Medford Bureau of Land Management
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Keene Creek Allotment –

STANDARDS OF RANGELAND HEALTH ANALYSIS




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INTRODUCTION

This is an Oregon/Washington Bureau of Land Management (BLM) Standards of Rangeland Health Evaluation that addresses the Keene Creek Allotment (10115). The Keene Creek Allotment is located south of the Dead Indian Memorial Highway and north of the Greensprings Highway. The entire allotment is 44,190 acres. The BLM managed portion of the allotment is 23,643 acres with 350 cows permitted from June 16–October 15 and 59 cows from June 16-September 30 totaling 1,612 Animal Unit Months (AUMs).

The Keene Creek Allotment is partially (45 percent) 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 3,800 feet to 6,100 feet at the summit of Chinquapin Mountain. The ecological sites of the monument support special status plants and animals, productive wildlife habitat, fisheries, visual resources, and provide recreational opportunities.

Vegetation

Conifer communities create a landscape matrix within which the riparian areas and meadows grazed by livestock are embedded. Riparian areas include willow thickets hosting beaver, as well as more open wetland areas incorporating sedges and grasses. Shallow soils define open meadows that may be dominated by California oatgrass on clayey sites or Roemer's fescue on soils with more sand or silt. Seasonally inundated soils may support California false hellebore, cone flower, and other forbs. Other open meadows may be dominated by shrubs such as chinquapin, Pacific serviceberry, common snowberry, and Saskatoon serviceberry.

Soils

Soils consist primarily of the Farva, Rustlerpeak, Pinehurst, and Woodseye soil series. They are generally classified as deep, well drained soils with a surface layer of needles, leaves and twigs overlying loam, very cobbly loam, or gravelly loam. Permeability is described as moderately slow to moderate, with a water capacity of 3 to 10 inches, and a corresponding rooting depth of about 20 to 60 inches. These soils have low to moderate erosion factors by water. Areas of concern for livestock are primarily localized areas of compaction and disturbance in riparian meadows.

Hydrology

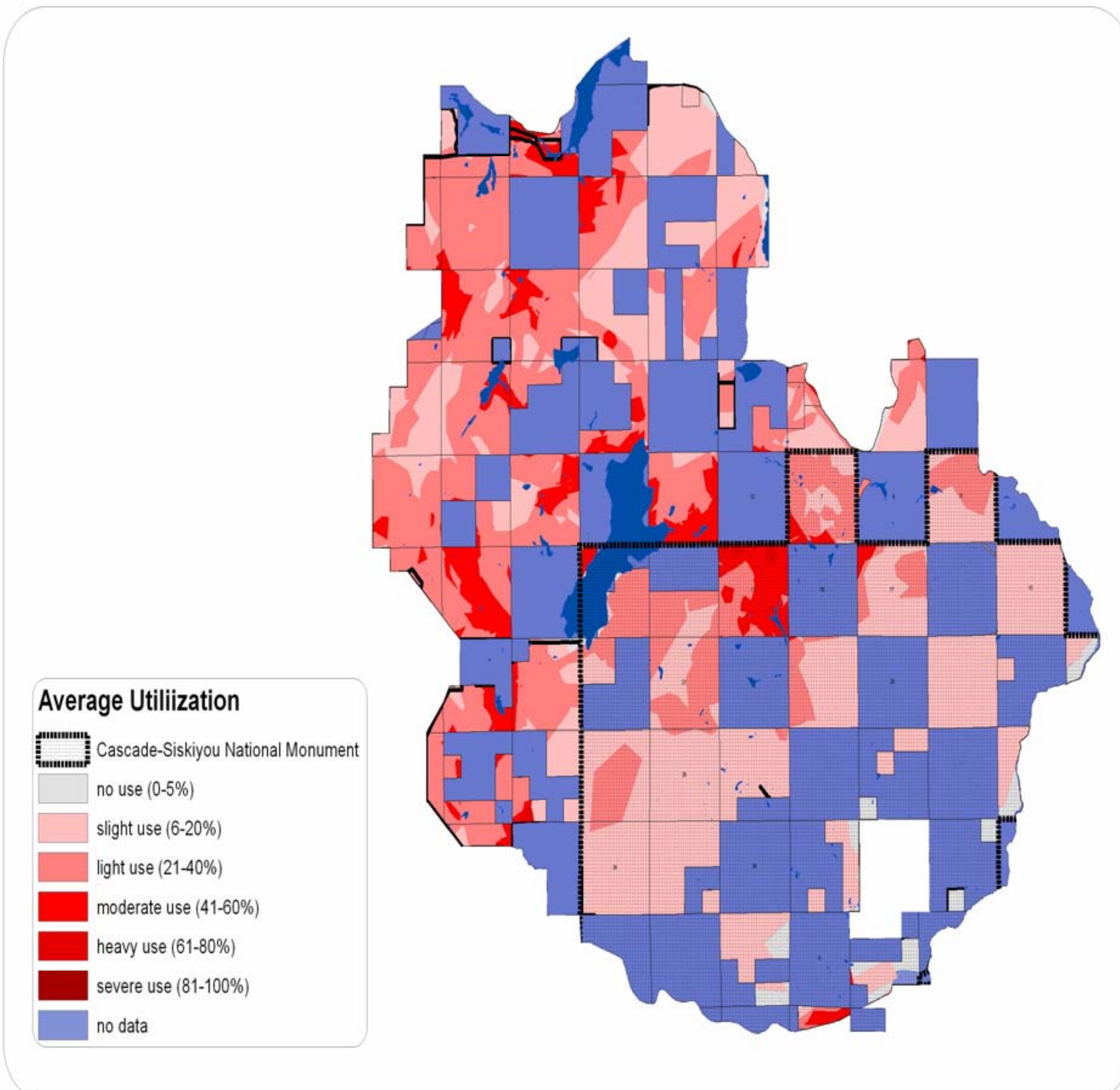
Describing the hydrology of this allotment in a clockwise direction, starting with the northernmost point, it follows along the west side of Howard Prairie Reservoir and continues down Jenny Creek including the Jenny Creek tributaries of Soda Creek, Beaver Creek, and Corral Creek to the confluence of Corral Creek and Jenny Creek. The south side parallels the Keene Creek mainstem and onto the ridgeline between Keene Creek and Sampson Creek. Continuing north, the allotment captures headwaters of Sampson, Cove, and Walker Creeks before following Dead Indian Creek back over to Howard Prairie Reservoir. Within the allotment boundary there are 81 miles of perennial streams, 104 miles of intermittent streams, and 74 miles of dry draws.

Utilization Data, Transect Data and Actual Use

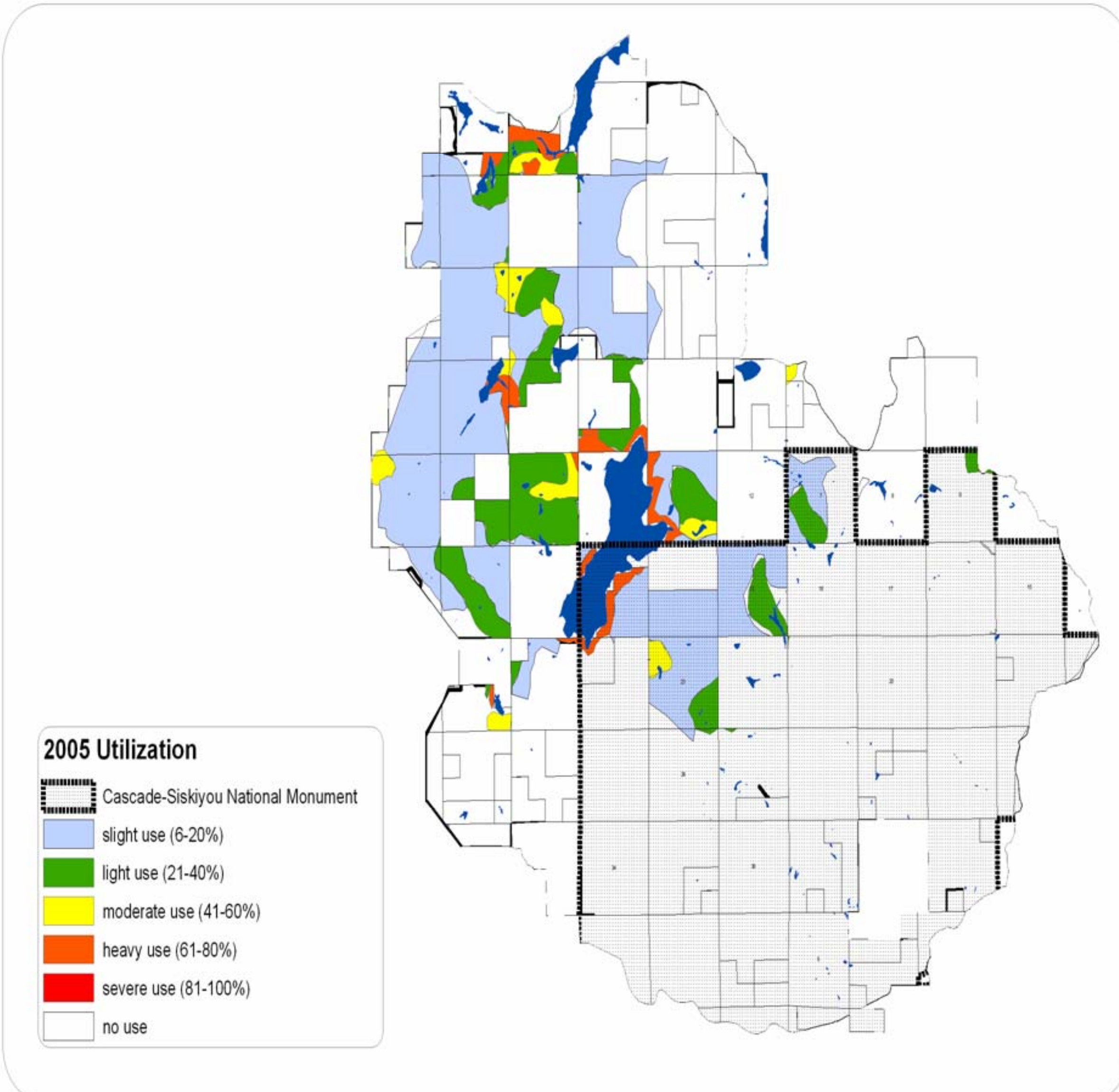
Utilization data is collected using the key species method and mapping use zones (TR 4400-3, 1996). A seven class delineation is used (No Use: 0-5 percent, Slight Use: 6-20 percent, Light Use: 21-40 percent, Moderate Use: 41-60 percent, Heavy Use: 61-80 percent, Severe Use: 81-100 percent). A composite map of utilization was created using data collected (1987-2002) for the Keene Creek Allotment to illustrate the use over time within the allotment and corresponds with the studies associated with the Livestock Impact Studies (Map 1).

Utilization mapping and transect data collected shows an overall decrease in utilization over the past decade (Map 2). 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 1. *Map of Average Livestock Utilization in the Keene Creek Allotment.*

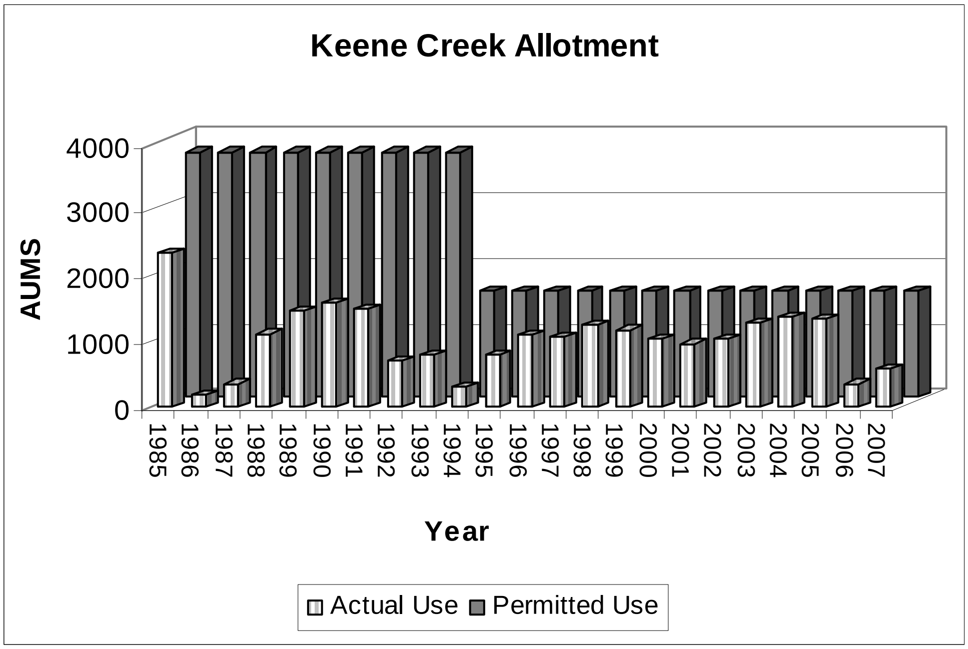


Map 2. *Map of Livestock Utilization in 2005 in the Keene Creek Allotment.*



Current stocking rates have been significantly reduced (39 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). In 2006 and 2007 there was slight-no use in the monument portions of the allotment.

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 Keene Creek 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 19^{th} 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, 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. Two factors allow the BLM to use the results of the Livestock Impact Studies beyond the Cascade-Siskiyou National Monument: 1) A few of the studies extended beyond the monument boundaries (riparian exclosure project) by virtue of having widely dispersed observations and 2) Other studies are of regional significance, allowing the extrapolation of results beyond the monument boundaries within areas of similar environmental character.

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 30, 2007 at three ecological sites on the Keene Creek Allotment: wet meadow, chinquapin-fir forest, and snowberry meadow. 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, ODFW collected initial data in the Keene Creek, its tributaries, and Beaver Creek in 1993 and 2003. Jenny Creek surveys were completed in 2003. BLM hydrology surveys were completed in Emigrant Creek (2000) and Keene Creek (1999). Photo point monitoring has occurred at eleven sites within this allotment.

Baseline Stream Temperature Monitoring: Seasonal 30-minute interval stream temperature data is collected at four long-term monitoring sites within this allotment using USGS and Oregon DEQ-established methodologies. Additionally, stream temperature data has been collected at 17 other shorter-term sites (two or more years of record). 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 Station and 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. Streamflow data is collected at four locations within this allotment. 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 four monumented sites in this 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 is conducted at four sites in 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. Approximately thirty-seven springs in the Keene Creek Allotment were sampled for aquatic mollusk presence, species data, and livestock impacts (Frest and Johannes 2005, USDI 1999-2006). Livestock grazing was measured by a combination of factors (stubble height, trampling, 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 Keene Creek 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 Oregon spotted frog using the appropriate survey protocols. Also the Oregon Department of Fish and Wildlife conducts black-tailed 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.

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

<u>Amount and distribution of bare ground, rock, stone, gravel, plant litter, and plant cover:</u>
Livestock exclosure studies indicate 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 with grazing pressure, while bunchgrasses decline in canopy cover to reveal more bare soil.

The three Rangeland Health Field Assessment (RHFA) ecological sites visited on this allotment all showed levels of bare ground consistent with what would be expected at those ecological sites (USDI 2007).

<u>Plant community composition and community structure</u>: Vegetation in the Keene Creek Allotment is primarily forest with interspersed riparian and meadow areas. Points of broadleaved noxious weed invasion indicate areas of deteriorating plant composition (associated with moderate to high levels of utilization estimated at six percent of the landscape). The most common noxious weed prevalent through this allotment is Canada thistle (Hosten 2007a).

<u>Accelerated erosion and overland flow:</u> The high rainfall within this allotment allows for the maintenance of sufficient vegetation cover to preclude accelerated erosion and overland flow. In the RHFA, there are six indicators pertaining to erosion: none of the sites showed departure from the ecological site description.

<u>Root occupancy in the soil profile</u>: 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 Keene Creek Allotment (Hosten et al. 2007d, USDI 2007).

Road density: Road densities throughout the Keene Creek Allotment range from a low of 2.5 mi./mi.^{2} in the Lower Emigrant Creek and Walker Creek Subwatersheds to 5.82 mi./mi.^{2} in Upper Jenny Creek Subwatershed (Table A). 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 A. *Road Densities by Subwatershed within the Keene Creek Allotment*

Level 6 Subwatershed	Level 5 Watershed	Road Density (mi./mi.^{2})
Walker Creek	Bear Creek	2.61
Upper Emigrant Creek	Bear Creek	3.72
Lower Emigrant Creek	Bear Creek	2.57
South Fork Little Butte-Dead Indian Creek	Little Butte Creek	3.55
Keene Creek	Jenny Creek	4.27
Upper Jenny Creek	Jenny Creek	5.82
Middle Jenny Creek	Jenny 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 severe livestock use areas (Hosten and Whitridge 2007).

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 moderate or greater livestock use) indicates that the timing and intensity of grazing is allowing the recovery of many riparian plant communities (Hosten and Whitridge 2007).

<u>Large wood and surface litter:</u> Repeat photos show no difference in large wood between grazed and ungrazed areas (Hosten and Whitridge 2007). Wood volume was low in all surveyed stream reaches of Jenny Creek, Beaver Creek and Keene Creek (ODFW 2002, 2003).

<u>Frequency and duration of soil saturation:</u> The frequency and duration of flooding are controlled by topographic position, seasonal rainfall patterns, and influence of beaver. Exclosure studies indicate livestock use can impede the development of willow stands (Hosten 2007b).

<u>Plant composition:</u> Stream channel riparian areas show improvement 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 Keene Creek Allotment (Hosten and Whitridge 2007) in areas accessible to livestock.

<u>Point bar revegetation:</u> 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).

<u>Riparian area width:</u> Keene Creek Allotment showed no instances of recent increase in riparian area width. Eighty-three percent of inventoried stream segments were static, while 17 percent showed reductions in riparian zone width (Hosten and Whitridge 2007).

<u>Root mass:</u> The expansion of sedges and or woody riparian vegetation implies that there has been an increase in streamside root mass critical to stream stability (Hosten 2007b, Hosten and Whitridge 2007).

<u>Water diversions and impoundments:</u> 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 (USDI 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. Impoundments and diversions, by attenuating winter flushing flows and peak flow events, cause the stream to become channelized within its historic bankfull channel, losing access to the historic floodplain, and losing its ability to sort and transport sediment through the system. The mainstem streams are gradually changing in response to the modification of the flow, but it is likely to be many decades before these streams have recovered to their full biological and physical capability possible under the new flow regime.

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: The Keene Creek Allotment is the only allotment in the monument showing no instances of decline in composition by riparian shrubs or rushes and sedges (Hosten and Whitridge 2007). However, conditions recorded at the time of aquatic mollusk surveys described cattle grazing as a negative anthropogenic influence on streamside environments with heavy to severe impacts at 58 percent of the survey sites (Frest and Johannes 2005).

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 reaches in Jenny Creek (29 percent) and Beaver Creek (41 percent) (ODFW 2002, 2003). BLM Stream Surveys conducted in 1999 found high levels of fine sediment throughout the surveyed reaches in this allotment displayed in Table B (BLM 1999). Actively eroding streambanks contribute to elevated fine sediment levels in stream substrate (Table B).

Table B. *Percent fines and actively eroding stream banks*

Stream name	Percent fines in stream substrate (BLM 1999)	Percent actively eroding stream bank
Keene Creek	40	4
Keene Creek tributaries	64	18
Corral Creek	35	13
Corral Creek tributaries	61	27
Beaver Creek	42	22
Beaver Creek tributaries	46	14
Jenny Creek	43	5
Grizzly Creek	45	15

Road systems, especially road-side ditches, contribute fine sediment at times when flows are dropping and sediment is not as efficiently transported. Grazing and timber harvest contribute fine sediment through direct stream channel disturbance in months when sediment inputs would naturally be at a low and flow is not sufficient to transport sediment out of the system. The Keene Creek Reservoir traps sediment, leaving segments of Keene Creek below the dam devoid of fines. As tributaries with high levels of fine sediment enter the main channels, sediment levels in the main channels increase. Further down stream, the attenuation of flows as a result of the reservoir system reduces the sediment transport capacities of mainstem Jenny and Keene Creeks, again increasing fine sediment levels.

Upland watershed conditions: The major management activities in the uplands that influence riparian condition are logging, livestock grazing, and roads. High utilization levels by livestock outside of riparian areas are restricted to a few meadows.

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.

Stubble height:
Stubble heights less then four inches were observed in the Keene Creek Allotment primarily in Burnt Creek, Upper Beaver Creek, Sampson Creek, and Yew Springs. Riparian grazing

recommendations suggest that four to six inches of forage stubble height should remain on streamside areas at the end of the growing season, after fall frost, to limit potential impacts to the herbaceous plant community, the woody plant community, and streambank stability (Clary 1999). 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).

<u>Pedestalling/soil disturbance:</u> Pedastalling and hoof sheer were observed at photo points on seeps and springs in Burnt Creek, Beaver Creek, and Chinquapin Mountain drainages (USDI 2004, 2005).

<u>Road density:</u> Road densities throughout the Keene Creek Allotment range from a low of 2.5 mi./mi.^{2} in the Lower Emigrant Creek and Walker Creek Subwatersheds to a high of 5.82 mi./mi.^{2} in Upper Jenny Creek Subwatershed (Table A). 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).

<u>Amount and distribution of bare ground, rock, stone, gravel, plant litter, and plant cover:</u> 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 (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, and protect the soil surface from raindrop impact, and help prevent the establishment and persistence of broadleaved weeds with winter rosettes. 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 ungulate defecation is considered to promote the energy cycle by enhancing the plant’s ability to trap radiant energy on new plant tissues.

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 areas of 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.).

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 (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. However the increased abundance of bulbous bluegrass is a concern because it functions more like an annual plant. 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).

Soil compaction: The inability of riparian vegetation to extend beyond cutbanks 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 the Keene Creek Pasture of the Soda Mountain Allotment indicates that compaction may also influence plant productivity in high elevation meadows with higher livestock use (Hosten Unpubl.).

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. The decline of black oak across stands throughout 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 (Canada thistle) implicate livestock influence in moderate to severe forage use areas (Map 1 and 2), as well as other disturbances and edaphic factors.

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 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.

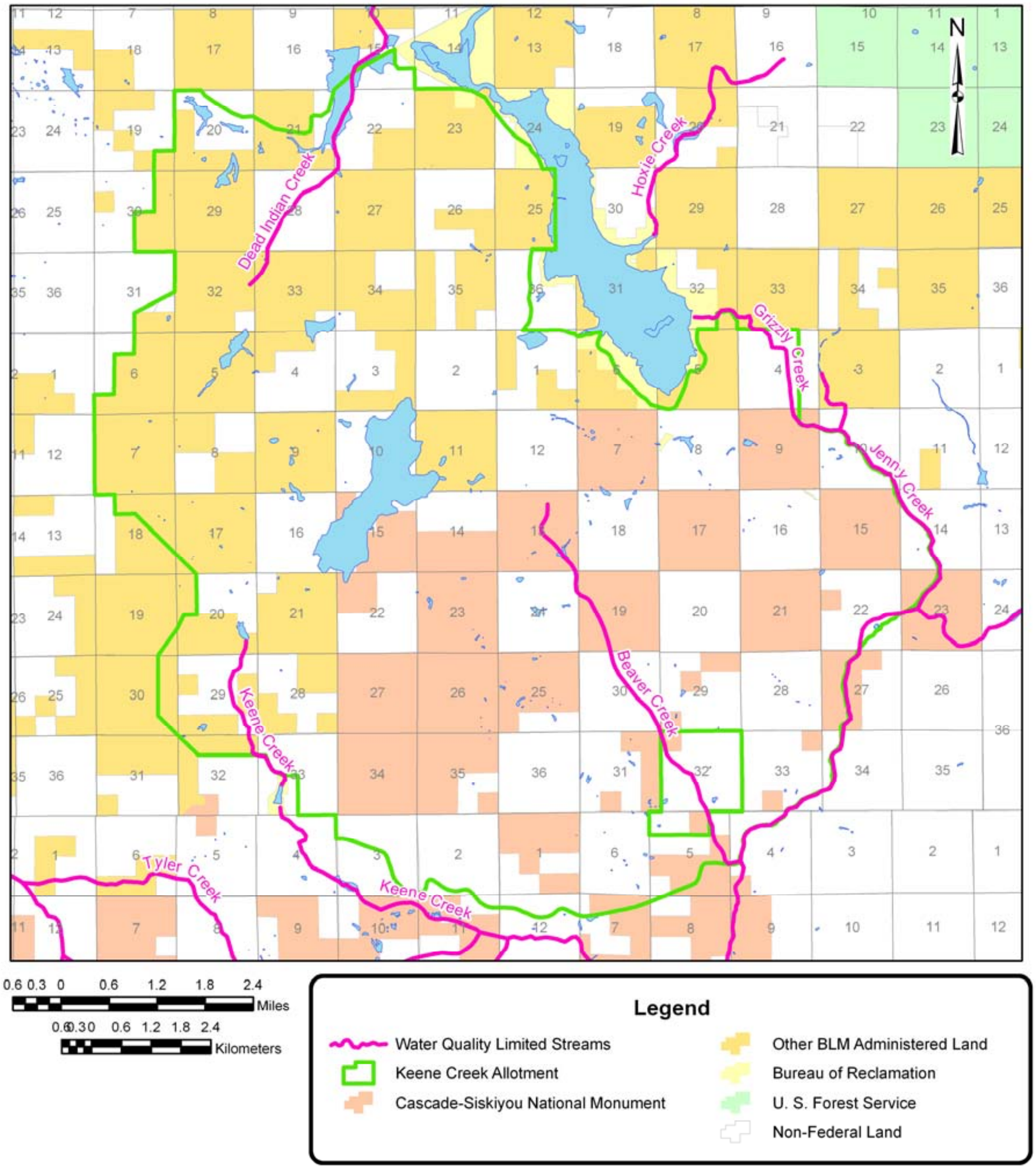
Direct measures of water quality: Barr et al. (In prep.) found significantly lower water temperature and higher levels of dissolved oxygen in ungrazed versus grazed springs. Past conversion of seeps and springs to stockponds and the limited size of seep and spring systems result in livestock concentrations and consequent soil and vegetation impacts preventing recovery of some seeps and springs.

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 three streams in the Keene Creek Allotment that are on the Oregon DEQ's 2004/2006 Environmental Protection Agency approved 303(d) list for summer temperature (salmonid fish rearing) and two streams for year around temperature (core cold water habitat) (ODEQ 2006) (Table C and Map 3). The Hyatt Lake Reservoir was added to ODEQ's water quality limited database for aquatic weeds (algae) and nutrients in 1998; however, there was insufficient data to list it as water quality limited.

Table C. *Water Quality Limited Streams within the Keene Creek Allotment (ODEQ 2006).*

Level 5 Watershed	Stream	River Miles	Parameter	Status
Jenny Creek	Jenny Creek	0 to 17.8	Temperature-Summer	303(d)
	Grizzly Creek	0 to 3.0	Temperature-Summer	303(d)
	Keene Creek	7.5 to 9.7	Temperature-Summer	303(d)
	Beaver Creek	0 to 5.5	Temperature-Year Around	303(d)
Little Butte Creek	Dead Indian Creek	0 to 9.6	Temperature-Year Around	303(d)

Map 3. *Water Quality Limited Streams within the Keene Creek 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. Maintenance of intolerant species and species indicative of clean water (*Ephemoptera*, *Plecoptera*, and *Trichoptera*) suggest low to moderate grazing would retain macroinvertebrate species diversity (Dinger et al. 2007).

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. Frest and Johannes (2005) observed extensive grazing impacts in 31 of the 37 springs surveyed in the Keene Creek Allotment.

Macroinvertebrate samples were taken at three sites in this allotment and one site just outside the allotment: 1) Grizzly Creek, above Soda Creek confluence (Aquatic Biology Associates 2000); 2) Jenny Creek, below Johnson Creek confluence (1992, 2000); 3) Jenny Creek, downstream of Site 2 (2000); and 4) Soda Creek, near the Grizzly Creek confluence (1994, 2000). At Site 1, water temperature and fine sediment were the limiting factors for macroinvertebrate communities. Site 2 had a weakly developed shredder community, warm-water and fine sediment tolerant species. Abundance and types of taxa present were indicative of a relatively nutrient-rich stream (1992). Surveys conducted at Site 3 found this stream segment to be lacking large wood and shade. Fine sediment, embeddedness, and lack of shade were limiting habitat features observed at Site 4 (1994). Cold water taxa abundance and richness were rated moderate to good. Resurvey found habitat limited by excessive fine sediment and lack of large wood (2000).

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).

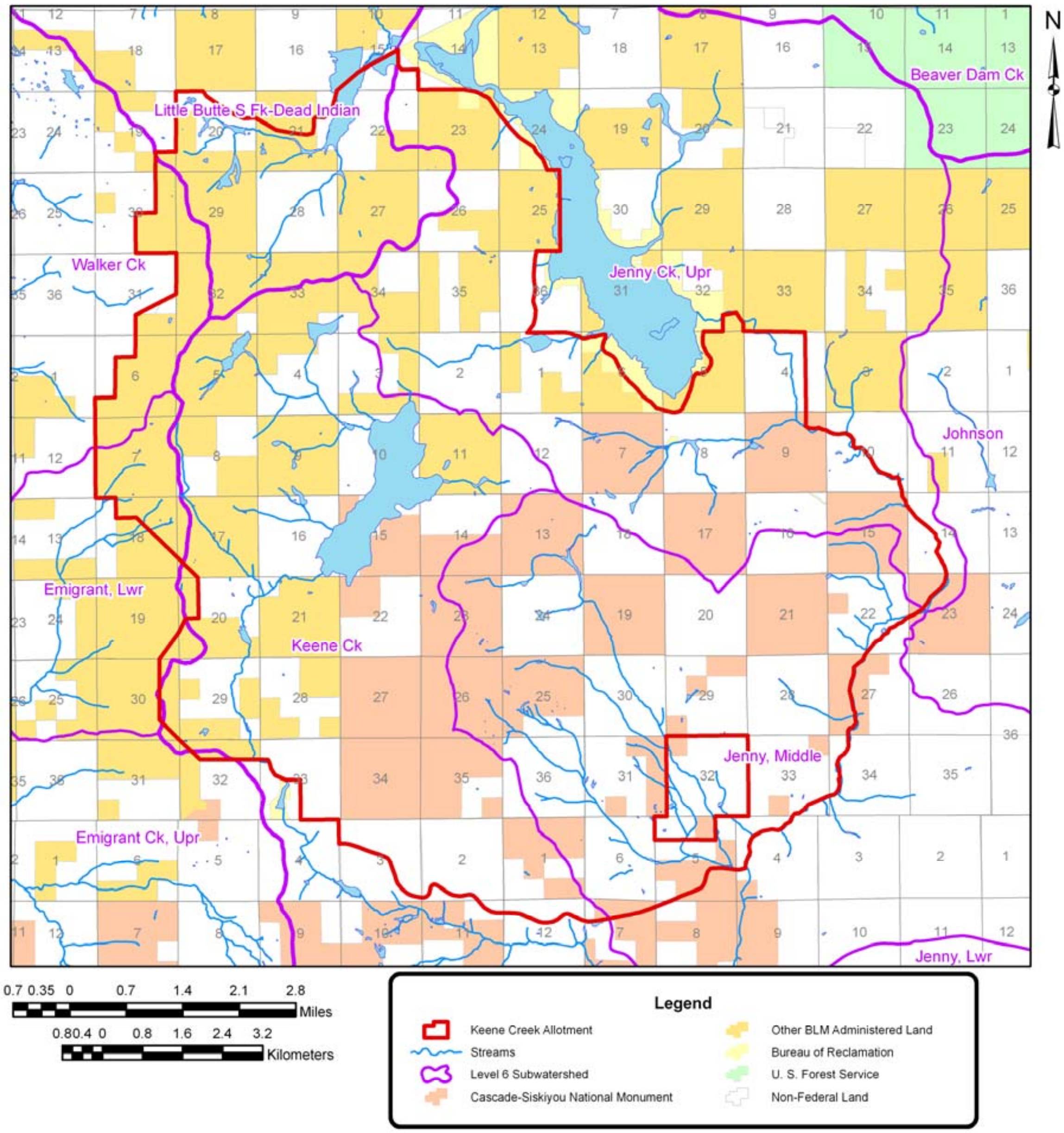
Seep/spring riparian plant community cover/structure: Photo retakes at seeps and springs suggest that little change in riparian vegetation has occurred over recent decades, likely because small seeps and springs result in a concentration of livestock seeking water (Hosten 2007b; Hosten and Whitridge 2007). Overall reduction in stocking rates and timing of livestock have not reduced disturbance enough 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 Keene Creek 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 and Little Butte Creek Watersheds are included in the source water area and 2,354 acres of the allotment are in the Upper Emigrant Creek, Lower Emigrant Creek, and Walker Creek Subwatersheds of Bear Creek and 4,136 acres are in the South Fork Little Butte-Dead Indian Subwatershed of Little Butte Creek (Map 3). The allotment lands in the Bear Creek and Little Butte Creek Watersheds are approximately 25 miles upstream from the closest public water system intake. The water source for Yreka is Fall Creek. The Fall Creek Subwatershed lies within the Jenny Creek Watershed. Approximately 37,700 acres of the allotment are within the Jenny Creek Watershed. Fall Creek is outside the Keene Creek 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 CSNM. 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 and Little Butte Creek portion of the allotment consists of open range grazing with an average of approximately 112 cows across the 6,490 acres of the allotment. 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 BLM lands were identified in the state source water assessments.

Map 4. *Subwatersheds in the Keene Creek 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 Keene Creek Allotment range from a low of 2.5 mi./mi.^{2} in the Lower Emigrant Creek and Walker Creek Subwatersheds to a high of 5.82 mi./mi.^{2} in Upper Jenny Creek Subwatershed (Table A).

Roads within riparian areas can greatly influence aquatic and riparian conditions. Road 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.

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. Livestock 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 macroinvertebrate 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.).

The Medford District and the monument in particular, have been thoroughly surveyed for the presence of aquatic mollusks. Distribution of both Chinquapin and Fredenburg pebblesnails are very limited with six sites and only one confirmed site, respectively, all of which are in the Keene Creek Allotment. Both are very local, southwest endemics (Frest and Johannes 2005); however, despite their extremely restricted range, neither species is on the Special Status Species list (2008). The Fredenburg pebblesnail was a ROD (1994) Riparian Reserve and Survey and Manage species but lost all special designations with the latest Special Status Species list (2007). Many (57 percent) of the pebblesnail survey sites are impacted by grazing (Frest and Johannes 2005).

Spatial distribution of habitat: 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).

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 impeding recovery of upland plant communities towards perennial grass domination outside of sites currently dominated by broadleaved weeds. Studies indicate that livestock are retarding the development of riparian vegetation associated with seeps and springs. Past conversion to stockponds and the limited size of these systems 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.

Bureau Special Status terrestrial 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. The Keene Creek Allotment is partially (45 percent) within the CSNM. Based on the best information available [studies in the monument (Johnston and Anthony 2006, DellaSala and Barr 2007, Alexander et al. 2008, Runquist In prep., 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. As similar vegetation communities exist in the Keene

allotment to those in the CSNM, a corresponding collection of terrestrial wildlife species would be expected to be present.

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 D: *Elevational zones within the Keene 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).

Special Status species known or likely to be present on the allotment are displayed in Table E.

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

Species	**Species Status**
northern spotted owl (*Strix occidentalis caurina*)	FT
fisher (*Martes pennanti*)	FC
Oregon spotted frog (*Rana pretiosa*)	FC
mardon skipper (*Polites mardon*)	FC
bald eagle (*Haliaeetus leucocephalus*)	BS
Lewis' woodpecker (*Melanerpes lewis*)	BS
white-headed woodpecker (*Picoides albolarvatus*)	BS
pallid bat (*Antrozous pallidus*)	BS
fringed myotis (*Myotis thysanodes*)	BS
northwestern pond turtle (*Actinemys marmorata marmorata*)	BS
foothill yellow-legged frog (*Rana boylii*)	BS
coronis fritallary (*Speyeria coronis coronis*)	BS
Siskiyou short-horned grasshopper (*Chloealtis aspasma*)	BS
Oregon shoulderband snail (*Helmithoglypta hertleini*)	BS
Chase sideband snail (*Monadenia chaceana*)	BS
Franklin's bumblebee (*Bombus franklini*)	BS

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

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 (IM) No. 2008-050. The IM 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 F displays those species that are known or likely to present on the allotment.

Table F: *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
grasshopper sparrow (*Ammodramus savannarum*)	BCC
red-naped sapsucker (*Sphyrapicus thyroideus*)	BCC
Williamson's sapsucker (*Sphyrapicus ruber*)	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
wood duck (*Aix sponsa*)	GBBDC
mallard duck (*Anas platyrhynchos*)	GBBDC
mourning dove (*Zenaida macroura*)	GBBDC
band-tailed pigeon (*Columba fasciata*)	GBBDC

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

Grazing occurs throughout all of the vegetative zones found in the Keene 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.

Bald eagle nests are known to be located near Hyatt Lake, but are unlikely to be impacted by grazing as neither their treetop nest sites nor the fish and waterfowl upon which they feed are subject to significant impacts from grazing.

There are six known breeding locations for northern spotted owls within the Keene Creek Allotment. Northern spotted owls are unlikely to be affected by the current livestock grazing because their preferred habitat is dense forest, and grazing is light to non-existent in these areas (Map 1 and 2).

Fisher have been confirmed to occupy forested habitat within the Keene Creek Allotment. Fisher are unlikely to be impacted by grazing as they primarily utilize forested areas and depend upon large wood for denning sites, and small to medium sized mammals for prey. Denning sites and prey species are unlikely to be impacted by grazing.

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. Two frog species and one reptile are listed on the Bureau Sensitive list. The foothill yellow-legged frog and the Oregon spotted frog (which is also a Federal Candidate species) both depend on aquatic environments for their entire life cycles. Foothill yellow-legged frogs are associated with low gradient streams. Oregon spotted frogs are associated with marshes, permanent ponds, and lake edges. Both of these species are impacted by issues of water quality and habitat degradation (trampling, wading, and consumption of vegetation) which may be caused by livestock. The northwestern pond turtle, our only Bureau Sensitive listed reptile, occurs at several locations within the Keene Allotment. Northwestern pond turtle spend the majority of their life cycle in aquatic environs, but must leave the water to dig terrestrial nests and lay their eggs. These turtles often overwinter in upland settings as well. Both of these activities may be impacted by heavy grazing, and post-holing by livestock.

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. The mardon skipper butterfly is a Bureau Sensitive Species and is listed as a Federal Candidate species under the U.S. Endangered Species Act. At a minimum, 5 reproductive sites are known within the allotment. Twelve known sites occur in the Ashland Resource Area. The "primary threat" listed for each of these sites is "grazing" (Xerces 2007, Hosten 2007c).

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). The Siskiyou short-horned grasshopper (a Bureau Sensitive Species) is known to occur at a location within 1 mile of the boundary of this allotment. It is dependent on Elderberry for the egg-laying phase of its life cycle. Suitable habitat occurs within the Keene Creek Allotment. Cattle have been documented to impact elderberry through use as rubbing objects. 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. As with the Siskiyou short-horned grasshopper, band-tailed pigeon are likely affected by grazing due to impact to blue elderberry which is a preferred food for this species during migration.

Franklin's bumblebee (a Bureau Sensitive Species), was once locally common throughout the Rogue and Klamath Basins in southern Oregon. Now known to only one site confirmed active in 2006 (Robbin Thorp, pers. Comm.), the species is in steep decline. This bee species favors open areas with abundant flowering shrub and forb species and rodent burrows used for nesting. Consumption of such shrubs and forbs, and trampling of suitable nesting sites limits the ability of this species to successfully maintain a population at formerly suitable sites.

The grasshopper sparrow is likely to be directly affected by grazing. A ground nesting bird, the grasshopper sparrow depends on forbs, grasses and shrubs for protection. Its diet consists of insects and seeds, both of which are negatively impacted by consumption of the vegetation in the open grassland habitat that this bird requires. Several other bird species on these lists (e.g. olive-sided flycatcher, mourning dove, and band-tailed pigeon) depend on either seeds or insects for their diet and may also be affected by grazing in this same manner.

<u>Big Game Winter Range Area</u>
Approximately 40 acres along the western edge of this allotment are within Big Game Winter Range for deer and elk designated by the Medford District RMP (1995). This designation is meant to identify areas to promote forage, and hiding and thermal cover for deer and elk (USDI 1994a). Grazing has little influence on hiding and thermal cover conditions, but it can have a profound effect on forage conditions.

There is little diet overlap between livestock and deer with greater overlap of preferred forage between livestock and elk. 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). The effect of grazing in this allotment has minimal impact to designated Big Game Winter Range; however, reduced forage from heavy grazing during spring, summer, and fall has detrimental effects on big game species.

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.).

<u>Bureau Special Status aquatic species:</u> The following list is known or suspected to occur in the Keene Creek Allotment (Table G).

Table G: *Special Status Species (Aquatic).*

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

BS- Bureau Sensitive

The Jenny Creek Watershed supports populations of native and Jenny Creek redband trout (*Oncorhynchus mykiss)* considered "sensitive" on the Final Interagency Special Status/Sensitive Species List (January 2008). In the Klamath River system, 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 15 miles downstream of the Keene Creek Allotment. Fredenburg pebblesnails (*Fluminicola* sp. 17), Chinquapin pebblesnails (*Fluminicola* sp. 39), Jenny Creek suckers (*Catostomus rimiculus*), and speckled dace (*Rhinycthyes osculus*) are other native species known to occur in the system.

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, 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 affects 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 15 miles downstream, below a reservoir that acts as a sediment trap in all but the worst flood conditions.

<u>Bureau Special Status fungi, lichens, and bryophytes:</u>
The following list of Bureau Special Status fungi, lichens, and bryophytes occur in the Keene Creek Allotment (Table H).

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

Species	**Species Status**	**Occurrences***
Alice Eastwood's bolete (*Boletus pulcherrimus)*	BS	3
bryum moss *(Bryum calobryoides)*	BS	1
orange coral mushroom *(Ramaria largentii)*	BS	1

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

These species are fungi found in coniferous forests. Because none of these species are palatable to livestock, and because they occur in coniferous forests where livestock seldom forage, it is unlikely that livestock have any impact on their populations.

<u>Federally Listed and Bureau Special Status Vascular Plants:</u>
The following list of Bureau Sensitive Status and federally listed vascular plants occur in the Keene Creek Allotment (Table I).

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

Species	Species Status	Occurrences*
twotooth sedge *(Carex serratodens)*	BS	2
tall bugbane *(Cimicifuga elata var. elata)*	BS	2
beautiful stickseed *(Hackelia bella)*	BS	49
Bellinger's meadow-foam *(Limnanthes floccosa ssp. Bellingeriana)*	BS	3
slender nemaclaudus *(Nemacladus capillaris)*	BS	16
coral-seeded allocarya *(Plagiobothrys figuratus ssp. corallicarpus*	BS	7

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

There are no known occurrences of federally listed vascular plant species within the allotment. The allotment is outside of the range of federally listed plants recognized by the U.S. Fish and Wildlife Service (*Fritillaria gentneri*, *Limnanthes floccosa*, *Arabis macdonaldiana* & *Lomatium cookii*) (USDI Fish and Wildlife Service, 2003).

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 sites listed above, the only graminoid is *Carex serratodens*. The *Carex serratodens* populations occur in wet habitats in areas receiving light grazing. Because of its wet habitat and its growth of fibrous root masses, *Carex* species generally recover well from herbivory, but severe repeated grazing and trampling could impact populations.

Hackelia bella occurs in coniferous forest plant communities in areas that receive very little use by livestock. *Cimicifuga elata var. elata* is a broadleaved forb that is somewhat toxic, and generally avoided by livestock. Populations typically occur in coniferous forests on north facing slopes. Potential threats to this species are timber management activities, lack of reproductive potential, lack of seedling recruitment, and fire suppression. The occurrence of this species in the Keene Creek Allotment is in areas that receives light use. *Nemacladus capillaris* is an annual herb that occurs in an area receiving slight to no utilization by livestock. These three species are not likely impacted by livestock grazing.

Limnanthes floccosa ssp. bellingeriana grows in high-elevation vernal pools (seasonal wetlands) in rocky meadows with shallow soils that are at least partially shaded in the spring. Two of the sites occur in an area that receives heavy use and one site is in an area that receives slight use. *Plagiobothrys figuratus spp. corallicarpus* grows in seasonal wetlands that are usually inundated by water in the winter and spring and dry in the summer. Four of the seven sites occur in heavy use areas and the remaining sites occur in areas receiving slight or no use by livestock. These two species would likely be damaged from trampling and being buried under feces.

Noxious Weeds:
Field surveys have located a number of noxious weed species within the allotment, including Canada thistle (*Cirsium arvense*), yellow star-thistle (*Centaurea solstitalis*), spotted knapweed *(Centaurea stoebe* L. ssp. *Micranthos*), Dalmatian toadflax (*Linaria dalmatica*), scotch broom (*Cytisus scoparius*), teasel (*Dispacus L.*), and Dyer's woad (*Isatis tinctoria*). Left untreated these species may contribute to significant ecological decline. Many of the weed populations occur along roads and other disturbed areas (logged, scarified, etc.) (Hosten 2007).

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 Rangeland Health Field Assessments indicate that there is a none-to-slight departure in a Chinquapin-fir forest, snowberry meadow, and wet meadow ecological site (USDI 2007 indicator 16 invasive plants). 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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