expand the Monument to include more suitable habitat and active spotted owl sites.

Of these possible strategies, probably only number 2 is feasible, because there is not the expertise or time for #s 1 and 3; and #4 (expansion of the Monument) is not an option at this time.

*Potential for Spotted Owl Dispersal*

Banding records make it clear that the spotted owls in the Monument are not currently isolated from spotted owls in the NWFP Matrix. It is also clear that there is genetic exchange with populations to the north, east and west. There is no documented spotted owl movement in either direction across the I-5 corridor within the Monument or to and from the LSRs to the west of the Monument. However, in one notable case, a bird banded as a fledgling near Ruch, Oregon was recaptured some years later in the Jenny Creek LSR as a breeding adult. This bird moved 35 miles into the Monument area. The route this individual took is unknown. Table 2-16 below indicates the distance between the Monument and the closest neighboring LSRs.

**Table 2-16. Distance and Direction to nearest LSRs from CSNM**

| Direction | Center to Center Distance (miles) | Edge to Edge Distance (miles) | Majority Ownership of Intervening Lands |
|---|---|---|---|
| N | 18 | 5 | Federal Matrix and Private Industrial Timberlands |
| SE | 21 | 6 | Private, Unknown Type/Use |
| W | 12 | 5 | Federal Withdrawn/Reserved and Private mixed Type/ Use |
| E | None | None | N/A |

## Golden Eagle (*Aquila chrysaetos*)

While the golden eagle is not listed under the ESA and is not a Bureau Sensitive species, it is protected under the Bald and Golden Eagle Protection Act of 1940. There are no known nests in the Monument. There have been numerous sightings in the Jenny Creek and Emigrant Creek drainages, and it is likely that there are undiscovered nests in the timbered patches in the southern portions of the Monument. This species is associated with late-successional habitat in this part of it's range; it builds large nests in dominant overstory trees. The nest trees often have significant defect, such as a blown out top or large branches, and are usually one of the largest diameter trees in mature and old-growth stands. Known nest sites are located several miles outside of the Monument.

## Northern Goshawk (*Accipiter gentilis*)

The northern goshawk is a Bureau-sensitive species. In southwest Oregon, this species appears to be a foraging habitat generalist and a nesting habitat specialist. Preferred nesting habitat for northern goshawks in this part of their range is late-successional Mixed Conifer and White Fir Forest plant communities. Nests are built in crotches of forked trees, at the base of large limbs, or at the "barber chair" of a blown out top that has been replaced by an upward curving side branch that has assumed apical dominance. Nest trees are usually among the largest diameter trees in the stand. There

are three known nest sites within the Monument. There has not been any systematic inventory for goshawks within the Monument. However, numerous incidental sightings documented over the years make it likely that there are as yet undiscovered nests in the Monument.

### Great Gray Owl *(Strix nebulosa)*

The great gray owl is a Bureau-sensitive species. Great gray owls in southwest Oregon nest in mature/late-seral Mixed Conifer and White Fir Forests, and forage primarily in the meadows/grassland or early-seral stand conditions of conifer forests. There is one known great gray owl nest site in the Monument. Since 1992, there have been some opportunistic inventories for great gray owls, but no widespread systematic inventory in the Monument. However, incidental sightings have been reported over the years. It is highly likely that there are undiscovered nests in the Monument. The mix of mature timber stands and grassy open areas in the southern portions of the Monument looks especially suitable for the Great Grey Owl. Population trend in the Monument is unknown, but based on the number of reported sightings and the results of surveys in adjacent matrix lands to the north, the population in the southern Cascades appears to be stable.

### White-headed Woodpecker (*Dendrocopos albolarvatus*)

The white-headed woodpecker is a Bureau assessment species. In southwest Oregon, primary habitat is found in the White Fir and Mixed Conifer forests where pines are a component of the conifer stands. This species nests in cavities it creates in relatively large pine snags. Little is known about this species within the Monument. However, field observations indicate that the population is probably quite small. There are only occasional reported sightings of white-headed woodpeckers in the northern portion of the Monument.

### Black-backed Woodpecker (*Picoides arcticus*)

The black-backed woodpecker is a Bureau assessment species. Little is known about this species in the Monument. In this area, primary habitat is found in the white fir communities.

### Northern Three-toed Woodpecker (*Picoides tridactylus*)

The northern three-toed woodpecker is a Bureau assessment species. Little is known about this species in the Monument. Primary habitat is found in the White Fir Forests.

### Pileated Woodpecker (*Dryocopus pileatus*)

The pileated woodpecker is a Bureau assessment species that is found throughout the Monument. Primary habitat is mature/old-growth Mixed Conifer and White Fir coniferous forests. It is also found in lower elevation woodlands in fewer numbers than in the other zones, but only if conifers or hardwoods are large enough to create nest and roost cavities. Nothing is known about actual population trend for this species in the Monument. Populations have likely declined due to harvesting of the mature/old-growth coniferous forest previous to designation of the Jenny
Creek LSR in 1995, and later, the Monument.

### Flammulated Owl (*Otus flammeolus*)

The flammulated owl is a Bureau assessment species that is found throughout the Monument. Primary habitat is conifer forest intermixed with oak-woodland and grassland in mixed conifer communities. Population trend in the Monument is unknown. This species has been most often detected during spotted owl inventories. Flammulated owls nests in cavities created by other birds species (pileated woodpecker) in large pine trees and snags.

### Pygmy Nuthatch (*Sitta pymaea*)

Primary habitat is mature/old-growth conifer forest with a component of pine in the mixed conifer and white fir communities. An open canopy is preferred. Roost sites, which may shelter over 100 individuals, are very important for winter survival. Little is known about this species in the Monument other than that its occurrence has been documented. There are no known roost sites in the Monument. There has been no specific inventory of this species in the Monument.

## Reptiles and Amphibians

### Western Pond Turtle (*Clemmys marmorata*)

The western pond turtle is a Bureau-sensitive species. Preferred habitat is ponds or streams with abundant aquatic vegetation, basking structure (rocks and/or logs), and adjacent terrestrial habitat suitable for nesting and overwintering (Holland personal communication 1993). They are generally found below 3,600 feet in elevation. There are several known populations within the Monument.

Preferred nesting habitat is dry, clay soil on a southern aspect. Western pond turtles generally overwinter under the duff layer of a tree or shrub. They have been observed (in other parts of their range) to travel up to 300 meters from water to find overwintering sites. Some individuals are known to spend up to nine months at a time on dry land. Consequently, this species is somewhat dependant on upslope as well as in-stream conditions.

In other parts of the turtle's range grazing in and near the riparian zone impacts nests due to trampling. This may occur in the Monument as well, although it has not been documented. Nests are also lost to predation by racoons (native species) and opossums (introduced species). Ashland Resource Area initiated an informal monitoring program for two Jenny Creek turtle populations in 1994. There is not enough data to show any trends.

### Cascade Frog (*Rana cascadae*)

The Cascade frog is a Bureau assessment species. The frog prefers mountain meadow habitat characterized by marsh marigolds and small ponds or potholes with little aquatic vegetation. This species is known from at least one location in the Monument. Extensive, but informal, surveys for aquatic amphibians conducted in 1999 in the southern portion of the Monument resulted in negative results for this species.

# Mammals

## Fisher (*Martes pennanti*)

The Fisher is a Bureau assessment species. Preferred habitat is dense conifer forests in mixed conifer and white fir communities. There are no recent records of Fisher in the Monument. Populations were quite high in the upper portions of the Jenny Creek Watershed at the turn of the century, but intensive trapping caused a decline in the population. There is no concrete explanation why Fisher have not recovered with the decrease in trapping pressure, but it is speculated that habitat loss due to intensive timber harvest and associated road building has kept the population depressed. Track counts were conducted in portions of the old Jenny Creek LSR in the winters of 1992-93 and 1993-94 with negative results.

There are no specific protection measures prescribed for this species. The steps necessary to protect the species and its habitat are largely unknown, other than the retention/protection of hollow logs and trees, large tree and snag cavities, and large horizontal brooms as potential den sites.

## American Marten (*Martes americana*)

The marten is a Bureau assessment species. Preferred habitat is mature/old-growth conifer forests with an abundance of large down woody material and standing snags in mixed conifer and white fir communities. Marten tracks have been found in the Jenny Creek Watershed in the Howard Prairie and Johnson Creek areas. It is highly likely that marten occur in the Monument. However, little is known about the present distribution and abundance of this species in the Monument. Historically, the population is believed to have been quite high, but declined because of intense trapping. As with the fisher, habitat loss due to intensive timber harvest and associated road building probably has kept populations depressed.

There are no specific protection measures prescribed for this species. It is largely unknown what steps are necessary to protect the species and its habitat other than retention/protection of potential den site, in hollow logs and trees, large tree and snag cavities, and on large horizontal brooms.

## Pacific Pallid Bat (*Antrozous pallidus*)

The Pacific pallid bat is a Bureau assessment species. Preferred habitat is canyons and other rocky areas near water sources in arid areas. There are records of this species occurring in the Monument. However, little is known of its distribution and abundance.

## Townsend's Big-eared Bat (*Plecotus townsendii*)

The Townsend's big-eared bat is a Bureau sensitive species. Preferred habitat is caves, crevices, and abandoned mines. There are no known records of this species being present in the monument. The standard bat inventory technique of mist netting over water sources does not usually result in captures of this species because their superior echolocation ability allows the bats to detect and avoid the nets. The absence of this species in inventory data should not be interpreted as absence of the species in the survey area. The rimrock/cliffs of the lower Jenny Creek canyon, Pilot Rock area, and the "Cathedral Cliffs" likely provide suitable habitat. Townsend's big-eared bats have been found in the Klamath Canyon, which is nearby to the south east of the Monument (and were reported to be present at Pilot Rock according to the nomination document).

## Fringed Myotis (*Myotis thysanodes*)

The fringed myotis is a Bureau assessment bat species. It appears to be a habitat generalist since it is found in both forested and non-forested habitats. Caves, crevices, abandoned buildings, or other similar structures are required for nursery colonies. There are records of this species occurring in the Monument, but little is known of its distribution and abundance.

# Terrestrial Mollusks

There are three species of terrestrial mollusks (slugs and land snails) with special status that are known or suspected to occur in the Monument (Table 2-17). These species are listed in the *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (USDA 2001) which amends the Northwest Forest Plan Record of Decision (USDA 1994a). There have been limited surveys by researchers in the Monument. Down wood and vegetative cover are important habitat attributes for these species.

**Table 2-17. Special Status Terrestrial Mollusks known or suspected in the CSNM**

| Species | Status | Presence |
|---|---|---|
| *Helminthoglypta hertleini* (land snail) | S&M | Suspected |
| *Monadenia Chaceana* (land snail) | S&M | Probable |
| *Trilobopsis tehemana* (land snail) | S&M | Suspected |

# Special Emphasis Species

## Butterflies

The CSNM provides habitat for an unusually large number of butterfly species, both common and rare, for a relatively small area. Collections have been made at several localities over the years. Runquist (2000) observed 107 butterfly species at Oregon Gulch RNA, Scotch Creek RNA, Pilot Rock Area, and the Soda Mountain Area in the past few years (Appendix Q). Runquist feels that the potential number of butterfly species in the CSNM total over 120 (Jackson County = 118 documented species, Klamath County = 124 documented species).

The mardon skipper (*Polites mardon*) is a federally listed species of concern (SoC) found in the CSNM. It is considered as globally imperiled and rare by the Nature Conservancy and is on the Oregon Natural Heritage Program List 2 (1995). The Klamath mardon skipper (*Polites mardon klamathensis)* was recently described from the Soda Mountain Area (Matton and others 1998) and is included under the mardon skipper listing. This rare endemic subspecies is known only from the southern Cascades (Lake of the Woods, Dead Indian Plateau, and Soda Mountain) in Klamath and Jackson County, Oregon, and the Shasta Valley in northern California. The type locality (the geographical place where the specimens are found) is along the Soda Mountain Road in the CSNM. The Soda Mountain population occupies a small, moist, grassy forest glade along the Soda Mountain Road (39-3E-32.3) at 4,500 to 4,800 feet elevation. Runquist (1999) observed up to 300 individuals at Mardon Meadow, a name he bestowed on the type locality glade.

The species uses native fescues, including Idaho fescue (*Festuca idahoensis*), as host plants (Matton and others 1998, Potter and others 1999). The Klamath mardon skipper

was observed visiting an unidentified clover, probably for nectar, at the type locality. Although precise demographic information (size, survival) is unknown, the Soda Mountain population is thought to be small.

Butterflies are discussed further under the sections dealing with the RNAs (Appendices DD and EE).

## Deer and Elk

As a result of public interest, Black-tailed deer (*Odocoileus hemionus*) and Roosevelt elk (*Cervus elaphus*) are considered special emphasis species in the area. These species are not old-growth/late-successional habitat associated; they are dependant on early-successional stages for forage. They have been given special attention in the assessment because of their recreational value for both hunting and viewing. The Medford District RMP (USDI 1995a) designated big game management areas (map 29). Two of these areas, Jenny Creek Elk Management Area and State line Deer Winter Range Area, fall entirely within the Monument. The Emigrant Creek Deer Winter Range area is partially within the Monument. The Jenny Creek Elk Management area is 9,900 acres. The combined acreage of the two deer winter range areas within the Monument is 7,650 acres.

### Black-tailed Deer *(Odocoileus hemionus)*

Both a residential population and a migratory population uses the Monument. The resident population appears to make a short distance altitudinal migration, mostly within the Monument. The migratory population includes individuals that summer as far away as Fort Klamath, Oregon on the east side of the Cascades.

The Monument includes Agate Flat which ODFW considers to be the most important deer winter range in southwestern Oregon. Deer trend counts conducted by Oregon Department of Fish and Wildlife (ODFW) indicate a 50 percent reduction in Black-tailed Deer population in southwest Oregon since 1991. Historically, there have been some decreases in the population due to die-offs during extreme winter weather, but the population has recovered. In recent years, surveys have revealed lower than desired buck/doe ratios. This finding indicates heavy hunting pressure in the areas used by the deer in the fall and/or poor escapement of legal bucks. High road density and large expanses of land without adequate hiding cover on the summer/fall range are suspected of contributing to poor buck survival through the hunting season.

Most of the deer using the Monument generally winter in the lower elevation woodlands and summer in the Mixed Conifer and White Fir Forests and openings at higher elevations. Habitat condition on both the winter and summer range is fair.

Summer range forage condition appears to be fair but declining, but there is concern that managing the upper elevation areas of the Monument for predominantly late-successional forest conditions will limit forage availability on public lands. ODFW is concerned about decreases in summer thermal cover due to intensive timber harvest (both recent and historic) on both private and public lands in the area.

Forage condition on deer winter range is deteriorating due to the encroachment of unpalatable exotic grasses and forbs, fire exclusion from the mountain chaparral vegetative community, and livestock use, particularly on private land. Yellow starthistle, medusahead, and cheatgrass are some of the more common introduced species that are displacing native grasses and forbs. Compared to native species, these exotics produce poor deer forage. Fire exclusion has allowed wedgeleaf ceaonothus (the browse species favored by wintering deer) to become decadent and of little forage value.

Under natural conditions, fire regenerates wedgeleaf ceaonothus. Due to intensive, largely successful fire suppression efforts, wedgeleaf has declined. Existing plants are old and decadent and forage quality and quantity have decreased dramatically. The objective of several controlled burns in the winter range area in Oregon was to regenerate wedgeleaf ceanothus. These burns were small, occurred over 10 years ago and were only marginally successful.

Deer in this area use the timbered stringers which are intermixed with the brush fields, open areas, and oak woodlands for thermal cover. Winter thermal cover generally has the following attributes:

- conifer stands composed of trees greater than approximately 30 feet in height
- canopy closure 70 percent or greater
- the stands are greater than 0.50 acre

Thermal cover present on the winter range in the Monument is limited due to the natural open condition of vegetation at lower elevations. What limited cover there is aids deer in energy conservation by retarding heat loss and can make the difference in survival in extreme weather. Thermal cover condition on winter range has been degraded primarily by timber harvest.

### Roosevelt Elk *(Cervus elaphus)*

Roosevelt elk are present throughout the Monument in varying numbers. There are substantial herds found in the Chinquapin Mountain and Keene Creek Ridge areas and a small herd in the Cottonwood Creek drainage west of Interstate 5. The rest of the elk in the Monument tend to congregate in smaller scattered herds. Radio telemetry indicates that there is very little, if any, interchange of individuals from the herds separated by the freeway. ODFW trend counts for the Rogue Big Game Management Unit indicate an increasing population of elk. The counts are not specific to the Monument, but the population trend in the Monument should not differ much from the management unit as a whole. Habitat condition for elk is judged to be good as reflected in the increasing populations. ODFW is concerned about potential competition between elk and deer for the somewhat limited available forage because of the increasing elk population on shared winter range.

The elk management area in the Jenny Creek Watershed was established to emphasize elk management in the watershed's valley floor. The Jenny Creek Elk Management Area encompasses 15,300 acres of the Jenny Creek Watershed and overlays deer winter range as well. Part of the former Jenny Creek LSR (now referred to as Old-Growth Emphasis Area) overlays the elk management area. A combination of improved habitat conditions, especially forage conditions, and a regulated elk population would minimize the competition between elk and wintering deer.

# Vegetation

The vegetation patterns and plant communities in the Cascade-Siskiyou National Monument are the result of the interaction between the living organisms and their environment over time. Topography, aspect, soils, geology, climate, fire, other organisms (pathogens, herbivores, vectors), and geographical position at the nexus of the Cascade, Klamath, and Eastern Cascade Slope Ecoregions interact to develop the complex and rich pattern of CSNM vegetation.

Plant communities in the CSNM area can be broadly classified into grasslands, shrublands, woodlands, mixed conifer, white fir, semi-wetlands and wetlands. Although these communities do not reflect the full biological richness of the CSNM,

descriptions in the following sections on rare and threatened plant and wildlife species, habitat, and communities better describe the area's biological richness. Map 17 serves as a framework for describing the ecology and distribution of plant communities across the CSNM landscape.

The mixed conifer plant community occupies the greatest area within the CSNM landscape (26,933 acres). White fir predominates on more fire protected areas at high, above 4,500 feet, elevation (3,135 acres). Grasslands, shrublands and woodlands (22,772 acres) dominate on southerly facing slopes leading downwards from Pilot Rock, Soda Mountain, and Keene Creek Ridge towards the California border and the Klamath River. Table 2-18 shows amount of area occupied by major plant communities in the CSNM.

**Table 2-18. Major Plant Communities within the CSNM**

| Plant Communities | Area (acres) |
|---|---|
| Grassland | 9,788 |
| Shrubland | 6,573 |
| Woodland | 6,411 |
| Mixed Conifer | 26,933 |
| White Fir | 3,135 |
| Semi-wet meadows | 31 |
| Wet meadows | 76 |

# Plant Community Groupings

Plant communities in the Monument have been grouped into two "Emphasis Areas" for the purpose of addressing and prioritizing management of the respective plant communities and ecosystem processes (map 41). The Grasslands, Shrublands, Woodlands, Semi-Wet Meadows and Wet Meadows make up the "Diversity Emphasis Area" while the Mixed Conifer and White fir plant communities make up the "Old-Growth Emphasis Area". A brief description of each Emphasis Area will precede the description of the plant communities within them. These Emphasis Areas will be referred to throughout the document, particularly when describing possible vegetation management alternatives in Chapter 3.

# Diversity Emphasis Area

The Diversity Emphasis Area (DEA) is the land in the CSNM that consists of hardwood, shrub, grass, semi-wet meadow and wet meadow plant communities. There are an estimated 19,741 acres of federal land in the Diversity Emphasis Area with the majority located south of Soda Mountain.

Unlike conifer communities, the plant communities in the DEA are characterized by large changes in species abundance over relatively short periods of time. This is because many plant species have short life spans, and are dependent on fire and insects for reproduction. Various herbaceous species thrive for only a few years before conditions change enough to prevent growth. Shrub species may become decadent after a few

decades, and need to be renewed through activation of their seedbank by fire. Furthermore, many hardwood species are dependent on fire for creating conditions favoring their persistence on the landscape. This condition is best described in terms of fuel-loading. Presently, fire exclusion has led to high fuel conditions conducive to intense fires with the potential to kill above-ground parts, as well as latent, below-ground buds.

## Grass, Shrub, Woodland and Meadow Plant Communities

Hickman (1971) reports a series of rangeland sites descriptions, many of which occur within the CSNM. These vegetation descriptions also form the basis for the Natural Resource Conservation Service (NRCS) (1993) vegetative sites. A description of these vegetation types can be found below. Where named differently, the NRCS (1993) derivative is provided in brackets.

### Grasslands

Slope, aspect, elevation, edaphic conditions, mineralogy, fire history, and weed invasion all play a role in creating the range of grasslands and conditions present within the analysis area. It is likely that many grasslands have converted to annual grasses and starthistle consequent to fire exclusion, poor livestock management, and weed invasion. Particularly susceptible are sites with soils dominated by montmorillonitic clays. The moisture induced shrink-swell action of the montmorillonitic clays constitutes an endogenous disturbance favoring weed invasion. Medusahead and yellow starthistle are common on such Carney and Coker clay dominated soils. Lower elevation grasslands contain a high proportion of non-native annual grasses. Controlling noxious weeds and other non-native grasses constitute the major vegetation management objectives for grassland plant communities.

*Steep Foothill Grasslands* [Droughty Foothill Slopes]
Bluebunch wheatgrass (*Agropyron* [*Pseudorogneria*] *spicata*) dominate the sites with variable amounts of Idaho fescue (*Festuca idahoense*) and Lemmon needlegrass (*Stipa* [*Achnatherum*] *lemmonii).* Sites occur on shallow soils on south-facing slopes that exceed 40 percent. Elevation ranges from 1,800 to 4,000 feet.

*Steep Mountain Grassland* [Shallow Mountain Slopes]
Idaho fescue (*Festuca idahoense*) dominates the sites with variable amounts of bluebunch wheatgrass (*Agropyron* [*Pseudorogneria*] *spicata*) and Lemmon needlegrass (*Stipa* [*Achnatherum*] *lemmonii).* Sites are located on steep (over 40 percent) south-facing slopes with shallow, rocky soils. Elevation varies from 3,000 to 5,500 feet.

*Dry Meadow*
This community exists on flatter sites on moderately deep soils with a high shrink swell capacity. Ground vegetation consists of California oatgrass (*Danthonia californica*), pine bluegrass (*Poa secunda* [*P. scabrella*]), and various forbs. These meadow sites may have a scant canopy cover of shrubs and oaks. The shrink-swell capacity action of the soil may facilitate invasion by annual grasses such as cheatgrass and medusahead. Elevation varies from 1,600 to 6,000 feet.

### Shrublands

Brush fields are occasionally interspersed in the oak woodlands community, particularly the portion of the Monument north of Keene Ridge. At lower elevations, patches dominated by whiteleaf manzanita (*Arctostaphylos viscida*), wedgeleaf ceanothus (*Ceanothus cuneatus*), and poison oak (*Rhus diversiloba*) are common. At higher elevations, deerbrush (*C. intergerrimus*), mountain whitethorn ceanothus (*C. cordulatus*),

skunkbrush sumac (*Rhus trilobata*), and brown dogwood dominate the brush fields. Chokecherry (*Prunus virginiana*), bittercherry (*P. emarginata*), Klamath plum (*P. subcordata*), birchleaf mountain mahogany (*Cercocarpus montanus*), pale serviceberry (*Amelanchier pallida*), and yellow rabbitbrush (*Chrysothamnus viscidiflorus*) also make up a significant portion of the brushfield flora. This complex collection of shrubs is commonly known as Southern Oregon Chaparral.

### *Shrub Scabland* [Loamy Shrub Scabland]

Shrub communities occupy a greater portion of the landscape within the Agate Flat area. Wedgeleaf ceanothus (*Ceanothus cuneatus*) is the dominant shrub within this community. Fire exclusion has resulted in a preponderance of mature and decadent shrub maturity classes across the landscape. These shrublands frequently have a hardwood component in the form of Oregon white oak, birchleaf mountain mahogany, and the various plum species. The soils are shallow, rocky, and consequently well drained.

The herbaceous component of the shrub scablands are frequently dominated by annual grasses, particularly under wedgeleaf ceanothus canopy. Starthistle infestations occur throughout the shrubland areas, doubtlessly established through wind-dispersal of plumed seeds, as well as agents such as off-road vehicles, livestock, deer, elk, and hiking boots.

### *Mahogany-Oak-Fescue*

Communities dominated by members of the rose family (plums and chokecherry (*Prunus* spp.), birchleaf mountain mahogany (*Cercocarpus montanus*), and serviceberry (*Amelanchier alnifolia*) are commonly referred to as rosaceous chaparral.

## Woodlands

Oak woodlands in the CSNM are predominately at lower elevations and on south-facing and west-facing slopes. Oregon white oak woodlands frequently represent the major tree dominated associations of the Agate Flat portion of the CSNM (in the Lower Jenny Creek Subwatershed) and on south-facing slopes of Keene Creek Ridge and Rosebud Mountain. Soils and fire have been the most frequent coarse influence. The result is a mosaic of brush fields, scattered trees, grasslands, and pockets of conifers.

The integration of woodlands with grasslands and shrub scablands imply that the ecological issues and management objectives for grasslands and shrub scablands are also pertinent to woodlands. In addition to concern about weeds and shrub age/maturity class distribution, woodlands also show conifer invasion and overly dense understories of a younger cohort of Oregon white oak consequent to fire exclusion.

### *Juniper Scabland* [Loamy Juniper Scabland]

This site is defined by dry conditions, and may intergrade with steep mountain grasslands, various woodlands, and shrub scablands. Soils are shallow with a high percentage of bare ground. Associated forbs and shrubs show a Great Basin heritage.

### *Oak-Juniper-Fescue* [Droughty Slopes]

The woody dominants of this community indicate a mixing of flora from the Great Basin and Siskiyous. Often remarked as a plant community distinct for this region, it is commonly found across the Agate Flats and adjacent southerly-facing ridges.

### *Oak-Bunchgrass* [Droughty Fan]

Oak-bunchgrass sites are common within the lower elevation Agate flats area. Identified as areas of high canopy cover by oaks, these sites frequently identify the only areas with an intact native bunchgrass understory.

*Oak-Pine-Fescue* [Loamy Hills]
This site type occurs most typically on gently rolling hills at low elevations and on steep south-facing slopes at the higher elevations. Overstory is dominated by Oregon white oak with secondary amounts of ponderosa pine. Understory is mainly Idaho fescue (*Festuca idahoense*) with minor densities of bluebunch wheatgrass (*Agropyron* [*Pseudorogneria*] *spicata*). Forbs are variable. Soils are well-drained, shallow, and rocky.

*Oak-Pine-Oatgrass* [Clayey Hills]
Canopy cover of Oregon white oak, usually at high densities, with minor amounts of ponderosa pine. The dominant grass is California oatgrass. Soils are clayey at subsurface horizons. These sites are typically found on gentle slopes or flats at both north and south aspects.

*Pine-Oak-Fescue* [Loamy Slopes]
Overstory is dominated by ponderosa pine, Oregon white oak, and/or California black oak. Ground cover consists of high densities of Idaho fescue (*Festuca idahoense*). Mid-story may include birchleaf mountain-mahogany, serviceberry, and/or Klamath plum. Soils are moderately deep and are well-drained. Most sites occur on rolling hills, though some are found on steep slopes.

## Riparian Vegetation

As defined here, riparian vegetation grows where adequate water from nearby streams and small ponds or a high water table can support a terrestrial broadleaf deciduous plant community along their margins. These species cope with the long, dry summers by growing where there is adequate water to meet their transpirational needs throughout the dry period. These plant communities may have been impacted by past livestock activities.

Typical trees include: Oregon white alder (*Alnus rhombifolia*), black cottonwood (*Populus balsaminifera* var. *trichocarpa*), Oregon ash (*Fraxinus latifolia*), and bigleaf maple (*Acer macrophyllum*).

Commonly encountered shrubs are mock-orange (*Philadelphus lewisii*), willow species (*Salix* spp.), Douglas spiraea (*Spiraea douglasii*), ninebark (*Physocarpus capitatus*), Indian-plum (*Oemleria cerasiformis*), and Douglas hawthorn (*Crataegus douglasii*).

The NRCS (1993) database identifies a loamy flood plain of Abin soils. Associated plants include willow, himalaya blackberry, common snowberry, skunkbush sumac, Pacific serviceberry, Pacific poison oak, Klamath plum, black cottonwood, Oregon ash, Oregon white oak, Kentucky bluegrass, and wild grape.

## Special Plant Communities

Included within special communities are plant groupings considered rare within the larger, regional landscape (Western Juniper-Oregon white oak, Rosaceous chapparal), groupings rare within the Monument (Mountain Mahogany stands, old growth Sugar Pine stands), plant communities susceptible to undesired change (biscuit scablands), or, plant communities of great ecological significance within the analysis area (aquatic vegetation, and wet and semi-wet meadows). Refer to map 18 for the location of these special plant communities across the CSNM.

*Biscuit Scabland* [(Biscuit-Scabland (Intermound), Biscuit Scabland (Mound)]
The wet lands associated with patterned ground and vernal pools support a diverse and biologically important flora. As vernal pools dry seasonally, they undergo a series of transformations with one set of species replacing another. These vernal pools are

characterized by certain plant species including: Howell quillwort (*Isoetes howellii*), least mouse-tail (*Myosurus minimus*), mountain navarretia (*Navarretia intertexta*), downingia (*Downingia elegans*), and various species of popcorn-flowers (*Plagiobothrys* spp.). The most significant species is Bellinger meadowfoam (*Limnanthes flocosa* var. *bellingeriana*), a Federal Species of Concern and Oregon Natural Heritage Program Level 1 species is discussed further under Plant Species with Special Status section.

The characteristic biscuit scabland, or mound and swale topography is relatively rare on the landscape. In the analysis area these topographies are generally associated with grasslands with a predilection for annual grass invasion.

### *Oak-Juniper-Fescue* [Droughty Slopes]

Kagan and Caicco (1996) describe a western juniper-Oregon white oak woodland on south slopes and rolling hills found around Siskiyou Pass and Pilot Rock east along the California border often on deep clay, stony soils. A similar type is found in the Oregon Gulch RNA. Western juniper and Oregon white oak co-dominant with ponderosa pine along the margins or as isolated individuals within the stand. Wedgeleaf ceanothus is the dominant shrub, although Klamath plum (*Prunus subcordata*), Brewer oak (*Quercus garryana* var. *breweri*), and serviceberry (*Amelanchier alnifolia*) are important under the oak canopy. Idaho fescue (*Festuca idahoense*), bluestem wheatgrass (*Agropyron* [*Pseudorogneria*] *spicata),* California oatgrass (*Danthonia californica*), pine bluegrass (*Poa sucunda*), and needlegrasses (*Stipa* [*Achnatherum*] spp.) are dominant native grasses. However, the habitat is usually dominated by introduced alien annual grasses, including Medusahead rye (*Taeniatherium caput-medusae*), dogtail (*Cynosurus echinatus*), and various *Bromus* species. Forbs include: wooly sunflower (*Eriophyllum lanatum*), Western hawksbeard (*Crepis occidentalis*), narrowleaf desert parsley (*Lomatium triternatum*), Oregon mariposa lily (*Calochortus tolmei*), Blepharipappus (*Blepharipappus scaber*), and woolyhead clover (*Trifolium eriocephalum*). At lower elevations, yellow starthistle (*Centaurea solstitialis*) can be a significant weed.

### *Rosaceous Chaparral Types* [not described by Hickman 1971 or NRCS 1993]

Brock and Callagan (1999a) have discovered that the eastern Siskiyou rosaceous chaparral for which the Scotch Creek RNA was established consists of three relatively distinct plant communities.

### Oregon white oak/Klamath Plum-Wedgeleaf Ceanothus

This community is a minor component of the Scotch Creek RNA, occurring on the lower and middle slopes of the west aspects of Lone Pine Ridge and extending south across the Oregon/California border. It is a typical dry-site chaparral but appears to be fairly localized in its occurrence. It differs significantly from similar communities in the Applegate Valley because poison oak is absent. This community may extend up the Klamath River Canyon to the east.

Oregon white oak is always present, usually in shrub form, at a cover which can vary widely depending on soil depth. Wedgeleaf ceanothus and Klamath Plum are both usually present with covers averaging 23 percent and 57 percent respectively. Klamath plum is clearly the more abundant species on most sites. Birchleaf mountain mahogany is common at the higher elevations with covers of up to 5 percent. Annual grasses (*Bromus japonicus, B. tectorum* and *B. mollis*) dominate the grass/forb layer with frequent *Lomatium californicum*, *Claytonia perfoliata* and *Dichelostemma capitata*.

The soils supporting this type are classified as McMullin-Rock Outcrop complex. This community typically has very gravelly surface soils. Elevation ranges from 3,000 to 4,000 feet. The aspect is south to southwest. Slope position is lower to mid.

## Oregon white oak/Mountain Mahogany-Klamath Plum Chaparral Complex

The upper slopes of the west face of Lone Pine Ridge are covered with a dense chaparral consisting of a mix of white oak, birchleaf mountain mahogany, with a regular presence (but low cover) of Klamath plum. Some areas are dominated by white oak with reduced levels of mountain mahogany; other areas are dominated by mountain mahogany with white oak cover reduced; much of the area is a more or less equal mix of these two. Where mountain mahogany is the dominant (and white oak cover low), canopy gaps are frequent and the herb layer is significantly more dense as well as more diverse with several dry-site (grassland) species occurring in the canopy gaps. Most of the area is very dense and extremely difficult to walk through.

Throughout the area, the dominant herb-layer species are *Claytonia* (both *perfoliata* and *parviflora*), *Galium aparine,* and *Nemophila parviflora*. These species are the same as are found to be dominant in the White Oak Woodland type and in the chaparral on Slide Ridge. Three other species, however, are found in high frequentcy in this complex; *Hydrophyllum occidentale* (average 2 percent cover), *Osmorhia chilensis* (1 pecent) and *Clarkia rhomboidea* (average 2 percent cover). These elements are significantly different than the Slide Ridge chaparral complex.

This complex consists of roughly the following proportions:

- 40% "Mixed Type" with white oak averaging 60 percent cover and mountain mahogany averaging 50 percent cover with 3 percent chokecherry and 3 percent Klamath plum and with 4 percent tall snowberry. This type closely resembles some of the drier chaparral (Mt. mahogany dominant) found on Slide Ridge.
- 30% "Dry Type" with Mountain mahogany averaging 65 percent and white oak averaging 5 percent. Klamath plum is usually present a 1 to 2 percent cover. Chokecherry and snowberry are usually absent. This type has frequent small open spots with dry-site species such as *Collomia granidflora, Bromus sterilis, Lomatium californicum* and *Eriophyllum lanatum*.
- 10% White Oak Woodland: see separate description for the type; it occurs here fairly randomly often in the form of a large (apparent) clone in the middle of one of the other types.
- 10% Grassy openings; with typical mid-slope annual-grassland species; star thistle was not seen in this part of the RNA.
- 10% Rock outcrops

There does not seem to be any apparent aspect affinities in this complex except that the "Dry" Type (Mt. Mahogany dominant) seems to prefer the more southerly aspects. For the most part, the types are apparently randomly mixed.

The soils supporting this type are mapped as Heppsie-McMullin complex. The elevations ranges between 4,200 and 5,100 feet. The aspect is mainly southwest with some due west and some due south.

## Oregon white oak/ Mountain Mahogany-Snowberry Chaparral Complex

On the entire east slope of Slide Ridge (west of Scotch Creek) is a complex similarly dominated by Oregon white oak and mountain mahogany but more moist than the Lone Pine Ridge complex. There is considerable variation in species composition across the slope and some patterns are discernable. However, there are no clear delineations, and all of the "types" more or less integrated. The vegetation is fairly uniformly short-statured (10-20 feet in height) and moderately dense. The tree/shrub layer cover is consistently high, averaging 90 percent. White oak is always present with an average cover of 54 percent. Mountain mahogany is usually present with an average cover of 30 percent. Snowberry is usually present with an average cover of 18 percent. Serviceberry, tall Oregon grape, Klamath plum and chokecherry all have high frequency and average 2 - 9 percent cover. Mock orange (*Philadelphus)* and Indian plum *(Oemleria)*

occasionally occur. *Claytonia* (*perfoliata* and *parviflora*) and *Galium aparine* dominate the herb layer with *Smilacina racemosa* usually present. Other high frequency species include *Nemophila parviflora, Viola sheltonii* and *Clarkia rhomboidea*. This complex differs from the Lone Pine Ridge chaparral complex in the consistent high cover of snowberry (average 18 percent), the consistent presence of *Smilacina racemosa* and *Viola sheltonii* and the significantly lower cover of *Hydrophyllum*, *Clarkia rhomboidea* and *Osmorhiza chilensis*. It also lacks the dry grassland species which are fairly frequent in the Lone Pine Ridge chaparral.

While it is difficult to distinguish distinct types in this complex, there are some patterns which can be described. The complex is roughly composed of the following mix of community types:

- 40% White Oak-Mt. Mahogany; White Oak Dominant: This type averages 60-70 percent white oak and 20 percent mountain mahogany with 20 percent snowberry; it is fairly moist and occurs on northeast, east, southeast aspects.
- 20% White Oak-Mt. Mahogany- Mt. Mahogany dominant: This type averages 30-35 percent white oak and 60 percent Mountain mahogany with snowberry much less abundant; it is fairly dry and usually occurs on southeast aspects. This type is closely related to the "mixed" type of the Lone Pine Ridge upper complex.
- 10% White Oak Woodland: see the separate description for this type. It occurs here on east and southeast aspects, typically on lower slope position.
- 5% Riparian: in each of the small draws which dissect the area there is a narrow band dominated by dense *Philadelphus*, with *Holodiscus* and occasional maple.
- 5% Rocky grassy openings: typically on southeast aspects, often with a strong native Idaho fescue component.
- 20% Sites with Douglas Fir-White Oak or Douglas Fir/Serviceberry-Oregon Grape conifer potential are mostly dominated by white oak (40-50% cover), mountain mahogany (20-25% cover) and snowberry (32% cover) like the previous two types, but also have consistent serviceberry (20% cover) at higher elevation. Also distinctive in this more moist type is the regular presence of chokecherry, baldhip rose, silktassle, *Oemleria*, *Lonicera ciliosa* and occasional thimbleberry. The herb layer also has some distinctive species such as *Trientalis latifolia* and *Moehringia macrophylla* which are both usually present with a 2 percent cover. Douglas fir, black oak and ponderosa pine are present in some of the areas. The potential for some of this area is for an open canopied Douglas-fir or ponderosa pine overstory with white oak or black oak in the understory and continued fairly dense shrub layers. Some areas are trending toward the Douglas-fir/Serviceberry-Oregon Grape (PSME/AMAL-BEPI) type. Other areas seem to be more trending toward keeping Oregon white oak as a co-dominant. It is probable that most of this area has not seen much more than scattered conifers for a long time due to repeated fires, but given enough time without disturbance, the conifer component would develop. This does not mean that the area "should" be pushed toward conifer dominance...it just means that the ecology of the area is more difficult to interpret than was formerly thought. These conifer-potential sites are on north and northeast aspects, often clearly delineated by ridgelines.

The soils in this area are mapped as Bogus very gravelly loam with large inclusions of Heppsie-McMullin complex. Aspect includes north through southeast with northeast dominant. The elevation ranges from 3,000 feet to 4,100 feet.

### <u>*Mountain Mahogany*</u> (not described by Hickman 1971 and NRCS 1993)

The Curlleaf Mountain mahogany series by Sawyer and Keeler-Wolf (1995) is the only vegetation description that approximates the isolated stands of Mountain Mahogany occurring within the analysis area. However, the description includes many species not present within the analysis area.

*Rock Outcrops* (not described by Hickman 1971 and NRCS 1993)
Rock outcrops are sparsely vegetated with the most frequent species being *Juniperus occidentalis*, *Prunus subcordata*, *Bromus tectorum*, *Pseudoroegneria spicata*, *Alyssum alyssioides*, *Penstemon deustus* and *Lomatium californicum*. At higher elevations, *Sedum obtusatum* is common. A large population of *Woodsia oregana* also occurs at the higher elevations. A large sprawling member of the Hydrophyllaceae, *Phacelia ramosissima* var. *eremophila*, interesting eastern Oregon species, was found in protected (shady) areas of rock outcrops. The distinctive Scotch Creek RNA rock outcrop plant community is frequently associated with grassland complexes and outcrops in tree and shrub dominated communities. *Opuntia fragilis* is associated with the Cathedral Cliffs area.

Franklin and Dyrness (1973) describe two xeric meadow communities that could be associated with rock outcrops: forest openings with exposed bedrock dominated by cryptogams; and rock-bound communities dominated by *Sedum oregonense*, Caespitose Polygonaceae, and Xeromorphic ferns.

*Semi-Wet Meadows*
Sites are located on flats under semi-wet conditions. Moderately deep, clay-loam soils are poorly drained. Site is dominated by California oatgrass (*Danthonia californica*) and meadow sedge (*Carex praticola*). Swamp buttercup (*Ranunculus orthorhynchus*) is usually the dominant forb on various elevations.

Meadows in the White Fir Zone frequently have islands of white fir in them. The white fir in these islands form compact, densely stocked clumps where crowns extend to the tree base on the meadow's outer edge. The interiors of these tree groups are protected from wind exposure and moisture extremes. A moist, shady microclimate is maintained that is beneficial to tree and stand vigor and that is preferred habitat for many wildlife species.

Some openings in the white fir forest are maintained by late melting snow fields. These openings are important as the main habitat for Klamath lambs-tongue (*Erythronium klamathense*), an endemic species known mostly from the Southern Cascade and Klamath River Ridges Ecoregions. Yellow-bells (*Frtilliaria pudica*), also abundant in these openings, is an example of an east of the Cascade species that illustrates to the importance of the CSNM for connectivity. The western most distribution of Yellow-bells is the Rogue River Valley.

The NRCS (1993) data identify poorly drained bottoms (rush, sedge, mannagrass, cattail, willow, timothy), wet loamy terraces (Douglas spirea, common snowberry, Ponderosa pine, Idaho fescue, Western fescue, Pacific serviceberry) , semi wet meadows (California danthonia, sedge, clover, timothy, redtop, Canada bluegrass, Kentucky bluegrass, slender wheatgrass), and wet meadows (tufted hairgrass, meadow barley, sedge) as plant communities mediated by wet edaphic conditions. Many of these plant communities attract livestock during the latter part of the summer after senescence of the upland herbaceous vegetation.

Springs, seeps, semi-wetlands, wetlands and high elevation meadows occupy the smallest area of the landscape relative to other plant communities. Their relative rarity on the landscape define a limited habitat for vascular and non-vascular plants, insects, amphibians, birds and mammals. The specialized nature of these areas also attract unwanted attention from livestock and off-road vehicles.

As a source of water, springs, seeps and other moist areas attract livestock during the drier, hotter parts of the summer. Heavy grazing, deposition of urine and fecal matter, and trampling are detrimental to many permanent residents of these sites. While native ungulates can have the same effect on water sources, their lower numbers make annual landscape-wide impact unlikely.

Wet areas frequently identify more open habitats within conifer plant communities, particularly within the higher elevation white fir habitat. These open areas invite road construction and illicit OHV use. OHVs could disseminate weed seeds and alter the hydrology of wet areas, though their impact is generally less severe than that of livestock. Road construction has altered the hydrology of wet areas, while also providing access for livestock. Removal of existing roads may constitute an undesired disturbance to plant communities that have stabilized since initial road construction.

*Aquatic Vegetation*

Aquatic vegetation consists of those species that grow in or near still or flowing water and may be free-floating or attached and/or emergent. Free-floating species include various duckweeds and their relatives (*Lemna, Spirodela,* and *Wolffia*). These tiny plants float on the surface of ponds and in still water of flowing streams. Common attached floating vegetation consists of water-star wort (*Callitriche* sp.), waterweed (*Elodea*), various species of pondweed (*Potamogeton*), water smartweed (*Polygonum amphibium*), and Indian pond-lily (*Nuphar polysepalum*). Emergent species include: cattail (*Typha latifolia*), bulrush (*Scirpus* sp.), spike-rush (*Eleocharis* sp.), and bur-reed (*Sparganium* sp.), and water plaintain (*Alisma sp.*). These species occur at different places in the CSNM (in streams, stockponds, and the Parsnip Lakes) depending on current water depth and substrate.

# Ecological Interactions within Diversity Emphasis Area

Fire history and the local effects of fire exclusion are not well known. However, the role of fire in plant life-histories is well known. Grasslands, shrublands and woodlands are fire-dependent, and change if fire is excluded. Changes include altered distribution of species over the landscape, increased woody canopy cover with a resultant decrease in understory abundance and species diversity, increased duff accumulation, and reduced seed germination and production. These changes may be desirable or undesirable depending on management or ecological objectives.

Many of the changes caused by fire exclusion often facilitate future weed invasion. Increased canopy cover and deeper duff accumulation create more intense fires which could incinerate seeds and vegetative propagules. Increased physical dominance by an overstory (shrub, hardwood, or conifer) may suppress understory seed production. Any condition which reduces the abundance of native herbaceous plants or seedbanks would facilitate invasion by non-native weeds following a fire event, roadside disturbance, and in areas where livestock congregate.

At lower elevations, particularly within the Agate Flat area, much of the grassland, shrubland and open woodland have an understory dominated by annual weeds. The literature indicates that annual grass dominated plant communities are extremely difficult to convert back to native vegetation. Annual grasses monopolize soil water and nutrients, and alter soil surface conditions that result in low native grass seedling establishment. Excessive duff accumulation by introduced annual grasses often makes a poor seed bed for native bunch grasses. Open communities at higher elevation retain more of their native herbaceous species, although they may still be susceptible to weed invasion.

The open grasslands, shrublands and woodlands of the Scotch Creek RNA and other CSNM areas are a testament to the invasive abilities of yellow starthistle (map 19), even in the absence of recent grazing. The source of this invasion by weedy species is from adjacent infestations on uncontrolled grazing areas along the California border. High

elevation meadows surrounded by high canopy conifer communities appear particularly impacted by past livestock use. Many high elevation meadows retain a native herbaceous component.

The shrink-swell characteristics of the clay soils that are so prevalent in the CSNM are weed friendly. The eradication of weeds and the establishment of native plants is difficult because of the churning action of the soil, the impenetrable nature of the dry soil, and the lack of soil pore space.

Few shrublands have experienced fire in the past few decades. Most existing shrublands dominated by wedgeleaf ceanothus or manzanita could be described as decadent, since these species are not long-lived and reproduce from refractory seedbanks needing heat scarification to induce germination. Other shrub species (birchleaf mountain-mahogany, bittercherry, Klamath plum, and chokecherry) all resprout from root crowns after fire.

Oak woodlands intergrade with shrublands as well as grasslands. Where hardwoods exist within a matrix of shallow soils, the ecology of the understory approximates that of grasslands. Where mixed shrubs and oaks combinations occur, the plant community ecology mirrors that of shrublands. While the oaks and other hardwoods resprout following fire, intense fires following years of litter and fuel accumulation may result in the local extirpation of woody species. Since the native herbaceous component is frequently concentrated below oak canopies, the loss of isolated hardwoods could result in a decline of the native herbaceous component.

Several of the special plant communities described in this document are also considered fire-dependent. The rosaceous chaparral is dominated by members of the rose family. All are known to resprout following fire or surface disturbance. Studies of annual growth rings derived from the Scotch Creek RNA rosaceous chaparral suggest that members of the rose family are able to maintain themselves through resprouting in the absence of fire. However, longer term dominance by Oregon white oak, a longer lived and physically dominant member of the plant community, is likely after hundreds of years of the absence of fire.

The mix of Oregon white oak and western juniper is intriguing, since Oregon white oak is resistant to fire, while juniper is extremely susceptible to fire. Two hypotheses might explain the coexistence of these species. The plant community may have arisen as a result of fire exclusion. Juniper could thus be considered to be an invasive component of formerly oak dominated plant communities. Alternatively, the trees coexist on a matrix of fire-safe and fire-prone sites. In this case, juniper would be relegated to rocky or shallow soils unable to support an understory of fuels facilitating the spread of fire. It is likely that both of these scenarios apply. The long history of local use of fire would have extirpated juniper from the landscape if fire-safe areas did not exist. Young juniper can also be observed as an understory component along the edges of black oak and Oregon white oak gallery forests along Scotch Creek. The latter situation could only occur with fire exclusion.

Semi-wet meadows and wet meadows have been impacted by past livestock use. While the composition and structure of these communities may have been noticeably altered, the moist edaphic conditions usually prevent the invasion of non-native weeds, with the exception of introduced non-native forage grasses. Proper grazing management practices could allow these plant communities to recuperate and provide the important ecological functions and rare plant/wildlife habitats of the past. Semi-wetlands and wetlands have also been impacted by roads and by off-road vehicles use. In some cases, the restoration of hydrological functioning may be necessary for full plant community restoration.

Riparian areas show similar impacts including excessive historical livestock use, roads, and conversion to irrigated pastures in the former Box-O Ranch area. Changes in hydrological functioning may prevent the attainment of historical conditions, particularly in areas where water has been diverted, or streams have become channelized or incised. The development of a healthy woody riparian component is of primary importance to improve water quality, particularly along Jenny Creek. Time series photographs indicate considerable improvement in riparian areas over the past 20 years.

Rocky outcrops and rocky meadows usually retain their native flora. The lack of herbaceous component makes these naturally fire-free communities. Lack of herbaceous forage make these communities unattractive to cattle, although they may have been heavily impacted by historical sheep browsing. However, the open nature of these sites invites the use of off-highway vehicles, this is particularly evident in the Pilot Rock area.

# Conifer Plant Communities

## Old-Growth Emphasis Area

The Old-Growth Emphasis Area (OGEA) consist of approximately 23,903 acres of land within the CSNM which is presently late-successional habitat and old-growth (LSOG) coniferous forest or is capable of becoming late-successional habitat and old-growth forest. Before the establishment of the CSNM, most of the Old-Growth Emphasis Area was identified as the Jenny Creek Late-Successional Reserve (LSR). The Old-Growth Emphasis Area is an important corridor in providing a key link between LSRs in the Cascade and Klamath Mountains (map 52).

## Past Timber Management Practices

The first timber harvesting in the CSNM occurred around the turn of the century with economic selection for the best quality old-growth ponderosa pine, sugar pine and Douglas-fir trees (Larsen 1976). The Oregon and California Act of August 28, 1937 established timber production as the primary use of BLM forest lands in western Oregon.

Large scale salvage logging, partial harvests, and selective logging began in the 1940s to provide ammunition shell crate boxes. During the 1950s and 1960s, shelterwoods, a few seed trees and clearcuts, and group selection harvesting was practiced. After harvest, individual seed trees were usually lost to high winds common at these upper elevations and, over time, these regeneration cuts came to resemble clearcuts. By the 1970s, logging practices shifted from "mortality-salvage"/selection operations to more and larger regeneration harvesting as three-step shelterwood harvest system was generally practiced. LSOG stands were often entered as part of large-scale developmental sales. These sales were planned in order to enter an "undeveloped" area with some regeneration harvest to establish the road systems for future sales. The 1980s saw a continued increase in clearcutting despite recognized problems with reforestation as a result of these practices (Minore 1978). Within the OGEA lands, approximately 83 percent has a timber harvest history and approximately 6 percent has had some form of regeneration harvest that has produced plantations. Timber sales have involved removal of significant LSOG forest components in the Chinquapin Mountain, Beaver Creek, and Lincoln Creek areas in the late 1980s. Harvesting stopped in 1994 with the designation of the Jenny Creek LSR as a result of the Northwest Forest Plan. The regeneration harvested areas are occupied by young even-aged pure pine plantations. The clearcutting on private lands both within and adjacent to the CSNM involved the

removal of whole sections of LSOG forest at a time and most regenerated as pure pine plantations. Private forest lands continue to be clearcut and most lands that have not been clearcut have been harvested too heavily to continue functioning as suitable Type 1 & 2 habitat. Some may function marginally as dispersal (type 5) habitat.

## Plant Community Description

*Mixed Conifer*

There is no clear transition at higher elevations between the Mixed Conifer Zone and the White Fir Zone. The Mixed Conifer Zone is found in the Upper Tyler Creek, Baldy, Lower/Middle Jenny Creek and Keene Creek Subwatersheds between 2,500 and 4,200 feet elevation. The Mixed Conifer Zone landscape pattern is coarse grained because of interspersed shrublands, meadows, clearcuts, and forestland.

The Mixed Conifer Zone supports a variety of conifers including Douglas-fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), ponderosa pine (*Pinus ponderosa*), sugar pine (*P. lambertiana*), incense cedar (*Calocedrus decurrens*), Pacific yew (*Taxus brevifolia*), and western juniper (*Juniperus occidentalis*). Douglas-fir is the most common conifer with sugar pine, ponderosa pine, and incense cedar also present in the overstory of mature stands. In mature stands, white fir (and Douglas-fir with enough canopy gaps) dominates other understory conifers, which indicates that it is the climax species. Before 1910, more frequent fires prevented the more flammable, shade tolerant white fir from becoming a dominant climax species at lower elevations. As a result of fire cessation, a shift toward dense stands of white and Douglas-fir at the expense of sugar pine, ponderosa pine, and incense cedar has occurred.

Much of the Mixed Conifer Zone and all of the white fir zone in the CSNM would be classified with Atzet et al. (1996) the white fir series made up of several white fir (ABCO) associations. White fir associations are recognized by a high rate of constancy (the percent of plots with a given species present) among understory trees. In some plant communities, Douglas-fir might have 100 percent constancy in the overstory but would be considered a white fir association because 100 percent constancy of white firs in the understory.

*White Fir Series*

Atzet et al. (1996) WHITE FIR-INCENSE CEDAR/WESTERN STARFLOWER (ABCO 44). This association is particularly well represented in the northern part of the Monument. Douglas-fir, white fir (*Abies concolor*), incense-cedar, and sugar pine are the main overstory trees. White fir is the main constituent among the understory trees and has increased to the detriment of the less shade tolerant sugar pine, Douglas-fir, and incense cedar with lack of fire as an important ecosystem factor. Sugar pine and incense cedar quickly fill in canopy gaps caused by blow-down white fir and Douglas-fir that have succumbed to *Phellinus weirii* and other root rot infections. Sugar pine, in many associations, often appears as the long-term dominant continuing to grow as generations of white fir and Douglas-fir perish from fire or root rot. Sugar pine usually occurs as isolated individuals and never in solid stands. White fir stocking levels have increased compared to other conifers in the area because of fire suppression and lack of Native American burning practice. Under even the lightest fire regimes, young white firs are fire sensitive because of their low branches that sweep to the ground creating fuel ladders to the crowns and relatively thin resinous bark.

South of Keene Ridge mixed conifer forests tend to occur as more isolated stands as opposed to the more contiguous stands located to the north. Stands south of Keene Ridge are often surrounded by non-forest grassland and shrubland plant communities while stands to the north are fragmented by historic logging practices. The conifer stands south of Keene Ridge are distinctive as biologically diverse islands and represent unique isolated communities that are the last forest stands in the Klamath physiographic region. Conifer forest linkage with the Sierra Nevada Mountains occurs further to the east through the eastern Cascades.

Several variants of mixed conifer stands found as islands are of note south of Keene Ridge and Pilot Rock. Below Pilot Rock are stands of Douglas-fir with a large white fir and incense cedar component. Further south and lower in elevation are stands with more of a pine component. Near the California border are stands with both a large dominant ponderosa pine component and a healthy pine understory. Throughout this area are open pine (mixed conifer stands) that grade into woodland pine-oak communities. Many of the mixed conifer stands have extended marginally (ecotonal or transition zones) into non-forest communities in the absence of fire. Another mixed conifer variant occurs in Oregon Gulch (see Oregon Gulch RNA). All of the mixed conifer variants described are distinctive as biologically diverse islands and represent unique isolated plant communities that need further study.

## Connectivity

Connectivity is a measure of the extent to which conditions among habitat, in this case specifically late-successional and old-growth (LSOG) habitat, can provide for breeding, feeding, dispersal, and movement of a species (LSOG-associated wildlife, fish and plant species). Habitats for providing these functions are described in the wildlife section of this chapter.

The OGEA was previously identified as the Jenny Creek LSR. This area was part of a large network of LSRs in the Oregon Cascades, Northern California Cascades, Siskiyou Mountains and is located at one of two connectivity "hotspots" in Oregon (the other is Galesville LSR). These LSRs provide a vegetative link for Northern Spotted Owls to move from the Oregon Cascades to the Oregon and California Siskiyou Provinces. The baseline vegetation (Table 2-18) and habitat types (Table 2-14) are used as a reasonable representations of the connectivity that exists on the landscape.

Identifying an area as an OGEA does not automatically transform the area into functional habitat for the array of plant and animal species associated with the LSOG habitat. Fragmentation of the LSOG habitat within the OGEA has produced breaks in habitat that can be larger than some species are willing to cross. Enhancing connectivity by protecting existing habitat and avoiding further degradation of existing LSOG habitat should be a priority in the CSNM.

The ability to assess the effect of connectivity habitat on the specific persistence of terrestrial species is limited by incomplete information for most wildlife species on dispersal capabilities, genetic interactions, and demographic parameters that influence successful dispersal of a species. Despite the lack of definitions, tools and data to assess connectivity, the ability of a landscape to provide for species movement between refugia is a persistent concern in addressing ways to manage for LSOG habitat. There is little evidence that the CSNM has ever played a major role in the east-west plant and animal migration although it does provide a relatively undisturbed east-west corridor for local animal movement, with the exception of the Interstate Highway.

## Current Stand Conditions

Most recently, forest vegetation has been influenced by timber harvest and fire exclusion. This has caused changes in structure, tree sizes and habitat. Mixed conifer forests account for approximately 93 percent of the forests in the CSNM. Therefore most of the following discussion pertains to mixed conifer types. The remaining 7 percent is in white fir types which are more influenced by root rots as opposed to fire as a historic disturbance agent. Stand conditions are first discussed by size class and then by ecoregion and habitat type. The stand conditions are discussed in two ways because the Forest Operations Inventory identifies forest stands by size while habitat types are defined by tree size, canopy closure, stand structure and ecoregion. The use of ecoregion and habitat description allows for assessing different forested plant communities throughout the OGEA. This cannot be accomplished using dominant tree sizes only.

## Current Stand Condition by Size Classes

*Mature/Oldgrowth (21" + DBH)*

Mature old-growth stand conditions occupy approximately 15,000 acres in the OGEA. The size class refers to the dominant size class found on site. Dominant tree age tends to exceed 150 years. The majority of these mature old-growth stands make up the LSOG habitat (habitat type 1 & 2) with the remainder being habitat type 5. Stand conditions only partially describe habitat type (see wildlife section for description of habitat type). In the OGEA approximately 83 percent has been entered for timber harvest. As a result, stands are often represented by groups or single individual large mature trees at varying densities. Trees species composition within the stands has shifted from pine and Douglas-fir domination towards white fir. Tree canopy is discontinuous with many gaps created by timber harvest. Gaps are occupied by a number of species, but white fir is the most common. Often only 6-8 mature trees are found per acre. Growth rate demonstrated by increment coring shows a slowdown from historic growth rates. Understory subdominant trees are often young in age having ingrown since timber harvest and/or the last fire event. Stands that are un-entered (approximately 4,000 acres) or that have been lightly entered still retain high densities of mature trees that are similar to historic levels. Most of the understory trees are white fir and are commonly at levels exceeding historical conditions. Levels of root rot and insect infestation are thought to be higher as a result of species shifts and increased tree densities. Pine are at risk of beetle infestation due to these higher tree densities. Recent observed wildfire behavior in the Monument indicates high rates of mortality of even the largest mature trees and potential stand replacement when wildfire occurs due to excessive ground and ladder fuels and heating in the white fir component.

*Mid- Seral (11-21" dbh)*

Mid-seral forest stands in the OGEA are 30-120 years of age. Most are habitat type 5. Some of the younger stands are habitat type 3. They tend to have one to two age classes and are mostly composed of Doug-fir and white fir. Many of these originated as even age stands just prior to wildfire suppression beginning around the turn of the century. Most have been entered, particularly in areas within stands that have a component of larger trees. Gaps are common. Multiple canopy layers are not as notable as in the mature stands because of the more even aged nature of these stands. Growth rates may be fairly good, but are hampered by ingrowth of young white fir and surrounding trees of the same age. Many of these stands are growing at a higher density than stands that historically developed into LSOG. The pine that occur in these stands are often stressed by surrounding high densities of white fir making them a high risk for beetle infestation. Excessive fine fuels have accumulated during mortality of young trees resulting in a higher risk of stand replacement during wildfire events.

*Poles (5-11" DBH)*

A fairly small amount of the OGEA is represented by pole sized stands. Most of these are natural stands that are extremely dense with stocking levels up to 1,500 trees per acre. Some have a mixed conifer and fairly open yet clumpy nature due to over story removals. Tree age varies, they tend to be less than 60 but can exceed 100 years. Growth in these stands is relatively slow. These stands will not develop into mid-seral or late-seral stages in the near future without management intervention. These stands tend to be habitat type 3 stands because the tree size is presently too small to provide for nesting, roosting, foraging, or dispersal but has the potential to become LSOG habitat in the future. Very few larger trees are found within these stands. Predominant species are Doug-fir and white fir. Brush is common in the understory as it has not yet been shaded out. Given the age and size of trees in these stands wildfire would probably be a stand replacement event in most cases.

*Early Seral /Plantations*

Most of these forest stands are habitat type three and are monocultural even aged pine plantations that resulted from planting clearcuts. The majority of these are less than 30 years old. They are overstocked and should have been thinned during the last decade. Growth rates are showing a slowing trend as the stands close in. Stocking levels tend to be 250 to 500 trees per acre. Very little natural ingrowth of other mixed conifer species is occurring. These plantations often exceed 30 acres in size. Unless thinned these stands will continue this slow growth trend resulting in overstocking and excessive basal area. This will cause an increase in beetle and wild fire risk as well as an inability to release and develop into stands with LSOG characteristics .

### Current Stand Conditions by Ecoregion and LSOG Habitat Types

As a result of being located at the intersection of the Cascade Mountains and the Klamath Mountains there is considerable variation in physiographic characteristics. The Oregon Natural Heritage Program (ONHP) in its 1998 plan to conserve Oregon's natural heritage and protect its biodiversity adopted an ecoregion concept. These ONHP Ecoregions are described by several ecological factors or characteristics and each ecoregion is designated by a geographic name and number. The ONHP Ecoregions are used in this Plan to define important biophysical relationships in the CSNM including the coniferous forest (Appendix T) .

The CSNM overlaps portions of three Level III Ecoregions: Klamath Mountains (78), Cascades (4), and Eastern Cascades Slopes and Foothills (9) (Pater et al. 1997a and 1997b and Natural Heritage Advisory Council 1998). These Level III Ecoregions are further subdivided into subordinate Level IV Ecoregions which in the ONHP classification system uses the Level III number plus a lower case letter to distinguish each Level IV Ecoregion. There are four Level IV Ecoregions found in the Monument: Southern Cascades (4g), Southern Cascades Slopes (9i), Siskiyou Foothills (78b) and Klamath River Ridges (78g) ( map 3).

## Disturbance Agents and Processes

The first disturbance section lists individual insects and diseases found having an effect in the OGEA. The second section discusses and illustrates processes: Current vs. historic.

### Forest Insects and Disease

Insects and pathogens are often predictable agents of change currently present in the CSNM and surrounding areas. Individually or acting together they can decrease growth and cause mortality in individual trees. At a landscape level, they influence stand

structure, composition, and function within forest ecosystems by creating canopy gaps, altering plant succession, creating decay columns and snags, which contribute woody material to the forest floor and streams. Insect and disease influences may be beneficial or detrimental to development and maintenance of late-successional or old-growth conditions, depending upon the mix of hosts, insects, and pathogens; current weather patterns; fire history; host species composition; host vigor; and past management activities. The following is a description of the diseases and insects most commonly found in the CSNM.

## Laminated Root Rot

Laminated root rot, caused by *Phellinus weirii* (Basidiomycota), is the most damaging tree disease in the CSNM. This disease is found on at least 3,000 acres of mixed conifer and white fir forest lands with a mix sugar pine and incense cedar and a white fir understory. On some sites, large, individual sugar pine have survived for 600 years, while generations of surrounding Douglas-fir and white fir grew, matured, and then succumbed to laminated root rot.

Laminated root rot has always been present at some level on these sites for centuries. Good examples of the establishment of shade intolerant pine and incense cedar in gaps left by the death of firs by laminated root rot are found in the Soda Jenny and Crane Prairie areas. Here, laminated root rot causes extensive growth declines, decay, and mortality among susceptible white fir and Douglas-fir. Lodgepole pine and sugar pine are tolerant, while ponderosa pine and incense cedar are resistant. Approximately 400 acres of LSOG forest in the area with laminated root rot were clearcut and planted to pine plantations. Eighty years of fire exclusion has caused a shift to dense stands of more intolerant white fire and Douglas-fir that stress the older pines and cedars. The last stand replacing wildfire event in this area was in 1910.

## Annosus Root Disease

Annosus root disease caused by *Heterobasidion annosum* (Basidiomycota) damages white fir in the CSNM. Several incidences of *Annosus* root rot have been noted in cut over areas where it has colonized stumps from previous stand entries and infected conifer regeneration in the vicinity. Infection occurs when roots from healthy trees come in contact with infected root material. Ten or tewnty years after entry, a significant proportion of the associated stand and subsequent reproduction often shows a large proportion of *Annosus* infection mainly in the form of butt rot, windthrow, and stem breakage.

Other root or butt rot diseases observed in the area include shoestring root rot *(Armellaria mellea*) and velvet top *(Polyporous schweinitzii)*. Black stain root disease (*Verticacladiella wagonerii)* was surveyed in 1986. No reported infection centers were observed on Douglas-fir or ponderosa pine because few Douglas-fir plantations of the age class (10-30 years) are found in the CSNM due to the severe frost problem associated with clearcuts.

## White Pine Blister Rust

White pine blister rust on sugar pine is caused by *Cronartium ribicola* introduced from Europe around 1910. It causes top kill and flagging of small branches on large trees and mortality of poles, saplings, and seedlings due to girdling cankers. Seedlings from resistant parents are planted in partial cut stands and gaps. Significant sugar pine mortality has been observed on seedlings and saplings in several areas within the CSNM. Because sugar pine often seeds into gaps in mixed conifer stands, small sugar pine mortality is significantly altering future forest structure because incense cedar, white fir, and Douglas-fir fill these gaps instead. Presently, young sugar pine are not occupying these sites.

## Common Heart Rot

Common heart rot or decay column causing pathogens include *Polyporous amarus* on incense cedar, *Phellinus pini* on Douglas-fir, and *Echinodontium tinctorium* on white fir. These necessary and beneficial fungi create habitat used by cavity nesters and dwellers. Heart rots usually do not cause mortality because they grow for decades with the maturing tree, forming cavities that provide nesting habitat for decades in late-successional stands.

## Insects

Several primary tree killing insects are present in the CSNM including western pine beetle (*Dendroctonus brevicomis*) on ponderosa pine; mountain pine beetle (*D. ponderosae*), red turpentine beetle (*D. valens*) and pine engravers (*Ips spp*.) on sugar and ponderosa pine; Douglas-fir beetle (*D. psuedotsugae*) on Douglas-fir; and fir engraver (*Scolytus ventralis*) on white fir. Recently insect species associated with pine have significantly effected large old trees due to stress associated with dense stocking of white fir in the understory and drought. Sugar pine and ponderosa pine are being lost in many areas within the CSNM as a result of increased competition by white fir and subsequent insect attacks. Blister rust on sugar pine exacerbates insect attack. Fir engraver activity associated with root rots is another example of trees being predisposed to insect outbreaks due to an existing stress problem. Historic references record major beetle infestations from 1925 to 1934. Periodic and local infestations continue to occur over the area.

## Dwarf Mistletoe

Dwarf mistletoe on Douglas-fir and white fir is common. The most significant impacts on the growth and survival occur in multi-storied Douglas-fir stands where partial cutting and fire exclusion have created uneven- aged stands resulting in higher infection levels and increased occurrence of Douglas-fir mistletoe (*Arcuethobium douglasii*). It is recognized by its aerial shoots accompanied by host stem swelling and multiple branching pattern called witches brooms. Some level of dwarf mistletoe in a stand is desirable for future old-growth tree character and structure, as well as spotted owl habitat. The Douglas-fir in particular develops brooms, which are important to wildlife. The large brooms that form over the course of several years on large old-growth trees are desirable habitat and irreplaceable in the short term. Development of old-growth character from heavily infected trees in overstocked understory is unlikely due to infection of the actively growing tops on intermediate to small trees. Historically, many of the smaller infected trees were removed from the stand by wildfires. Presently, infected understory trees are acting as fuel ladders that increase the likelihood of killing the larger overstory stand components. Areas in the CSNM, such as Fredenburg Springs, are good examples of the fuel ladder problem.

## Other Diseases

Some additional diseases in hardwoods include a number of leaf blight fungi on madrone. These often occur in epidemic proportions over significant areas. They may be the result of drought and localized weather and generally have short term effects. Oak plant communities commonly have root rots such as *Armellarea mellea.* Various decay fungi inhabit long lived oaks. Lack of fire likely effects mast production and regeneration in oak communities. Recently sudden oak death (SOD) has been noted in Northern California. It is caused by a Phytopthora species that causes cambial cankers and has resulted in significant dieback in some areas. As yet no incidence on oak has been noted in Oregon. California black oak *(Quercus kelloggii),* a common associate in the CSNM, has been found to be highly susceptible in California. The location of the CSNM and the common occurrence of oak woodland plant communities south of the Keene Creek Ridge just north of the California border and its proximity to the I-5 corridor make this area a prime candidate for (SOD) introduction in Oregon. Road closures and avoiding transport of infected plant materials will be essential in protecting these oak woodland plant communities.

## Winds

High winds periodically cause windthrow in managed forest stands and natural stands. Blowdown is common on ridges especially when soils are saturated. Trees that are shallow rooted as result of high water tables have increased susceptibility to windthrow during storms, particularly where the stand has been recently thinned. Heavy snowfall accompanied by high winds during severe winter storms result in increased tree breakage and windthrow of white fir and other tree species. The most severe blowdown problems in the CSNM in recent history have been due to heavy thinning for shelterwoods. Clearcutting has exposed forest stand edges to direct wind resulting in increased blowdown. Open areas in rugged terrain exacerbate wind tunnel circumstances wherein windthrow at the edges of intact forest stands gradually erodes stand integrity. All of these situations contribute to fragmentation of intact forest communities.

## Animal Influences

Most animal problems in the CSNM are associated with favorable habitat conditions created as a result of historic clearcutting. Only incidental problems have been noted in late-successional forests.

Pocket gophers (*Thomomys sp.*) have posed the most significant animal problem to reforestation on the CSNM. Historic clearcutting practices have converted old-growth or late-successional forests to grass fields. This is ideal habitat for gophers and, coupled with severe frost heaving, the only reforestation option is to plant lodgepole, Jeffrey and ponderosa pine. These are the only species that can survive successfully in what is now an early seral community. Heavy gopher infestation typically causes mortality of pine seedlings for up to five years and sometimes longer. Mortality has been as high as 90 percent of stocking in a single year. Gophers prefer fleshy or succulent roots and stems of herbaceous plants and trees, injuring tree seedlings by root pruning, stem girdling, and stem clipping. Replanting has been the normal procedure on these sites. Methods employed to control gopher populations include baiting with poison, trapping, and plowing. Success has been limited as gopher populations fluctuate rapidly due to weather, altitude, soil characteristics, and food quality and quantity. Coupled with increased acreage of pine plantations there has been an increase in porcupine populations that continue to girdle and top kill pine at a detrimental level up to 40 years of age. Reforestation is extremely difficult as is young stand management after clearcutting at the high elevations (white fir and mixed conifer communities) that characterize the CSNM.

Gophers provide food for a host of small and medium-sized predators, including spotted and great grey owls, coyote, and various snakes and weasels. They are suspected to play a role in maintenance of vernal mound (ground) topography outside LSOG communities.

Deer and elk often nip buds and browse seedlings or saplings, slowing down tree establishment in the process, but are generally not a large problem in this area. Cattle are only a problem in small areas where they congregate for shade and water. They are a positive factor in decreasing grass competition in pine plantations beyond 4 to 5 years in age where trees are too large to be trampled. Overall, cattle are not believed to be a significant problem to reforestation efforts within the CSNM.

## Disturbance Processes

*Current Trends vs Historical Processes*

The management activities that most likely affect overall forest health are timber harvest, thinning of vegetation and prescribed fire. These activities change forest structural characteristics at the time of treatment. Disturbance agents are always a factor at the stand and landscape level. Disturbance agents will have various impacts depending on successional stages and plant communities affected. Management activities may aid in decreasing the relative impact of disturbance agents to historic levels over time and over the landscape. Past management has often increased impacts. A short overview of these processes is provided in Table 2-19 and is intended to show the relative impacts of disturbance processes. Map 20 (aerial insect surveys, 1995-99) and Map 21 (laminated root rot) show recent occurrences or presence in the OGEA. These maps illustrate the most obvious impacts that are currently occurring and their locations.

Stand structural characteristics change in response to disturbance agents and also determine to what extent a disturbance agent may alter stand development. For instance, lower densities in natural stands generally will result in lower levels of mortality due to beetles. Species composition will determine the extent host specific root rots effect future stand development. Often beetle-pathogen interactions occur together and are affected by density and species composition. Fir engraver/root rot interactions are common in the CSNM particularly in white fir plant communities and the more mesic higher elevation mixed conifer forest communities where white fir is found. As previously noted, most of the assumptions pertain to mixed conifer because mixed conifer plant communities make up 93 percent of the forest types found in CSNM while white fir accounts for 7 percent.

The overall disturbance processes in Table 2-19 are landscape level trends.

**Table 2-19. Disturbance Agents and Processes**

| Disturbance Agent | Current Processes | Historic Processes: Desired Future Condition |
|---|---|---|
| Laminated Root Rot *(Phellinus weirii)* | Ramifies through the stand, large impact due to lack of older structure and resistant species. The organism is on the site indefinitely. | Forms gaps for intolerant species establishment, remains onsite indefinitely, affects only white fir and Doug fir, main disturbance agent in white fir plant communities. Gaps are filled by incense cedar and pine. |
| Annosus Root Rot *(Heterobasidion annosum)* | Heavy mortality of susceptible species (white fir) in previously entered stands, opens up stands, reduces basal area, decreases canopy, reduces stand structure. | Low natural levels, forms gaps, stumps treated when stands are entered to discourage spread. |
| Shoe String Root Rot *(Armellaria mellea)* | Causes mortality of most species particularly in dense stands where trees are stressed. Increased incidence due to logging damage and compaction occurs. | Acts in concert with other root rots at lower levels. Fewer trees are stressed and are then less susceptible to an often secondary pathogen. |
| Fir Engraver *(Scolytus ventralis)* | Heavy infestations in concert with root rots in dense stands. Risk is increased to larger forest areas. | Forms gaps, found at lower levels due to fewer overly dense stands, natural density reduction occurs. Root rot/ insect interactions occur at lower levels. |
| Mountain Pine Beetle *(Dendroctonus ponderosae)* | Causes heavy mortality of large mature sugar and ponderosa pine in overly dense mixed conifer stands. | Reduced levels of pine mortality due to decreased stand densities, less water stress and more vigorous trees. Reduced risks to infestation. |
| Western Pine Beetle *(Dendroctonus brevicomis)* | Causes heavy mortality of large and small ponderosa pine in dense stagnate mixed conifer stands. | Reduced levels of pine mortality due to decreased stand densities, less water stress and more vigorous trees i.e. reduced risk. |
| Wind; winter storm events and windthrow. | Increased windthrow due to heavy harvest treatments, previous clearcuts that created wind tunnels and edge effects due to cut stands adjacent to un-entered stands i.e. increased exposure. | Random windthrow events still occur, however effects are reduced on intact forests on the landscape. |
| Catastrophic fire effects | Without prescribed burning: high intensity stand replacement fires due to buildup of ladder fuels, fine fuels, CWD and snags. | With prescribed burning: low intensity mosaic fires which decrease the amount of fuels over the landscape at historic intervals. |

# Dead Wood

Large (greater than 16 inches in diameter) snags and logs are important distinguishing features within LSOG conifer forests. Many LSOG associated wildlife species are known to be associated with both vertical (snags) and downed coarse woody debris (dead wood). The occurrence of dead wood in forest ecosystems is quite variable because dead wood is created and destroyed in an variety of ways. Over time, mortality of individual trees or waves of tree mortality from disturbance events, such as windthrow, insects, disease, and wildfire, occur. Retention of snags and down woody debris is dependent on fire frequency and fire intensity, and on the decomposition rates of the various wood species present. Comparison of stand age to dead wood decay class from previous stands suggests that decomposition rates for large logs is about 80-100 years from decay Class 1 (recent dead) to decay Class 5 (advanced decay).

## Snags

During the summer of 1998 sixteen 100-acre Northern Spotted Owl (NSO) Activity Centers in the area that is now the Monument were sampled for snags. With the exception of one activity center, 1,500 feet of fixed width (66 feet) belt transect were run in each activity center (approximately 2.27 acres of transect area per 100-acre activity center). The exception was one stand with only 1,300 feet sampled (snag density calculations for this site were adjusted). Only those snags greater than 8" dbh were included in this analysis. An assumption was made that the NSO Activity Centers represent the most functional LSOG habitat in the Monument, and as such the observed snag densities in those stands would be a logical basis for developing snag density targets for stands proposed for some kind of treatment. See Appendix JJ for a discussion of the target snag densities for stands in each ecoregion.

The 16 NSO sites sampled in the Monument are distributed quite evenly among the ecoregions with five sites in each of the three major ecoregions within the Monument (Siskiyou Foothills, South Cascades, and Klamath River Ridges) and one site in the minor South Cascade Slopes Ecoregion. (map 3)

The snag inventory recorded a total of 401 snags greater than 7.9" diameter at breast height (dbh). The snags were assigned to 5 decay classes in the field and 5 size classes during the analysis phase, see Appendix JJ. Descriptive statistics were calculated for the three major ecoregions within the Monument: Siskiyou Foothills, South Cascades, and Klamath River Ridges. The South Cascade Slopes Ecoregion contained only one sampled NSO site in the Monument. Consequently no descriptive statistics were calculated based on the data collected there.

Tables 2-20 through 2-25 display the results of the snag inventory including observed snag densities by species and size classes for each ecoregion.

# Coarse Woody Debris

Coarse woody debris (CWD) has been identified as a key component of late-successional forests. This material performs many functions including providing foraging habitat for small, medium, and large mammals and many species of birds and invertebrates. Coarse woody debris also provides denning sites and hiding cover for most terrestrial vertebrates dwelling on the forest floor. Larger CWD is important for the development and function of forests; and because large diameter pieces of CWD have more durable heartwood than smaller pieces, they last longer. Large logs are key habitat components for many forms of wildlife; by disrupting air flow and providing shade, they insulate and protect various forest species.

**Table 2-20. Observed Snags per acre within NSO Activity Centers in the Siskiyou Foothills Ecoregion within the Monument (5 sample sites)**

| Size Class (DBH) | Mean Snags Per Acre | Sample Standard Deviation | Mean Snags + one Standard deviation | Observed Range |
|---|---|---|---|---|
| **8-15.9"** | 4.58 | 2.70 | 7.35 | 1.3-7.9 |
| **16-17.9"** | 0.5 | 0.48 | 0.98 | 0-1.3 |
| **18-19.9** | 0.24 | 0.22 | 0.46 | 0-0.4 |
| **20-21.9** | 0.26 | 0.40 | 0.66 | 0-0.9 |
| **22-23.9** | 0.08 | 0.18 | 0.26 | 0-0.4 |
| **24-25.9** | 0.16 | 0.22 | 0.38 | 0-0.4 |
| **26-27.9** | 0.08 | 0.18 | 0.26 | 0-0.4 |
| **28-29.9** | 0.08 | 0.18 | 0.26 | 0-0.4 |
| **30-31.9** | 0 | 0 | 0 | 0-0 |
| **32-33.9** | 0.16 | 0.22 | 0.38 | 0-0.4 |
| **34-35.9** | 0.16 | 0.22 | 0.38 | 0-0.4 |
| **36-39.9** | 0.08 | 0.18 | 0.26 | 0-0.4 |
| **40-49.9** | 0.08 | 0.18 | 0.26 | 0-0.4 |
| **50+** | 0 | 0 | 0 | 0 |
| **8"+** | 6.46 | 5.36 | 11.89 | |
| **16”+** | 1.88 | 2.66 | 4.54 | |
| **20"+** | 1.14 | 1.96 | 3.1 | |

Mean snags per acre 6.6 (n = 5 sites) Sample standard deviation of snag density 3.80 (n = 5 sites)
Snag density at most snag-rich site 10.6 per acre Snag density at snag-poorest site 1.8 per acre.

**Table 2-21. Distribution of Snags within Siskiyou Foothills Ecoregion**

| Decay Class | Percent Observed | Snag Species | Percent Observed |
|---|---|---|---|
| 1 | 21.7 | Sugar Pine | 0.0 |
| 2 | 8.7 | Ponderosa Pine | 13.0 |
| 3 | 26.1 | White Fir | 26.1 |
| 4 | 26.1 | Douglas-fir | 52.2 |
| 5 | 17.4 | Incense Cedar | 4.3 |
| | | Black Oak | 4.4 |
| **Total** | 100.0 | | 100.0 |

**Table 2-22. Observed snags per acre within NSO Activity Centers in the Southern Cascades Ecoregion within the Monument (5 sample sites)**

| Size Class (DBH) | Mean Snags Per Acre | Sample Standard Deviation | Mean Snags + one Standard Deviation | Observed Range |
|---|---|---|---|---|
| **8-15.9** | 7.96 | 6.16 | 14.12 | 2.2-17.0 |
| **16-17.9** | 1.08 | 0.93 | 2.01 | 0.4-2.2 |
| **18-19.9** | 0.92 | 0.70 | 1.70 | 0.-2.0 |
| **20-21.9** | 0.28 | 0.41 | 0.69 | 0.-0.9 |
| **22-23.9** | 0.44 | 0.32 | 0.76 | 0.-2.0 |
| **24-25.9** | 0.46 | 0.48 | 0.94 | 0.-1.0 |
| **26-27.9** | 0.44 | 0.62 | 1.06 | 0.-0.3 |
| **28-29.9** | 0.78 | 0.77 | 1.55 | 0.-0.4 |
| **30-31.9** | 0.26 | 0.40 | 0.66 | 0.-0.9 |
| **32-33.9** | 0.44 | 0.32 | 0.76 | 0.-0.9 |
| **34-35.9** | 0.34 | 0.19 | 0.53 | 0.-0.4 |
| **36-39.9** | 0.88 | 0.66 | 1.54 | 0.-1.8 |
| **40-49.9** | 0.34 | 0.37 | 0.71 | 0.-0.9 |
| **50+** | 0.52 | 0.48 | 1.00 | 0.-1.3 |
| **8"+** | 15.14 | 12.81 | 28.03 | |
| **16"+** | 7.18 | 6.65 | 13.91 | |
| **20"+** | 5.18 | 5.02 | 10.2 | |

Mean snags per acre 15.20 (n = 5 sites) Sample standard deviation of snag density 5.73 (n = 5 sites)
Snag density at most snag-rich site 24.5 per acre Snag density at snag-poorest site 10.1 per acre

**Table 2-23. Distribution of Snags within Southern Cascade Ecoregion**

| Decay Class | Percent Observed | | Snag Species | Percent Observed |
|---|---|---|---|---|
| 1 | 38.7 | | Sugar Pine | 3.8 |
| 2 | 27.5 | | Ponderosa Pine | 12.5 |
| 3 | 8.7 | | White Fir | 57.4 |
| 4 | 18.8 | | Douglas-fir | 17.5 |
| 5 | 6.3 | | Incense Cedar | 8.8 |
| | | | Black Oak | 0.0 |
| **Total** | 100.0 | | | 100.0 |

**Table 2-24. Snags per acre within NSO Activity Centers in the Klamath River Ridges Ecoregion Within the Monument (5 sample sites)**

| Size Class (DBH) | Mean Snags Per Acre | Sample Standard | Mean Snags + one Standard Deviation | Observed Range |
|---|---|---|---|---|
| **8-15.9** | 7.02 | 2.26 | 9.28 | 5.2-10.5 |
| **16-17.9** | 1.48 | 0.65 | 2.13 | 2.6-0.9 |
| **18-19.9** | 0.78 | 0.64 | 1.42 | 0-1.7 |
| **20-21.9** | 0.88 | 0.53 | 1.41 | 0-1.3 |
| **22-23.9** | 0.60 | 0.50 | 1.10 | 0-1.3 |
| **24-25.9** | 0.86 | 0.53 | 1.39 | 0.4-1.8 |
| **26-27.9** | 0.50 | 0.48 | 0.98 | 0-1.3 |
| **28-29.9** | 0.34 | 0.56 | 0.90 | 0-1.3 |
| **30-31.9** | 0.70 | 0.50 | 1.20 | 0-1.3 |
| **32-33.9** | 0.18 | 0.40 | 0.58 | 0-0.9 |
| **34-35.9** | 0 | 0 | 0 | 0 |
| **36-39.9** | 0.26 | 0.40 | 0.66 | 0-0.9 |
| **40-49.9** | 0.24 | 0.22 | 0.46 | 0-0.4 |
| **50+** | 0.08 | 0.18 | 0.26 | 0-0.4 |
| **8"+** | 13.92 | 7.85 | 21.77 | |
| **15"+** | 6.9 | 5.59 | 12.49 | |
| **20"+** | 4.64 | 4.3 | 8.94 | |

Mean snags per acre 14.10 (n = 5 sites) Sample standard deviation of snag density 2.94 (n = 5 sites)
Snag density at most snag-rich site 17.2 per acre Snag density at snag-poorest site 9.7 per acre

**Table 2-25. Distribution of Snags within Klamath River Ridges Ecoregion**

| Decay Class | Percent Observed | | Snag Species | Percent Observed |
|---|---|---|---|---|
| 1 | 38.0 | | Sugar Pine | 5.1 |
| 2 | 22.7 | | Ponderosa Pine | 3.8 |
| 3 | 11.4 | | White Fir | 62.0 |
| 4 | 15.2 | | Douglas-fir | 19.0 |
| 5 | 12.7 | | Incense Cedar | 10.1 |
| | | | Black Oak | 0.0 |
| **Total** | 100.0 | | | 100.0 |

Large materials (e.g., coarse woody debris, stems, large branches) are important for healthy soil biology because they influence soil nutrient availability, soil moisture, and population levels of soil organisms. Soil organisms interact with each other and their environment while playing a fundamental role in many site processes. Soil organisms promote carbon cycling, nutrient transfer, water availability, vegetation vigor, and maintenance of soil structure. Most biological fixation of nitrogen in ecosystems occurs because of soil organism activity. Mycorrhizal fungi increase the absorbing surface area of roots, which directly increases the total soil volume that can be explored for nutrients and water. Mycorrhizal fungi and other microbes effect soil structure by helping bind soil particles into water-stable aggregates which, in turn, create soil volume with stable and adequate pore space. Soil pores are essential for adequate movement of water and air required by plants and soil organisms (USDI 1995b, p.109). Many forest dwelling wildlife species depend on soil organisms and/or fungi for food sources.

In 1998 coarse woody debris information was collected in the four ecoregions of the former Jenny Creek LSR. These sampling sites were located in the same NSO Activity Centers where the snag inventory discussed above was performed. The CWD data presented below represents the status of coarse woody debris in some of what are believed to be the most functional late successional stands in the Monument. Sampling along transects was conducted on five sites in each of the respective ecoregions except for the Southern Cascade Slopes which only contained one sample site in the Monument. Based on the current information, target levels for coarse wood in the respective ecoregions were calculated. Table 2-26 display the amount of coarse woody debris by ecoregion that is 16 inches or greater in diameter (large end) and at least 16 feet in length in decay class 1 or 2. Table 2-26 also displays current average numbers of snags available by for potential future coarse wood recruitment.

Most of the CWD in the NSO Activity Centers is in the older decay classes. There is some very large wood in the NSO Activity Centers. These large pieces are extremely valuable components of the ecosystem. They perform all of the functions of CWD and do it better and longer than smaller logs.

# Special Status Plant Species

The Cascade-Siskiyou National Monument, located at the confluence of the Klamath, Cascades, Eastern Cascade Slopes and Foothills Ecoregions, has a unique geology, climate, and topography that contributes to the presence of many rare and endemic

**Table 2-26. Coarse Woody Debris by decay class measured in NSO Activity Centers**
**(16 NSO Actvity Centers sampled)**

| Large End Diameter (inches) | Mean number of logs and Mean number linear feet per acre | | | | | | | | | | Total Mean Number of Pieces and Feet | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Decay Class 1 | | Decay Class 2 | | Decay Class 3 | | Decay Class 4 | | Decay Class 5 | | | |
| | Logs # | linear ft | Logs # | linear ft | Logs # | linear ft | Logs # | linear ft | Logs # | linear ft | | |
| 16-27 | 0.5 | 21' | 0.8 | 31' | 0.3 | 17' | 0.5 | 23' | 0.2 | 6' | 2.3 | 98' |
| 28-39 | 0.0 | 4' | 0.2 | 11' | 0.2 | 13' | 0.3 | 8' | 0.1 | 4' | .8 | 40' |
| 40+ | 0.0 | 6' | 0.1 | 04' | 0.1 | 10' | 0 | 2' | 0 | 0' | .2 | 22' |

In Table 2-26, there is a "0" for the average number of pieces per acre, but a value for the number of linear feet per acre is given. This apparent inconsistency is due to averaging and rounding.

**Table 2-27. Summary of Coarse Woody Debris within NSO Activity Centers by Ecoregions**

| Ecoregion | Down Coarse Wood Debris >16"dia. & >16' Decay Classes 1 or 2 (Ave. # pieces/acre) | Standing snags >16"dia. & >16' (Ave. # snags/acre) |
|---|---|---|
| Siskiyou Foothills (78b) | **1.4** | 1.9 |
| Southern Cascades (4g) | **4.2** | 7.2 |
| Klamath River Ridges (78g) | **5.2** | 6.9 |

plants and fungi. Extreme southwest Oregon and adjacent northern California have one of the highest rates of plant endemism in the United States (The Nature Conservancy 2000). There are 24 species of Special Status Plant Species (Table 2-28) known to exist within the Monument, including one federally endangered plant, Gentner's fritillary (*Fritillaria gentneri*). Bureau Special Status Species include species that are federally listed or proposed, Bureau Sensitive, Assessment or Tracking species. Several species of fungi and plants that have had status under the Northwest Forest Plan (USDA 1994a) as Survey and Manage are also listed as Bureau Special Status Species (See Appendix Z).

Following the definition in BLM 6840 Policy, Sensitive species include those that could easily become endangered or extinct within the State. These include vascular plants, bryophytes (mosses and liverworts), and rare fungi. Sensitive species are restricted in range and have natural or anthropogenic threats to survival. Bureau sensitive species are not federally listed, however, they are eligible for Federal or State listing or candidate status. Sensitive species are designated by the BLM State Director so as to manage to preclude the need for federal listing under the Endangered Species Act. The Sensitive species lists are tiered to the State of Oregon fish/wildlife/botanical agencies' and the Oregon Natural Heritage Program (ONHP) designations. Plants that are State candidates or ONHP List 1 are considered Bureau Sensitive (USDI 2000c).

BLM Assessment species are plants that are currently not eligible for official federal or state listed status but are of concern in Oregon and that may, at a minimum, need

**Table 2-28. Special Status Plants Found within the CSNM**

| Scientific Name | Common Name | Status* | TNC Rank* |
|---|---|---|---|
| *Asarum wagneri* | green-flowered ginger | T, SC | G4/S4 |
| *Astragalus californicus* | California milk-vetch | A | G4?/S1 |
| *Bondarzewia montana* | Bondarzew's polypore | T | |
| Calochortus greenei | Greene's mariposa lily | S, SC | G2/S2 |
| *Carex serratodens* | saw-toothed sedge | A | G4?/S2 |
| *Cypripedium fasciculatum* | clustered lady's-slipper | S, SC | G3G4/S2 |
| *Cypripedium montanum* | mountain lady's-slipper | T | G4G5/S4 |
| *Fritillaria gentneri* | Gentner's fritillary | SE, FE | G1/S1 |
| *Fritillaria glauca* | Siskiyou fritillary | A | G4/S2 |
| *Hackelia bella* | beautiful stickseed | T | G4/S1 |
| *Hieracium greenei* | Greene's hawksweed | T | G4/S? |
| *Iliamna bakeri* | Baker's globe mallow | S | G3?/S2 |
| *Isopyrum stipitatum* | dwarf isopyrum | A | G4?/S2 |
| *Lathyrus lanszwertii* var. *tracyi* | Tracy's peavine | T | G?T3/S1 |
| *Limnanthes floccosa* ssp. *bellingeriana* | Bellinger's meadow-foam | S, SC | G4T2/S2 |
| *Microseris laciniata* ssp. *detlingi* | Detling's microseris | S | G4T2/S2 |
| *Monardella glauca* | pale monardella | T | G4G5/S? |
| *Nemacladus capillaris* | common nemacladus | A | G4/S1 |
| *Perideridia howellii* | Howell's false-caraway | T | G4/S3 |
| *Pithya vulgaris* | common pithya | T | |
| *Plagiobothrys figuratus* ssp. *corallicarpus* | coral-seeded allocarya | S, SC | G5T1/S1 |
| *Plectania milleri* | Miller's cup-fungus | T | G3?/S2 |
| Ribes inerme var. *klamathese* | Klamath gooseberry | T | G5T3?/S? |
| *Solanum parishii* | Parish's nightshade | T | G4/S? |

*A = BLM Assessment species in Oregon G = Global rank SE = Oregon State endangered FE = Federally endangered
S = BLM Sensitive species in Oregon T = Trinomial (subspecies, variety, race) rank S = State rank
SC = Oregon State candidate T = BLM Tracking species in Oregon
1 = Critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation.
2 = Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction (extirpation).
3 = Rare, uncommon or threatened but not immediately imperiled. 4 = Not rare and apparently secure but with cause for long-term concern.
5 = Demonstrably widespread, abundant, and secure. ? = Not yet ranked or assigned rank is uncertain.

protection or mitigation in BLM activities. These species are ones tracked by the Oregon Natural Heritage Program as List 2, 3, or 4s. Where possible, measures should be taken in project planning to protect the species (USDI 2000c).

Bureau Tracking Species are plants and fungi that more information is needed to determine their rarity status. To enable an early warning for species which may become of concern in the future, data is collected to determine their status within the state. This would include species that are rare but currently stable, and species that are declining in numbers or habitat but are still too common to be proposed as federally or state listed, Bureau Sensitive or Assessment species. While special protection or mitigation is discretionary for Tracking species, occurrence data is collected to determine its rarity status.

## Federally Listed Plants

Gentner's fritillary (*Fritillaria gentneri*) was listed by the U.S. Fish & Wildlife Service as endangered in January 2000 (USDI 1999b). Consultation with the U.S. Fish & Wildlife Service on any federal action that may affect this species or its habitat is required. Gentner's fritillary is a southern Oregon endemic that is primarily known from the area around Jacksonville, the Little and Middle Applegate River, east to Big Butte Creek near Butte Falls, and west to near Merlin, Oregon. The single site known in the Monument is the most southerly occurrence for this species and was discovered in 1990 in the Dutch Oven drainage.

This rare lily grows in lower elevation (less than 4500 feet) mixed conifer/hardwood forests, open oak woodlands, chaparral, and grasslands, often in the transitional habitat, or the 'ecotonal edge' between these discrete plant communities, often along ridgelines (USDI 1999a; Brock and Callagan 2000). As a result of its proximity to lower elevation valley bottoms and foothills, this plant is susceptible to habitat alteration from agricultural uses, rural and urban development, impacts from grazing, road building, forest management, and recreation, especially on private lands. While this species has protection on Federal and State public lands, the Endangered Species Act of 1973 does not provide protection for this species on private lands.

This lily is rather large, between 8 - 34 inches tall with bright reddish-purple flowers (Brock and Callagan 2000). This species has likely experienced impacts from incidental collection (wildflower picking) by recreationists (Brock 2000). This species looks very similar to several 'common' red fritillaria lillies, (*Fritillaria affine and F. recurva*), making cursory identification by lay persons problematic. Unless it is flowering, the rare Genter's fritillary is nearly indistinguishable from the more common species. These species often occur together in the same habitats. Most known populations of Genter's fritillary are small with few reproducing individuals. Monitoring of Gentner's fritillary sites on federal lands have found that 34 out of 41 sites (83%) contained, on average, less than 10 flowering plants in any given year (Brock and Callagan 2000). Only two populations had more than 100 flowering plants in any given year since monitoring began in 1998.

The Genter's fritillary population in the Monument has had between seventeen to thirty-eight flowering plants over the last three years of monitoring. There are hundreds of vegetative plants at the site, but what percentage is actually Gentner's fritillary is not known as both of the common fritillary's are also present. The habitat at this site is a fairly distinctive ecotone between a dry, oak woodland / mountain mahogany chaparral, and a Douglas-fir - white fir / serviceberry plant community along a moist riparian area. It occurs in an area that is a mosaic of deep soils and shallow, rocky spots, up out of the riparian zone. Some incidental surveys have occurred in the immediate area, however, systematic surveys for this species have not occurred in large portions of the Monument.

The Monument is outside the known range of the federally endangered plant McDonald's rockcress (*Arabis macdonaldiana*), and no habitat is present [serpentine outcrops] (USDI 2000c). The Monument is also outside the known range for 2 federally proposed species, large-flowered wooly meadowfoam (*Limnanthes floccosa ssp. grandiflora*), and Cook's lomatium (*Lomatium cookii*) (USFWS, 2000f). These species were proposed for listing in May 2000, and are known for the Agate desert area north of Medford, and in the Illinois Valley near Cave Junction. These species are not expected to occur here. If these species are documented in the future within the Monument they will be managed according to the Endangered Species Act.

## Bureau Special Status Plants

Green-flowered ginger(*Asarum wagneri*) is known only from southwest Oregon in Douglas, Jackson, Josephine and Klamath counties. It occurs near Chinquapin Mountain and in areas near Howard Prairie Lake in the Monument. This species, while locally restricted, can be quite abundant in certain habitats. It is most often found in mixed conifer communities with white-fir, Douglas-fir, ponderosa pine, sugar pine and white pine. It can occur in a variety of successional states, including in areas that have been disturbed by timber harvests.

California milk vetch (*Astragalus californicus*) was only recently discovered in Oregon (Brock 1999a) in the Scotch Creek RNA. Other populations occur further south into northern California. Undocumented occurrences in grasslands in the Monument are likely. Its habitat is in bluebunch wheatgrass / Idaho Fescue grasslands, on southerly aspects in rocky, shallow soiled sites. Some of California milk vetch sites in these grasslands are becoming dominated by yellow star-thistle, and an apparent competitive relationship between these two species has been documented (Brock and Callagan 1999b).

Bondarzew's polypore (*Bondarzewia montana {B. mesenterica})* is a rare fungus that is generally found in later successional conifer communities, usually as a saprophyte with white fir (*Abies concolor*). This species is also a Survey and Manage species under the NWFP (USDA 1994a). The one documented population within the Monument is near the southern extent of this species range.

Greene's mariposa lily (*Calochortus greenei*) is a rare, beautiful, local endemic species found in open shrub / Oregon white oak woodlands along the California - Oregon Border and south into the Shasta Valley. The soils are usually deep and high in clay content. Brock (1996) found that its reproduction is limited by the browsing removal of the flowers and fruits which appear during mid summer and are quite palatable to both cattle, deer and rabbits. This species is at risk from horticultural collection and grazing pressure from deer, rabbits and livestock. Much of this species habitat in low and mid elevation has been altered by rural development, impacted by livestock grazing, and noxious weed invasion, all of which have reduced the species viability in these areas (Brock 1996). Cattle grazing, if properly managed, does not appear to be a threat in its self, however, uncontrolled, or poorly controlled grazing can severely impact the species (Brock 1988b; Brock 1996). There are populations near Hutton Creek/ Pilot Rock, in the Oregon Gulch RNA, along Keene Ridge, and in the oak woodlands on Agate Flat.

Saw-toothed sedge (*Carex serratodens*) was recently discovered in the Monument (Brock and Callagan 1999b) in the Scotch Creek RNA in a *Acer macrophylum* dominated riparian area. This plant is known for moist meadows and rocky places near seeps and springs in the Rogue Valley, and down the Sierra Nevada and coast range in California. Clustered lady's-slipper (*Cypripedium fasciculatum*) is found in isolated, widely scattered and usually small populations in the west from the Rocky Mountains in Colorado to the Pacific coast. Mid to late-successional forests with canopy closures greater than 60 percent appear to be the optimum habitat for this species. This species has been managed both as a Bureau Special Status plant, and a Survey and Manage species under the Northwest Forest Plan. *Cypripedium fasciculatum* is a slow-growing, long-lived orchid

with a obligate mycorrhizal association and an arguable dependence on fire. Two populations of *C. fasciculatum* have been located in the Monument. One vigorous population occurs in a mixed conifer-madrone stand on a steep slope above Emigrant Creek and the other population occurs in old growth Douglas-fir near the edge of a clearcut in the Lincoln Creek drainage. *Cypripedium fasciculatum* was also collected in 1923 at Johnson Prairie, but has not been relocated and may be extirpated.

Several occurrences of the Mountain lady slipper (*Cypripedium montanum*) are known from the Monument. Like *C. fasciculatum*, this species has been managed both as a Bureau Special Status Plant, and a Survey and Manage Species under the Northwest forest plan. This species is found in a variety of plant communities, with 60-80 percent canopy closure in mixed conifer and mixed evergreen /oak woodland communities.

Siskiyou fritillary (*Fritillaria glauca*) is found in numerous locations in the Rogue Valley in open, gravelly slopes and ridges, usually on serpentine soils. The two occurrences known for the Monument, however, occur on dry open, rocky ridge lines with mountain mahogany and are not on serpentine soils. This local endemic occurs in scattered locations in southwest Oregon and into northern California.

Beautiful stickseed (*Hackelia bella*) is a southwest Oregon and northern California endemic, found in forest openings, grasslands, and along streambanks. This Bureau Tracking species has been under- reported in the Monument (Tong 2000). It is known to occur in grassy meadows, and openings in white fir forests around Table and Chinquapin Mountain. It is not found in the southern portion of the Monument.

Greene's hawksweed (*Hieracium greenei*), another Northern California and SW Oregon endemic is found in single location in a dry, open Ponderosa Pine / Douglas-fir community along a small rock ridge. This small population (7 plants) is the only occurrence documented in the Monument.

Baker's globemallow (*Iliamna bakeri*) is known for the west Cascades and Modoc plateau in California, and the Klamath Mountains in southwest Oregon. Its habitat in its range is open areas in juniper woodlands, and lava beds. Four occurrences are documented in the Monument, two in clearcuts (white fir community types), one along road edge, and one in a rocky 'opening in a white fir (*Abies concolor*) community'. While it appears this species can be found in early successional, or disturbed habitats, the existing populations are very small. Additional sites are likely in the southern end of the Monument adjacent to the California border.

Dwarf isopyrum (*Isopyrum stipitatum*) is known from just north of San Franciso, through the northern Sierras and Coast range into Southern Oregon. It is found in shaded slopes, chaparral, and mixed evergreen /oak woodlands. There are several large occurrences (thousands of plants) of this species around the Agate flats area of the Monument in grassy meadows, and under shrubs in Oak /ceanothus woodlands. There is one occurrence near Round prairie in a ecotone between a mixed conifer and rocky grassland.

Tracy's peavine (*Lathryus lanszwertii* var. *tracyi*) is a northern California and southwest Oregon endemic plant known to occur in a few sites in and adjacent to the Scotch Creek RNA in small patches (less than 10 plants) in white oak /mountain mahogany chaparral. More sites are likely in unsurveyed portions of the Monument in these chaparral communities.

Bellinger's meadow-foam (*Limnanthes flocosa* var. *bellingeriana*) occupies a special habitat associated with high winter and spring water tables and impervious basalt subsoil layer. Soils are wet for three or more months of the year. Plants grow in or near the edges of vernal pools. This plant is a narrow endemic found on impervious basalt areas in the

vicinity of Lincoln, in the Oregon Gulch RNA, and in tributaries of Jenny creek. The site near Lincoln is of botanical importance as the type locality for the species (the place where the designated nomenclatural type was collected).

Detling's microseris (*Microseris laciniata* ssp. *detlingi*) is a BLM sensitive species that is found only in Oregon. It is found in grassy openings in open, rocky shrublands with scattered Oregon white oaks. This plant is known in the Monument from Siskiyou Pass, Skookum creek, lower Keene ridge and near Agate Flat. Several large (thousands) of populations occur in the southern portion of the Monument.

Pale monardella (*Monardella glauca*) is known from one area in the Monument near Chinquapin Mountain in open mixed conifer forest (white fir - Douglas-fir) on rocky south slopes at 5200 feet. More occurrences are known in Josephine county, and south into northern California, and east into the great basin into Nevada.

Common nemacladus (*Nemacladus capillaris*) is a species found in the Sierra Nevada Mountains of California, and in the Monument. It is known from the four sites in xeric, rocky openings in mixed conifer forests (Juniper, white fir and Douglas-fir). Two of the sites have very few plants (less than 10) and the other two number in the hundreds.

Howell's false-caraway (*Perideridia howellii*)is a northern California and southwest Oregon endemic known from a number of locations in wet meadows, moist mountain slopes in oak woodlands and mixed conifers, and along riparian zones in the Monument.

Common pithya (*Pithya vulgaris),* despite its name, is a rare fungus known for the Pacific Northwest, and boreal forests in the temperate zone (British Columbia, Idaho). It is also documented in the Alps in Europe. It is most often found as a needle /branch endophyte on downed Abies branches in white fir communities in the Monument.

Coralseed allocarya (*Plagiobotyrys figuratus* ssp. *corallicarpus*) grows in open vernal creeks near Lincoln. The Lincoln population is unusual for its size (thousands), and isolated from other known populations in Sams Valley, north of Medford. Interference with surface hydrology would put the population at risk.

Miller's cup fungus (*Plectania milleri*) is a rare Pacific Northwest endemic fungus that is saprophytic on downed conifer branches. Sites in the Monument are associated with mixed conifer sites, often with Douglas-fir, Ponderosa pine, Incense cedar, and Oregon white oak, under moderately closed canopies (50%).

Klamath gooseberry (*Ribes inerme* var. *klamathese*) is known in southwest Oregon and adjacent northern California from streamsides and moist meadow edges. Four occurrences are documented for the Medford District of BLM. In the Monument, it is documented in the riparian zone in Scotch Creek RNA in small patches of up to 16 'clumps'. This species rarely fruits and heavy browsing by caterpillars was documented in surveys by Brock and Callagan (1999b). More populations are likely in other riparian areas in the southern portion of the Monument. Himalayan blackberry (an exotic species) has been documented out competing this rare species in the Rogue valley.

Parish's nightshade (*Solanum parishii*) is known from California and adjacent southern Oregon in dry chaparral and dry oak /pine woodlands. There are three sites within the Monument, each with fewer than ten plants. Two occur in old, open clearcuts in dry Douglas-fir /Oregon oak communities, and one in a dry wedgeleaf ceanothus-Klamath plum chaparral in the Scotch Creek RNA. Several other sites in southwest Oregon are in dry chaparral communities, and all are very small populations.

## Survey & Manage Plant Species

This group includes the vascular plants, bryophytes, lichens, and fungi that were managed following the implementation of the Northwest Forest Plan. Occurrence data

for bryophytes, lichens, and fungi has only been collected since 1997. General surveys have been conducted on the northern portion of the Monument, almost exclusively in conifer dominated communities. Only small areas in the dryer and less forested southern portion of the Monument have been examined for bryophytes, lichens, and fungi.

Seven fungi, two lichens and two vascular plant species (also Special Status Plant species) have been found in the Monument (Table 2-29). All organisms, except one lichen, are associated with mid-mature to late-successional conifer forests. One lichen, *Calicium viride*, is found commonly on hardwoods in moist (riparian) to xeric conditions. In Table 2-29, absence of The Nature Conservancy (TNC) rarity rating for most of the bryophytes, lichens, and fungi reflects a lack of information on species biology, distribution and ecological requirements.

**Table 2-29. Survey and Manage Plants Found within the CSNM**

| Species | Taxa Group | TNC* |
|---|---|---|
| *Bondarzewia mesenterica* | fungus | - |
| *Calicium viride* | lichen | - |
| *Cypripedium fasciculatum* | vascular plant | G3G4/S2 |
| *Cypripedium montanum* | vascular plant | G4G5/S4 |
| *Dendriscocaulon intricatulum* | lichen | - |
| *Gyromitra esculenta* | fungus | - |
| *Gyromitra montana* | fungus | - |
| *Tremiscus helvelloides* (syn. *Phlogiotis)* | fungus | - |
| *Pithya vulgaris* | fungus | - |
| *Plectania milleri* | fungus | G3?/S2 |
| *Sarcosphaera coronia* (syn. *eximia)* | fungus | - |

*G = Global rank S = State rank
1 = Critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation.
2 = Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction (extirpation).
3 = Rare, uncommon or threatened but not immediately imperiled.
4 = Not rare and apparently secure but with cause for long-term concern. 5 = Demonstrably widespread, abundant, and secure.

## Special Status Plant Surveys

Formal and informal rare plant surveys have been done within the Monument area on BLM lands since the mid 1980s. No surveys have occurred on private lands. Prior to 1999, about 8,261 acres had been surveyed, mostly in conifer communities for forest management projects (i.e. timber sales) in the northern zone (USDI 2000c). Some incidental surveys not associated with projects have also occurred around existing rare plant sites, but these for the most part are not well documented. In 1999, landscape level surveys on about 11,987 acres were surveyed for Bureau special status plants in the south-eastern portion of the Monument (Keene Ridge/Jenny Creek/Agate Flat area), which included the eastern portions of the Soda Mountain Grazing allotment north and east of the power line, and all of the Jenny Creek allotment. Plant community inventories, that also documented rare species occurrences, were also done in 1999 on 1,800 acres in the Scotch Creek RNA (Brock and Callagan 1999b).

# Noxious Weeds and Introduced Plants

Introduced non-native plant species were brought to the Pacific Northwest, accidentally or purposefully, from other continents over the past 150 years. These species are often referred to as 'weeds'. Many weeds or introduced plants are relatively harmless or beneficial. Others, that are not already invasive or noxious, have a high potential to become so in all or part of their range. Plants that have been determined to be 'noxious' based on their negative environmental and/or ecological impacts have a special legal status that requires specific actions to eradicate them.

Noxious Weeds are designated by the Oregon State Weed Board. Noxious weeds are defined by the Weed Board as "[those plants] which are injurious to public health, agriculture, recreation, wildlife, or any public or private property." Noxious weeds have been declared a menace to public welfare (ORS 570.505) (ODA 2000). Not all weeds that can cause ecological harm are designated as "noxious".

Two statutory mandates guide the BLM in managing weeds on public lands. Section 302(b) of the Federal Land Policy and Management Act of 1976 directs the BLM to "take any action necessary to prevent unnecessary or undue degradation of the lands" (43 USC 1732(b)). Section 2(b)(2) of the public Rangelands Improvement Act of 1978 adds that the BLM will "manage, maintain, and improve the condition of the public rangelands so that they become as productive as feasible..." (43 USC 1901(b)(2)).

In general, introduced plants are likely to invade or become noxious since they lack co-evolved competitors and natural enemies to control their populations. Many of these species have the ability to out-compete native species for light, food, water and space. A few plants such as dandelion (*Taraxacum officinale*) and yarrow (*Achillea millefolium*) have both introduced and native populations in the North America, making identification difficult.

Introduced plants can potentially displace native species, alter native plant and animal habitats, and alter ecological processes in plant and animal communities. Noxious weeds can rapidly infest areas following fire events, reducing the natural levels of species diversity (Asher and Harmon, 1995). Weeds compete with native species for water, space, and nutrients, are often early and prolific seeders, and may produce fruits capable of long distance dispersal by various means, such as wind, water, or animal transport. Weed seed can be distributed by being caught-up in fur or hooves of native animals and livestock. The clothes and soles of recreationists can transport weeds along trails and at campsites. Seeds and root pieces in mud or vegetation that cling to motor vehicles and equipment (bumpers, wheel wells, tires) can be spread along roads to newly disturbed areas or even invade relatively undisturbed sites. Wind, generated by passing vehicles, helps spread weed seeds along roads.

Some introduced species present on public lands have essentially integrated into the natural flora, are not aggressive, don't dominate plant communities, and generally don't cause the problems we usually associate with noxious weeds. Species like certain speedwells, (*Vernonica* spp.) and chickweeds (*Stellaria media*) occur in numerous habitats, but in relatively low densities. Some introduced species can be desirable for reasons such as erosion control after disturbance while waiting for native species to gradually reestablish themselves. Non-persistent species like clover or short-lived grasses like slender wheatgrass (*Elymus trachycaulus*) or annual rye *(Lolium multiflorum*) are sometimes used in this manner. Unfortunately, persistent, aggressive exotics have also been used in erosion control mixes, such as crested wheatgrass (*Agropyron cristatum*) and tall fescue (*Festuca arundinacea*). Species like Himalayan blackberry (*Rubus discolor*), or yellow star-thistle (*Centaurea solstitialis*) can quickly dominate plant communities, and out-compete native species. These species have the ability to create significant pressure on the succession and evolution of plant communities. Many non-native species are poisonous to wildlife, livestock and humans.

Of special concern in grasslands, sage lands, and oak woodlands in the west has been the establishment of non-native annual grasses. Grasses like cheatgrass (*Bromus tectorum*) and medusa head (*Taeniatherum caput-medusae*) dominate large areas in open woodlands, shrublands, and savannahs throughout the western United States, and in the Monument. These annual grasses out compete native perennial species and have changed the ecology of vast areas in the western North America. The harmful effects of these introductions are just now being realized.

Generally, introduced species respond to disturbance events and can thrive under disturbed conditions. Large populations of exotic species are often present in open, disturbed areas at lower elevations; especially in dry meadows, oak and shrub communities, open pine savanna, and to a minor degree in wet meadows. Once disturbed, these communities are quickly invaded by non-native species from outside seed sources or the soil seed bank. Native grasses and forbs often have great difficulty competing with the weeds that germinate in the fall or winter, and are able to out-compete the natives species for moisture in soils that are shallow or have limited moisture holding capacity.

Non-native species in the Monument are currently uncommon in undisturbed, closed canopy, mixed conifer or white fir forests at higher elevations; except where canopy light gaps and soil disturbance are created by roadsides, recreation sites, or skid-trails from timber harvests. This is not the case through-out the west however. In Idaho, yellow hawkweed (*Hieracium pratense*) has been observed invading into relatively undisturbed grand-fir and mesic western red cedar habitats in Idaho, after being introduced and establishing along roadways and timber harvest landings (Anderson 1998). This same species is also found invading pristine sub-alpine grasslands above 7,000 feet in the Bitteroot mountains. There are weed species that once introduced and established, can expand into relatively undisturbed habitats. In southwest Oregon, *Torilis arvensis* can dominate understories in relatively undisturbed Douglas-fir forests and white oak woodlands (Tong 2000). Several thistle species (*Cirsium* spp.) and mullein (*Verbascum thapsus*) are common in disturbed areas at higher elevations. At higher elevations where low intensity fires were historically common, attempts to create open "park-like" areas in stands of conifers can result in the establishment of weedy thistles and annual grasses.

Sedge and rush dominated wet meadows tend to be more resistant to an invasion by non-native species. However, weedy species which are adapted to wet soils associated with ponds, ditches, or open riverine systems, such as portions of the Parsnip Lakes or Jenny Creek, may occasionally become established. An introduced grass, Reed canary grass (*Phalaris arundinacea*) has recently been documented in Jenny Creek (Salix Associates 2000). This species can form a solid mat that excludes all other species. Purple loose-strife (*Lythrum salicaria*) is becoming a problem in riparian areas, ponds, seeps, in the Rogue Valley, but has not yet been documented in the Monument.

About 10 percent (66 species) of the flora within the Monument is composed of introduced species, (see Appendix F) and occur in all plant communities. Introduced plants are found in open plant communities (woodlands, shrublands, savannahs) and disturbed areas in the greatest number and density. Non-natives frequently dominate these areas and some are considered noxious weeds. A high number of introduced grasses exist in the Jenny creek area, as a result of past grazing activities and pasture management. There are 12 listed noxious weed species introduced in the Monument of particular interest because of their intensity of impact on human welfare and the natural environment, and their potential to cause significant environmental damage (Table 2-30).

Road building, grazing, logging, recreation and other disturbance activities have resulted in a number of noxious weeds becoming established in the Monument. Future disturbance activities have the potential to introduce new weeds, and create conditions optimal for the expansion of existing populations.

The three most serious noxious weeds in the Monument are yellow starthistle (*Centaurea solstitialis*), Canada thistle *(Cirsium arvense)*, and medusahead (*Taeniatherum caput-medusa*). Dyer's woad (*Isatis tinctoria*) also has the potential to become a serious ecological problem.

Yellow starthistle is associated with roads traversing the more open habitats. It has spread into relatively pristine areas from these establishment points. In the Scotch Creek Research Natural Area, yellow starthistle is common and becoming dominant in portions of the savannahs. Other areas where yellow starthistle is also established are along the entire length of the Schoheim road and in portions of the Jenny Creek drainage.

Canada thistle is common along the roads in the area around Hobart Peak and Mill Creek. Canada thistle is an aggressive noxious weed and if left unmanaged, has the potential to form dense infestations. This plant's ability to propagate both sexually and asexually gives it a competitive advantage over many of the plants occupying the same site.

Medusahead is the most common noxious weed in the Monument in terms of numbers and area covered. Many low to middle elevation grasslands are heavily infested. Grasslands on high clay content soils are particularly prone to invasion. Medusahead forms a heavy, high silica thatch that retards or prevents germination of native species, and may become a fire hazard.

Dyer's woad (*Isatis tinctoria*), while not widespread in the Monument is of special concern because of its ability to spread rapidly and invade undisturbed sites. In the Pacific Northwest, it is estimated that dyer's woad is spreading at an annual rate of 14 percent on BLM rangeland (USDI 1986).

Table 2-30 lists the most prevalent noxious weed species known to occur in the Cascade-Siskiyou National Monument. Other introduced weeds are documented in Appendix F. It is primarily based on the 1996-1998 Medford District noxious weed surveys, rare plant

**Table 2-30. Common Introduced and Noxious Weeds in the CSNM**

| Scientific Name | Common Name | List* |
|---|---|---|
| *Centaurea diffusa* | diffuse knapweed | B |
| *Centaurea maculosa* | spotted knapweed | B, Target |
| *Centaurea pratensis* | meadow knapweed | B |
| *Centaurea solstitialis* | yellow star-thistle | B, target |
| *Cirsium arvense* | Canada thistle | B |
| *Cirsium vulgare* | bull thistle | B |
| *Convolvulus arvensis* | field bindweed | B |
| *Cuscuta pentagona* | dodder | B |
| *Hypericum perforatum* | klamathweed | B |
| *Isatis tinctoria* | dyer's woad | B |
| *Linaria dalmatica* | dalmatian toadflax | B |
| *Taeniatherum caput-medusae* | medusahead | B |

*State of Oregon Noxious Weed List

"B" desinated weeds are weeds of economic importance that are regionally abundant but may have limited distribution in some counties.

surveys performed in the 1990s, recent surveys of the Scotch Creek RNA (Brock and Callagan 1999a), and Carex (sedges) inventories done in 2000 (Salix Associates 2000).

# Fire and Fuels

## Wildfire History

Fire is recognized as a key natural disturbance process throughout Southwest Oregon (Atzet and Wheeler 1982). Human-caused and lightning fires have been a source of disturbance to the landscape for thousands of years. Native Americans influenced vegetation patterns for over a thousand years by igniting fires to enhance values that were important to their culture (Pullen 1995). Early Euro-American settlers to this area used fire to improve grazing and farming and to expose rock and soil for mining. Fire has played an important role in influencing successional processes. Observations based on fire scars and vegetative patterns indicate that large fires were a common occurrence in the area and were of varying severities.

Climate and topography combine to create the fire regime found throughout the CSNM. Fire regime refers to the frequency, severity and extent of fires occurring in an area (Agee 1991). Vegetation types are helpful in delineating different fire regimes. Three broad fire regimes within the CSNM were identified using vegetation types as a basis for fire regime delineation. These regimes are based on the effects from fire on the dominant vegetation. Refer to map 22 for the location of these fire regimes on the landscape.

## Fire Regimes

### Low-Severity Regime

This regime is characterized by vegetation types such as grasslands, shrublands, hardwoods and mixed hardwood, and pine which are similar to the Interior Valley Vegetative Zone of Franklin and Dyrness (1988). These plant communities recover rapidly from fire and are directly or indirectly dependent on fire for their continued persistence. The dominant trees within this regime are adapted to resist fire due to the thick bark they develop at a young age. A low-severity regime is characterized by nearly continual summer drought; fires are frequent (1-25 years), burn with low intensity, and are widespread. Approximately 64 percent of the CSNM falls into this category.

### Moderate-Severity Regime

This regime is associated with the Mixed Conifer Vegetative Zone of Franklin and Dyrness (1988). Approximately 33 percent of the CSNM is categorized in this regime. This regime is characterized by long summer dry periods; fires are frequent (25-100 years). It is the most difficult to characterize and is often located in a transitional position between low and high elevation forests or plant communities. Fires burn with different degrees of intensity within this regime. Stand replacement fires as well as low intensity fires can occur depending on burning conditions. The overall effect of fire on the landscape in this regime is a mosaic burn.

### High-Severity Regime

This regime is characterized by the White Fir Vegetation Zone (Franklin and Dyrness 1988). This environment is characterized by moist, cool conditions with infrequent fires. Accurate fire return intervals have not been calculated because of the long intervals between fires. When fires occur, they are due to unusual conditions, such as

drought periods associated with high winds. Fires are of high intensity and normally are stand replacement fires. Approximately 3 percent of the CSNM is in this fire regime.

In the early 1900s, uncontrolled fires were considered to be detrimental to forests. Suppression of all fires became a major goal of land management agencies. From the 1950s to present, suppression of all fires became efficient because of an increase in suppression forces and improved techniques. As a result of the absence of fire, there has been a build-up of unnatural fuel loadings and a change to fire-prone vegetative conditions.

Based on calculations using fire return intervals, it is estimated that five fire cycles have been eliminated in the southwest Oregon mixed conifer forests that occur at low elevations (Thomas and Agee 1986). Species, such as ponderosa pine and oaks, have decreased. Many stands, which were once open, are now heavily stocked with conifers and small oaks which has changed the horizontal and vertical stand structure. Surface fuels and laddering effect of fuels have increased, which has increased the threat of crown fires that were once historically rare.

Many seedling and pole size forests of the 20th century have failed to grow into old-growth forests because of the lack of natural thinning once provided by frequent fire. Frequent low intensity fires serve as a thinning mechanism which naturally regulates the density of the forests by killing unsuited and small trees. Consequently, much old-growth forest habitat has been lost along with diminished populations of old-growth dependent and related species. In addition, ponderosa pine trees that thrive in fire prone environments are quickly shaded out by the more shade tolerant Douglas-fir or white fir species in the absence of fire. As a result, some late-successional forests have undergone a rapid transition from ponderosa pine stands to excessively dense true fir stands. Trees growing at lower densities, as in ponderosa pine stands, tend to be more fire-resistant and vigorous. Eventually they grow large and tall, enhancing the vertical and structural diversity of the forest. Some populations of organisms that thrive in the more structurally diverse forests that large trees provide are becoming threatened.

Many forests developed high tree densities and produced slow growing trees rather than faster growing trees after abrupt fire suppression became policy in about 1900. Trees facing such intense competition often become weakened and are highly susceptible to insect epidemics and tree pathogens. Younger trees (mostly conifers) contribute to stress and mortality of mature conifers and hardwoods. High density forests burn with increased intensity because of the unnaturally high fuel levels. High intensity fires can damage soils and often completely destroy riparian vegetation. Historically, low intensity fires often spared riparian areas, which reduced soil erosion and provided wildlife habitats following the event.

The absence of fire has had negative effects on grasslands, shrublands, and woodlands. Research in the last few decades has shown that many southern Oregon shrub and herbaceous plant species are either directly or indirectly fire-dependent.

Several shrub species are directly dependent on the heat from fires for germination. Without fire these stands of shrubs cannot be rejuvenated. Grass and forbs species may show increased seed production and/or germination associated with fire.

Indirectly fire-dependent herbaceous species are crowded out by larger-statured and longer-lived woody species. This is particularly so for grasses and forbs within stands of wedgeleaf ceanothus and whiteleaf manzanita with a high canopy closure. High shrub canopy closure prevents herbaceous species from completing their life-cycle and producing viable seed. Many grass species may drop out of high canopy shrub lands in the absence of fire because of their short-lived seed-bank.

Fire history recorded over the past 20 years in Southwest Oregon (outside the CSNM) indicate a trend of more large fires which burn at higher intensities in vegetation types associated with low-severity fire regimes and moderate-severity fire regimes. This trend is also seen throughout the western United States. Contributing factors are the increase of fuel loading due to the absence of fire, recent drought conditions, and past management practices.

## Fire Risk

Risk is the probability of when a fire will occur within a given area. Historical records show that lightning and human caused fires are common in the CSNM. Activities within this area such as established campgrounds, dispersed camp sites, recreational use, and major travel corridors add to the risk component for the possibility of a fire occurring from human causes. The time frame most conducive for fires to occur in the CSNM is from July through September.

Information from the Oregon Department of Forestry database from 1967 to 1999 show a total of 232 fires occurred throughout the CSNM. Lightning accounted for 55 percent of the total fires started. Of these fires, 186 were less than 0.25 acres in size (Class A fire), and only 1 fire was larger than 100 acres in size. Fire data previous to 1967 is not available.

Fire history data was used to assess fire risk for the CSNM. This risk assessment utilized the total number of fire starts over a given period of time for the CSNM. The derived value corresponds to the likelihood of fire starts per 1,000 acres per decade. Results show that the Cascade-Siskiyou National Monument is in the low fire risk rating. See Appendix H for information regarding the fire risk rating calculation. Maps 23, 24, 25,and 26 illustrate specific information regarding past fires within the CSNM.

## Fire Hazard

Fire hazard assesses vegetation by type, arrangement, volume, condition and location. These characteristics combine to determine the threat of fire ignition, the spread of a fire and the difficulty of fire control. Fire hazard is a useful tool in the planning process because it helps in prioritizing watersheds and areas within a watershed in need of fuels management treatment.

Hazard ratings were developed for the CSNM. Map 27 shows the location of the different fire hazard ratings within the area. Table 2-31 summarizes the percent acres in each fire hazard rating category. Reference Appendix I for a description of how fire hazard was determined.

**Table 2-31. Fire Hazard Ratings for the CSNM**

| Fire Hazard Rating | Percentage of Acres in each Category |
|---|---|
| Low hazard | 2% |
| Moderate hazard | 66% |
| High hazard | 32% |

# Fire Suppression

The Bureau of Land Management has a master cooperative fire protection agreement with the Oregon Department of Forestry (ODF). This agreement delegates the responsibility of fire protection of all lands within the CSNM to the Oregon Department of Forestry. This contract directs ODF to take immediate action to control and suppress all fires. Their primary objective is to minimize total acres burned while providing for fire fighter safety. The agreement requires ODF to control 94 percent of all fires before they exceed 10 acres in size. Areas within the CSNM which requires special suppression methods designed to minimize damage to unique habitat and resources have been designated. Required specific fire suppression tactics or limited tactics within the CSNM are listed in Appendix L.

It is acknowledged that fire will occur within the CSNM. Over the past thirty years a large percent of lightning caused fires in the CSNM have been accompanied by rain. Moist fuels and quick response times by Oregon Department of Forestry have been the main reason the fires have not been large in size and burned at high intensities.

Road access plays an important role in determining response time of initial attack forces to a fire. Analysis of fires in the CSNM over the past thirty years indicates only 9 percent were farther than 600 meters from existing roads. The average response time to these fires was 2-1/2 hours compared to an average response time of 1 hour to fires that were within 600 meters of existing roads.

Road access is limited in the area of the CSNM which is south of Soda Mountain, Pilot Rock, and Keene Ridge. Specific roads in this area which are critical for initial attack forces have been identified by the Oregon Department of Forestry. Refer to Table 2-32 for a list of these roads. Without these roads the probability increases, under certain weather parameters, that wildfires would become large and burn at higher intensities. Due to the majority of the CSNM being in a moderate to high fire hazard in this area, there is the concern that without these roads, it would be difficult to keep fires that start on BLM land within the CSNM from burning adjacent private lands.

**Table 2-32. Key Roads needed for Wildfire Suppression Efforts south of Pilot Rock, Soda Mountain, and Keene Ridge**

| Road Name | Road Number/General Location |
|---|---|
| Power line Roads (Skookum Creek Road) | BLM 40-3E-27.2 |
| Pilot Rock Jeep Road | BLM 40-3E-30.0 |
| Tie Through Road to Emigrant Creek | Private road in T.40S.,R.2E., Section 36 |
| Randcore Pass Road through Private Property to Agate Flat | BLM 40-4E-19.2 |
| Randcore Pass to Rosebud Helipond | BLM 40-3E-19.1 |
| Soda Mountain Road | BLM 39-3E-32.3 |
| Mill Creek to Soda Mountain Road | BLM 40-3E-12.0 |
| Access across Jenny Creek in multiple locations to private property | |
| Access from California | Copco Road |

## Fuels Management

Prescribed fire is a management tool that would assist in meeting the objectives of conserving, protecting and restoring values for which the Monument was established. In 1995, a new federal fire policy (USDA 1995) was issued directing federal land managers to expand the use of prescribed fire in order to reduce the risk of large wildfires due to unnatural high fuel loadings and to restore and maintain healthy ecosystems. All fuel management activities which would occur within the CSNM would meet Monument Aquatic Conservation Strategy.

When utilizing prescribed fire in Research Natural Areas (RNA), it should be based on the fire history of the area and past vegetation patterns known for the area. The application of prescribed fire should closely approximate the frequency, intensity, size, and the "natural" season of fire when possible. Management plans for the Oregon Gulch RNA and Scotch Creek RNA can be found in Appendix DD and EE.

The Fire Management Plan for the Soda Mountain Wilderness Study Area allows the use of prescribed fire within the WSA. It states "prescribed fire, resulting from planned ignitions, shall be permitted in the Soda Mountain WSA to maintain the natural condition of a fire dependent ecosystem." The intent of prescribed fire within the WSA is to reintroduce the natural process of fire. The Fire Management Plan for the Soda Mountain Wilderness study area can be found in Appendix G.

Prescribed fire is a tool that could be used to help eliminate and or reduce the spread of noxious weeds within the CSNM. Fuels management activities can also be utilized within the CSNM to meet the objectives of protecting and enhancing late-successional habitat for the Northern Spotted Owl. To protect or minimize damage of this habitat from wildfires, desirable fuel characteristics adjacent to and within this habitat needs to be maintained.

As previously discussed, fire is recognized as playing an important role in the development and maintenance of vegetative diversity in fire prone ecosystems as found throughout the CSNM. Prescribed fire is a tool which could be used to meet objectives for vegetative communities within the Diversity Emphasis Area of the CSNM. In the grasslands prescribed fire could be used for the improvement of native grass/annual grass mix to a more native grass domination and assist in the restoration of annual grass monoculture to a native grass domination. In the shrublands, prescribed fire would help recreate a range of wedgeleaf ceanothus stand ages across the landscape. The use of prescribed fire in the Woodlands would help restore tree composition due to the invasion of conifers. The balance of herbaceous plants, shrubs and trees could also be restored in the Woodlands. Fire would also assist in the thinning of White Oak stands to historic tree densities.

## Air Quality

Prescribed burns are conducted within the limits of a Burn Plan which describes prescription parameters so that acceptable and desired effects are obtained. Smoke produced from prescribed burning is the major air pollutant of concern.

Fuels management activities generate particulate pollutants in the process of treating natural and activity related fuels. Smoke from prescribed fire has the potential to effect air quality within and surrounding the CSNM. The use of prescribed fire for ecosystem restoration can produce enough fine particulate matter to be a public health and/or welfare concern. Fine particulate matter in smoke can travel many miles downwind impacting air quality in local communities, causing a safety hazard on public roads,

impairing visibility in class I areas, and/or causing a general nuisance to the public. If properly managed, most negative effects of prescribed fire smoke can be minimized or eliminated.

The National Ambient Air Quality Standards (NAAQS), set by the authority of the Clean Air Act (CAA), cover six "criteria" airborne pollutants: lead, sulfur dioxide, carbon monoxide, nitrogen oxides, ozone and particulate matter. The lead and sulfur content of forest fuels is negligible, so these two forms of air pollution are not a consideration in prescribed burning.

Prescribed burning does emit some carbon monoxide (CO), from 20 to 500 lb. per ton of fuel consumed. This would be a concern if there were other persistent large CO sources in the immediate vicinity. CO is such a reactive pollutant, however, that its impact is quickly dissipated by oxidation to carbon dioxide where emissions are moderate and irregular and there is no atmospheric confinement.

Burning also emits moderate amounts of volatile organic compounds (VOC) and minor amounts of nitrogen oxides (NOx). These are precursors to formation of ground level ozone. Here, fire-related emissions may be seen as important only when other persistent and much larger pollution sources already cause substantial non-attainment of NAAQS . Particulate matter smaller than 10 micrometers (PM 10) is a term used to describe airborne solid and liquid particles. Because of its small size, PM 10 readily lodges in the lungs, thus increasing levels of respiratory infections, cardiac disease, bronchitis, asthma, pneumonia, and emphysema.

The fate of PM emissions from prescribed burning is twofold. Most (usually more than 60%) of the emissions are 'lifted" by convection into the atmosphere where they are dissipated by horizontal and downward dispersion. The "unlifted" balance of the emissions (less than 40%) remain in intermittent contact with the ground. This impact is dissipated by dispersion, surface wind turbulence and particle deposition on vegetation and the ground. The risk of impact on the human environment differs between the two portions of smoke plume.

## Smoke Aloft

Until recent decades, the impact of the lifted portion of smoke was ignored because it seemed to "just go away." These impacts are generally not realized until the mechanisms of dispersal bring the dispersed smoke back to ground level. Because the smoke has already dispersed over a broad area, the intensity of ground-level exposure is minimal. The duration of exposure may include the better part of a day, however, and the area of exposure may be large.

## Ground Level Smoke

Unlike smoke aloft, the potential for ground level smoke to create a nuisance is immediate. This part of the smoke plume does not have enough heat to rise into the atmosphere. It stays in intermittent contact with the human environment and turbulent surface winds move it erratically. Also in comparison to smoke aloft, human exposure is more intense, relatively brief (a few hours) and limited to a smaller area. Smoke aloft is already dispersed before it returns to the human environment while ground level smoke must dissipate within that environment. Dissipation of ground level smoke is accomplished through dispersion and deposition of smoke particles on vegetation, soil and other objects.

## Non-attainment Areas

The population centers of Grants Pass, Medford/Ashland (including Central Point and Eagle Point), and Klamath Falls have past history of being in violation of the national ambient air quality standards for PM 10 and are classified as non-attainment for this pollutant. The non-attainment status of these communities is not attributable to

prescribed burning. Major sources of particulate matter within the Medford / Ashland non-attainment area is smoke from woodstoves and dust and industrial sources. The contribution to the non-attainment status of particulate matter from prescribed burning is less than 4 percent of the annual total for the Medford / Ashland air quality management area. Over the past seven years the Grants Pass and Medford / Ashland population centers have not been in violation of national ambient air quality standards for PM 10.

The pollutant most associated with the Medford District's resource management activities is PM 10 found in smoke produced by prescribed fire. Monitoring in southwest Oregon consists of nephelometers (instrument designed to measure changes in visibility) in Grants Pass, Provolt, Illinois Valley, Ruch and eventually in Shady Cove. One medium volume sampler is collocated with the nephelometer at the Provolt site. The medium volume sampler measures the amount of PM 10 and smaller at ground level.

National Ambient Air Quality Standards for PM2.5 have been established to protect human health. Due to the lack of monitoring data for PM2.5 these standards have yet to be implemented. It is estimated that by year 2003 that monitoring data for PM2.5 will be completed. When standards are implemented for PM 2.5 all burning proposed within the CSNM will comply with these standards.

### Administration of Smoke Producing Projects

The operational guidance for the Oregon Smoke Management Program is managed by the Oregon State Forester. The policy of the State Forester is to:

1. Regulate prescribed burning operations on forest land.
2. Achieve strict compliance with the smoke management plan.
3. Minimize emissions from prescribed burning.

For the purpose of maintaining air quality, the State Forester and the Department of Environmental Quality shall approve a plan for the purpose of managing smoke in areas they designate. The authority for the State administration is ORS 477.513(3)(a).

ORS468A.005 through 468A.085 provides the authority to DEQ to establish air quality standards including emission standards for the entire State or an area of the State. Under this authority the State Forester coordinates the administration and operation of the plan. The Forester also issues additional restrictions on prescribed burning in situations where air quality of the entire State or part thereof is, or would likely become adversely affected by smoke.

In compliance with the Oregon Smoke Management Plan, prescribed burning activities on the Medford District require pre-burn registration of all prescribed burn locations with the Oregon State Forester. Registration includes specific location, size of burn, topographic and fuel characteristics. Advisories or restrictions are received from the Forester on a daily basis concerning smoke management and air quality conditions. These advisories or restrictions insure that burning done by the Medford BLM is in compliance with standards set for particulate matter.

# Transportation System

Travel routes in the CSNM are used by cars, trucks, heavy equipment, motorcycles, bicycles, horses, pedestrians, and other modes of transportation. These routes are used for recreation, resource management, and private property access. The BLM provides a transportation system for many different recreation experiences and management opportunities (map 30 and Plate 1).

The BLM identifies approximately 470 miles of road on approximately 85,173 acres of land across all ownerships associated with the CSNM. Of this total, the BLM controls approximately 251 miles of road that accesses the 52,947 acres Monument. Roads in the CSNM vary from primitive four wheel drive roads to paved highways. BLM inventories contain very little information about non-BLM controlled roads. Most of the County and State roads have a bituminous surface and private roads are usually rocked or are left unsurfaced.

Existing Transportation Management Objectives (TMOs) have been developed for individual roads based on maintenance level definitions and access status (see Plate 1 and Appendix CC). Roads associated with the CSNM are controlled or owned by the BLM, timber companies, Jackson County, the State of Oregon, and many private landowners. Several county roads, State Highway 66, old State Highway 99, and Interstate 5 are major highways that provide access into and across the CSNM. Major access roads that the BLM uses to access the CSNM are Pilot Rock, East Hyatt Lake, Copco, Emigrant Creek, Baldy Creek, and Soda Mountain roads. Many shorter private and BLM roads provide access throughout the CSNM. In many areas the public has no legal right to use roads to access public lands (Appendix CC, and Plate 1). In several areas the BLM has obtained legal access for the management of public lands. In most areas the BLM and large land owners have reciprocal agreements that allow access for forest management of lands and removal of timber (map 34, Appendix CC). On several roads the BLM has obtained road easements which allow public access. Other types of easements obtained by the BLM do not provide public access on non-federally owned roads. At this time some landowners have not prevented the public from general use of their road (i.e., Copco road, and portions of Emigrant Creek, Baldy Creek, and Soda Mountain roads). However, this informal public use across private lands could cease at any time.

BLM controlled roads are generally open for vehicle use by the public unless blocked by gates or other road barriers. Some roads have been officially closed and have signs designating the closure. Officially closed roads may not have barriers (other than signs) but use of the roads are prohibited by law. Of the total of 251 miles of BLM controlled roads approximately 77 miles are blocked (map 30). Gates and road barriers regulate vehicle access to reduce maintenance costs, road damage, soil erosion, water quality degradation, transfer of noxious weeds, wildfire protection, and wildlife disturbance.

Road maintenance is conducted by the different owners and management agencies. Water, oil, or lignin are usually applied to road surfaces when hauling rock or timber during dry periods for dust abatement and to keep roads from disintegrating. Water is used when placing surface rock and for road maintenance, which allows for proper processing and reduced segregation of the road surface rock. There are developed water sources and rock quarries in the Monument where the BLM obtains water and rock for road work.

Most BLM controlled roads were constructed for log hauling and administrative purposes. The BLM charges fees for commercial use of roads and then uses these fees to help pay for road maintenance. Many roads previously maintained at a high level are not being maintained to that extent any longer due to reduced timber harvesting. To reduce maintenance requirements and erosion potential, some unnecessary roads have been, or could be, decommissioned. However, roads with rights-of-way grants provide primary access to private lands may not be permanently closed or decommissioned. Other roads are closed until future access is needed and many others are maintained at the lowest possible levels with an emphasis on proper drainage.

BLM roads have a maintenance level assigned to them (map Plate 1 and Appendix CC). Roads are monitored and the maintenance levels are modified when needs and conditions change. Maintenance levels range from minimal standards on short roads to high standards on main roads. Roads are like any other facility or structure, they need to be maintained to function as designed. Roads that have been maintained and are in good condition are shown on map 35. Sharing and maintaining roads with landowners has reduced total miles of BLM road necessary for access and also reduced maintenance costs. The goal is to protect Monument resources while maintaining the transportation system in a safe condition. The result is a transportation system that provides limited access for law enforcement, various recreational activities, private property access, resource management, wildfire suppression, and other administrative uses.

Road maintenance includes removing safety hazards, reducing soil erosion potential and providing for fish passage at all potential fish-bearing stream crossings. Safety hazards include hazard trees that have the potential to fall on houses, recreation areas, or roadways. Hazard trees are usually dead, but may be alive with roots undercut or with significant physical damage to the trunk or root system. Proper maintenance of road drainage systems and stream crossing culverts is essential to avoid both erosion and fish passage problems. Most of the existing culverts were designed to withstand 50-year flood events. New drainage structures will be designed to withstand a 100-year flood event and if appropriate, provide for fish passage. Road protection measures include constructing drainage structures, grass seeding, blocking roads, placing road surface rock, and applying bituminous surfacing.

Three road surface types are found on BLM-administered roads: bituminous (asphalt), rocked, and natural (no surface protection). Main access roads usually have a bituminous surface, but may have a crushed rock surface. Roads off main access roads usually have a crushed rock surface, and dead end spurs generally have a natural surface (map 36). Most rocked roads in the CSNM are located in the northern portion. The southern portion has more natural surfaced roads which include jeep roads. Adequately surfaced roads generally allow for year-round travel and reduce soil erosion, which helps to minimize stream sedimentation. Several unsurfaced roads are closed to minimize resource damage and control erosion. There are developed quarries in the CSNM where rock may be obtained for surfacing roads, drainage protection, and maintenance for administrative purposes.

All motorized and non-motorized mechanized travel is currently prohibited on BLM roads 41-2E-10.1 and roads leading to it (Plate 1) as a result of the creation of the CSNM. Persons who are exempt from the prohibition are:

- Any federal, state, or local officers engaged in fire, emergency and law enforcement activities;
- BLM employees in official duties;
- Persons authorized to travel on designated routes by the Monument manager.

This restriction will remain in effect until completion of this Resource Management Plan. The planning process may result in a decision to maintain or modify this prohibition.

# Livestock Grazing

The history of livestock grazing in the area of the Cascade-Siskiyou National Monument dates back to the 1850s. Large herds of horses and cattle grazed the area from the Klamath River to the Dead Indian Plateau. With the expansion of farming and ranching in the 1850s, ranchers began to move livestock from the Rogue Valley to the lands east of the Cascades. During the mid-1860s ranchers began to exploit the rich meadows of the

high elevation meadows. Prior to 1870, Rogue Valley ranchers were unable to supply all of the meat needed to meet the demands of gold miners. Sheep operators ran large bands of sheep in the area. Sheep were pastured with cattle in the high mountain meadows of the Cascades. Severe overgrazing was reported in some areas of the upper Rogue Valley. Woolen mills established in Ashland were successful until the drop in wool prices during the 1930s. Raising livestock was very profitable in both the Rogue Valley and Klamath Basin in these early years.(Follansbee 1978).

During this period of unregulated use, rangeland resources and ecological conditions are reported to have suffered significant harm from overgrazing. Control of these ranges did not occur until passage of the Taylor Grazing Act in 1934. Prior to 1934, public rangelands of the west were administered by the General Land Office. This office was to provide for survey and disposition of public domain lands from federal ownership to state and private ownership. The Taylor Grazing Act was the vehicle for recognizing these public domain lands as a national asset and withdrawing them from future filing or transfer. The long term goals of this law were the improvement of range conditions and the stabilization of the western livestock industry. The Taylor Grazing act gave a preference for grazing permits to settlers, residents, and other stock owners who owned adjacent or nearby lands or water rights. Grazing allotments established on BLM lands were based upon historical areas of grazing use at the time of passage of this important land management tool.

In 1946, the Bureau of Land Management was established. During the early 1960s, range surveys were completed to determine the capacity of the land for grazing. Following these surveys, decisions on forage were adjudicated and livestock numbers set on most areas in the west. In April of 1975, a Federal court agreement required the BLM to prepare Grazing Environmental Statements on public grazing lands. To comply with this agreement, the *Medford District Grazing Management Program Environmental Impact Statement* was completed in 1984. Additional planning documents have been completed since that time in the form of the *Final Supplemental EIS on Management of Habitat for Late-Successional and Old growth Forest Related Species Within the Range of the Northern Spotted Owl*(USDA 1994a)*; the Medford District Resource Management Plan EIS* (1995a)*; and the Jenny Creek Watershed Assessment and Analysis* (USDI 1995b). The Oregon/Washington Office of the BLM has adopted Standards and Guidelines for Rangeland Health that are to be applied to rangeland management decisions (USDI 1997).

Early grazing was largely uncoordinated and conflicts occurred between California livestock operations moving cattle onto summer ranges and the operators who lived in Oregon. In 1974, a Coordinated Resource Management Plan was written which attempted to reduce conflicts between California and Oregon operators and to improve rangeland conditions on the Soda Mountain Allotment. A separate Allotment Management Plan was developed to improve rangeland conditions and riparian habitat within the Jenny Creek Allotment in 1997. The Allotment Management Plan includes terms and conditions to achieve specific resource condition objectives.

The cattle numbers on the Soda Mountain and Keene Creek allotments have been reduced dramatically since the 1970s. Cattle numbers are presently 34 percent and 39 percent, respectively, of the numbers grazed in the 1970s. Reductions on the Soda Mountain allotment have taken place for a variety of reasons. Timber companies have reduced cattle leases due to environmental concerns, conflicts, and low revenues which failed to cover administrative costs. In some cases, leases were lost due to retirements, failures to comply with regulations and conflicts with rural interface areas. In 1994, the Keene Creek allotment was reduced through a voluntary agreement with the livestock operator. Reorganization of the ranch and rebuilding of herd numbers, increasing

conflicts with recreationists at Howard and Hyatt Lakes, summer homes, recognition of increasing numbers of deer and elk, and the presence of candidate fish species such as the Jenny Creek sucker and Red-band trout contributed to this agreement.

Livestock grazing is a "grand-fathered" use that occurs within the Soda Mountain Wilderness Study Area. Rangeland management activities in the Soda Mountain WSA are administered under guidelines contained in the *Interim Management Policy for Lands Under Wilderness Review* (H-8550-1). This policy outlines minimum data requirements and maximum acceptable impacts for rangeland developments and livestock grazing.

There are seven separate grazing allotments within the CSNM. Table 2-33 displays the allotments, present operators and livestock use within the Monument. Refer to map 37 for location of allotments and rangeland improvements across the CSNM. Currently, eight operators have active authorized use within the area. The authorized active use on public lands for the 2000 grazing year was 3,754 AUMs (an AUM or animal unit month, is the amount of forage required to sustain a cow and calf for one month).

**Table 2-33. BLM Grazing Allotments within the Cascade-Siskiyou National Monument**

| Allotment Name | Acres* | Lessee | Livestock Numbers | Use Dates | AUMs Authorized |
|---|---|---|---|---|---|
| **Ashland Resource Area (Medford District)** | | | | | |
| Agate | 97 | Vacant | ---------- | ---------- | 9 |
| Box R Ranch | 80 | Don Rowlett | 1 | 6/15-11/15 | 5 |
| Jenny Creek | 1,303 | Taylor Ranch | 30 | 5/16-9/10 | 116 |
| Keene Creek | 10,240 | Joe Dauenhauer | 350 | 6/16-10/15 | 1,404 |
| Keene Creek | | Jim Miller | 59 | 6/16-9/30 | 208 |
| Siskiyou | 1,930 | Vacant | ---------- | ---------- | 200 |
| Soda Mountain | 35,471 | John Mosby | 181 | 5/1-10/15 | 1,000 |
| Soda Mountain | | Bob Miller | 47 | 5/16-10/15 | 238 |
| | | | 58 | 6/16-10/15 | 232 |
| Soda Mountain | | Jennifer Walt | 80 | 6/16-10/15 | 321 |
| **Klamath Resource Area (Lakeview District)** | | | | | |
| Dixie | 100 | Jerry Barry | 75 | 5/15-9/15 | 8** |
| Buck Mountain | 520 | Vacant | 56 | ---------- | 13** |

*indicates approximate public land acres in the CSNM **AUMs proportioned to reflect the amount of the allotment within the CSNM

Management objectives for individual allotments are dynamic and change over time as new information is discovered. This helps to determine the level of intensity with which allotments are managed in terms of planning, monitoring, and investments in rangeland improvement projects. In order to describe the level of management required, each allotment has been placed in one of three categories. This process is referred to as Allotment Categorization and is comprised of :

- Improve (I) – the allotment will be managed intensively for improvements
- Maintain (M) – current management will be sufficient to maintain conditions
- Custodial (C) – a minimum amount of labor will be expended to maintain existing resources

The categorization of allotments into these categories is not dependent solely on a rangeland condition rating, but also reflects such factors as potential conflicts between resource uses and potential productivity on the allotment. All of the allotments within the CSNM are categorized as Improve allotments based upon resources with the exception of the Agate allotment which is a Custodial allotment.

## Wild Horses

The Pokegama Herd Management Area was established in the 1970s with the passage of the Wild Horse and Burro Act and the first management plan for the area was written in 1978. The herd is believed to have been established in the early 1900s by a rancher who originally turned out a quarter horse stud and seven mares. Herd census indicates a relatively stable population with only gradual increases in horse numbers. The BLM Klamath Falls Field Office has primary responsibility for management of this wild horse herd and has established an Appropriate Management Level of between 30 and 50 horses for the area (USDI 1995c).

Approximately 20 acres of the 80,900 acre Pokegama Herd Management Area are within the CSNM. This area lies along Copco road and East of the former Box-O Ranch. Due to the insignificant area of overlap, the impacts to the Pokegama Herd Management Area will not be analyzed in this proposed Plan.

# Recreation

The major recreation activities occurring on BLM administered lands in the Monument include camping, hiking, horseback riding, mountain biking, driving for pleasure, sightseeing, hunting, fishing, driving off highway vehicles, snow play, cross country skiing, snowmobiling, rock climbing, nature study, and vegetative gathering (mushrooms, Christmas trees, firewood). The Hyatt Lake Recreation Complex is the only developed recreation site within the Monument.

What is now the Hyatt Lake Recreation Complex was part of the Hyatt-Howard Special Recreation Management Area (SRMA) before the Monument was created. This SRMA was designated in the Medford District RMP in 1995 and consisted of the lands that comprised the viewshed around Hyatt Lake and Howard Prairie Reservoirs. These lands were given a visual resource management classification of II to protect the visual quality of the area for recreational users. A portion of this SRMA was included in the Monument (Plate 1) and is now referred to as the Hyatt Lake Recreation Complex (HLRC).

The Hyatt Lake Recreation Complex consists of the main Hyatt Lake Campground, Wildcat Campground and a Watchable Wildlife site. The Hyatt Lake campground consists of 57 campsites, hot showers, a group camping facility, group day use facility, a playground, a ballfield, two boat launches, fishing docks and a fish cleaning station. Wildcat Campground has 12 campsites, two vault toilets, and a gravel boat ramp. There is no potable water at Wildcat Campground. A Watchable Wildlife site with wildlife interpretive panels, a picnic table and a vault toilet is located on the west side of Hyatt Lake in the northwest corner of the Monument. Outside of the HLRC, the majority of use is unstructured or dispersed recreation with most use occurring on roads, streams, Pilot Rock, or the Pacific Crest National Scenic Trail (PCNST).

There are two nationally designated areas within the Monument, the PCNST and the Soda Mountain Wilderness Study Area (WSA). The PCNST consists of the main trail and two spur trails leading to scenic overlooks. These spur trails are at Hobart Bluff and Wildcat Hills. The PCNST receives moderate use from local residents for day hikes and approximately 50-100 people pass through the area on the trail as through hikers (traveling from Mexico to Canada).

The Soda Mountain Wilderness Study Area (WSA) consists of the headwaters of the Dutch Oven Creek, Camp Creek and Salt Creek Subwatersheds. The boundary of the WSA is the same as originally identified, however, technical advances in mapping have recalculated the area within the original boundary. The WSA was previously thought to be 5,867 acres but geographical information system calculations show the area within the boundary as 6,447 acres. The Soda Mountain WSA was recommended for wilderness designation by the Secretary of the Interior in 1991. The President, in turn, recommended it for wilderness designation to the Congress in 1991. To date no Congressional action has been taken on these recommendations, therefore, the area is managed under the BLM's *Interim Management Policy for Lands Under Wilderness Review*, H-8550-1(USDI 1995d) which outlines what must be done to insure that the Area's suitability for wilderness designation is not impaired by proposed activities.

Currently there are about 60 miles of existing roads open to snowmobile use within the Monument. The BLM snowmobile road system is a part of the Southern Oregon High Lakes Trail System, which goes from Chemult, Oregon to Hyatt Lake. The snowmobile use in and around the Monument has always been very light due to the lack of gasoline for sale at Hyatt Lake. With the closest gasoline available at Lake of the Woods, most use occurs there. Present use within the Monument comes almost exclusively from local area residents.

Before the area was proclaimed a monument, snowmobiles were limited to existing roads until the snow depth reached 12 inches at which point the area was considered open and not limited to existing roads. With the establishment of the Monument, all snowmobile use is limited to existing roads which are open for public use regardless of snow depth. No cross-country travel by snowmobiles is allowed on BLM lands within the Monument.

Driving for pleasure is the number one recreational activity in the United States and OHV use was popular in the area now recognized as the Monument. As a result of the Presidential Proclamation, all off-road use by motorized and mechanized vehicles is prohibited within the Monument so vehicle use is now restricted to designated roads and trails.

The Pilot Rock area is another popular recreation destination where people can access the PCNST, climb rocks, collecting fossils and observe wildflowers.

Since the majority of the Monument is undeveloped, there are no accurate use figures, but use is estimated as light to moderate throughout the Monument. The Hyatt Lake Recreation Complex receives moderate use throughout the months of April through October. In 2000, records show that approximately 7,455 people visited the Hyatt lake Recreational Complex.

# Minerals

The CSNM has low potential for locatable minerals, moderate potential for oil and gas, and low potential for geothermal resources, depending on the location within the area now designated as the Cascade-Siskiyou National Monument (USDI 1995a). The

Presidential Proclamation withdrew the Monument from all forms of entry, location, selection, sale, or leasing or other disposition under public laws, including but not limited to withdrawal from location, entry, and patent under the mining laws.

A mineral resources study of the Soda Mountain Wilderness Study Area conducted by the U.S. Geological Survey concluded much of the northern portion of the WSA has a moderate potential for gold and silver (Pickthorn 1990). Based on this study, there is speculation that the area north of the WSA to the top of Soda Mountain has low to moderate potential for gold and silver but development of the area is prohibited by the Presidential Proclamation. This study also indicated a low potential for oil and gas and geothermal resources. In the past, there were mining claims located in the Agate Flat area. These claims were primarily for agates and were held by a local gem and mineral club. These claims have since been abandoned and no claims were on record at the time of the Presidential Proclamation of the Monument.

# Authorized Uses

## Background

Over time, the BLM has formally recognized and authorized a variety of uses within the boundary of the National Monument. The magnitude of the uses within the Monument includes an airstrip, a public school facility, a lookout, a group religious gathering, two communication facilities, as well as other uses. The oldest of these varied uses is the fire lookout located atop Soda Mountain. This lookout was established in 1933 by the Oregon Department of Forestry (ODF) and is still in active status. ODF regards Soda Mountain as the most important lookout in their jurisdictional area due to its strategic position serving a two state\three county area.

## Existing Authorizations

Existing Authorizations (Valid Existing Rights) within the Cascade-Siskiyou National Monument fall broadly into two main types: linear and site authorizations. Water rights are addressed in the Hydrology section. Examples of linear authorizations are roads, utility lines, and water developments such as ditches or canals. Site authorizations are mainly associated with the communication site which has gradually developed on Soda Mountain since the days of the first fire lookout more than sixty years ago (see photos Appendix O). Other site authorizations include the microwave communication facility located on "Chestnut Mountain" just southwest of Chinquapin Mountain, the Pinehurst School complex, and the State Highway Department Maintenance site. Appendix P provides basic information on the current authorized uses (Valid Existing Rights) which exist in the National Monument on public lands. Lands that are under reciprocal rights-of-way agreements are displayed on map 34 and information concerning these lands is in Appendix CC.

These authorizations serve a wide range of commercial and non-commercial uses and interests. Some authorizations are held by private citizens for legal access to their personal property within the overall Monument area. Some are held by large corporations such as PacifiCorp, U.S. West, U. S. Cellular, and COBI, which serve major markets in Oregon and California. Other authorizations are held by non-profit entities or governmental agencies which serve diverse interests along the I-5 corridor, the Green Springs Highway (State Hwy 66) and the greater three county area (Jackson, Klamath and Siskiyou) located in southern Oregon and northern California. The authorizations range in size from a fraction of an acre to major utility lines which span long distances and cross both public and private lands. The commercial interests associated with the

various authorizations represent significant outlays of capital investment and benefit a wide range of end users who utilize water, electricity and communication services. All commercial site users pay an annual rental which is based on a national "schedule" for determining communication site values. These are important services to agriculture, commerce and the public sector in this region.

### Rights to Sub-lease

Several communication site authorizations include the right for the Holder to sub-lease to other compatible users. Under this arrangement, additional users operate equipment for their own particular needs. This group includes a private towing company, a Jackson County consortium of users, a Federal Agency, and additional commercial operations. All commercial users are assessed an annual site rental fee per the national schedule and are billed each calendar year for use of the site.

### Other Rights

Holders of existing authorizations have a valid existing right to "operate, maintain, and terminate" their use, system, or facility. In many cases, this right includes use of service roads which provide physical access to the use, system, or facility. In the case of the major electrical transmission lines, this right of access includes the use of minimum standard road(s) for periodic inspection and maintenance. PacifiCorp has an ongoing maintenance program whereby their facilities are monitored and maintained either on a scheduled basis or on an as needed basis when emergency conditions dictate. (See "Transportation Section" for further discussion of these roads).

Approximately seven acres of the Monument are currently leased to Pinehurst School located in the town of Lincoln. Pinehurst School is a community school serving K-8th grades, and has held a Recreation and Public Purposes (R&PP) lease for school use since 1964. The lease was renewed in 1984 and currently includes the school building, the ball fields, and several other structures. The lease will be up for renewal in 2009. The BLM plans to continue renewing this lease as long as the original purposes for leasing the lands remain the same.

# Visual Resources

The BLM Medford District Resource Management Plan (RMP) currently allocates the area within the Cascade-Siskiyou National Monument into Class II, III, and IV. Class II is allocated for the Hyatt/Howard Prairie Lake Special Recreation Management Area and a 1/4 mile corridor on either side of the Pacific Crest National Scenic Trail and the Hyatt Lake Recreation Area. Class IV is allocated to the southeastern quarter within the Monument. The remaining area is allocated as Class III. Although not reflected in the Medford District's RMP, the land comprising the Soda Mountain Wilderness Study Area is to be managed as Class I, according to BLM Washington D.C. Office Memorandum (No. 2000-096). This memorandum states that the visual resources within Wilderness Study Areas (WSA) are to be managed the same as federally designated Wilderness (Class I ) until released from WSA designation.

# Public Outreach/Education

Interest in visiting and learning about the area increased in both the local and regional community with the proclamation of the Cascade-Siskiyou National Monument. The Medford District BLM, the Ashland Visitor's Center, the Hyatt Lake Recreation Area, and local businesses received many requests for information on the new Monument. In addition to generating interest in the area, the Monument designation caused concern among some local residents over potential use restrictions in this area. Residents with

property adjacent to Monument lands also notified BLM of increased trespassing on their lands. In response to increased interest in the area, and concerns raised within the local community, the BLM has taken several interim steps to communicate and educate the public about the Monument.

Interim goals for the creation and dissemination of public outreach and education materials were as follows:

- Provide the public with an updated map of the area identifying roads that are open and suitable for public access. Many roads in the Monument pass through public and private land, and in most cases the BLM does not have rights for the public to access privately owned roads.
- Emphasize visitor awareness of and respect for the significant amount of private property interspersed with CSNM lands.
- Direct visitors seeking recreational opportunities to the Hyatt Lake Recreation Area and the Pacific Crest National Scenic Trail, both of which are already established as recreation sites. Avoid establishing any new visitation trends prior to the development of a management plan.
- Develop interpretive materials that identify and explain the resource values that the Monument is meant to protect.
- Clarify the immediate implications of the proclamation, as well as the direction of interim management. Publicize any interim management that changes existing use of the area.
- Explain the need to develop a management plan for the area, and how interested individuals and groups can become involved in the planning process.

With these goals in mind, the BLM sent a letter and additional information to over 1,500 people on the CSNM mailing list, created a temporary four page informational hand-out, updated the Monument website, and developed a full color interim brochure for distribution at the BLM Medford District Office, the Ashland Visitor's Center, Hyatt Lake Recreation Area, and at local businesses. In addition, a two page newspaper advertisement was published in the Ashland, Grants Pass, Klamath Falls and Medford newspapers providing a map and information about the newly created Cascade-Siskiyou National Monument.

The BLM is currently working on collaborative public outreach/education projects within the local community. Shortly after the Proclamation, the BLM worked with students in Southern Oregon University's Environmental Education Program to develop sample interpretive brochures and signs for the Monument. The BLM also has a cooperative agreement with Friends of the Greensprings to develop an informational kiosk at an existing site on the Greensprings summit. In addition, the Greensprings Inn distributes maps and brochures for visitors to the Monument area.

# Social and Economics

### Introduction: Defining the Affected Area

The social and economic assessment and effects analysis was done through contact with community residents, discussions with organization and group representatives with responsibility or interest in the CSNM area, and analysis of existing information. Kevin Preister and Luis Ibanez, of Social Ecology Associates, talked with over 41 community residents, store owners, ranchers, and recreationists, and about 46 representatives of environmental organizations, timberland owners, industry support groups, and representatives of federal land management agencies. Citizens most directly affected by

CSNM decisions are:

- Residents that live in the immediate vicinity;
- Individuals that make a living from public land resources, specifically grazing, forest resources, and recreation;
- Recreation users;
- Soda Mountain Wilderness Council, Friends of the Greensprings (FOG) and other organized interests;
- The Jackson County Board of Commissioners

From a social and economic standpoint, the Greensprings, Pinehurst and I-5 summit areas represent the primary zones influenced by CSNM. The secondary zone of influence is Jackson County. This section will present a rationale for this approach based on human geography and summarize major social and economic conditions for each area. Appendix M contains much of the statistical and demographic data used to support conclusions contained in this section.

Map 38 shows the boundaries of Social and Human Resource Areas in southwest Oregon and northwest California The red line shows the boundary for the Jefferson Social Resource Unit (SRU), an area with a common history, lifestyles and values. The "State of Jefferson" has long been known as an area of similarity, embodied in an effort to secede from Oregon and California that was cut short by the attack on Pearl Harbor in 1941. The story won a Pulitzer Prize in 1942 for the San Francisco Chronicle (Olson 1987). Today, there are over twenty businesses in the region sporting the name Jefferson, including the public radio station at Southern Oregon University.

Human Resource Units (HRUs) are subdivisions (shown within blue line on map 38) that reflect the boundaries within which people conduct most work, recreation, and lifestyle routines, including shopping, school affiliation, and family and social ties. These boundaries are derived from seven cultural descriptors and by self-reporting of residents. The methodology is described in Kent and Preister (1999). The seven descriptors are:

1) Publics: Segments of the population or group of people having common characteristics, interests, or some recognized demographic feature.

2) Networks: A structured arrangement of individuals who support each other in predictable ways because of their commitment to a common purpose, their shared activities, or similar attitudes.

3) Settlement Patterns: Distribution of a population in a geographic area, including historical cycles of settlement and changing land uses.

4) Work Routines: The ways in which people earn a living, including where and how. The types of employment, the skills needed, the wage levels, and the natural resources required in the process.

5) Supporting Services: Any arrangement people use for taking care of each other, including the institutions serving a community and the caretaking activities of individuals.

6) Recreational Activities: The way in which people use their leisure time.

7) Geographic Boundaries: Any unique physical feature that defines the extent of a population's routine activities.

The CSNM is located in the southeast part of the Jefferson Social Resource Unit in the Rogue Valley Human Resource Unit in Oregon. It does not extend east to Klamath County or south to Siskiyou County, California. By and large the California border in this area serves as the human border as well even though there are a small number of grazing interests that cross the California/Oregon border and there are modest shopping and social ties between Yreka and Ashland. Residents in the primary influence zone of Greensprings, Pinehurst and the I-5 summit relate primarily to the Rogue Valley Human Resource Unit.

# The Greensprings/Pinehurst Community

## History

The Greensprings area is a 4,000-foot high plateau near where the Southern Cascades join the Siskiyou Mountains. The Greensprings extends from Keene Creek Ridge in the southwest to Parker Mountain summit in the east. Several Native American tribes used the area, among them the Klamath and the Rogue, who tended to spend most of each year in the valleys. They also liked to camp in the natural prairies at higher elevations to hunt, gather seasonal resources, to meet and trade with other groups and escape the summer heat.

In 1846, Jesse and Lindsay Applegate opened a trail that crossed the Greensprings (Plate 1). By the mid-1860s, people were moving in both east and west on the Applegate Trail. National events then influenced Southern Oregon and the Greensprings. The 1906 Forest Homestead Act was abused by local residents and timber companies. The settlement of many lands, including the Greensprings, was done in part by people paid by both large and small lumber companies to live on the property and make improvements until they obtained legal title to the lands. Settlers would turn over their titles to these companies. This was followed by a congressional grant of alternate sections of public land to the Oregon and California Railroad that was misused by the railroads.

Several mills were established on the Greensprings for the purpose of cutting the huge stands of old-growth sugar pine and fir. The first significant population growth came with completion of the new highway in the 1920s. Most of the residents at this time worked for mills. There was an economic downturn in the 1960s when many local mills closed their doors because they were unable to compete with the big lumber companies.

The 1970s brought a change in the Greensprings population. Unable to find suitable work, many residents moved away, changed jobs or retired. Land is said to have gone from $32 per acre in the early 1960s to $500 an acre, a price that for many out-of-state folks was a bargain. The few that moved to the Greensprings in the 1970s went there to escape the big city life and to "get back to the land."

The present Greensprings community still shares the values and traditions of those who first moved there. Residents call the Greensprings, "a strong and committed community." A major theme of community life seems to be interdependence through self-sufficiency. The caretaking aspect of this community is evident in their stories, from the old settlers to the newcomers. The value of knowing your neighbors and the commitment to respond to a call of need continue to live in these parts

The community is also very committed to education. As in the past, the Pinehurst School serves as the social hub for young and old. Currently there is interest in expanding the school district boundary to include those residents west of Tubb Springs. The average price of land is now around $2,000 per acre.

## Current Conditions

Map 39 shows four general socioeconomic areas for the CSNM. The Local residents, subdivide the Greensprings community into Areas B, C, and D. Area A, the I-5 summit,

is included because of its proximity to CSNM lands, while the Old Highway 99 area north of the Siskiyou Summit is excluded from the primary zone of influence because there is no direct access to BLM lands from this area.

The 211 units in the primary zone (Table 2-34), is based on data provided by Jackson County Information Services. If the density of 2.94 per household from the census of this area is used, about 620 people reside in this area. The Greensprings community, as defined above, is thus estimated to contain 588 people. This estimate may be high because the Greensprings Directory, developed by Friends of the Greensprings (FOG), estimates the 1996 population at 400. Between the beginning of Buckhorn Creek Road west to the Klamath County line, there are 165 mailboxes. With the same density ratio, that would mean 485 people reside on the Greensprings assuming every household has a mail box. If the difference is split, a reasonable estimate of the Greensprings population is 537. Of this estimated number, 47 are students (at Pinehurst School, Ashland public schools, and a private school).

Although some local officials have criticized the census for undercounting in Jackson County, the 1990 census provides further clues about the population. The data of Census Tract 25, Block Group 1 are shown in Table AM-1 in Appendix M. It encompasses a wide area the east of Interstate 5 from the Oregon border, through the Greensprings area and Dead Indian Memorial Road country, the eastern Talent and Phoenix areas, ending at White City and Lake Creek. The 1990 census of this area was 1,205.

**Table 2-34. Developed Properties in CSNM Area**

| Location | 1901-1950 | 1951-1974 | 1975- 1989 | 1990- 1999 | Total |
|---|---|---|---|---|---|
| Area A<br>I-5 Summit | 2 | 4 | 3 | 2 | 11 |
| Area B<br>Emigrant Creek/<br>Greensprings Summit | 12 | 19 | 39 | 26 | 96 |
| Area C<br>Hyatt/ Howard Prairie | 3 | 31 | 21 | 13 | 68 |
| Area D<br>Pinehurst/Copco | 11 | 8 | 10 | 7 | 36 |
| Total | | | | | 211 |

Source: Jackson County Information Services

- Area A is the I-5 summit, Township 40S, Range 2E, Sections 31-36; Township 41S, Range 2E, Sections 1-12.
- Area B is the Emigrant Creek drainage, including Tyler Creek and Highway 66 past the Greensprings summit to Lincoln, Township 40S, Range 2E, Sections 1-2; 11-14; 23-26; Township 41S, Range 3E, Sections 1-12; Township 40S, Range 3E, all sections.
- Area C is the Hyatt Lake/Howard Prairie area generally north of Highway 66, Township 39S, Range 3E, all sections; Township 39S, Range 4E.
- Area D is the Copco/Pinehurst area, Township 40S, Range 4E, all sections; Township 41S, Range 4E, all sections.

On the basis of the 1990 census, and acknowledging that only about 45 percent (537/1205) of the people described in the Block Grant are estimated to be residents of the

Greensprings community, the following social and economic conditions pertain. The Greensprings community:

- Has more children and fewer seniors than Jackson County or the State of Oregon
- Is significantly more educated
- Has significantly greater incomes and dramatically less poverty
- Relies more on wage income, self-employment, and farm income, and less on social security
- Has a much greater proportion of owner-occupied units
- Has a much higher proportion of residents who pay more than 35% of their income for monthly homeowner costs
- Pays significantly less for rent
- Has about the same commuting time as others

Two points are worth developing. First, the numbers indicate what residents say—that they have a vibrant community with little poverty and high degrees of self-sufficiency. Second, there is some evidence of a rich/poor split. The Housing and Urban Development agency (HUD) considers a family under "cost burden" if 30 percent or more of monthly income is spent on housing. As illustrated in table AM-1 in Appendix M, 21 percent of homeowners spend 35 percent or more on housing indicates family budgets from stressed to simply inadequate.

Table AM-2 in Appendix M shows the results of an intercensal estimate of poverty rates for school age youth, conducted by the Census Bureau in 1996. It estimated that 16.7 percent of Pinehurst students were living in poverty. This finding is not consistent with the 1990 census or with estimates of school district officials. Of the 29 students currently enrolled in the Pinehurst school, only one family had a financial hardship during the winter of 1999 and is now doing very well.

Table AM-1 (Appendix M) illustrates that ethnicity of the community is mostly white with about two percent being of Hispanic origin and other ethnic groups comprising less that one percent of the total population.

The Rogue Valley Council of Governments (RVCOG) engaged in extensive community contact in the Greensprings area while implementing Oregon's "Rural Unincorporated Communities" program in 1997. This effort documented pertinent social and economic conditions as well as community goals. The study reported most of the soils of the area as "severe" in relation to absorption capability of septic systems. Higher construction costs, special designs, increased maintenance, and perhaps larger drain fields to accommodate poor soils were predicted. Whether this condition would limit future development was not stated.

The RVCOG report makes clear that Greensprings residents want to maintain their rural way of life, and that they want modest development opportunities to be consistent with rural lifestyles. A preference for low densities and for small-scale and home-based businesses was expressed. The long-range goal of the community was for sustainable development which they defined as "the allowance for small amounts of growth in commercial and residential uses that sustain the needs of the community for housing and local economy while maintaining preservation of the community's rural pattern of dispersed developments in a forested environment" (RVCOG 1997: p.35).

## Social Institutions

A number of social institutions in the Greensprings links people within the community and with the "flatlanders" in the valley. The Pinehurst School with its active board and parent group is probably most important social institution. The school is the location for numerous community events. In addition, there are two churches, the Cascade

Christian Fellowship and the Lincoln Christian Church. The Oregon Extension of Houghton College contributes to the economy and to local life by bringing college students to the Greensprings each year. In addition, Health Emergency Access Response Team (HEART) was formed in 1990 to address emergency medical assistance needs.

The Friends of the Greensprings (FOG) was formed in 1986 and has served as a community forum for a variety of issues since that time. It serves to educate members about community issues and to advocate on their behalf. It has engaged in a wide range of activities from flower planting to mediating issues related to open range cattle and timber sales. It currently has about 350 members, half of whom do not live on the Greensprings.

Finally, the Soda Mountain Wilderness Council has been active for many years in promoting a wilderness designation for the Soda Mountain area. Although its interest in full preservation of the area does not have universal agreement in the community, it has gone to tremendous lengths to develop local and regional support.

## The Greensprings Economy

The census revealed occupational differences between Greensprings residents and Jackson County and State of Oregon. As reported in Table AM-3 (Appendix M), this area:

- Has slightly less employment in agriculture and forestry than Jackson County and the State of Oregon;
- Has higher rates of employment, nearly double in most cases, in construction, personal services, recreation services, and educational services;
- Experiences a lower proportion of its workforce engaged in durable goods manufacturing, transportation, wholesale trade, finance/real estate, and public administration, which is not surprising in a rural area;
- Like the rest of southern Oregon, relies greatly on retail trade, indicating a strong commuting lifestyle to the nearby urban centers;

Newcomers tend to be affluent. Many who lived economically on the edge during the early part of the nineties have moved away. The elderly are the only ones who are financially on the edge, according to local residents.

What was noted, in conversations with local residents, is an economy composed of:

- Commuting to employment in the Rogue Valley, which seems to dominate the local economy; those for whom commuting is not possible talk of being "locked into" a low cash condition;
- Unearned income through retired citizens;
- "Modem cowboys" making a living from the global economy in a variety of ways (a creativity consultant with international clientele, an accountant from southern California);
- An informal economy, called by "The Handyman Economy;" by which residents actively exchange services, some for cash and some for trade, by which they survive;
- A handful of former loggers/tree planters who offer their services to the community for forest management, road building or excavation; Logging history is still part of the culture and active interest was expressed in fostering higher levels of forestry work in the future;
- Numerous home occupations (RVCOG 1997);
- Fewer ties to the land. Whereas a generation ago, primary incomes were earned from the land in some way, today that is no longer the case.

## Predesignation Community Interests

Many people of the Greensprings are interested in the forest stewardship and

management, especially in the interface. The RVCOG study reported a broad sentiment among residents that they are the real stewards of the forest resources in the area. As a corollary, they believe that corporate and government management has "pursued land management policies that do not protect or enhance the resource values of the area as effectively as the local community which is vested in the livability, responsibility to and character of the area" (RVCOG 1997: p.34).

Many of these folks, as well as many of the owners whose land borders public lands, stated their concern about removing fuels and thinning to keep a forest healthy. In their opinion the BLM could do more to maintain a healthier forest at the "interface." "We worry about a fire coming onto our property," was a common statement. The summer ranger for the Oregon Department of Forestry lives in the community and is well-regarded. He has in his house a map with locations of high risk for fire. His job has been to work with residents around fire concerns and to increase awareness of and readiness for fire events.

Many residents are very concerned with the current logging of private lands going on in the Greensprings. Many have reported seeing the same levels of logging on private lands that they witnessed on public lands in the early 1970s. One resident said the difference is that "now they are logging lands that are very dry--where it takes hundreds of years to grow trees that in other areas would take only a few years. The long term effects that will have in the corridor between the Cascades and the Siskiyous will be devastating."

Data for the Greensprings are not available through Oregon Department of Forestry except estimates of intent to cut a certain volume, nor through the timber tax receipts of the State Department of Revenue. Table 2-35 contains Jackson County information that substantiates a significant trend in timber harvest toward reliance on private lands.

The cost of settlement in the Greensprings has made it impossible for average people to live there. Currently, the county has many permit fees that run in the thousands of dollars, from permitting septic tanks to buildings. Also there is a time limit attached to these permits in which work must be completed, making it difficult for those with limited resources to complete work without re-permitting. Many residents have said that it is more feasible to buy already-developed property than to start from scratch.

Concerns about open range cattle on the Greensprings have been going on for many years. FOG has taken the lead in providing a voice to these issues, conducting a survey in 1990 that documented the widespread nature of the concerns and the costs to homeowners of open range cattle. Livestock districts have been formed as one method to deal with the problem and efforts with the Oregon State Police related to traffic risk have intensified in the last year. Residents say that allotments do not have good fences. Many residents have had to repair their fences and have experienced other costs. The expected BLM investment in rangeland improvements has not materialized. "There are a couple of bad apples out there that give everyone else in the business a bad name," one person said. Others are clear about wanting to preserve the cattle culture on the Greensprings. "Cattle is not what it used to be," an oldtimer said. Other residents pointed out how cattle "keep the fuels down."

Newcomer integration remains an ongoing interest and challenge on the Greensprings. It takes about a year for newcomers in the Greensprings to feel a part of the community. During the year, it is helpful if they participate in the school functions and other social events, like the oldtimers' picnic, a yearly event where the community gathers to cut, split and stack wood for the school. Many new residents are also new to rural life and many of them do not have snow removal equipment or fire fighting capabilities such as a water truck. Longer-term residents point to the cycle of people coming in and out of the community because they do not realize what living on the Greensprings will require.

"It is especially hard on the men," one woman observed, "because they don't socialize as much as women."

## Post-Designation Community Interests

Post-designation group and individual interviews were conducted in early December 2000 for the BLM by social scientists from The University of Idaho (UI), College of Natural Resources. Residents and landowners adjacent to the Monument responded to open-ended questions posed by neutral facilitators regarding social and economic effects of CSNM designation on local communities. The purpose of these interviews was to identify the range of perspectives in the community related to two main questions:

- What have been the effects of CSNM on you and your community?
- How do you think CSNM will affect you and your community over the next 1 to 5 years?

The post-designation interviews revealed that there is a wide spectrum of perspectives within the community regarding the current and future effects of CSNM. For specific details on the post-designation interviews, and a complete listing of the themes that emerged from the interview data refer to Appendix FF.

One general theme that emerged from the interviews is that many community members currently have strong sense of uncertainty as to how the final form of the CSNM management plan will protect the Monument, and whether or how the management plan may affect private property and public land management. Many members of the community assume that the intent of proclamation that created CSNM will be carried out, but since the management plan has not yet been completed and released to the public, they are uncertain how.

A second general theme focused on how the designation of CSNM has polarized the community. While the polarization has in some cases led to less communication between people with opposing views on CSNM, it also appears to have facilitated greater communication between groups of people with shared views.

Potential changes to the character of the community and the local economy was another general theme. There is a wide range of opinion within the community regarding how CSNM may affect demographics, visitors, land ownership, development, extended families, and other aspects the community. Similarly, the community members perceive numerous ways in which CSNM may or may not affect the area's economy.

Access roads was another general theme. The network of forest roads in CSNM is used for recreation access, and in some cases, to access private property. Some community members felt that recent management activities related to road access in the Monument had been for the good. Others were concerned that new visitors to the Monument were causing deteriorating road surface conditions, or using roads to trespass private property. Others were concerned about gating roads and restricting access to public and private land.

Private property rights was another general theme. Some community members felt that CSNM management activities could result in potential spillover effects that may alter property values and the freedom to use property, may increase the need for landowners to actively discourage trespass, and may threaten other private resources such as timber, water, and structures.

Another general theme focused on BLM's ability to effectively manage CSNM. Some people were concerned that sufficient funds and personnel would not be available to BLM to conduct desired monitoring, restoration, protection, and administrative

activities necessary to manage the Monument properly. Others were concerned that BLM has already implemented management changes before the Monument's management plan is completed and made public.

### Summary of the Greensprings/Pinehurst Community

This is a strong, committed community. Residents expressed high value and action around education, land stewardship and production, self-sufficiency, and taking care of each other. Newcomers are wealthier, have an active interest in land stewardship, but are not thought to know much about taking care of the land. There is increasingly less livelihood tied to the land.

## A Social and Economic Profile of Jackson County

Jackson County is considered the secondary zone of influence for purposes of social and economic analysis. That is because people in the Greensprings are oriented in their routines to Jackson County—work routines, family and social ties, schools, and so on. In addition, the economic costs and benefits of public land management accrue to Jackson County—timber receipts, agricultural spending, and recreation demand. The Jackson County Board of County Commissioner's representative for natural resource issues has stated the interest of Jackson County in maintaining management options for public lands in the CSNM area, regardless of the level of timber and grazing production that ecological analysis indicates.

Appendix M contains a statistical overview of the County. RVCOG has projected expected population in Jackson County to grow by 1.7 to 2.8 percent between 2000 and 2020.

### The Economic Structure of Jackson County

Table AM-4 (Appendix M) confirms what everyone now knows. The economy of Jackson County has been profoundly changing over the last thirty years. The traditional sectors of agriculture, forestry, and wood manufacturing has been slowly but steadily declining, while the trades and services sectors, associated with recreation, tourism and retirement has been steadily increasing. From 1970 to 1998, wood manufacturing employment has gone from 12.3 percent to 4.8 percent, a loss of 7.5 percent of workforce share. During the same time period, services have come to claim 22 percent of the workforce, an increase of 9.9 percent, while trade (retail) activities comprise 23.2 percent of the workforce, an increase of 5.5 percent.

Non-farm employment in the state increased by nearly 40 percent from 1986 to 1996. Construction, trade and services has seen the most growth, with four elements of services particularly noteworthy: 1) business services (including temporary help, supply firms, computer software, service companies; 2) engineering and management firms; 3) social services; and 4) health care. Most of the government growth has occurred at the local level, while federal jobs have declined, especially with natural resource management agencies (Anderson 1998: 22).

All net employment growth in Jackson and Josephine Counties in the last decade has been in non-manufacturing. Of these nearly 22,000 jobs, three-fourths of them have been in wholesale and retail trade and services. Spurred by population growth, such employment increased from 19,000 in 1987 to almost 25,000 in 1997, associated with new outlets opening in the area—Target, Costco, Wal-Mart, Fred Meyer, and Montgomery Ward, to name just a few (Anderson 1998: 25).

Oregon Economic Development (OED) projects 19,000 net new jobs in the Rogue Valley by the year 2006. Nearly 50 percent are projected to occur in professional and technical occupations and service jobs (teachers, education workers [+1,340], health care

specialists and technicians [+1,050], social workers and social service technicians [+600]). Service workers include food and beverage preparation and service occupations (+2,200), and personal service workers (+540), the largest group of which will be social service aides and childcare workers (because of day care and assisted living demands). Almost 20 percent of new jobs are expected to be in production, construction and related occupations, with smaller job growth in clerical and sales workers. Agriculture, forestry and related jobs will experience the least job growth—timber cutters, loggers and other kinds of forestry employment will decline by another 20 percent, while the rest of agriculture and forestry occupations are expected to increase by 330 net new jobs (19%). Gardeners, groundskeepers, farm workers, and forest conservation workers (forestry aides and tree planters) are expected to gain the most new jobs (Anderson 1998: 32-33).

The Oregon Employment Department conducted a study of people who moved to southern Oregon in 1997. The major reasons they gave for doing so were: 1) to be with family and friends; 2) quality of life; and, 3) retirement. In contrast, for the state of Oregon as a whole, the third reason was to look for a job (Anderson 2000: 4).

The composition of personal income has also shifted in southern Oregon. The Oregon Employment Department's latest regional economic profile shows a continuation of a trend toward less personal income through wages and more personal income "dividends, interest, and rent" and through a higher rate of transfer payments. Net earnings for the two-county region dropped from 72 percent of personal income to 55 percent between 1967 and 1997. Correspondingly, dividends, interest and rent climbed to 23 percent of personal income, while transfer payments rose to 22 percent. Transfer payments are Social Security and other retirement payments, Medicare, and veterans' benefits. The growth in transfer payments indicates the strength of the retirement presence in southern Oregon. The decline in the proportion of earnings reflects the loss of higher paying jobs in heavy industry (Anderson 2000).

## A Summary of Key Economic Sectors Potentially Affected by CSNM

The relevance of this summary for CSNM decisions is that southern Oregon in the future will be increasingly comprised of individuals with disposable income, higher education, and environmental values who will create recreation demand on public lands.

### Timber

Four areas of activity fall under this category: traditional timber harvest, small diameter timber, restoration forestry and special forest products.

Timber will continue to be an important economic activity but will not be a significant source of new jobs or higher incomes. Value-added and secondary wood products manufacturing can be an important component of the economy but is unlikely to replace the timber industry in jobs and income produced (ECONorthwest 1999).

The causes of decline in forest-based employment in southern Oregon have been much debated over the last few years. Many people have felt that environmental activism has been the cause, and they point to the spotted owl injunction of 1989 as evidence of a dramatic decline in the availability of federal timber supply. Indeed, the amount of harvested board feet in the Siskiyou and Rogue National Forests, as well as the Medford District of the Bureau of Land Management (BLM) has never returned to the levels of

the 1980s. However, other observers have pointed to another cause of employment decline in the lumber and wood sectors—industry restructuring. For example, by 1986 timber production had returned to prior rates from the recession of the early 1980s, but timber employment in that year for Josephine County was only 81 percent recovered. By 1993, Josephine County had only 54 percent of the timber employment that it did in 1978 (Reid and Flagg 1995: 29). In short, a variety of supply and demand factors is likely to limit the lumber and woods products sector in the future.

In practice, this means that timber sales emerging from federal agencies will be at reduced level than in years past, will include greater quantities of small diameter material, and will continue to be purchased by the remaining mills in the region.

Statistics confirm what Greensprings residents and others have said—private lands are accounting for more and more of annual timber harvest. Table 2-35 below shows a general downward trend in the amount of timber harvested in Jackson County over the last several years. It also shows a trend toward greater reliance on private land cutting.

**Table 2-35. Timber Harvest in Jackson County For Selected Years in Thousands of Board Feet (Scribner Log Scale)**

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|
| Forest Industry | 57,015 | 49,069 | 92,960 | 43,985 | 80,646 | 90,475 |
| Other Private | 36,958 | 25,943 | 29,132 | 13,501 | 13,234 | 8,997 |
| State | 35 | 12 | 0 | 0 | 5 | 0 |
| BLM | 38,644 | 5,960 | 18,275 | 28,037 | 20,701 | 21,028 |
| USFS | 37,495 | 32,346 | 22,041 | 19,798 | 26,720 | 10,680 |
| Other Public | 228 | 69 | 58 | 52 | 183 | 4 |
| Totals | 170,375 | 113,399 | 162,466 | 105,373 | 141,489 | 131,184 |
| Total Private | 93,973 | 75,012 | 122,092 | 57,486 | 93,880 | 99,472 |
| % Private/Public | 55/45 | 66/44 | 75/25 | 55/45 | 66/34 | 76/24 |

Source: Oregon Department of Forestry, Annual Oregon Timber Harvest Report, Salem, Oregon.

Because of wildfire suppression and timber harvesting policies of the last few decades, southern Oregon forests have become dominated by highly dense stands of small diameter trees. To increase production levels and to promote forest health generally, land management agencies have been very interested in harvesting small diameter material. A number of pilot projects are underway in small diameter contracting and harvesting in the region. This management attention is giving rise to an increasingly visible secondary woods products industry.

Secondary wood processing creates specialty products with less volume of smaller diameter wood. These include millwork, dimension lumber, wood containers, prefabricated housing and miscellaneous products (SIC 243). Products created in Jackson County include pole furniture, fencing, wooden gift boxes, carved art forms, lamps, tables, and other products.

In Jackson County for the production of secondary wood products (SIC 243, excluding plywood/veneer, 244-249), total payroll increased from $25,325,384 to $43,858,438 between 1985 and 1993, an increase of 74 percent. The number of workers during this

time period increased from 1,389 to 1,825, an increase of 31 percent. The average payroll for this sector in 1993 was $24,032, the same as a high technology job. The average yearly salary for lumber and wood manufacturing in 1993 was $28,210 (Reid and Flagg 1995: Appendix D). Hence, secondary wood products manufacturing is holding its own in Jackson County and is expanding in importance.

A "restoration forestry" is emerging in southern Oregon. Fueled by federal efforts to retrain timber workers, and by state and federal efforts to restore salmon runs, the local area has received resources designed to do riparian repair, tree planting, thinning, weed pulling, and erosion control activities on both private and public lands. A number of individuals and at least one firm, Small Woodland Services, make their livelihood from contracting for restoration services from individuals and natural resource agencies.

Finally, special forest products have received much attention in recent years because of the high incomes their harvest can generate, as well as the social conflicts generated with large numbers of people, some of different ethnic backgrounds, engaged in harvesting. Cedar boughs, ferns, mushrooms, medicinal plants and firewood are among the many non-timber species harvested in the woods. Local merchants reported increased spending by workers during harvest periods. Mushrooms are a significant source of holiday income for a large number of local families. Organizing efforts have been undertaken to educate the workers about environmentally safe harvest methods, identification and marketing. Local discussion about creating a storage facility, or of organizing harvesters into a guild-like structure, have failed to materialize, and special forest products gathering continues to be an individual and family activity.

## Agriculture

ECONorthwest reported that both the number of farms and the acreage in farms have declined in the region, while farm jobs have increased slightly due to value-added activities. Citing census data for agriculture, they noted that agriculture is claiming a lower percentage of overall employment over time (Niemi and others 1999: 15).

Between 1992 and 1997, Oregon farms increased in number and decreased in size. The number of farms now is 34,030, and the average farm size is 513 acres. Oregon farming is tremendously diverse, third in the nation after California and Florida in the range of its production. Farms in Western Oregon tend to be much smaller than the average and more intensive in use. The Agricultural Census also changed the definition of a farm which may have caused the number to increase as well. Christmas tree, pleasure horse, and hybrid/poplar operations are now considered to constitute a "farm."

Small farmers in Oregon overwhelmingly have other jobs and most operations do not make much money. About 62 percent of farms earn less than $10,000 yearly. Almost all farming in Oregon is family owned (Oregon State University Extension Service press release, May 5, 1999).

On the Greensprings, cattle grazing is the primary agricultural activity. Indeed, cattle and sheep grazing was the means of settlement of this area, providing livelihood for some families for many decades, but leading to overgrazing in some areas. The Taylor Grazing Act of 1934 and subsequent efforts have improved range conditions to a degree, although concerns about the effects of grazing remain high for both residents and environmentalists. The number of cattle permitted on public lands in the CSNM area has declined significantly during the last several years. The Livestock Grazing section of this report summarizes these changes, current rangeland conditions, and the present number of people dependent on grazing allotments.

In both the region and the nation, the cattle industry has fallen on hard times during the last several years. Table AM-5 shows that total cattle numbers in Jackson County have stayed relatively constant but the value of the industry has risen substantially,

contributing nearly $8 million to the economy in 1996. In 1998, cattle and calves contributed $8.4 million to the Jackson County economy (Economic Information Office, Oregon State University, January 26, 1999).

Cattlemen could be affected by decisions made in the CSNM because they have private business interest dependant on public lands. Poor market conditions over several years, lack of investment in public land allotments, declining animal unit months (AUMs) on public lands, and the lack of young people in the business point to a stressed industry.

Oregon State University does "enterprise budgets" for typical agricultural operations in the state. Certain assumptions are made about herd size, pregnancy rate, and mortality, as well as about expenses and incomes given current market conditions. While they have conducted no enterprise budgets for Jackson County cow/calf operations, their enterprise budgets for other areas of Oregon show a dismal financial picture. For a 50 cow/calf operation in the high desert area of Oregon in 1997, they projected an overall loss of $12,958 and a per cow loss of $259, despite a gross revenue of $18,162. For a 210 cow/calf operation on irrigated pasture in the Klamath Basin, they projected a net loss to the operation of $34,269 in 1996, and a per cow loss of $163, despite a gross revenue of $72,370 (EM 8653 and EM 8477, respectively, Oregon State University Extension Service, http://osu.orst.edu/Dept/EconInfo/ent_budget/). The latter example assumes an AUM cost of $7, while a BLM AUM on the Greensprings costs $1.34. Although this year has witnessed a rise in prices after a six-year low, no one expects dramatic changes in the near term.

## Recreation and Tourism

Dean Runyan and Associates, in calculating the economic effects of tourism for the Oregon Tourism Commission, determined that Jackson County ranked 9th in the state for travel expenditures, although the county is 6th in population. They found that Jackson County travel spending grew 3.6% annually between 1991 and 1997, and 4.3% from 1996 to 1997. Travel expenditures were valued at $204.7 million in 1997 in Jackson County.

A 1995 study of outdoor recreation in Oregon showed that motorized recreationists (off-highway plus pleasure driving) spend on average $23.89/day, compared to $10.04 for non-motorized, dispersed users (Johnson and Rasker 1995). The Motorcycle Industry Council reported that sale of units was 453,000 in 1990 and 488,000 in 1993. Of this figure, off-highway motorcycles and all terrain vehicles (ATVs) accounted for 59 percent of sales, reaching $1.5 billion. In Oregon, motorcycles numbered 98,000 in 1997, of which 52,700 were on highway, 13,000 were dual sport (on and off highway), and 32,500 off highway. This means that 3.1 percent of the population in Oregon are motorcycle users (From a presentation by Terry Eccles, Oregon State Parks, to Johns Peak Recreation Committee, City of Jacksonville, Oregon).

The International Snowmobile Manufacturers Association reported 181,000 sales in 1994 and 258,000 in 1998, an increase of 43 percent (Press release, 7/22/98; www: snowmobile.org). The Oregon State Snowmobiler Association conducted a survey in 1994 of their 3000 members. They received 310 surveys back that showed spending patterns as follows:

Snowmobiles, $3,239,000 (per capita, $10,448); Trailers, $500,000 (per capita, $1,613); Tow vehicles, $3,000,000 (per capita, $9,677); Motels, $62,000 (per capita, $200); Food, $92,000 (per capita, $297); Clothes, $60,400 (per capita, $195).

Recreationists, shopkeepers and agency people interviewed for this report stated a common perception that most outdoor recreation on public lands in Jackson County represents local use. It is possible that more out-of-area visitors could be attracted to outdoor recreation opportunities in Jackson County. Data from Jackson County parks showed that Californian use of the Howard Prairie campgrounds has ranged from 5 to 14 percent over the years but is generally increasing.

The California State Department of Parks and Recreation commissioned a study in 1993 of the economic impacts of Off-Highway Vehicle use in the state. It found a family-oriented sport that generated $3 billion for the economy, with significant contributions to rural areas. The average spending per household, not including vehicle purchases, averaged $3,516 per year.

BLM for years has assumed a 2 percent rate of growth in recreation demand in the CSNM area. Although no documentation of use rates has been undertaken, the figure seems appropriate. A number of outdoor enthusiasts have pointed out that this area does not have the spectacular scenic beauty of other areas, but a number of other features do make it an attraction:

- It is known as a local area. Conversations with outdoor stores and with hikers reveal that the area is known as a local area. In the same way that the trades and services economy is fueled by a combination of a growing local population and by visitors, demand for recreation opportunities in the CSNM areas will grow as well.

- It is accessible for day uses from the tourism market of Ashland. With a half-million visitors coming to Ashland to see the Shakespeare Festival alone, a good number of people take the time to explore local surroundings. Outdoor stores in Ashland stated that they often direct day hikers and sight-seers to the Pilot Rock and Greensprings areas.

- Its biological diversity is an attraction for students, academicians, and forest lovers from other regions. In the Illinois Valley, biological and geo-physical resources have begun to be a tourist draw in their own right (Preister 1999), and some local residents believe a similar attraction could occur in the CSNM area, especially with national designation.

- The Pacific Crest National Scenic Trail, and related opportunities to create regional links for equestrian, snowmobile and other uses, encourage recreational uses of the area.

A number of individuals and businesses depend directly or indirectly on the natural amenities provided by BLM lands in the CSNM. Callahan's Restaurant and Lodge, Buckhorn Springs Resort, the Greensprings Inn and Lodge, Pinehurst Inn, Houghton College, and a fairly large artist community use the CSNM lands for their livelihood. The Box-R Ranch is creating a destination resort. The resorts at Hyatt and Howard Prairie Lakes, and Campers Cove, depend directly or indirectly on natural resource amenities.

### Other Sectors

Appendix N summarizes two other sectors, medical services and the "modem cowboys"(global entrepreneurs), who are becoming a significant economic engine in rural areas of the U.S. West.

## A Summary of Social and Economic Trends

Like other parts of the region, a trades and services economy has become dominant over the traditional sectors of timber, mining, and agriculture. These sectors tend to pay less than traditional sectors and help create families dependent on multiple income streams. Although a trades and services economy, especially one associated with tourism and recreation, pays low wages, this tendency is mitigated by the presence of retirement

services, and particularly of medical services in Jackson County. Some social problems, such as latch key children and the need for youth outlets, can be created by a trades and services economy. A trades and services economy favors high levels of education and quality of life amenities, especially natural environment amenities.

Wage income as a percentage of total income generated in the valley has been declining. Conversely, transfer income associated with pensions, social security, and retirement benefits, as a percentage of total income in the valley, has been increasing as a function of the increased presence of older people in the population.

The number of people drawing economic livelihood from the global economy through computer modems, package delivery services and airports is high. These so-called "modem cowboys" or "lone eagles" are making serious, although unmeasured, contributions to the economy. These people live where they wish and rank quality of life considerations as highly important in choosing a place to live.

In the Greensprings area, there is now a more diverse mix of occupations than in prior generations. Some forestry workers remain, but commuters, professional people, self-employed cottage industry owners and retirees now have a presence as well.

## Conclusions

The Greensprings community has an avid interest in participating with BLM in developing management strategies for public lands near them. Community members have an interest in creating or sustaining livelihoods for their families derived from public land management. Their history is steeped in forest work and they believe that their stewardship ethic can create ecological soundness while re-creating a labor force capable of restoration forestry.

The profound social and economic shifts that have been experienced in southern Oregon during the last thirty years will affect the management of public lands. The emerging population is more numerous, older, more educated, and has more leisure time and disposable income. Preservation interests are likely to intensify because they are demographically generated by the settlement of ex-urbanites into the small towns of southern Oregon.

Recreation demand is likely going to increase across a wide variety of recreation opportunities—off-highway vehicle use, equestrian, hiking, driving tours, snowmobiling, as well as more "specialty niches" in the future, such as special tours or group events. Recreation demand will be driven from old as well as young, and by specialized populations, such as handicapped persons.

Newcomers have strong environmental values but are not well-acquainted with southern Oregon ecology. Local communities have had varying success in educating newcomers in how to take care of the land. In the Greensprings area, absorption and education of newcomers has been positive, although economics are driving continued logging of private lands. Demands for diverse educational opportunities related to forest management will grow.

The polar positions in regard to CSNM decisions are preservation or production. Each position has articulate representatives. Many Greensprings residents and recreation enthusiasts believe that national designation of the area will create an attraction that will bring further recreational users into the area. They believe that designation on a map will create a destination area of the CSNM area. For many this is positive and represents livelihood opportunities, while for others, increased recreation use should not be promoted (i.e., Soda Mountain Wilderness Council). Production-oriented people, on the

other hand, like timber companies and ranchers, are worried about foreclosing options, both for their short-term interests and for the longer term interests of society. They think keeping options open is important for future flexibility. The Jackson County Commissioner representing natural resource issues has also voiced concerns that management options are kept open--ecological integrity can be sustained and still derive some level of human benefit.