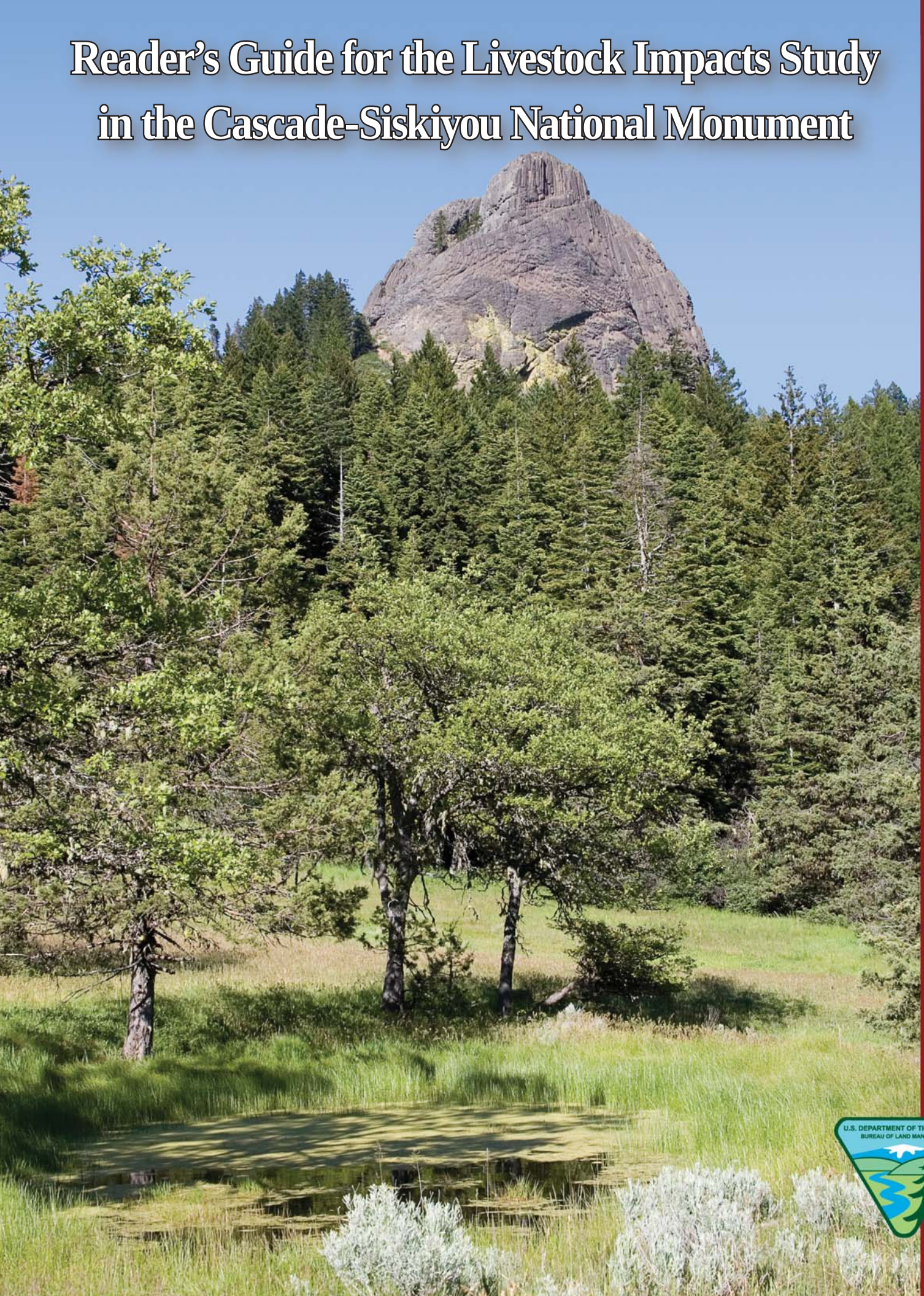
Reader's Guide for the Livestock Impacts Study in the Cascade-Siskiyou National Monument



BLM

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

The Cascade-Siskiyou National Monument (CSNM) proclamation, signed June 9, 2000, directed the Secretary of the Interior to "…study the impacts of livestock grazing on the objects of biological interest in the monument with specific attention to sustaining the natural ecosystem dynamics." The Draft Study of Livestock Impacts on the Objects of Biological Interest was published in April 2001. The final Plan for Studying the Impacts of Livestock Grazing on the Objects of Biological Interest was released by the Medford District BLM in November 2005. The study results are written in the form of nine papers. Interested citizens are encouraged to use this supplemental reader's guide as an introduction to the studies. This guide was created to provide a general understanding of the study results. The complete papers are available on the internet at: http://www.blm.gov/or/districts/medford/index.php

Contents

EXECUTIVE SUMMARY OF THE STUDIES EXAMINING THE INFLUENCE OF LIVESTOCK ON OBJECTS OF BIOLOGICAL INTEREST WITHIN THE CASCADE-SISKIYOU NATIONAL MONUMENT

Major findings relating to livestock influence on objects of biological interest within the Cascade-Siskiyou National Monument (CSNM) are summarized below. The synopsis is followed by a more detailed description of results including photos and diagrams. Full descriptions of the individual projects listed in the references can be found in the form of individual study reports on the Bureau of Land Management (BLM) Medford website and ultimately on the Southern Oregon University digital archives.

Synopsis

Historic Background

- The monument has experienced 150 years of livestock influence
- The highest stocking rates occurred between WWI and WWII
- Fencing and water development allowed change from season-long to the current pasture system
- Pattern, seasonality, intensity, and of use by cattle has changed over time
- Historic shrub-use has been curtailed at low elevation, but continues at high elevation
- There have been many range-related activities over time (scarification, herbicide/fertilizer application, prescribed fire, seeding)
- Over 50 forbs and grasses have been introduced since 1950
- The current extent and intensity of grazing is lower than historic times

Upland Areas

- A historic loss of perennial bunchgrass and conversion to “weeds” occurred in the late 1800s /early 1900s
- Weeds have been replaced by shrubs in some areas (early 1900s)
- Recent broadleaved weed invasion is associated with moderate to severe-use areas
- A major change in the herbaceous component is due to increased abundance by the introduced bulbous bluegrass
- Bulbous bluegrass is indirectly linked to livestock by its preponderance for gentle slopes

Riparian Areas

- There has been general improvement in the past 30 years in riparian condition across all stream systems, but rate of improvement is slower outside of exclosures
- Livestock show high fall use of riparian species
- Seeps and springs show less improvement than streamside riparian areas
- Intense use areas by livestock, deer, and elk around seeps and springs are dispersed throughout grazed areas
- Intense use by livestock, deer, and elk exclude certain macroinvertebrate species considered intolerant of disturbance.
- Geographic area is important in describing patterns of aquatic macroinvertebrates implying that springs from all areas need to be conserved

Detailed Synthesis of Livestock Impact Studies

The Bureau of Land Management studies of livestock influence on objects of biological interest combines a historic perspective together with detailed examinations of individual objects of biological interest. The historic studies provide the background fabric of management and vegetation change within which more recent change and possible influence by livestock are described. Final reports provide information about historic management and vegetation change, recent vegetation change (20 to 30 years) in upland and riparian vegetation, and biological objects of interest (native ungulates, the Jenny Creek Sucker, aquatic macroinvertebrates, noxious weeds, and a rare mariposa lily [*Calochortus greenei*]). Together with variables such as the bare soil, vegetation cover, and eroding banks, these individual biological objects are commonly used as indicators of landscape condition.

Historic Background

Studies indicate that the monument landscape was more open historically, and that historic high canopy woody-dominated vegetation spread into adjacent more open meadows and woodlands soon after Euro-American settlement. Some of these changes are associated with the heavy livestock use of the landscape in the late 1800s and early 1900s. Livestock are reported to have caused the replacement of native bunchgrasses by weeds, in turn replaced by woody shrubs and trees depending on the location (Figure 1). Many of the meadows and prairies remain open because of shallow soils, or the high abundance of shrink-swell clays. Anecdotes, photos, and old reports indicate that a wide range of management activities took place on public lands now part of the monument. These activities include scarification, seeding, herbicide/fertilizer application, and prescribed fire. Patterns of forage and browse utilization by livestock have changed over time. Old photos with trailing (parallel paths along the contours of hillsides) by livestock identify more extensive and higher utilization prior to World War II (Figure 2). Fencing and the improvement of seeps and springs has allowed the development of the current allotment/pasture system. The current grazing system provides seasonally restricted grazing at a lower stocking rate than historic times. The major findings relating to livestock influence on objects of biological interest are described separately for upland and riparian portions of the landscape.

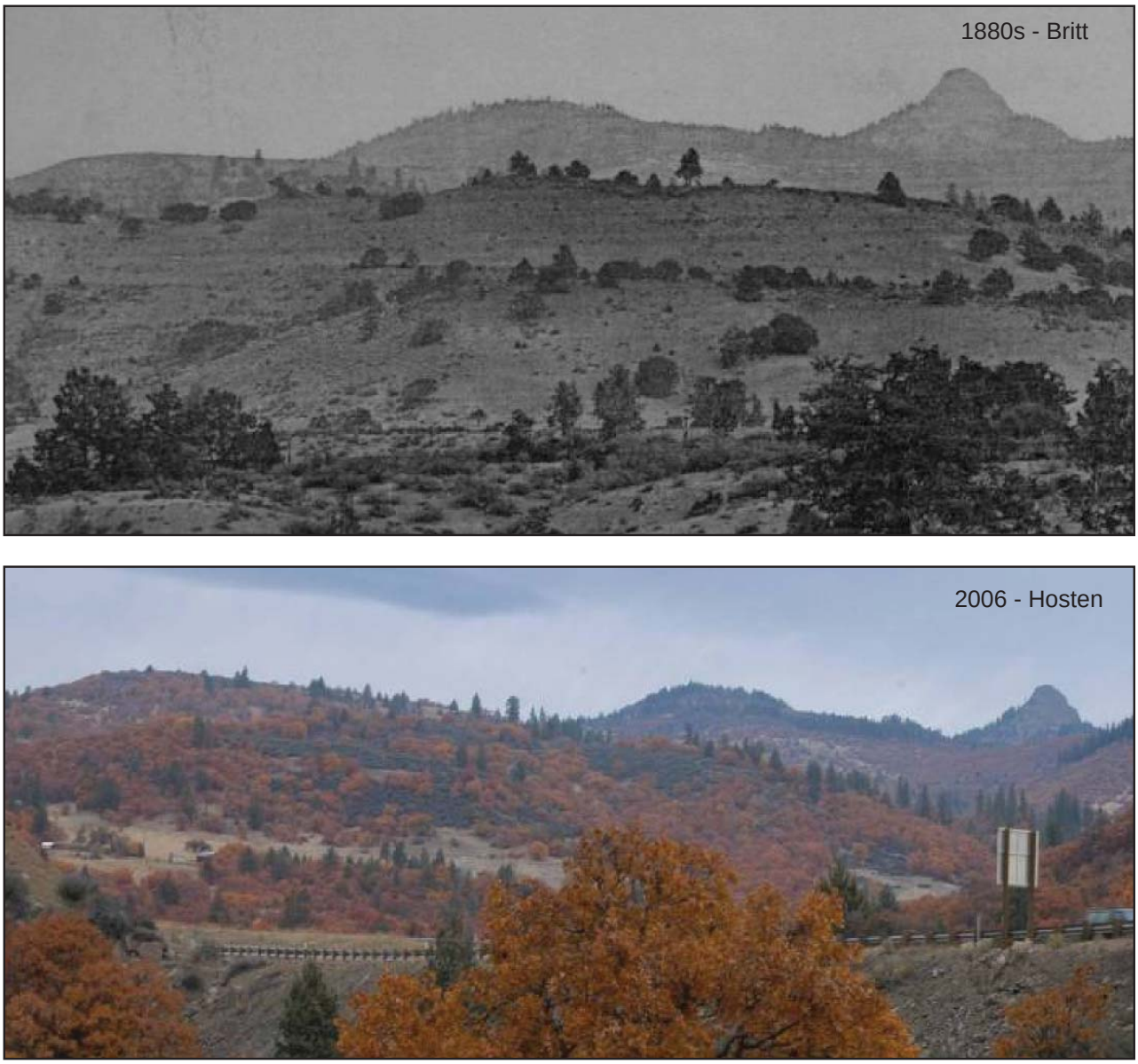


Figure1. California-Oregon border: original and repeat photos showing the early conversion of open areas to woody vegetation. Note that photos are not exact repeats.

Figure 2. Sampson Creek: The old photo shows trailing by livestock. The recent photo shows conversion from perennial grasses and forbs to annual grasses and yellow starthistle. While livestock may have played a role in the loss of native vegetation, the high abundance of shrink-swell clays in the soil predispose this site to weed invasion.

Upland Areas

In the uplands, the noxious weeds are the most visible outcome of grazing influence by livestock and native ungulates (Figure 3). Other factors playing a role in the distribution of weeds include the road network and soil characteristics. In particular, a high abundance of shrink-swell clays was found to predispose sites to weed invasion. Repeat stand surveys reveal that increases of bulbous bluegrass, an introduced alien grass, defines a major pattern of recent change in the herbaceous understory of plant communities (Figure 4). Both bulbous bluegrass and native perennial grasses are thought to have replaced less desired annual grasses such as cheatgrass and medusahead. Other patterns of upland change reflect the influence of an elongated fire-return interval as a consequence of fire suppression. Such changes include the loss of California black oak, and the increased abundance of conifer and shrubs in the understory. Surveys indicate that a rare upland plant, the Greene's mariposa lily, has smaller populations in areas with high annual grass abundance. It is likely that the annual grasses out-compete mariposa lily seedlings for light and moisture so that populations are not able to replace older individuals by a younger cohort.

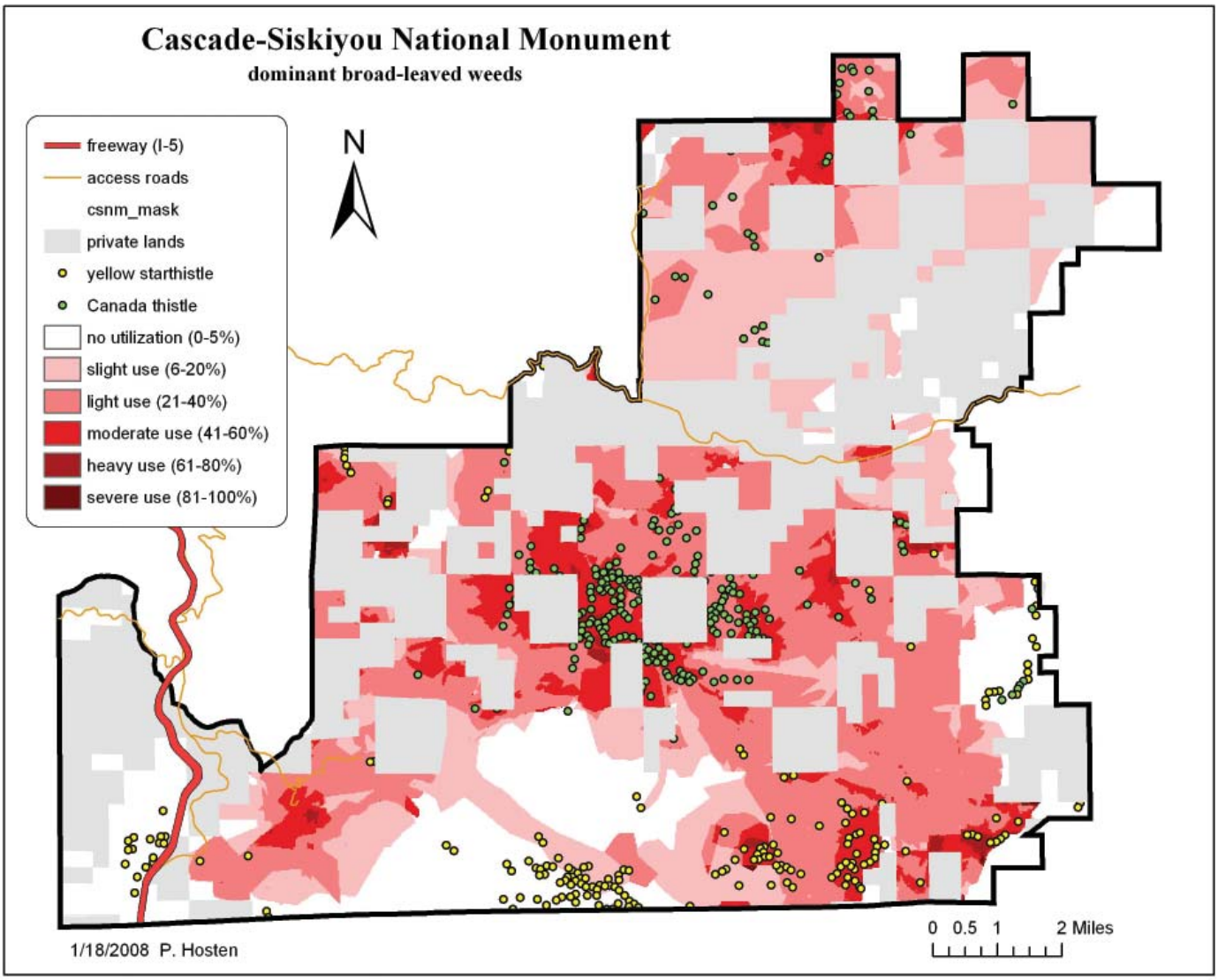


Figure 3. The distribution of Canada thistle and yellow starthistle across the Cascade-Siskiyou National Monument.

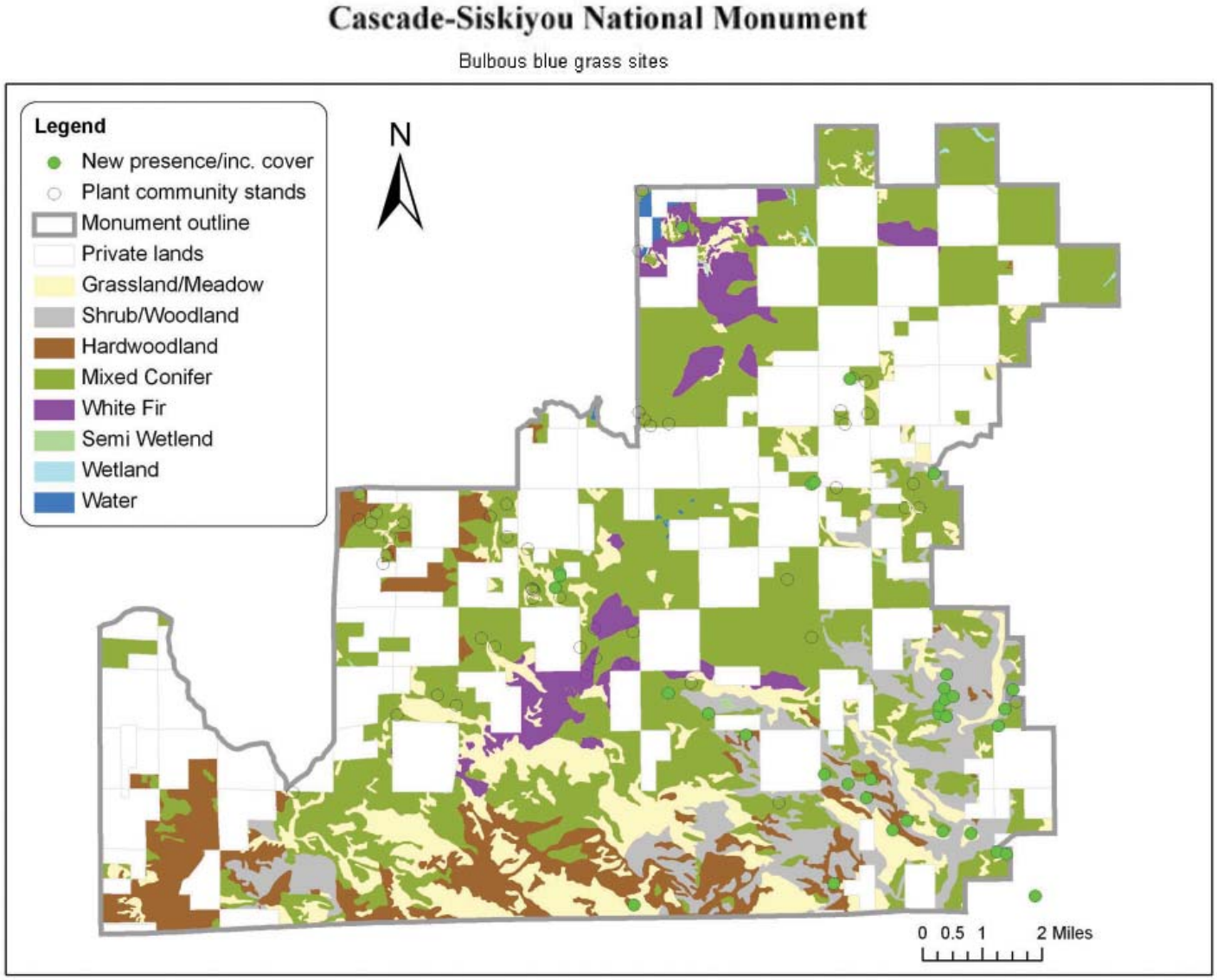


Figure 4. Stand surveys showing changes in cover by bulbous bluegrass.

Riparian Areas

Riparian areas are also in the process of recovery from historic livestock grazing influence. Livestock exclusion from streamside riparian areas showed the replacement of bare soil by grasses and riparian shrubs at a faster rate than that observed in unfenced riparian areas. Vegetation inside exclosures shows change in both plant composition and the complexity of the vegetation structure (Figure 5). Improvement in riparian areas outside of exclosures in areas not burned or subjected to scouring floods within living memory indicate that other landscape factors may be responsible for improved riparian condition (Figure 6). Improved range management practices are most likely responsible for favoring improved riparian conditions within streamside riparian areas. Such riparian improvement is not as apparent in smaller seeps and springs, likely because of the concentrated use by native and non-native ungulates at watering sites. These seeps and springs form the headwaters of creeks at higher elevations. Especially hard hit are seeps in the Soda Mountain area. Many seeps and springs have been converted to stockponds, and also serve as point sources of noxious weeds. A higher proportion of low elevation springs have been converted to stockponds than at high elevations. macroinvertebrate studies show that high utilization (by native and non-native ungulates) excludes certain macroinvertebrate species considered intolerant of disturbance. It was also found that geographic area is important in describing patterns of aquatic macroinvertebrates, implying that springs from all areas need to be protected to conserve macroinvertebrates across the monument landscape.

Seeps and springs are also the focal point of possible social interaction between native and non-native ungulates. Fewer native ungulate bedding sites and scat are visible near springs used by livestock. Livestock appear to push elk into different habitats when they enter a new pasture for the first time in the grazing season. Deer do not appear influenced by cattle away from water, since they have different food requirements and thus use different habits. The use of different habitats is shown by the differences in diet. Deer favor browse species, while cattle and elk favor grasses and forbs. Even though cattle and elk favor herbaceous species, their diet overlap remains relatively low.

The percent fecal composition by sedges (riparian obligate plants) in cattle scat increases towards the end of the grazing season (September/October). This end-of-season increase in wetland plant composition reflects the increased use of wetlands towards the end of the grazing season as the upland grasses and forbs dry out and become less palatable (Figure 7).

Figure 5. The Schoolhouse Meadow Exclosure demonstrates the change in riparian plant composition and increased complexity of riparian vegetation structure over time.

Figure 6. Parsnips Lakes show an increase in woody riparian vegetation in areas not subjected to scouring floods or fire within living memory. These changes suggest that improved livestock management compared to historic times has allowed the recovery of riparian vegetation associated with creeks and large sagponds.

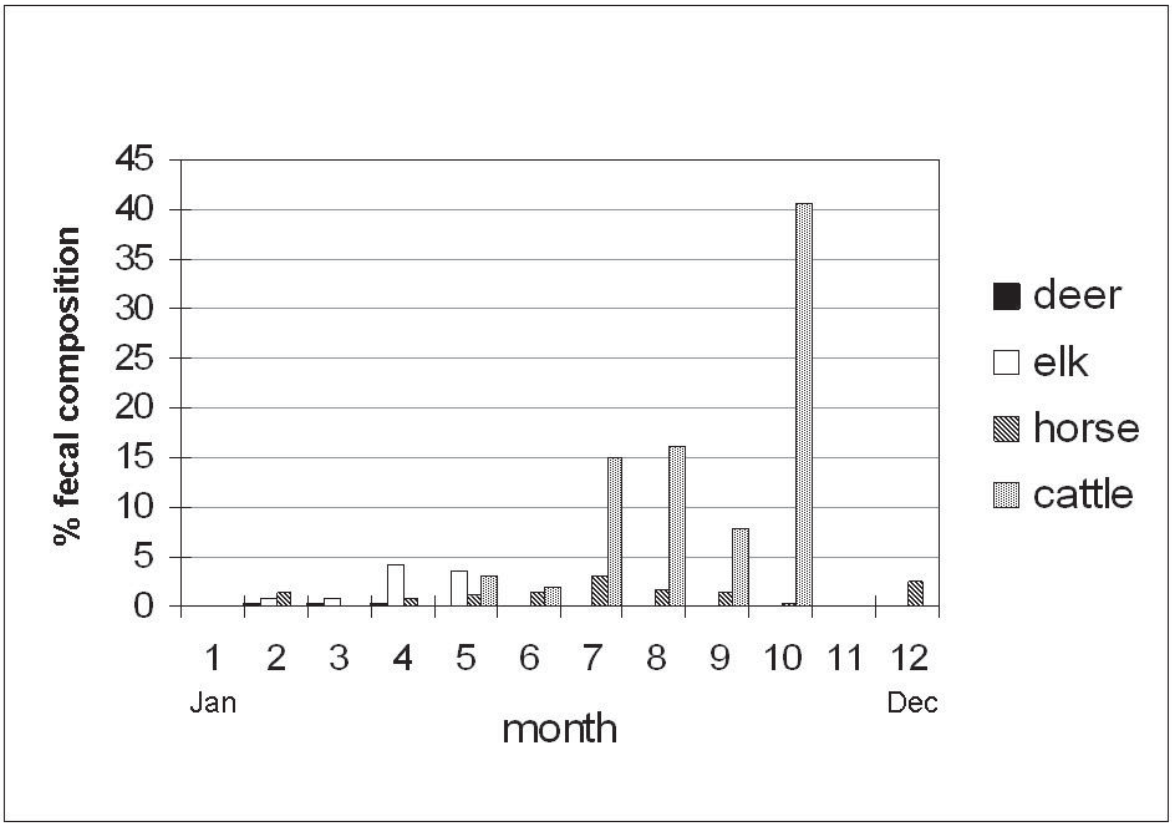


Figure 7. Fecal composition of native and non-native ungulate scat by riparian sedges (Carex spp.).

Summary

Studies and patterns of livestock use on the Cascade-Siskiyou National Monument suggests that livestock influence riparian areas more than upland portions of the landscape. Other streamside riparian areas are fenced off from livestock (Box O Ranch, Lower Jenny Creek Allotment), or are in steep-sided canyons not negotiable to livestock. The small size of seeps and springs results in excessive livestock concentrations and impacts to these isolated sources of water. These patterns of intense livestock use are reflected by change observed in repeat photos and patterns of the aquatic macroinvertebrate community of seeps and springs. Both utilization patterns and the percent fecal composition suggest that impacts to riparian areas is most likely to occur at the end of the grazing season when grasses and forbs of the uplands dry out and become less palatable, forcing native and non-native ungulates to seek sustenance in riparian areas.

Weeds (particularly yellow starthistle) also identify areas of livestock impact in upland plant communities. Patterns of livestock utilization and presence of noxious weeds identify Soda Mountain as a major problem area. However, livestock are not the only factor influencing the distribution of weeds. The presence of shrink-swell clays, proximity to roads, past vegetation manipulation, and other factors may also predispose sites to weed invasion. Roads likely provide habitat as disturbed sites, areas of low woody vegetation cover, and travel routes to ungulates, thus playing an important role in the distribution of weeds. Other undesired changes in upland plant communities are associated with the introduction of weeds as a consequence of seed application (bulbous bluegrass in particular) and fire suppression. Elongated fire return interval has allowed a preponderance of conifer, and a subsequent loss of black oak and herbaceous understory in formally more open areas.

List of Individual Studies

Hosten, P. E., H. Whitridge, D. Schuster, and J. Alexander. 2007. Livestock on the Cascade-Siskiyou National Monument: A Summary of Stocking Rates, Utilization, and Management. U.S. Department of the Interior, Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

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

Hosten, P. E., H. Whitridge, and M. Broyles. 2007. Diet Overlap and Social Interactions among Cattle, Horses, Deer and Elk in the Cascade-Siskiyou National Monument, southwest Oregon. U.S. Department of the Interior, Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

Hosten, P. E. 2007. Factors Controlling Patterns of Canada Thistle (Cirsium) and Yellow Starthistle (Centaurea solstitialis) Across the Cascade-Siskiyou National Monument. U.S. Department of the Interior, Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

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

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

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

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. U.S. Department of the Interior, Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

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
U.S. Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

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. U.S. Department of the Interior, Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

Individual Project Summaries

Long-term Vegetation Change in Jackson County

Little information exists about vegetation change over time in the grasslands, shrublands, and woodlands of southwest Oregon. Multi-aged oak stands, encroachment into non-conifer vegetation by shade-tolerant conifers, reduced reproduction by pine, and the loss of meadows support the generally accepted belief that the advent of fire suppression has negatively impacted historically open vegetation types. However, a collation of historic anecdotes, General Land Office (GLO) survey records, homestead patent applications, original and repeat photographs, and other historic information on the general dynamics among oak, chaparral, grassland, and conifer vegetation indicate a more diverse pattern of vegetation change only partially explained by fire exclusion. The historic presence and continued persistence of some meadows and savanna without recent fire are counter to general assumptions about the loss of open (i.e. herbaceous dominated) plant community structures as a result of fire-suppression (Figure 1). Areas dominated by ecological processes other than fire (rocky, shallow and/or vertisol clay soils, and ecotones between edaphically mediated grasslands and woody dominated sites) continue to support large oaks with an open herbaceous understory despite effective fire suppression since World War II. Coarse vegetation derived from General Land Office Surveys indicates that oak woodlands were historically far more common than oak savanna along the Rogue Valley (Table 1). Early descriptions of chaparral and high-elevation oak thickets indicate the existence of stand structures facilitated by stand replacement fire at the time of Euro-American colonization. For example, a vegetation description for the Bear Creek area from 1853, “Chaparral, the crookedest, ugliest, & most obstinate brush you ever saw, forms the upland undergrowth” indicates a preponderance of shrubs at some locations. Another anecdote, “On the southern slopes, grass, much of it clover, takes the place of timber, while northern slopes are covered with pine, mostly pitch pine, fir and yellow cedar” identifies open meadows and large fire-dependent pine communities. Chaparral and oak thickets appear stable over the time-period examined (Figure 2). The range of historic data indicates that woody canopy cover dominated much of the southwest Oregon landscape. Where forest structure was open, the understory may have been dominated by shrubs rather than herbaceous species at certain locations.

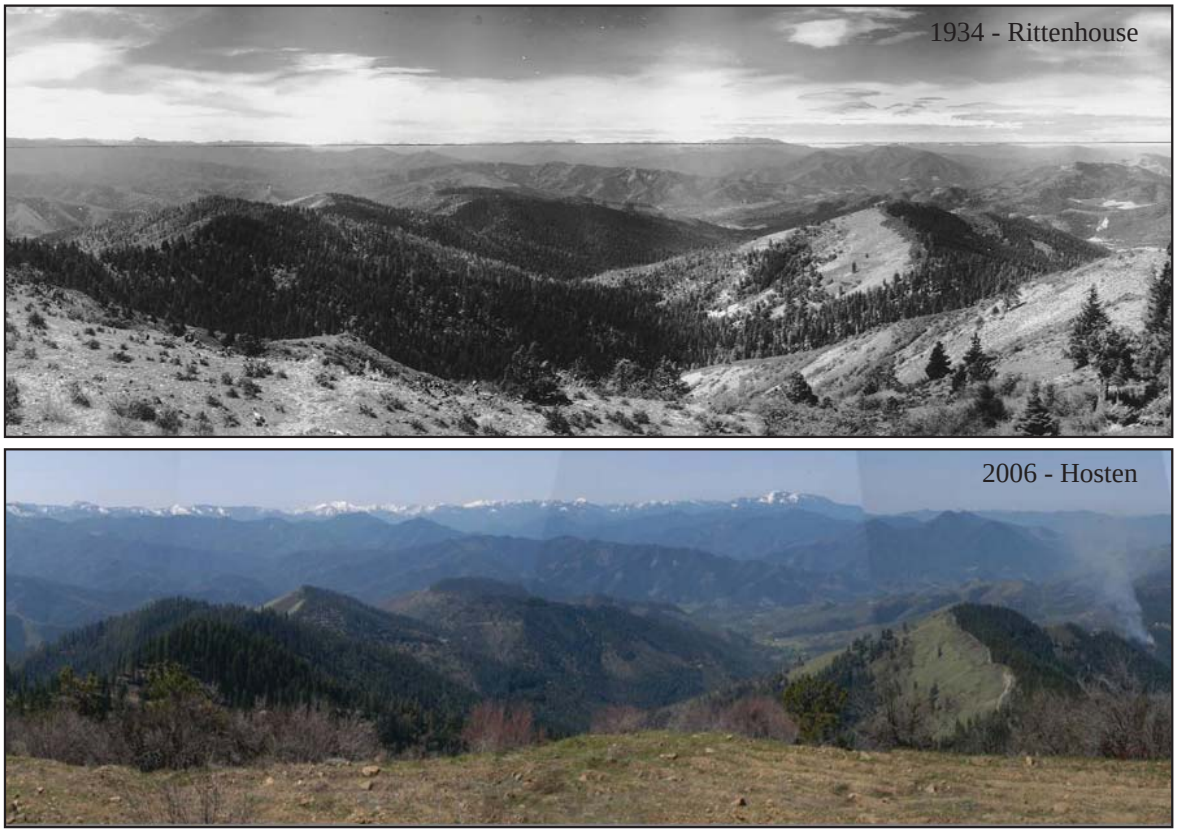


Figure 1. Anderson Butte: original and repeat photos show an increased density of vegetation at some sites and the maintenance of grasslands at other locations.

Table 1. Cross-tabulation of GLO survey vegetation descriptions with Western Oregon Digital Implementation Plan (WODIP) (1993) vegetation classes based on area expressed as a percentage.

GLO vegetation class	Percent Area
Prairie	30.9
Shrubland	0.4
Savanna (oak)	1.2
Woodland (mixed hardwood – mixed conifer)	41.2
Closed forest, upland conifer	24.4
Closed forest, riparian wetland	1.8
Water	0.3

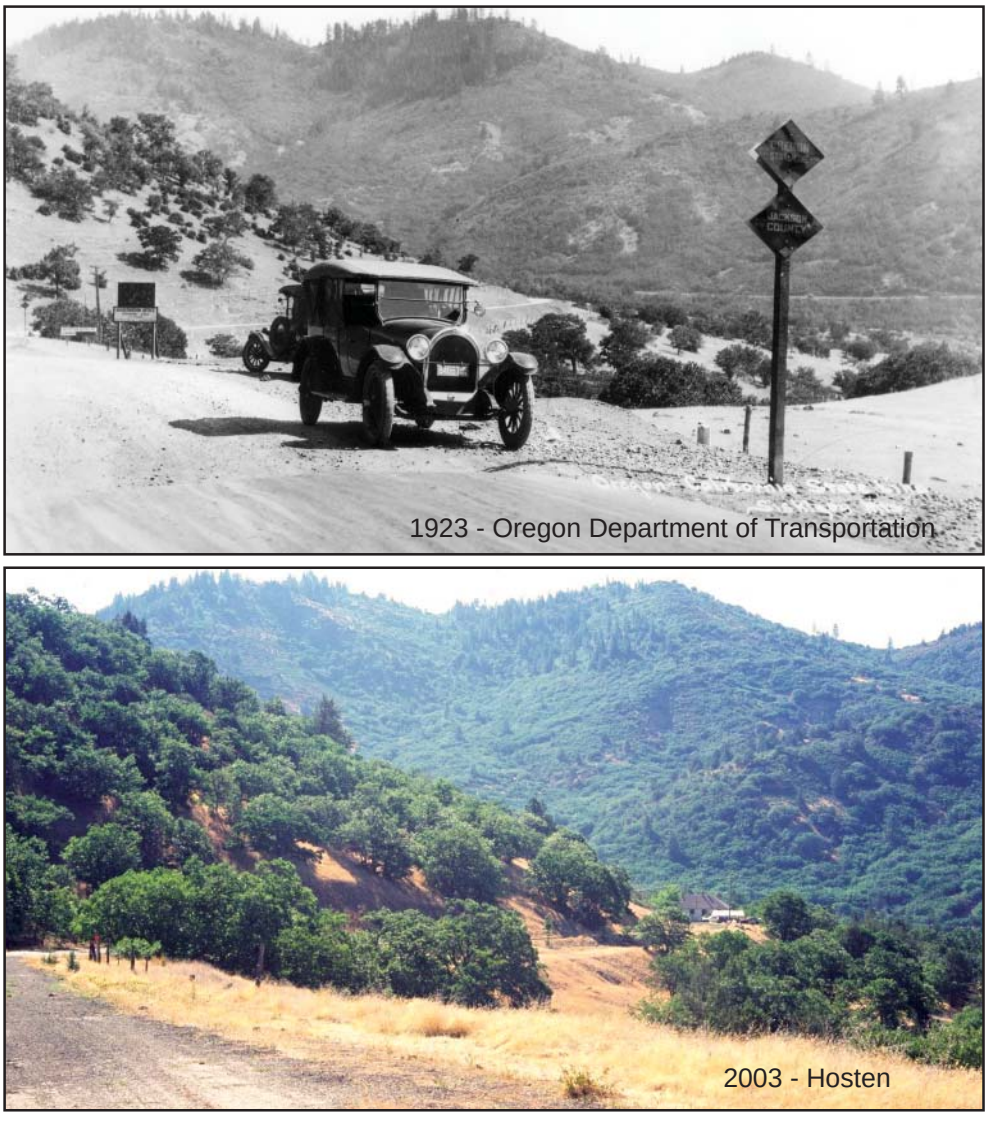


Figure 2. California-Oregon border: original and repeat photos show increased canopy cover in former open woodland (mid-foreground), and also the maintenance of oak thickets in the photo background.

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

History of Rangeland Management in the Cascade-Siskiyou National Monument

This paper describes range management related practices to provide a historic and landscape context for studies examining the influence of livestock on objects of biological interest within the Cascade-Siskiyou National Monument. Historic records show livestock numbers increased rapidly following initial settlement by Euro-Americans. Anecdotal data suggests that stocking rates early in the last century were greater than current stocking rates by at least an order of magnitude. Historic unregulated season-long use of the uplands during the spring, summer and fall resulted in severe environmental degradation. Disagreements between livestock operators and the desire of agency personnel to improve the condition of the range led to large-scale fencing and concomitant water development projects. Such projects contributed to improved livestock control in riparian areas, a retardation of livestock movement to higher elevations, and improved livestock dispersion in the absence of herding. Observation of livestock use on upland shrubs and winter deer dieback resulted in exclusion studies culminating in more precise timing of livestock use to preserve the browse resource for native ungulates at lower elevations (Figure 3). While livestock use of shrubs at lower elevations has been reduced, use of upland shrubs at the end of the grazing season continues in moderate to high use areas accessible to livestock. Large-scale patterns of livestock use are associated with environmental factors such as elevation, soil texture, and management factors such as distance from water-source, distance from roads, and past vegetation manipulations. Activities associated with livestock management include: road construction, aerial fertilization, herbicide application, seed application, development of water-sources, vegetation manipulation (scarification), and prescribed fire. At the time of implementation, many of these activities were considered to benefit wildlife as well as rangeland condition. Large-scale vegetation manipulation was initiated in the 1950s (Figure 4). Since then, associated seed applications have introduced over 50 grasses and forbs across the monument. Miles of fence construction appears bi-modal over time – an initial spate of construction followed by more recent renovation. Water developments appear associated with fence construction, likely to ensure water availability within newly fenced pastures for stock later in the season compared to historic times.

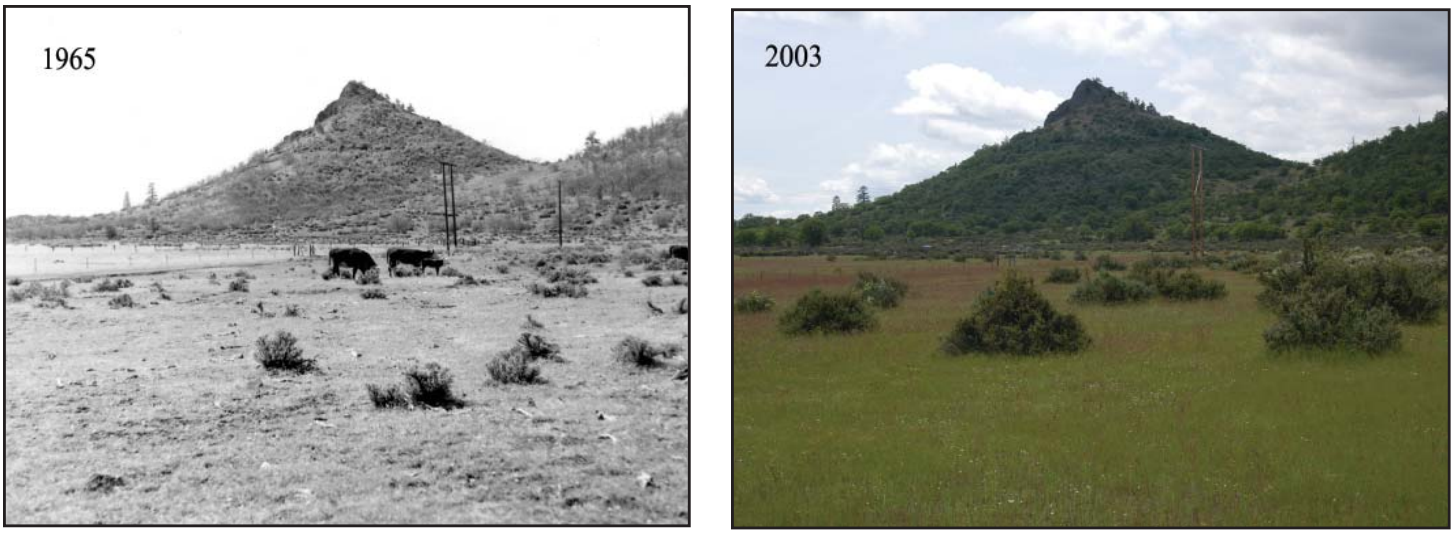


Figure 3. Historic observations of cattle browsing on shrubs were linked to winter deer die-offs of the time. Fecal analysis and observation indicates minimal current use of shrubs by livestock at low elevations.

Hosten, P. E., H. Whitridge, D. Schuster, and J. Alexander. 2007. Livestock on the Cascade-Siskiyou National Monument: A Summary of Stocking Rates, Utilization, and Management. U.S. Department of the Interior, Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

Figure 4. Scarification followed by seeding was a common practice on rangelands through the 1960s, 1970s and 1980s.

Mid-term Patterns of Vegetation Change within the Cascade-Siskiyou National Monument

According to memoirs and historical anecdotes, weedy species replaced native bunchgrasses at many locales in the Cascade-Siskiyou National Monument during the late 1800s and early 1900s under high intensity, season-long grazing by sheep, cattle, and horses. Starting in the 1950s, improved management reduced the spread of medusahead (*Taeniatherum caput-medusae*) and replaced weedy annual grasses with non-native perennial bulbous bluegrass (*Poa bulbosa*). Anecdotes reported that native perennial grasses increased in response to improved management of the livestock. Recent inventories verify continued increase of native bunchgrass under modern range management practices at certain locations. Re-examination of 15 to 30 year old stand inventories indicates changes in extent and abundance of individual species and life-forms at the landscape level. Non-native perennial forbs, native or non-native grasslike plants (including sedges), and non-native perennial grasses have increased in extent over time. Only one non-native perennial forb occupies fewer stands than previously. Native and non-native perennial grasses were the only life-forms that changed significantly in cover abundance over time at the landscape. Individual species showing the most consistent increases in cover abundance over time include short-lived non-native perennial grass bulbous bluegrass (Figure 5), and Douglas-fir (*Pseudotsuga menzieszii*). Black oak (*Quercus kelloggii*) was the only species that showed consistent declines in cover abundance across the landscape. Spatial patterns of non-native annual grass reflected the influence of topography, soils and historic livestock grazing. Declines in annual grasses at some locations were matched by increases in abundance at other locations. Indirect evidence from patterns of bulbous bluegrass abundance suggests that livestock promote non-native grass invasion of the landscape, but its decrease on a site with increased grazing indicates that livestock may also reduce bulbous bluegrass with spring-grazing. Topographic and edaphic factors influence vegetation composition relative to current livestock-induced changes in species composition. Recent changes in herbaceous species extent and cover abundance reflect the invasion of non-native species introduced in seeding trials in the 1960s and 1970s. Increase in Douglas-fir and decline of black oak are consequences of natural succession in the absence of fire. Southerly portions of the monument show a higher abundance of shrubs (Figure 6).

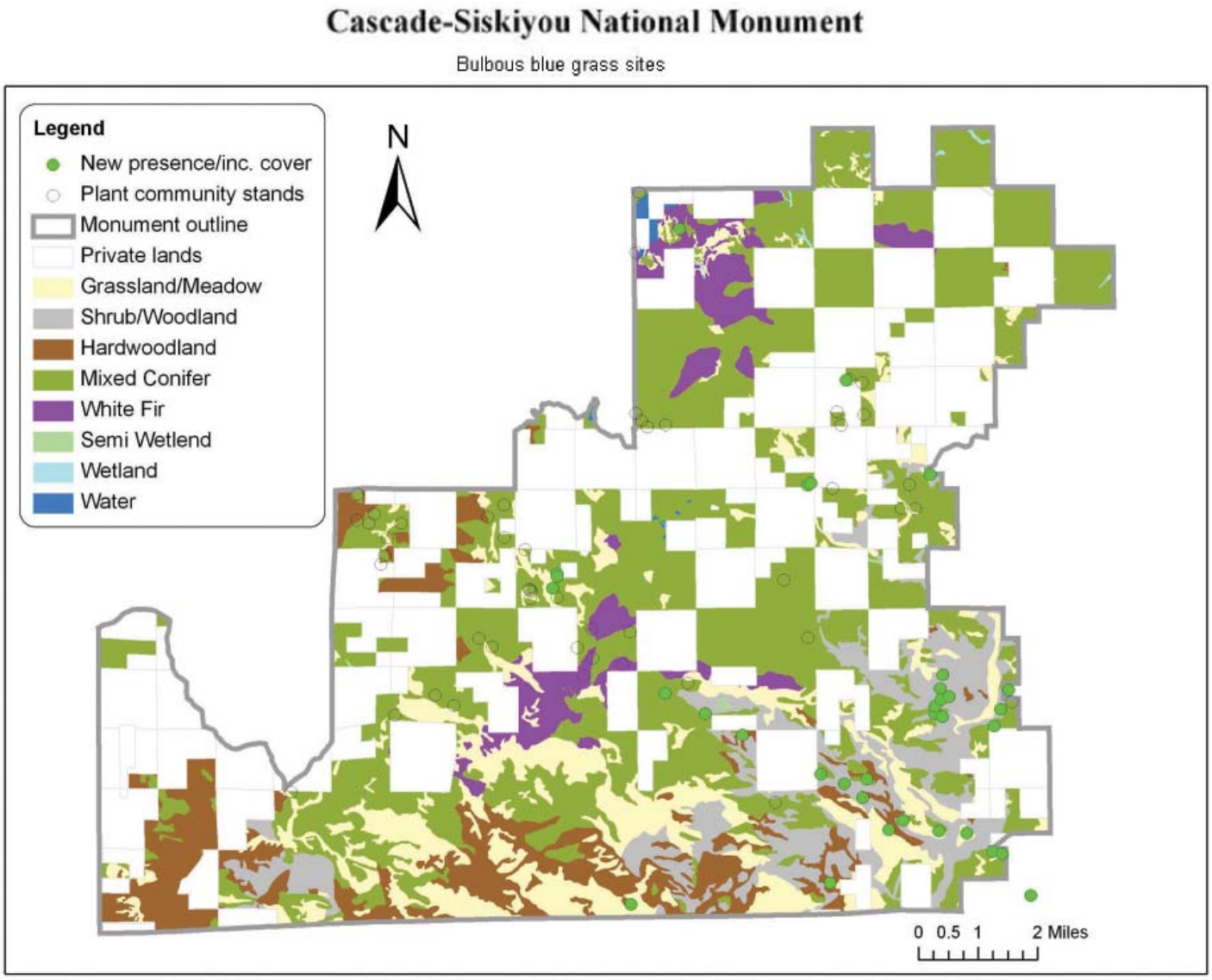


Figure 5. Stand surveys showing changes in cover by bulbous bluegrass.

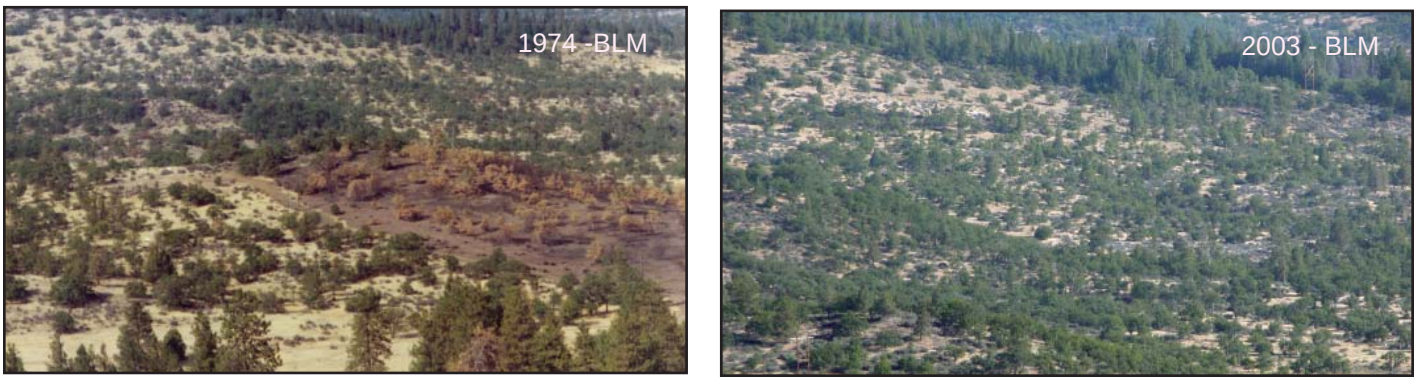


Figure 6. Repeat photos of the southern portions of the monument show an increased abundance of shrubs, including areas burned by the 1974 fire.

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

Factors Controlling Patterns of Canada Thistle (Cirsium arvense) and Yellow Starthistle (Centaurea solstitialis) across the Cascade-Siskiyou National Monument

Broadleaved noxious weeds have long been a problem on the Cascade-Siskiyou National Monument (Figure 7). Landscape patterns of broadleaved noxious weeds (Figure 8) across the Cascade-Siskiyou National Monument are examined in the context of environmental and management factors to improve our understanding of weed dynamics. Environmental factors include a range of topographic and edaphic variables, while management factors provide insight about historic vegetation manipulation, road construction and forage utilization by wildlife and livestock. Distribution patterns of Canada thistle (*Cirsium arvense*) and yellow starthistle (*Centaurea solstitialis*) across the monument are best described by a combination of topographic, edaphic, biotic, and management factors. Variables incorporated within models describing landscape patterns of weeds varied with response variable (actual weed locations versus weed density at random locations throughout the landscape) and the incorporation of private lands, characterized by less intense or localized lack of weed surveys, with public lands. Optimization of data quality by restriction of analysis to public lands in a landscape context identified elevation, maximum forage utilization by livestock and native ungulates, and past management treatments as predictors common to both Canada thistle and yellow starthistle distribution. Additional variables associated with the pattern of Canada thistle included heat-load and soil depth. The optimal model describing yellow starthistle distribution also included soil classification as vertisol, Natural Resources Conservation Service (NRCS) ecological type, woody vegetation cover, and average utilization by livestock and native ungulates. 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. Recent photo-retakes indicate that weed invasion continues at many locations across the monument (Figure 9).

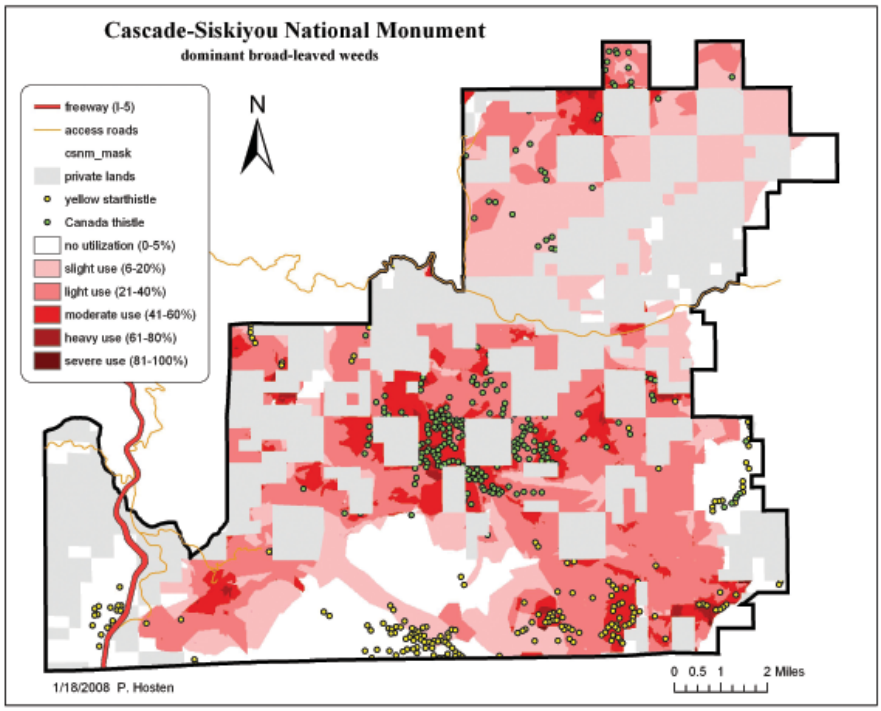


Figure 7 (top). An early field trip to examine the Canada thistle problem on Soda Mountain.

Figure 8 (left). The distribution of Canada thistle and yellow starthistle across the Cascade-Siskiyou National Monument.

Figure 9. Canada thistle has continued to increase in abundance in many high utilization areas close to water.

Citation: Hosten, P. E. 2007. Factors Controlling Patterns of Canada Thistle (Cirsium arvense) and Yellow Starthistle (Centaurea solstitialis) Across the Cascade-Siskiyou National Monument. U.S. Department of the Interior, Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

Habitat and Landscape Distribution of the Greene's Mariposa Lily across the Cascade-Siskiyou National Monument

The Cascade-Siskiyou National Monument includes a range of slope, elevation, soil types, and historic management activities. Greene's mariposa lily (*Calochortus greenei)* occupies a wide range of habitats primarily defined by topographic and edaphic factors. Several environmental factors are confounded with patterns of livestock use, making it difficult to separate the influence of individual factors (Figure 10). The inclusion of many environmental variables in multivariate models with little predictive power suggests that few generalizations about *C. greenei* abundance relative to environmental factors are valid across the larger landscape. Distance from vegetation edge was an important biotic variable incorporated in models of *C. greenei* population density across the landscape, suggesting that ecotones between soil types may play a role in defining suitable habitat. The varied localized influence of edaphic factors may indicate their indirect importance to *C. greenei* habitat by controlling the expression of mixed shrub and hardwood vegetation. Habitat analyses and examination of population size and change over time are similarly confounded by environmental and management factors. However, an examination within three areas of *C. greenei* aggregation with distinct soils and elevation indicate that the relative proportion of native perennial and non-native short-lived grasses is correlated with population size. These results suggest that invasive annual and short-lived perennial grasses may prevent the successful establishment and persistence of *C. greenei* seedlings, resulting in the long-term decline of populations in habitats and circumstances prone to invasion by ruderal species, including high livestock use areas.

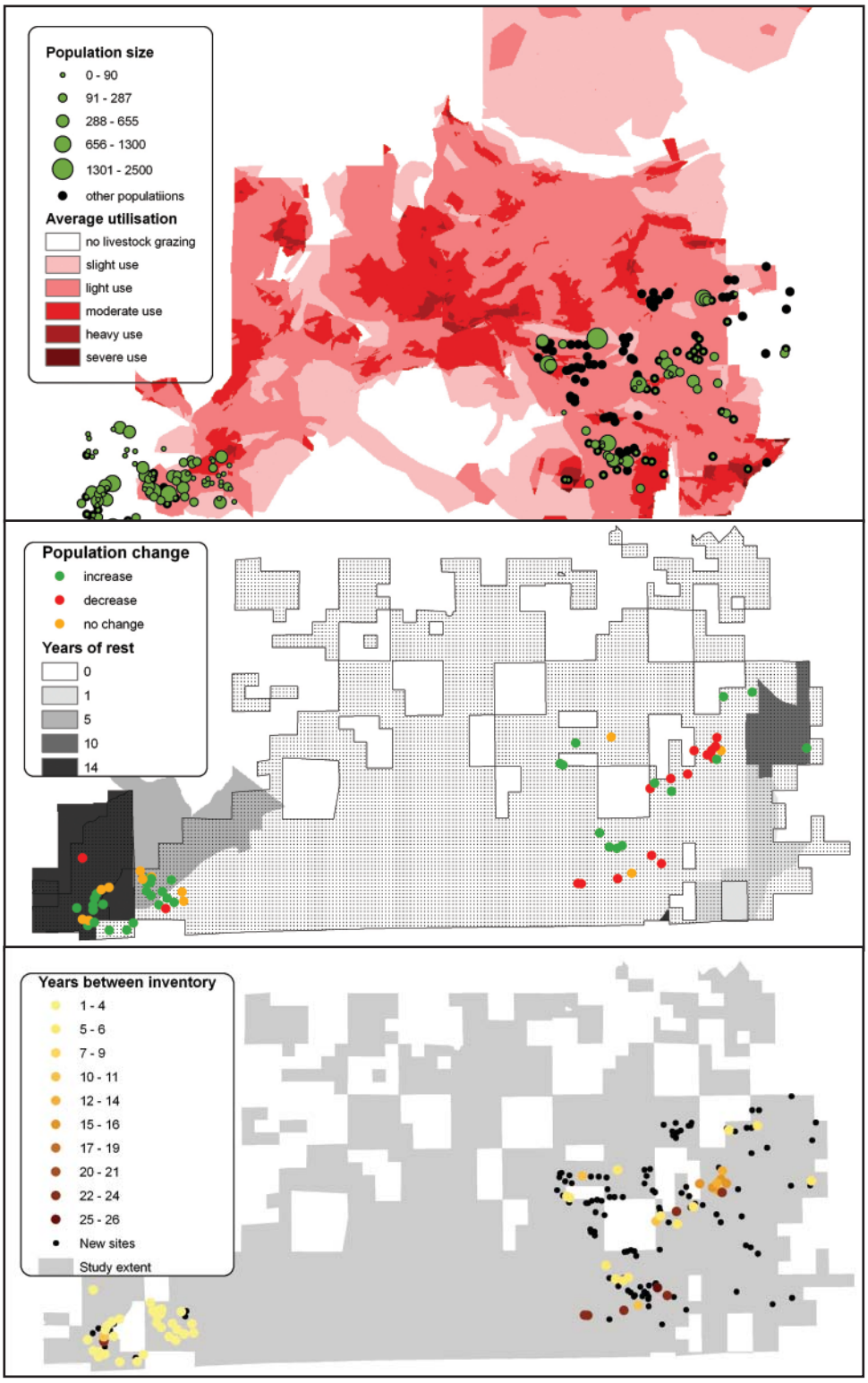


Figure 10. Distribution maps of C. greenei indicate factors confounding the distribution of C. greenei across the monument: a) C. greenei population sizes in relation to patterns of livestock utilization; b) Increasing, decreasing, and no-change C. greenei populations relative to areas rested from grazing; c) Years between C. greenei population surveys.

Citation: 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. U.S. Department of the Interior, Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

Vegetation Changes Associated with Livestock Exclusion from Riparian Areas on the Dead Indian Plateau of Southwest Oregon.

Livestock exclusion (more than 10 years) resulted in the colonization of bare soil by grasses and sedges, in turn replaced by riparian shrubs and trees. Similar patterns of change were observed in nearby paired grazed areas, though magnitudes of change were lower. The collection of repeat photos across the monument indicates that observations from photos of grazed areas paired to exclosures are representative of the larger monument landscape. The increase in woody vegetation across the landscape is likely a response to time since the last disturbance (fire and floods), a decline in spatial extent of livestock influence, and improved livestock management practices. In areas that have not experienced fire for many decades, and are not prone to scouring floods, livestock management factors are the most plausible explanation for increased riparian woody species abundance (Figure 11). The rapid recovery of riparian shrubs in areas with a cobbly substrate relative to areas with deeper alluvial soils may be due in part to the protection from grazing and hoof impact afforded by boulders. Improved management practices have allowed the development of riparian herbaceous vegetation and increased vegetative reproduction by aspen close to point sources of water and other intensely utilized areas of the landscape (Figure 12). Grazed seeps, springs, and small sagponds show less improvement of vegetation composition and structure over time than lotic riparian systems, a reflection of intense localized disturbance by livestock. One of the exclosures, formerly a ranch under private ownership, showed a replacement of yellow starthistle (*Centaurea solistitalis*) by annual grasses, perennial grasses, and riparian vegetation (Figure 13). Photos in grazed areas showed increased yellow starthistle in the vicinity of stockponds and Canada thistle (*Cirsium arvense*) in higher elevation highly utilized riparian areas. Observation indicates beaver activity is associated with the escape of riparian vegetation from the confines of cutbanks. Increased extent of riparian habitat, the girdling of conifer, and vegetative reproduction of hardwoods (willow, white alder, and aspen) emphasize the influence of beaver play on riparian composition and structure.

Figure 11. Parsnips Lakes shows an increase in woody riparian vegetation in areas not subjected to scouring floods or fire within living memory. These changes suggest that improved livestock management compared to historic times has allowed the recovery of riparian vegetation associated with creeks and large sagponds.

Figure 12. The Moon Prairie exclosure shows aspen regeneration in areas of livestock use adjacent to the fence.

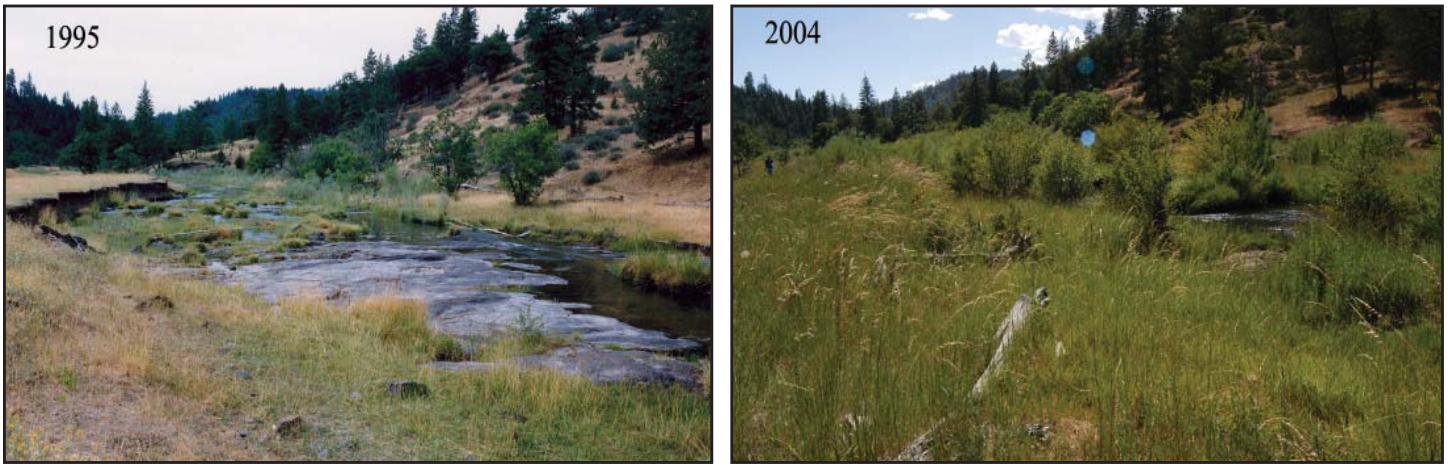


Figure 13. The former Box O Ranch shows an increase in wetland obligate species and decline of noxious weeds in the riparian area following livestock removal.

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

Spring Aquatic Invertebrates and their Relation to Environmental and Management Factors

The purpose of this study is to document the biodiversity of aquatic invertebrates in the Cascade–Siskiyou National Monument springs (Figure 14), and relate distribution patterns to environmental and management factors. Of particular interest is the influence of past and current management activities on aquatic macroinvertebrate distribution in the springs of the monument. The Cascade-Siskiyou National Monument springs are highly diverse, with 92 different genera being identified in the total number of 10,427 individuals collected. This diversity is similar to invertebrate diversity of other spring systems – even when sampling efforts of the other systems are much more extensive, or when the spring system covers a much larger geographic area (Figure 15). External factors used to explore interactions of spring invertebrates and environmental and management factors are many, and showed some general patterns – mainly intense utilization (by native and non-native ungulates) excludes certain invertebrate species considered intolerant of disturbance. However, high diversity and species indicative of clean water (mainly Ephemeroptera, Plecoptera, and Trichoptera) are compatible with low to moderate amounts of utilization. Although these patterns are distinct and supported by multiple analytical methods, there is a wide amount of variance associated with the data in general. Continued sampling, incorporation of quantitative sampling, and collection of more direct factors relating to macroinvertebrate distribution will help clarify the relationship of invertebrate biodiversity to management factors.

Figure 14. Sorting aquatic macroinvertebrates in the field.

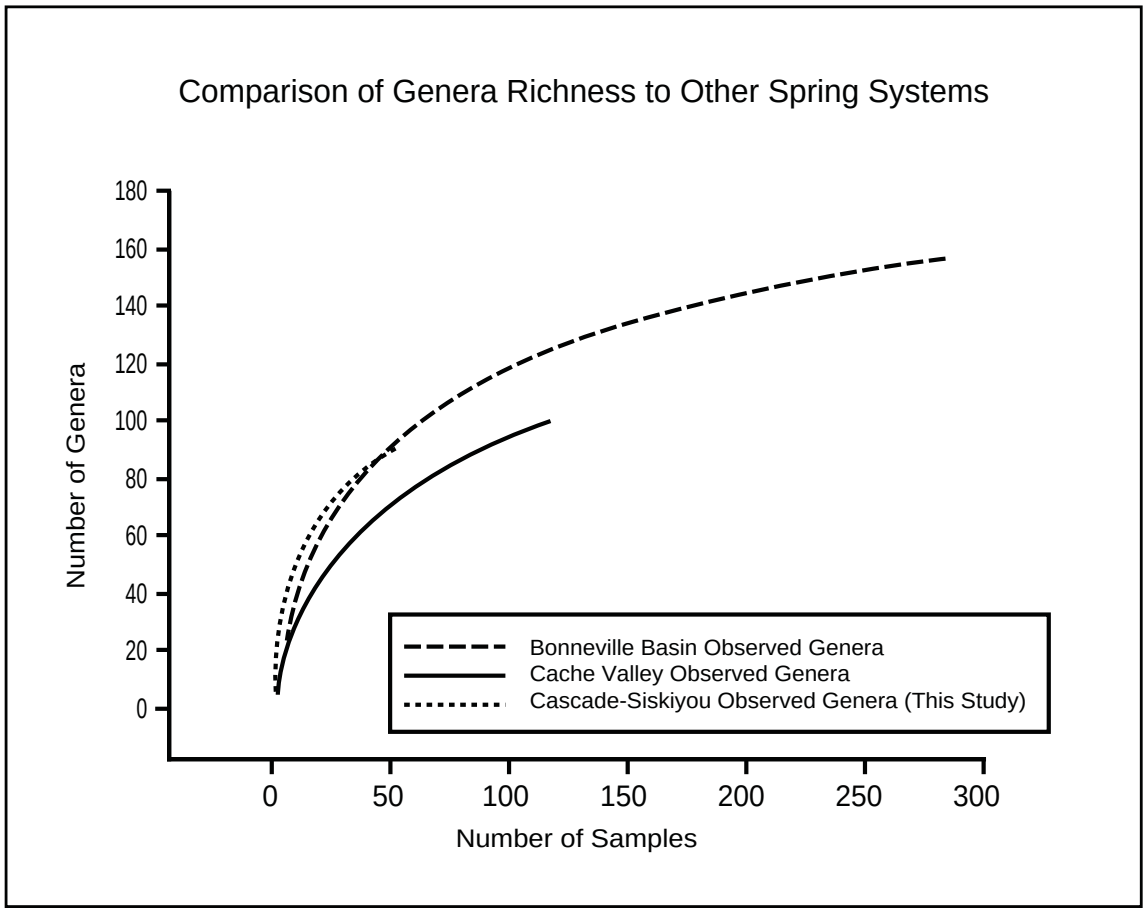


Figure 15. Comparisons of CSNM genus richness to other western spring systems.

Citation: 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. U.S. Department of the Interior, Bureau of Land Management, Medford District.
http://soda.sou.edu/bioregion.html

Population Characteristics of Jenny Creek Suckers (Catostomus rimiculus): Age-Size Relationships, Age Distribution, Apparent Densities, and Management Implications

Jenny Creek suckers (*Catostomus rimiculus*) are an isolated population of Klamath smallscale suckers, separated from the river by a large, natural waterfall. We compared growth rates between the Jenny Creek and Klamath River populations, aging fish by counting opercle annuli. The Jenny Creek suckers had slower growth rates. Maximum size (>200 mm SL) and size at maturation were also smaller in the stream-dwelling population. We then took our age-length regression and applied it to four summers of snorkeling population data for the Jenny Creek sucker. If our regression equation holds true for suckers over 170 mm, it is possible that Jenny Creek suckers are long-lived, unlike Santa Ana suckers (*C. santannae*), another smaller, stream-dwelling Catostomid. The population data from the 2003/2004 surveys found almost no adult Jenny Creek suckers compared to the data from the 1992/1993 surveys. This decline in adult suckers is troubling. Although young-of-the-year recruitment seemed to be taking place, an isolated population like the Jenny Creek sucker depends entirely on larval recruitment to sustain densities.

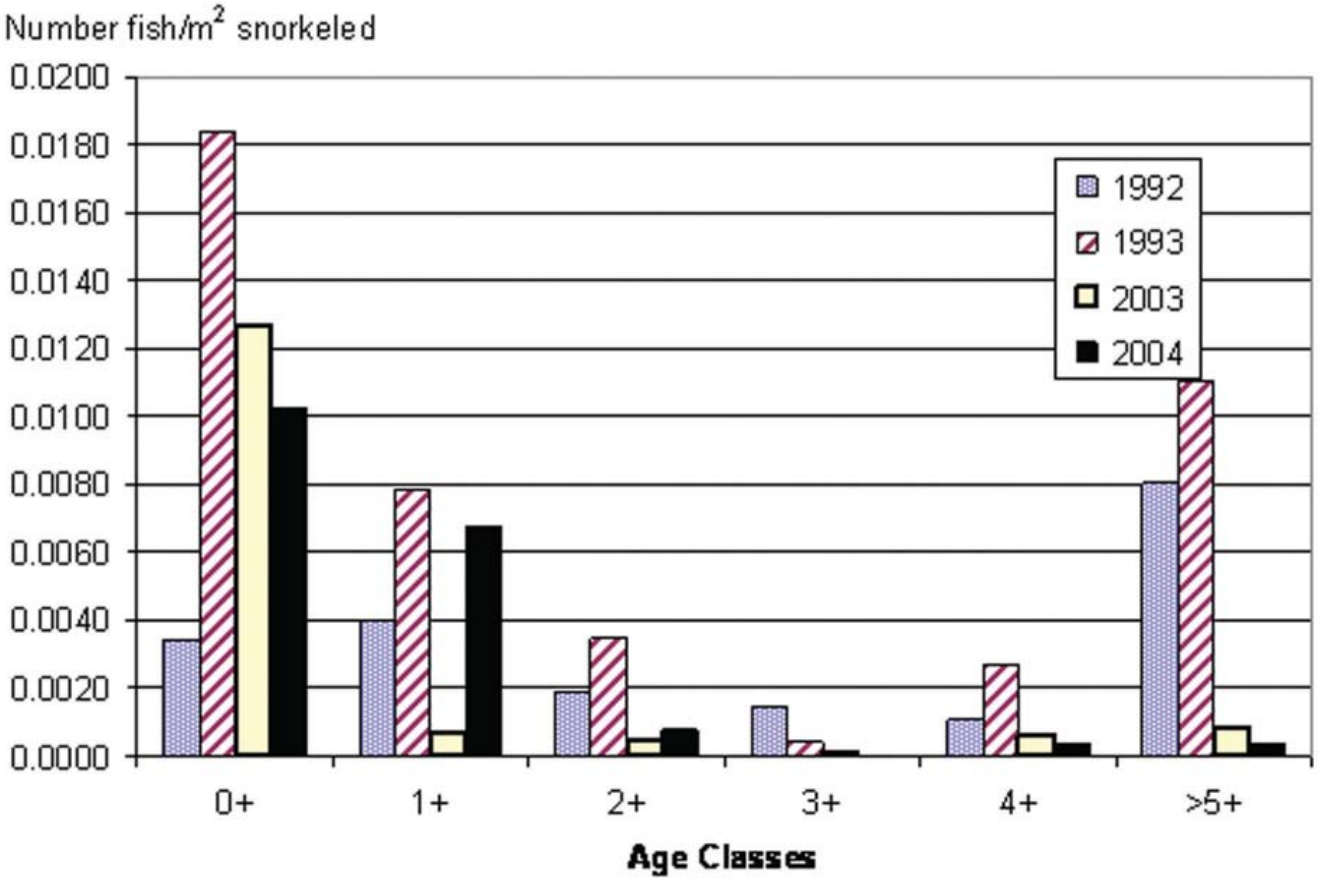


Figure 16. Jenny Creek sucker densities (number fish per m^{-2} snorkeled) by age class, based on length-age regression of fishes ages 2 – 5. Data from summer daylight snorkel surveys.

Citation: 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 U.S. Bureau of Land Management, Medford District. http://soda.sou.edu/bioregion.html

Diet Overlap and Social Interactions among Cattle, Horses, Deer, and Elk in the Cascade-Siskiyou National Monument

This paper examines fecal composition and movement patterns of cattle, horses, deer, and elk to determine the potential for competition between native and non-native ungulates. Fecal analysis of deer, elk, horse, and cattle scat in the Cascade-Siskiyou National Monument show similar composition and seasonal trends identified in the literature. Seasonal variation of plant fragments and seeds found in fecal composition studies includes: for cattle (June through October) an increase in use of forbs through the progression of the grazing season with a concomitant decrease in use of grasses; for deer, a high forb use (April through August) with a reciprocal use of shrubs; for elk, a high use of shrubs during July and August, high use of tree foliage during the winter months, and high use grass during the early growing season (April and May). Horses showed a consistent high use of grasses through the entire year. Fecal sedge composition for samples including riparian vegetation increased towards the end of the grazing season for cattle, indicating an increased use of riparian vegetation as the upland vegetation dried (Figure 17). Total average overlap of diet between cattle and native ungulates is 6% (min=0%; max=53%) for deer and 13% (min=0%; max=54%) for elk. The average percent similarity between samples of individual ungulates range from 31% (min=5%; max = 83%) for elk, 30 % for cattle (min=0%; max=95%), and 27% (min=0%; max=98) for deer. Average individual species dietary composition by month indicates that late

season cattle grazing is most similar to winter grazing by elk and early summer and fall grazing by deer. While approximately twenty individual plants were commonly used by deer, elk and livestock, diets were dissimilar enough to conclude that competition for forage and browse resources were unlikely within the monument area. Observations of the presence or absence of native ungulate scat and bedding sites, relative to cattle use at seeps and springs, indicated reduced sign by elk and deer in areas used by cattle. Deer and elk favored soil complexes, likely because such complexes support complex vegetation structure and composition thereby yielding several resource needs (browse, forage, and hiding cover). Telemetry data and observations indicated little interaction occurred between deer and cattle away from water sources. Telemetry data and observations indicate that elk move away from cattle to different habitats at the onset of cattle presence, but do not necessarily vacate larger pastures with livestock presence. The avoidance of cattle by elk in the summer, but subsequent intermingling of elk with livestock on private lands during the fall and winter may indicate a preference for segregation overcome by browse/forage constraints during the fall and winter months.

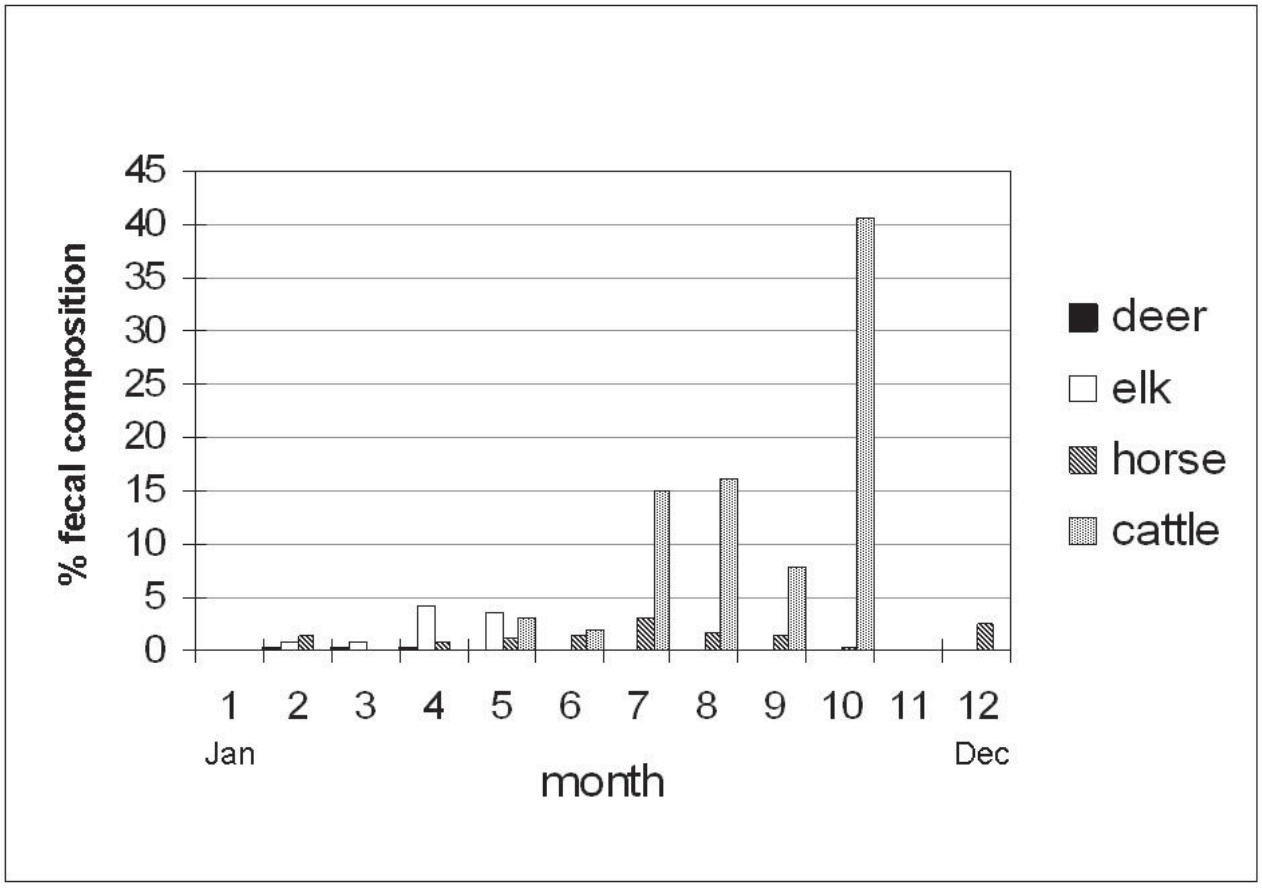


Figure 17. Fecal composition by sedge within samples including riparian vegetation.

Citation: Hosten, P. E., H. Whitridge, and M. Broyles. 2007. Diet Overlap and Social Interactions among Cattle, Horses, Deer, and Elk in the Cascade-Siskiyou National Monument, southwest Oregon. U.S. Department of the Interior, Bureau of Land Management, Medford District.
http://soda.sou.edu/bioregion.html

How Will the Data be Used?

The results of the Livestock Impacts Study will help: 1) evaluate the CSNM grazing allotments for lease renewal, and 2) determine if livestock grazing is compatible with "protecting the objects of biological interest." Rangeland Health Assessments are required on each allotment prior to consideration of grazing lease renewal. Assessments include field visits to the allotments and evaluation of all other available data as described in the Oregon Standards for Rangeland Health, in light of the Fundamentals of Rangeland Health at 43 CFR § 4180.1. The monument manager (authorized officer) will determine whether current livestock grazing practices within the monument allotments are meeting the Oregon Standards for Rangeland Health and if grazing practices are compatible with protecting "the objects of biological interest." Decisions regarding continued livestock grazing will utilize a landscape approach gained from this study mandated by the proclamation.