Medford Bureau of Land Management
3040 Biddle Road
Medford, Oregon 97501

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Soda Mountain Allotment –

STANDARDS OF RANGELAND HEALTH ANALYSIS

Photos left to right Agate Flat, Oregon Gulch, Scotch Creek and Parsnip Lakes

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INTRODUCTION

This is an Oregon/Washington Bureau of Land Management (BLM) Standards of Rangeland Health Assessment for the Soda Mountain Allotment (10110). The Soda Mountain Allotment is located south of the Greensprings Highway and extends to the California state line border. The entire allotment is 49,163 acres. The BLM-managed portion of the allotment is 35,619 acres with 366 cattle permitted from May 1–October 15 totaling 1,794 Animal Unit Months (AUMs). The allotment has eight partially fenced pastures and is managed under the Soda Mountain Coordinated Resource Management Plan (Table 1 and Map 1).

Table 1. *Grazing Schedule*

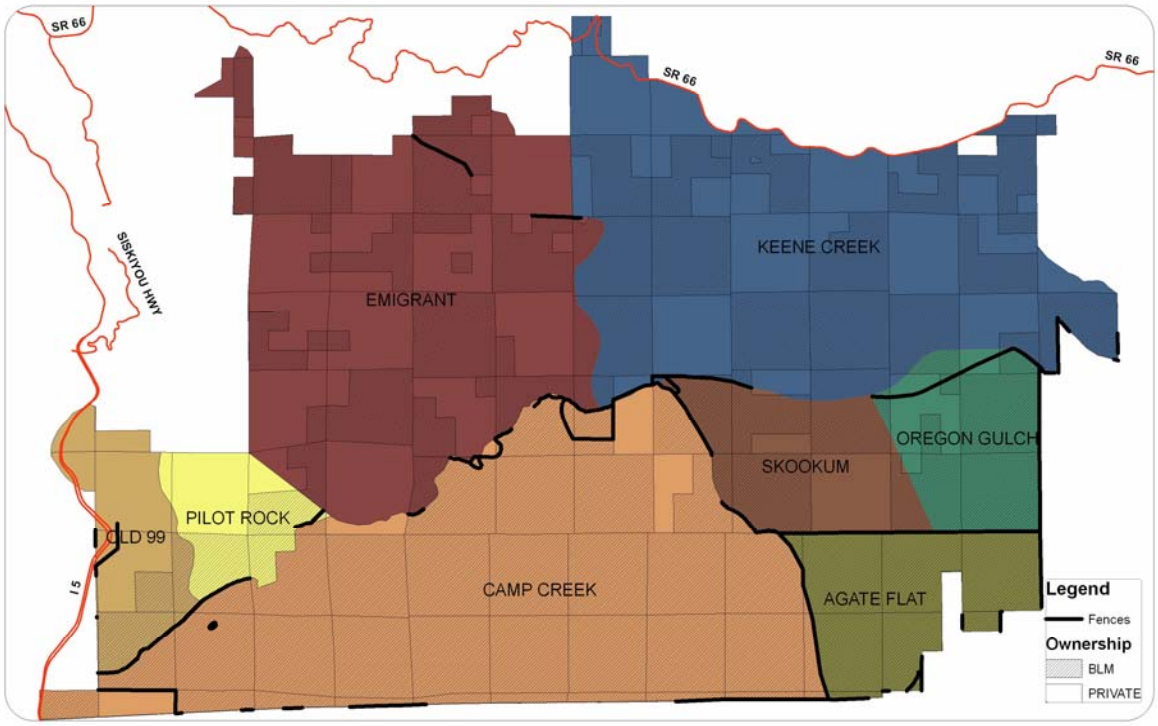
Grazing Schedule	
Pastures	**Dates***
Agate Flat	May 1- June 15
Oregon Gulch	June 16 – July 7
Skookum	June 16 – July 7
Camp Creek	Sporadic use
Pilot Rock	Sporadic use
Old 99	Sporadic use
Emigrant	June 1 – October 15
Keene	June 15 – October 15

*Dates are approximations and vary based on range readiness and grazing schedule.

The Soda Mountain Allotment is within the Cascade-Siskiyou National Monument (CSNM). The CSNM was reserved in June 2000 by presidential proclamation in recognition of its remarkable ecology and to protect a diverse range of biological, geological, aquatic, archeological, and historic objects. The elevation ranges from 1,500 feet on the Agate Flat to 6,500 feet at the summit of Soda Mountain. Average annual precipitation for this area ranges from 23 to 43 inches with most coming in the form of rain below 3,500 feet and snow above that level. The ecological sites of the monument support special status plants and animals, productive wildlife habitat, fisheries, visual resources, and provide recreational opportunities.

The Soda Mountain Allotment incorporates one Wilderness Study Area (WSA) and two Research Natural Areas (RNAs). The Soda Mountain WSA covers 5,965 acres and was established for its wilderness character. The Oregon Gulch RNA (1,047 acres) includes mixed conifer forest and Oak Ceanothus/ bunchgrass chaparral community. The Scotch Creek RNA is 1,797 acres in extent and was proclaimed to protect rosaceous chaparral. Both RNAs were designated for scientific research and as baseline study areas.

Map 1. *Map of the Soda Mountain Allotment Pastures*



Vegetation

Cattle grazing commences annually at lower elevations (1,500 feet) on the generally south-facing slopes of the Agate Flat Pasture of the Soda Mountain Allotment. The vegetation there is a mosaic of chaparral, prairie, and Oregon white oak woodland. By mid-season, livestock have been moved to higher elevations on the steeper and more densely wooded slopes surrounding Soda and Chinquapin Mountains. The component of mixed-conifer forest increases with elevation. Late in the season, cattle graze meadows and harvested forest openings within a matrix of conifer communities (mixed-conifer, Douglas-fir (*Pseudotsuga menziesii*), and white fir (*Abies concolor*) at elevations up to 6,500 feet. Native grasses, including needlegrass (*Achnatherum*), Roemer's fescue (*Festuca roemerii*), and oatgrass (*Danthonia*) grow across the elevational range, depending on local conditions of soil, topography, and shade. At lower elevations, riparian areas are associated with perennial and intermittent streams, with relatively few springs and seeps. At higher elevations, riparian areas are more commonly associated with seeps, springs, and sag ponds. These may be dominated by sedges, rushes, or willows, depending on disturbance history and site conditions. California false hellebore (*Veratrum californicum*) and waterleaf (*Hydrophyllum fendleri*) indicate seasonally wet meadows, which usually dry out by mid-summer. Many of the open areas (meadows and roadsides) have been seeded with non-native pasture grasses after treating unwanted vegetation California false hellebore (*Veratrum californicum),* larkspur (*Delphinium*), and manroot (*Marah oreganus*) with herbicide. Annual and short-lived perennial weedy grasses, including cheatgrass (*Bromus tectorum*), medusahead (*Taeniatherum caput-medusae*), and bulbous bluegrass (*Poa bulbosa*) grow throughout the allotment. The most predominant broadleaved weeds are yellow starthistle (*Centaurea solstitialis*) and Dyer's woad (*Isatis tinctoria*) at lower elevations, and Canada thistle (*Cirsium arvense*) at higher elevations.

Soils

Soils vary in the Soda Mountain Allotment with land-form and source material. The topography is variable with the area around Agate Flat being nearly level to slopes in excess of 70 percent along the headwalls of Scotch, Camp and Dutch Oven Creeks. Most of the soils were formed in alluvium or colluvium from hard volcanic rocks and, as a result, often are shallow or have high rock content. The volcanic parent material has also influenced the mineralogy of the soil as a large portion (52 percent) of the soils in the Soda Mountain Allotment have montmorillonitic mineralogy. Soils with montmorillonitic mineralogy have a high shrink/swell ratio that results in large cracks in the soil when it is dry. These soils are very slippery when wet and have potential for movement at steeper slopes. Mechanical damage to these soils is difficult to ameliorate.

Soils on wet alluvial margins and meadows are typically Klamath (99) and Sibannic (167). These very deep, poorly drained 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 major soils series on the Western Cascades hill slopes are typically McMullin (113), McNull (114), Skookum (173), and Tatouche (190). These are well drained, moderately dense, moderately deep to deep soils with clayey subsoils (varying amounts of coarse fragments), except for McMullin, which is a shallow loamy soil. Soil patterns and landscape in this part of the area 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 sediments derived from these soils are fine-textured and stay suspended in solution for extended periods of time. These soil types are also susceptible to cutbank failures and turbid runoff.

Soils 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 moderately deep, loamy soil. This complex occurs as patterned land on the landscape. Other soils associated with Agate Flat in alluvial fans on slopes ranging 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 clay. All of these soils except for Tatouche have soil moisture limitations as a result of depth, rock content, or heavy clay.

Most of the soils in this area exhibit erosion rates near natural levels, except where recent tree harvesting has occurred; roads have been built; or cattle disturbance along stream cutbanks has occurred. These areas will have erosion rates well 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.

Most of the soils in the Soda Mountain Allotment are productive, but many have limitations of high rock content and/or a perched water table (in the spring time). Soils along the ridges tend to be shallow which limits water holding capacity. In both undisturbed and disturbed forest stands, there is competition for water and nutrients between tree species and grass. When stands are opened up during tree harvesting more sunlight reaches the ground and, as a result, herbaceous plants increase in abundance. This influences the microbial population of the soil (both numbers and types) and their ability to synthesize organic material into nutrients available for plant growth. A soil dominated by annual grass has a microbial population predominantly composed of bacteria; bunchgrasses are inoculated with endo-mycorhizae, while an old-growth forest is predominantly a fungal population. 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.

Hydrology

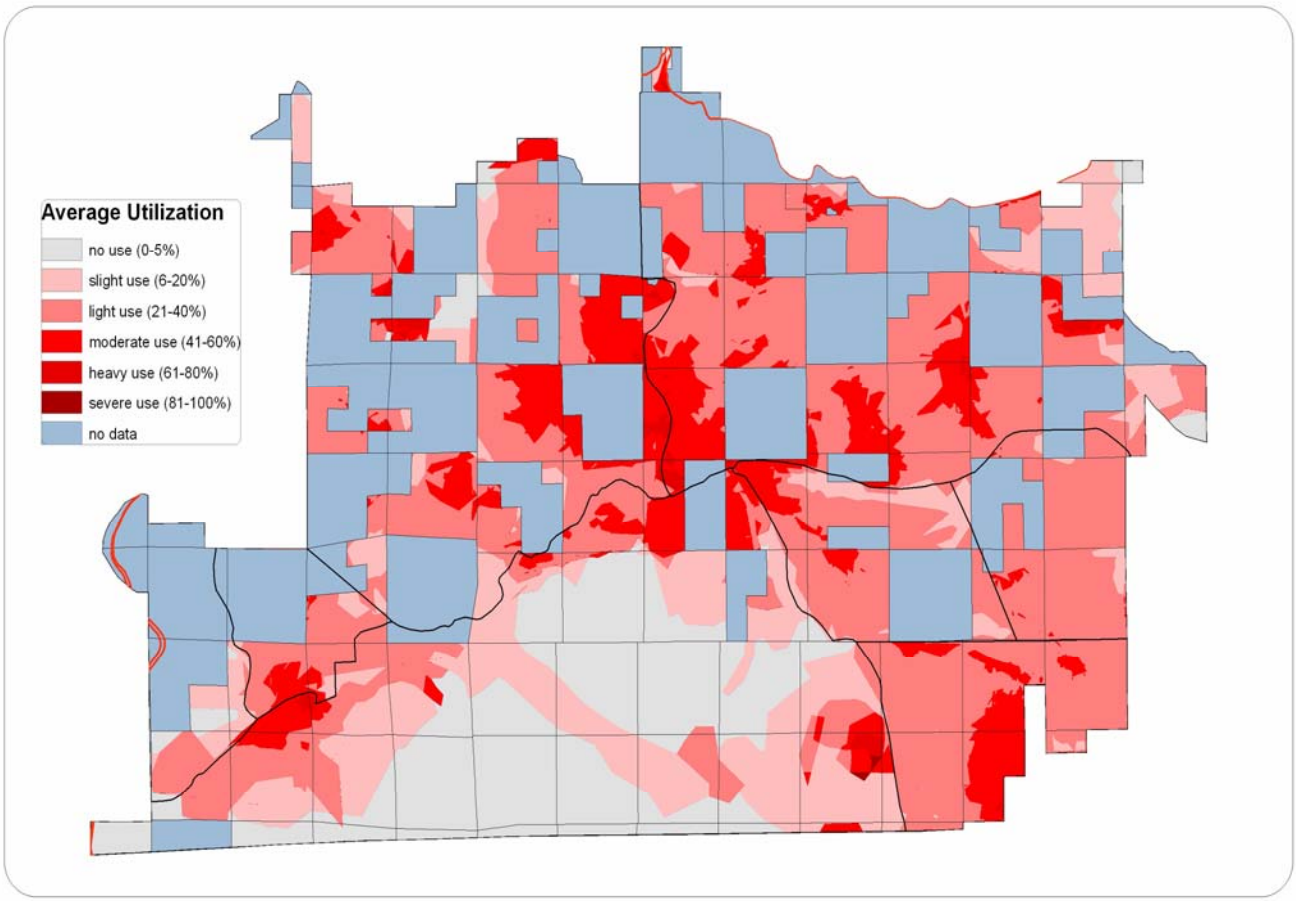
The Soda Mountain Allotment covers over 35,000 acres from Cottonwood Creek tributaries on the west side to Jenny Creek tributaries on the east side. In between, the allotment covers most of the Emigrant Creek drainage above Emigrant Reservoir, almost all of the Keene Creek mainstem (a tributary to Jenny Creek) and its north flowing tributaries, Skookum Creek (another Jenny Creek tributary), a one mile section of the Jenny Creek mainstem, and the headwaters of many other Klamath River tributaries: Scotch, Dutch Oven, Camp, and Salt Creeks. Within the allotment boundary, there are 89 miles of perennial streams, 174 miles of intermittent streams, and 192 miles of dry draws.

Utilization Data, Transect Data and Actual Use

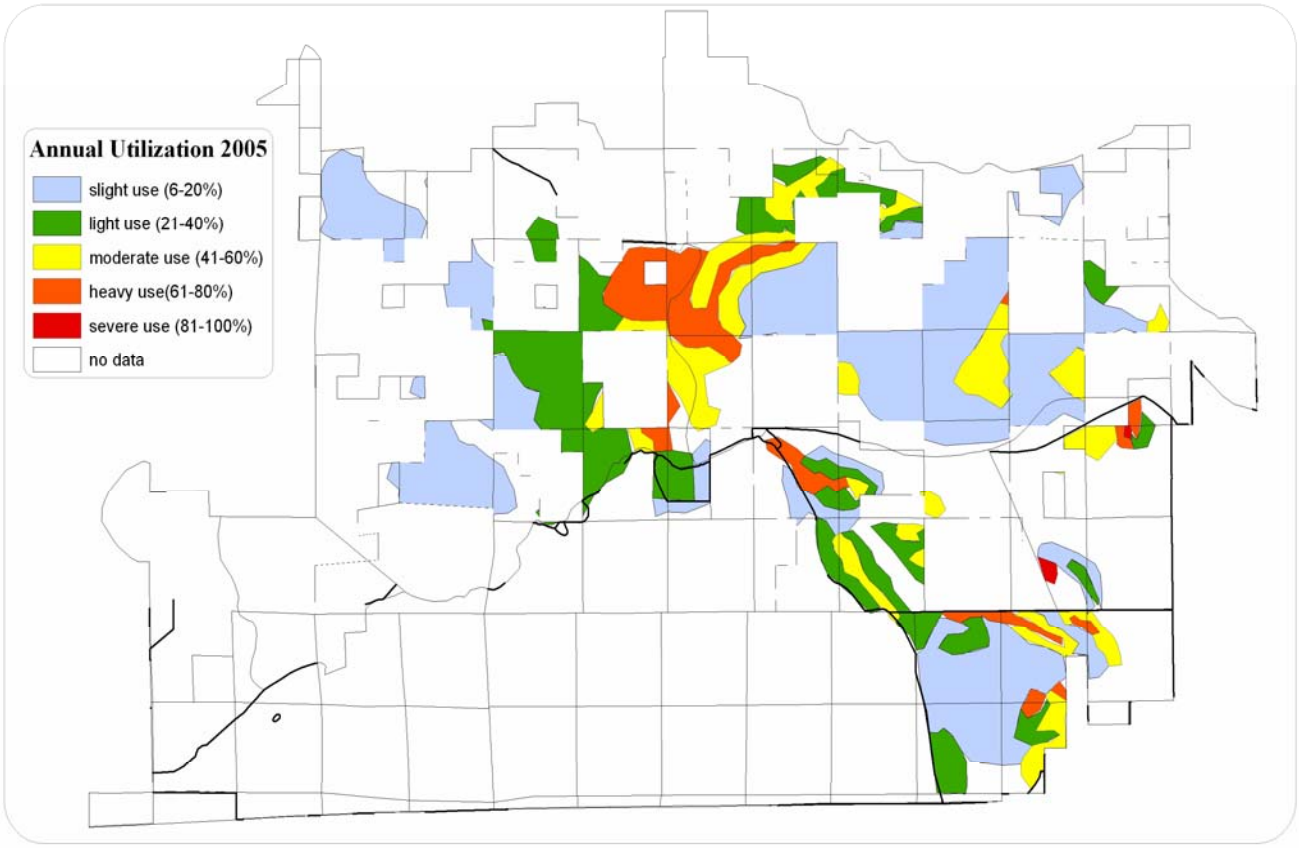
Utilization data is collected using the key species method and mapping use zones (TR 4400-3, 1996). A seven class delineation is used (No Use: 0-5 percent, Slight Use: 6-20 percent, Light Use: 21-40 percent, Moderate Use: 41-60 percent, Heavy Use: 61-80 percent, Severe Use: 81-100 percent). A composite map of utilization was created using data collected between the years of (1986-2004) for the Soda Mountain Allotment to illustrate the use over time within the allotment and corresponds with the studies associated with the Livestock Impact Studies (Map 2).

Utilization mapping and transect data shows an overall decrease in utilization over the past decade (Map 3). The major variables defining utilization include proximity to water, roads, and elevation. Patterns in utilization with elevation are associated with the transition in grazing from summer to fall when uplands are drier and grazing becomes concentrated in riparian areas (Hosten et al. 2007a).

Map 2. *Map of Average Livestock Utilization in the Soda Mountain Allotment*

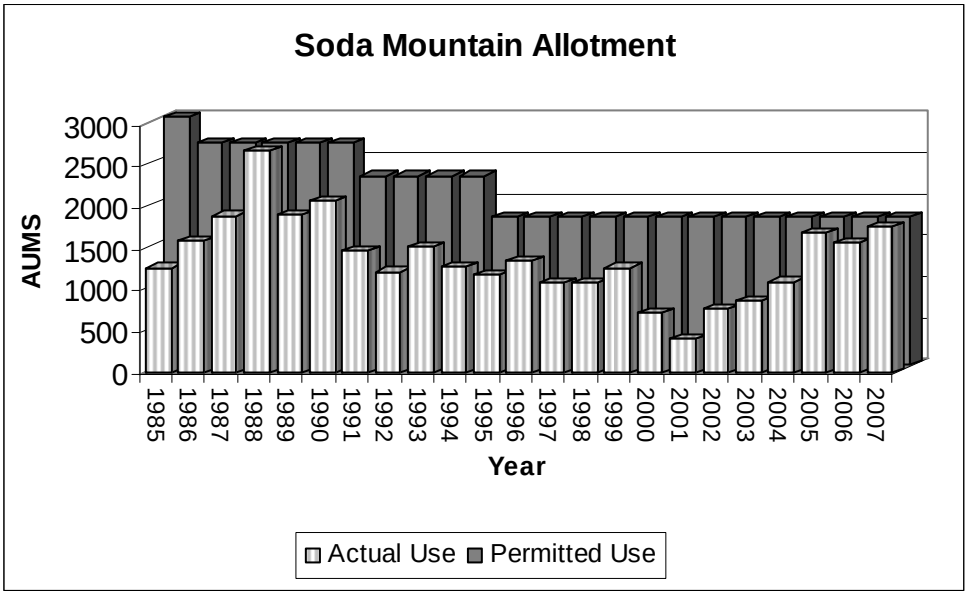


Map 3. *Map of Annual Livestock Utilization (2005) in the Soda Mountain Allotment*



Current stocking rates have been significantly reduced (34 percent) since the 1970s. The actual use is currently lower than permitted use (Figure 1). The permitted use is the AUMs authorized in the *Medford District Resource Management Plan* (1995).

Figure 1. *Actual Use Data*



ASSESSMENT

Rangeland Health Assessments are required on each allotment prior to consideration of grazing lease renewal. These assessments are conducted by an interdisciplinary team of resource specialists who assess ecological processes, watershed functioning condition, water quality conditions, special status species, and wildlife habitat conditions on an allotment. Assessments include field visits to the allotments and evaluation of all available data. All available data, including the results of the Livestock Impacts Study, will be used to make an overall assessment of rangeland health as described in the *Standards for Rangeland Health and Guidelines and Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the States of Oregon and Washington* (Standards and Guidelines) (USDI 1997), in light of the Fundamentals of Rangeland Health at 43 CFR 4180.1.

The Standards and Guidelines identify five specific standards that are used to determine the degree to which "ecological function and process exist within each ecosystem." Standards address the health, productivity, and sustainability of the BLM-administered public rangelands and represent the minimum acceptable conditions for the public rangelands. The guidelines are management practices that will either maintain existing desirable conditions or move rangelands toward statewide standards within reasonable timeframes.

The Standards and Guidelines also specify a set of potential indicators for use when determining whether or not standards are being met. The Livestock Impacts Study has been designed to provide information regarding many of these potential indicators. The results of the Livestock Impacts Study will be used in conjunction with other available data to determine whether or not the grazing standards are being met under current grazing practices.

This assessment summarizes existing resource conditions on the Soda Mountain Allotment using information derived from the Livestock Impacts Study, rangeland field assessments; BLM monitoring data; and all other available data in relation to the five specific standards described in the Standards and Guidelines (USDI 1997).

Primary Supporting Data

Data used by the BLM to support this assessment includes, but is not limited to, the following studies and monitoring projects.

Livestock Impacts Studies: This collection of reports includes studies that provide a historic and spatial context to the examination of individual plant and wildlife species. Historic anecdotes and photos provide a glimpse of vegetation condition at the time of Euro-American settlement and the remainder of the 19th century. More recent plot (range trend plots) and stand examinations (derived from Natural Resources Conservation Service and Soil and Vegetation Inventory Method) provide a baseline for re-examining change over the past 30 years. Other studies focus on the distribution of weeds, Greene's mariposa lily, native ungulates, aquatic macroinvertebrates, and the Jenny Creek Sucker. All of the above species are examined relative to patterns in topography, vegetation, soils, past management, and utilization by native and non-native ungulates.

Rangeland Health Field Assessments: Field assessments using the protocol described in *Technical Reference 1734-6: Interpreting the Indicators of Rangeland Health* (USDI and USDA 2005) were conducted July 25-August 2, 2007 at nine different locations (seven distinct ecological types) on the Soda Mountain Allotment: two semi-wet meadows; oak-juniper-fescue; pine-Douglas-fir-fescue; oak-pine-oat grass; loamy shrub scabland; mixed fir-dogwood; wet meadow; and two droughty fans. Line-point-intercept transect data was collected at each of the ecological sites. The transect data collected provides quantitative data on percent bare ground, species composition, plant mortality and decadence, litter cover and dominance of invasive plants.

Hydrologic/Riparian Surveys: These surveys are conducted using the Ashland Resource Area Stream Survey Protocol. Location, flow duration, channel classification/morphology data for streams, wetlands, and other hydrologic features; instream large wood; impact descriptions and restoration opportunities, especially related to livestock, transportation, and vegetation throughout the monument is collected. Properly functioning condition (PFC) is assessed during the surveys. On BLM lands within the monument, initial data collection in the Keene Creek and a portion of the Middle Jenny Creek subwatersheds was completed in 1999; portions in the upper Emigrant Creek subwatershed were completed in 2000. Portions in Fall, Camp, Scotch, upper Cottonwood, lower Cottonwood, upper Jenny, lower Jenny, and the remainder of Middle Jenny Creek subwatersheds were collected in 2006.

Baseline Stream Temperature Monitoring: Seasonal 30-minute interval stream temperature data is collected at 18 monitoring sites within this allotment using USGS and Oregon DEQ-established methodologies. Changes in riparian vegetative cover, channel dimensions, and bank/floodplain water storage are known to influence stream temperature. Temperature monitoring data assists in assessment of Aquatic Conservation Strategy (ACS) Objectives 2, 4, and 9 (USDA/USDI 1994b); for assessment of compliance with state water quality standards; and assists in development of State of Oregon/EPA-required Water Quality Management Plans for the area.

Gaging Stations, Staff Gages, Flow and Water Quality Assessment: Calculation and assessment of peak, high, and low flows is extremely difficult without actual field measurement and reference over time. Flow data is also required for the meaningful analysis of water quality parameters. Because of rapid fluctuation in stream levels, continuous records are required at a key location to interpret data collected in non-continuous sampling from other locations. Monthly grab samples of turbidity, air temperature, water temperature, pH, flow, fecal coliform, and

dissolved oxygen are collected at three locations within the allotment. A continuous record (15-minute interval) of stream stage, water and air temperature is collected at one location in the CSNM. Standard USGS, Oregon DEQ and EPA approved protocols are used in the data collection.

Stream Channel Cross Sections: Stream cross-section measurements are collected at three locations within the allotment. Measurement methodologies include standard cadastral survey techniques and those outlined in Rosgen (1996). Sites are measured at five-year intervals (approximately) and after major flood events. Cross-sections provide a reference point from which to document changes in channel morphology, conduct flow measurements, and estimate flood flows. Documentation of changes in channel morphology provides an indication of stability and functioning of the upstream surface hydrologic system.

Rain Gages: Rainfall data is collected at 15-minute intervals at one site in lower Jenny Creek using tipping bucket rain gage. Daily precipitation is collected at Howard Prairie Dam (NOAA), Parker Mountain (RAWS), and Buckhorn Springs (RAWS). Daily snowfall and snow-on-the-ground is collected at Howard Prairie Dam (NOAA). Assessment of hydrologic response and water quality parameters, as well as many other aspects of ecosystem function, can only be analyzed accurately in the context of recent precipitation. Although year-to-year trends in precipitation tend to be uniform over an area the size of the CSNM, there is substantial variability in precipitation between locations based on terrain, elevation, etc. Precipitation data from a number of sites at varying elevations and locations in and around the monument is needed for interpretation of related data including hydrologic and vegetation conditions.

Aquatic Macroinvertebrate Monitoring: Macroinvertebrate monitoring has been conducted by Aquatic Biology Associates at seven sites within this allotment using methods that meet or exceed state or EPA protocols for the sampling of benthic macroinvertebrates. Taxa abundance, taxa richness, and other metrics are measured at 5-6 year intervals. Numerous springs (151) throughout the monument were sampled for aquatic mollusk presence, species data, and livestock impacts (Frest and Johannes 2005, BLM 1999-2006). Livestock grazing was measured by a combination of factors (stubble height, trampling, presence of feces, bank destabilization, and bare ground) and was rated on a scale with the same range, as follows: 1- nil or nearly so; 2-light; 3- moderate; 4-heavy; 5- severe. These are not claimed to be quantitative measures but merely attempts to divide a complex range continuum, often multi-faceted in cause, into more or less proportionate segments (Frest and Johannes 2005).

Botany Surveys: Botany surveys were conducted on the Soda Mountain Allotment in 2007 using the Intuitive Controlled Survey. This method includes a complete survey in habitats with the highest potential for locating Special Status Species. The surveyor traverses through the project area enough to see a representative cross section of all the major habitats and topographic features, looking for the target species while en route between different areas. Most of the project area has been surveyed. When the surveyor arrives at an area of high potential habitat (that was defined in the pre-field review or encountered during the field visit), a complete survey for the target species was made.

Wildlife Surveys: Surveys have been conducted in various parts of the allotment for northern spotted owl, butterflies, small mammals, fisher, birds (including neotropical migrants), and the Oregon spotted frog using the appropriate survey protocols. Also the Oregon Department of Fish and Wildlife conducts blacktail deer trend counts.

Standard 1: Watershed Function – Uplands

To meet this standard, upland soils exhibit infiltration and permeability rates, moisture storage, and stability that are appropriate to soil, climate, and landform.

This standard focuses on the basic physical functions of upland soils that support plant growth, the maintenance or development of plant populations and communities, and promote dependable flows of quality water from the watershed.

To achieve and sustain rangeland health, watersheds must function properly. Watersheds consist of three principle components: the uplands, riparian/wetland areas and the aquatic zone. This standard addresses the upland component of the watershed. When functioning properly, within its potential, a watershed captures stores and safely releases the moisture associated with normal precipitation events (equal to or less than the 25 year, 5 hour event) that falls within its boundaries. Uplands make up the largest part of the watershed and are where most of the moisture received during precipitation events is captured and stored.

While all watersheds consist of similar components and processes, each is unique in its individual makeup. Each watershed displays its own pattern of landform and soil, its unique climate and weather patterns, and its own history of use and current condition. In directing management toward achieving this standard, it is essential to treat each unit of the landscape (soil, ecological site, and watershed) according to its own capability and how it fits with both smaller and larger units of the landscape.

Indicators Used to Evaluate this Standard:

The following set of indicators has been identified for subsequent use to determine if this standard is being met.

Amount and distribution of bare ground, rock, stone, gravel, plant litter, and plant cover:
Upland sites with bare soil consequent to past disturbance (scarifications, livestock, and road construction) show less bare soil and succession towards perennial plant domination. Other sites appear to maintain a bare soil surface because of soil mineralogy. The Natural Resource Conservation Service (NRCS) describes montmorillonitic soils through much of the region (USDA 1993). The confluence of shrink-swell clays and low precipitation results in naturally bare soil at many sites through the Agate Flat and Camp Creek Pastures. High elevation semi-wet meadows dominated by California hellebore show lush vegetation in the spring, but bare soil later in the summer due to fluctuating water-tables. The exclosures on Soda Mountain indicates that the relation between livestock use and bare ground is dependent on the predominant grass (Hosten unpubl.). Sod forming grasses such as California oat grass may increase in abundance with grazing pressure, while bunchgrasses decline in canopy cover to reveal more bare soil.

Of the nine Rangeland Health Field Assessment (RHFA) ecological sites visited (two semi-wet meadows; oak-juniper-fescue; pine-Douglas-fir-fescue; oak-pine-oat grass; loamy shrub scabland; mixed fir-dogwood; wet meadow; and two droughty fans), all but the oak-pine-oatgrass plant community (slight-to-moderate departure) showed levels of bare ground consistent with what would be expected at those ecological sites (USDI 2007).

Plant community composition and community structure: Vegetation in the Soda Mountain Allotment is primarily steep mountain grassland, high mountain grassland, mixed fir-ocean spray forest, oak woodlands, dry and wet meadows, and Douglas-fir forest components. Points of broadleaved noxious weed invasion indicate areas of deteriorating plant composition (associated

with moderate to high levels of utilization estimated at 15 percent of the landscape). High elevation sites with Canada thistle (primarily Keene Creek Pasture of the Soda Mountain Allotment in the vicinity of Soda Mountain) are associated with livestock use. Lower elevation sites with yellow starthistle are associated with several environmental and management factors including the presence of shrink-swell clays, past management activities (scarification and seeding) and areas subject to high livestock influence (trampling and forage intake) within prairies and open woodlands. Higher than expected counts of broadleaved weeds occurred at moderate to higher average levels of grazing for yellow starthistle at lower elevations and Canada thistle within meadows at higher elevations (Hosten 2007a).

Repeat photos show an increase in the percent cover by shrub vegetation (mostly buckbrush) through much of Agate Flat, Oregon Gulch, Skookum, and the eastern portion of Camp Creek Pastures on soils capable of supporting woody vegetation. The increase in shrubs observed from repeat photos at lower elevations is more likely attributable to the time since the last fire rather than to influence by livestock. The RHFA at a droughty fan ecological site in the Old 99 Pasture showed an accumulation of shrubs since the last fire and intense, historic season-long grazing (late 19^{th} – early 20^{th} centuries) by cattle, sheep, and horses.

Bulbous bluegrass, a short-lived non-native perennial grass, shows the largest increase in extent and cover abundance in a wide range of plant communities across the Soda Mountain Allotment. Bulbous bluegrass appears more strongly related to physical disturbance along roads, past rangeland improvements, and topographic variables than to livestock utilization (Hosten et al. 2007d). Bulbous bluegrass is indirectly related to livestock by its association with gentle slopes. Bulbous bluegrass was recorded in five of the nine RHFA transects (USDI 2007).

Accelerated erosion and overland flow: In the RHFA, there are six indicators pertaining to erosion: only one site showed departure from the ecological site description.

The droughty fan site in the Old 99 Pasture and the oak-pine-oatgrass site in the Agate Flat Pasture were rated as having a slight-to-moderate departure for soil surface resistance to erosion and moderate departure for soil surface loss or degradation (USDI 2007).

Root occupancy in the soil profile: The general trend in herbaceous vegetation from annual domination towards perennial vegetation (Hosten et al. 2007d) signifies improved root occupancy of the soil profile through much of the Soda Mountain Allotment. The exception may be the Agate Flat and Camp Creek Pastures of the Soda Mountain Allotment (Hosten et al. 2007d, USDI 2007). These Pastures continue to be dominated by annual grasses and forbs, showing only very slow increase in perennial grasses. The root system of these impoverished areas has diminished the ability for water to infiltrate the soil compared to historic times.

Road density: Road densities throughout the Soda Mountain Allotment range from a low of 1.89 mi./mi.^{2} in the Scotch Creek subwatershed to over 4 mi./mi.^{2} in Keene Creek and Middle Jenny Creek subwatersheds (Table 2). High road densities are generally associated with impaired hydrologic function; loss of connectivity; introduction and spread of exotic species and noxious weeds (Hosten 2007a.); reductions in site productivity; and increased sediment production.

Table 2. *Road Densities by Subwatershed within the Soda Mountain Allotment*

Level 6 Subwatershed	Level 5 Watershed	Pasture	Road Density (mi./mi.^{2})
Camp Creek	Jenny Creek	Camp Creek	2.13
Scotch Creek	Jenny Creek	Camp Creek	1.89

Level 6 Subwatershed	Level 5 Watershed	Pasture	Road Density (mi./mi.^{2})
Middle Cottonwood	Klamath-Irongate	Camp Creek	2.85
East Fork Cottonwood	Klamath-Irongate	Old 99	3.13
Upper Emigrant Creek	Bear	Pilot Rock	3.72
Upper Emigrant Creek	Bear	Emigrant	3.72
Lower Jenny Creek	Jenny Creek	Skookum	2.95
Lower Jenny Creek	Jenny Creek	Oregon Gulch	2.95
Lower Jenny Creek	Jenny Creek	Agate Flat	2.95
Keene Creek	Jenny Creek	Keene Creek	4.27
Middle Jenny	Jenny Creek	Keene Creek	4.43

Standard 2: Watershed Function - Riparian/Wetland Areas

To meet this standard, riparian-wetland areas are in properly functioning physical condition appropriate to soil, climate, and landform.

Riparian-wetland areas include standing water systems such as lakes, ponds, seeps, bogs, and meadows; and moving water systems such as rivers, streams, and springs. Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Riparian areas commonly occupy the transition zone between the uplands and surface water bodies (the aquatic zone) or permanently saturated wetlands.

Properly functioning condition of riparian and wetland areas describes the degree of physical function of these components of the watershed. Their functionality is important to water quality in the capture and retention of sediment and debris, the detention and detoxification of pollutants, and in moderating seasonal extremes of water temperature. Properly functioning riparian areas and wetlands enhance the timing and duration of stream flow through dissipation of flood energy, improved bank storage, and ground water recharge. Properly functioning condition should not be confused with the Desired Plant Community (DPC) or the Desired Future Condition (DFC) since, in most cases, it is the precursor to these levels of resource condition and is required for their attainment.

Indicators Used to Evaluate this Standard:

The following set of indicators has been identified for which site-specific criteria will be used subsequently to determine if this standard is being met. The criteria are based upon the potential (or upon the capability where potential cannot be achieved) of individual sites or land forms.

Active/stable beaver dams: Beaver activity appears to have increased over the landscape as a whole, the lack of beaver activity from some areas may still be limiting the development of wetlands. The return of beaver may be hindered by the influence of livestock on the propagation of riparian shrubs in heavy to high severity livestock use areas (Keene Creek Pasture) (Hosten and Whitridge 2007). Two observations indicate that livestock are influencing the integrity of beaver dams in the Parsnip Lakes area. In one case, livestock impacts caused the premature drying out of a beaver pond, resulting in the desiccation of Oregon Spotted Frog egg masses (Parker Pers. comm.).

Vegetation age class distribution, and community structure: Stream channel riparian areas show improvement in age class distribution and community structure. Much of this improvement is due to natural successional processes following past flood events. Changes in season-of-use and

reduction in livestock numbers appear partly responsible for the increased extent of sedges, rushes and riparian woody vegetation. In particular, the increased vegetative propagation of aspen clones inside and outside of exclosures (generally in areas of substantial livestock use) indicates that the timing and intensity of grazing is allowing the recovery of many riparian plant communities (Hosten and Whitridge 2007).

Large wood and surface litter: Repeat photos show no difference in large wood between grazed and ungrazed areas (Hosten and Whitridge 2007). All reaches examined in the Emigrant Pasture showed increased surface litter, while only 67 percent of reaches in the Keene Pasture showed increased litter, the rest showed decline in litter cover (Hosten and Whitridge 2007). Physical habitat surveys conducted by ODFW (1993, 1997, 2002, and 2003) found all surveyed reaches had little or no large wood.

Frequency and duration of soil saturation: The frequency and duration of flooding are controlled by topographic position, seasonal rainfall patterns, and influence of beaver. Exclosure studies indicate high livestock use can retard the development of willow stands, a phenomenon most likely occurring in the Keene Creek Pasture of the Soda Mountain Allotment.

Plant composition: Stream Channel riparian areas show improvement over the past 15 years in vegetation composition expressed as the establishment of vegetation on bare ground, replacement of grass by sedge, and replacement of herbaceous vegetation by riparian shrubs depending on the site. While change is slow relative to ungrazed areas, streamside riparian areas are generally improving throughout the Soda Mountain Allotment (Hosten and Whitridge 2007). There are exceptions within the heavy to severe cattle use areas of Soda Mountain and Oregon Gulch (Map 2). These sites have shown invasion by Canada thistle over the past few decades (Hosten 2007). While recent weed treatments have reduced noxious weeds, grazing and vegetation condition still favors invasion of new weeds. Repeat photos indicate little improvement of vegetation composition has occurred in the vicinity of seeps and springs associated with livestock use. The few repeat photos of fenced seeps and springs show rapid development of perennial riparian vegetation (Hosten 2007b, Hosten and Whitridge 2007).

Point bar revegetation: Repeat photos on the Soda Mountain Allotment show rapidly revegetating pointbars in protected areas (former Box O Ranch) and in areas with much reduced livestock use, but slower revegetation in high use areas such as below the Keene Creek Reservoir (Keene Creek Pasture). Other sites with cobbly substrates show rapid recolonization by willow following the last flood event. This may be related to the tendency of livestock to avoid cobbly areas (Hosten 2007b, Hosten and Whitridge 2007).

Riparian area width: Camp Creek, Emigrant, and Keene Creek Pastures all show between 14 and 25 percent of stream reaches with reduced stream width. Only Keene Creek Pasture shows stream reaches with increases in stream width (Hosten and Whitridge 2007).

Root mass: The expansion of sedges and or woody riparian vegetation implies that there has been an increase in streamside root mass critical to stream stability. Exceptions are the intensely used areas on Soda Mountain in the Keene Creek Pasture (Hosten 2007b, Hosten and Whitridge 2007).

Water diversions and impoundments: Water withdrawals and diversions for agricultural, hydropower, and irrigation district uses in other basins have reduced expected runoff in the Jenny Creek Subbasin by 28 percent (CSNM Draft RMP/EIS 2002). This reduction of flow decreases the stream's sediment transport capacity, increases stream temperatures, and reduces available habitat for aquatic organisms. Impoundments and diversion dams function as sediment traps,

effectively disrupting the natural downstream movement of stream substrate, wood, and nutrients. Within the Jenny Creek Watershed, water is held back during winter flushing flows and peak flow events causing the stream to become channelized and lose floodplain access. This practice also contributes to higher flows in summer months when stream channels would naturally have less water. Dams restrict upstream and downstream passage for aquatic organisms. Small impoundments constructed for watering wildlife and livestock create unnatural levels of grazing impacts upstream and downstream of the impoundment by drawing animals to these areas in summer months when water is scarce.

Streambank/shoreline stability: Of the two pastures in the Soda Mountain Allotment examined for Properly Functioning Condition (PFC) status, both Keene and Emigrant Pastures show approximately 12 percent of examined stream reaches with actively eroding banks (Hosten and Whitridge 2007). ODFW physical habitat surveys (1993, 1991, 1997, 2002, and 2003) found active bank erosion along Camp Creek (52 percent of stream banks surveyed), Mill Creek (20 percent), Jenny Creek (13 percent), and Lincoln Creek (18-29 percent). Livestock have trampled many headwater springs in the east fork of Camp Creek and Dutch Oven Creek resulting in extensive alteration of the streambed, erosion and export of fine sediments into the main channel, increased exposure to direct sunlight, and potentially high nutrient inputs (Parker 1999).

The incised nature of many of the watercourses in these pastures indicates severe erosion in past decades in Agate Flat, Oregon Gulch, and Skookum Creek Pastures. Active gullies exist in the Camp Creek, Old 99, and the Emigrant Creek Pastures of the Soda Mountain Allotment. Most active gullies appear initiated by road construction and are found on inherently unstable soils with high shrink-swell clay content. An exception is the gully within the Porcupine Gap area associated with a stockpond (T.40S., R.3E., Section 35, SESE¼).

Sediment deposition: Fine sediment (sand, silt, clay) exceeded the PFC benchmark of greater than 20 percent fines (Klamath Province/Siskiyou Mountains Matrix of Factors and Indicators) for the following streams: South Fork Keene Creek (34 percent), Lincoln Creek (31 percent), Mill Creek (26 percent), Jenny Creek (31 percent), and Camp Creek (23 percent) (ODFW 1993, 1997, 2002, and 2003), due in part to the upstream reservoir system that moderates the magnitude and intensity of winter flushing flows. Active bank erosion is probably contributing fine sediment to all the above listed streams except Keene Creek. The common observation of siltation in seeps, springs, streams and ponds on Soda Mountain indicates bank destabilization and sediment transport along watercourses. While studies within the Soda Mountain Allotment attribute excess sediments within paired sub-watersheds to livestock, logging, and high road density, no statistical differences between macro-invertebrate communities could be discerned (Barr et al. In review).

Upland watershed conditions: Since little logging has occurred on public lands within the allotment during the last few decades, the major influences on upland condition that impact riparian condition are livestock grazing and road density. Intense livestock use at high elevations by livestock outside of riparian areas is restricted to a few areas.

Amount and distribution of plant cover: Repeat photos show the loss of bare ground to vegetation cover throughout the CSNM (Hosten and Whitridge 2007). Other sources of information indicate that bare ground is generally proportionate to the level of ungulate use, the higher the use the greater the amount of bare ground. This is supported by PFC surveys. Streams and seeps still show disturbance by native and non-native ungulates (Hosten 2007b, Hosten and Whitridge 2007).

Stubble height: Interdisciplinary teams have in the past identified areas where stubble heights do

not meet the terms and conditions in the grazing lease which state that a six inch stubble height will be maintained in riparian zones, particularly in the Soda Mountain area of the Keene Creek Pasture (Letter to Soda Mountain lessees July 27, 2005). Past stubble height measurements in the vicinity of the Parsnip Lakes indicates that livestock use has resulted in stubble heights less than minimum stubble heights recommended in the literature (Audet 2002). For recovery of depleted meadow riparian systems, ten to fifteen centimeters (4-6 inches) of forage stubble height should remain on streamside areas at the end of the growing season, or at the end of the grazing season after fall frost, to limit impacts to the herbaceous plant community, the woody plant community, and streambank stability (Clary 1999). In other situations, fifteen to twenty centimeters (6-8 inches) of stubble height may be required to reduce browsing of willows or limit trampling impact to vulnerable streambanks (Clary and Leininger 2000). According to Hall and Bryant (1995), cattle preference will shift to woody vegetation as stubble height for the most palatable species (Kentucky bluegrass) approaches three inches but in sedge and rush communities the shift will happen earlier and six to nine inch stubble heights may be more suitable (Marlow pers. comm. 2003).

Pedestalling/soil disturbance: Of the two pastures where stream surveys from the early 1980s showed pedestalling, Emigrant Pasture showed 100 percent of stream segments improving, while Keene Pasture showed 91 percent of stream segments improving (Hosten and Whitridge 2007). Stream surveys found areas of trampling and extensive soil disturbance in areas of heavy-to-severe livestock use throughout the allotment (BLM Stream Surveys 2000).

Road density: Road densities throughout the Soda Mountain Allotment range from a low of 1.89 mi./mi.^{2} in the Scotch Creek subwatershed to over 4 mi./mi.^{2} in Keene Creek and Middle Jenny Creek subwatersheds (Table 2). Road density within the Riparian Reserves of the entire (BLM lands only) CSNM is 3.75 mi./mi.^{2} (USDI 2008). Roads within riparian areas can greatly influence aquatic and riparian conditions. Roads contribute to the disruption of aquatic connectivity, large wood and nutrient storage regimes, peak flow routing, aquatic habitat complexity, temperature regimes, channel morphology, and direct sediment inputs from road failures. The matrix of pathways and indicators for the Klamath Province/Siskiyou Mountains considers road densities of less than 2.0 mi./mi.^{2} as properly functioning condition and greater than 3.0 mi./mi.^{2} as not properly functioning (ODFW 2002, 2003).

Amount and distribution of bare ground, rock, stone, gravel, plant litter, and plant cover: Studies examining riparian vegetation change over time identify a decline in bare ground within streamside riparian areas. Bare ground is usually colonized by grasses and sedges, sometimes replaced in turn by woody riparian areas. Unfenced seep and spring riparian systems subject to livestock use continue to show bare ground (Hosten and Whitridge 2007).

Standard 3: Ecological Processes

To meet this standard, healthy, productive, and diverse plant and animal populations and communities appropriate to soil, climate, and landform are supported by ecological processes of nutrient cycling, energy flow and the hydrologic cycle.

This standard addresses the ecological processes of energy flow and nutrient cycling as influenced by existing plant and animal communities. While emphasis may be on native species, an ecological site may be capable of supporting a number of different native and introduced plant and animal populations and communities while meeting this standard. This standard also addresses the hydrologic cycle which is essential for plant growth and appropriate levels of energy flow and nutrient cycling.

The ability of plants to capture sunlight energy, to grow and develop, plays a role in soil development and watershed function. Nutrients necessary for plant growth are made available to plants through the decomposition and metabolization of organic matter by insects, bacteria and fungi, the weathering of rocks and extraction from the atmosphere. Nutrients are transported through the soil by plant uptake, leaching and by rodent, insect and microbial activity. They follow cyclical patterns as they are used and reused by living organisms.

The ability of rangelands to provide habitat for wildlife and satisfy social and economic needs depends on the buildup and cycling of nutrients over time. Interrupting or slowing nutrient cycling can lead to site degradation, as these lands become increasingly deficient in the nutrients plants require.

Some plant communities, because of past livestock use, fire frequency, or other past extreme or continued disturbances, are incapable of meeting this standard. For example, shallow-rooted winter-annual grasses that completely dominate some sites do not fully occupy the potential rooting depth of some soils, thereby reducing nutrient cycling well below optimum levels. In addition, these plants have a relatively short growth period and thus capture less sunlight than more diverse plant communities. Plant communities like those cited in this example are considered to have crossed the threshold of recovery and often require great expense to be recovered. The cost of recovery must be weighed against the site's potential ecological/economic value in establishing treatment priorities.

Indicators Used to Evaluate this Standard:
The following set of indicators has been identified for subsequent use to determine if this standard is being met.

Accumulation, distribution, and incorporation of plant litter into the soil: Litter accumulation in upland areas is thought to conserve soil moisture within the soil profile, protect the soil surface from raindrop impact, and help prevent the establishment and persistence of broadleaved weeds with winter rosettes. A litter layer and competition by winter annual seedlings may also prevent the establishment and persistence of native grasses, forbs, and rare plants such as *Calochortus greenei* (Frost and Hosten 2007). Two of the sites analyzed as part of the RHFA had litter amounts below the expected percentage due to the high abundance of annual grass. Livestock movement is thought to improve contact between the soil and litter thereby promoting decomposition and enhancing the nutrient cycle. Removal of decadent vegetation through grazing and defecation is considered to promote the energy cycle by enhancing the plants ability to trap radiant energy on new plant tissues. The accumulation of litter in riparian areas can favor native sedges and rushes and confer habitat for macro-invertebrates, amphibians, reptiles and other wildlife species, while at the same time reducing the overall productivity of the site. This is demonstrated by changes observed on the former Box O Ranch and other former intensively grazed areas of the CSNM (Hosten and Whitridge 2007). The positive and negative aspects of a litter layer are different at individual sites, and are not suitable for ecological interpretation across the landscape characterized by a diverse pattern of vegetation and grazing intensities.

Wildlife community structure: Livestock influence deer and elk movement, although it is not known if livestock alter native ungulate community structure or population beyond the constraints of suburban and agricultural expansion into former deer and elk winter range (Hosten et al 2007b). While richness and diversity of small mammals is not influenced by livestock grazing in riparian, woodland, and mixed conifer communities, small mammal biomass is less in moderate to severe utilization levels versus ungrazed or lightly grazed areas (Johnston and Anthony. In

review a, b).

Birds: Ungulate use appears to lead to an increase in abundance of ground nesting birds, but may not favor overall reproductive success by these species. This may result from a decrease in the cover of shrubs which provides more nest sites for ground-nesting birds. Ungulate use has a negative influence on abundance of shrub-nesting birds including migratory neo-tropical birds (Alexander et al. 2008). It is not known if the increased abundance of shrubs found in formerly open fire-mediated plant communities (Hosten et al. 2007c) compensates for livestock influence on shrub nesting bird species.

Butterflies: Ungulate utilization has been shown to negatively influence the Great Basin wood nymph, a butterfly dependent on grass species for its lifecycle. Other butterflies with grass host plants (e.g. mardon skipper) may experience similar negative influences (Runquist In prep.).

Biological activity including plant growth, herbivory, and rodent, insect and microbial activity: Historic browsing by livestock within current day winter deer and elk habitat is thought to have contributed to winter native ungulate die-off. Changes in the timing of grazing have reduced the level of browsing at lower elevation, thus eliminating the conflict between native and non-native ungulates. Shrub growth in previously reported areas of heavy browsing (Agate Flat) now appears normal. Observation in areas that have not burned for many decades are showing shrub stagnation (Siskiyou Allotment), an influence of elongated fire return interval rather than livestock influence.

Plant composition: Observations about the ecological process of plant community change (Succession) suggest several influences on current vegetation composition. Elapsed time since the last fire is expressed in conifer dominated communities by an increase in canopy cover by saplings, and the loss of mature black oak. Non-conifer communities show an increase in shrub cover (mostly buckbrush) within the Agate Flat, Skookum, Oregon Gulch, and eastern portions of Camp Creek Pastures. Other changes include a slow increase in perennial grasses, most likely recovery from historic grazing disturbance. Broadleaved weeds have increased in abundance throughout the allotment as a response to more recent disturbance (livestock, scarifications, roads, and the presence of shrink-swell clays) (Hosten 2007). The spread of bulbous bluegrass, a non-native grass introduced in seeding projects, is problematic for maintaining native dominated communities and can only be indirectly linked to patterns of livestock use (Hosten et al. 2007d).

Root occupancy in the soil profile: The replacement of annual grasses by deeper rooted native perennial grasses over much of the allotment (Hosten 2007d) is considered to enhance the nutrient and energy cycles. The increased abundance of bulbous bluegrass is a concern because it functions more like an annual plant.

Soil compaction: The inability of riparian vegetation to extend beyond cut-banks within livestock exclosures constructed 10 to 20 years ago indicates that soil compaction may be a concern in heavily utilized riparian areas (Hosten 2007b; Hosten and Whitridge 2007). Indirect evidence from recently constructed exclosures in Keene Creek Pasture indicates that compaction may influence plant productivity in high elevation meadows with higher livestock use (Hosten unpubl.). Longer term monitoring will separate the confounding effect of precipitation from soil characteristics such as compaction. A droughty fan and oak-juniper-fescue site had a weak compaction layer, not expected for the site most likely as a result of past heavy livestock utilization (USDI 2007).

Fire: While average fire-return interval is longer than immediately prior to settlement by Euro–

Americans, the vegetation is still considered to be within the 'natural range of variability' at the stand-level. The loss of meadows, other open vegetation, and early seral brush fields across the landscape has no precedent in the past several thousand years, and may be a partial consequence of historic livestock impacts (Hosten et al. 2007c). Such change at the landscape scale has likely resulted in the loss of special habitats, the stagnation of certain shrub species, and the loss of more palatable browse to native ungulates (Hosten et al. 2007c, USDI 2007). The decline of black oak across stands examined across the landscape is also an indication that the elongated fire-return interval is influencing the persistence of long-lived woody species (Hosten et al. 2007d).

Successional processes: Vegetation plots across the landscape show an increase in native perennial grass abundance, as well as non-native bulbous bluegrass. Patterns of noxious weeds (yellow starthistle, Canada thistle) implicate livestock influence in moderate to severe forage use areas (15 percent), as well as other disturbances and edaphic factors. The increase in buck brush through much of the lower elevation areas outside of Camp Creek Pasture is likely a response to elongated fire return intervals. While patches of chaparral were likely always prevalent within drier portions of the allotment, this expansion of shrubs may alter vegetation dynamics in areas previously kept open by more frequent fire. Long-term domination of formerly open areas by woody vegetation may result in the loss of extant grasses and their short-lived seedbank. In the longer term, heavy season-long grazing likely contributed to the increase of woody shrubs through the local extirpation of native perennial grasses (Hosten et al. 2007c). Annual production was less then what would be expected at six of the nine sites analyzed (USDI 2007).

Standard 4: Water Quality

To meet this standard, surface water and groundwater quality, influenced by agency actions, complies with State water quality standards.

The quality of the water yielded by a watershed is determined by the physical and chemical properties of the geology and soils unique to the watershed, the prevailing climate and weather patterns, current resource conditions, the uses to which the land is put and the quality of the management of those uses. Standards 1, 2 and 3 contribute to attaining this standard.

States are legally required to establish water quality standards and Federal land management agencies are to comply with those standards. In mixed ownership watersheds, agencies, like any other land owners, have limited influence on the quality of the water yielded by the watershed. The actions taken by the agency will contribute to meeting State water quality standards during the period that water crosses agency administered holdings.

Riparian plant community structure influences water quality by shading, thus maintaining lower water temperature. Repeat photos show a general improvement in streamside riparian plant community structure, albeit at a slower rate than change within exclosures.

Indicators Used to Evaluate this Standard:

The following set of indicators has been identified for which site-specific criteria will be subsequently used to determine if applicable water quality standards are being met.

Direct measures of water quality: Barr et al. (In prep.) found significantly lower water temperature and higher levels of dissolved oxygen in ungrazed versus grazed springs. Past conversion of seeps and springs to stockponds and the limited size of seep and spring systems result in livestock concentrations and consequent soil and vegetation impacts preventing recovery of some seeps and springs. Surveys of seeps and springs showed few areas not converted to

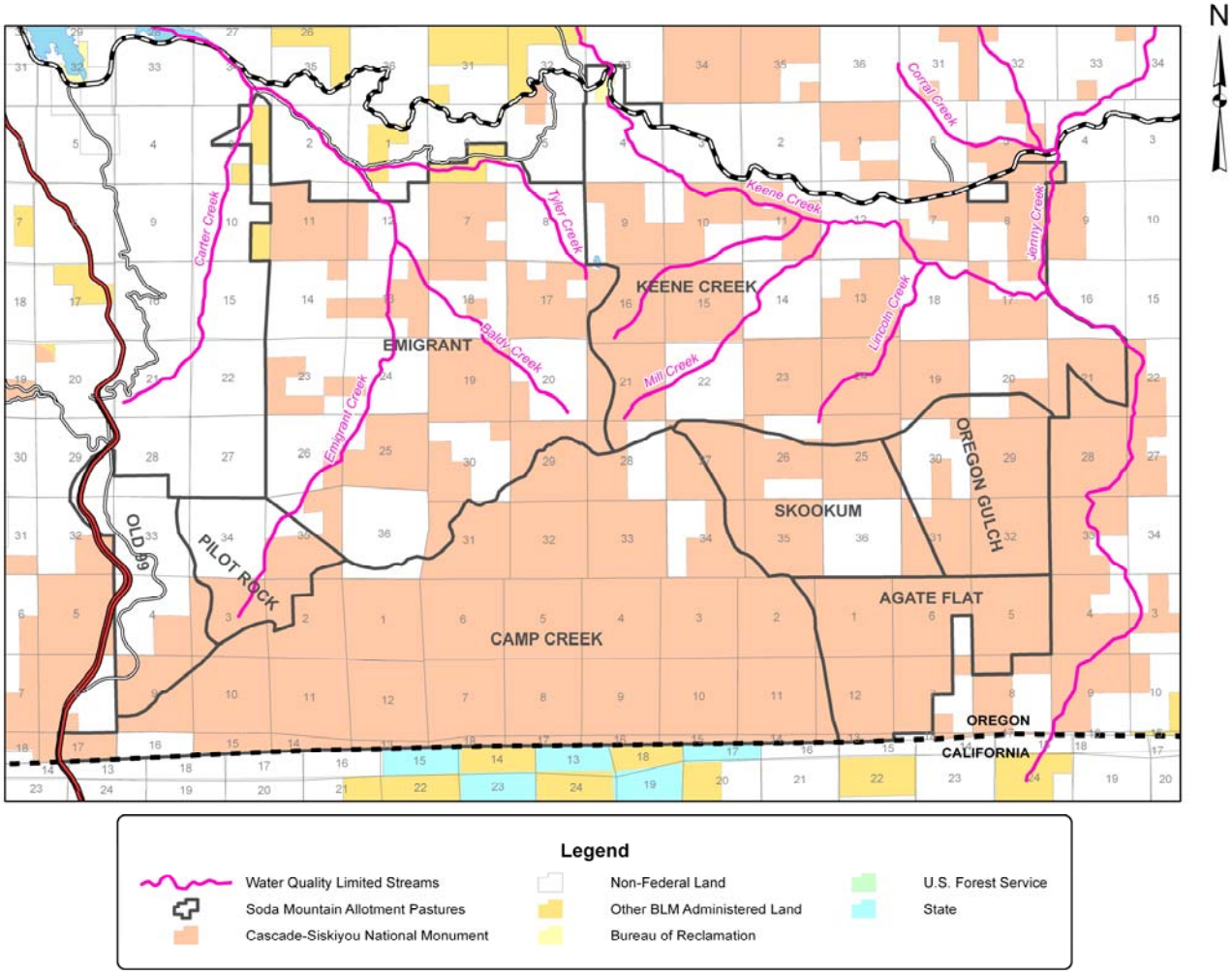
stockponds at lower elevations.

The Oregon Department of Environmental Quality (DEQ) is required by the federal Clean Water Act (CWA) to maintain a list of stream segments that do not meet water quality standards for one or more beneficial uses. This list is called the 303(d) list because of the section of the CWA that makes the requirement. There are seven streams in the Soda Mountain Allotment that are on the Oregon DEQ's 2004/2006 Environmental Protection Agency approved 303(d) list for temperature (summer) (ODEQ 2006) (Table 3 and Map 4). Emigrant Creek is also water quality limited due to flow modification.

Table 3. *Water Quality Limited Streams within the Soda Mountain Allotment (ODEQ 2006)*

Level 5 Watershed	Stream	River Miles	Parameter	Status
Jenny Creek	Jenny Creek	0 to 17.8	Temperature-Summer	303(d)
	Mill Creek	0 to 3.9	Temperature-Summer	303(d)
	Keene Creek	0 to 7.2	Temperature-Summer	303(d)
	South Fork Keene Creek	0 to 3.1	Temperature-Summer	303(d)
Bear Creek	Tyler Creek	0 to 4.0	Temperature-Summer	303(d)
	Carter Creek	0 to 4.8	Temperature-Summer	303(d)
	Emigrant Creek	5.6 to 15.4 5.6 to 15.4	Temperature-Summer Flow Modification	303(d) Not a Pollutant

Map 4. *Water Quality Limited Streams within the Soda Mountain Allotment*



Water diversions and impoundments: There are two ways that water diversions increase stream temperature; 1) by reducing volume in the mainstem and 2) as warmed ditch water is returned to the main channel. This ditch water is also of lower water quality as it picks up excess nutrients and sediment. Small impoundments increase water temperatures by slowing water movement and increased cumulative insolation.

Spring/seep macroinvertebrate community: Disturbance-intolerant taxa decline with increased average livestock utilization across the CSNM. Continued presence of intolerant species and species indicative of clean water (Ephemoptera, Plecoptera, and Trichoptera) suggest low to moderate grazing would retain macro-invertebrate species diversity (Dinger et al. 2007, Frest and Johannes 2005). Parker (1999) found springs in East Fork Creek trampled by livestock with concomitant increases in fine sediment and loss of riparian vegetation. Loss of riparian vegetative cover results in increased sun exposure and decreased insect productivity.

Streamside macroinvertebrate community: Barr et al. (In review) found that road density, livestock use, and logging likely acted interdependently to increase fine sediments in first and second order streams. Macroinvertebrate richness and diversity remained high for all four streams

examined within the CSNM, and in comparison to other samples within the Utah State University National Aquatic Monitoring Center. Lowest macroinvertebrate richness was found in South Fork Keene Creek associated with measures indicating localized disturbance by livestock. Macroinvertebrate surveys were conducted on the north end of the former Box O Ranch on Jenny Creek; Mill Creek above the confluence with Keene Creek; Keene Creek about the confluence with Jenny Creek; Keene Creek west of the Box D Ranch; Dutch Oven Creek above the confluence with Camp Creek; Emigrant Creek above the confluence with Porcupine Creek; and Porcupine Creek above the confluence with Emigrant Creek. At the Jenny Creek site, high summer temperatures, low habitat complexity, lack of large wood for riparian shade and detrital inputs, and embeddedness result in a low/poor cold water taxa rating and severe truncation of the macroinvertebrate community (Aquatic Biology Associates 1995, 2000). In Mill Creek, embeddedness and complexity were the limiting factors. The Dutch Oven site is atypical of a medium elevation xeric area; it supports an invertebrate fauna more typical of moist, maritime and mid-higher elevation western Cascades streams. Many taxa present are unusual for this xeric area. Stream temperatures remain relatively cool and overall complexity is moderate to high. Embeddedness and entrained silt is moderate (Aquatic Biology Associates 1993, 2000).

Macroinvertebrate abundance increases and species diversity decreases downstream of dams. Loss of habitat heterogeneity downstream of dams results in greater abundance of species favored by these altered conditions (David 1995). Mollusk diversity is highest along the Keene Creek corridor however many of the springs inside this allotment support mollusk populations, some of which have yet to be described. Frest and Johannes (2005) observed grazing impacts in eight of the sixteen springs surveyed in the Soda Mountain Allotment.

Conversion to stockponds: Surveys of seeps and springs showed few seeps and springs not converted to stockponds at lower elevations. Stock pond conversions limit connectivity, increase water temperatures, provide suitable habitat for non-native species introductions, and reduce stream flow in downstream channels.

Streamside riparian plant community cover/structure: Riparian plant community structure influences water quality by shading, thus maintaining lower water temperature. Repeat photos show a general improvement in streamside riparian plant community structure, albeit at a slower rate than change within exclosures (Hosten and Whitridge 2007).

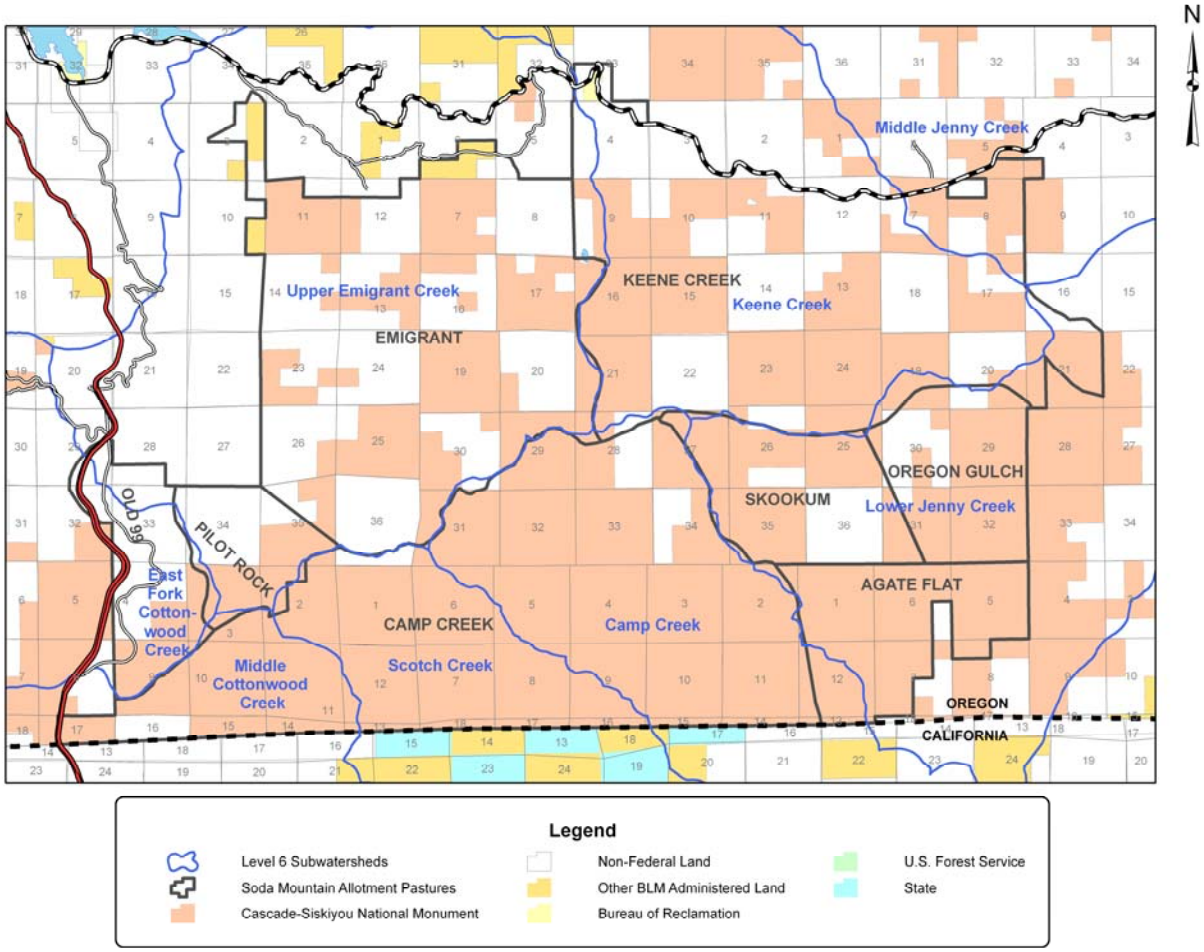
Seep/spring riparian plant community cover/structure: Photo retakes of seeps and springs suggest that little change in riparian vegetation has occurred over recent decades, likely because small seeps and springs result in a concentration of livestock seeking water (Hosten 2007b; Hosten and Whitridge 2007). Overall reduction in stocking rates and timing of livestock have not reduced disturbance to allow vegetation recovery observed in livestock-excluded areas. Lack of overhanging and streambank vegetation likely influences water quality by facilitating higher temperatures and suspended sediments.

Beneficial uses: The Soda Mountain Allotment falls within the source water areas for the cities of Gold Hill, Rogue River, and Grants Pass in Oregon and Yreka in California. The surface water source for the three cities in Oregon is the Rogue River downstream from Bear Creek. The Bear Creek Watershed is included in the source water area and 6,181 acres of the allotment are in the Upper Emigrant Creek Subwatershed (Map 5) of Bear Creek. The allotment lands in the Bear Creek Watershed are over 30 miles upstream from the closest public water system intake. The water source for Yreka is Fall Creek. There are 292 acres of allotment lands within the Fall Creek Subwatershed (Map 5). Fall Creek is outside the Soda Mountain Allotment; however, PacifiCorp diverts up to 16.5 cubic feet per second (cfs) from Spring Creek in the Lower Jenny

Creek Subwatershed for hydroelectric power and transports this water via an open earthen canal to Fall Creek above the intake for the City of Yreka. The PacifiCorp diversion and all but approximately 100 feet of the canal (approximately 2,400 feet in length) are located on BLM-administered land within the monument. Approximately 250 feet of Spring Creek above the diversion are within the monument. Monument lands are over 3.5 miles upstream of the City of Yreka intake.

Source water assessments have been completed by the DEQ and the Oregon Department of Human Services for the cities of Gold Hill, Rogue River, and Grants Pass and by the California Department of Health Services for the City of Yreka. The assessments include an inventory of potential contaminant sources within the source water areas. Grazing animals (greater than five large animals or equivalent per acre) were identified as a potential contaminant source for the Gold Hill, Rogue River, and Grants Pass drinking water protection areas. The assessments recognized that concentrated livestock may contribute to erosion and sedimentation of surface water bodies. Grazing in the Bear Creek Watershed portion of the monument consists of open range grazing with an average of less than 200 cows across the 6,181 acres of monument land. The City of Yreka source water assessment identified open range cattle as a potential contaminating activity. No other potential contaminant sources that could occur on monument lands were identified in the state source water assessments.

Map 5. *Level 6 Subwatersheds in the Soda Mountain Allotment.*



Road density: Roads may alter the groundwater and surface flow patterns locally and may create an imbalance in hydrologic systems. Natural and graveled road surfaces, road cuts, fill slopes, and ditch lines are subject to erosion. Ditch lines that are not effectively drained by relief culverts (cross drains) act as extensions of stream networks that deliver fine sediment, as well as intercepted ground and surface water directly into stream channels. Research (Jones and Grant 1994; Wemple 1994; Wemple et al. 1996) suggests that roads that contribute to the extension of the stream channel network are related to changes in the timing and magnitude of peak flows. Road cuts intercept subsurface flow, effectively increasing the amount of surface flow, and the ditch lines allow the water to move through the stream systems quicker. Road densities throughout the Soda Mountain Allotment range from a low of 1.89 mi./mi.^{2} in the Scotch Creek subwatershed to over 4 mi./mi.^{2} in Keene Creek and Middle Jenny Creek subwatersheds (Table 2).

Road density within the Riparian Reserves of the entire (BLM lands only) CSNM is 3.75 mi./mi.^{2} (USDI In prep). Roads within riparian areas can greatly influence aquatic and riparian conditions. Roads contribute to the disruption of aquatic connectivity, large wood and nutrient storage regimes, peak flow routing, aquatic habitat complexity, temperature regimes, channel morphology, and direct sediment inputs from road failures. The matrix of pathways and indicators for the Klamath Province/Siskiyou Mountains considers road densities of less than 2.0 mi./mi.^{2} as properly functioning condition and greater than 3.0 mi./mi.^{2} as not properly functioning (ODFW 2002, 2003).

Standard 5: Native, T&E, and Locally Important Species

To meet this standard, habitats support healthy, productive, and diverse populations and communities of native plants and animals (including special status species and species of local importance) appropriate to soil, climate, and landform.

Federal agencies are mandated to protect threatened and endangered species and will take appropriate action to avoid the listing of any species. This standard focuses on retaining and restoring native plant and animal (including fish) species, populations and communities (including threatened, endangered and other special status species and species of local importance). In meeting the standard, native plant communities and animal habitats would be spatially distributed across the landscape with a density and frequency of species suitable to ensure reproductive capability and sustainability. Plant populations and communities would exhibit a range of age classes necessary to sustain recruitment and mortality fluctuations.

Studies examining special status species are restricted to *Calochortus greenei* and aquatic mollusks. Apart from influence on plant community composition, described elsewhere, the interaction between native ungulates, small mammals, and butterflies is also considered a relevant influence on locally important species.

C. greenei seedlings are thought to be susceptible to competition by annual grass seedlings (Frost and Hosten 2007). A recent exclosure cage study indicates that the size and reproduction are influenced by livestock, particularly in areas of higher livestock use on Agate Flat Pasture (Menke and Kaye 2006).

Indicators Used to Evaluate this Standard:

The following set of indicators has been identified for subsequent use to determine if this standard is being met.

Native ungulate interaction with livestock: While livestock and hunters were both found to influence native ungulate movements, these influences are considered less biologically relevant than suburban and agricultural expansion into winter range. Historic browsing by livestock within current day winter deer and elk habitat is thought to have contributed to winter native ungulate die-off. Changes in the timing of grazing have reduced the level of browsing at lower elevation, thus eliminating the conflict between native and non-native ungulates. Shrub growth in previously reported areas of heavy browsing (Agate Flat) now appears normal. Observation in areas that have not burned for many decades are showing shrub stagnation, more likely an influence of elongated fire return interval than livestock influence. However, livestock still use browse at higher elevations (particularly past mid-September), these areas are generally not accessed by native ungulates during the critical winter/early spring period (Hosten et al. 2007a).

Small mammal community composition, productivity: Richness and diversity of small mammals is not influenced by livestock grazing in riparian, woodland, and mixed conifer communities, small mammal biomass is less in grazed versus ungrazed areas. However, a study of small mammals on the monument indicates that several small mammals are reduced in number in areas of moderate to severe use. Total small mammal biomass is also reduced in moderate to severe use areas by 138 g/ha (Johnston and Anthony. In review a, b).

Birds: Ungulate use appears to lead to an increase in abundance of ground nesting birds, but may not favor overall reproductive success by these species. This may result from a decrease in the cover of shrubs which provides more nest sites for ground-nesting birds. Ungulate use has a negative influence on abundance of shrub-nesting birds including migratory neo-tropical birds (Alexander et al. 2008). It is not known if the increased abundance of shrubs found in formerly open fire-mediated plant communities (Hosten et al. 2007c) compensates for livestock influence on shrub nesting bird species.

Butterflies: Ungulate utilization has been shown to negatively influence the Great Basin wood nymph, a butterfly dependent on grass species for its lifecycle. Other butterflies with grass host plants (e.g. mardon skipper) may experience similar negative influences (Runquist In prep.).

Patterns of aquatic macroinvertebrates with ungulate use: A study examining patterns of aquatic macroinvertebrates in streamside riparian influence found that the combined influence of road density, logging, and livestock reduced aquatic macro-invertebrate richness (Barr et al. In review). Studies in seeps and springs found that high diversity and species indicative of clean water were compatible with low to moderate ungulate use (Dinger et al. 2007). Higher use resulted in a loss of intolerant species.

Patterns of aquatic mollusks with livestock use: There were no statistically significant associations of aquatic mollusk richness with livestock utilization (Barr et al. In prep.); however, aquatic communities of larger and minimally altered springs are more diverse than are those of small and more disturbed springs. Sada and Vinyard (2002) established that 158 of 199 Great Basin endemic aquatic animal taxa are found only or primarily in mid- to low-level springs. These authors concluded that spring degradation and biotic population decline and loss were primarily due to anthropogenic factors, including livestock grazing in mollusk-occupied spring habitats.

The Keene Creek pasture has a higher incidence of the Keene Creek pebblesnail than elsewhere in the allotment; however, several *Fluminicola* species occur throughout the allotment. Two other *Fluminicola* species occur in this allotment: Chinquapin pebblesnails (sp. 39) occur at six

sites and appear to have very limited distribution; and the Emigrant Creek pebblesnail (sp. 17?) is a narrow endemic. Endemic hotspots occur to the north and east of the allotment (Frest and Johannes 2005).

Habitat elements and connectivity Greene's mariposa lily (*Calochortus greenei*): Recent surveys have located many new *C. greenei* populations, suggesting that habitat connectivity is not an issue. It is likely that historic grazing by livestock and conversion of open habitat to woody vegetation domination may have resulted in the loss of the grass-shrub ecotone favored by *C. greenei*. Neither is it known if the loss of meadows, grassy interspaces, and increased density of woody vegetation consequent to the time elapsed since the last fire influences the persistence of *C. greenei*.

Spatial distribution of habitat: Historic yearlong livestock grazing at stocking rates approximately 10 times the current converted some historic perennial bunchgrass to weeds. The consequent reduction in competition together with elongated fire-return interval resulted in the loss of open fire-mediated grasslands (Hosten et al. 2007c). The current predisposition of *C. greenei* for shrub-grassland interfaces indicates that historic conversion to shrublands may have resulted in the loss of habitat (Frost and Hosten 2007). More recent repeat photos indicate an increase in shrub density and canopy cover (particularly by *Ceanothus cuneatus*) in the Agate Flat Pasture and eastern portions of the Camp Creek Pasture. These changes are more likely a consequence of time elapsed since the last fire than a response to livestock grazing.

C. greenei population stability/resilience: Insects, small mammals, native ungulates, as well as livestock ingest *C. greenei* as a food-source. Exclosure cages indicate that livestock reduce plant size and reproduction in higher livestock use areas (as defined by the average utilization map) (Menke and Kaye 2006). Livestock influence also occurs through the influence of the surrounding plant community. Livestock management favoring annual grasses likely favors against the persistence of *C. greenei* by allowing annual grasses to compete against native *C. greenei* seedlings. The Agate Flat Pasture represents the confluence of higher utilization (as defined by the average utilization map) favoring annual grasses and *C. greenei* locations.

Plant community composition (general): There is little doubt that livestock strongly influenced vegetation at the end of the 19th and early 20th centuries when stocking rates were ten times higher than the current (Hosten et al. 2007a). Studies indicate that many plant communities are still recovering from past livestock-induced annual grass domination (Hosten et al. 2007d). More recent invasion by bulbous bluegrass (introduced as a consequence of range seedings) and its preference for gentle slopes is an indirect measure of livestock influence on bulbous bluegrass invasion (Hosten et al. 2007d). It is not known if livestock are retarding recovery of upland plant communities towards perennial grass domination in areas of current livestock use away from sites currently dominated by broadleaved weeds. Repeat photos show considerably more buckbrush in recent times; this has likely resulted in a concomitant decline in the herbaceous component in some areas. Studies indicate that livestock are retarding the development of riparian vegetation associated with seeps and springs. Past conversion of seeps and springs to stockponds and there limited size result in livestock concentrations and consequent soil and vegetation impacts preventing recovery of seeps and springs (Hosten and Whitridge 2007).

Age class distribution: Repeat photos show an increase in seed obligate and resprouter species through much of the allotment negating the concern about uneven age class distribution in most shrub species. Few decadent bunchgrasses have been noticed anywhere in the monument. The only problem with age class distribution may be associated with *C. greenei* (see federally listed and bureau sensitive status vascular plants). The reproductive capability of perennial plants was

reduced at three of the nine sites analyzed (USDI 2007).

Bureau Special Status wildlife: The CSNM provides an extensive array of habitat types/plant communities, and this is reflected in the diversity of terrestrial wildlife species that are present in the monument. Based on the best information available [studies in the monument (Johnston and Anthony 2006, DellaSala and Barr 2007, Alexander et al. 2008, Runquist 2008, and Barr et al. In press) additional observations, and habitat associations] there are approximately 278 vertebrate terrestrial wildlife species present in the monument, this includes 202 birds, 53 mammals, 9 amphibians, and 14 reptiles. Additionally, approximately 115 butterfly species have been documented.

The many plant communities that support wildlife in the monument are grouped into various zones based primarily on elevation. The zones found in the monument are the Interior Valley Zone (low elevation), Mixed Conifer Zone (mid elevation), and White Fir Zone (high elevation). Representative plant communities for each zone are presented in the following table (USDI 1995).

Table 4. *Elevational zones within the Soda Mountain Allotment*

Zones	Representative Plant Communities
Interior Valley Zone	Grassland, Dry and Semiwet Meadows, Shrublands, Dry Oak Woodlands
Mixed Conifer Zone	Douglas Fir, Mixed Fir and Pine,
White Fir Zone	White Fir, Shasta Red Fir

Special/unique habitats that support various wildlife species occur at numerous locations through out the monument. These special habitats include cliffs, seeps and springs, caves and meadows (USDI 1995a).

Given the extent of the Soda Mountain allotment, and the range of topography, geology, soils, and plant communities, most of the species found in the monument and all of the special habitats found in the monument are present in this allotment. The exception to this would be those species that are highly associated with water bodies, e.g., ducks, geese, etc. Deer and elk are considered locally important species because approximately 50 percent of the allotment is designated as big game winter range and an elk management area by the Medford District RMP (1995). Special Status species known or likely to be present on the allotment are displayed in (Table 5).

Table 5: *Special Status Species (Terrestrial Wildlife)*

Species	**Species Status**
Lewis' woodpecker (*Melanerpes lewis*)	BS
American peregrine falcon (*Falco peregrinus anatum*)	BS
white-headed woodpecker (*Picoides albolarvatus*)	BS
northern spotted owl (*Strix occidentalis caurina*)	FT
pallid bat (*Antrozous pallidus*)	BS
fringed myotis (*Myotis thysanodes*)	BS
fisher (*Martes pennanti*)	FC
northwestern pond turtle (*Actinemys marmorata marmorata*)	BS
foothill yellow-legged frog (*Rana boylii*)	BS
Oregon spotted frog (*Rana pretiosa*)	FC
mardon skipper (*Polites mardon*)	FC
coronis fritallary (*Speyeria coronis coronis*)	BS

Species	Species Status
Siskiyou short-horned grasshopper (*Chloealtis aspasma*)	BS

BS - Bureau Sensitive
FT - Federal Threatened
FC - Federal Candidate

BLM recently issued interim guidance for meeting BLM's responsibilities under the Migratory Bird Treaty Act and Executive Order 13186. Both the Act and the EO promote the conservation of migratory bird populations. The interim guidance was transmitted through Instruction Memorandum No. 2008-050. The I.M. relies on two lists prepared by the U.S. Fish and Wildlife Service in determining which species are to receive special attention in land management activities; the lists are *Bird Species of Conservation Concern* (BCC) found in various Bird Conservation Regions and *Game Birds Below Desired Condition* (GBBDC). Table six displays those species that are known or likely to present on the allotment.

Table 6: *Bird Species of Conservation Concern*

Species	Species Status
black-throated gray warbler (*Dendroica nigrescens*)	BCC
flammulated owl (*Otus flammeolus*)	BCC
golden eagle (*Aquila chrysaetos*)	BCC
Lewis' woodpecker (*Melanerpes lewis*)	BCC
white-headed woodpecker (*Picoides albolarvatus*)	BCC
northern goshawk (*Accipiter gentilis*)	BCC
olive-sided flycatcher (*Contopus cooperi*)	BCC
american peregrine falcon (*Falco peregrinus anatum*)	BCC
prairie falcon (*Falco mexicanus*)	BCC
rufous hummingbird (*Selasphorus rufus*)	BCC
mourning dove (*Zenaida macroura*)	GBBDC
band-tailed pigeon (*Columba fasciata*)	GBBDC

BCC- Bird Species of Conservation Concern
GBBDC- Game Birds Below Desired Condition

Grazing occurs throughout all of the vegetative zones found in the Soda Mountain Allotment, i.e., Interior Valley Zone, Mixed Conifer Zone, and White Fir Zone. The impacts of grazing in the Mixed Conifer Zone and White Fir Zone are most notable in the meadows and riparian areas that are interspersed throughout the more dominant conifer matrix. Grazing impacts in the Interior Valley Zone are more widespread due to the abundant grasses found in this zone; but, as in the other zones, cattle use tends to be concentrated in the meadows and riparian areas.

Livestock grazing primarily affects wildlife by changing vegetation composition, structure, and function. Grazing can result in a reduction of forage available to native herbivores (e.g. deer and elk), as well as reductions in vegetative ground cover for ground-nesting birds, rodents, and other wildlife species dependent on ground cover for protection, food, and breeding sites. Grazing also reduces water quality in seeps, springs, and streams used by native wildlife. The presence of livestock can also change local distribution and habitat use by native species due to interspecific behavioral traits. Generally, the extent of impacts to individual T&E species and their habitats are unknown.

Some of the species of special interest found in the allotment are not greatly affected by grazing. The suite of species that would not be affected or affected only to a minor degree includes the

following: Lewis's woodpecker, American peregrine falcon, prairie falcon, golden eagle, white-headed woodpecker, fisher, black-throated gray warbler, flammulated owl, northern spotted owl, northern goshawk, olive-sided flycatcher, pallid bat and fringed myotis. Grazing has little or no impacts on these species because it does not physically reduce their numbers nor does it reduce feeding, breeding and sheltering opportunities. These species are primarily associated with the Mixed Conifer and White Fir Zones, except for Lewis's woodpecker and prairie falcon which are more closely associated with the Interior Valley Zone.

Some species of special interest are susceptible to the physical aspects of grazing, e.g., trampling, rubbing, and water quality degradation while others are sensitive to the removal of forage. Those in the former group include foothill yellow-legged frog, northwestern pond turtle, Oregon spotted frog, and Siskiyou short-horned grasshopper. The frogs and pond turtle are dependent on riparian and aquatic habitat and are affected when these habitats are degraded by cattle. Habitat degradation occurs through streambank trampling; wading in shallow ponds, springs, and streams; and defecation/urination in springs and seeps.

The Siskiyou short-horned grasshopper is known to occur at one location within the allotment. It seems to be dependent on elderberry for the egg-laying phase of its life cycle. Cattle impact elderberry through rubbing and/or browsing, and this has been noted at the known site. Siskiyou short-horned grasshoppers are actively feeding and reproducing from July through September and are likely to be impacted by reduction of elderberry vegetation and by grass and forb resources upon which they depend for food and protective cover.

Those species in the latter group (i.e., affected by forage removal) include rufous hummingbird, mardon skipper, coronis fritillary, band-tailed pigeon, deer, and elk. Rufous hummingbird, mardon skipper, and coronis fritallary are likely affected by grazing due to the removal of plants used for nectaring. Grasses used by mardon skipper and herbaceous vegetation (violets) used by coronis fritillary for ovipositing can also be removed or trampled, and heavy grazing facilitates the invasion of non-native species (Xerces 2007, Hosten 2007a).

As with the Siskiyou short-horned grasshopper, band-tailed pigeon are likely affected by grazing due to the impact to blue elderberry which is a preferred food for this species during migration.

Approximately half of the allotment is within an area designated by the Medford RMP as Big Game Winter Range for deer and elk (primarily the Interior Valley Zone). This designation is meant to identify areas to promote forage, and hiding and thermal cover for deer and elk (USDI 1995). It should be pointed out that the elk management area in the allotment is recognized for "management" in order to control the population rather than to promote it – black-tailed deer is a featured species for this area. Grazing has little influence on hiding and thermal cover conditions, but it can affect forage conditions.

There is little diet overlap between livestock and deer with greater overlap of preferred forage between livestock and elk (Hosten et al. 2007b). But, the reduced forage from heavy grazing can be detrimental to big game species. Heavy utilization late into the grazing season (mid October) can result in inadequate regrowth by grasses and forbs. This regrowth (fall green-up) is important to deer and elk in building fat reserves that help sustain them during the winter season.

There is a tendency of both deer and elk to avoid areas being grazed by cattle. However, this tendency was not present when elk were on their winter range at which time they were observed utilizing the same pasture as livestock. This is likely due to constraint of forage and browse resources by snowfall (Hosten et al. 2007b).

Standard 4 indicates that road density ranges from 2 to 4 miles per square mile throughout the allotment. A goal for open roads in deer winter range is to have no more than 1.5 miles of open road per square mile in order to reduce vehicular disturbance during this critical period (ODFW personal communication). The administrative road closures in the monument likely accomplish this goal in winter range (USDI In prep.).

Bureau Special Status Aquatic Species: The following list is known or suspected to occur in the Soda Mountain Allotment (Table 7).

Table 7: *Special Status Species (Aquatic)*

Species	**Species Status**
Jenny Creek redband trout (*Oncorhynchus mykiss*)	BS

BS- Bureau Sensitive

Jenny Creek supports populations of native Jenny Creek redband trout, a "sensitive" species on the State Director's Special Status Species List (January 2008). The Jenny Creek sucker and Keene Creek pebblesnail also occur in the allotment both are species listed as objects of biologic interest under the CSNM's proclamation. Southern Oregon/Northern California (SONC) coho salmon (*Oncorhynchus kisutch*), a "threatened" species under the Endangered Species Act (ESA) are restricted to habitat below Irongate Reservoir located approximately 9 miles downstream of the allotment. Very little information exists on the abundance or distribution of the Special Status species caddisflies.

Increases in fine sediment occur where cows have direct access to streams. Trampling in seeps/springs and along streams compromises the physical integrity of these environments by increasing compaction, width:depth ratio, and sedimentation. Livestock use, especially in wet areas, changes flow patterns in these naturally sensitive sites. Grazed riparian vegetation allows higher levels of solar radiation to reach water surface in seeps/springs/streams resulting in increased water temperatures.

Fine sediment increases negatively impact Jenny Creek suckers, Jenny Creek redband trout, pebblesnails, and other aquatic organisms in this system that has existing high levels of fine sediment and a limited capacity to move sediment naturally as the reservoir system moderates the magnitude and intensity of winter flushing flows. Grazing negatively effects aquatic mollusks and their habitat by disturbing the soil, removing vegetation that provides shade and habitat for the mollusks, and by trampling the mollusks themselves. These impacts do not affect coho salmon or Coho Critical Habitat (CCH) as the nearest CCH is 9 miles downstream, below a reservoir that acts as a sediment trap in all but the worst flood conditions.

Bureau Special Status fungi, lichens, and bryophytes:
The following list of Bureau Special Status fungi, lichens, and bryophytes occur in the Soda Mountain Allotment (Table 8).

Table 8: *Special Status Species (Non-Vascular Plants)*

Species	**Species Status**	**Occurrences***
meesia moss (*Meesia uliginosa)*	BS	1

BS- Bureau Sensitive

*Occurrences can be used synonymously with populations and meta-populations.

Meesia uliginosa is a moss found growing on peaty soil banks, seeps, meadows, and rock fissures upon exposed, damp organic soil within upper montane to subalpine coniferous forest. Its elevational range is from 3,950 ft. to 8,550 ft. The population of *Meesia uliginosa* occurs in an area where there is light utilization by livestock. Direct damage to this species would occur through, trampling, and burying under cattle feces.

Federally Listed, and Bureau Special Status Vascular Plants:
The following list of Bureau Special Status and federally listed vascular plants occur in the Soda Mountain Allotment (Table 9).

Table 9: *Special Status Species (Vascular Plants)*

Species	**Species Status**	**Occurrences***
California milkvetch (*Astragalus californicus)*	BS	23
Gambel's dwarf milkvetch (*Astragalus gambelianus)*	BS	4
Green's mariposa lily (*Calochortus greenei)*	BS	138
twotooth sedge *(Carex serratodens)*	BS	1
coastal lipfern *(Cheilanthes intertexta)*	BS	2
clustered lady's-slipper *(Cypripedium fasiculatum)*	BS	2
red larkspur *(Delphinium nudicaule)*	BS	1
Gentner's fritillaria *(Fritillaria gentneri)*	FE	22
Bellinger's meadowfoam *(Limnanthes floccosa ssp. Bellingeriana)*	BS	7
common threadplant *(Nemacladus capillaris)*	BS	10
fragrant popcornflower *(Plagiobothrys figuratus ssp. Corallicarpus)*	BS	1
rhizome bluegrass (*Poa rhizomata)*	BS	10
Parish's nightshade *(Solanum parishii)*	BS	4

BS - Bureau Sensitive
FE- Federally Endangered
*Occurrences can be used synonymously with populations and meta-populations.

The allotment is outside of the range of *Limnanthes floccosa ssp. Grandiflora* and *Arabis macdonaliana* federally listed plants recognized by the U.S. Fish and Wildlife Service. The western portion of the allotment is within the range of *Lomatium cookii* (USDI Fish and Wildlife Service, 2003) and there are no known occurrences.

There are 22 occurrences of federally listed *Fritillaria gentneri* within the allotment. This species is found off ridge lines, on steep slopes in the transition zone between open oak woodland and grass land. The sites are protected from grazing simply by slope position. Based on existing information (BLM utilization data) grazing is not having an impact on this listed species.

Livestock generally seek out grasses and grass-like plants (graminoids) to form the bulk of their diet (Hosten et al. 2007b). Of the special status species listed above, the graminoids are; *Poa rhizomata* and *Carex serratodens*. The *Poa rhizomata* and *Carex serratodens* populations occur in an area that receives no use by livestock and therefore are not impacted by livestock grazing. *Cypripedium fasiculatum* grow in coniferous forests where little livestock forage is available and livestock presence is transitory. *Limnanthes floccosa ssp. Bellingeriana* is not palatable to

livestock and the populations occur in areas that receive light use by livestock. Direct damage to this species would occur through, trampling, and burying under cattle feces. Populations of the other known special status vascular plant species either occupy habitats that receive none to slight livestock use, or have life history characteristics that prevent them from being significantly affected by livestock.

Noxious weeds:
Field surveys have located a number of noxious weed species within the allotment, including yellow star thistle (*Centaurea solstitialis*), Canada thistle (*Cirsium arvense*), Dyer's woad (*Isatis tinctoria*), medusahead (*Taeniatherum caput-medusae*), and teasel (*Dispacus L.*) in the southern portion of the allotment. The northern portion of the allotment has noxious weed species that include, bull thistle (*Cirsium vulgare*), Himalayan blackberry (*Rubus discolor*), and Common St. Johnswort (*Hypericum perforatum*). Left untreated these species may contribute to ecological decline. Many of the weed populations occur along roads and other disturbed areas (logged, scarified, etc.) (Hosten 2007). In the non-conifer habitats preferred by livestock, medusahead and other exotic annual grasses are present in most meadows, and dominant in some areas. Medusahead where it is well established interrupts the nutrient cycle as it forms litter mats on the soil surface which decay slowly due to high silica content and retain nutrients. It also grows early in the season thus out-competing perennial grass seedlings for early soil moisture and nutrients. In areas where these annual grass species are already well established the plant community has likely crossed over a threshold into a less desirable stable state.

Landscape patterns of broadleaved noxious weeds across the CSNM are examined in the context of environmental and management factors to improve our understanding of weed dynamics. Environmental factors include a range of topographic edaphic variables, while management factors provide insight about historic vegetation manipulation, road construction and forage utilization by wildlife and livestock. Analysis of individual variables indicated that roads and distance from water influenced the distribution of weeds. The association between roads, water, and forage utilization implies a synergy between road construction, proximity to water, livestock and wildlife dispersion, with weed establishment (Hosten, 2007a).

The RHFA indicate that there is a slight ecological departure in the two forest plant communities assessed on the allotment and an extreme departure in the two dry sites, a moderate-to-extreme departure in the oak/pine/juniper sites and a slight-to-moderate departure in the semi-wet and wet meadow sites (USDI indicator 16, invasive plants). The Nested Frequency data (seven plots across the allotment) suggests exotic annual grasses are not spreading rapidly under current grazing regimes.

However, areas of moderate to heavy livestock utilization, congregation areas (salt blocks, water sources, shade) and loading areas that experience soil and vegetation disturbance within the allotment are at risk for weed colonization. Weed treatments are ongoing in this allotment and have been successful at reducing weed populations. The primary method of weed treatment on this allotment is herbicide application. Hand-pulling is used to treat small patches, while the release of bio-control may influence weeds across the larger landscape over time.

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REFERENCES

Alexander, J.D., Stephens, J.L. and N.E Seavy. In prep. Livestock utilization and bird community composition in mixed-conifer forest and oak woodland in southern Oregon.

Audet, J. 2002. Surveying for cattle grazing impacts on riparian plants around Parsnip Lakes of the Cascade-Siskiyou National Monument. Senior student project, Southern Oregon University.

Barr, B.R., Williams, J.E., R.C. Horton, and M.S. Parker. In review. Ecological conditions of headwater streams in the Cascade-Siskiyou National Monument, Oregon. Draft submitted to *Western North American Naturalist.*

Barr, B.R., Frest, T. and E.J. Johannes. In prep. Effects of livestock grazing on springsnail presence and water quality in the Cascade-Siskiyou National Monument spring habitats.

Clary, Warren P. 1999. Stream channel and vegetation responses to late spring cattle grazing. *Journal of Range Management* 52:218-227.

Clary, Warren P. and W. C. Leininger. 2000. Invited Paper. Stubble height as a tool for management of riparian areas. *Journal of Range Management* 53:562-573.

DellaSala, D. A. and B. R. Barr. 2007. Is commercial livestock grazing compatible with protecting objects of biological interest in the Cascade-Siskiyou National Monument, southwest Oregon. National Center for Conservation Science & Policy, Ashland, OR.

Dinger, E., P. E. Hosten, M. Vinson, and A. Walker. 2007. Cascade-Siskiyou National Monument spring aquatic invertebrates and their relation to environmental and management factors. USDI Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

Frest, T.J. and E.J. Johannes. 2005. Springsnails of the Cascade-Siskiyou National Monument and vicinity, Oregon 2004 report. World Wildlife Fund Klamath-Siskiyou Ecoregion Office, Ashland, OR.

Frost, E. and P.E. Hosten. 2007. Habitat and landscape distribution of *Calochortus greenei* S. Watson (*Liliaceae*) across the Cascade-Siskiyou National Monument, southwest Oregon. USDI Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

Hall, Frederick C. and Larry Bryant. 1995. Herbaceous stubble height as a warning of impending cattle grazing damage to riparian areas. General Technical Report PNW-GTR-362.

Hosten, P. E. 2007a. Factors controlling patterns of Canada thistle (*Cirsium arvense*) and yellow starthistle (*Centaurea solstitialis*) across the Cascade-Siskiyou National Monument. USDI Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

Hosten, P. E. 2007b. Select riparian photo-pairs from the Dead Indian Plateau. USDI Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

Hosten, P. E. unpubl. Plant composition and vegetation structural change associated with recently constructed livestock exclosures, Cascade-Siskiyou National Monument, southwest Oregon.

Hosten, P. E. and H. Whitridge. 2007. Vegetation changes associated with livestock exclusion from riparian areas on the Dead Indian Plateau of southwest Oregon. USDI Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

Hosten, P. E., H. Whitridge, D. Schuster, and J. Alexander. 2007a. Livestock on the Cascade-Siskiyou National Monument: a summary of stocking rates, utilization, and management. USDI Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

Hosten, P. E., H. Whitridge, and M. Broyles. 2007b. Diet overlap and social interactions among cattle, horses, deer and elk in the Cascade-Siskiyou National Monument, southwest Oregon. USDI Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

Hosten, P. E., G. Hickman, and F. Lang. 2007c. Patterns of vegetation change in grasslands, shrublands, and woodlands of southwest Oregon. USDI Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

Hosten, P. E., G. Hickman, and D. Schuster. 2007d. Recent and historic changes (5 to 30 years) in plant community composition in the Cascade-Siskiyou National Monument, southwest Oregon. USDI Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

Johnston, A.N. and R.G. Anthony. In Review a. Grazing effects on abundance and diversity of small mammals in two forest types in southern Oregon.

Johnston, A.N. and R.G. Anthony. In Review b. Small-mammal microhabitat associations and response to grazing in Oregon.

Jones, J.A. and G.E. Grant. 1994. Peakflow responses to clearcutting and roads, western Cascades, Oregon: I. small basins. Corvallis, Oregon.

Marlow, Clayton. 2003. Personal communication.

Menke C.A. and T.N. Kaye. 2006. Population monitoring and effects of grazing on *Calochortus greenei* on the Cascade-Siskiyou National Monument. 2006 Progress Report. December 2006.

Oregon Department of Fish and Wildlife. 1991-2003. Physical Habitat Surveys, Aquatic Inventory Project.

Parker, Michael S. 1999. Aquatic surveys of seven streams within the Cascade-Siskiyou Ecological Emphasis Area. Report prepared for the USDI Bureau of Land Management, Medford District.

Parker, Michael S. 2006.. Personal communication to Paul Hosten

Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

Rossa, J. and M. Parker. 2007. Population characteristics of Jenny Creek suckers (*Catostomus rimiculus*): Age-size relationships, age distribution, apparent densities, and management implications. Report prepared for the USDI Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

Runquist E.B. In prep. Butterflies, cattle grazing, and environmental heterogeneity in a complex landscape.

USDA Soil Conservation Service. 1993. Soil Survey of Jackson County Area, Oregon.

USDI Bureau of Land Management. 2008. Oregon and Washington Bureau of Land Management special status species list. Portland, Oregon.

USDI Bureau of Land Management. 2007. Soda Mountain Allotment rangeland health assessment summary of field evaluation. Medford, Oregon.

USDI Bureau of Land Management. 2005. Letter to Soda Mountain lessees July 27, 2005. Medford, Oregon.

USDI Bureau of Land Management. 2000. Stream and riparian survey data. Medford, Oregon.

USDI Bureau of Land Management. 1997. Standards for rangeland health and guidelines for livestock grazing management for public lands administered by the Bureau of Land Management in the states of Oregon and Washington. Portland, Oregon.

USDI Bureau of Land Management. 1996. Utilization studies and residual measurements (Technical Reference 4400-3). BLM Service Center. Denver Colorado.

USDI Bureau of Land Management. 1995. Jenny Creek Watershed Assessment and Analysis. Medford, Oregon.

USDI Bureau of Land Management. 1995a. Medford district record of decision and resource management plan. Medford, Oregon.

USDI Bureau of Land Management. 1994a. Medford district proposed resource management plan and final environmental impact statement. Medford, Oregon.

USDI Bureau of Land Management. 1994b. Riparian area management: process for assessing properly functioning condition for lentic riparian-wetland areas (Technical Reference 1737-11). BLM Service Center. Denver, Colorado.

USDI Bureau of Land Management. 1993. Riparian area management: process for assessing properly functioning condition (Technical Reference 1737-9). BLM Service Center. Denver, Colorado.

USDI Bureau of Land Management. 1984. Medford grazing management program environmental impact statement. Medford, Oregon.

USDI Bureau of Land Management, USDA Forest Service. 2000. Interpreting indicators of rangeland health. v. 3 (Technical Reference 1734-6). National Science and Technology Center. Denver, Colorado.

Wemple, B.C. 1994. Hydrologic integration of forest roads with stream networks in two basins, western Cascades, Oregon. [Masters Thesis]. Oregon State University, Corvallis, Oregon.

Wemple, B.C., Jones, J.A., and G.E. Grant. 1996. Channel network extension by logging roads in two basins, western Cascades, Oregon. *Water Resources Bulletin* 32:1195-1207.

Xerces Society. 2007. Xerces Society surveys of *Polites mardon klamathensis* in southern Oregon (Summer 2007). 76 pp.