CONSERVATION AND RECOVERY STRATEGY FOR SAGE-GROUSE (*Centrocercus urophasianus*) AND SAGEBRUSH ECOSYSTEMS WITHIN THE DEVIL'S GARDEN / CLEAR LAKE POPULATION MANAGEMENT UNIT

Clear Lake Sage-Grouse Working Group

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TABLE OF CONTENTS

Chapter 1: General Overview of Sage-Grouse 13
Status As A Protected Species 13
Biology 13
Taxonomy and Description 13
Distribution 14
Life History and Habitat Requirements 15
Movement/Migration Patterns 21
Habitat Use of the Clear Lake Population 23
Population Viability 23
Sage-Grouse Genetics 23
Implications for the Clear Lake population 26
Chapter 2: History of the Devil's Garden Population 27
Clear Lake National Wildlife Refuge 30
Monitoring 32
Radio-telemetry Study of Sage-Grouse on the Clear Lake National Wildlife Refuge 33
Chapter 3: Sagebrush Ecosystems and Sage-grouse 35
Evolutionary History 35
Sagebrush 35
Sage-grouse 35
Sagebrush Ecosystems Today 35
Sagebrush Ecosystem Health and Condition 38
Implications for Management of Clear Lake AMA 39
Chapter 4: Habitat Management 40
Clear Lake National Wildlife Refuge – U.S. Fish & Wildlife Service 40
Land Use History 41
Modoc National Forest – U.S. Forest Service 42
Grazing History 43
Grazing Allotment Improvements & Re-vegetation History 48
Vegetation Description 50
Range Allotments 52
Fire History 53
Current Habitat Conditions in the Tucker and Carr Allotments 54
Line Transect Canopy Cover Measurements 55
Lava Beds National Monument – National Parks Service 57
Endangered/Threatened Species 58
Private Lands 59
Chapter 5: Habitat Conservation Assessment 60
Habitat Condition Assessment (R-Value) 60
Risk Factors Summary: 64
Habitat 64
Population 64
Elements not considered current risk factors in the PMU: 64
Predation, Production and Survival: 65
Emerging Threats 66
Energy Development 66
Disease 67
Chapter 6: Conservation Goals, Objectives, and Actions 68

Habitat Goals 69
Population Goals 73
Conservation Goals Summary 75
Description of Management Actions 76
Monitor populations and habitats 76
Private Lands 81
USDA-NRCS Conservation Planning 81
Grazing 82
Translocations 83
Literature Cited 85
Appendices 101
Appendix A: Devil's Garden/Clear Lake PMU Habitat Risk Assessment Matrix - April 2006 102
Appendix B: Biological Methods 109
Appendix C: Project Review Guidelines 115
Appendix D: Summary of Habitat Assessment and Monitoring 116
Appendix E: Land Health Standards. Grazing and OHV Guidelines 118
Appendix F: Regulatory Authority and Enforcement Guidelines Including Introductions Transplants & Re-establishment/ Augmentation 133
Appendix G: Sage-Grouse Lek and Other Habitat Informational Signs for Public Lands and Private Lands 135
Appendix H: Clear Lake / Devil's Garden Sage-Grouse Working Group and Technical Sub-Committee Members 136
Appendix I: Incentive Programs for Sage-grouse Habitat Enhancement on Private Lands 137
Appendix J: Summary of Sage-Grouse Reports for Clear and Klamath Lake National Wildlife Refuges – 1944-1999. 142
Appendix K. Habitat Conservation Prioritization (DRAFT) 160
Appendix L. Memorandum of Understanding/Conservation Agreement 163

INDEX OF TABLES

Table. 1. Consequences of inbreeding 24
Table 2. General ranges of precipitation, elevation, and soil depth for sagebrush cover types found in the PMU 36
Table 3. Range Improvement Projects within the Tucker Allotment 49
Table 4. Plants favored by sage-grouse, and their frequency of occurrence in the Tucker Grazing Allotment 51
Table 5. Cattle and sheep use permitted in 2005 for grazing allotments around the perimeter of Clear Lake and within the Devil's Garden/Clear Lake PMU. 53
Table 6. WAFWA Guidelines for Sage-Grouse Habitat as Compared to Clear Lake Habitat Area. 55
Table 7. Line transect estimates of cover. 55
Table 8. Line transect canopy cover estimates by transect. 56
Table 9. List of forbs identified in the study area, 2007. 56
Table 10. Estimated Habitat Characteristics ("R" Value) and acreages by Management Entity and Geographic Area 61
Table 11. WNv reports in mosquitoes (Mos) and birds, 2005-2007 67
Table 12. Management and Monitoring Responsibilities (2006 – 2016). 77

INDEX OF FIGURES

Figure 1. Location of management area in northeastern CA……12
Figure 2. Devil's Garden PMU and Clear Lake Active Management Area……12
Figure 3. Current and estimated historic Greater Sage-Grouse population distribution……..14
Figure 4. Regional sage-grouse populations, USFWS……..15
Figure 5. Use of Clear Lake area by translocated grouse, 2005……..22
Figure 6. The increase of average inbreeding coefficient as a function of genetic effective population size and the number of generation of breeding……...……25
Figure 7. Estimated average yearly sage-grouse harvest by county……..……27
Figure 8. Locations of original 56 leks in Devil's Garden PMU…….……..……27
Figure 9. Devil's Garden Male Sage-grouse Counts, 1950-2007……..……..28
Figure 10. Peak makle lek counts at Clear Lake NWR…….……29
Figure 11. Photo: 1948, 46 leks active……....29
Figure 12. Photo: 1998, 1 lek active……29
Figure 13. Sage-grouse Lek Counts, Clear Lake NWR 1989-2004……31
Figure 14. Radio-Telemetry locations for aerially-tracked grouse, April 2000-April 2008…...34
Figure 15. Conceptual model illustrating factors influencing the expansion of western juniper since the late 1800's and throughout the 1900's…….....……....38
Figure 16. Looking east from the lower crest of the Clear Lake Hills, April 2007….....39
Figure 17. Big sagebrush transect, west of Clear Lake Hills, 2007……..…..39
Figure 18. Juniper-invaded low-sage site……..…..39
Figure 19. Low sagebrush site on Clear Lake "U", October 2007…….…..40
Figure 20. Grazing allotments in Clear Lake AMA……42
Figure 21. Approximate area of cattle range (circa 1900) described in MNF history…….. 43
Figure 22. Approximate area of cattle range 1916-1918, described as summer range in MNF history……44
Figure 23. Approximate area of horse ranges, 1916-1918(?), described in MNF history……44
Figure 24. Interstate Deer Herd shows heaviest grazing pressure……..45
Figure 25. Approximate area of Intersate Deer Herd range, 1949 (Dasmann)……..46
Figure 26. Approximate area of sheep range, 1917-1920, described in MNF history……..46
Figure 27. Approximate area of sheep range, 1916-1918…….……47
Figure 28. Approximate area of lambing range described in MNF history……47
Figure 29. Combined grazed units for the Interstate Deer Herd winter range, west to the Lower Klamath Lake/Mt. Done area……48
Figure 30. Tucker Allotment – from MNF GIS……50
Figure 31. Clear Lake Allotment – from MNF GIS……..51
Figure 32. Devil's Garden Grazing Allotments……..…...52
Figure 33. Fire Areas and Years of Occurrence for MNF, 1900-2003……..……..54
Figure 34. R-Value Habitat Classifications in Active Management Area……..……..63
Figure 35. GIS analysis of juniper canopy cover on Doublehead Mountain, from 2005 NAIP imagery…….…63
Figure 36. Map of raven population change in CA, 1966-1999…….…...65
Figure 37. Devil's Garden Wild Horse Territory……..82

LIST OF ACRONYMS USED

Agencies/Organizations

BLM	Bureau of Land Management (USDI)
BIA	Bureau of Indian Affairs (USDI)
CalPIF	California Partners In Flight (http://www.prbo.org/calpif/)
CDF	California Department of Forestry
CDFG	California Department of Fish and Game
SGWG	Devil's Garden / Clear Lake Sage-grouse Working Group
MNF	Modoc National Forest (USFS)
NFWF	National Fish and Wildlife Foundation (www.nfwf.org/)
NPS	National Parks Service (USDI)
NRCS	Natural Resources Conservation Service (USDA)
RCD	Resource Conservation District (public, associated with USDA-NRCS)
RHJV	Riparian Habitat Joint Venture (http://www.tws-west.org/riparian/rhjv.html)
SLC	State Lands Commission
UCCE	University of California Cooperative Extension (http://cemodoc.ucdavis.edu/)
USDA	United State Department of Agriculture
USDI	United States Department of the Interior
USFS	United States Forest Service (USDA)
USFWS	United States Fish and Wildlife Service (USDI)
WAFWA	Western Association of Fish and Wildlife Agencies (http://www.wafwa.org/)
WCB	Wildlife Conservation Board (State of California; http://www.wcb.ca.gov/)

Programs/Policies

CCI	Cooperative Conservation Initiative (USDI, www.doi.gov/initiatives/conservation.html)
NCCP	Natural Communities Conservation Planning Program (CDFG)
CCR	California Code of Regulations
CEQA	California Environmental Quality Act (ceres.ca.gov/ceqa/)
CESA	California Endangered Species Act (http://www.dfg.ca.gov/hcpb/ceqacesa/cesa/incidental/cesa_policy_law.shtml)
CRHCP	California Riparian Habitat Conservation Program http://www.wcb.ca.gov/Pages/california_riparian_habitat_conservation_program.htm)
CRP	USDA Conservation Reserve Program (www.nrcs.usda.gov/Programs/crp/)
EQIP	USDA Environmental Quality Incentives Program (www.nrcs.usda.gov/Programs/eqip/)
NEPA	National Environmental Policy Act (http://www.epa.gov/compliance/nepa/)
PLM	California Private Lands Management Program (CDFG; http://www.dfg.ca.gov/hunting/deer/plm.html)
WHIP	USDA Wildlife Habitat Incentives Program (www.nrcs.usda.gov/Programs/whip/)

General/Technical

AMA	Active Management Area
AML	Appropriate Management Level (Wild horse/burro population target)
BP	Before Present
CA	Conservation Agreement
CCS	Challenge Cost Share
CE	Conservation Easement(s)
CFR	Code of Federal Regulations
CS	Conservation Strategy
DM	Data Manager
ESA	Endangered Species Act of 1973, as amended
FLPMA	Federal Land Policy Management Act
GBH	Great Basin Heritage
GIS	Geographical Information System (Computer-based mapping software)
HMA	Herd Management Area (BLM)
LIP	Landowner Incentives Programs (NDOW, USFWS, etc.)
LUP	Land Use Plan (BLM)
MLRA	Major Land Resource Area (USDA-NRCS)
MOU	Memorandum of Understanding
OHV	Off-Highway Vehicle
PMU	Population Management Unit
RMP	Resource Management Plan
TBD	To Be Determined
TSC	Technical Sub-Committee
WNv	West Nile Virus
WPB	Wildlife Programs Branch (CDFG)
WSA	Wilderness Study Area (BLM)

This document is intended as a tool for the conservation and recovery of the Clear Lake sage-grouse population. We anticipate that with the progression of time and the accumulation of more detailed information, habitat and population assessments and management strategies and priorities will change. The success of this effort to recover a viable sage-grouse population in the Devil's Garden/Clear Lake PMU is dependent upon the continued cooperative partnership and participation among the agencies, organizations and private individuals identified in this document, and others who may join the effort in the future.

Partners in Sage-Grouse Conservation:
Devil's Garden/Clear Lake PMU

A Memorandum of Understanding (MOU) between the BLM, USFS and USFWS and WAFWA was signed on August 14, 2000 to undertake conservation planning to improve populations, reverse habitat declines, demonstrate the commitment of all involved to the long-term conservation of the species, and perhaps, to preclude the need to list sage-grouse as threatened or endangered.

The following have committed to the planning and implementation of a conservation strategy in the Devil's Garden/Clear Lake PMU:

- Bureau of Land Management (USDI-BLM)
- California Department of Fish and Game (CDFG)
- U.S. Forest Service (USDA-USFS) – Modoc National Forest
- U.S. Fish and Wildlife Service (USDI-USFWS)
- Local Landowners
- Natural Resources Conservation Service (USDA-NRCS)
- University of California Cooperative Extension (UCCE)

These constitute the primary participants in the Devil's Garden/Clear Lake Sage-grouse Working Group (DG/CL SGWG).

Primary Missions of Agency Partners:

BLM: The USDI-BLM manages public lands in accordance with the Federal Land Policy and Management Act of 1976 (FLPMA). Wild horses and burros are managed in accordance with the Wild Free-Roaming Horse and Burro Act of December 15, 1971 [16 U.S.C. 1331-1340].

CDFG: The mission of CDFG is to manage California's diverse fish, wildlife, and plant resources. These are to be managed for their ecological values and for their use and enjoyment by the public.

NPS – Lava Beds National Monument: Lava Beds National Monument is a unit of the National Park System and is managed by the National Park Service. As part of the National Park System, Lava Beds' mandate includes the protection and preservation of natural and cultural resources. The mandate is derived from the National Park Service Organic Act of 1916 which outlines the fundamental purposes of the National Park System. The mandate also directs the National Park Service to allow for public use and enjoyment of national parks, provided that the resources therein remain unimpaired for future generations. The conservation of resources, both natural and cultural takes primacy over all other activities.

USFS – Modoc National Forest: The mission of the USDA Forest Service is to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations.

USFWS – Clear Lake National Wildlife Refuge: The U.S. Fish and Wildlife Service is the principal Federal agency responsible for conserving, protecting and enhancing fish, wildlife and plants and their habitats for the continuing benefit of the American people.

USDA-NRCS: The Natural Resource Conservation Service's mission is to provide leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment with a vision of harmony between people and the land.

UCCE: The University of California Cooperative Extension (UCCE) conducts county-based applied research, education outreach, and other creative activities to help local or regional clientele groups effectively solve problems or improve upon current conditions.

Introduction:

This recovery plan was modeled on the Buffalo-Skedaddle Sage-Grouse Conservation Strategy, borrowing some of the general content from that document and adapting selections from other sage-grouse plans where appropriate. Members of the Devil's Garden/Clear Lake Sage-Grouse Working Group (DGWG) provided critical background information and assistance to the technical subcommittee (TSC) which developed this document. The following subcommittee members contributed significant time and material directly towards the creation of this plan:

John Beckstrand, USFWS
Patricia Buettner, USFS
Ed Burns, USDA-NRCS
Marc Horney, USDA-NRCS
Don Lancaster, UCCE
Paul Schmidt, BLM
Richard Shinn, CDFG

Description of the Sage-Grouse Management Area

The Devil's Garden PMU (Figs 1 & 2) is located in the northeast corner of California, covering roughly one quarter of Modoc County and a portion of eastern Siskiyou County. The entire PMU is approximately 1,140,000 acres in size. There are 39 grazing allotments (entire or partial) in the Devil's Garden, which encompass 817,000 acres. The PMU also includes a 300,000 acre Wild Horse Territory (Fig 32) that includes all or portions of 21 of the grazing allotments. The USFS manages most of the land in the Devil's Garden PMU through the Modoc National Forest. Additional lands are held by the Bureau of Indian Affairs (BIA), the Bureau of Land Management (BLM), the California Department of Fish & Game (CDFG), the National Park Service (NPS; Lava Beds National Monument), the California State Lands Commission (SLC), the US Fish & Wildlife Service (USFWS), and private landowners.

Although sage-grouse were found throughout most of the PMU into the 1940's and 1950's, the population went into decline shortly thereafter. Primarily because the sole remaining active lek and known nesting/rearing areas are located there, the DGWG established the immediate area around Clear Lake National Wildlife Refuge (NWR) as the priority area for sage-grouse population and habitat management until the population is capable of expanding to other locations. This region, referred to as the "Active Management Area" (AMA) in the recovery plan, is approximately 254,000 acres in size, excluding the surface of Clear Lake (Fig. 2).

Conservation Strategy (see Chapter 6 for detail)

After evaluating the available evidence, the DGWG determined that both recovering lost habitat extent and quality and achieving a viable breeding population are necessary for the permanent re-establishment of sage-grouse in the PMU. Although evidence indicates that sufficient habitat still exists in the PMU to support a viable population, if minimally so (≈500), the present population, estimated at less than 50 individuals, is not viable by any generally accepted measure of population viability (Chpt. 1, Population Viability) and is unlikely to

achieve viability without active intervention. Therefore the SGWG has placed a high priority on increasing the number of reproductively viable birds in the AMA. The primary cause of reductions in usable habitat area and quality throughout the PMU is the expansion and increase in density of western juniper (*Juniperus occidentalis*) (Chpt. 5). The BLM, USFWS, NPS (Lava Beds NM), USFS and private landowners (some with assistance from USDA-NRCS) have all been active in attempting to reduce juniper density in and near the AMA. To be successful, these efforts will need to be continued, maintained, and, especially, accelerated on USFS lands, which comprise 80% of the AMA (Fig. 2).

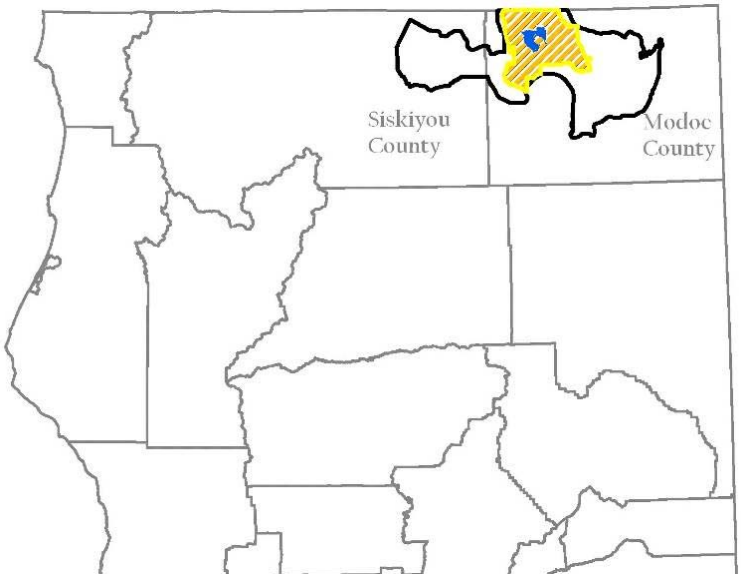


Figure 1. Location of management area in northeastern CA.

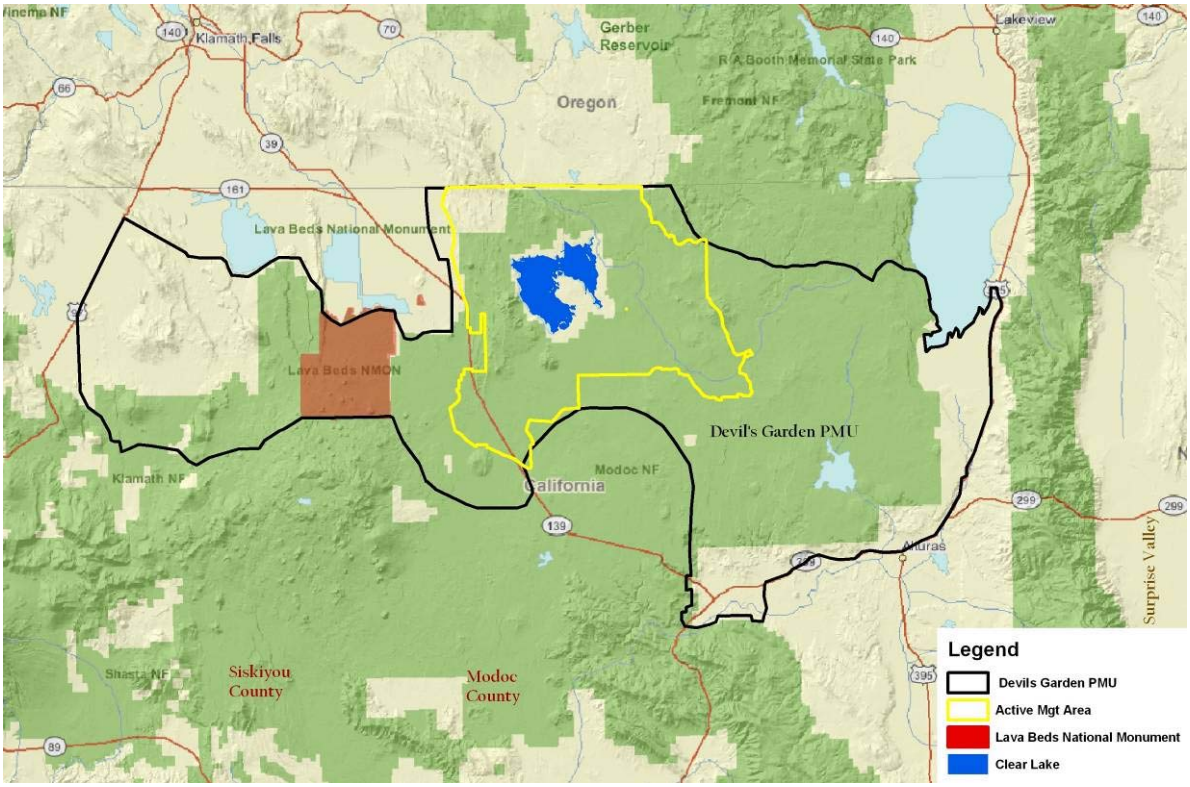


Figure 2. Devil's Garden PMU and Clear Lake Active Management Area

Chapter 1: General Overview of Sage-Grouse

Status as a Protected Species

Sage-grouse (*Centrocercus urophasianus*) is a sagebrush obligate species found in all the western states except Arizona and New Mexico. Breeding populations have declined by 17 – 47% throughout much of its range (Schroeder, 2004; Connelly et al., 2004; Connelly and Braun 1997). The Gunnison sage-grouse, Washington greater sage-grouse populations, and Mono Basin/Lyon sage-grouse population, and greater sage-grouse rangelwide have been petitioned for listing under the Endangered Species Act. The Gunnision sage-grouse and Washington greater sage-grouse populations were given candidacy, though candidacy has since been withdrawn for the Gunnison sage-grouse. To date, the petition to list greater sage-grouse rangewide has been found to lack sufficient merit to warrant listing by the U.S. Fish and Wildlife Service (Federal Register, 2005). However, the FWS's 12-month status review decision was challenged in Federal District Court and has been remanded back to FWS to re-evaluate the merit of listing the sage-grouse. In California, sage-grouse are a resident upland game-bird (Fish and Game Code Section 3500) and a species of special concern. The Bureau of Land Management (BLM) in California and the U.S. Forest Service consider the sage-grouse a Sensitive Species.

Biology

Taxonomy and Description

The sage-grouse is a member of the subfamily Tetraoninae (Tetraonids; which includes grouse and ptarmigans) within Phasianidae and is one of seven species of grouse found in North America. Also known as the "sage hen", "sage chicken", or "sage cock", the first written accounts of the species were made by Lewis and Clark in 1805. The species was formally described as *Tetrao urophasianus* by C.L. Bonaparte (1827) and later placed in a monotypic genus Centrocercus, meaning "spiny-tailed pheasant," by Swainson and Richardson (1832). The species was later differentiated into two subspecies, the Western Sage-Grouse *(Centrocercus urophasianus phaios)* and the Eastern Sage-Grouse *(C. urophasianus urophasianus)* (Aldrich 1946, 1963; AOU 1957). However, similarities in appearance and morphological measurements resulted in poorly defined ranges. The Western Sage-Grouse was considered to occur west of a contact zone diagonally crossing southeast Oregon, northwest Nevada, and northeast California, while the Eastern Sage-Grouse was said to occur east of this zone (Schroeder et al. 1999). Recent genetic work by Benedict et al. (2003) and Oyler-McCance (2005) indicate that differences between the two subspecies exist, but they are not sufficient to warrant a subspecies designation. Thus the two subspecies previously recognized are now considered one species: the Greater Sage-Grouse *(Centrocercus urophasianus).* This is the species that inhabits the Devils Garden/Clear Lake area and is the focus of this management plan. For the purpose of simplicity, the name "sage-grouse" will be used to refer to this species in this document.

The same genetic sampling used to determine that there was no genetic basis for splitting sage-grouse into an eastern and western subspecies revealed a genetically distinct population of sage-grouse in Mono County, California and Lyon County, Nevada (Benedict et al., 2003 and Oyler-McCance, 2005). However, no obvious physical or morphological

differences exist between the Mono/Lyon birds and other greater sage-grouse and additional work may be warranted to determine if this population should formally be treated as a subspecies. Taylor and Young (2006) found no differences in strutting behavior between male greater sage-grouse in the Inyo/Mono population and in two others they surveyed. DNA work in recent years has identified a sage-grouse population in southwest Colorado with distinct genetic and behavioral characteristics in addition to being 2/3's the size of the Greater Sage-Grouse. This population has been recognized by the American Ornithologists Union as *Centrocercus minimus* and is known as the Gunnison Sage-Grouse. In 2000 the Gunnison sage-grouse was designated as a candidate for listing by the U.S. Fish and Wildlife Service.

The sage-grouse is the largest of the North American grouse. They are grayish-brown with a dark belly and long, pointed tail feathers. Males range from 27-34 inches in length and weigh five to seven pounds, while females are 18-24 inches in length and weigh from two to three pounds. The male is equipped with two air sacs (esophageal pouches); covered with short, stiff, scale-like white feathers, one on each side of the lower neck and upper breast. When the pouches are distended, two yellow, pear-shaped patches of bare skin are exposed. A yellow fleshy comb occurs above the eye, and long filoplumes extend from the back of the neck and head. The female has the same general appearance but lacks the air sacs and filoplumes. The feet are feathered to the toes on both sexes. Sage-grouse are relatively long-lived with birds surviving to 5 years or more are not unusual (Rue 1973). However, birds that live to age three or four years are considered old (Wallestad 1975).

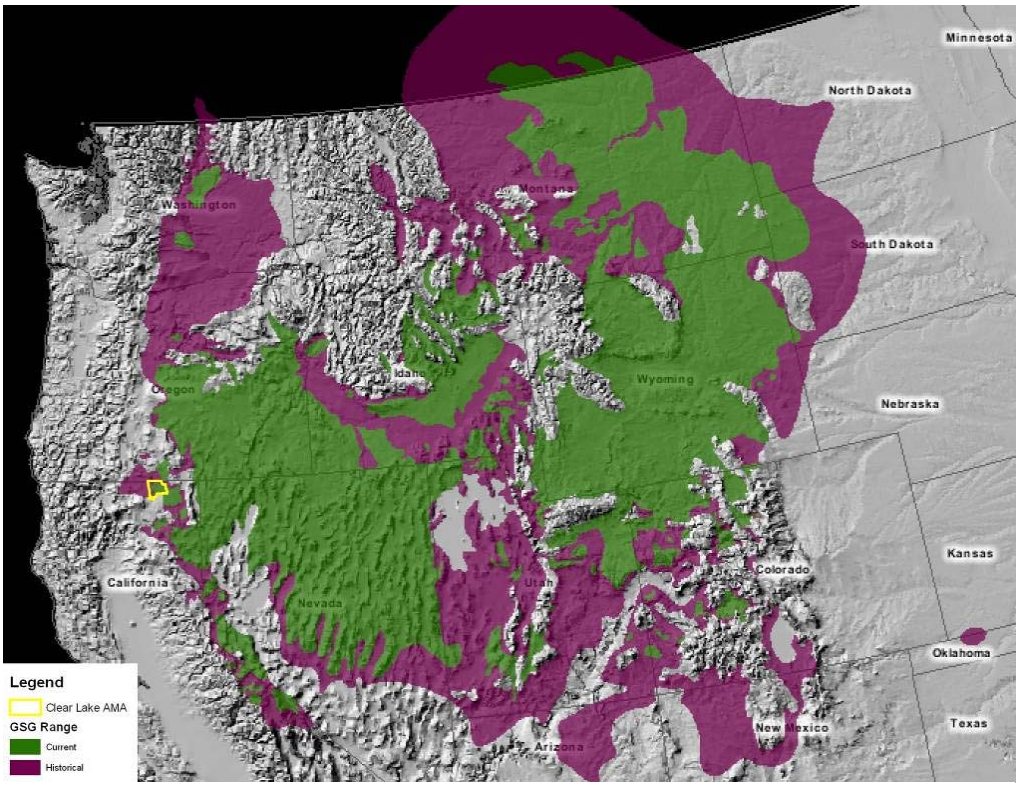


Figure 3. Current and estimated historic Greater Sage-Grouse population distribution, from Schroeder (2002).

Distribution

Historically sage-grouse were found throughout the western United States in 16 western states and 3 Canadian Provinces (AOU 1983; Aldrich 1963; Johnsgard 1973). Sage-grouse distribution closely paralleled the range of sagebrush (*Artemisia* spp.) from British Columbia, Alberta and Saskatchewan in the north; western Nebraska and the Dakotas to the east; Nevada, Utah, New Mexico and Oklahoma to the south, and eastern Oregon, Washington, and California to the west (Patterson 1952; Aldrich 1963; Guiquet 1970; Johnsgard 1973; Figure 3). In the last century sage-grouse became extirpated in British Columbia, Nebraska, New Mexico and Oklahoma

(Braun 1991, 1993). Greater sage-grouse are currently found in Washington, Oregon, California, Nevada, Utah, Colorado, Idaho, Montana, North Dakota, South Dakota, and Wyoming. They are also found in small populations in the Canadian provinces of Alberta and Saskatchewan. Today, the core of sage-grouse populations has contracted to include land in Colorado, Idaho, Montana, Nevada, Oregon, and Wyoming with remnant populations in other states (Figure 3).

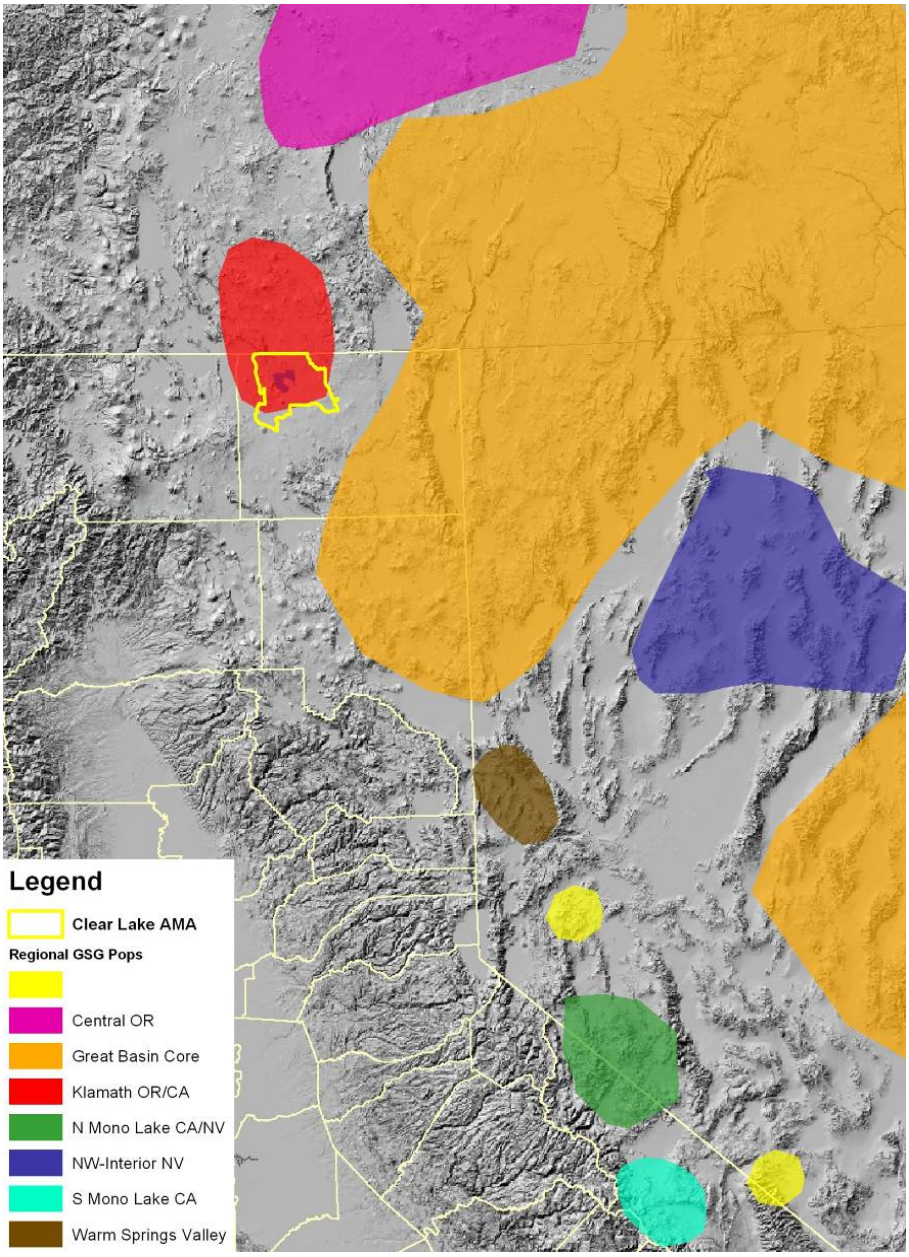


Figure 4. Regional sage-grouse populations, USFWS

Even within this remaining core area of their range, populations have dramatically declined (Braun 1998; Wisdom et al. 1998). Braun (1993) considered populations remaining in Alberta, North Dakota, Saskatchewan, South Dakota, California, Colorado, Utah and Washington to be "greatly reduced" or marginal." In California, the sage-grouse ranges from the Oregon border in northeastern California, along the east side of the Cascade Range and Sierra Nevada to northern Inyo County, with Lassen and Mono counties having the most stable populations (Fig. 4).

Connelly et al. (2004) places the Clear Lake population in the “Lake Area, OR/NE CA/NW NV” subpopulation. The population unit defined by the USFWS for the area around Clear Lake is “Klamath OR/CA” (Fig. 4).

Life History and Habitat Requirements

Breeding

Sage-grouse engage in a lek or strutting ground mating system where males perform a strutting display to attract females (Bond 1900; Scott 1942; Gullion 1957; Schroeder et al.,

1999). These activities are accompanied by movements and postures directed at other males (Hjorth 1970; Wiley 1973a) that act as a defense of the breeding territory (Hartzler 1972). However, only a few males on a lek do the majority of the mating, generally those located in the center of the lek (Gibson et al. 1991; Scott 1942; Lumsden 1968; Wiley 1973b; Hartzler and Jenni 1988). The display includes fanning the tail feathers to expose white-tipped under tail feathers, expanding the esophageal pouches that expose the yellow skin patches, and erection of the yellow eye-combs and filoplumes. The expansion of the pouches also produces a series of "plop" sounds that may be heard by humans over a mile away. Males begin displaying before dawn and continue until mid-morning unless interrupted by inclement weather or the presence of predators such as golden eagles or coyotes. Often they will begin again at dusk and continue into the night displaying by moonlight (Simon 1940; Scott 1942; Batterson and Morse 1948). When not strutting males generally fly to a roost site a short distance from the lek. In Northeast California males may begin strutting on leks in late February and continue into May.

Generally, the same leks are used year after year (Simon 1940; Scott 1942; Batterson and Morse 1948; Wiley 1978; Autenrieth 1981). Leks are established in small open areas, 0.2 to 12 acres in size, adjacent to large areas of sagebrush, which may be used for nesting as well as provide escape and protection from predators (Patterson 1952; Gill 1965). Lek sites may occur in low sagebrush flats, old lake beds or playas, openings on ridges, roads, crop land, burned areas and landing strips (Connelly et al. 1981; Gates 1985). For resident populations the lek is the center of year-round activity (Eng and Schladweiler 1972; Wallestad and Pyrah 1974; Wallestad and Schadweiler,1974). However, critical habitats that are essential for the survival of migratory populations of sage-grouse may be located long distances from leks (Connelly et al. 1988; Wakkinen et al. 1992). A decline in lek use by males or the discontinued use of some leks is often a sign of population decline. Likewise, increased lek attendances by males, reuse of old leks, or new lek establishment are often signs of a population increase.

Nesting

After mating, females leave the lek to nest, usually returning to the same area (often within 2,600 meters of the previous year's nest) each year (Fisher et al. 1993; Gates 1983; Lyon 2000). Nesting and early brood rearing in California generally occurs from April through June. Although the guidelines for maintenance of sage-grouse habitat (Braun et al. 1977) recommended no sagebrush control within two miles (3 km) of a lek to protect nesting and brood areas, several studies have demonstrated that hens will nest at considerable distance from the lek (Peterson 1980; Autenrieth 1981; Fischer 1994). On average, most nests are located within 4 miles (6.2 km) of the lek; however, some hens may nest more than 12 miles (20 km) from the lek (Autenrieth 1981; Wakkinen et al. 1992; Fisher 1994; Hanf et al. 1994). Autenrieth (1981) concluded that nest locations were related to quality of nesting cover. All nest building, incubation and brood rearing is done by the female. Away from the lek males don't display territorial behavior and flocks made up of only males are not uncommon outside of the mating season (Beck 1977).

The nest consists of a shallow depression on the ground, mostly under big sagebrush, with residual grasses or other vegetation for concealment of incubating hen (Terres 1991). Nest lining is sparse, consisting of dry grasses, sagebrush leaves and a few feathers (Batterson and Morse 1948; Autenrieth 1981).

The selection of nesting sites by sage-grouse is not clearly understood despite considerable investigation, but some general principles have been drawn. Popham and Gutierrez (2003) found that sage-grouse strongly preferred Wyoming big sagebrush (67%) and mixed shrub (29%) cover types for nesting compared to low sagebrush (4%) in their Lassen County, California study area. The selection of these three cover types differed from their availability in the study area, which was 58% for Wyoming big sagebrush, 13% for mixed shrub and 29% for low sagebrush. Sage-grouse nests were found located under Wyoming big sagebrush (59%), littleleaf horsebrush (*Tetradymia glabrata*; 17%), rabbitbrush (*Chrysothamnus* spp.; 7%), native bunchgrasses (6%), antelope bitterbrush (*Purshia tridentata*; 4.5%), low sagebrush (4.5%), and Mormon tea (*Ephedra viridis*; 2%). Nesting success was similar to success rates reported in other studies, and did not appear to vary by the species chosen for cover; however, the various cover types were not represented sufficiently well in the dataset for a formal test of this relationship. The authors suggest that sage-grouse select nesting cover on the basis of canopy structure rather than canopy species, at least in heterogeneous landscapes. By contrast, in Idaho habitats dominated by Wyoming big sagebrush, Connelly et al. (1991) reported that nests placed under Wyoming big sagebrush had greater success rates than those placed in other plant species.

Pure stands of sagebrush with few grasses and forbs are less valuable to sage-grouse than mixed stands (Trimble 1989). Very tall, mature stands of sagebrush often have reduced herbaceous cover within them (Klebenow 1969). Winward (1991) found that herbaceous cover associated with potential nest sites, and sage-grouse habitat in general, could be limited by excessive shrub canopy cover. When shrub canopy cover exceeded 10 to 12 percent in the Wyoming big sagebrush vegetation type, and approximately 15 percent in basin and mountain big sagebrush vegetation types, grass and forb cover needed for sage-grouse cover and forage could decrease due to competition with shrubs.

Shrub height reported at nest sites ranges from 9 to 39 inches (Patterson 1952; Klebenow 1969; Autenrieth 1981; Gregg et al. 1994; Sveum et al. 1998a; Schroeder et al. 1999) but shrubs that are taller than the average shrub height at a given site appear to be preferred (Keller et al. 1941; Trueblood 1954; Klebenow 1969; Wallestad and Pyrah 1974; Autenrieth 1981; Keister and Willis 1986). In Lassen County, California (Popham, 2000) found that total shrub height was higher at successful nests than at unsuccessful ones (24-28” vs. 18-20”).

In core sage-grouse habitat areas, preferred nesting habitat has been characterized as primarily Wyoming big sagebrush communities of 15 to 38 percent canopy cover and a grass and forb understory (Connelly et al. 1991; Gregg et al. 1994; Sveum et al. 1998a). In Montana (Wallestad and Pyrah 1974) and Oregon (Gregg 1991) sagebrush cover near the nest site was greater around successful nests than unsuccessful nests. Wallestad and Pyrah (1974) also indicated that successful nests were in sagebrush stands with greater average canopy coverage (27%) than those of unsuccessful nests (20%). Similarly, Gregg (1991) found that grass cover was greater at successful nests than at unsuccessful nests in Oregon. Nests located in sagebrush stands 16” to 32” in height with grasses averaging more than 7” tall had less predation than nests located in similar sagebrush stands where grasses were shorter (Gregg et al. 1994).

These studies, however, may not as accurately represent habitat use by sage-grouse in this PMU as they do for habitats located further into the core habitat area. The Devil’s Garden /

Clear Lake PMU is on the edge of what is believed to have been the historical range for the species (Fig. 3), and the big sagebrush communities more typical of core habitat areas are a minor component of this landscape, which is instead dominated by low sagebrush and other shrubs. In a study conducted in Lassen County, Popham and Gutierrez (2003) reported that, while it was a common shrub on the landscape, sage-grouse avoided using low sagebrush for nesting, preferring taller shrub species Including Wyoming big sagebrush, littleleaf horsebrush and rabbitbrush. Telemetry data for grouse translocated into Clear Lake since 2005 indicate that hens are consistently using low/Lahontan sagebrush during the nesting season (Clear Lake Hills, plains east of Clear Lake Hills, and the Clear Lake "U"; Fig. 5). Big sagebrush, generally thought to be preferred for siting nests, is much less common than low sagebrush throughout the management area, which may partly explain this behavior. Detailed mapping of sagebrush populations throughout the AMA is planned to begin in summer/fall 2008, and this may help reveal more details about sage-grouse selection and use of sagebrush species for nesting.

Clutch size of sage-grouse nests range from six to twelve eggs (Schroeder 1997). These differences may be related to habitat quality and overall condition of pre-laying females (Coggins 1998). Sage-grouse eggs are olive to olive buff in color with brown spots and dots (Harrison 1978). Eggs are laid three to 14 days after copulation at a rate of two eggs every three days (Peterson 1980). Incubation lasts for 25-28 days, and begins within two days after the last egg has been laid (Peterson 1980). During incubation the hen will leave the nest to feed and loaf, usually during early morning and evening for up to a half hour (Autenrieth 1981).

Nesting rates vary from year to year and from area to area (Schroeder 1997; Connelly et al. 1993; Gregg 1991; Bergerud 1988a; Coggins 1998). This variation is likely a result of forage quality (nutritional value) and the general health of pre-laying females (Barnett and Crawford, 1994). Up to 70 percent of the females in studied populations have initiated nests each year. Higher nest initiation rates were recorded during years of higher precipitation as compared to nest initiation rates during periods of drought (Coggins 1998). Because sage-grouse breed early in the spring, diets of pre-nesting hens are usually limited to sagebrush leaves.. During warm springs, however, hens may supplement their diets with forbs. Preferred rangeland forbs have more protein, calcium and phosphorus than sagebrush in the early spring (Barnett and Crawford, 1994), allowing for better egg production and higher chick survival. Sage-grouse hens are so effective at digesting sagebrush leaves that they are able to gain body condition over the winter on a nearly exclusively sagebrush diet.

The re-nesting rate for females is 10 to 40 percent; far lower than that of other upland game birds (Connelly et al. 1993; Patterson 1952; Eng 1963; Petersen 1980; Bergerud 1988a). Nest success is also highly variable depending on the year and area. Studies have shown nest success rates of 10 to 86 percent (Trueblood 1954; Gregg 1991; Connelly et al. 1993; Schroeder 1997). Adult females may have higher success rates than yearling females (Wallestad and Pyrah 1974), a characteristic that may be related to past nesting experience.

Other Nesting Season Habitat Use

Males and non-nesting females gather in flocks during the nesting season. They may feed in open areas such as low sagebrush sites, burned areas or other areas where forbs are

abundant and roost in nearby big sagebrush stands. In southeastern Oregon and Nevada, these flocks used mosaics of low and big sagebrush.

Early Brood Rearing

A clutch of sage-grouse eggs will usually hatch within an hour of each other and the young can be led away from the nest as soon as the natal down is dry. (Wallestad 1971). Chicks weigh approximately one ounce (30 to 31 grams) at hatching (Peterson 1980), but quickly gain weight. Chicks are precocial and begin feeding immediately after hatching.

The area in proximity to the nest is used for several weeks by hens for brood rearing. During the first week the hen broods the chicks for approximately half of the daylight hours, but only rarely by the second week after hatching (Schroeder et al. 1999). By the time they are 10 days old chicks are able to fly weakly; becoming relatively strong fliers by five weeks of age (Girard 1937). Chicks develop rapidly during the first few weeks and the habitat must meet their nutritional requirements and provide cover for concealment. Brood areas are characterized by a richness of plant species, especially forbs, and insects (Dunn and Braun, 1986; Klott and Lindzey 1990; Drut et al. 1994a; Apa 1998). Sage-grouse chicks rely on insects early in their lives and gradually switch to forbs and shrub foliage as they mature (Patterson 1952; Klebenow and Gray 1968; Wallestad 1971; Klebenow 1985). Ants and beetles are two of the more important insect foods to recently hatched sage-grouse chicks (Drut et al. 1994; Fischer et al. 1996). Forbs increase in the diet after the first week and remain the major food item for juveniles throughout the summer. Some of the forbs found in quantity in the diets of juvenile sage-grouse include: common dandelion (*Taxaxacum officinale*), common salsify (*Tragopogon dubius*), prickly lettuce (*Lactuca serriola*), pepperweed (*Lepidium densiflorum*), Harkness gilia (*Linanthus harknessii*), tapertip hawksbeard (*Crepis acuminate*), loco (*Astragalus convallarius*), phlox (*Phlox longifolia*), and common yarrow (*Achillea millifolum*) (Klebenow and Gray 1968; Peterson 1970). Sagebrush (*Artemisia* spp.) occurs in only trace amounts until chicks are about five weeks old (Klebenow and Gray 1968; Peterson 1970). Diets of sage-grouse chicks in Oregon included 34 genera of forbs and 41 families of invertebrates (Drut et al. 1994b). Optimum brood-rearing habitat has been described as sagebrush stands that are 16 to 32 inches tall with a canopy cover of 10 percent to 25 percent and an herbaceous understory of 15 percent grass canopy and 10 percent forb canopy (this is consistent with nesting habitat). This type of habitat will be found, ideally, on at least 40 percent of the area that is considered brood rearing habitat (Connelly et al., 2000).

Summer Brood Habitat

At six weeks of age hens will usually move the chicks from the nest area/early brood habitat to summer habitat, where the majority of brood rearing occurs. Males and females without broods typically move to summer range two weeks before that of hens with broods (Connelly et al. 1988). By the time they are six to eight weeks old chicks have acquired full juvenile plumage and resemble adult hens. Summer habitat consists of sagebrush mixed with areas of wet meadows, riparian, or irrigated agricultural fields (Connelly et al., 2000). In general, a sagebrush ecosystem with a good understory of grasses and forbs, and associated wet meadow areas, are essential for optimum habitat.

The food habits of adult grouse during the summer are similar to juvenile food habits, with some differences in proportion of foods eaten. As upland habitats begin to dry up, sage-grouse broods move to more wet meadows where succulent grasses and insects are still available (Savage 1968; Schlatterer and Pyrah 1970; Oakleaf 1971; Neel 1980; Autenrieth 1981; Klebenow 1985; McAdoo et al. 1986). This can be especially important in drier years and during long drought periods. Klebenow (1982) found that sage-grouse would stay on the uplands through late July in years when precipitation was sufficient to maintain forage. However, during drought years, grouse switched to using meadows earlier in the summer.

Fall and Winter

Early in the fall sage-grouse broods begin to break up and flocks form. The diet of sage-grouse shifts primarily to sagebrush leaves as meadows dry and frost kills the remaining forbs (Patterson 1952; Connelly and Markham 1983; Connelly et al. 1988; Wallestad 1975). As fall progresses toward winter, sage-grouse move toward their winter ranges. Observations from Idaho showed these movements to wintering areas to be slow and meandering, occurring between late August and December (Connelly et al. 1988). Exact timing of this movement varies depending on the sage-grouse population, geographic area, overall weather conditions, and snow depth. However, Connelly and Markham (1983) observed that most sage-grouse in a southeastern Idaho population had abandoned summer use areas by early October.

Sagebrush is essential for survival during the fall, winter, and early spring months because their winter diet consists almost exclusively of sagebrush leaves. Food and cover is provided by a mosaic of sagebrush species of varying heights and densities. Observational evidence suggests that, where snow accumulation is significant and variable, winter use areas are selected more on the basis of sagebrush exposure than any persistent affinity for a particular site (Beck 1977; Barrington and Back 1984). It is crucial that at least 10 to 12 inches of sagebrush be exposed to provide food and cover for wintering sage-grouse (Barrington and Back 1984; Hupp and Braun 1989). Wallestad (1975) found that in Montana less than 10 percent of the range was available when snow depth exceeded 12 inches. Also in Montana, most observations of radio-marked sage-grouse during winter occurred in sagebrush habitats with > 20 percent canopy cover (Eng and Schladweiler 1972; and Wallestad 1975). However, during 3 winters in southeastern Idaho Robertson (1991) indicated that sage-grouse used sage brush habitats that had average canopy coverage of 15 percent and average height of 18 inches. In cold wet winters, the amount of winter range is expected to be substantially reduced. During days or nights of strong winds, rain or snow, sage-grouse may roost in big sagebrush canopies, if they are available. Other shrub species may be used in this fashion as well, to some extent, although this has not been documented. In Idaho, sage-grouse selected areas with greater canopy cover of Wyoming big sagebrush *(A. tridentata wyomingensis)* in stands containing taller shrubs when compared to random sites (Robertson, 1991). Although big sagebrush dominates the diet in most portions of the range (Patterson, 1952; Wallestad et al. 1975; Remington and Braun 1985; Welch et al. 1988, 1991), low sagebrush (*A. arbuscula*), black sagebrush (*A. nova*; Dalke et al. 1963; Beck 1977), fringed sagebrush (*A. frigida*; Wallestad et al. 1975), and silver sagebrush (*A. cana*; Aldridge, 1998) are consumed in many areas depending on availability. Barrington and Back (1984) found that low sage was the preferred foraging and night roosting habitat during the fall. Low sagebrush was used as long as available in northeastern Nevada (Barrington and Back, 1984) and Idaho (Crawford, 1960), with birds moving to big sagebrush sites as snow depths increased.

Low sagebrush *(Artemisia arbuscula ssp. arbuscula)* and Lahontan sagebrush (*Artemisia arbuscula longicaulis*) communities are both common in northeastern California, and are considered more widespread in the PMU than Wyoming big sagebrush. Klebenow (1985) found low sagebrush is often preferred by sage-grouse during winter when snow depth is not limiting. However, Barrington and Back (1984) reported that sage-grouse moved from low sage to Wyoming big sage areas in winters when snow depth exceeded 10" – 12".

Year-Long Habitat

Despite being sagebrush obligates, sage-grouse use a variety of habitats throughout the year. There are important seasonal habitats that do not have a sagebrush component (e.g., riparian meadows), but generally habitats used by sage-grouse have sagebrush nearby. Sage-grouse have also been observed in or near aspen stands and other areas with trees or very tall shrubs; however, these habitats are not used with any consistency, and they may be areas of high predation. The spatial arrangement of the habitats is also important. Leks generally have taller sagebrush cover nearby, and leks and nesting habitat are often in close proximity. Early brood habitat and nesting habitat should also be in close proximity to one another. Meadows should have sagebrush nearby to provide for escape and loafing cover during summer. Height and cover density of sagebrush areas used for winter should be variable. A mosaic of habitat types and conditions is necessary to provide all of the seasonal cover and nutrition required by sage-grouse.

Movement/Migration Patterns

Sage-grouse populations alter their movement/migration patterns as they shift among winter, breeding and summer ranges (Connely et al. 2000). Variations in movements between seasonal ranges have been associated with gender, behavior, seasonal habitat quality and distribution, and weather (Connelly et al. 1988). A given population may have: 1) geographically distinct winter, breeding, and summer areas; 2) geographically distinct summer areas and common winter and breeding areas; 3) geographically distinct winter areas and common breeding and summer areas; or 4) a common habitat area towards which the population shows little seasonal differentiation in use (non-migratory populations). Birds that belong to populations having different migration patterns may be still found together in certain seasons, most commonly in summer ranges.

Seasonal movements between distinct seasonal ranges may exceed 75 km (Dalke et al. 1963; Connelly et al. 1988), which complicates attempts to define populations. Thus, Connelly et al. (1988) suggested that sage-grouse populations be defined on a temporal and geographic basis. Because of differences in seasonal movements among populations (Dalke et al. 1963; Wallestad 1975; Connelly et al. 1988; Wakkinen 1990), three types of sage-grouse populations can be defined based on their movement patterns: 1) non-migratory, where grouse do not make movements greater than 10 km between or among seasonal ranges; 2) one-stage migratory, where grouse move between only two distinct seasonal ranges; and 3) two-stage migratory, where grouse move among three distinct seasonal ranges.

On an annual basis, migratory sage-grouse populations may occupy areas that exceed 2,700 km^2 (Hulet 1983; Leonard et al. 2000). Robertson (1991) reported that migratory sage-grouse

in southeastern Idaho made mean daily movements of 752 m and occupied an area >140 km^2 during winter. Wallestad (1975) reported that a non-migratory population in Montana had a winter home range size that ranged from 11 to 31 km^2. During summer, migratory sage-grouse in Idaho occupied home ranges of 3 to 7 km^2 (Connelly and Markham 1983; Gates 1983). Despite large annual movements, sage-grouse have high fidelity to seasonal ranges with females returning to the same area to nest each year (Keister and Willis 1986; Fischer et al. 1993).

Where topographic relief allows, sage-grouse will generally move up in elevation from spring through fall as snow melt occurs and plant growth advances (Savage 1968; Klebenow 1985). Brood movement from nesting/brood areas to summer areas may be driven by forb phenology, leading broods to higher elevations where plant phenological development is delayed (Pyrah, 1954; Crawford 1960; Gill and Glover 1965; Savage 1968; Wallestad 1971; Connelly et al. 1988; Wakkinen 1990; Fischer et al. 1966). Movements to fall/winter range correspond to increasing use of sagebrush as the major food item, and movements may be related to food quality (Beck 1977; Remington 1983; Barrington and Back 1984). Movements during winter are related to snow depths and food quality/availability (Bean 1941; Crawford, 1960; Beck 1977; Autenrieth 1981; Barrington and Back 1984). Some birds may move to nesting areas in mid-winter if the weather is mild (Berry and Eng 1985; Schroeder et al. 1999).

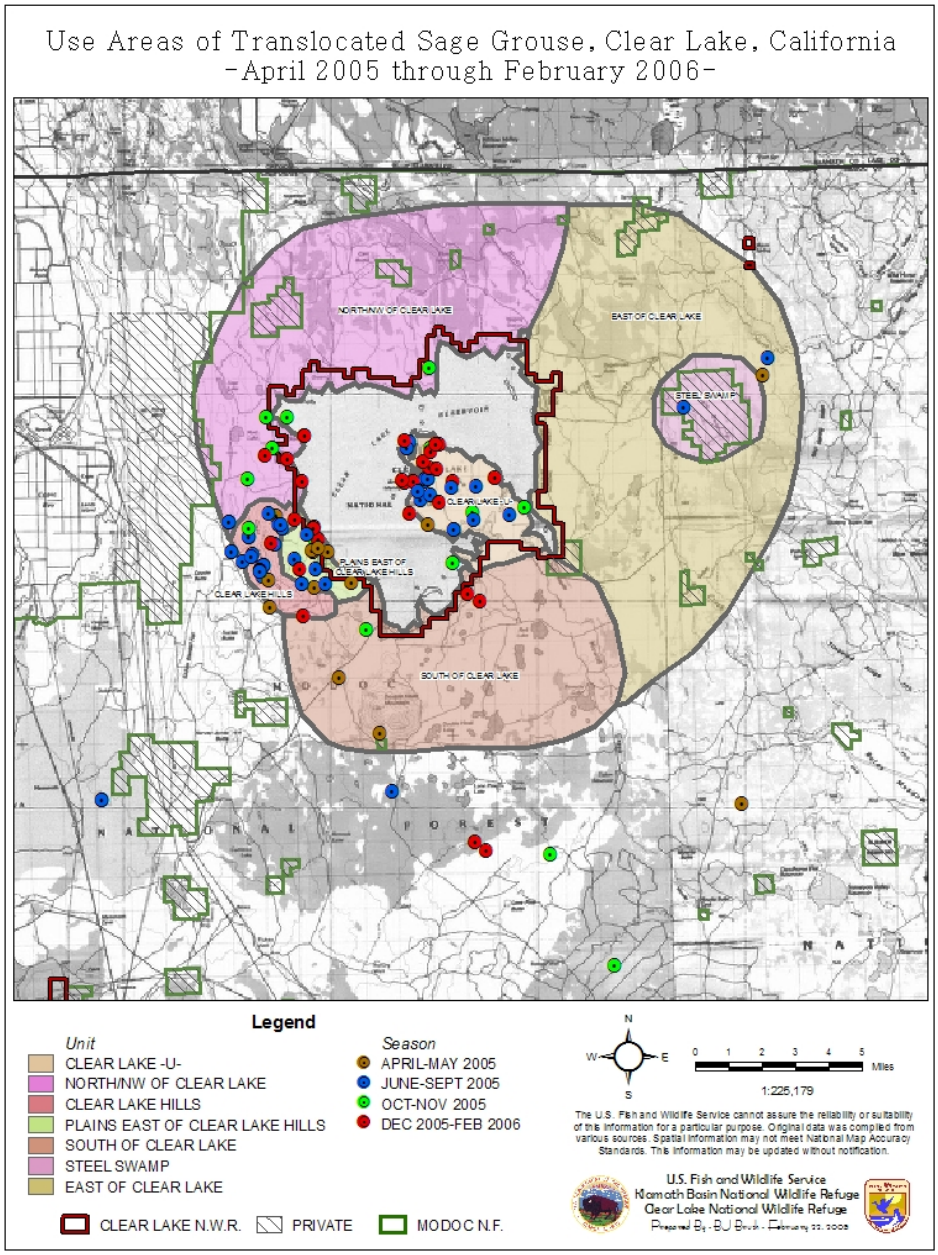


Figure 5. Use of Clear Lake area by translocated grouse, 2005.

Habitat Use of the Clear Lake Population

At this stage it is not clear whether there really is differential use of habitats around Clear Lake. Telemetry data, both of the native birds monitored in 2000-2002 and the birds translocated since 2005, indicate that the birds presently utilize a relatively small area in the vicinity of Clear Lake, especially the Clear Lake "U" and Clear Lake Hills, which are separated by roughly 4 miles of open water. Both areas are similar in terms of vegetative cover, with low sagebrush, with Poa sandbergii (*Sandberg's bluegrass*) and *Pseudoroegneria spicata* (Bluebunch wheatgrass) and roughly similarly rich in forbs. The main difference in the sites being utilized is that the crest of the Clear Lake Hills is the most elevated place on the landscape, and is largely free of junipers. The "U" is also largely free of junipers. It will be necessary to collect more extensive, and frequent, telemetry data to tease out variation in seasonal use – if there is any. Data on wintertime is most limited in the current dataset,.

Population Viability

Sage-Grouse Genetics

Molecular analysis using mitochondrial markers from sage-grouse DNA samples has improved the understanding of sage-grouse genetic relationships (Benedict et al., 2001 and Benedict et al. 2003). Haplotypes (Clade I and Clade II) have been used to determine genetic bottlenecks in sage-grouse populations (Benedict et al., 2001 and Benedict et al., 2003). A haplotype is a collection of alleles for different genes that are located closely together on the same chromosome, and tend to be inherited together as a unit. The percentage of novel haplotypes (high percentages indicate extended genetic isolation) from the sage-grouse population in neighboring Lassen County is "normal" (<10%), indicating a genetically intermixed population. In contrast, more than 85% of the haplotypes sampled from the Mono County, CA population were determined to be novel, suggesting that this population has been isolated for some time – possibly thousands to tens of thousands of years (Oyler-McCance et al., 2005; Benedict et al., 2003).

The genetic makeup of the Clear Lake sage-grouse population is unknown, but recent evidence does not indicate that it contains characteristics that would differentiate it from other populations in the region.. Blood samples were taken from 3 male grouse captured in 2001 for the 2000-2002 radio-telemetry work and provided to USGS for DNA analysis as part of a wider sage-grouse genetics study (Oyler-McCance, 2005). No information beyond what was published in this report was received back. With translocation efforts having been underway for three seasons at this time, the genetic characteristics of the remnant indigenous population may not be recoverable. Even if DNA from members of the original population could be obtained, tests for genetic "bottlenecks" from allele frequency data has only been shown to be useful out to four generations from the time that the bottleneck has occurred (Luikart & Cornuet 1998). Given that the decline in this population occurred sometime between the late 1950's and early 1980's, certainly more than four generations have now passed since any genetic bottleneck occurred. That would likely rule out current allele frequency methods as a tool for teasing out evidence of a bottleneck. Whether alternative methods might be developed to assist in determining characteristics of this population is unknown.

Genetic isolation can be catastrophic for small populations. Bouzat et al.(1998) documented this in an isolated greater prairie chicken population in Illinois. This population suffered a significant reduction in genetic diversity and a 40% drop in hatchability rates in association with a demographic collapse from ~2,000 birds in 1960 to less than 50 in 1993. This drop in population roughly parallels what appears to have taken place at Clear Lake. If the Clear Lake sage-grouse population is, in fact, in a similar genetic condition, efforts to restore habitat without simultaneous recovery of breeding bird numbers and genetic diversity will not likely prevent the extinction of the remaining population. In central Idaho a sage-grouse population that supported at least six leks prior to 1981 (Autenrieth 1981) collapsed to a single male on one lek by 1986 even though carrying capacity of the habitat was judged to be adequate for a larger population (Musil et al. 1993). More recently, the state of Washington (WDFW, 2004) performed genetic analyses on its two remaining populations of sage-grouse to determine their viability. The two isolated populations numbered 624 and 387 birds in 2003, having declined by nearly 80% since the 1960's (Schroeder et al. 2000). Results of the genetic analysis were interpreted to indicate that neither of these populations possessed enough genetic diversity to persist. The Washington state biologists estimated that it would take more than 3,000 birds to maintain viable populations (WDFW 2004).

Inbreeding Depression

Inbreeding is inevitable in geographically isolated populations, leading to increased genetic homozygosity (Falconer 1981). This increase in homozygosity can have consequences for individuals and populations alike (Fig. 6), by either increasing the phenotypic expression of harmful recessive alleles (Charlesworth and Charlesworth 1987), or by a reduction in the overall fitness of individuals in the population, in cases where heterozygosity confers specific advantages (Wright 1977), or both (Kimura and Ohta 1971).

Table. 1. Consequences of inbreeding (GSGRSC, 2005).

GENETIC CONSEQUENCES	**INDIVIDUAL CONSEQUENCES**	**POPULATION CONSEQUENCES**
Less genetic diversity; Increased frequency of recessive genes	Greater risk of disease and physical deformity; Reduced reproduction; Increased mortality	Reduced recruitment rates; Higher probability of extirpation

Crnokrak and Roff (1999) reviewed 35 studies of inbreeding depression in the wild and found that 141 out of 157 populations showed reduced fitness in inbred individuals, to a greater extent even than observed in captivity. This agrees with experiments that found greater evidence of inbreeding depression in more stressful environments (Miller 1994). Species appear to have widely differing sensitivity to inbreeding depression, however (Price and Waser 1979, Ralls and Ballou 1983, Ralls et al. 1988, Laikre and Ryman 1991).

Studies of greater prairie chickens in Illinois showed that fertility and hatching success of greater prairie chickens were associated with a reduction in genetic variation due to a population bottleneck (Bouzat et al. 1998a, Bouzat et al. 1998b, Westemeier et al. 1998). Whether inbreeding depression was the principal mechanism for this reduction in viability could not be determined from the data. Stiver et al, (2007) estimated the total (N) and effective (N_e) population sizes for the second-largest Gunnison sage-grouse population in

Colorado. Total population size was estimated at 212-220 individuals, but poor nest success (27%) and low brood size (4.3 chicks/hen) produced an N_e of 42 for the entire population.

Mathematically, the initial rate of increase in inbreeding is 25 times faster in a population of 20 than 500 (Figure 6). This suggests that avoiding small population size, even for a few generations, is essential for reducing the potential for inbreeding depression. Additionally, small populations, (regardless of the amount of genetic variation) are at higher risk of extinction because they are more susceptible to population attrition caused by disease, drought, predation, etc. (Gilpin and Soulé 1986, Caughley 1994). Because of this, Lande (1988) and Caughley (1994) argued that demographic and behavioral concerns should take a higher priority than genetic concerns in the formulation of conservation plans (i.e. small and/or isolated populations should be treated with urgency, regardless of whether they are presently exhibiting signs of declining genetic health).

While inbreeding depression is considered a threat to small populations, we have no data that definitively indicate that the sage-grouse population in the Devil's Garden/Clear Lake PMU is being affected by it. This would seem likely, however. Long-term data on demographic rates (e.g., nest success, hatchability, juvenile or adult survival) would be necessary to determine whether population fitness is stable or declining.

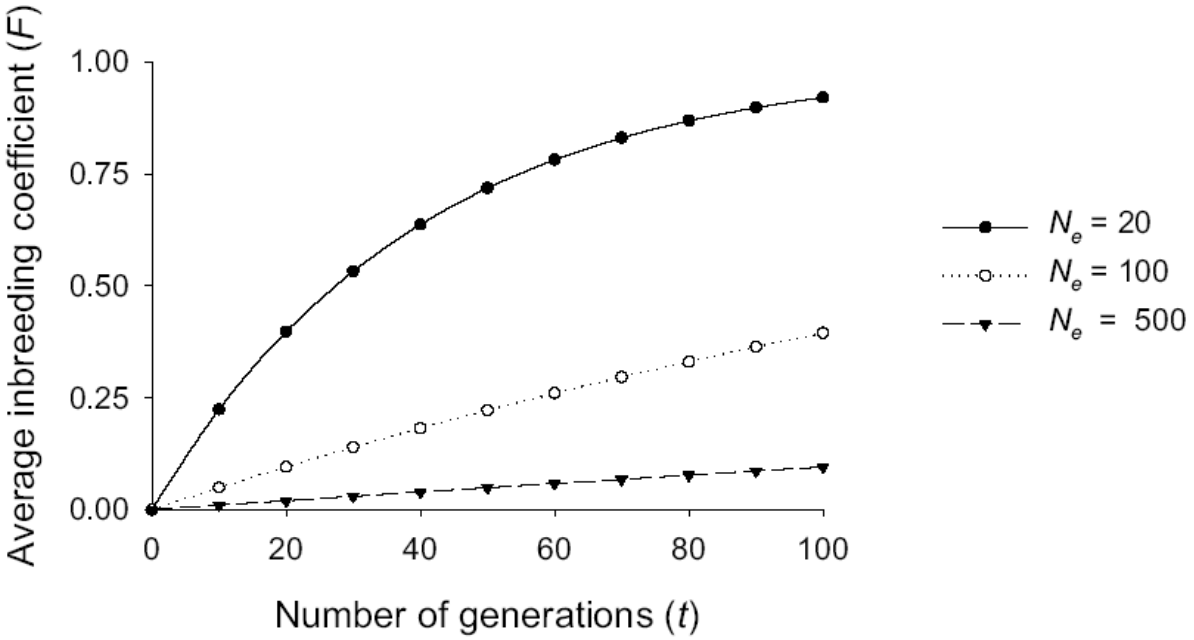


Figure 6. The increase of average inbreeding coefficient as a function of genetic effective population size and the number of generations of breeding.

Many efforts have been made to estimate how large populations of at-risk species must be to persist on their own. Over the last four decades, conservationists have largely tried to estimate minimum population size on the basis of habitat use and population genetics parameters. These alone are probably not adequate to fairly represent pressure exerted on populations in the field. In 1981, Lande outlined four types of interacting random events that may lead to the elimination of populations, even in habitats that are usually adequate to support them.

- Demographic chance – events that directly alter death and/or birth rates in a population (such as the replacement of a highly fertile male by one that is less fertile).
- Environmental chance – periodic events that alter a population's productivity through fluctuations in habitat quality, and densities of competitors, predators, parasites and disease-causing organisms.
- Natural catastrophes – rare events that dramatically alter populations and habitats.
- Genetic chance – events that alter gene frequencies in a population as a result of inbreeding, founder events (expansion of a population from a few individuals) and random fixation.

There is no consensus on how large a population must be to avoid biologically significant inbreeding depression, and there is little reason to believe that a single critical size or threshold exists. When inbreeding depression was first recognized as a threat to managed populations, Franklin (1980) and Soulé (1980) suggested that 50 individuals should be sufficient to avoid biologically significant inbreeding depression. This rule-of-thumb was based on anecdotal evidence that domesticated animals seemed to tolerate this level of inbreeding. Subsequent experimental inbreeding (in house and fruit flies), however, has shown that populations with a genetic effective size of 50 individuals often have substantial extinction rates (Latter et al. 1995, Bryant et al. 1999, Read and Bryant 2000).

Franklin (1980) and Lande (1988) recommended an *effective breeding population* (N_e) of 500 as the minimum necessary to maintain a viable population. This effective breeding population size (N_e) value is a smaller number than the total population because of unequal sex ratios, variable survival rates to breeding age, fluctuations in population size and generational overlap (Hartl 1980). In the case of sage-grouse, which are a lekking species, only 10-15% of males may actually breed in a given year (Anonymous 1997). Given these factors, a total population of 5,000 may be required just to ensure an N_e of 500 (Braun 1995; Anonymous 1997; Aldridge 2000). Schroeder et al. (2000) recommended 1,000 individuals (385 counted males) as a minimum population size, assuming good genetic diversity.

The persistence of populations is usually influenced most strongly by demographic processes, i.e. external factors that affect birth and death rates (Lande 1988, Caughley 1994, Soulé and Mills 1998). With very small populations, the interaction of genetics with those external factors becomes critical (Gilpin and Soulé 1986, Lande 1988, Soulé and Mills 1998). Inbreeding depression, reduced genetic diversity, and the accumulation of new mutations can make small populations more susceptible to severe environmental or climatic changes, disease, and predation. Frankham (2005) argues that *in vivo* and *in vitro* evidence is now quite strong that genetic factors in small, isolated populations - resulting from the unavoidable progression of inbreeding and loss of genetic diversity - accelerate extinction/extirpation risk.

Implications for the Clear Lake population

Because (1) the Clear Lake sage-grouse population has been cut off from other populations for at least 30 years, and (2) has declined from several thousand to less than 50 birds in that time, the likelihood that a significant proportion of the population is suffering from inbreeding depression is high. As this can affect reproduction in both genders, the best immediate response is to introduce birds of both genders from healthy outside populations. The main purpose of this is to reverse the likely genetic contribution to poor recruitment rates.

Chapter 2: History of the Devil's Garden Population

Nowhere in California has the decline of sage-grouse populations been as dramatic as in Modoc County. In the early part of the 20th Century, portions of Modoc and eastern Siskiyou counties supported thousands of grouse. Admittedly generous, the Department of Fish and Game (CDFG) estimated there to be 14,000 sage-grouse in Modoc County in 1970 (CDFG). This estimate would have included other areas within the county besides the Devil's Garden. However, there was a time that if someone mentioned hunting or observing sage-grouse in the golden state they were probably referring to the Devil's Garden sage-grouse population. Those days have long since passed. Much of the information relating to past populations of sage-grouse in the area is anecdotal. Reports from long-time Modoc county residents, hunters, and resource agency employees have contributed much to our knowledge of sage-grouse populations in the region. During times when the Department of Fish and Game conducted hunts in the area, hunter bag checks also contributed important information, such as nest success, and sex and age ratios

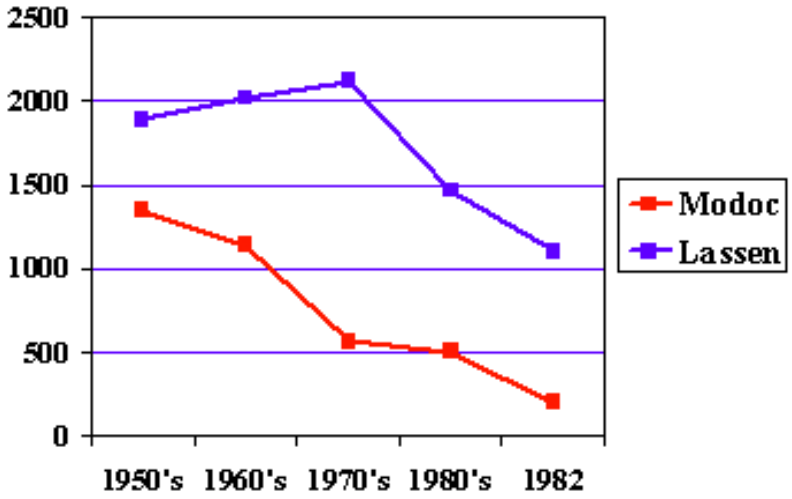


Figure 7. Estimated average yearly sage-grouse harvest by county: 1950 to cessation of hunting in 1982.

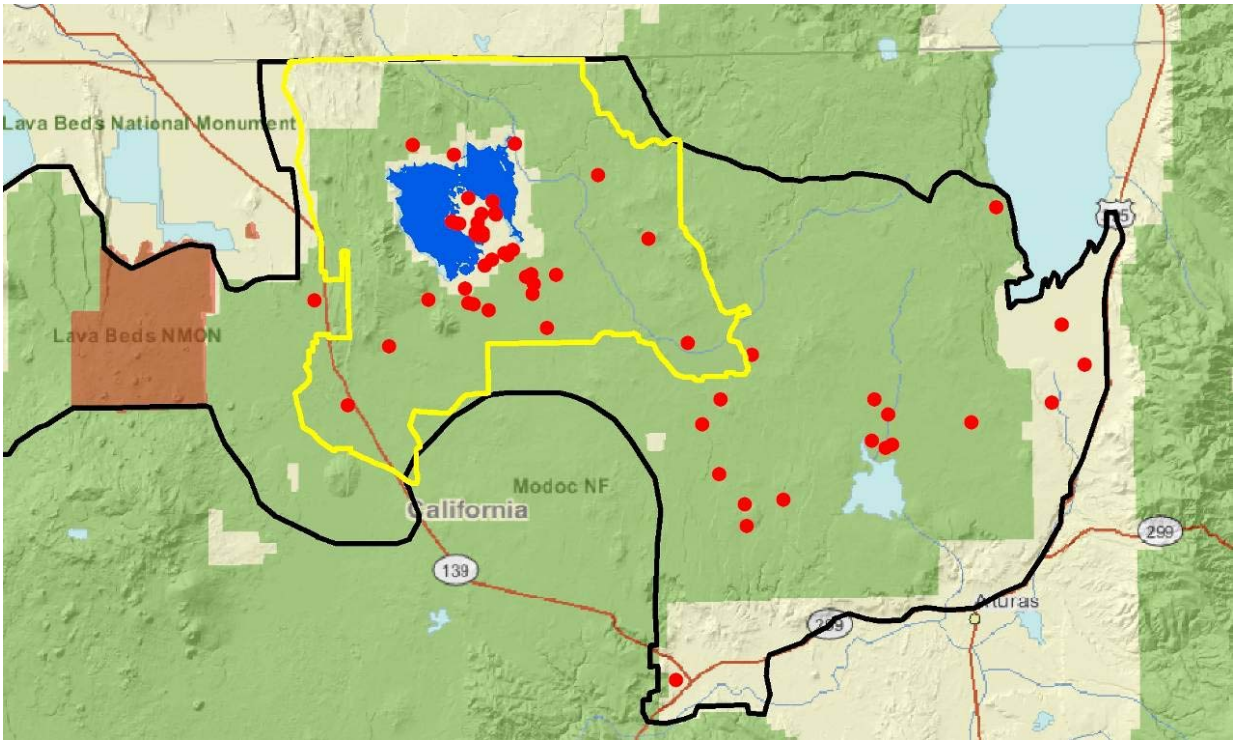


Figure 8. Locations of original 56 leks in Devil's Garden PMU, most concentrated around Clear Lake.

of sage-grouse in the area (Hall, 1995). In response to decreased populations observed during hunting seasons and during lek counts, the Department closed hunting seasons on the Devil's Garden after the 1982 season (Figure 7). Since that time, lek counts have produced the only population data for sage-grouse in the region.

U.S. Forest Service, Bureau of Land Management, DFG biologists and a host of trained volunteers have been observing sage-grouse on their leks in the region since the early 1950's. Peak male attendance at these leks is the main monitoring information available to us today. At least 56 leks were known to be active throughout the Devil's Garden and Clear Lake NWR region in the 1940's (Figure 8). By 1977, nine leks were known to be active (CDFG). In the spring of 2002 one lek (and one satellite lek), located on the peninsula of the Clear Lake NWR, were all that remained. Unfortunately, the monitoring of lek activity in the PMU was inconsistent until the 1990's, and therefore much of the earlier data is unreliable. Of the 39 leks in the Devil's Garden PMU where lek counts were made from 1950 to 2005, individual leks were rarely visited in more than two of the six intervening decades. For a given lek, population counts often varied widely among observations, even within years, and methods used for counting varied in ways that are not easily reconciled. While there is no doubt that sage-grouse populations in the Devil's Garden PMU declined significantly during this period, the low quality of the lek count data makes it impossible to speculate with confidence about when and where the population declines happened, and the rates at which they occurred (see Figs. 9 & 10).

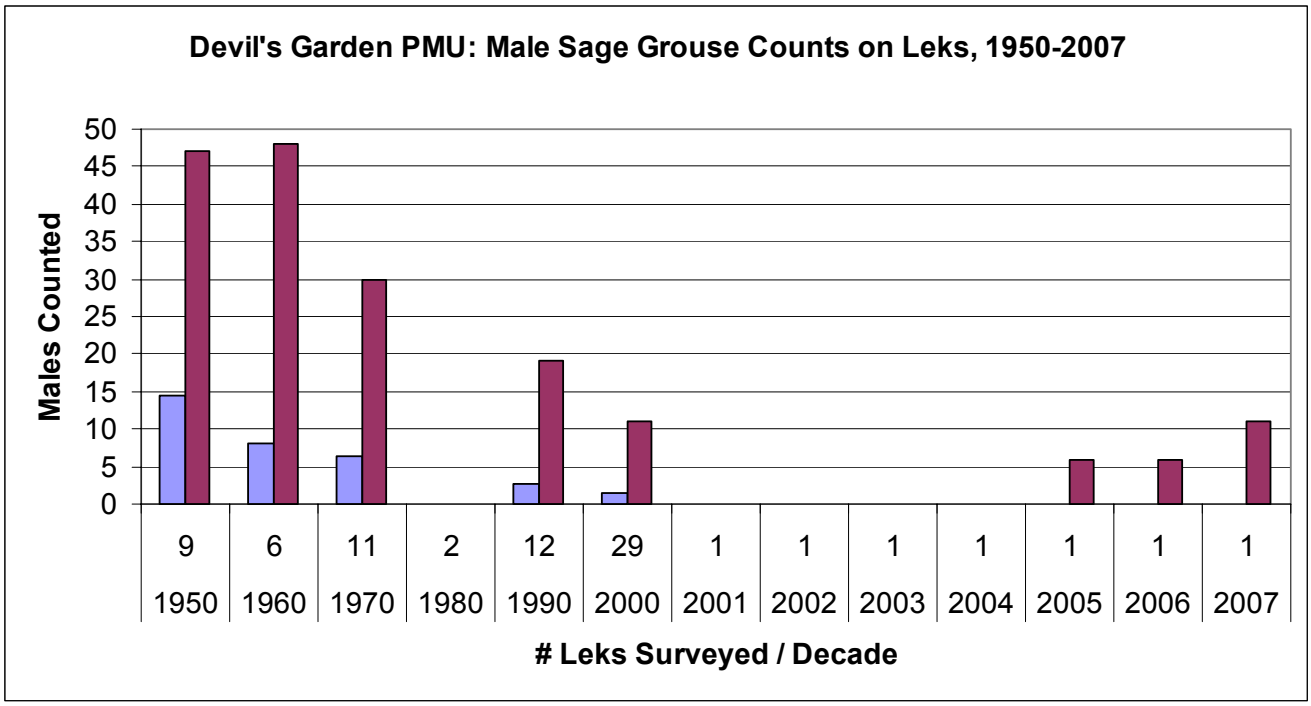


Figure 9. Devil's Garden Male Sage-grouse Counts, 1950-2007.

Loss of sagebrush habitats to the expansion of western juniper (*Juniperus occidentalis*) is thought to be a contributing factor to the dramatic population decline in the region, but, as with the lek counts, because of the very limited data on plant community changes that was recorded during this period, it may be impossible to determine what the magnitude of impact the juniper expansion has had on sage-grouse populations. In 1948, the CDFG and the U.S.

Forest Service collaborated on a project intended to assess range condition on the Devil's Garden due to concerns expressed regarding the effect of heavy grazing and browsing by cattle and deer. Sixty-nine permanent vegetative transects were established throughout the Devil's Garden. Data describing changes in ground cover, tree overstory and distribution of plant species were collected and examined four times between 1957 and 1998. Analysis of this data revealed that tree (juniper) overstory has greatly increased while shrub understory has decreased (Schaefer et al. 2003). Dead shrub cover (mostly sagebrush) also increased during this time. Reductions in sagebrush were consistent with increases in western juniper cover.

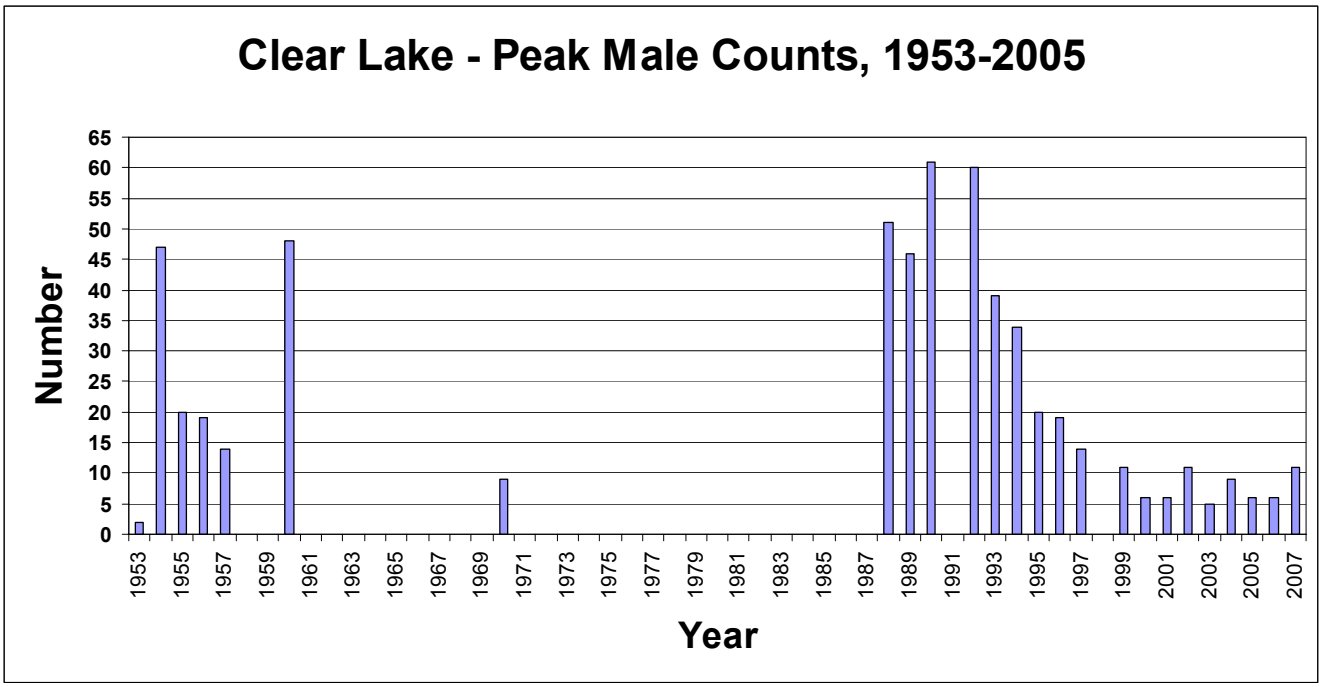


Figure 10. Peak male lek counts at Clear Lake NWR.

The local deer herd, known as the "Interstate" herd, also experienced significant declines in population during this period, from an estimated high of 45,000 animals in the mid-20th century (Salwasser 1979) to a current population of approximately 3,000-5,000 (CDFG unpublished data). This decline in deer numbers has been as precipitous as that of the sage-grouse.

Figure11. 1948, 46 leks active.

Figure 12. 1998, 1 lek active. Beckstrand, USFWS

Progressive decadence of stands of sagebrush and other shrubs, invasion of exotic annual grasses (primarily cheatgrass, *Bromus tectorum*) and expansion of western juniper continue to degrade habitat conditions for many wildlife species in the region. While pockets of suitable habitats for sage-grouse still exist throughout the Devil's Garden, many of them have been fragmented by the expansion of juniper, and many sites that seem suitable are unoccupied. Habitats that are currently in acceptable condition may become unsuitable if expansion of western juniper continues unabated. The current U.S. Forest Service and BLM strategy to address juniper expansion and restore and enhance sagebrush steppe habitats in the region has potential to improve habitat conditions for sage-grouse and a host of wildlife species. Detailed, site-specific restoration and enhancement plans will need to be developed, implemented, and monitored to ensure that wildlife habitats are being enhanced as a component of sagebrush-steppe habitat management efforts.

The estimated breeding sage-grouse population in this PMU has been trending downwards from several thousand individuals since the 1970's. It currently is believed to number less than 50 individuals, all of which are thought to use habitat areas in or near the Active Management Area for all or most of the year. Population counts are being made by USFWS service staff and volunteers at the Clear Lake Wildlife Refuge, with assistance from CDFG and BLM.

Clear Lake National Wildlife Refuge

The Klamath Basin National Wildlife Refuge Complex (KBNWR) consists of six individual refuges of which two, Lower Klamath NWR and Clear Lake NWR, have supported sage-grouse. Clear Lake NWR is presently the only one of the two that does.

Lower Klamath NWR is currently 46,900 acres. It is made up primarily of freshwater marsh and cropland, but borders formerly brushy BLM lands to the southwest. Sage-grouse were observed on refuge property, typically near these BLM lands, as recently as 1970.

Clear Lake NWR is currently 46,460 acres. It consists of Clear Lake, a reservoir of approximately 20,000 acres, and surrounding shoreline. Included in the shoreline is the "U," a 5,500 acre peninsula stretching northwest into the lake, dividing it into two narrowly connected lobes, west and east. Shoreline habitats are comprised largely of bunchgrasses, low sagebrush, and juniper. Sage-grouse traditionally use one or more sites on the "U" as strutting grounds.

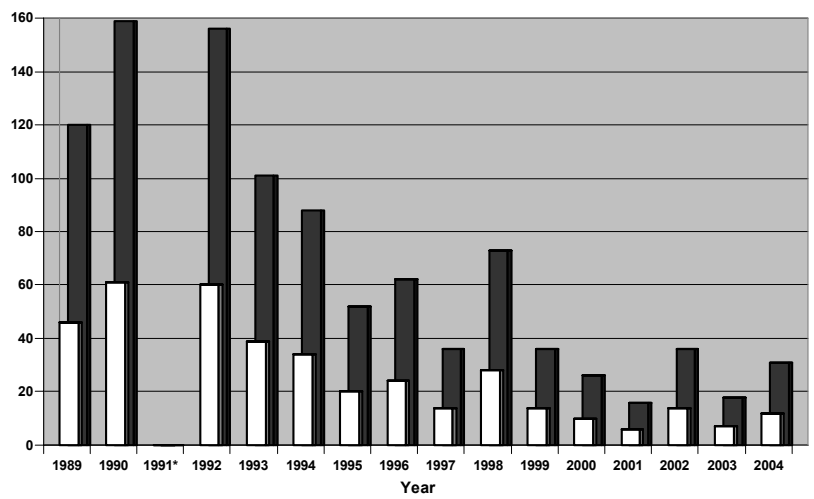
A year by year summary of sage-grouse observations and reports on these two refuges from 1944 to 1999 is provided in Appendix M. Population estimates given for 1989 to the present are based on counts of the numbers of males observed attending leks. The following formulas (Hall, pers. comm.) are used to estimate the lower and upper bounds of the population size from the lek counts:

LOWER = (# Observed Males x 1.6) + # Observed MalesObserved Males
UPPER = (# Observed Males x 2.0) + # Observed Males

Population estimates given for years prior to 1989 may be based on lek counts, brood counts, or both, and/or on weather, food, and cover conditions present at the time. Also, certain

estimates from this period include all birds within a population living both on and off a refuge while certain others include only those birds thought to be within refuge borders. It was not often possible to determine which estimation technique was in use in any given year.

Data on sage-grouse on Clear Lake Refuge goes back to 1944 and indicates a healthy population in the area for many years. As recently as 1974 the peak population on Clear Lake was estimated to be 425 birds (Summary of Sage-Grouse Observations and Reporting, Klamath Basin National Wildlife Refuges, 1944 through 1999. Unpub.). Bag checks of hunters on Clear Lake Road (south of the refuge) showed that 53 hunters took 24 sage-grouse during the 2-day season in 1976. However, the last sage-grouse hunt was held in Modoc County was held the following year (Bob Schaefer, CA Dept. of Fish and Game, pers. comm.). In 1981, at least 18 sage-grouse leks were known to be active on Modoc National Forest land within 5 miles of the refuge. But, by 1988 it was noted in the Klamath Basin NWR narrative that "with the exception of the 'U', most of the other strutting grounds in the area had either no or minimal sage-grouse use". The winter of 1992-93 was one of deep snow and extended cold temperatures which greatly impacted wildlife populations throughout the west including Clear Lake. Here, the number of displaying male grouse declined from 60 to 39 between 1992 and 1993 respectively. In the spring of 1994, 1995, and 1998, one aerial survey of the Modoc forest leks known to be active in 1981 was made each year by a Klamath Basin NWR biologist; however, no grouse were seen other than on Clear Lake Refuge. Sage-grouse were present at one time on the Lava Beds National Monument and south of Lower Klamath NWR, both to the west of Clear Lake, but are no longer present. Grouse disappeared from the Lower Klamath Refuge area by 1970 and sooner from the Lava Beds.



	1989	1990	1991*	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Males	46	61	0	60	39	34	20	24	14	28	14	10	6	14	7	12
Population**	120	159	0	156	101	88	52	62	36	73	36	26	16	36	18	31

Figure 13. Sage-grouse Lek Counts, Clear Lake NWR 1989-2004

*** No sage-grouse count was conducted in 1991.**

**** Upper and lower boundaries of the population size is estimated by the formula:**

LOWER = (# Observed Males x 1.6) + # Observed Males

UPPER = (# Observed Males x 2.0) + # Observed Males

The LOWER estimate of the population size and actual male counts are presented in this chart.

Monitoring

Population monitoring is important for establishing total population size, demographic structure (ratio of males:females, age classes, etc.) and recruitment rates. Much of this information, useful as it can be when available, is difficult to obtain. The following are types of monitoring data that are used or have been used in the PMU.

Leks: Searches and detections of active leks, follow-up surveys for active leks, and counts of males on active leks, ideally for peak male attendance each year, have been the specific lek monitoring efforts.

Lek Locations: Breeding populations cannot be evaluated unless lek locations are known (Connelly et al 2003). Many historical leks in this PMU ceased activity over the last several decades, and therefore were identified anecdotally from the knowledge of local landowners, hunters and agency staff with extensive careers in the area. Fifty-six lek sites are known to have once been active within the PMU, and have been mapped. Of these, one was on private land, 22 were on USFS-managed land and 13 were on USFWS-managed land around Clear Lake. Fourteen of the historical lek sites are located in what is currently classified as "good" habitat (R0), 19 are located in recovering sagebrush-limited areas (R1) managed by the USFS and USFWS around Clear Lake, and the remaining three leks are in juniper (X3) or juniper-encroached (R3) sites. It should be noted that nearly half of the leks in R0 habitats are less than 0.5 miles from areas that have been converted to juniper woodland (X3). The only area where strutting has been observed since 1990 is the Clear Lake "U".

Lek Counts: Leks in the Devil's Garden, including Clear Lake have been counted for peak male attendance since 1953. The remaining lek on the Clear Lake "U" has been monitored with much greater frequency since 1996 (ranging from twice to six times per lekking season). Prior to 1996, the Clear Lake leks were last observed in 1977.

Brood Counts: This information is not formally collected because of concerns over distressing and endangering the few remaining birds, scarcity of trained staff, and the difficulties in replicating and standardizing samples, and problems with year to year comparisons cited by Connelly et al (2003). Volunteers and agency biologists do try to note the numbers of offspring observed when sage-grouse encounters occur during the spring and summer.

Using the above monitoring methods, the following information can be obtained:

- The Number and Size of Populations

  The fundamental unit of population monitoring is peak male attendance at leks. Coupled with the number of active and inactive leks, an estimate of the total population can be made and trends deduced. The number of males counted on the Clear Lake "U" during lekking season has not exceeded 12 since 1999 (Fig. 9). Total population size can be estimated from this information so long as (1) the lek surveys fairly

represent the population being estimated and (2) male/female ratios in the actual population are similar to the ratio assumed by the equation (Fig. 10).

Radio-telemetry Study of Sage-Grouse on the Clear Lake National Wildlife Refuge

The number of lekking male sage-grouse counted on Clear Lake National Wildlife Refuge (NWR) dropped from 60 in 1992 to 14 by 1999. In addition, sage-grouse had not been observed on 18 historic leks on the adjacent Modoc National Forest since the early 1980's (Fig. 6). Because of the rapid decline in grouse numbers, and because so little was known about the habits of the grouse on the refuge, a radio-telemetry study was conducted to identify seasonal use areas and, if possible, locate unknown active leks on the Modoc plateau. Because of the small population size only four birds were marked initially. In April 2000, refuge staff radio-marked 3 adult males and one adult female sage-grouse on the refuge and recorded their locations with a GPS once per month from an airplane. The original intention was to radio-mark only females in order to track them to unknown leks and locate brood rearing areas, but few females were seen and males were used instead.

In April 2001 3 more males were radio-marked. Blood samples were taken from each for DNA analysis by a USGS team led by Sara Oyler-McCance (follow-up has been made, but samples may have been lost or discarded). Between April 2000 and April 2002 seven males and 2 females were marked, with a maximum of 5 birds 'on the air' at any time. Radios were equipped with mortality sensors and, as birds died or lost their radio, they were transferred to other birds when possible. A total of 99 telemetry locations were recorded (71 males and 28 females). The longest-lasting radio on a male grouse was 22 months (May, 2000 - March 2002) while the longest lasting radio on a female grouse was 14 months (September, 2000 - November 2001). Of the 2 radio-marked females, one attempted to nest on the refuge in 2000 and the other 5 miles south of the refuge in 2001. Neither hen was successful. It had been hoped that important wintering areas might be identified, but the 2 winters during which birds were monitored were mild and the birds did not leave the refuge.

In general, radio-marked grouse spent early to late summer on the Modoc National Forest or the refuge and the rest of the year on the refuge. Locations on the Modoc National Forest were mostly in unburned areas within the perimeter of the 1999 Pine Fire. The farthest points from the refuge where marked grouse were located was Boles Creek (approximately 5 miles east of the Clear Lake "U"), east of Doublehead mountain to the south (approximately 5 miles south of the "U"), and on the north shore of Clear Lake 1.5 miles north of the "U". All the outlying locations were recorded during late summer. It appears that the Clear Lake population is non-migratory and isolated. The nearest known population is at Payne reservoir, south of Alturas, which is about 45 miles SE of Clear Lake. Other populations that might eventually be connected with the Clear Lake population are located in Surprise Valley, east of the Warner Mountains (60 miles SE of Clear Lake), or one that has existed near Gerber Reservoir in Oregon (25 miles north of Clear Lake). Whether the population near Gerber Reservoir remains viable is unknown. The last public document referencing it (obliquely) was published in 2001 (USFWS, Federal Register; http://www.fws.gov/policy/library/01fr22984.html)

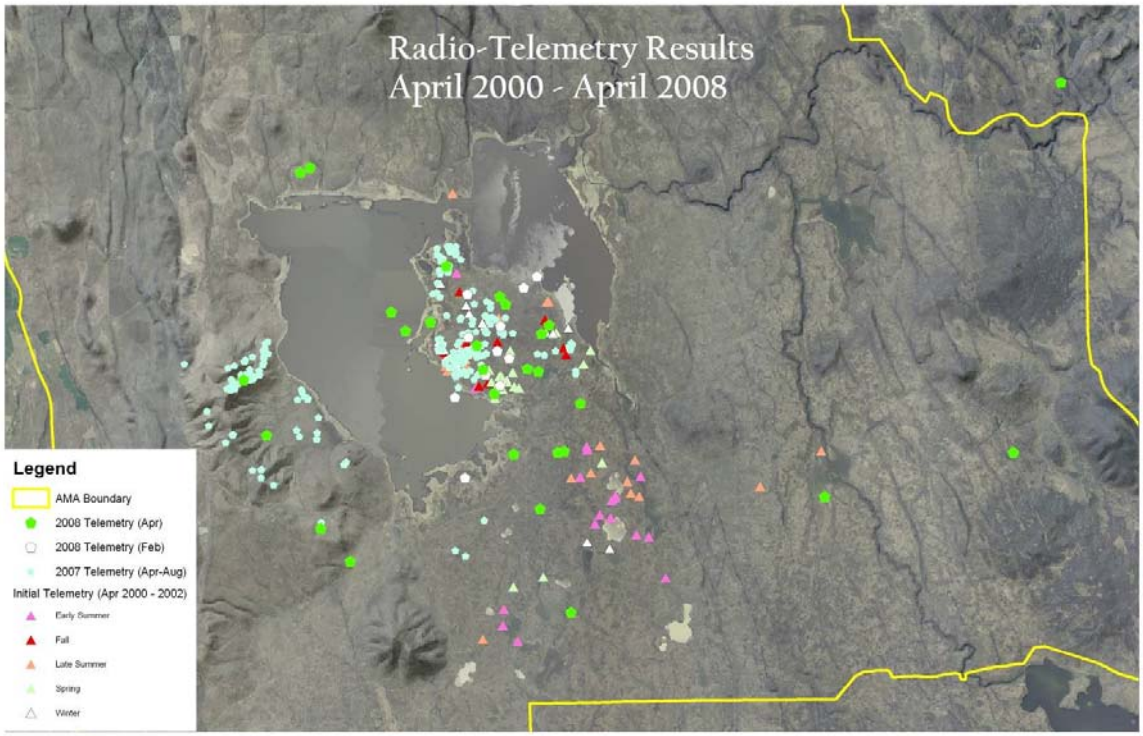


Figure 14. Radio-Telemetry locations for aerially-tracked grouse, April 2000- April 2008. Data from USFWS. Data from 2000-2002 was collected by season. Translocations were conducted in 2005-2008. All translocated birds were collared and aerially tracked.

All subsequent telemetry has been obtained from translocated birds due to fears of increasing mortality in the critically small population from capture, handling and radio collars. The first of these birds (one male, nine females) were introduced onto the Clear Lake "U" in April 2005 from Hart Mountain NWR near Lakeview, OR. In 2006 a second group (two males; 13 females) was also captured at Hart Mountain NWR in April and released on the "U". In 2007 10 males and 22 females were captured at the Sheldon NWR in Nevada and released on the "U", and in 2008 five males and 14 females were captured at a lek approximately 75 miles north of Gerlach, NV from March 27-April 1, and released on the "U".

The translocated birds may have a somewhat stronger affinity for the Clear Lake "U" than the indigenous birds, but this cannot be stated with any certainty because of the limited dataset. Also, aside from a single February 2008 flight, no fall/winter habitat use telemetry has been collected since 2001.

Chapter 3: Sagebrush Ecosystems and Sage-grouse

Evolutionary History

Sagebrush

At present there are two general hypotheses about the origins of sagebrush species in North America. According to the first, they originally derived from Eurasian *Sirphidium* species that migrated across the Bering Strait (Bremer and Humphries 1993). The second, proposed by McArthur and associates (McArthur and Plummer 1978; McArthur et al. 1981), suggests that North American sagebrush taxa developed out of herbaceous members of the subgenus *Artemisia* during the extreme climatic fluctuations of the Pleistocene. What does appear to be certain is that *Artemisia* species have depended on extensive hybridization and, especially in the case of *A. tridentata* subspecies, autopolyploidy (chromosome multiplication) to diversify and adapt to a wide range of environmental conditions (McArthur and Sanderson, 1999). Wyoming big sagebrush (*A. tridentata* ssp. *Wyomingensis*) is believed to have evolved from the hybridization of basin big sagebrush, (*A. tridentata* ssp. *tridentata*), mountain big sagebrush, (*A. tridentata* ssp. *vaseyana*) and black sagebrush (*Artemisia nova*). While polyploidy (having extra sets of chromosomes) is apparently more common among *A. tridentate* subspecies (McArthur and Sanderson 1999), hybridization apparently occurs between all three of the *Artemisia* species found in this local area (*A. tridentata*, *A. arbuscula* and *A. nova*). Of these, perhaps the most important hybrid species is *A. arbuscula* ssp. *longicaulis*, Lahontan low sagebrush, which is believed to be a hybrid of Wyoming big sagebrush and low sagebrush (*A. arbuscula*; Winward and McArthur 1995).

The parental lines that led to the present big sagebrush complex were thought by Axelrod (1950) to have developed by 5 million years BP. The present sagebrush taxa may have spread across much of their present range as the glaciers receded at the end of the Wisconsin glaciation, approximately 12,000 years BP (Axelrod, 1950; McArthur et al. 1981).

Sage-grouse

Centrocercus is strictly a Northern Hemisphere genus, and sage-grouse likely evolved in North America. Johnsgard (1973) believes that during the late Pliocene Epoch, approximately 2 million years BP, the current genera of *Centrocercus* evolved from forest-dwelling species as forests contracted and arid habitats expanded. During the middle to late Pleistocene, and into the Holocene, as the big sagebrush complex was expanding into drier sites sage-grouse probably completed their move from higher elevation mountain big sagebrush ecosystems into the lower elevations of the Great Basin (Trimble 1989).

Sagebrush Ecosystems Today

Floristic diversity in sagebrush steppe communities is usually considered “moderate” (West 1983). Jensen (1989), while evaluating 372 ecological sites in Nevada, encountered 218 species of plants. Thirty-nine were shrubs, 35 were grasses, and 140 were forbs. Within 112 mountain big sagebrush communities in the northern Great Basin, 247 of the total 337 plant species were forbs. Forbs, however, generally account for less than 10% of the total plant cover or biomass in shrub-steppe communities (Miller and Eddleman 2001).

The structure and densities of shrub canopy that sage-grouse use changes throughout the year, from open areas used for leks, to moderately dense (10-25%) sites used for nesting (Popham and Gutierrez 2003) and brood rearing habitat, to highly variable areas (10-30%) used for wintering (Connelly et al. 2000). Shrub heights associated with nesting range from 61-70 cm (24”-28”) (Popham and Gutierrez 2003). Shrub heights associated with brood rearing areas range from 40-80 cm (16”-31”), and in winter habitat, shrub heights tend to be lower, 25-35 cm (10”-14”), except when snow cover is deep. Shrub cover, density, and height are determined by factors such as soil type, climate, etc., shrub species, and past history of disturbance. Fire is a part of natural sagebrush ecosystems. Low to moderate-intensity fires usually result in an increase in the variability of canopy density and structure within the affected area.

The primary sagebrush species found within the Devil’s Garden PMU are low sagebrush, Lahontan sagebrush and a subspecies of mountain big sagebrush (USFS, pers. comm.). Some black and silver sagebrush occurs in the area, and it is likely that populations of basin and mountain big sagebrush can also be found. To date, no extensive, methodical surveys of sagebrush species and their distribution within the PMU have been conducted. The distribution of sagebrush species generally depends on a variety of environmental, climatic and anthropogenic factors, including soil depth, elevation and precipitation (Table 1), in addition to adaptations by local ecotypes.

Table 2. General ranges of precipitation, elevation, and soil depth for sagebrush cover types found in the PMU (from Miller and Eddleman 2001).

Species	***PPT*** **(in.)**	***Elevation*** **(ft)**	***Soil Depth*** **(in.)**
Artemisia tridentata tridentata Basin big sagebrush	8-16	<7,546	deep (30-60+)
Artemisia tridentata vaseyana Mountain big sagebrush	14-18	3,937-10,500	mod.-deep (20-60)
Artemisia tridentata wyomingensis Wyoming big sagebrush	7-12	490-5,500	moderate (20-50)
Artemisia arbuscula arbuscula Low sagebrush	8-16	3,280-10,830	shallow (5-30)
Artemisia arbuscula longicaulis Lahontan sagebrush	7-14	3,445-6,562	shallow (5-30)
Artemisia nova Black sagebrush	8-12	4,593-8,366	shallow (5-30)

Wyoming big sagebrush normally ranges from 40 cm-55 cm (16”-22”) in height (Tisdale 1994). On highly productive sites Wyoming big sagebrush can exceed 80 cm (31”). Tisdale (1994) found that shrub canopy cover varied from 5-25%. Sagebrush canopy cover has been suggested by some researchers as a tool for assessing ecological condition, though not without some controversy. Goodrich et al. (1999) found that once Wyoming big sagebrush reaches 15% canopy cover herbaceous understory production declined nearly 4% for every 1% increase in sagebrush canopy. Welch and Criddle (2003), however, contended that the full range of current scientific data does not support the proposition that high canopy cover

reflects poor ecological condition. Brackley (2003) countered that Welch and Criddle did not address differences in climate, soils, and ecological site variability across the region occupied by Wyoming big sagebrush communities in their review of the literature.

Canopy cover of low sagebrush (*Artemisia arbuscula* ssp. *arbuscula*) communities commonly vary between 5 and 25%. Shrub heights (30-50 cm [12”-20”)) and herbaceous production are highly variable within this type. On shallow rocky soils, shrub stature does not often exceed 30 cm (12”). Sandberg bluegrass (*Poa sandbergii*) is common, forb species are usually diverse, and bare ground often exceeds 50% (Passey et al. 1982). On deeper, poorly aerated soils, shrubs can reach 50 cm (20”), bare ground is commonly <50% and Idaho fescue (*Festuca idahoensis*) or bluebunch wheatgrass (*Pseudoroegneria spicata*) usually dominate the understory. Low sagebrush types are often preferred by sage-grouse during winter when availability is not limited by snow depth (Klebenow 1985). Greater forb abundance in the wetter low sagebrush communities has been used to explain their preference to sage-grouse over Wyoming big sagebrush communities.

Lahontan sagebrush (*Artemisia arbuscula* ssp. *longicaulis*) was formally described by Winward and McArthur in 1995. Previously some had characterized it as an ecotype of Wyoming big sagebrush, but it is currently recognized as a stable hybrid of low sagebrush and Wyoming big sagebrush (Winward and McArthur 1995) This subspecies is suspected to be common in the PMU, but has yet to be mapped in the management area. Growth characteristics are generally similar to low sagebrush. Lahontan sagebrush can be found in pure stands or growing in association with Wyoming big sagebrush and low sagebrush. Little is presently known about its value as sage-grouse habitat, although there are anecdotal references to its use by sage-grouse (Brunner, 2005). Work performed by the Eagle Lake BLM Field Office’s Land Health Assessment Interdisciplinary Team in Lassen County, California indicates that Lahontan communities resemble low sagebrush communities under similar environmental conditions.

Winward (2001) suggested that Wyoming big sagebrush communities with age distributions skewed towards individuals approximately 60 years of age or older generally appeared to be in a state of declining health/condition. Wyoming big sagebrush communities in southeastern Oregon which had an “intact” native herbaceous understory – the most desirable as sage-grouse habitat - exhibited shrub canopy cover ranging from 5-10% on the dry end of its distribution (20 cm [8”] ppt.) and from 13-18% on the wet end (30 cm (12”) ppt.; Kindschy 1991). Kindschy took higher shrub canopy levels (≥20%) with depleted herbaceous understories to be evidence of overgrazing. In areas of high winter concentrations of mule deer (*Odocoileus hemionus*) and pronghorn (*Antilocapra americana*) sagebrush canopy cover was <5% (Goodrich et al. 1999).

Wyoming sagebrush communities have been observed to contain a high percentage of bare ground and sparse but variable forb cover (Tisdale 1994). Perennial forb cover is usually <10% and highly dependent on amount and timing of precipitation (Kindschy 1991).

New growth and re-growth of all sagebrush species and types is usually more nutritious than older material and can play an important role in both the distribution and pre-breeding condition of sage-grouse on winter ranges.

Sagebrush Ecosystem Health and Condition

Western juniper woodlands have expanded and contracted in their range repeatedly since the end of the last major ice age in the Pleistocene (Miller et al., 2005). The severity of winter temperatures, precipitation and fire return intervals have most limited occupation by juniper species. Since European settlement expanded into the Pacific Northwest in the late 1800's, it appears that human-caused landscape modifications (beginning with reductions in grass biomass from livestock grazing) may have reduced fire frequency. This, in turn, released western juniper to expand its range into more productive areas since the last major climate shift. This expansion may have been further accelerated in areas that experienced more moderate temperatures and/or increases in precipitation in recent decades. Some evidence suggests that increases in atmospheric CO_2 may improve juniper establishment (Knapp and Soulé 1996, 1998, 1999b; Soulé et al. 2004) and water use efficiency (Knapp et al. 2001a, b).

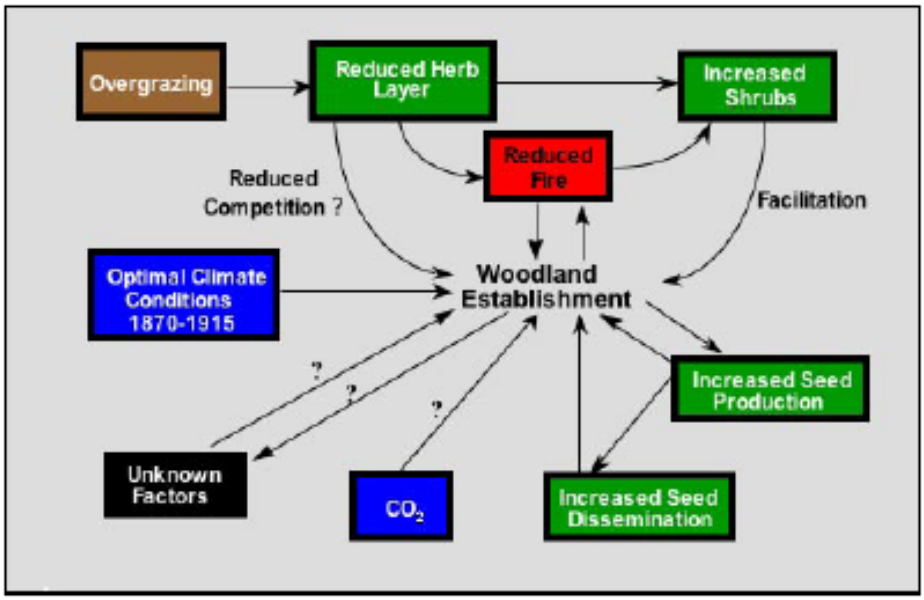


Figure 15. Conceptual model illustrating factors influencing the expansion of western juniper since the late 1800's and throughout the 1900's (Miller and Tausch, 2001).

The recent expansion of western juniper has generally been from sites of relatively low productivity into sites that are more productive (with more potential to produce enough fine fuels to carry large fires). These more productive sites are typically dominated by big sagebrush species. In contrast, low sagebrush communities, which tend to occupy less productive sites, may have had a lower fire return interval for much of the recent past. Young and Evans (1981) and Miller and Rose (1999) reported evidence of fire-free periods of 90 – 138 years in low sagebrush / Sandberg bluegrass (*Poa sandbergii*) associations in northern California and central Oregon. Widely scattered old-growth western juniper trees are characteristic of this low sagebrush plant association (Miller et al. 2005), whereas they would be presumed to be rare in big sagebrush habitats.

As shrub-steppe communities are converted to juniper woodlands, not only do the types and numbers of plant species change, but so also does the capacity of the sites they occupy for cycling water and nutrients, and for building and transporting soil. During the early phases of woodland development, this transition can be reversed with fire (Miller et al. 2000) or cutting (Bates et al., 2000). The further the community structure changes, however, the more limited the management options become. As the shrub-steppe gives way to woodland, fire drops out as fine fuels become scarce, and cutting becomes the most feasible approach to remove

juniper competition (Bates et al., 2000). Treatments at this stage may require extensive planting/seeding and/or decades of patience to re-vegetate the site.

Implications for Management of Clear Lake AMA

The fundamental objective for habitat recovery in the AMA is the re-establishment of healthy low, Lahontan and big sagebrush communities throughout the majority of the area. This will entail (1) reversal of western juniper expansion and occupation of the area, (2) suppression of cheatgrass and medusahead in order to minimize fire ignition hazard and seedling competition, and (3) grazing management that allows the survival of sagebrush seedlings and maintains conditions favorable for perennial grasses and native forbs. There still remain large areas where understory vegetation in juniper encroachment sites is sufficiently viable that 'natural' recovery after juniper removal should proceed with minimal need for intervention. Even so, recovery of sagebrush canopy densities of 18-30% will take decades in many locations. Soil evaluation by NRCS indicates that there are a number of pockets of very productive soils that, with good management, may allow for more rapid recovery and long-term productivity.

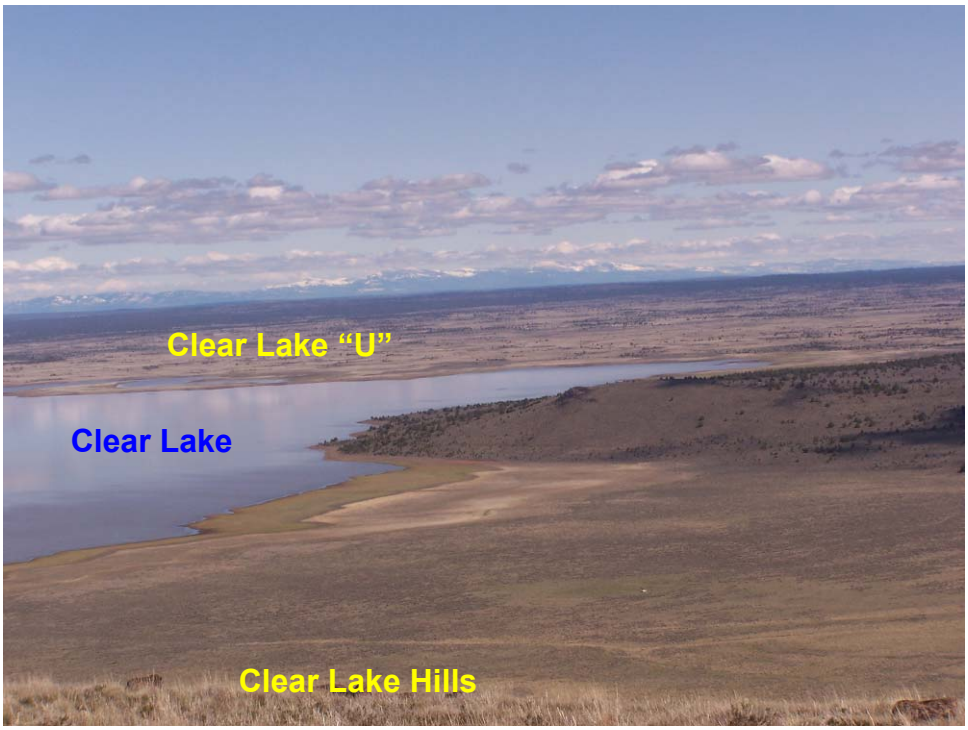


Figure 16. Looking east from the lower crest of the Clear Lake Hills, April 2007.

Figure 17. Big sagebrush transect, west of Clear Lake Hills. 2007.

Figure 18. Juniper-invaded low-sage site.

Chapter 4: Habitat Management

Management of lands in the Devil's Garden, and, more specifically, the area being used near Clear Lake by the remaining sage-grouse population is divided between four federal agencies that are responsible for over 90% of the total area, and a number of private landowners who, while they own but a small fraction of the land, use the majority of it for economic enterprises.

Clear Lake National Wildlife Refuge – U.S. Fish & Wildlife Service

The Clear Lake National Wildlife Refuge is 33,440 acres in total area. Of this, approximately two-thirds of the area is the lake itself. The remaining third is made up of upland habitat that surrounds Clear Lake, consisting of low sage (*Artemisia arbuscula*), native bunchgrasses, forbs, western juniper (*Juniperus occidentalis*), and isolated riparian habitats. The lake elevation averages 4,536.4 feet (USBR 2008). Uplands extend from the lake to 4,800 feet along the edge of the Clear Lake Hills on the west side. The refuge was established on April 11, 1911 by Executive Order Number 1332 by President William Taft "…as a preserve and breeding ground for native birds..." Islands in the lake support colonies of California and ring-billed gulls, great blue heron, great egret, Caspian tern, double-crested cormorants and the largest colony of American white pelicans in California. The uplands are used by pronghorn, mule deer and sage-grouse.

Figure 19. Low sagebrush site on Clear Lake "U", October 2007.

The refuge is surrounded by the Modoc National Forest, with private land of the Tule Lake Basin within several miles of the refuge's western boundary. A narrow band of approximately 5,000 acres of uplands surrounds the lake. The "U" is a peninsula, also approximately 5,000 acres in size, which extends into the lake from the south. The "U" is used by sage-grouse year around and is home to the last known active lek in the Modoc Plateau. Over the last quarter century, the sage-grouse's use of the 18 leks adjacent to the refuge has dropped to zero while attendance on the "U" lek has declined by 80% since 1992.

Clear Lake reservoir is part of the Klamath Project administered by the Bureau of Reclamation and its water is used for agricultural irrigation in the Langel Valley of Oregon to the north. From late summer to fall, the lake shore provides excellent forage for sage-grouse chicks as the lake recedes and forbs emerge on the newly exposed soil. Common shoreline forbs used by sage-grouse include clover *(Trifolium sp.),* Lemmon's milk vetch *(Astragalus lemmonii),* Modoc hawksbeard *(Crepis modocensis)*, Purshe's milk vetch *(Astragalus purshii),* Great Basin Lomatium *(Lomatium simplex)*, False buckwheat *(Erigonum sphaerocephalum)* and Low Everlasting *(Antennaria dimorpha)*. Upland shrubs consist primarily of low sage *(Artemisia arbuscula*), Lahontan sagebrush (*Artemisia arbuscula longicaulus*) and rabbitbrush *(Chrysothamnus sp.).* Grasses include bluebunch wheatgrass *(Pseudoroegneria spicata)*, Great-Basin wildrye *(Leymus cinereus)*, Sandberg's bluegrass *(Poa sandbergii),* Idaho fescue

(*Festuca idahoensis)* and bottlebrush squirreltail *(Elymus elymoides)*. The current condition of the uplands on the refuge is considered 'good' by rangeland specialists.

Small amounts of the invasive annual grasses medusahead *(Taeniatherum caput-medusae*) and cheatgrass *(Bromus tectorum*) are found primarily on the southwest corner and south side respectively of the refuge. Western juniper has spread into the refuge primarily on the north side and to a lesser extent the south side. Few junipers are found on the west side of the "U" the site of the last known sage-grouse lek. The east side of the "U" however, has a slightly higher density of junipers some of which were killed by the 2001 wildfire. Sage-grouse avoid trees because they serve as perches for raptors, particularly golden eagles that prey on sage-grouse and ravens that rob nests of eggs. In northeastern California one of the greatest changes to the landscape in the last 150 years has been the encroachment of western junipers. From an aerial view, it becomes readily apparent that Clear Lake Refuge is like an island of sagebrush surrounded by a sea of junipers.

Land Use History

Grazing

Cattle use of the refuge was largely unregulated prior to the mid 1990's because of inadequate fencing between the refuge and Forest Service grazing allotments. Even though the fences were in poor shape, it is doubtful that an excessive number of cattle were allowed to roam throughout the refuge. In 1994 a new boundary fence was constructed on the east and south sides of the refuge to replace an old ineffectual fence. In 1997 a new fence was built on the north side of the refuge where none had existed before. The steep banks on the west side of the refuge limit livestock access to the refuge. Clear Lake lands are covered by the 1964 Kuchel Act which provides that 21,000 acres of refuge land within the Klamath Reclamation Project be managed "…for the major purpose of waterfowl management, but with full consideration to optimum agricultural use that is consistent therewith…" which includes livestock grazing. Over the past decade, use by cattle has been limited to 600 AUMs on the "U" between mid August and Mid November. As a result of a wildfire on the "U" in 2001, grazing on the "U" was deferred for a year and the southwest corner of the refuge was utilized instead. In 2002 and 2003 the "U" was again grazed from August 16 – November 15. In 2004 grazing was allowed only during August over concerns that low lake levels in the early fall, due to drought, would place exposed cultural artifacts at greater risk of trampling.

Fire

In an effort to increase the amount of forage available for deer, pronghorn and sage-grouse, some prescribed fires were conducted on the refuge in the 1990's. In 1993 a 100 acre prescribed fire on the west side of the "U" was lit in low sage to stimulate production of forbs and grasses. In August, 1995 an additional 800 acres of low sage on the northwest side of the "U" was burned. In July 2001, a lightning-caused wildfire burned over approximately 80% of the "U". Only about 1,000 acres on the west side were spared. As a result of this fire, the sage-grouse lek on the north side of the "U" and the main lek on the southwest side have been abandoned. Strutting was observed at various locations on the west side of the "U" for three years after the fire.

Currently, the FWS manages the Clear Lake Refuge to serve as a preserve and breeding ground for native birds". Today that includes nesting colonies of water birds such as: white pelicans, caspian terns, Ringed bill and California gulls, great-blue herons and double-crested cormorants, spring migrant and resident waterfowl, fall shorebirds as well as sage grouse in the uplands. The refuge is closed to all public entry except for limited hunting access. The west side of the refuge is open during the regular waterfowl season (on land only) in a line between Carr Butte to the north and Double-head Mountain to the south while the "U" is open to a small number of pronghorn hunters who have tags for the surrounding game management unit and in a separate drawing are selected to hunt the "U".

Modoc National Forest – U.S. Forest Service

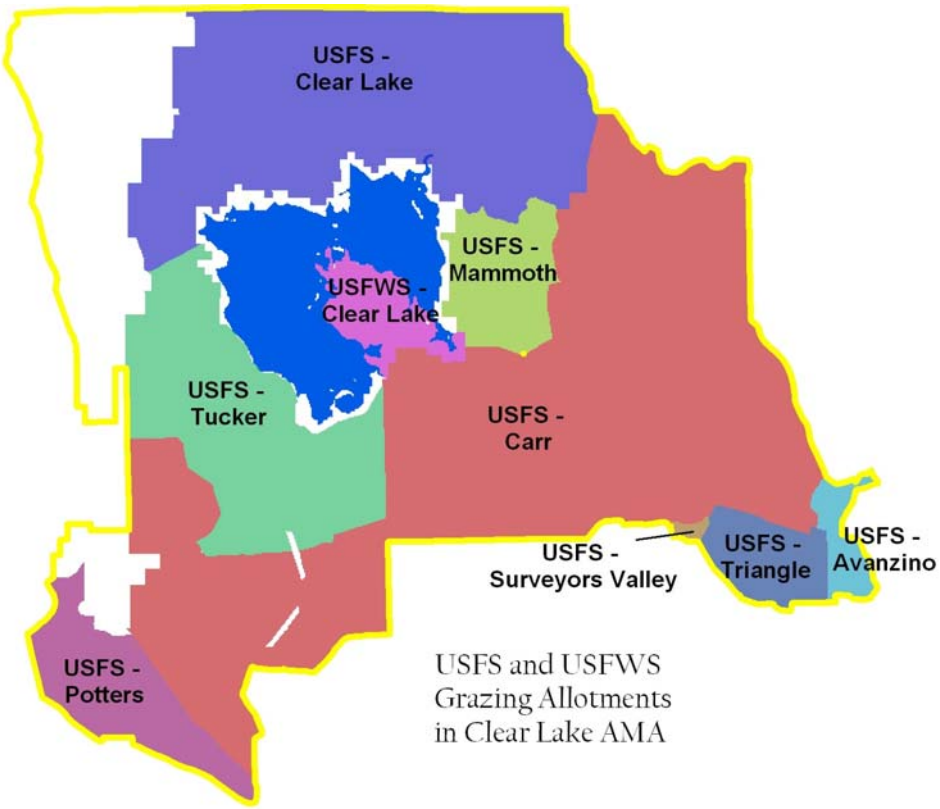


Figure 20. Grazing allotments in Clear Lake AMA.

The area immediately surrounding Clear Lake is comprised of four Forest Service grazing allotments – Tucker, Clear Lake, Mammoth, and Carr (Figure 17). The number of cattle and season of use vary somewhat from year to year, however numbers are similar between years. Information for the 2005 season for these allotments is summarized in Table 3. The number of cattle for the Carr Allotment is presented by pasture because the allotment is so large and some pastures are next to Clear Lake whereas other pastures are more removed from the active lek.

The historical narratives which follow came from archives at the Doublehead Ranger District Office in Tulelake. Inconsistencies are known between these records and some recollections of long-time residents. An effort is being made to collect and document references from both USFS and local residents and reconcile them, to the extent possible, for use in improving interpretations of vegetation and wildlife (particularly sage-grouse and deer) changes over the last 150 years.

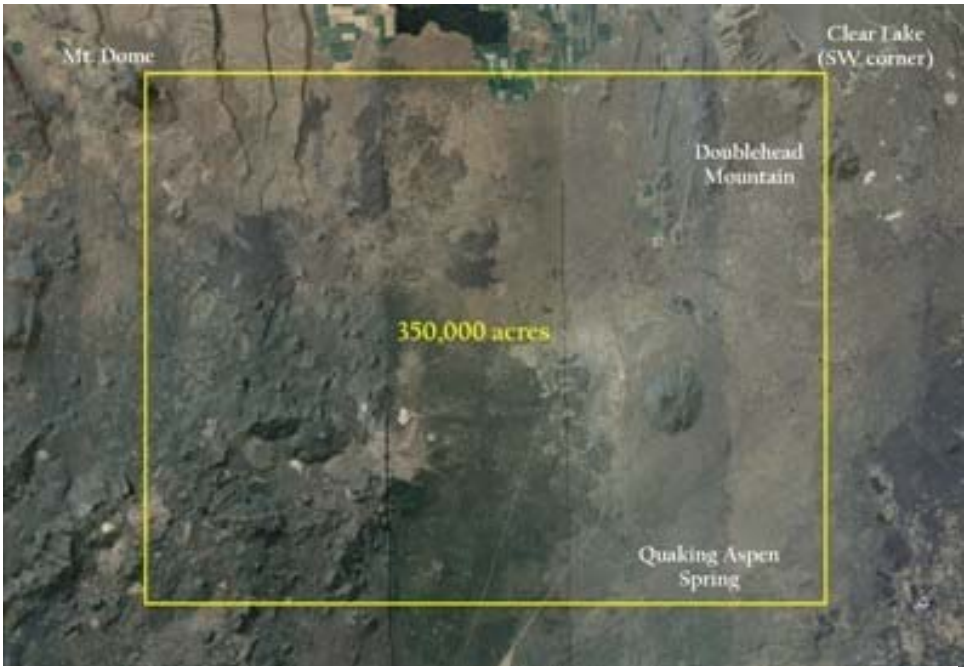


Figure 21. Approximate area of cattle range (circa 1900) described in MNF history. Livestock numbers reported as 75-80,000 cattle & horses. Imagery from August 2005 (USDA-NAIP).

Grazing History

The grazing history of the Modoc National Forest (MNF) includes the present day Tucker Allotment which encompasses the areas west and south of Clear Lake, including the Clear Lake Hills and areas west to Cougar Butte, and the Doublehead Mountain area east about two miles. Part of the history also includes the Northwest portion of the Modoc National Forest west to Mt. Dome, and what is now the Lava Beds National Monument. The Tucker Allotment is part of the area that was added to the Modoc National Forest in 1920.

Cattle/Horses

The first cattle grazing occurred in 1873 when the Dorris and Churchill Ranches ranged in the Lava Beds area. Native Americans lived off the cattle until being relocated to a reservation, at which time the early pioneers felt free to expand into western Modoc County.

The winter of 1889-90 was a hard winter. An estimated 18,000 head of cattle were lost by three large cattle companies. By 1900, 75-80,000 cattle and horses were running from Mt. Dome to Clear Lake (28 miles) and south to Quaking Aspen Spring (21 miles) near Mud Lake (roughly 350,000 acres in total area). The Klamath Land and Livestock Company ran between 2,000 and 2,500 head of cattle on the Modoc National Forest and had an unlimited right to the Public Domain surrounding Clear Lake between 1915 and 1920. This level of use continued until about 1920. It should be noted that an “unlimited right” does not mean that an “unlimited” number of animals was maintained on the unit, nor does it imply that such a unit was necessarily overstocked (although they could have been). Establishing whether overstocking was or wasn’t occurring (and, if so, when and for what duration) would require reasonably accurate estimates of livestock and wild ungulate numbers, geographic area, timing and duration of grazing activities, and plant production/climatic conditions. Those may be difficult to come by now.

Figure 22. Approximate area of cattle range 1916-1918, described as summer range in MNF history. Combined cattle numbers for several ranches reported as 15,000. Imagery from August 2005 (USDA-NAIP).

In a conversation with Herman Vowell (8/03/07), who worked for W.C. Dalton from the 1930's to 1960's, he recalled there being far fewer than 8,000 hd of cattle grazing in the vicinity of Clear Lake during his time. Prior to construction of allotment and pasture fences, cattle were gradually pushed from the Dry Lake area towards Clear Lake from spring to summer, and they were widely scattered in small bands (40-50 hd, on average). Herman also recalled that pronghorn were quite scarce in the area when he arrived in the mid-1930's, but numbers swelled through the 1960's, when several bands numbered in the hundreds.

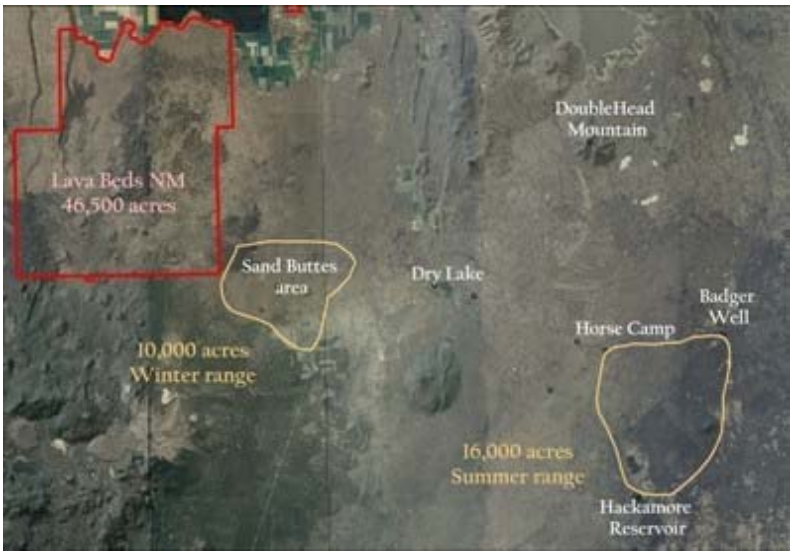


Figure 23. Approximate area of horse ranges, 1916-1918(?), described in MNF history. Horse numbers reported as 600, with another 300-400 also wintering in the Lava Beds area. Imagery from August 2005 (USDA-NAIP).

During 1916, 1917 and 1918, several ranches ranged over 15,000 cattle between Mt Dome and Dry Lake (23 miles; 120,000 acres) for summer grazing. I assume the 15,000 head figure is for all ranches combined? One individual had 600 head of horses which ran in the Horse Camp – Badger – Hackamore country and wintered near Sand Butte. Between 300 and 400 horses wintered in the Lava Beds area (total, or in addition to the 600 hd from Horse Camp?).

From 1936 to 1941 the Klamath Land and Livestock Company had a National Forest permit for 1,700 head. The full permit was transferred to W.C. Dalton Company in 1941. In 1952 this permit was reduced by 5% (to 1,615 hd) for unauthorized post-season use.

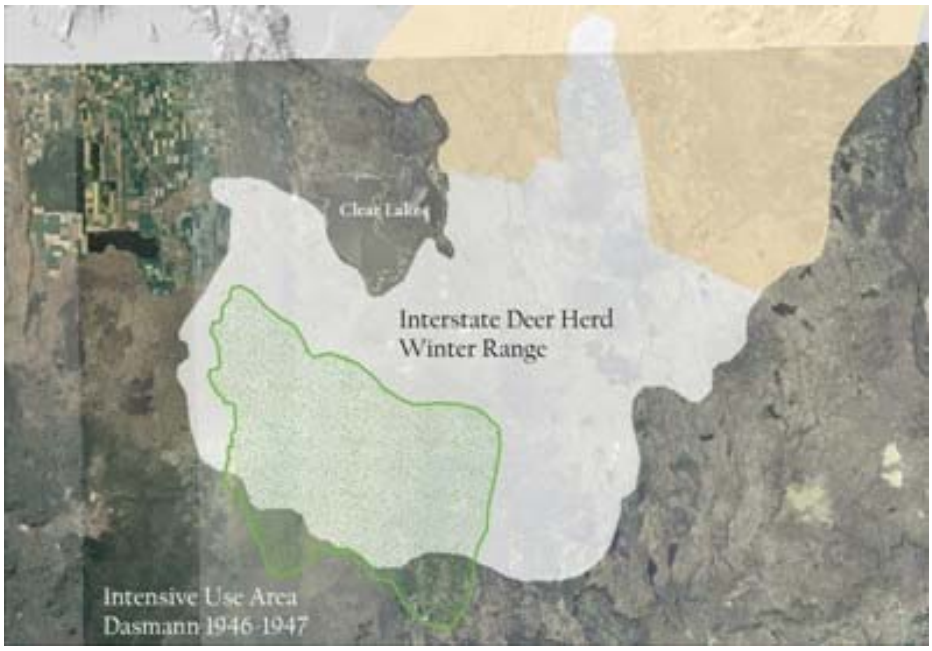


Figure 24. Green area is the region demarked by Dasmann (1949) as where the Interstate Deer Herd showed heaviest grazing pressure.

Approximately 90,000 acres were enclosed by rock and wire fences built by Chinese labor for Jesse Carr. This included most of the area that is now in the Tucker Allotment. With the exception of the structures built by the Chinese, there were very few water developments, fences, or other improvements until after 1940. Stock water development was started and the north and south allotment boundary fences were built in 1949-50. After the Interstate Deer Herd Committee was formed in 1945, one of their major decisions was to allocate forage resources 50/50 between livestock and the deer herd (Dasmann 1949). This was to be accomplished by estimating forage utilization trends over three year periods using key species (bitterbrush, *Purshia tridentate*, and bluegrasses, *Poa secunda* and *Poa nevadensis*), in fall and spring. Fall (October) utilization surveys were used to estimate livestock use (April-September), and spring (March) utilization surveys were used to estimate deer use (October-April). This was in response to the increasing population size of the Interstate Deer Herd and the concern that there would be inadequate browse in the deer winter range. In the 1950s cattle were permitted for spring use when they would utilize mostly ground feed, and that summer use was excluded to limit their use of shrubs. It should be pointed out that Dasmann, in his 1949 paper, reported 22% of the bitterbrush plants in the areas where they were most heavily utilized ("pine-bitterbrush range type") were over-browsed (i.e. had been utilized to greater than 60% in a season). That certainly indicates that significant browsing was taking place, but not at catastrophic levels. His assessment was not sufficient to determine the long-term sustainability of that level of use. I have requested a copy of his Ph.D. thesis on the herd, and other reports and documentation of the subsequent monitoring in the area to try and make some better determinations of that. Across all range types, Dasmann found that deer and livestock were consuming bitterbrush at roughly equal levels, despite their use of these areas at different times.

Dasmann (1949) places beef cattle numbers at approximately 1,500 head (1,500 AU's) in the Interstate Deer Herd Winter Range to the south of Clear Lake in 1946. By the AUM estimates he used, sheep numbers would have been about 6,000 (1,000 AU's). The deer herd size given by Dasmann in the winter of 1946-'47 was 12,400 head (2,480 AU's). By Dasmann's estimates, deer and livestock use during the mid-1940's was roughly equal.

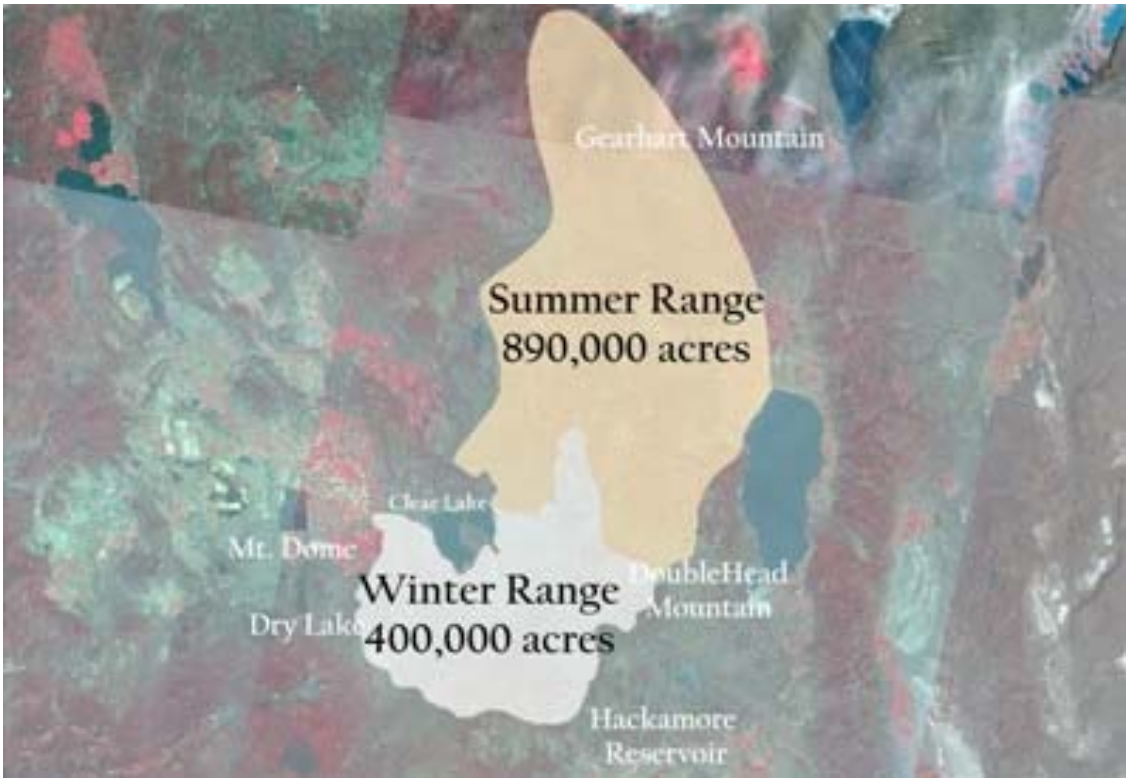


Figure 25. Approximate area of Intersate Deer Herd range, 1949 (Dasmann). Herd numbers reported as 12,400. Landsat imagery mosaicked from 2001-2002.

Figure 26. Approximate area of sheep range, 1917-1920, described in MNF history. Total sheep numbers estimated at 100,000, with roughly 35,000 using the west side. Imagery from August 2005 (USDA-NAIP).

Figure 27. Approximate area of sheep range, 1916-1918, recalled by Merrill OR resident in MNF history. Sheep numbers estimated at 32,400 (18 bands of 1,800 hd/band) in the two areas. Imagery from August 2005 (USDA-NAIP).

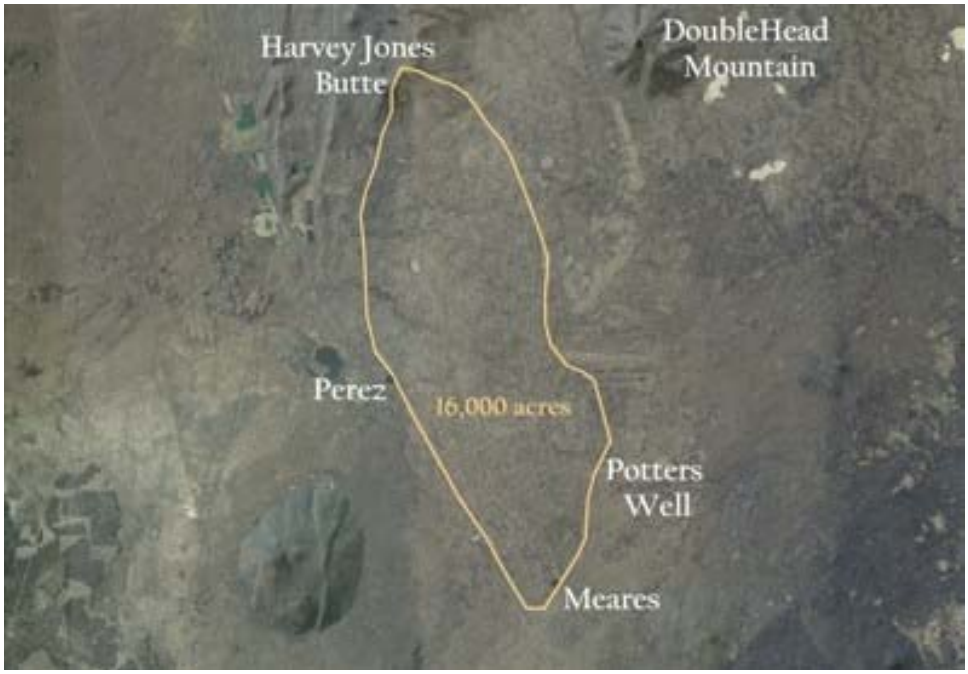


Figure 28. Approximate area of lambing range described in MNF history. Sheep numbers estimated at 10,000. Imagery from August 2005 (USDA-NAIP).

Sheep

The earliest documentation of sheep in the country was during the winter of 1879-1880 when one individual claimed to have lost approximately 30,000 head of sheep in the area north of Horse Mountain due to the harsh winter. Sheep bands again returned from the Chico area around 1885.

"After 1900 many bands of sheep came in from Oregon and the Sacramento Valley to winter and remained to lamb on the range in the spring. It has been estimated that up to 100,000 sheep came in between 1917 and 1920, using the area between Mt. Dome and Doublehead Mountain (roughly 190,000 acres in area. This was apparently the peak period prior to the time of the Doublehead addition to the Modoc National Forest. The area was segregated into east and west sides – the boundary line being at about Indian wells. On the west side there was not much sagebrush and by 1918 over 35,000 head of sheep (<6,000 AU's) used the area. An old-timer from Merrill, Oregon stated that between 1916 and 1918 he had seen 18 bands of sheep, 1,800 head to a band (32,400 sheep; 5,400 AU's), grazing on the two benches between Tulelake and Crumes Lake (approx. 18,000 acres), and from Lower Klamath to the Black Lava (18 miles, approx. 36,000 acres), in addition to cattle use by the Mitchell ranch. Between Potters well and Perez and

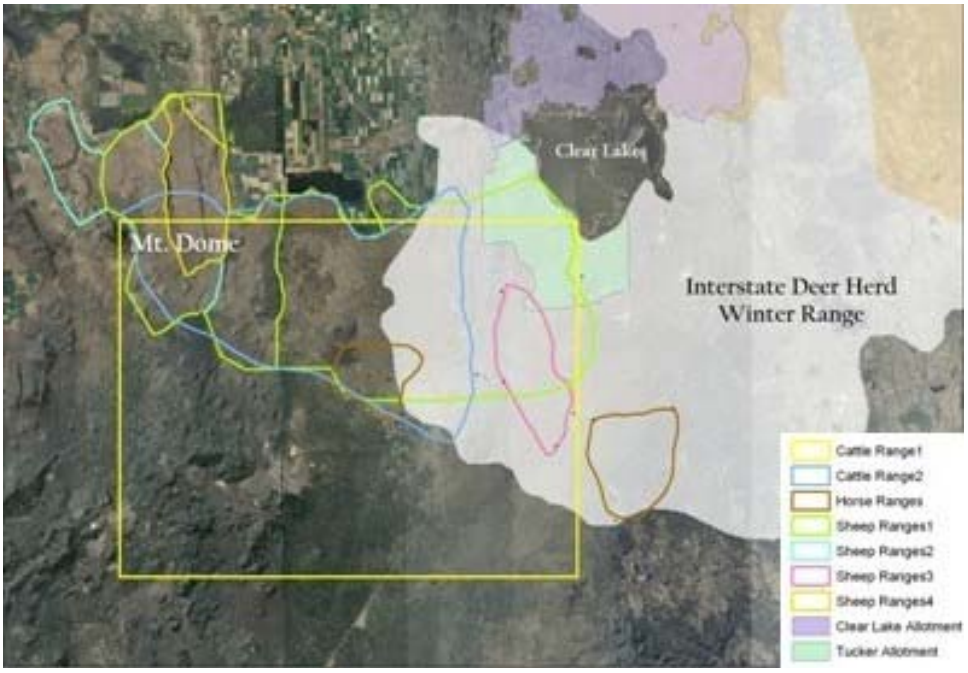


Figure 29. Combined grazed units for the Interstate Deer Herd winter range, west to the Lower Klamath Lake/Mt. Done area. Imagery from August 2005 (USDA-NAIP).

Meares north to Harvey Jones Butte (approx. 16,000 acres), sheepmen used to lamb up to 10,000 sheep (1,650 AU's) in the spring."

Grazing Allotment Improvements & Re-vegetation History

Records indicate that considerable effort was planned to get full development and use of the Tucker Allotment because of its potential for water and forage development, the need for additional usable AUM capacity to care for stock and adjacent deer winter range, and possible overstocking of adjacent allotments. "There are very few allotments on the Modoc where a large part of the allotment can be improved through plowing and reseeding or spraying sagebrush such as Tucker" (District Ranger, Elmo A. Brough, 1957).

According to the District Ranger, Elmo A. Brough, (documented in a letter to a permittee in 1957) the Tucker allotment was selected for extensive re-vegetation projects and management because large acreages were adapted to plowing and drilling to grasses; other large acreages which supported sagebrush and native bunch grasses could be improved by killing the sagebrush which would in turn allow more moisture and room for the native bunch grasses to increase. It was stated that an intensive program on the Tucker Allotment would relieve the pressure on the Boles and Dry Lake Cattle and Horse Allotments through lighter use on Boles and a shorter season on Dry Lake. The shorter season (spring season only) on Dry Lake and re-vegetation on Tucker would simplify the forage/browse issues for the Interstate Deer herd during critical winters.

As of 1959, 1,800 acres of spraying and re-seeding, 22 miles of fence, construction of 18 stock tanks, and one branding corral were completed. A salt distribution plan was put into effect in 1959. As of 1981, at least 5,575 acres of re-vegetation and prescribed burning projects had been implemented on the Tucker Allotment. Most of these projects involved plowing the native vegetation and planting wheatgrass and alfalfa. Over 1,000 acres were burned through prescribed fires. These vegetation management projects, the general area of implementation, the acres, type of ground treatment and vegetation planted, and project name, are presented in Table 3. This table may not represent all of the projects that were carried out. Based on a 1958 map in the Doublehead Ranger District files, thousands of acres were also sprayed with herbicides in 1948 and 1958 in the areas west and southwest of Clear Lake within the PMU. These areas would have been in addition to the re-vegetation projects listed in Table 3.

Table 3. Range Improvement Projects within the Tucker Allotment

Year	General Area	Acres	Ground Treatment & Vegetation Planted	Project Name
1940s	Clear Lake Hills	695	Plowed & planted with crested wheatgrass & alfalfa	Tucker Reveg. I & II
1962	SE of Doublehead Mtn.	240	Plowed & planted with intermediate wheatgrass & alfalfa	Hartlerode Reveg.
1963	Between Clear Lake & Clear Lake Hills	1,100	Tall & intermediate wheatgrass & alfalfa	Holbrook Reveg.
1964	Northern Clear Lake Hills	Unk.	Plowed & planted with intermediate wheatgrass & alfalfa	Lacey Reveg.
1965	Eastern part of Clear Lake Hills & East of Harvey Lake in vicinity of County Rd. 136	1000	Plowed & planted with intermediate wheatgrass & alfalfa	Chandler Ranch Reveg.
1968	East of OTHB Radar Installation & NE flank of Doublehead Mtn.	800	Burned, plowed, & planted with intermediate wheatgrass & alfalfa	Doublehead Unit Reveg.
1968	East flank of Doublehead Mtn. & Double Head Lake area	680	Plowed & planted with intermediate wheatgrass & alfalfa	Doublehead Mtn. Reveg.
1968	Near junction of the Clear Lake Hills Road (46N15) & County Rd. 136	Unk.	Plowed & planted with intermediate wheatgrass & alfalfa	Chandler Reveg.
1976	Near junction of the Clear Lake Hills Road (46N15) & County Rd. 136	60	Prescribed Burn	Chandler Test Burn
1980	Areas within 3 sections north of Rd. 46N15 in the Clear Lake Hills	700	Prescribed Burn	Chandler Burn
1981	Northern Clear Lake Hills	314	Prescribed Burn	Lacy Burn
	Total Acres	5,575+		

U.S. Fish and Wildlife Service reports in Appendix M include the following mentions of USFS sagebrush control and re-vegetation near Clear Lake:

> "The Forest Service carried out sage control east of Mammoth, through aerial spraying of 1,100 acres with 2,4-D and plowing some 800 acres of the same for seeding and range improvement work during 1968. It will be of interest to watch the response since both antelope and sage-grouse depended on the area in past years." KBNWR Narrative, 1967).

> “The U.S. Forest Service burned, plowed, and seeded to Intermediate wheat grass

Figure 30. Tucker Allotment – from MNF GIS. Imagery from August 2005 (USDA-NAIP).

approximately 1,600 acres in the Holbrook area on the west side of Clear Lake. This included approximately 100 acres of shoreline within the refuge." (KBNWR Narrative, 1963).

Vegetation Description

Up until 1890, the Clear Lake Hills were densely covered with 'wheatgrass'. This and the Mt. Dome area were known as the "wheatfields". In 1910, the first cheatgrass was reported at sheep bedding grounds in the area which is now the Lava Beds National Monument. About 1945, some of the first attempts to re-seed perennial grasses into sites infested with cheatgrass were completed.

Today, the area surrounding Clear Lake is comprised of four allotments – Tucker, Clear Lake, Mammoth, and Carr. Information on the vegetation and geology are presented for the Tucker and Clear Lake Allotments. Vegetation data for the Mammoth and Carr Allotments is not readily available at this time.

Tucker

Currently, the Tucker Allotment is dominated by three different vegetation types. Native and introduced bunchgrasses occur in the Clear Lake Hills, sagebrush/bunchgrasses occur along the foot hills, with juniper occurring as single trees to dense stands throughout the allotment. Current data on plant species composition within the Tucker Allotment is available from range data. According to the range conservationist on the Doublehead Ranger District, it is believed the Tucker Allotment is in good ecological health. As an example, it has been observed that several plots (Clusters 6, 9 and 10) surveyed within the allotment that had been ripped of native vegetation and seeded with introduced grasses as of 1968, are found to contain large numbers native grasses, forbs and shrubs and few introduced grasses, indicating a well-functioning system. This does not mean that all the surveyed areas converted back to natives, but it is a good sign. Data collected between 1960 and 2005 indicate that 81 species of plants occur in the area. These species include forbs, grasses, shrubs, and a few introduced species. Twelve forbs favored by sage-grouse are present within the allotment. Frequency data for nine of these forbs was obtained from circular plots measured in 2005. This data is presented in Table 2.

Table 4. Plants favored by sage-grouse, and their frequency of occurrence in the Tucker Grazing Allotment

Plants - Common name	Percentage of Plots Where Present
Phlox	71
Astragalus	100
Common dandelion	14
Daisy/fleabane	14
Desert parsley	14
Hawksbeard	71
Mariposa/Sego Lily	71
Salsify	29
Yarrow	43

Other forbs favored by sage-grouse which were found to be present, but for which no frequency data is available, are clover (*Trifolium spp.),* prickly lettuce (*Lactuca serriola*), pussy toes (*Antennaria spp.),* and rough eye lash (*Blepharipappus scaber*).

Clear Lake

The Clear Lake Allotment covers approximately 53,210 acres, with elevations ranging from 4160 feet on Lost River to 5482 feet at the top of Carr Butte. Dominant vegetation is characterized by juniper/sagebrush grasslands and shrublands. Ponderosa pine is present at higher elevations and on northern aspects. The terrain is predominantly rolling basalt lava flow plains and low hills, interrupted by alluvium-filled valleys and basins, a few cinder cone volcanoes, and both low- and high-relief tectonic fault traces and scarps. Willow Creek runs along the southeast side of the allotment and flows into the Clear Lake Reservoir, which lies south of the allotment. Lost River flows out of Clear Lake Reservoir, then northwesterly through the central part of the allotment. Rock Creek drains Wilson Valley, a private inholding on the northeast corner of the allotment, and flows into Lost River.

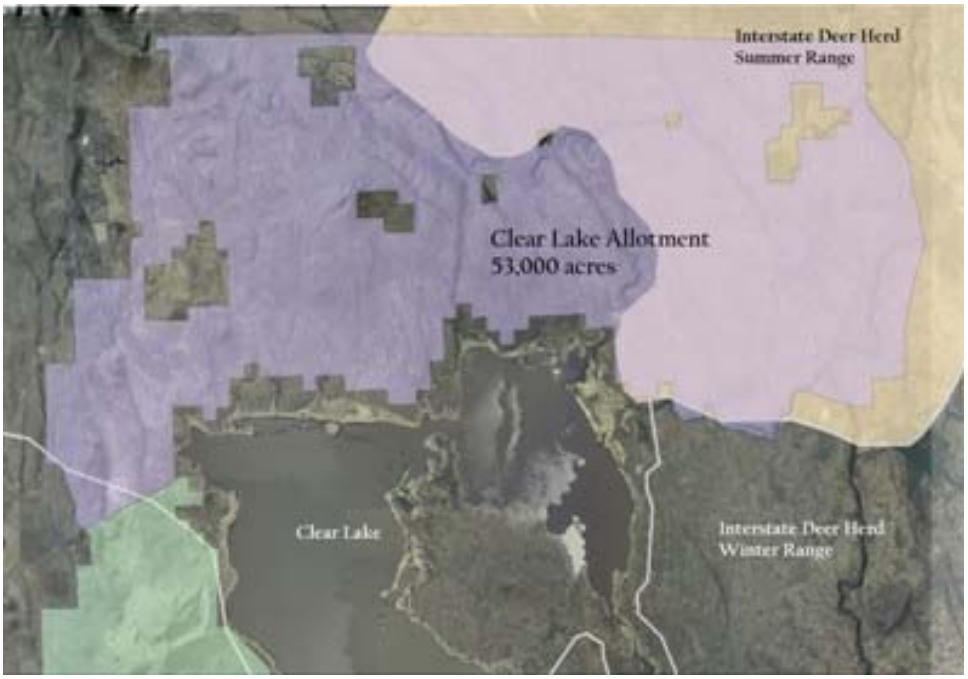


Figure 31. Clear Lake Allotment – from MNF GIS. Imagery from August 2005 (USDA-NAIP).

Soils on the Clear Lake Allotment have been strongly influenced by volcanic processes. Nearly 70% of the allotment is covered by Pliocene and Pleistocene basalt flows. These flows occur in all parts of the area and are associated with two types of soil. Where there has been significant deposition and incorporation of pumice, soils are deeper and loamier than on those flows where pumice is not a component. Loamy flow areas can be identified by the presence of Wyoming big sagebrush, whereas clayey flow areas support low sagebrush. Shallow alluvial basins and drainages also exhibit both loamy/deep and clayey/shallow soil types, with the same sagebrush distribution as on flows. These alluvial areas, which are scattered throughout the allotment, occur most frequently around the perimeter of Clear Lake Reservoir, in the flood plain zone. This includes areas that are now above the high water level but were once part of the floodplain for a larger, ancestral Clear Lake. High-relief fault blocks, with offsets of up to 1000 ft., occur on the south side of Lost River. Colluvial slopes have filled in the escarpment side of the faults; these soils are deeper and loamier than elsewhere on the allotment. Mountain mahogany and scattered pines are indicators of these soils. Springs on these colluvial slopes support aspen groves.

Range Allotments

Figure 32 shows the grazing allotments in the Devil's Garden PMU, including the Clear Lake AMA. These allotments are further subdivided into pastures, which are the primary management units (owing to fencing, they are the smallest areas to which grazing prescriptions can be applied). Table 5 on the next page gives a short synopsis of allotment management, in terms of livestock numbers and time of use.

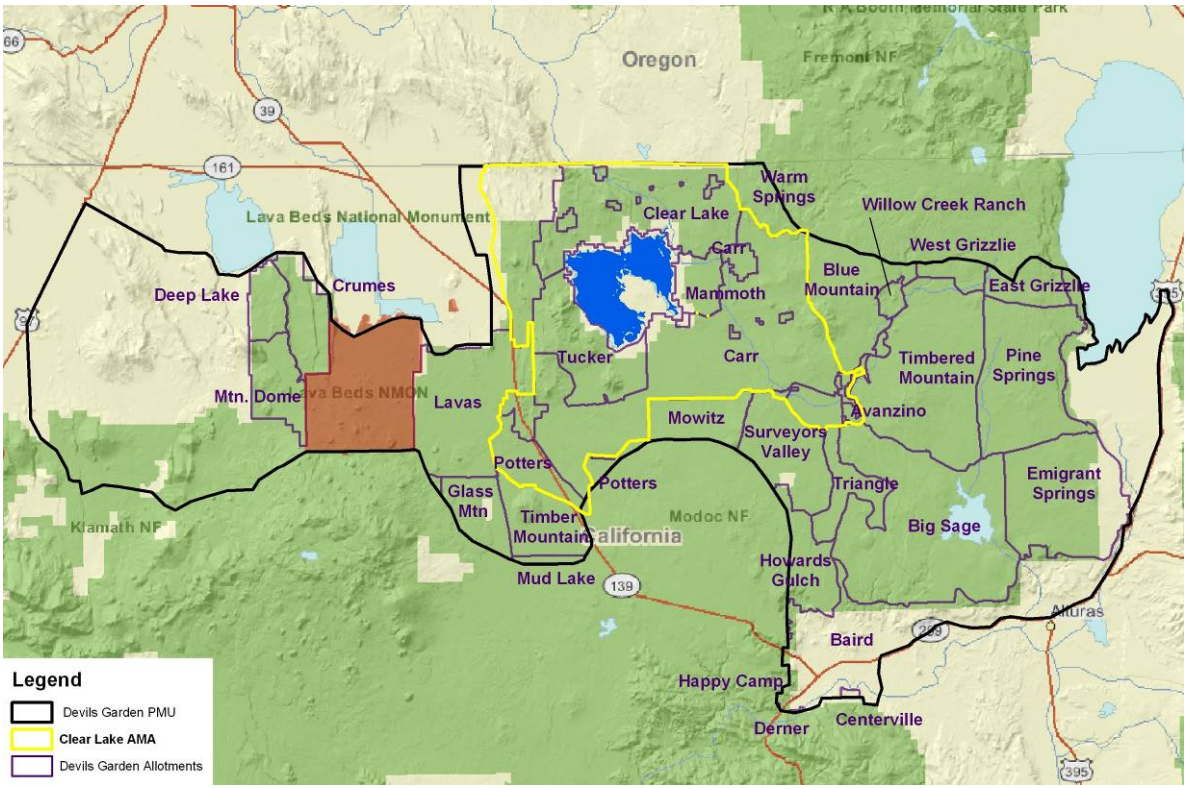


Figure 32. Devil's Garden Grazing Allotments.

Table 5. Cattle and sheep use permitted in 2005 for grazing allotments around the perimeter of Clear Lake and within the Devil's Garden/Clear Lake PMU.

ALLOTMENT NAME	Cow/Calf & Ewe/Lamb Pairs	Season of Use
Tucker	300 C/C 2,000 E/L	5/1-9/30 4/16-5/31
Clear Lake	270 C/C 290 C/C	4/16-10/15 5/16-10/15
Mammoth	300 C/C	5/16-7/10
Carr		
Carr Pastures		
Harvey Jones	550 C/C	4/16-5/25
Perez	Rest	Rest
Lone Pine	550 C/C	6/6-7/15
Red Lake	550 C/C	7/16-8/26
Pinnacle	595 C/C	9/1-9/30
Timbered	795 C/C 200 C/C	6/11-7/01 6/25-7/25
Pothole	795 C/C	5/16-6/10
Bird	795 C/C 100 C/C	7/2-8/09 7/15-8/09
Quaking Aspen	100 C/C	6/25-7/14
Willow Creek	300 C/C	5/16-6/24

Fire History

The Modoc National Forest has maintained a record of fires that dates back to the early 1900s. While wildfire is believed to have played a role in suppressing the expansion of juniper into more productive lowland areas, fire also impacts sagebrush species. When fires are of low to moderate intensity, and patchy in distribution their effects may often be beneficial in terms of diversifying habitat and stimulating the production of forbs and other herbaceous species that can be crowded out by dense shrub canopies. However, with the introduction of cheatgrass into the system, wildfires may become both more frequent and more intense. As most sagebrush species may take 8-16 years to recover canopy density following an intense fire, in some areas high fire frequencies may make it difficult to maintain desirable levels of sagebrush for sage-grouse habitat.

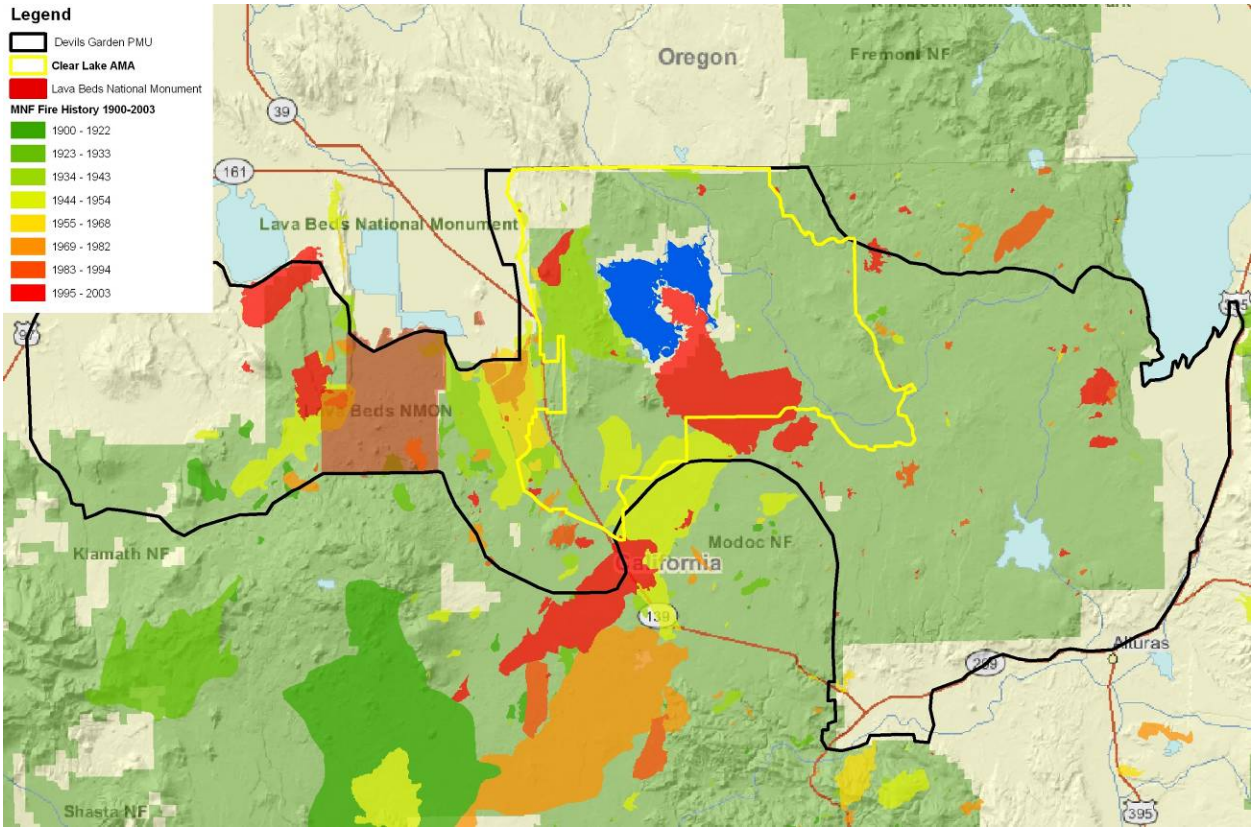


Figure 33. Fire Areas and Years of Occurrence for MNF, 1900-2003.

Current Habitat Conditions in the Tucker and Carr Allotments

From April through October 2007 portions of the Tucker and Carr allotments, plus one location on the Clear Lake "U", were monitored for composition of forbs (wildflowers), grasses and shrubs. Monitoring was accomplished using eight "hub-and-spoke" transects, which consisted of a center stake (T-post) and three additional posts set 150' out from the center stake and 120° apart from each other. Both line transect and belt transect methods were used for collecting data. A line transect is where a tape is run from the center stake to one of the "spoke" posts, and measurements are recorded along the tape. A belt transect is where a straight line is walked between the center stake and each spoke post, and a count is made of every target object (e.g. live shrub/dead shrub) that falls within a set distance left or right of that line (in this case, 4.5' either side, for 9').

Over 65 species of forbs were found in this area, with forbs being common nearly everywhere except in one of the two big sagebrush sites, which had been grazed prior to making the measurements. As a result, these measurements only represent what remained in late summer after grazing - not what the site had produced during the year. Thirteen forb genera/species known to be consumed by sage-grouse were documented in the area, most being fairly to highly abundant.

Low sagebrush canopy cover averaged 22%, ranging from 12% to 32%. On the two big sagebrush sites that were surveyed, sagebrush canopy cover averaged 36%. In terms of population, low sagebrush averaged 2,500 plants per acre with an estimated population change (#juvenile-#dead) of +213 plants per acre. On the two big sagebrush sites, the

average population size was 4,800 plants/acre with an estimated population change of -70 plants/acre (insufficient observations for high confidence).

Six perennial grass species were documented from the eight transect sites. *Poa sandbergii* (Sandberg bluegrass) was far the most common grass, accounting for over 75% of all observations. Average leaf height for all grasses across all transects was 11 cm, with a range of 3-43 cm. Even left ungrazed, *P. sandbergii* would only rarely attain the residue height recommended for sage-grouse nesting sites (≥18 cm). Two species present in the survey area have potential to provide adequate height to hide nests, however: *Pseudoroegneria spicata* (Bluebunch wheatgrass) and *Agropyron cristatum* (Crested wheatgrass). Average heights of these species were 28 and 23 cm, respectively. Their abundance, however, is low, except in localized areas, accounting for 4% and 13% of all observations.

Table 6. WAFWA Guidelines for Sage-Grouse Habitat as Compared to Clear Lake Habitat Area.

Characteristic	**Guideline**	Low Sagebrush		Big Sagebrush	
	Nesting	AVG	RANGE	AVG	RANGE
Canopy cover, sagebrush	**15-25%**	22%	12-32%	36%	17-49%
Canopy cover, herbaceous	**≥25%**	31%	18-47%	31%	7-51%
Grass height	**≥18 cm**	11 cm	3-28 cm	16 cm	4-43 cm

Eight "hub-and-spoke" transects (each "spoke" = 150') were constructed in the area occupied by the Tucker and Carr allotments south and west of Clear Lake, and one transect was constructed on the Clear Lake "U". These transects were monitored for forbs (wildflowers) from April through June, grasses from late August through September and shrubs from early to mid-October.

Line Transect Canopy Cover Measurements

Overall, live shrubs covered 26% of the line transect distances, herbaceous plants (forbs & grasses) 31% and the remaining 43% of the transect distances intercepted bare ground or dead shrubs. Live shrub canopy cover ranged from 12% to 32% in the six low-sage sites (average 22%), and averaged 36% in the two big-sage site (Tables 1 & 2). Sagebrush canopy cover estimates in sage-grouse nesting sites published in research cited by Connelly et al. (2000) ranged from 15-38%. Most areas surveyed in 2007 would fit in this range.

Table 7. Line transect estimates of cover. "Herb" means both grasses and forbs.

	All sites	Low sagebrush	Big sagebrush
Type	**% Cover**	**% Cover**	**% Cover**
	n=8	n=6	n=2
Shrub	26%	22%	36%
Herb	31%	31%	31%
Bare	43%	47%	33%

Table 8. Line transect canopy cover estimates by transect. Big sagebrush sites are shaded.

Type	Transect							
	T02	T03	T04	T05	T06	T07	T08	T10
Shrub	29%	12%	17%	19%	23%	26%	32%	46%
Herb	23%	31%	25%	40%	47%	44%	18%	18%
Bare	48%	56%	58%	41%	30%	30%	49%	36%

Counts were made of total live, total juvenile and total dead for each shrub species using a 9' "belt" measurement method on seven of the eight transects (T01 had no shrubs). These counts were used to estimate the population of each species, and estimate the rate of population expansion (or decline). Low sagebrush populations were estimated to range from 500 to 7,500 plants per acre (avg 2,500), with a population change rate of -247 to +946 plants per acre (avg +213, CV ±202%). Big sagebrush populations were estimated to range from 2,200 to 7,500 plants per acre (avg 4,800), with a population change rate of -237 to +97 plants per acre (avg -70, CV ±337%).

Table 9. List of forbs identified in the study area, 2007. Species highlighted in green represent genera or species reported by Barnett and Crawford (1994) as being consumed by sage-grouse in SE Oregon.

Achillea millefolium	*Adonis aestivalis*	*Agoseris glauca*	*Agoseris retrorsa*
Alyssum desetorum	*Antennaria argentea*	*Antennaria dimorpha*	*Apocynum androsaemifolium*
Arabis sparsiflora	*Arenaria congesta*	*Astragalus lemmonii*	*Astragalus purshii*
Balsamorhiza macrolepis var. platylepis	*Balsamorhiza sagittata*	*Blepharipappus scaber*	*Calyptridium umbellatum*
Camissonia tanacetifolia	*Castilleja applegatei*	*Chrysolepis chrysophylla*	*Cirsium cymosum*
Collinsia parviflora	*Crepis acuminata*	*Crepis modocensis*	*Crepis occidentalis*
Crocidium multicaule	*Cryptantha intermedia*	*Draba verna*	*Erigeron bloomeri*
Erigeron divergens	*Eriogonum nudum*	*Eriogonum umbellatum*	*Fritillaria pudica*
Geum triflorum	*Hieracium scouleri*	*Horkelia fusca*	*Hydrophyllum capitatum*
Leucocrinum montanum	*Lithophragma parviflora*	*Lomatium macrocarpum*	*Lomatium piperi*
Lomatium triternatum	*Lomatium vaginatum*	*Lotus purshianus*	*Lupinus agenteus*
Lupinus brevicaulis	*Lupinus Lepidus*	*Montia linearis*	*Paeonia brownie*
Phacelia hastata	*Phacelia linearis*	*Phlox diffusa*	*Phlox gracilis*
Phlox hoodii	*Phoenicaulis cheiranthoides*	*Plagiobothrys mollis*	*Polyctenium fremontii*
Ranunculus glaberrimus	*Ranunculus testiculatus*	*Senecio canus*	*Senecio integerrimus*
Sidalcea glaucescens	*Taraxacum officinale*	*Trifolium macrocephalum*	*Viola beckwithii*
Viola glabella	*Wyethia mollis*		

Lava Beds National Monument – National Parks Service

Lava Beds National Monument covers 72 square miles within Siskiyou and Modoc counties in northeastern California. Precipitation averages approximately 15 inches yearly, but very little water is present due to the fractured surface rock and porous pumice-rich soils. Snow melt and rain immediately percolate through the soils and out of the reach of most plants. For this reason, there are no springs, streams or surface water. Most plants found within the monument have adapted to semi-arid conditions. However, in the highest elevations within the monument, exceeding 5,000 feet, one finds a more typical coniferous forest community. Along the northern boundary is the Tule Lake Wildlife Refuge. Here, the elevation is 4,040 feet, where a typical bunchgrass community existed in the past, but has given way to a cheatgrass/mustard community. As you travel south through the monument, the typical bunchgrass community remains, for the most part, intact.

Although the monument appears to be a desert type at first glance, none of the extremes of a desert are found. Temperatures are seldom over 90 degrees F. during the summer, and the winters are quite moderate. The 15 inches of precipitation a year are quite adequate for a higher climactic community, but due to the porous nature of the soils much of this moisture is lost before it can be used by the plants.

The monument is divided into a number of recognizable plant communities: Bunchgrass-Sagebrush; Juniper-Chaparral, and Ponderosa Pine. A plant list has been compiled over the years containing over 280 different species. The monument maintains a working herbarium.

Lava Beds National Monument was originally administered by the U.S. Forest Service. It was established under Presidential Proclamation in November 1925 and subsequently transferred to the National Park Service to administer in 1933. The land within the monument was heavily grazed by sheep and some cattle, continuing through 1974, with only one life lease granted after 1947. The grazing of the monument had a significant negative impact upon the native vegetation. The park is beginning to recover; however the intrusion of exotic plant species, such as cheatgrass (*Bromus tectorum*) and woolly mullein (*Verbascum thapsus*), are found throughout the monument.

The monument supports an abundant and diverse wildlife community including over 250 vertebrates. There are 51 known species of mammals, 217 known bird species and at least 12 species of reptiles.

The lands within the monument provide preferred winter habitat for mule deer (McCloud Herd). During a normal winter season, snow depth at the upper elevations of the Medicine Lake Highlands forces the deer to move down the eastern slope and into the monument. Small populations of pronghorn are also observed in the monument's northern extent, where the terrain is rolling shrub/grassland.

The monument has always provided habitat for mountain lions (*Felis concolor*). Until recently, very few sightings have occurred (2-5/yr.). A substantial increase in lion sightings since 1994 has prompted management to initiate a mountain lion awareness program that informs and educates visitors to the potential hazards of living and recreating in lion country.

Endangered/Threatened Species

Lava Beds National Monument has currently identified three State protected species within the monument. They are the bald eagle (*Haliaeetus leucocephalus*), the great grey owl (*Strix nebulosa*) and the peregrine falcon (*Falco peregrinus*). Although the bald eagle and the peregrine falcon have been delisted from the Federal Endangered Species Act in 2007 and 1999, respectively, they are still listed as endangered species via the California Endangered Species Act. The bald eagle is also protected under the Bald and Golden Eagle Protection Act, as amended in 1962. The bald eagle uses the monument for winter roosting cover. The sites identified are the Caldwell/Cougar Butte and Eagle Nest Butte Roosts.

Other species on the California threatened list that are rare visitors to the monument include the sandhill crane (*Grus canadensis*), Swainson's Hawk (*Buteo swainsoni)*, and the bank swallow (*Riparia riparia*). Other California Species of Special Concern that may be present in the Monumument are: Northern Goshawk (*Accipiter gentilis),* Cooper's Hawk (*Accipiter cooperii)*, Sage-grouse (*Centrocercus urophasianus),* and Golden Eagle (*Aquila chrysaetos).* There are no reptiles, amphibians, or plants listed as threatened or endangered within the monument. However, an inventory of all species has yet to be completed.

The monument has signed several agreements with other agencies involving the management of wildlife species. They are:

1) The California Bighorn Sheep Recovery and Conservation Guidelines for Northeastern California (1991) serve as a basis for evaluating the potential for bighorn sheep reintroduction into northern California. The document provides guidance for reintroduction, habitat management, and monitoring/research opportunities.

2) The Klamath Basin Habitat Management Plan: A plan for the re-introduction of peregrine falcons into a historic territory in the Klamath Basin in northern California (1986). The plan encourages the cooperation of participating agencies in the re-establishment of the species through introduction of captively-hatched eyasses, manage to improve nesting and foraging habitats, provide for disturbance-free habitats, and apply species management to ensure long-term viability of the breeding pairs.

3) The McCloud Flats Deer Herd (CDFG 1985) agreement specifies that the participating agencies cooperate to encourage the development of specific action plans for each sub-herd.

The lands within the monument provide preferred winter habitat for mule deer. During a normal winter season, snow depth at the upper elevations of the Medicine Lake Volcano forces the deer to move down the eastern slope and into the monument. Deer populations according to the California Fish & Game are lower than in past years and are continuing to decline. This may be attributed to widespread vegetative habitat age and species structural changes due to seven successive drought years; to the exclusion of fire; and/or to some other problems in herd health. Since 1996, it seems that deer populations are slowly rebounding; however no population studies have been initiated to confirm or refute this observation. Deer are readily observed within the monument throughout the year.

Populations of pronghorn are observed within the northern and eastern portions of the monument. They prefer the more open habitats, and indications are that the monument may

be used as an important kidding ground. Again, no research has been conducted to study pronghorn within the monument.

In the past, populations of sage-grouse were found within the monument, however, since the late 1970's only unconfirmed sightings have been made near Hovey Point. Changes in habitat due to the lowering of the water tables, the retreating of the Tule Lake shoreline, removal of sagebrush through fire/grazing, and invasion of cheatgrass have disrupted this native species. Hunting and grazing have been eliminated from the monument, and there is a growing interest in reintroducing the sage-grouse to the monument. Healthy, breeding populations exist at Hart Mountain NWR, in the Buffalo-Skedaddle PMU in Lassen County, and in several western Nevada locations which could serve as a source of birds for Lava Beds. An evaluation of the monument's habitat for the potential reintroduction of the sage-grouse should be conducted. **(LABE-N-114)**

Private Lands

There are fewer than a dozen private landowners in the AMA. These manage approximately 40,000 acres of their own land, and have grazing permits for specific allotments on adjacent federal lands. Nearly the whole AMA is utilized for grazing to some extent, and has been since the late 1800's. Virtually all of the private lands are adjacent to or surrounded by the Modoc National Forest, with a few parcels bounded by BLM lands or the Clear Lake National Wildlife Refuge. These private lands are primarily used for irrigated or dryland livestock pasture and hay production. Just over half of the private lands in the AMA have been classified as being good quality (R0) habitat (Table 6), with most of the remainder having been converted to juniper woodland (X3) or undergoing the transition to juniper woodland (R3). Many of these private lands have been held or managed by the same families for several generations. Some are descendants of the original settlers, and possess significant knowledge of the history of the area since the late 1800's.

Prior to the creation of fenced management units (allotments & pastures) on the Modoc National Forest, sheep and cattle would be herded across their respective ranges, from Goose Lake in the east to Butte Valley – a distance of over 50 miles. Changes over time in the infrastructure and management of the private ranches and the Modoc National Forest occurred contemporaneously with increases in juniper and, later, declines in sage-grouse and deer populations.

A number of landowners in or near the AMA have received assistance through the USDA Sage-Grouse WHIP program to improve habitat conditions, beginning in 2005. The Lava Beds/Butte Valley Resource Conservation District received USFWS Partners for Wildlife Grants in 2005 and 2006 to fund 500 acres of juniper removal and 50 acres of range seeding/planting on private lands. Approximately half of that work had been completed by spring 2008, with the remainder scheduled for completion before termination of funding. Several large landowners in the AMA have been clearing juniper and improving habitat conditions at their own expense, including, when approved, on adjoining public lands where they hold grazing permits.

Chapter 5: Habitat Conservation Assessment

Habitat Condition Assessment (R-Value)

The condition of the 254,000 acres of potential sagebrush habitat within the sage-grouse AMA of the Devil's Garden/Clear Lake PMU reported below have been rated based on their ability to respond positively to management with specific constraints. These Response-Value (R-value) categories were developed initially by the BLM in Idaho and adapted for use in this conservation strategy effort. Staff at the Alturas BLM office classified lands in the PMU and AMA into the R-value types listed below in order to provide a broad assessment of existing and potential sage-grouse habitat within the management area. This work was done in 2005 using satellite and aerial imagery to classify vegetation types. Classifications within the AMA are in the process of being refined and corrected from GIS canopy cover classification from 2005 NAIP Orthoimagery and field surveys.

AMA	*ENTIRE PMU*
R0 – 82,431 acres (32.4%*)	***286,982 acres (28.8%**)***

Areas with desired species composition which have desirable levels of sagebrush canopy and sufficient grasses and forbs in the understory to provide adequate cover and forage to meet seasonal needs of sage-grouse (nesting, early brood, summer, and fall/winter).

R1 – 34,337 (13.5%)	***78,348 (7.9%)***

Areas with potential to produce sagebrush plant communities that have good understory composition of desired grasses and forbs, but lack adequate sagebrush canopy cover.

R2 – 620 acres (0.2%)	***77,220 acres (0.7%)***

Areas with potential to produce sagebrush plant communities that have a sagebrush overstory, but lack sufficient herbaceous understory.

R3 – 27,804 acres (10.9%)	***143,748 acres (14.4%)***

Areas with potential to produce sagebrush communities (mature sagebrush and seedlings present) but are transitioning to juniper woodlands.

X3 – 106,080 acres (41.7%)	***400,256 acres (40.2%)***

Areas which have crossed the threshold from sagebrush plant communities (sagebrush seedlings absent) into juniper woodlands.

R4 – 522 acres (0.2%)	***23,697 acres (2.4%)***

Areas with potential to produce sagebrush communities (mature sagebrush and seedlings present) but where understory vegetation is dominated by annual grass, forbs, or bare ground.

X4 – 2,396 acres (0.9%)	***56,279 acres (5.6%)***

Areas that have crossed the threshold from sagebrush communities (seedlings absent) into annual grasslands, forbs, or bare ground.

*** These percentages are based out of 254,191 acres of Potential Sagebrush Habitat In the AMA**

***** These percentages are based out of 996,530 acres of Potential Sagebrush Habitat In the entire PMU***

These habitat value estimates indicate that approximately 11% of the AMA currently has a high percentage of juniper or annual grass invasion (R3 and R4), versus 17% in the whole PMU. Roughly 40% of the sagebrush communities have been converted from sagebrush to juniper woodland (X3) in both the AMA and the PMU. In the PMU relatively more area (5.6% vs. 1%) has been converted to annual grasslands (X4) than in the AMA.

Table 10. Estimated Habitat Characteristics ("R" Value) and acreages by Management Entity and Geographic Area (Active Management Area or Entire Devil's Garden/Clear Lake PMU). Black text represents the Active Management Area, and gray text represents the Devil's Garden PMU.

Mgt Entity	Classification	AMA Acres	Percent	PMU Acres	Percent
BIA					
	R0			1,394	22.0%
	R3			788.451	12.4%
	R4			47	0.7%
	X3			3,386	53.3%
	X4			732	11.5%
	TOTAL	**0**	**0%**	**6,348**	**0.6%**
BLM					
	R0	1,283	28.0%	22,445	39.2%
	R1	34	0.7%	1,529	2.7%
	R2			233	0.4%
	R3	748	16.3%	6,027	10.5%
	R4	3	0.1%	1,702	3.0%
	X3	2,440	53.3%	24,772	43.3%
	X4	75	1.6%	542	0.9%
	TOTAL	**4,583**	**1.7%**	**57,251**	**5.1%**
CDFG					
	R0			0	0%
	R3			101	54.3%
	R4			85	45.3%
	X3			0	0%
	X4			1	0.3%
	TOTAL	**0**	**0%**	**187**	**0.0%**
NPS					
	R0			20,734	60.0%
	R1			4	0.0%
	R2			99	0.3%
	R3			5,226	15.1%
	R4			7,989	23.1%
	X3			211	0.6%
	X4			310	0.9%
	TOTAL	**0**	**0%**	**34,574**	**3.1%**

Mgt Entity	Classification	AMA Acres	Percent	PMU Acres	Percent
PRIVATE					
	R0	20,964	55.7%	62,289	28.2%
	R1	3,009	8.0%	4,579	2.1%
	R2	0	0.0%	0	0.0%
	R3	3,937	10.5%	29,199	13.2%
	R4	120	0.3%	7,619	3.4%
	X3	7,311	19.4%	63,056	28.5%
	X4	2,302	6.1%	54,442	24.6%
	TOTAL	**37,644**	**14.1%**	**221,185**	**19.6%**
SLC					
	R0	0	0.0%	336	30.9%
	R3	98	30.4%	268	24.6%
	R4			10	0.9%
	X3	225	69.6%	475	43.6%
	X4			0	0.0%
	TOTAL	**350**	**0.14%**	**1,089**	**0.1%**
USFS					
	R0	58,562	28.5%	177,442	26.5%
	R1	27,275	13.3%	67,894	10.1%
	R2	620	0.3%	6,886	1.0%
	R3	22,871	11.1%	101,932	15.2%
	R4	399	0.2%	6,243	0.9%
	X3	96,023	46.7%	308,267	46.1%
	X4	19	0.0%	251	0.0%
	TOTAL	**254,191**	**77.0%**	**668,915**	**59.2%**
USFWS					
	R0	1,621	27.6%	2,342	33.5%
	R1	4,020	68.4%	4,341	62.2%
	R2			1	0.0%
	R3	151	2.6%	206	3.0%
	R4			3	0.0%
	X3	81	1.4%	89	1.3%
	X4			1	0.0%
	TOTAL	**5,873**	**2.2%**	**6,983**	**0.6%**

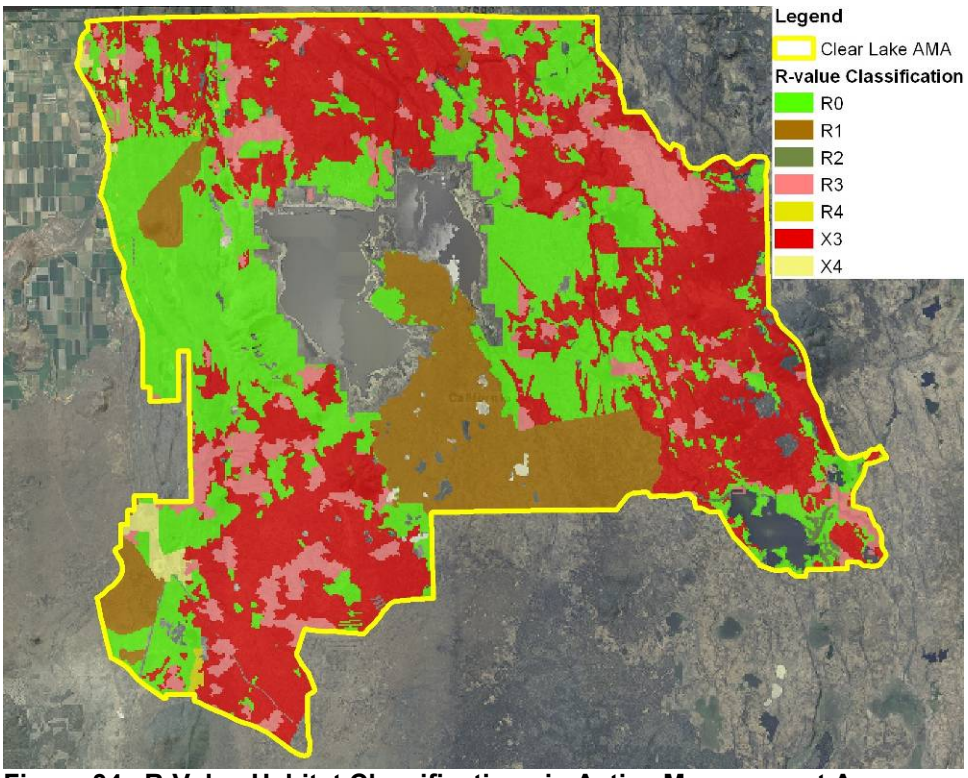


Figure 34. R-Value Habitat Classifications in Active Management Area.

Juniper Canopy Cover Assessment

As part of its conservation planning effort, NRCS staff are attempting to generate quantitative estimates of juniper canopy cover for the entire AMA. This is being done using GIS classification methods on 2005 NAIP imagery (Fig. 30), with the expectation that this will be repeated as often (every 5-7 years) as the NAIP ortho-photos are updated. Information developed from this will be used for prioritizing and developing projects, and more finely discriminating between R3 and X3 sites.

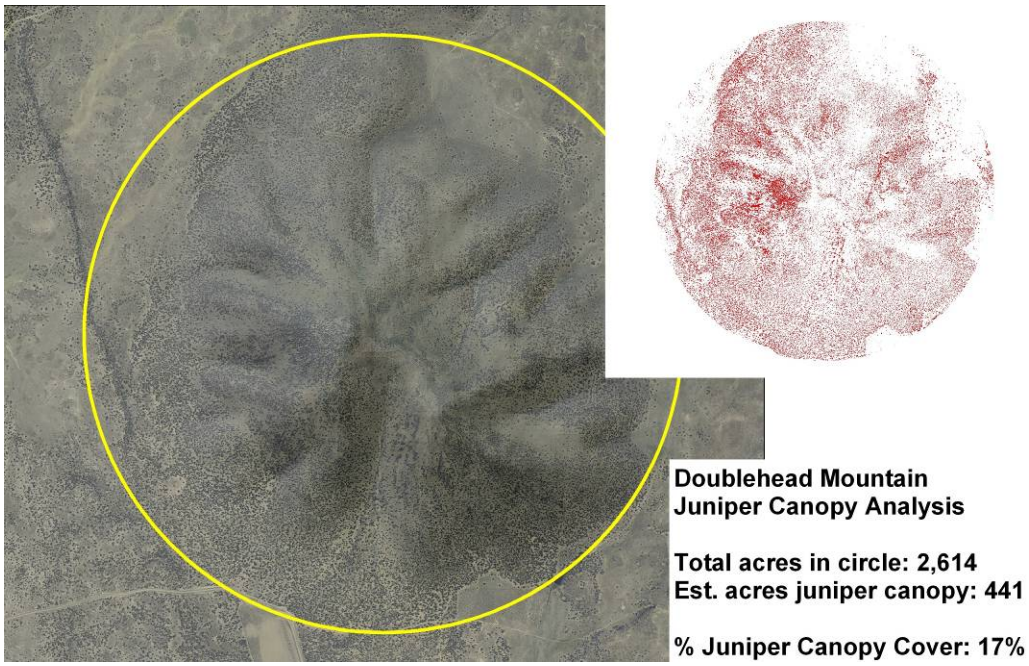


Figure 35. GIS analysis of juniper canopy cover on Doublehead Mountain, from 2005 NAIP imagery.

Risk Factors Summary:

The Clear Lake Sage-Grouse Working Group evaluated local risk factors believed to be impacting the sage-grouse population, and the habitats required by it.

Habitat

High Risk

- Juniper encroachment (conversion of habitats to R3/X3)
- Habitat improvement impediments (such as restrictions on juniper size and removal methods imposed to protect cultural resources)
- Loss of connectivity
- Loss of sagebrush to fire
- Increased fire ignition risk from annual grasses - conversion of habitats to R1
- Limited availability of nesting and winter habitat
- Loss of desired herbaceous understory
- Climate/weather pattern changes (increase in drought, severity of winter conditions)
- Powerlines
- Impacts of wild horse populations that chronically exceed AMLs.

Moderate

- Loss of meadows
- Conversion to annual grassland (R1)

Low

- Historical and current seeding of non-native forages in PMU
- Pesticide use
- Livestock grazing in active management area
- Collisions with vehicles and/or fences

Population

High

- Critically low population size
- Low recruitment of existing population
- Predation
- Lack of recruitment from adjacent populations
- Disease (West Nile virus)

Moderate

- Poaching

Elements not considered current risk factors in the PMU:

- Too few insects
- Water distribution
- Lack of late brood rearing habitat
- Conversion to annual grassland
- Junipers on historic lek sites
- Sagebrush encroachment in meadows
- Inadequate access to water (juniper)
- Off road vehicles
- Human impacts
- Roads

Effects of population and habitat conservation efforts cannot be meaningfully evaluated without rigorous field inventories of peak male lek counts and recruitment rates using standardized methods (Connelly et al., 2000, 2003). Unfortunately, the resources necessary to support this level of monitoring have not often been available. The California Department of Fish and Game was able to fund field a biologist in the summers of 2006 and 2007 to track and monitor the Clear Lake sage-grouse population. No funding for such a position is anticipated in 2008. The USFWS has also been able to support periodic (at most bi-monthly, often monthly during the summer and infrequently in the winter) aerial radio-telemetry surveys. One objective of the LWG is to secure the means to maintain population monitoring on a consistent basis and expand to include metrics that would allow recruitment levels to be assessed annually.

Predation, Production and Survival:

A growing body of evidence supports the contention that under certain circumstances, such as when predator populations are not limited by declines in the population size of the prey species, predation alone can be sufficient to extirpate the prey (Sinclair et al., 1998). In the case of small, geographically confined prey populations, predation alone can be the proximate cause of extirpation.

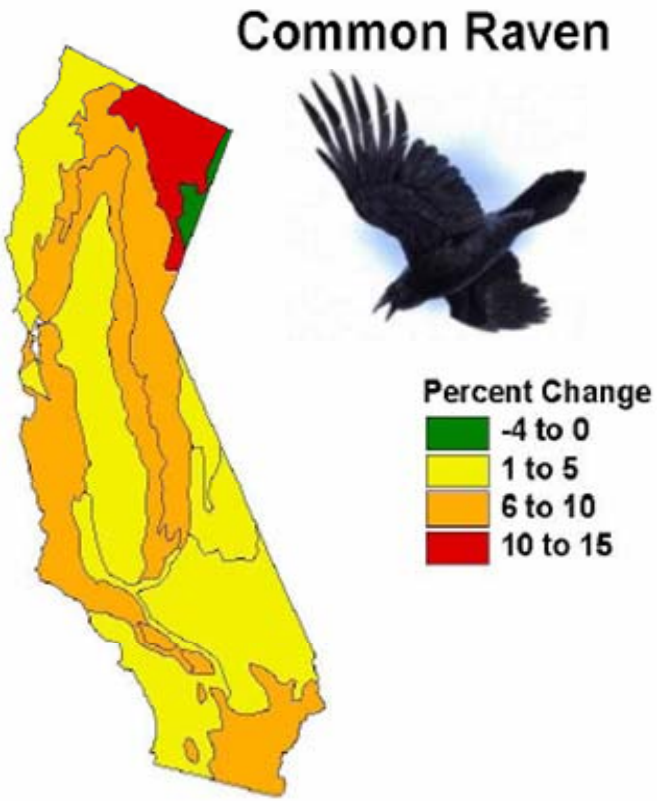


Figure 36. Map of raven population change in CA, 1966-1999, Liebezeit and George, 2002.

Local residents have reported observing more predators, especially ravens (*Corvus Corax*) and coyotes (*Canis latrans*), in the Clear Lake area than they remembered being present in the past. The California Breeding Bird Survey indicated that the greatest increase in raven populations (+10-15%) in the state from 1966 to 1999 was on the Modoc Plateau, including the Clear Lake area (Liebezeit and George, 2002). Some local residents believe that raven populations increased markedly since 2001. Historical Department of Fish & Game records dating to 1944 (Appendix M) implicate badgers (*Taxidea taxus*), skunks (*Mephitis mephitis*) and coyotes in predation on sage-grouse in the Devil's Garden. In 1962, for example, of five nests found by surveyors, only one had a hatched egg. All others showed evidence of loss to predation (attributed to coyotes and skunks by survey report authors; Appendix M). In 2007, of 11 sage-grouse nests identified by DFG staff near Clear Lake, only one appeared to have escaped predation. Identities of the predators could not be ascertained.

Rader et al. (2007) showed from other research that nest predation rates for a given predator species can vary considerably among geographic regions/habitat types. All the species listed in the preceding paragraph have been shown to be dominant nest predators in other areas. Which of these are doing the most damage to sage-grouse nests in the Clear Lake area, and under what circumstances, has yet to be ascertained – as has the actual annual nest predation rate.

Predation rates may increase if habitat conditions give grouse greater exposure to predators. For example, Gregg et al., (1994) found that successful sage-grouse nests were more often screened by grass residues taller than 7" than were predated nests. Others have asserted the value of taller grass residues for related ground-nesting birds (Hillman and Jackson, 1973; Lehman, 1941; Leopold, 1977). Corvids (ravens, in this case) are visual foragers, and poor screening might make nests especially vulnerable to them. Vegetation monitoring begun near nesting areas in the Clear Lake Hills and the "U" indicate that Sandberg bluegrass (*Poa sandbergii*) is by far the most common grass in the area, accounting for 75% of all grasses recorded in 2007 Clear Lake habitat survey (Horney, 2008), and ungrazed plants in the survey rarely produced residues more than 4-5" in height. Bluebunch wheatgrass (*Pseudoroegneria spicata*) and crested wheatgrass (*Agropyron cristatum*) are the only perennial grasses in the area that could readily produce residues tall enough to meet nest screening requirements (>7").

Perch sites for raptors and corvids in nesting, brooding and lekking areas can also increase exposure. Aldridge and Brigham (2002), Braun (1998), Braun et al. (2002), Knock et al. (2003), and USDI (2003) all found that the presence of raptors perching on overhead lines cause cessation of strutting on those leks they were visible to. At the present time there are no power lines near the nesting and lekking areas at Clear Lake, but high juniper densities just beyond them may be helping to concentrate the grouse population to the advantage of predators. Limited data from radio-telemetry on sage-grouse translocated to Clear Lake does not suggest that mortality among adults is greater than has been reported for 'healthy' sage-grouse populations elsewhere (≤50% per year).

The LWG acknowledges that predation may be one of several key factors limiting the potential for recovering the Clear Lake sage-grouse population, and is working to (1) improve monitoring of nest predation, (2) positively identify nest predators and (3) use that information to develop strategies for minimizing predation opportunities in the habitat areas being used by the population.

Emerging Threats

Energy Development

Installation of power producing facilities such as cogeneration plants, geothermal, and especially wind energy farms might have impacts on breeding populations if birds begin to disperse to private lands outside the Modoc National Forest (not anticipated soon). The likelihood of significant wind farms being established in the region is uncertain, however, and the actual impacts on hypothetical future grouse populations are highly speculative. Disturbances associated with power facility construction, maintenance of wind turbines, and

permanent establishment of power lines that may serve as predator perches might displace nesting females and discourage the use of sites for lek establishment. All this is dependent upon the location, design, and management of specific facilities. Wind farms should be constructed 8 km (5 miles) from known/occupied habitat. Preference should be given to developments that do not unduly limit population expansion, which is the goal of this conservation effort. The placement of such facilities and routing of power transmission lines will require careful planning in sage-grouse range to minimize the potential impacts (Manville 2004).

Disease

The most serious diseases threatening to impact sage-grouse in the Clear Lake PMU are West Nile virus (WNv) and avian influenza ("bird flu"). Avian influenza has not reached North America yet, but WNv is established in the area. West Nile virus has rapidly spread west across North America, infecting and killing wild and domestic birds, horses, humans, and other animals (Center for Disease Control and Prevention, e-com., 2004). Some groups of birds, especially corvids, raptors, and sage-grouse appear to be particularly susceptible. Outbreaks of WNv in sage-grouse have been detected in Wyoming, Montana and Alberta (Walker et al, 2004) and in Colorado , Utah , Nevada , California, and Idaho since 2003 (ODFW 2006) . Since July 2006, deaths of greater sage-grouse from West Nile virus have been reported in Oregon, Colorado, Idaho, Nevada, Montana, South Dakota, North Dakota, and Wyoming (USGS 2006). Mosquitoes are the primary vector of WNv.

Mortality of wild sage-grouse to WNv has been reported to average about 25% (Walker et al, 2004). No serum antibodies were detected from a sample of 112 individual sage-grouse from four populations in Wyoming, Montana and Alberta. Sage-grouse reared in captivity and exposed to WNv have suffered 100% mortality. Similarly, 100% mortality levels were shown within 48 hours in live sage-grouse exposed to carcasses of sage-grouse killed by WNv (Dave Naugle, pers. com.). There is, however, new evidence that sage-grouse may have some limited capacity for resisting WNv. The veterinary diagnostic lab at the University of Wyoming did find that five out of 50 sage-grouse samples submitted to them in 2005 had WNv antibodies, indicating that those birds had survived the infection. WNv-specific antibodies have been found in live, wild sage-grouse, and is evidence that individuals can survive WNv infection (Walker et al. 2007).

Table 11. WNv reports in mosquitoes (Mos) and birds, 2005-2007 USGS (http://diseasemaps.usgs.gov/) in counties closest to the Clear Lake/Devil's Garden PMU.

State	County	2005		2006		2007	
		Mos	Bird	Mos	Bird	Mos	Bird
CA	Lassen		3	3	3		2
CA	Modoc		1		2		1
CA	Shasta		28	7	89	17	48
CA	Siskiyou		6		1		4
NV	Washoe	26	8	9	5	1	6
OR	Klamath	2	2		2	2	
OR	Lake		1				2

Disease events started by chance circumstances in wild birds that result in rapid and widespread mortality of continental populations, such as sage-grouse, are relatively rare. Low seropositive rates for neutralizing antibodies are also rare in wild birds. However, if sage-grouse in this PMU are at risk of exposure, even a limited mortality from infection could push the population beyond recovery.

Any hope of limiting disease spread rests on mosquito control (the primary vector) and that control would likely be the only possible option. The Tule Lake Basin, including the area surrounding Clear Lake, provides an abundance of water for mosquito breeding, and significant populations of migrating waterfowl to serve as vectors for the disease. Unfortunately, the forb-rich lake and field margins are precisely where sage-grouse are likely to concentrate during July and August in this PMU.

Chapter 6: Conservation Goals, Objectives, and Actions

The following conservation goals, objectives, and actions will guide conservation and management actions for sage-grouse and the sagebrush habitat in the AMA. These goals and objectives are a summarization of risk levels developed by the Clear Lake Sage-Grouse Working Group. The Habitat and Population Risk Factor Matrix is provided in Appendix A.

Successful implementation of the Conservation Strategy (CS) is intended to prevent the extirpation of the Clear Lake sage-grouse population and recover its ability to sustain itself. The CS is not intended to alter the current regulatory requirements of the participating agencies or the protection afforded this species through existing policies and guidelines negatively affected by this CS. These goals and objectives are intended to provide additional direction to successfully conserve sage-grouse and the sagebrush ecosystems upon which they rely.

Another goal is to facilitate the expansion of the Clear Lake population out from its current area into its historical habitat (including north to Oregon and west to Lava Beds National Monument). It is hoped that, in time, this will include establishing contacts with other breeding populations in OR, CA, and NV.

Associated with each goal is a set of actions intended to achieve the goals. The actions described are general in nature. Site-specific actions for population recovery, and enhancement of nesting habitat, brood rearing, including summer brooding habitat, and winter habitat are listed in Appendix A.

At the present time, all habitats (breeding, nesting, brooding, winter) are to be afforded equal protection. However, the value of this ranking is the ability to prioritize and expand conservation resources as effectively as possible.

The adaptive management process is *one of* the mechanism*s* by which these goals and objectives may be refined. Using information from future research and monitoring of sage-grouse population response to habitat protection and enhancement, along with a better understanding of which factors are limiting recruitment and survival, may change these priorities.

Habitat and Population conservation goals are addressed separately below:

Habitat Goals

Goal 1: Restore 28,000 Acres (11% of the AMA) of R3 Habitats and Ecological Sites to Healthy Sagebrush Communities (R0).

Risk Factors: 1C, 2D, 2E, 2F

WAFWA Guidelines: Breeding Habitat Protection 1, 5; Winter Habitat Protection 1.

Justification: We estimate that approximately 41% of the Active Management Area in the PMU has been converted from plant communities dominated by sagebrush to western juniper woodland (X3) in the last 100 years. Approximately 11% (29,000 acres) of the Active Management Area is progressing through this plant community type-conversion (R3). Most X3 sites may be too expensive and time-consuming to justify restoration efforts. R3 sites are preferred for conversion, and should be the priority.

Monitoring/ Assessment: More accurate juniper stand mapping, including tree densities, slope, aspect, erodability and proximity to invasive annual grass populations, for sites being considered for treatment.

Actions: In areas where juniper has invaded a site but the site has not crossed a threshold (R3 to X3), appropriate conservation actions will include the following, in addition to the removal of juniper and minimization of damage to existing shrubs:

1) Strategically open corridors between R0 habitats by removing all but old-growth juniper.

2) Expand existing habitat areas and new sites where repeated telemetry signals from multiple birds indicate a disposition to use by removing all but old-growth juniper.

3) As sites with potential for distinct habitat uses are identified, proceed to improve them as follows:

a. Nesting Habitat: Consider developing patches (~100 m^2) of higher sagebrush density by seeding or plug planting in areas where existing sagebrush distribution is uniform and densities are judged to be low for the site's potential. Manage for spring grass residue levels that result in acceptable cover, inter-seeding perennials where appropriate.

b. Brood-Rearing Habitat: Identify sites that may retain moisture in the spring and have high forb production potential, and develop sagebrush corridors to and around these sites, if they are lacking.

c. Winter Habitat: Treat using a mixture of mechanical and prescribed fire treatments followed with reseeding of native perennial species.

Goal 2: Restore 34,000 Acres (14% of the AMA) of R1 Habitats and Ecological Sites to Healthy Sagebrush Communities (R0).

Risk Factors: 2A, 2B

WAFWA Guidelines: Breeding Habitat Protection 1, 5; Winter Habitat Protection 1.

Justification: A large area on and around the Clear Lake "U" that is used by the sage-grouse population has burned since 1985, reducing the low and Lahontan sagebrush densities there. This is the location of the only known active lekking area, and as such, has great importance to the remaining grouse population. Sagebrush has been recovering in the area, but densities are still less than ideal and are at risk from new wildfires fueled by cheatgrass.

Monitoring/
Assessment: Vegetation composition (herbaceous vs. shrub canopy cover), sagebrush recruitment rates, responses in these parameters to changes in management practices.

Actions: 1) Re-establish low sagebrush and Lahontan sagebrush to areas where remnants of their populations still exist, but plant densities are judged to be too low to allow populations to adequately recover in less than 10 years.

2) When fires occur, seed native grass and forb species into burn sites to provide competition for annuals, and increase cover and foraging value.

3) Establish appropriate measures for reducing ignition risk and develop wildland fire suppression strategies in R1 sites.

Goal 3: Prevent Wildfire from Damaging Habitats Near Existing Sage-Grouse Populations in the PMU.

Risk Factors: 2A, 2B, 2C, 2F

WAFWA Guidelines: Breeding Habitat Protection 1, 5; Winter Habitat Protection 1.

Justification: Sagebrush can take 30-60 years to fully recover to optimal density (25-30% canopy cover) from wildfire. Losing any of the few remaining habitat areas with high sagebrush densities could be critical to the survival of the population. Over the last two decades, cheatgrass and medusahead densities have increased to levels that present significant wildfire risk in some areas of the PMU (especially along Clear Lake road). As fire promotes the dominance of these annuals on the landscape, fire management and suppression is critical, as are efforts to minimize the spread these species.

Monitoring /
Assessment: Vegetation composition (herbaceous vs. shrub cover; cheatgrass/medusahead hotspots), residual dry matter (RDM) in September /October and/or fine fuel densities in June-September.

Actions: 1) Plan site-specific fire suppression and remediation strategies for critical areas in the PMU. Where possible, develop fuel breaks and other infrastructure around areas with significant cheatgrass/medusahead populations that can be

used to rapidly contain fires ignited in them before they spread to adjoining habitat units.

2) Identify and field test options with grazing allotment lessees for early spring (March-April) and/or dormant season grazing to reduce fine fuels.

3) Develop plans for establishing grasses, forbs, and sagebrush, where appropriate, in sites that may be vulnerable to cheatgrass conversion.

- Treatable area along Clear Lake road is approximately 4.5 miles in length. Buffer approximately 1,000' on either side would contain nearly 370 acres.

4) Establish protocols for slowing the spread of cheatgrass into management areas by the public, vehicles, livestock and equipment. This will entail mapping areas within the PMU that have high cheatgrass densities, and areas that are at most immediate risk of conversion.

Goal 4: Collaborate with MNF to establish procedures for juniper treatment that can accomplish habitat management objectives in a timely manner and still protect cultural heritage resources.

Risk Factors: All

WAFWA Guidelines: Breeding Habitat Protection 1, 5; Winter Habitat Protection 1.

Justification: The Modoc Tribe occupied this area for much of the last 6,000-7,000 years (Gates, 1983; King et al. 2004), and, as a result, remnants of this habitation can be found across the Modoc Plateau. Policies adopted by the Modoc National Forest to protect these artifacts (e.g., restriction of juniper removal to ≤12" trees, hand-felled) have made habitat restoration efforts on the Forest, which comprises 80% of the land area within the AMA, difficult or impossible to implement. The same policies have also impacted the ability of some private landowners whose properties adjoin the forest and have grazing leases on MNF lands to utilize cost-share support from USDA for habitat improvement projects. Other federal agency partners have been successful in establishing procedures for protecting cultural resources while accomplishing restoration work. The SGWG recognizes the expansion of juniper woodlands as not only a threat to sage-grouse habitats, but to cultural artifacts and sites, and their environmental context as well The SGWG and participating federal and state agencies are committed to work collaboratively with the MNF, SHPO and the Klamath Tribes to find solutions for overcoming these difficulties so that meaningful habitat improvements can be made which restore and protect sage-grouse habitats the cultural heritage of the area as well.

Monitoring / Assessment: None.

Actions: 1) Provide MNF Forest Supervisor with prioritized list of sites desired for sage-grouse habitat improvement, and proposals for protection of cultural resources

as part of the habitat restoration effort for review. We propose developing specific protections for each major project using an inter-agency group of cultural resource specialists and seeking SHPO review and comment prior to submission to MNF administration.

2) Explore opportunities to support and extend MNF cultural heritage protection efforts by sharing staff and other resources among agencies. As funding for cultural resource surveys will likely be limiting, avenues for additional support should be explored through other partners (LBBV RCD, Ore-Cal RC&D).

3) Encourage the participation of the Klamath Tribes in the planning, prioritization and implementation of sage-grouse habitat restoration projects in the AMA.

Goal 5: Manage Grazing to Maintain and Enhance Sage-Grouse Habitat.
Risk Factors: 2D, 2J, 2K, 2O
WAFWA Guidelines: Breeding Habitat Protection 6

Justification: Approximately 540,000 acres in the PMU is used for grazing, either on private lands or MNF and BLM grazing allotments. Proper management of rangeland use by domestic livestock and wild horses will help speed the recovery of impacted habitat and maintain the quality of existing good habitat.

Monitoring/
Assessment: On federal grazing allotments, track turn-in/turn-out dates plus stocking densities. Periodic monitoring of plant sagebrush and forb canopy cover would be valuable and spring/summer grass heights in sagebrush canopy driplines. Monitoring should be stratified by ecological sites.

Actions: 1) Reduce the population of horses in the Devil's Garden Wild Horse Territory to the established Appropriate Management Levels (AMLs).

The greater part of the Devil's Garden Wild Horse Territory (236,000 acres) lies in the Modoc National Forest. The BLM manages 8,307 acres (BLM 2004), and portions of the WHT include private lands. AMLs were determined for the horse population in 1980 and 1991 based on estimated carrying capacity and set at 305 head. The current population is estimated at 700 individuals (USFS 2005). Escalating costs of capturing, processing and adopting excess horses and a nearly 20% annual increase in population size has made the herds nearly impossible to manage. Unfortunately, it is unlikely that a remedy for the current situation is on the horizon.

2) In areas used by grouse for nesting, manage grazing to leave grasses at least 18 cm (7 inches) tall (or as near that height as the site can achieve) during the nesting period (April-June) within the dripline of sagebrush plants.

3) In areas where existing perennial grasses do not normally reach 18cm (7") of growth, but the soils and environment appear sufficient to support greater

productivity, attempts to establish perennial grasses that have greater vertical structure should be encouraged.

4) Where cheatgrass and medusahead are present, grazing should be managed to minimize the competitive advantages of the annuals over perennial grasses. Often this may mean early spring grazing in annual-dominated sites and frequently allowing perennials rest during early to mid-summer. Grazing practices should be flexible, however, and allow for differences in site characteristics and annual and seasonal variability in conditions.

From the grouse habitat standpoint, allotment stocking levels and grazing practices should not be interfered with so long as sage-grouse habitat objectives are being met.

Population Goals

Goal 6: Achieve a self-sustaining population at Clear Lake, and the eventual production of satellite populations by: (1) preventing immediate population extirpation; and (2) growing population to a minimum of 500 birds within 10 years through a combination of translocation and natural recruitment.

Risk Factors: 1A, 1B
WAFWA Guidelines: None established

Justification: While it is doubtful that a population of even 500 birds would be self-sustaining, this is a population target that has some theoretical basis (Franklin 1980; Frankel and Soulé 1981; Frankel 1983) and is potentially attainable. It would be helpful to collect data on annual recruitment and mortality rates so that better estimates of the minimum viable population size can be developed and appropriate population projections set. Braun (2002) estimated population densities of 5 to 10 birds per square mile in his scoping plan comments for the Green River Valley area in Wyoming. The Active Management Area in the PMU was estimated to have roughly 126 square miles of area classified as R0 habitat. If all this were used by grouse at the densities borrowed from Braun, it would support between 600 and 1,200 birds. The entire PMU presently has more than 650 square miles classified as R0 habitat. Fragmentation likely reduces the real carrying capacity of the R0 habitats, probably significantly, so it is best to estimate potential carrying capacities conservatively (although grouse will undoubtedly use non-R0 habitat areas as well, to some degree). These population density values themselves should be treated cautiously, both because Braun does not describe how they were arrived at and because the Clear Lake area is unquestionably a different environment than what exists in Wyoming. To this date, no other researchers have published population density estimates, so Braun's, rough as it is, is the only value available to use for estimating carrying capacity at the present time.

Monitoring /
Assessment: To the extent that staffing and resources permit, translocated birds will be equipped with tracking devices and their movements monitored to determine movement patterns, habitat use and mortality rates among the introduced population(s). Monitoring should continue no less frequently than once per month as long as transmitters can be detected, and more frequently during the nesting and brooding period if possible.

Actions: 1) Staff from CDFG, USFWS, BLM and members of the Devil's Garden/Clear Lake Sage-Grouse Workgroup will attempt to translocate enough birds to achieve this population level, by supplementing and accelerating natural recruitment, within ten years. The most readily available sources of birds are in Hart Mountain NWR, OR, and the Buffalo-Skedaddle PMU (BLM) in Lassen County, CA, but any reasonable sources should be investigated. Birds in the Little Sheldon and Hart Mountain National Wildlife Refuges are not hunted. The Sheldon NWR in Nevada also has a large sage-grouse population, but it was decided in 2007/08 cease translocations from this population for the time being.

2) Secure and maintain agreements between state and federal agencies that will allow these translocations to occur. Therefore it is recommended that the development of proposals for multi-year agreements to permit translocating birds to augment the existing Clear Lake population should be initiated as soon as possible.

Goal 7: Establish an effective population management process in the AMA.
Risk Factors: 1A, 1B
WAFWA Guidelines: Population Mgt 2, 3, 4, 5.

Justification: Successful movement of this population from the edge of extirpation to real viability will require timely, accurate and pertinent information, and the ability of managers to have the flexibility to take timely management actions in response to changing conditions and new information. Knowledge of nest success, recruitment rates, predator activity and populations of breeding-age individuals is critical for guiding management decisions and evaluating the effectiveness of conservation measures.

Monitoring/
Assessment: Locate and map nest locations of all birds with active radio collars. Record causes of nest/clutch failures when evident. Collect brood numbers, where feasible.

Actions: 1) Continue to record peak male attendance in the active lekking area on an annual basis.

2) Continue to use radio telemetry to track the movements of translocated grouse to determine seasonal movement and geographic use by translocated sage-grouse in the PMU.

3) The Technical Advisory Committee (TAC) will work to establish strategies for estimating recruitment rates and predator identities/activity levels.

4) The SGWG will meet at least annually to review all data and monitoring efforts with the TAC, and how management activities (habitat restoration, translocation and land use) are making use of that information.

Goal 8: Manage Risk of West Nile Virus (WNv).
Risk Factors: 1A, 1B
WAFWA Guidelines: Population Mgt 2, 3, 4

Justification: As of November 1, 2005, positive cases of WNv have been confirmed in horses, humans, and/or birds within 100 miles of the PMU. One bird case of WNv has been reported from Modoc County, six from Siskiyou County, three from Lassen County, and 28 from Shasta County. Cases of avian WNv from Oregon Counties near the border are still low, one from Lake County, 2 from Klamath County and nine from Jackson County, as of November 1, 2005. Sage-grouse have a very limited ability to develop immunity to the disease, and suffer high mortality rates when exposed.

Monitoring / Assessment: Track West Nile incident data for areas near the PMU and source sites for bird translocations. Maintain GIS layer for water sources potentially usable by mosquitoes in the PMU.

Actions: 1) Review and evaluate surface water developments for potential impacts on mosquito populations and access to grouse.

2) Test translocated birds for WNv before releasing.

Conservation Goals Summary

Habitat

Goal 1: Restore 28,000 Acres (11% of the AMA) of R3 Habitats and Ecological Sites to Healthy Sagebrush Communities (R0).
Goal 2: Restore 34,000 Acres (14% of the AMA) of R1 Habitats and Ecological Sites to Healthy Sagebrush Communities (R0).
Goal 3: Prevent Wildfire from Damaging Habitats Near Existing Sage-Grouse Populations in the PMU.
Goal 4: Collaborate with MNF to establish procedures for juniper treatment that can accomplish habitat management objectives in a timely manner and still protect cultural heritage resources.
Goal 5: Manage Grazing to Maintain and Enhance Sage-Grouse Habitat.

Population

Goal 6: Achieve a self-sustaining population at Clear Lake, and the eventual production of satellite populations by: (1) preventing immediate population extirpation; and (2) growing population to a minimum of 500 birds within 10 years through a combination of translocation and natural recruitment.
Goal 7: Establish an effective population management process in the AMA.
Goal 8: Manage Risk of West Nile Virus (WNv).

Description of Management Actions

Monitor populations and habitats

In studies of habitat use, the primary concern of biologists is the identification, availability, and relative importance of resources (e.g., food, cover, water, or space) found in areas used by wildlife. Habitat or resource selection by animals may be of interest in evaluating habitat management and the impact of habitat changes on wildlife populations. These studies have far-reaching importance to wildlife management particularly as they relate to federally protected species (Morrison et al. 2001).

The Devil's Garden/Clear Lake monitoring effort is utilizing both long- and short-term data. Long-term monitoring captures plant, animal and environmental data for characteristics that change more slowly over time, such as characteristics of long-lived plants like species, height, density, frequency, etc. This would serve as baselines for comparison with future measurements at approximately 5-year intervals. Short-term (usually annual) monitoring is for population census and assessment of more dynamic habitat attributes (such as the appearance and spread of invasive species, annual levels in residual grass height, recovery of plant species following fire, etc.) that may affect suitability for sage-grouse and indicate sagebrush community health.

Additional monitoring programs or amendments to current monitoring procedures may be developed to evaluate the effectiveness of habitat and population management efforts.

Population Monitoring

Monitoring of population responses to conservation actions is fundamental to evaluating the success or failure of any conservation strategy. Currently, sage-grouse population trends in the Devil's Garden / Clear Lake PMU are evaluated by peak seasonal counts of males in the single active lekking area.

Habitat Monitoring

Initial management and monitoring responsibilities:

Signatories to the Conservation Plan have developed a list of initial management and monitoring responsibilities (Table 7) based on the conservation goals for habitat and population. Different entities have agreed to perform specific conservation actions. Some of these actions are clearly the responsibility of one or more entities, and some of the actions require consideration by the Devil's Garden / Clear Lake Sage-Grouse Working Group

(SGWG). This list represents commitments by those assigned to these actions within the confines of funding by the appropriate legislative authority.

Table 12. Management and Monitoring Responsibilities (2006 – 2016).

Conservation Actions	Entity to Implement	Anticipated Completion	Status	Estimated Costs
Develop and implement an adaptive management strategy, including population/habitat monitoring and review mechanisms.	All Parties	October 2008, ongoing		Staff Time
Develop funding for implementation of conservation plan objectives.	All Parties	October 2008, ongoing		Staff Time
Develop site-specific conservation recommendations for habitats in current use.		June 2009, ongoing		Staff Time
✓ Upon completion of annual surveys, appropriate measures will be developed for each occupied area.	All Parties	August 2009, ongoing		Adaptive Mgmt
Goal 1: Restore 28,000 Acres (11% of the AMA) of R3 Habitats and Ecological Sites to Healthy Sagebrush Communities (R0).		**2015**		
✓ Nesting Habitat: Remove all junipers except 'old growth' trees. Consider developing patches (~30 m) of greater sagebrush density by seeding or plug planting in areas where existing sagebrush distribution is uniform and densities are judged to be low for the site's potential. Manage for spring grass residue levels that result in acceptable cover, interseeding perennials where appropriate.	All Parties		Started 2007	$150-$250/acre, plus Staff Time
✓ Brood-rearing Habitat: Remove all junipers except 'old growth' trees. Identify sites that may retain moisture in the spring and have high forb production potential, and develop sagebrush corridors to and around these sites, if they are lacking.	All Parties		Started 2007	$150/acre, plus Staff Time
✓ Winter Habitat: Remove all junipers except 'old growth' trees. Where sagebrush stand density exceeds 30% canopy cover, treat using a mixture of mechanical and prescribed fire treatments followed with reseeding of native perennial species.	All Parties			$150-$250/acre, plus Staff Time

Goal 2: Restore 34,000 Acres (14% of the AMA) of R1 Habitats and Ecological Sites to Healthy Sagebrush Communities (R0).		2025		
In areas where juniper has invaded a shrub site but the site has not crossed a threshold (R-3 to X-3) appropriate conservation actions will include the following:				
✓ Nesting habitat: Remove all juniper from these sites and manage slash piles to limit their use as perches.	All Parties			$150-$250/acre, plus Staff Time
✓ Brood-rearing habitat: Encourage wood and biomass cutting with reseeding of native perennial species.	All Parties			$150-$250/acre, plus Staff Time
✓ Winter habitat: Treat using a mixture of mechanical and prescribed fire treatments followed with reseeding of native perennial species.	All Parties			$150-$350/acre, plus Staff Time
✓ Map existing heavy stands of cheatgrass and medusahead within the AMA.		Fall 2010		
✓ Develop management guidelines for minimizing spread of cheatgrass and medusahead through grazing and juniper removal projects.		Spring 2011		
Goal 3: Prevent Wildfire from Damaging Habitats Near Existing Sage-Grouse Populations in the PMU.				
✓ Plan site-specific fire suppression and remediation strategies for critical areas in the PMU.	USFS, USFWS, BLM, NRCS, Private Landowners			Staff Time
✓ Identify and field test options with grazing allotment lessees for early spring (March-April) and/or dormant season grazing to reduce fine fuels.	USFS, USFWS, BLM, NRCS, Private Landowners			Staff Time
✓ Develop plans for establishing grasses, forbs, and sagebrush, where appropriate, in sites that may be vulnerable to cheatgrass conversion.	USFS, USFWS, BLM, NRCS, Private Landowners			Staff Time

Goal 4: Collaborate with MNF to establish procedures for juniper treatment that can accomplish habitat management objectives in a timely manner and still protect cultural heritage resources.		**March 2010**		
✓ Document impacts of agency policies on habitat quality and viability of the sage-grouse population.	DG/CL SGWG	August 2009		Staff Time
✓ Provide MNF Forest Supervisor with prioritized list of sites desired for sage-grouse habitat improvement, and proposals for protection of cultural resources as part of the habitat restoration effort for review .	DG/CL SGWG	August 2009		Staff Time
✓ Develop MOU for interagency assistance with cultural resources review/compliance verifications.				
✓ Invite representatives of Klamath tribes to assist in developing cultural resource protection strategies as part of the habitat recovery program.				
Goal 5: Manage Grazing to Maintain and Enhance Sage-Grouse Habitat.		**Ongoing**		
✓ Reduce the population of feral horses in the Devil's Garden Wild Horse Territory to the established AMLs.	USFS, BLM	2015		Staff Time
✓ In areas used by grouse for nesting, manage grazing to leave grasses at least 18 cm (7 inches) tall (or as near that height as the site can achieve) during the nesting period (April-June) within the dripline of sagebrush plants.	All Parties	Ongoing		Costs of alterations in livestock management, use of alternative forage sources, plus Staff Time
✓ In areas where existing perennial grasses do not normally reach 18cm (7") of growth, but the soils and environment appear sufficient to support greater productivity, attempts to establish perennial grasses that have greater vertical structure should be encouraged.	All Parties	2012, ongoing		$150/acre, plus Staff Time
✓ Where cheatgrass and medusahead are present, grazing should be managed to allow existing perennial grasses and forbs to accumulate energy and complete their reproductive cycles at high vigor, so as to compete with the annuals. Grazing practices should be flexible, and account for variability in annual conditions and site characteristics.	All Parties	Ongoing		Costs of alterations in livestock management, use of alternative forage sources, plus Staff Time

Goal 6: Achieve a self-sustaining population at Clear Lake, and the eventual production of satellite populations by: (1) preventing immediate population extirpation; and (2) growing population to a minimum of 500 birds within 10 years through a combination of translocation and natural recruitment.		**June 2020**		
✓ Increase the AMA population to 500 birds through natural recruitment augmented by translocations from other populations.	CDFG, USFWS, DG/CL SGWG		Started	Staff Time
✓ It is recommended that formal multi-year requests for permission to translocate birds to augment the existing Clear Lake population should be made to BLM, NDOW, ODF&W and Hart Mountain NWR, preferably no later than the fall of 2008.	USFS, USFWS, BLM	October 2008		Staff Time
Goal 8: Manage Risk of West Nile Virus (WNv).				
✓ Review and evaluate surface water developments for potential impacts on mosquito populations and access to grouse.	USFS, USFWS, BLM, NRCS, Private Landowners			Staff Time
✓ Test translocated birds for WNv before releasing.	CDFG			Staff Time, Testing Costs?
Goal 7: Establish an effective population management process in the AMA.		**Ongoing**		
✓ CDFG and USFWS will record peak male attendance in the active lekking area on an annual basis.	CDFG, USFWS, volunteers	Ongoing	Started 1999	Staff Time
✓ USFWS will continue to use radio telemetry to track the movements of translocated grouse to the extent that staff and funding are available to determine seasonal movement and geographic use by translocated sage-grouse in the PMU.	CDFG, USFWS	Ongoing	Started 2005	Staff Time

Private Lands

Any meaningful conservation strategy for sage-grouse in the Devil's Garden / Clear Lake AMA must be coordinated with private landowners. While private holdings in the AMA account for only 14% (37,644 acres) of the potential sage-grouse habitat, several of them are located in strategically important areas, particularly those with meadows, irrigated lands and wetlands adjacent to sagebrush communities that are valuable for summer brood-rearing habitats. Habitat restoration, particularly where large-scale juniper removal or re-vegetation is required, is often more readily accomplished on private lands than on public lands. However, habitat restoration cannot be implemented on private lands in the absence of support in overcoming the significant technical, regulatory and financial obstacles that landowners often face. Conservation measures applied to private land may take different forms from those applied on public lands due to the specific land-management objectives of individual owners, varied costs of implementing practices on private lands, and the availability of technical and financial support where CEQA/NEPA compliance is triggered. Close-coordination of activities and the sharing of resources and technical skills between private landowners public lands agencies is highly desirable and necessary for the success of this effort. Examples of private lands conservation related to sage-grouse habitat in the AMA includes the Lava Beds/Butte Valley RCD's providing $174,000 from the US Fish & Wildlife Service's Partnership Grants Stewardship Program for juniper removal and management activities on private lands.

USDA-NRCS Conservation Planning

The USDA-NRCS has a somewhat unique role in that its primary mission is to support and encourage the use of sound conservation practices on private lands. To that end, it makes both technical support and funding available to landowners and partners. The State Conservationist (director) for California, Ed Burton, has pushed rangeland conservation forward as a priority for the agency, and has strongly supported NRCS efforts to participate in the Clear Lake sage-grouse recovery effort. NRCS has provided more than $1,000,000 in cost-share funding and technical support to local landowners through its Environmental Quality Incentives Program (EQIP), with private landowners contributing an equal share. Through the Wildlife Habitat Incentives Programs (WHIP) NRCS has obligated over $880,000 to landowners who are responsible for 50-75% of project costs. All this cost-share was towards sage-grouse habitat related projects in or near the Clear Lake AMA. In addition, NRCS has initiated (2008) a conservation planning process for the Clear Lake AMA, beginning with the private lands and extending to the permitted federal lands (BLM, USFS, USFWS) associated with them. Once completed, these conservation plans would make it possible to allocate USDA cost-share funds for a variety of projects related to the restoration and efficient management of sage-grouse habitats. These plans will be developed through a process of resource inventory, assessment, prioritization and development of alternatives, recognizing the interests and objectives of land managers (in the case of permit-holders on federal lands, this means both permittees and federal land managers).

NRCS staff have already begun the process of inventorying soils, juniper canopy cover and site characteristics in the AMA. This will eventually result in more detailed information than is currently available, and lay the foundation for habitat trend monitoring and additional land-use planning. NRCS conservation planning processes are voluntary, wholly dependant on collaboration among all parties. NRCS' conservation planning process is intended to supplement and extend existing planning and management processes of federal land

management agencies, where they overlap, not replace or compete with them. The same is true for private landholders.

Grazing

Sagebrush communities and sage-grouse habitat can be impacted both positively and negatively by native ungulate populations, domestic livestock, and wild horses and burros. For each of these classes of large herbivores, the degree of impact will vary with population densities, timing of herbivory and the presence of other stresses on the habitat. These herbivore classes also each have management constraints that are more or less particular to it. For instance, the management alternatives for domestic livestock are quite numerous, but their viability varies according to the resources and infrastructure available to individual owner/operators, seasonal conditions, water availability and current market prices for alternative feeds/pasture and transportation. The management options for wild horse and burros, on the other hand, are few. Federal regulations stipulate that wild horses and burros are to be afforded a year-round free-roaming status, limited as little as possible by fencing. Appropriate Management Levels (AMLs) for wild horses and burros in the Devil's Garden / Clear Lake PMU were set in 1980 and reviewed in 1991 through the land management planning process conducted by the USFS and BLM. In theory, the management tool for maintaining AMLs is removal of feral horses and burros from the land when it is shown that their numbers have led to ecological imbalance. Wild horses and burros are also supposed to be removed from burned areas to facilitate recovery of the burn to an appropriate level of land health. Limited funding and steeply escalating costs, combined with an annual population growth rate of nearly 20% has confounded the ability of the BLM and USFS to keep populations within the AMLs that they have set, however.

According to Miller and Eddleman (2001), poorly managed grazing can lead to changes in the proportion of the shrub, grass, and forb structural groups, increase opportunities for invasive annuals, shorten the growing season, and can eventually reduce site potential if topsoil erosion is accelerated. Over time, sites in declining condition often lose their capacity to capture, store and release water, which can shorten the growing season and shift plant communities to different vegetation types. It should be noted that current management of feral horse and burrow populations has created such declines in site conditions in many areas on public lands. At the same time, a greater percentage of private land is classified as

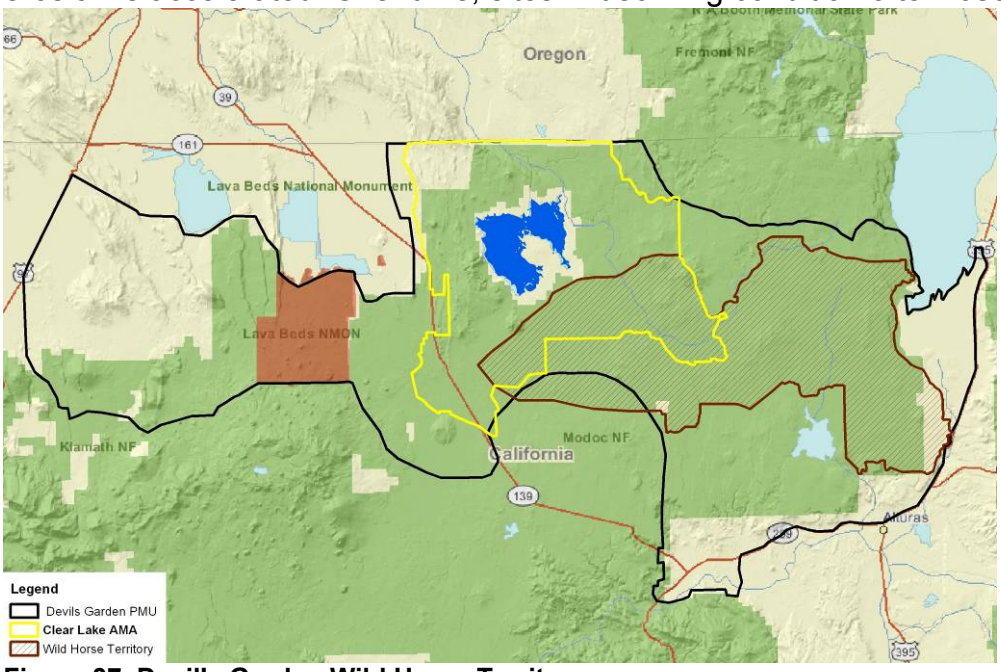


Figure 37. Devil's Garden Wild Horse Territory.

“good” (R-0) quality grouse habitat in the PMU than land under federal management. Whether on private or public lands, most of the problems given here can be solved with sound, creative management (Miller and Eddleman 2001) and attention to pertinent monitoring data.

Connelly et al. (2000) asserted “…there is little experimental evidence linking grazing practices to sage-grouse population levels. However, grass height and cover can affect sage-grouse nest site selection and success. Thus, herbivory that significantly reduces the herbaceous understory in nesting habitat may have negative impacts on sage-grouse populations.” Since domestic livestock are the only major herbivores in the habitat area that can be actively managed, it is important to understand that the season, duration, distribution, and intensity of use, as well as species and class of livestock will influence how livestock grazing may affect sage-grouse food and cover. These effects can be benign, positive or negative. Habitat characteristics, such as plant community composition and landscape structure, will also affect potential interactions between livestock and sage-grouse.

Topography and the spatial and temporal heterogeneity of the landscape will influence growing season periodicity and length, plant re-growth rates, total biomass yields, and the distribution of wild and domestic herbivores. Pasture design and water availability will also have effects on grazing distribution. These factors must all be considered when developing grazing management plans that provide for good quality sage-grouse habitat (Miller and Eddleman 2001). Effective grazing management plans must be site-specific and flexible enough to change with seasonal weather events and shifts in vegetation composition.

Dietary preferences of cattle, elk, horses and burros do not usually strongly overlap with those of sage-grouse, since these are primarily grass rather than forb/shrub feeders. The potential for competition for forbs with sheep and pronghorn antelope is much greater, as is the competition over sagebrush browse with goats and deer.

Proper timing and duration of livestock grazing can positively alter the germination, timing of phenological development, and nutritional quality of many plant species. This may be used to advantage on meadow sites that are an important of spring and summer forb and insect feeding for young grouse. Several studies have reported that grouse prefer meadows grazed by cattle early in the spring over those that have not been grazed (Neel 1980, Klebenow 1985). Evans (1986) reported birds did not differentiate between grazed or non-grazed meadows in mid-summer but in late summer preferred areas that had been grazed in the spring. This attraction was attributed to delayed phenological development (hence higher palatability and nutritional quality). Evans (1986) also reported grazing increased the abundance of succulent leaves favored by grouse.

Translocations

Based on the small size of the current Clear Lake sage-grouse population (<50), and its isolation from contact with any other populations, the immediate translocation of significant numbers of new birds from the outside is almost certainly the only way to save this population. In testing the feasibility of re-establishing a new population of sage-grouse in a recently abandoned habitat area, Musil et al. (1993) translocated 196 birds (46 adult females, 19 yearling females, 115 adult males and 16 yearling males) from 11 different leks in two years. These birds were relocated in March/April each year. Of 44 grouse marked with radio

transmitters, 24 did not survive more than two years. However, the introduced birds were still reproducing at least three years following release.

Reese and Connelly (1997) summarized the history of sage-grouse translocation attempts that have been made since the early 1930's. For the majority of these, post-translocation monitoring was insufficient to determine success, let alone the factors that may have contributed to success or failure of the effort. Monitoring of translocations performed since the 1970's has improved, and indicates that local persistence of sage-grouse is strongly affected by isolation of the receiving site from corridors that would allow the birds to move away (especially back to their origin), the presence of water and adequate good quality habitat. Translocating birds during the breeding season (March/April), and releasing them as soon after capture also seems to improve bird survival and persistence in the new habitat. Data from Musil et al. (1993) indicated that the greatest losses of translocated birds occurred during the first three weeks after capture and release.

On April 2, 2005, 10 grouse were translocated (nine females, one yearling male) to the Clear Lake "U" from a population at the Hart Mountain National Antelope Refuge in Oregon under an agreement with the Oregon Department of Fish and Wildlife (ODFW). Nine individuals were marked with radio transmitters. The juvenile male and at least one female failed to survive the summer, but one of the other females is known to have clutched. A second group of sage-grouse were translocated from the Hart Mountain refuge on March 31, 2006. This group comprised 15 females and two males. Shortly afterwards, the males were reported to have established a second lek near Clear Lake that was attended by females from the indigenous population. In late March 2007 22 grouse were translocated to Clear Lake from Sheldon NWR in Nevada. Half were males, half females. From March 27-April 1, 2008 14 females and five males were translocated from the "Fatty Martin" lek in Nevada. The procedures used for these translocations conformed closely to the recommendations of Musil (1993) and Reese and Connelly (1997).

The sage-grouse population located on BLM lands in Lassen County is also large enough that significant translocations might be made from it. However, an MOU between BLM and CDFG (see Appendix H) requires at least 12 months between the date of formal request and the date when birds may be translocated, except in the case of an emergency request. In all cases a NEPA assessment must be conducted before translocations can take place. This means, effectively, that the soonest birds might be introduced from that population, could agreements BLM be worked out, would be the spring of 2010, assuming the NEPA work can be completed quickly.

In May 2006 the California Department of Fish and Game received permission from the Nevada Department of Wildlife (NDOW) to translocate grouse from Nevada for three years. The first translocation was made from Sheldon NWR in April 2007. The second was made from the Fatty Martin, Nevada lek in March/April 2008.

It is the desire of the SGWG to continue this effort until evidence indicates that the population is genetically viable and achieving a measure of stability through internal recruitment.

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Appendices

A. Devil's Garden/Clear Lake PMU Habitat Risk Assessment Matrix

B. Biological Methods

C. Project Review Guidelines

D. Summary of Habitat Assessment and Monitoring

E. Standards for Land Health, Grazing and OHV Guidelines

F. Regulatory Authority and Enforcement Guidelines

G. Sage-Grouse Lek and Other Habitat Informational Signs for Public Lands and Private Lands

H. SGWG and Technical Sub-Committee Members

I. Incentive Programs for Private Lands

J. Summary of Sage-Grouse Reports for Clear Lake and Klamath Lake NWRs

K. Habitat Conservation Prioritization (DRAFT)

L. MOU/Conservation Agreement

Appendix A: Devil's Garden/Clear Lake PMU Habitat Risk Assessment Matrix - April 2006

HIGH RISK FACTORS: ***to sage-grouse population (1) and habitat (2) Ranked high to low***	**Contributing Factors**	**Conservation Measures/ Management Actions**	**Monitoring and Assessment Needs**
Risk factor for pop. # 1A **1) Critically low population (only known active lek in the PMU has a low population- on Clear Lake "U")**	• Habitat loss by conversion from shrub-steppe to western juniper dominated landscape which has also resulted in population isolation. • Loss of genetic diversity	• Increase population size in short term with translocations of sage-grouse (both sexes) from multiple outside populations to the PMU • Remove juniper from areas with intact sagebrush and herbaceous understory.	• Annual lek counts of active lek(s) • Search for additional leks in the spring • Determine reproductive success of radio-marked birds
Risk factor for pop. # 1B **2) Low recruitment**	• Low population • Low nest success • Low genetic diversity • Predation	• If predation is the cause of low nest success(less than 25%) determine predator(s) responsible and pursue options through the proper state or federal agency • Increase population size with outside translocations	• Lek counts • Determine brood size of translocated hens in Aug-Sept. • periodically examine genetic diversity in population via blood samples
Risk factor for pop. # 1C **3) Migration impeded and loss of connectivity**	• Juniper encroachment	• Remove junipers within designated corridors used for migration or to connect grouse within the PMU to neighboring populations • Prioritize habitat work in areas adjacent to those used by resident grouse population	• Monitor sage-grouse use of corridors as they are modified

HIGH RISK FACTORS: ***to sage-grouse population (1) and habitat (2) Ranked high to low***	**Contributing Factors**	**Conservation Measures/Management Actions**	**Monitoring and Assessment Needs**
Risk factor for pop. # 1D **4) Disease (West Nile virus)**	• Development of water impoundments on the Modoc Forest	• Stop process of developing water impoundments on the Modoc Forest within the range of historic sage-grouse use • If WNv becomes a source of sage-grouse mortality treat impoundments, ponds, troughs, etc. with larvicides in current known sage-grouse use areas between June and Sept to kill mosquito larvae. • Consult with county vector control agents	• Test any recovered sage-grouse carcasses for West Nile virus • Track incidence of WNv • Maintain GIS layer of water sources usable by mosquitoes
Risk factor for habitat # 2A **5) Loss of sagebrush to fire**	• Cheatgrass and medusa head encroachment	• Specify high priority fire suppression areas within the PMU • Use native seed mix (sagebrush, grass and forbs) post fire • Do not graze area for 2 years post fire. • Treat high density areas of cheatgrass and medusa head (such as found south of Clear Lake) with herbicides and reseed with native seed mix	• Monitor post fire shrub recovery • Fire risk assessment • Create firebreaks in fine fuels (especially cheat grass and medusa head) along Clear Lake road
Risk factor for habitat # 2B **6) Too much fire historically (Conversion to R1)**	• Cheatgrass and medusa head encroachment	• Specify high priority fire suppression areas within the PMU • Treat high density areas of cheatgrass and medusa head (such as found south of Clear Lake) with herbicides and reseed with native seed mix • Create fire breaks by removing areas of dense juniper from R0 habitat and areas of known or high probability sage-grouse use	• Monitor post fire shrub recovery
Risk factor for habitat # 2C **7) Habitat quantity (nesting and winter)**	• Wildfire • Juniper encroachment	• Remove junipers • Determine sage-grouse wintering and nesting areas with the use of radio-marked birds	• Track habitat improvement projects on public and private land within the PMU • Map nesting and wintering areas as they are discovered

HIGH RISK FACTORS: ***to sage-grouse population (1) and habitat (2) Ranked high to low***	**Contributing Factors**	**Conservation Measures/ Management Actions**	**Monitoring and Assessment Needs**
Risk factor for habitat # 2D **8) Juniper encroachment**	• Historic fire suppression • Climate change • Livestock grazing	• Remove junipers • Designate levels of fire suppression of juniper woodlands based on susceptibility to cheatgrass invasion	• Keep up to date with satellite imagery of juniper expansion • More detailed assessments of juniper stands including density, slope, aspect, erodability, cultural resources, and noxious weeds
Risk factor for habitat # 2E **9) Excessive bare ground**	• Juniper encroachment	• In areas of junipers with high canopy cover use mechanical means to remove trees and reseed with sagebrush and native seed mixes	• Evaluate potential of under story for recovery after juniper removal
Risk factor for habitat # 2F **10) Loss of desired herbaceous understory**	• Juniper encroachment • Wildfire • Decadent sagebrush stands	• In areas of junipers with high canopy cover use mechanical means to remove trees and reseed with sagebrush and native seed mixes • In areas of high shrub canopy cover ($\geq$35%) use brush beating or other mechanical treatment to reduce canopy cover to $\leq$ 25%. If mechanical means are not practical use prescribed fire or herbicides to create a mosaic of openings	• Monitor habitat improvement projects • Detailed vegetation assessments in PMU active area
Risk factor for habitat # 2G **11) Climate/weather (drought and winter habitat)**	• Drought/severe winter influence • Bird survival, nutrition and reproductive success	• Determine sage-grouse winter use areas with the use of radio-marked birds • Ensure that livestock range utilization is in compliance with responsible agency regulations in event of drought i.e. reduce stocking rates by some percent	• Monitor weather data to help predict influences on wildfire

HIGH RISK FACTORS: ***to sage-grouse population (1) and habitat (2)*** Ranked high to low	**Contributing Factors**	**Conservation Measures/ Management Actions**	**Monitoring and Assessment Needs**
Risk factor for habitat # 2H **12) Cultural resource protection policies (obstacle to habitat improvement)**	• Drought results in low lake levels	• Have Forest Service archaeologist identify archaeologically significant areas within USDA lands in PMU • Increase law enforcement presence on Clear Lake especially in years of low lake elevation to discourage arrow head hunters and reduce potential disturbance of grouse on lek (s) • Better communication between F.S. archaeologist and PMU partners	• Archaeologists monitor habitat projects for potential impacts
Risk factor for habitat # 2I **13) Powerlines**	• Increased avian predators • Habitat Fragmentation • Direct loss of habitat	• Ensure that sage-grouse concerns get into comments on future powerline developments within the PMU	• Ensure PMU members are informed of proposals for new powerlines
Risk factor for habitat # 2J **14) Wild Horse Grazing**	• Lack of funding for capture of wild horses	• Maintain wild horse numbers at target levels	• Annually monitor wild horse numbers

Moderate Risk Factors ***to sage-grouse population (1) and habitat (2) Ranked high to low***	**Contributing Factors**	**Conservation Measures/ Management Actions**	**Monitoring and Assessment Needs**
Risk factor for pop. # 1E **1) Predation**	• Agricultural operations conducive to supporting raven population (animal carcasses, increased foraging opportunities on croplands)	• Focus habitat development away from existing structures that may serve as perches for raptors • Implement predator control measures where appropriate if nest success falls below 25% or if annual adult hen survival rate falls below 45% (WAFWA guidelines)	• Monitor sage-grouse recruitment • Determine cause of bird mortality where possible
Risk factor for habitat # 2K **2) Loss of meadows**	• Stream downcutting • Excessive number of wild horses • Past grazing practices • Lack of fire • Sagebrush encroachment	• Remove junipers • Scrutinize future water impoundment developments • Evaluate potential of developed wetlands or water impoundments for sage-grouse use	• Public land management agency and CA extension monitoring
Risk factor for habitat # 2L **3) Chance of conversion to annual grassland**	• Wild fire • Roads • Powerlines	• If some risk of annual grassland conversion exists in an area after a fire do not use prescribed fire. • In the event of a wildfire, do not graze the area for 2 years post fire and reseed with native seed mix (sagebrush, grass and forbs) • Large wildfire in the active area of the PMU could put this category into High Risk category	• Public land management agency and CA extension monitoring

Low Risk Factors ***to sage-grouse population (1) and habitat (2) Ranked high to low***	**Contributing Factors**	**Conservation Measures/ Management Actions**	**Monitoring and Assessment Needs**
Risk factor for pop. # 1F **1) Poaching**	•	• Coordination of patrolling schedules among involved federal and state agencies to ensure no duplication of effort or no special or temporal gaps exist in coverage.	• Sufficient law enforcement
Risk factor for habitat # 2M **2) Non-native plant seedings**	• past and current non-native seedings within the PMU active area	• Evaluate as sage-grouse habitat/potential use • NRCS work with landowners on alternative plantings	• Evaluate sage-grouse use of seedings
Risk factor for habitat # 2N **3) Pesticides**	• Presence of noxious weeds • Agricultural practices	• Only pesticides used in the PMU should be herbicides for noxious weed control such as *Velpar* for juniper or *Plateau* for medusa head control.	• Ensure proper chemical use
Risk factor for habitat # 2O **4) Livestock grazing (in the active area)**	• Historic grazing practices	• Impacts (positive or negative) of livestock grazing on sage-grouse within the PMU are unknown. A range health analysis specifically as relates to grouse would be useful	• Ensure proper stocking rates • Evaluate grazing timing (spring vs. fall)

Low Risk Factors ***to sage-grouse population (1) and habitat (2) Ranked high to low***	**Contributing Factors**	**Conservation Measures/ Management Actions**	**Monitoring and Assessment Needs**
Risk factor for habitat # 2P **5) Traffic and/or fence collisions**	•	• Scrutinize building of new fences on public lands within the PMU. Note collision mortalities of sage-grouse to determine if a pattern exists. If necessary flag offending fences and determine if moving them is practical.	• PMU members comment on potential fence and road projects

Factors Not Considered A Risk to the **Devil's Garden/Clear Lake sage-grouse population**

- **Energy plant location and other energy development**
- **Too few insects**
- **Water distribution**
- **Lack of late brood rearing habitat**
- **Conversion to annual grassland**
- **Junipers on historic lek sites**
- **Sagebrush encroachment in meadows**
- **Inadequate access to water (juniper)**
- **Off road vehicles**
- **Human impacts**
- **Roads**

Appendix B: Biological Methods

NOTE: Biological methods commonly used for gathering information concerning sage-grouse populations and habitats are summarized in this section. More complete descriptions will be provided in lek complex management implementation plans. Biological methods are based on current accepted practices and established agency technical references.

LEK COUNTS

HOW TO COUNT A SAGE-GROUSE LEK

WHY ARE WE DOING THIS?

OBJECTIVE: Peak male attendance at ALL active leks for
A. Trend and
B. Population estimate

Equipment Needed:
1. Warm clothing
3. Maps (the correct maps for the leks being counted)
4. Data sheets (list of lek codes and coordinates,
5. A GPS (Document coordinate system and datum settings)
6. Vehicle (4wd, or ATV) Fuel tank should be full. Due to possibility of being stuck, chains or tow straps should be in vehicle.
7. Binoculars / spotting scope
8. Pen/pencil
9. Cell phone
10. A good attitude and, remember, **If it's worth doing, do it right!**

LOCATION:

Lek codes, locations in a defined coordinate system, leks located on map sheet (USGS Topographic map sheet or Aerial photo)

Definitions for Lek Counting:

1. Two or more males displaying (strutting) = "a lek"

2. A lek count is:
   A count of **MALES** (displaying or strutting **or not**) and
   A count of any females that may be present but this is secondary.

Questions and Answers:

Q. What do I do if it's raining/snowing/blowing?
A. Count the number of birds as best as you can, and plan for an additional visit once the precipitation stops.

Q. How close can I get?
A. Do not drive or walk to within less than 150 meters (See Lek Form).

Q. When do leks get counted?
A. Start approximately one-half hour before sunrise, do not spend too much time counting – count several times until no new observations are made – usually not longer than 15 – 20 minutes per lek. Do not count 1.5 hours after sunrise.

Q. How often do I count?
A. Counts of active leks must be made at least 4 times at 5 to 8 day intervals. Highest counts are almost always between March 15 and May 1st.

Q. What are disturbances?
A. Any activity or presence that causes the strutting birds to stop strutting or leave the lek prematurely. These include, but are not limited to; coyotes, raptors, you, pronghorn, livestock, or wild horses and burros running through the lek, approaching too close, etc.

Q. What is a lek?
A. Any site where two or more sage-grouse are strutting.

Q. What is a satellite lek?
A. Satellite leks are sites greater than 100 meters from the identified lek where two or more sage-grouse are strutting.

Q. What do I do if I have a "new" active site, or lek not previously identified?
A. If you have a new active site, not at a lek site already identified, take a GPS reading at the center of the strutting birds when they are gone. The (arbitrary) criterion for a "new" site is that it must be at least 100 meters from any previously active site.

Q. Can we record two or more leks on the same Lek Data Form?
A. NO!

Sage-grouse Lek Observation Data Sheet

DATE: Observer:

LEK NAME:

ID	Place Name	UTM X	UTM Y	Status	Males	Females	Unk.	Start Time	End Time

(Status: Active, Inactive, Not Checked)

COUNTY: USGS QUAD:

LAND OWNERSHIP (Public or Private):

TEMPERATURE (Deg.. F) WIND (Dir. & Speed)

CLOUD COVER (in 10ths) PRECIP
(None, Fog, Rain, Snow)

GROUND MOISTURE CONDITION (Dry, Wet, Snow)

DISTURBANCES (Coyote, Raptor, Other)

COMMENTS:

INSTRUCTIONS:

Arrive near grounds approximately 45 minutes before sunrise.
DO NOT DRIVE VEHICLE CLOSER THAN 150 METERS TO STRUTTING GROUND.
Listen for sage-grouse vocalizations to confirm exact location of lek.
Observe from inside the vehicle when possible. Be very cautious when out of vehicle.
Using binoculars or spotting scope, scan lek and count the birds by sex.
Repeat counting procedure until peak count is made.
Proceed to next lek.
Do not start counting any new leks 1.5 hours after sunrise.

Other sightings:

ID	Place Name	UTM X	UTM Y	Status	Males	Females	Unk.	Start Time	End Time

NOTE: The Lek Data Form is normally on one side of a single sheet of paper.

HABITAT

1. Nesting Habitat

Popham and Gutiérrez (2003) describe sage-grouse major habitat features in northeastern California as:

- ✓ 13% sagebrush cover within the habitat area.
- ✓ Total shrub height at nest site = 65.5 cm +/- 4.7 cm (26" +/- 2")
- ✓ Residual Grass Height at nest site = 22.1 cm +/- 2.7 cm (9" +/- 1"). The NCSGWG established 7" as acceptable at this time.
- ✓ Visual Obstruction Height at nest site = 40.2 cm +/- 2.6 cm (16" +/- 1")
- ✓ Average Distance from lek for successful nesting = 3,588m +/- 811m (2.2 miles +/- 0.5 miles)

All methodology is explained in depth in USDI (1996) and Robel et al. (1970).

a. Overall shrub and rock cover will be gathered using the step point method for cover data collection. There will be four transects per lek. Each transect will move from the lek in one of the cardinal directions (north, south, west, and east).

b. There will be 200 points of cover data collected with each point being approximately 30 meters apart. Data collected will include shrub, forb, and rock cover.

c. At each point height of the sagebrush nearest to the point will be collected. If the sagebrush is between 70 to 61 cm. in height, residual grass height, and visual obstruction data will be collected. If the sagebrush is less than or greater than the accepted height the other data will not be collected.

d. Residual grass height will be collected at the four cardinal directions within the drip line of the sagebrush canopy, and averaged into an average height.

e. Visual obstruction height will be gathered using a "Robel" pole viewed from a distance of 4.5 meters (15') and a height o 150 – 160 cm (59" – 63").

f. These data will be summarized by lek, by year, and stored with the Wildlife Biologist of the Field Office within which the data was gathered.

2. Brood-Rearing and Winter Habitat

Habitat monitoring data will be collected using step point cover analysis to a confidence interval of 80% +/- 10% within each known habitat area. Initial surveys to describe the habitat will be made using the natural resources Interdisciplinary (ID) Team performing a Land Health Assessment consistent with Technical Reference 1734-6 (Pellant et al. 2000), including a complete species list, cover per species, and a minimum of five height measurements per species. Riparian/wetland initial habitat analysis will be completed by an ID Team consistent with Technical Reference 1737-11 (USDI 1994), with the addition of a

complete plant list, cover by species, and a minimum of five height measurements per species.

NOTE: If habitat rehabilitation activities occur within these habitats rehabilitation success will be monitored as described in Appendix G until the site has recovered to the point where it can be monitored as described above.

Survey Protocols

Populations. Monitoring sage-grouse populations in the Devil's Garden / Clear Lake PMU is the responsibility of the California Department of Fish & Game (CDFG) and the U.S. Fish & Wildlife Service (USFWS).

Lek Counts. All known active leks will be counted for peak male attendance each year. Each lek shall be counted by ground count about 7 to 10 days apart at least 3 to 4 times during mid March through early May. Persons doing lek counts have included various state and federal agency biologists and non-agency volunteers. Count protocol, maps, data forms and over-all coordination are provided by CDFG staff biologists. Data are archived at the CDFG Modoc Unit office (original completed forms and Excel databases) and at the CDFG Wildlife Programs Branch in Sacramento (Excel and Access databases). Summary memoranda of count data are produced and distributed each year.

Lek Searches (for historic leks and "new" leks). These should be completed every 3 to 5 years by ground or aircraft searches. Historically active leks occasionally become active again after several years of inactivity provided no significant habitat changes have taken place. "New" leks are occasionally formed when populations increase or they may be discovered after having not been detected from previous searches. Any lek found to be active shall be subsequently counted each year as described in 1, above. Data and search maps are archived at the CDFG Modoc Unit office. Summary memoranda of search data are produced and distributed each year.

Monitoring of Grazing Impacts to Residual Grass Height Within the Dripline of Nesting Suitable Sagebrush. Residual grass height is one nesting habitat element that is affected by grazing. Grazing in this context includes domestic livestock, wild horses and burros, and wildlife. Actual field methods are described in Appendix B. Residual grass height will be measured only within the dripline of sagebrush that meet the overall height requirement for successful sage-grouse nesting as described by Popham and Gutiérrez (2003). Residual grass height will be measured following the grazing season and, if weather permits, prior to the strutting season. Nesting habitat within rested pastures will be monitored at the end of the season of rest to provide for a comparison of domestic livestock versus wild horse and burro use. All data sheets and electronically stored data will be archived by the appropriate field office wildlife management biologist.

Evaluation and Monitoring of Brood Rearing and Winter Habitats. Habitat evaluation is necessary to provide baseline information addressing physical characteristics of areas sage-grouse are using in relation to what has been described in the literature. From these data wildlife biologists can determine if habitats in use are appropriate or optimal, or isolated locations of the best available in an area of degraded habitats. All field data sheets and electronically stored data is maintained by the appropriate field office wildlife management biologist.

Appendix C: Project Review Guidelines

The project review process, as it relates to sage-grouse, sage-grouse habitat, and sagebrush ecosystem health, is described below.

Step 1. Determine if the proposed project may affect sage-grouse, sage-grouse habitat or sagebrush ecosystem health. Effects of the proposed project include direct and indirect effects of actions taken that affect sage-grouse, active or historical sage-grouse habitat, or sagebrush ecosystem health.

- If sage-grouse, sage-grouse habitat or sagebrush ecosystem health are not contained in, or may be affected by the action, standard NEPA/ CEQA analysis is completed by the initiating party, and the project is completed.
- If sage-grouse, sage-grouse habitat, or sagebrush ecosystem health may be affected by the proposed action, go to Step 2.

Step 2. Determine if the proposed action will adversely affect sage-grouse, sage-grouse habitat, or sagebrush ecosystem health.

a. Complete on-site project review during season of use to determine potential for adverse affect.

- If there is no apparent adverse affect, complete all NEPA/CEQA documentation necessary to facilitate a decision record to approve the project.
- If there is a significant risk of an adverse affect to sage-grouse, sage-grouse habitat, or sagebrush ecosystem health, go to Step 3.

Step 3. When it is determined there will be an adverse affect to sage-grouse, sage-grouse habitat, or sagebrush ecosystem health, a site specific management plan shall be developed. The plan shall include, but not be limited to:

a. Project modification to prevent any adverse impact to sage-grouse, sage-grouse habitat, or sagebrush ecosystem health.

b. Projects that cannot mitigate the potential of jeopardizing the continued existence of sage-grouse, sage-grouse habitat, or sagebrush ecosystem health to an insignificant level shall not be approved.

c. Monitoring during project application.

d. A long-term management plan for the site including, but not limited to, placement of educational signage, possible development of landscape practices guidelines, and access agreement for annual site surveys.

e. If previously unknown sage-grouse activity is discovered during a pre-application survey, or during project application, a site specific plan will be required as in Step 3.d.

Appendix D: Summary of Habitat Assessment and Monitoring

Results of nesting habitat assessment in Lassen County have been published (Popham and Gutierrez 2003), and are being applied to this Conservation Strategy. Summary information from Popham and Gutierrez (2003) is displayed in Tables 14 and 15.

Assessment

Variable	Successful Nests	Unsuccessful Nests	Random Sites
Perennial grass cover (%)	14	11	11
Litter cover (%)	8	11	10
Bare ground cover (%)	23	26	29
Rock cover (%)	28	14	18
Sagebrush cover (%)	13	16	15
Other shrub cover (%)	6	5	5
Total shrub height cm (inches)	65.5 (26”)	49.2 (19”)	49.1 (19”)
Perennial grass height cm (inches)	22.1 (9”)	24.2 (9.5”)	18.2 (7”)
Visual obstruction height cm (inches)	40.2 (16”)	32.5 (13”)	31.9 (12”)

Table 14 Mean habitat characteristics of successful, unsuccessful nests, and random sites in Lassen County, California (from Popham and Gutierrez 2003).

Plant Species	Successful Nests		Unsuccessful Nests	
	N	%	N	%
Artemisia arbuscula (Low sagebrush)	1	3.2	3	5.3
A. tridentata wyomingensis Wyoming big sagebrush	16	51.6	36	63.2
Chrysothamnus spp. Rabbitbrush	1	3.2	5	8.8
Ephedra viridis Mormon tea	2	6.5	0	0
Purshia tridentata Antelope bitterbrush	4	12.9	0	0
Tetradymia glabrata Littleleaf horsebrush	5	16.1	10	17.5
Leymus cinereus Basin wildrye	0	0	2	3.5
Pseudoroegneria spicata Bluebunch wheatgrass	2	6.5	1	1.8
Non – *A. tridentata* nests	15	48.4	21	36.8
Total number of nests	31		57	

Table 15. Plant species used for successful and unsuccessful nesting. N = number of nests in each category, and % = percent of nests relative to the number of total successful (N=31) or unsuccessful (N= 57) nests (from Popham and Gutierrez 2003).

Preliminary review of habitat data gathered in active brood-rearing areas indicates that prickly lettuce (*Lactuca serriola*) is a favorite of sage-grouse in the northern Tablelands. Monitoring will have to include analysis of whether this introduced annual forb has replaced a preferred native forb, or has the presence of prickly lettuce helped make this a favored area?

Monitoring

Prioritization of monitoring will follow the advice offered by the National Research Council (1994). Habitats that are at risk of becoming unhealthy will be monitored most heavily. Healthy habitats will be second in priority, and unhealthy habitats (those that have crossed a threshold) will be monitored as time is available. By following this priority criteria sage-grouse habitat that should respond to treatment will be addressed first, and healthy habitat will be monitored to ensure continued health. Unhealthy habitat will be recovered as opportunities arise such as emergency stabilization and rehabilitation following wildland fires.

Appendix E: Land Health Standards. Grazing and OHV Guidelines

In Reply Refer To:
4180 (220)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Washington. D.C. 20240
http://www.blm.gov

MEMORANDUM

To: The Secretary
Through: Sylvia Baca
Assistant Secretary, Land and Minerals Management (June 13, 2000)

From: Director, Bureau of Land Management

Subject: Approval of Northeastern California and Northwestern Nevada Standards and Guidelines for Livestock Grazing

In accordance with 43 CFR 4180.2(b), the Acting California State Director is submitting for Secretarial approval the attached Northeastern California and Northwestern Nevada Standards and Guidelines for Livestock Grazing. BLM review finds that they comply with the requirements of the regulations. Standard and Guidelines development occurred in consultation with the Northeast California and Northwest Nevada Resource Advisory Council and with full public participation. BLM analyzed these standards and guidelines in an Environmental Impact Statement (EIS), which was protested. BLM appropriately considered and addressed the issues stated in the protests, and used them when it developed the Record of Decision (ROD) following the EIS. The ROD also incorporated the Standards and Guidelines into the appropriate land use plans.

I recommend that you approve the Northeastern California and Northwestern Nevada Standards and Guidelines for Livestock Grazing.

I concur with (concur/not concur) with your recommendation and (approve/not approve) the Northeastern California and Northwestern Nevada Standards and Guidelines for Livestock Grazing.

Approved: Secretary of the Interior Bruce Babbitt
(Signed copy on File in the Eagle Lake field Office)

Date: JUL 13 2000
Attachment

Northeastern California
and
Northwestern Nevada

STANDARDS

for Rangeland Health

and

GUIDELINES

for Livestock Grazing Management

Prepared by the Bureau of Land Management
California State Office
June 1999

TABLE of CONTENTS

1. PREAMBLE 1

2. STANDARDS for RANGELAND HEALTH 1
STANDARD 1: UPLAND SOILS 1
STANDARD 2: STREAMS 2
STANDARD 3: WATER QUALITY 2
STANDARD 4: RIPARIAN and WETLAND SITES 4
STANDARD 5: BIODIVERSITY 5

3. GUIDELINES FOR LIVESTOCK GRAZING MANAGEMENT 6
Guideline 1: Adequate stubble will be present on all stream-side areas at the end of the growing season 6
Guideline 2: Desired seral states will be determined through the allotment management plan 6
Guideline 3: Periods of rest from livestock grazing 6
Guideline 4: Plans for grazing on any allotment must consider other uses 6
Guideline 5: Intensity, frequency, season-of-use, and distribution of grazing shall provide for growth and reproduction of desired plant species 6
Guideline 6: Grazing permits will include site-specific, measurable terms and conditions 6
Guideline 7: Design and work towards implementation of a grazing management strategy . . . 6
Guideline 8: Determination of grazing use by livestock must provide for the habitat requirements of fish and wildlife 7
Guideline 9: Grazing management practices must sustain biological diversity 7
Guideline 10: Take aggressive action to reduce the invasion of undesirable exotic plant species 7
Guideline 11: Prescribed fire and (natural) prescribed fire will be utilized 7
Guideline 12: Grazing and other management practices shall take advantage of transitional opportunities 7
Guideline 13: Development of springs, seeps, and other water related projects shall be designed to promote rangeland health 7
Guideline 14: Apply the management practices recognized and approved by the States of California and Nevada as Best Management Practices 7
Guideline 15: Protect, enhance, and restore beneficial uses of water 7
Guideline 16: Utilization Levels to be Applied to those Allotments Not Meeting or Making Significant Progress Toward Meeting the Standards 7
Utilization of key upland herbaceous species 8
Utilization of key upland browse species 8
Utilization of key riparian species 8
Application of the above utilization levels 9
Implementation of this guideline 9
If reductions in permitted use are required 11
Guideline 17: Rangeland monitoring 11

STANDARDS AND GUIDELINES for RANGELAND HEALTH in NORTHEASTERN CALIFORNIA and NORTHWESTERN NEVADA

1. PREAMBLE

Healthy rangelands contribute to the social and economic well being of rural communities in Northeastern California and Northwestern Nevada, and they provide, over the long-term, the most reliable harvest of rangeland resources. The objective of rangeland resource planning is to integrate BLM resources with other resources to achieve the mandate of multiple-use and sustained yield management of renewable resources in an environmentally sound and cost-effective manner.

The standards of rangeland health are expressions of physical and biological condition or degree of function required for healthy sustainable rangelands. The Standards are applied on a landscape scale. Some standards may not apply to all acres. For example, a mosaic of vegetation types and age classes may produce the diversity associated with healthy rangelands; however, some individual vegetation communities within the mosaic may lack diversity.

The Standards always relate to the capability or potential of a specific site. The land will not be expected to produce vegetation or support habitats not attainable due to climate, soils, or other limiting attributes. The Standards are designed to establish the threshold for healthy rangelands. The Standards contain exceptions for certain necessary or unavoidable circumstances (see, for example, Standard 4); however, the exceptions should be applied under extreme conditions only, and must be fully justified.

The guidelines for grazing management are the types of grazing management methods and practices determined to be appropriate to ensure that standards can be met or that significant progress can be made toward meeting the standard. The Guidelines were designed to provide direction, yet offer flexibility for implementation through activity plans and terms and conditions for grazing permits. The BLM must operate within the constraints of other regulatory requirements that may affect how S&G's are applied for livestock grazing, for example the Wild Free-Roaming Horse and Burro Act (1971).

2. STANDARDS for RANGELAND HEALTH

STANDARD 1: UPLAND SOILS

> *Upland soils exhibit infiltration and permeability rates that are appropriate to soil type, climate, and landform, and exhibit functional biological, chemical, and physical characteristics.*

Meaning that:

Precipitation is able to enter the soil surface and move through the soil profile at a rate appropriate to soil type, climate, and landform; the soil is adequately protected against human-caused wind or water erosion; and the soil fertility is maintained at, or improved to, the appropriate level.

Criteria to Meet Standard:

* Groundcover (vegetation, litter, and other types of groundcover such as rock fragments) is sufficient to protect sites from accelerated erosion.

* Evidence of wind and water erosion, such as rills and gullies, pedestaling, scour or sheet erosion, and deposition of dunes is either absent or, if present, does not exceed what is natural for the site.

* Vegetation is vigorous, diverse in species composition and age class, and reflects the potential natural vegetation or desired plant community (DPC) for the site.

STANDARD 2: STREAMS

Stream channel form and function are characteristic for the soil type, climate, and landform.

Meaning that:

Channel gradient, pool frequency, width to depth ratio, roughness, sinuosity, and sediment transport are able to function naturally and are characteristic of the soil type, climate, and landform.

Criteria to Meet Standard:

* Gravel bars and other coarse textured stream deposits are successfully colonized and stabilized by woody riparian species.

* Stream bank vegetation is vigorous and diverse, mostly perennial, and holds and protects banks during high stream flow events.

* The stream water surface has a high degree of shading, resulting in cooler water in summer and reduced icing in winter.

* Portions of the primary floodplain are frequently flooded (inundated every 1-5 years).

STANDARD 3: WATER QUALITY

Water will have characteristics suitable for existing or potential beneficial uses. Surface and groundwater complies with objectives of the Clean Water Act and other applicable water quality requirements, including meeting the California and Nevada State standards, excepting approved variances.

Management Objective: For water bodies, the primary objective is to maintain the existing quality and beneficial uses of water, protect them where they are threatened, and restore them where they are currently degraded. This objective is of even higher priority in the following situations:

a. where beneficial uses of water bodies have been listed as threatened or impaired pursuant to Section 303(d) of the Federal Clean Water Act;

b. where aquatic habitat is present, has been present, or is potentially present for Federal threatened or endangered, candidate, and other special status species dependent on water resources; and

c. in designated water resource sensitive areas such as riparian and wetland areas.

Meaning That:

BLM will:

Maintain the physical, biological, and chemical integrity of waters flowing across or underlying the lands it administers.

Protect the integrity of these waters where it is currently threatened.

Insofar as is feasible, restore the integrity of these waters where it is currently impaired.

Not contribute to pollution and take action to remedy any pollution resulting from its actions that violates California and Nevada water quality standards, Tribal water quality standards, or other applicable water quality requirements (e.g., requirements adopted by SWRCB or RWQCB in California, or Environmental Protection Agency (EPA) pursuant to Section 303(d) of the Clean Water Act or the Coastal Zone Reauthorization Act). Where action related to grazing management is required, such action will be taken as soon as practicable but not later than the start of the next grazing year (in accordance with 43 CFR 4180.1).

Be consistent with the non-degradation policies as identified by the States.

Develop and execute a Management Agency Agreement with the States of California and Nevada for the efficient protection of water quality associated with the BLM's management.

Work with the States' water quality administrative agencies and the EPA to establish appropriate beneficial uses for public waters, establish appropriate numeric targets for 303(d)-listed water bodies, and implement the applicable requirements to ensure that water quality on public lands meets the objectives for the designated beneficial uses of the water.

Develop and implement Best Management Practices (BMP's) approved by the States to protect and restore the quality and beneficial uses of water, and monitor both implementation and effectiveness of the BMP's. These BMP's will be developed in full consultation, coordination, and cooperation with permittees and other interests.

State or Tribal approved variances or exceptions to water quality standards may be applicable within their Basin Plans for specific types of activities or actions. The BLM will follow State or Tribal administrative procedures associated with variances.

As Indicated By:

* The following do not exceed the applicable requirements for physical, chemical, and biological constituents including but not limited to: temperature, nutrients, fecal coliform, turbidity, sediment, dissolved oxygen, and aquatic organisms and plants (e.g., indicator macro-invertebrates, fish, algae, and plants).

* Achievement of the standards for riparian, wetlands, and water bodies.

* Monitoring results or other data that show water quality is meeting the standard.

STANDARD 4: RIPARIAN and WETLAND SITES

Riparian and Wetland areas are in properly functioning condition and are meeting regional and local management objectives.

Meaning that:

The riparian and wetland vegetation is controlling erosion, stabilizing stream banks, shading water areas to reduce water temperature, filtering sediment, aiding in floodplain development, dissipating energy, delaying floodwater, and increasing recharge of ground water that is characteristic for these sites. Vegetation surrounding seeps and springs is controlling erosion and reflects the potential natural vegetation for the site.

Criteria to Meet Standard:

* Riparian vegetation is vigorous and mostly perennial and diverse in species composition, age class, and life form sufficient to stabilize stream banks and shorelines.

* Riparian vegetation and large woody debris are well anchored and capable of withstanding high stream flow events.

* Negligible accelerated erosion as a result of human related activities is evident.

* Age class and structure of woody riparian and wetland vegetation are appropriate for the site.

Exceptions and Exemptions to Standard 4 (where Standard 4 is not applicable)

* Structural facilities constructed for livestock/wildlife water or other purposes are not natural wetland and/or riparian areas. Examples are: water troughs, stock ponds, flood control structures, tailings ponds, water gaps on fenced or otherwise restricted stream corridors, etc.

STANDARD 5: BIODIVERSITY

Viable, healthy, productive, and diverse populations of native and desired plant and animal species, including special status species, are maintained.

Meaning that:

Native and other desirable plant and animal populations are diverse, vigorous, able to reproduce and support nutrient cycles and energy flows.

Criteria to Meet Standard:

* Wildlife habitats include seral stages, vegetation structure, and patch size to promote diverse and viable wildlife populations.

* A variety of age classes is present for most species.

* Vigor is adequate to maintain desirable levels of plant and animal species to ensure reproduction and recruitment of plants and animals when favorable events occur.

* Distribution of plant species and their habitats allow for reproduction and recovery from localized catastrophic events.

* Natural disturbances such as fire are evident but not catastrophic.

* Nonnative plant and animal species are present at acceptable levels.

* Habitat areas are sufficient to support diverse, viable, and desired populations and are connected adequately with other similar habitat areas.

* Adequate organic matter (litter and standing dead plant material) is present for site protection and decomposition to replenish soil nutrients and maintain soil health.

3. GUIDELINES FOR LIVESTOCK GRAZING MANAGEMENT

The following guidelines are meant to apply to one or more of the standards for rangeland health.

Guideline 1: Adequate stubble will be present on all stream-side areas at the end of the growing season, or at the end of the grazing season if grazing occurs after fall dormancy. The residual or regrowth should provide sufficient herbaceous forage biomass to meet the requirement of plant vigor maintenance, bank protection, and sediment entrapment. Stubble height thresholds will be set on a site-specific basis, except for those allotments to which Guideline 16 applies (see Guideline 16 for an explanation of when Guideline 16 applies).

Utilization of stream-side herbaceous and woody plants should be limited to a specified amount of the current growth, and/or livestock should be removed to allow sufficient time for plant regrowth.

a. Late season use (summer or fall grazed pastures) requires more restrictive utilization based on site specific situations.

b. Special situations such as fragile fisheries habitats or easily eroded stream banks may require more restrictive utilization thresholds.

c. Hoof action impacts or chiseling on stream banks will not exceed specified thresholds so that stream bank stability is maintained or improved.

Guideline 2: Desired seral states will be determined through the allotment management plan (AMP) development process; generally the goal will be to achieve advanced ecological status in the riparian zone, except where site-specific objectives call for lower ecological status (such as meadows in important sage-grouse habitat, where the objective might call for a pattern of meadows in different seral stages from mid seral to the potential natural community). These site-specific objectives will be determined through AMP's or other plans and analyzed through the NEPA process.

Guideline 3: Periods of rest from livestock grazing or other avoidable disturbances must be provided during/after periods of stress on the land (e.g., fire, flood, drought) and during critical times of plant growth.

Guideline 4: Plans for grazing on any allotment must consider other uses (recreation, archaeological sites, wildlife, horses and burros, mineral resource extraction, etc.) and be coordinated with the other users of public lands so that overall use does not detract from the goal of achieving rangeland health.

Guideline 5: Intensity, frequency, season-of-use, and distribution of grazing shall provide for growth and reproduction of desired plant species and the achievement of the potential natural vegetation or DPC.

Guideline 6: Grazing permits will include site-specific, measurable terms and conditions.

Guideline 7: Design and work towards implementation of a grazing management strategy for livestock for each grazing unit (pasture) within I (Improvement) and M (Maintenance) category allotments, to maintain or improve rangeland health. This may consist of, but not be limited to, season-of-use, rotation, or by setting utilization levels for desirable plants. Each management plan implemented will incorporate the factors necessary to maintain the health of desirable plants.

Guideline 8: Determination of grazing use by livestock must provide for the habitat requirements of fish and wildlife.

Guideline 9: Grazing management practices must sustain biological diversity across the landscape. A mosaic of seral stages, vegetation corridors, and minimal habitat fragmentation must be maintained.

Guideline 10: Take aggressive action to reduce the invasion of undesirable exotic plant species into native plant communities. The spread of noxious weeds will be controlled through appropriate methods such as grazing management, fire management, and other management practices.

Guideline 11: Prescribed fire and (natural) prescribed fire will be utilized to promote a mosaic of healthy plant communities and vegetative diversity.

Guideline 12: Grazing and other management practices shall take advantage of transitional opportunities (e.g., drought, flood, fire) to enhance or establish populations of desirable tree, shrub, herbaceous, and grass species. Utilization levels will be established for desired seedlings, saplings, and/or mature plants to promote their presence in the plant community.

Guideline 13: Development of springs, seeps, and other water related projects shall be designed to promote rangeland health. Wherever possible, water sources shall be available year long for use by wildlife.

Guideline 14: Apply the management practices recognized and approved by the States of California and Nevada as Best Management Practices (BMP's) for grazing related activities to protect and maintain water quality.

Guideline 15: In watersheds draining into water bodies that have been listed or are proposed for listing as having threatened or impaired beneficial uses, and where grazing activities may contribute to the pollutants causing such impairment, the management objective is to fully protect, enhance, and restore the beneficial uses of the water.

Guideline 16: Utilization Levels to be Applied to those Allotments Not Meeting or Making Significant Progress Toward Meeting the Standards

If monitoring or documented observation indicates that one of more of the standards is not being met, and if significant progress is not being made toward meeting all of those standards that are not being met, and if there is evidence that current grazing practices are causing or contributing to this unsatisfactory condition, then the following utilization levels will be applied.

Utilization of key upland herbaceous species

UTILIZATION GUIDELINES (adapted from Holechek 1988 and Holechek et al. 1998)	
Community Type	**Percent of Use of Key Herbaceous Species**
Salt desert shrubland	25-35
Semi-desert grass and shrubland	30-40
Sagebrush grassland	30-40
California annual grassland	50-60*
Perennial grass communities within the California annual grassland vegetation type	30-40
Coniferous forest	30-40
Mountain shrubland	30-40
Oak woodland	30-40
Pinyon-juniper woodland	30-40
Alpine tundra	20-30

*Residual dry matter (RDM) guidelines will be used instead of these utilization levels for management of annual species in the California annual grassland. These RDM levels correspond approximately with these utilization levels. The RDM levels given in the table in the Final EIS under Alternative 5, Ukiah RAC Recommended Standards and Guidelines (Section 2.92), will be used for those few annual allotments within the area covered by the Northeastern California and Northwestern Nevada Standards and Guidelines.

Utilization of key upland browse species

There will be no more than 20 percent utilization of annual growth on key browse species prior to October 1 within identified deer concentration areas. These concentration areas are those areas within mule deer habitat where mule deer numbers are most likely to be concentrated during the winter season (winter season normally occurs from December 16 through March 31). These areas have been identified through State Fish and Game Agency fall and spring counts over a period of several years. Maps of these deer concentration areas are on file at the BLM Eagle Lake Field Office.

Utilization of key riparian species

A 4-6 inch minimum stubble height will remain at the end of the growing season in most riparian areas.

There should be no more than 20 percent utilization on key riparian trees and shrub species in those areas where the presence of woody riparian species is necessary to meet standards.

Application of the above utilization levels

These utilization guidelines will be applied to those areas of the allotment responsible for the determination that the allotment is not meeting the standards. For example, an allotment has 10 riparian areas, of which six have been determined to be in proper functioning condition and four have been determined to be functional–at risk. The utilization guidelines for riparian species given above would be applied to the four riparian areas that are functional–at risk, not to the six that are in proper functioning condition (although *all* of the riparian areas will be managed to meet the standards). Also, only those guidelines that are applicable to making progress toward meeting the standards that are not being met would be applied. For example, if only riparian standards are not being met, then only the guidelines applicable to utilization and stubble height of riparian vegetation would be applied.

These utilization levels will be implemented unless and until a current site-specific analysis is completed and new utilization levels are developed for specific allotments and documented in AMP's, other

management plans, and/or in terms and conditions of grazing permits/leases. New site-specific utilization levels that are developed may be more restrictive than the guidelines presented above, consistent with achieving the desired resource conditions (as prescribed in land use plans and activity plans) and progress toward meeting the standards.

Implementation of this guideline

1. Uplands (including perennial grass and browse communities).

Guideline 16 will be implemented only on those upland areas that are responsible for the determination that the allotment is not meeting one or more of the standards and for which lighter utilization would be expected to move these areas toward meeting the standard(s).

Management changes (such as changes in season of use, timing, duration, and/or intensity; rotational grazing; fencing; herding; and/or adjustments in stocking rates) will be implemented if utilization guidelines on the average of the upland key areas across the pasture (or allotment if there is only one pasture) are exceeded for 2 consecutive years or in any 2 years out of every 5 years. In addition, at least 70 percent of upland key areas on the pasture (or allotment) are not to exceed maximum utilization guidelines in most years. Because of the potential long-term damage to perennial grass species associated with severe grazing, severe grazing use (>70 percent utilization) in any upland key area in any year will result in a management change the following year. If any particular key area fails to meet the guidelines for more than 2 consecutive years, then management action will be taken to remedy the problem in the area of the allotment that key area represents. The average (mean) utilization on key species will be estimated at each key area and used to determine if the guidelines have been met. There are indications that the median may be a better statistic to use than the mean; we will calculate both statistics from the same data sets and make a determination on which statistic to use after examining the data over a period of a few years. See Appendix 20 of the Final EIS for further discussion on this issue.

The management options to be implemented to meet this guideline will be determined in full consultation, cooperation, and coordination with affected permittees and other interests.

For allotments not meeting or making significant progress toward meeting the standards (and for which lower utilization levels of perennial upland species would be expected to help move these allotments toward the standards), utilization data already in hand will be used to determine whether a management change is necessary. Thus, for example, if utilization on a particular key area has exceeded the thresholds for the 2 years previous to the approval of these standards and guidelines, a management change will be implemented prior to the first grazing year following this approval. In addition to implementing management changes that are expected to bring utilization levels within threshold values, close monitoring will follow to ensure that the grazing use levels are not exceeded during the grazing period following the management changes. If utilization levels are exceeded or expected to be exceeded during this period, a reduction or curtailment of further grazing in the area represented by the key area will be required for the remainder of the grazing season. In addition, further management changes will be implemented prior to the start of the next grazing season to bring utilization levels within thresholds.

2. Riparian areas (including herbaceous and woody plant communities).

Guideline 16 will be implemented only on those riparian areas that are nonfunctional or functional--at risk and lighter utilization levels would be expected to move these areas toward meeting the standards. The guideline will apply where the riparian area in a healthy state has the capability to produce vegetation of the prescribed height. The stubble heights will be measured at the end of the growing season to determine if the guideline has been met. Management changes (such as changes in season of use, timing, duration, and/or intensity; rotational grazing; fencing; herding; and/or adjustments in stocking rates) will be implemented if stubble heights on the average of the key riparian areas across the pasture (or allotment if there is only one pasture) fall below the guidelines for 2 consecutive years or in any 2 years out of every 5 years. In addition, at least 70 percent of riparian key areas on the allotment are to exceed minimum stubble heights in most years. If any particular key area fails to meet the guidelines for more than 2 consecutive

years, then management action will be taken to remedy the problem in the area of the allotment that key area represents.

Because stream banks may be inadequately protected by heavy use in any one year and because stubble heights below 3 inches result in cattle shifting their preference to shrubs, stubble heights below 2 inches in any one year will require a management change in the following year.

The mean stubble height on key riparian species will be estimated at each riparian key area and used to determine if the guidelines have been met. There are indications that the median may be a better statistic to use than the mean; we will calculate both statistics from the same data sets and make a determination on which statistic to use after examining the data over a period of a few years. See Appendix 20 of the Final EIS for further discussion on this issue.

For allotments not meeting or making significant progress toward meeting the standards (and for which higher stubble would be expected to help move these allotments toward the standards), stubble height data already in hand will be used to determine whether a management change is necessary. Thus, for example, if stubble heights on a particular key area have fallen below the thresholds for the 2 years previous to the approval of these standards and guidelines, a management change will be implemented prior to the first grazing year following this approval. In addition to implementing management changes that are expected to bring stubble heights within threshold values, close monitoring will follow to ensure that the grazing use levels are not exceeded during the grazing period following the management changes. If utilization levels are exceeded or expected to be exceeded during this period, a reduction or curtailment of further grazing in the area represented by the key area will be required for the remainder of the grazing season. In addition, further management changes will be implemented prior to the start of the next grazing season to bring utilization levels within thresholds.

The management options to be implemented to meet this guideline will be determined in full consultation, coordination, and cooperation with affected permittees and other interests.

If reductions in permitted use are required

Any reductions in permitted use required as a result of implementing this guideline will be held in suspension and apportioned back to the permittee(s) or lessee(s) authorized to graze in the affected allotment if rangeland health improves to the extent that the authorized officer determines additional forage to be available.

Guideline 17: Rangeland monitoring to determine utilization of forage resources and trend of rangeland health will be conducted in each allotment based on current accepted practices and techniques as directed in the Interagency Technical References: *Utilization Studies and Residual Measurements* (BLM et al. 1996b) and *Sampling Vegetation Attributes* (BLM et al. 1996a). Monitoring methodologies will be applicable to local conditions and developed in consultation with permittees and interested publics.

To the extent possible, monitoring methods will be simple and easily accomplished. BLM, permittees, or others will do the monitoring. BLM will be responsible for ensuring that the monitoring is conducted in accordance with currently accepted practices and techniques, for analyzing and interpreting the data collected (in consultation, coordination, and cooperation with affected permittees and other interests), and for the accuracy of the data.

Existing key areas will be used where they exist. New key areas will be selected in full consultation, coordination, and cooperation with affected permittees and other interests. BLM will periodically review established key areas to determine if they continue to be appropriate to management. This review will be done in full consultation, coordination, and cooperation with affected permittees and other interests. If there is disagreement between BLM, permittees, and other interests over the location of key areas, the RAC will be asked for ideas on resolution. The final decision on the placement of key areas, however, rests with BLM.

BLM, in cooperation with other agencies, including Cooperative Extension, the Natural Resources Conservation Service, and the Forest Service, will provide training for permittees and other interested parties on rangeland monitoring methods.

IMPLEMENTATION

The fallback standards (43 CFR 4180.2(f)(1)) have been in effect in since August 12, 1997. An initial screening of allotments was made, based on existing information, to determine the status of each allotment with respect to meeting the fallback standards. Each allotment was placed into one of four categories as follows:

Category 1: Areas where one or more standards are not being met, or significant progress is not being made toward meeting the standards(s), and livestock grazing is a significant contributor to the problem.

Category 2: Areas where all standards are being met, or significant progress is being made toward meeting the standard(s).

Category 3: Areas where the status for one or more standards is not known, or the cause of the failure to not meet the standard(s) is not known.

Category 4: Allotments where one or more of the standards are not being met or significant progress is not being made toward meeting the standards due to causes other than (or in addition to) livestock grazing activities. (Those allotments where current livestock grazing is also a cause for not meeting the standards are included in Category 1 in addition to this category.) The authorized officer should take appropriate action based on regulation or policy; however, these actions not related to livestock grazing are outside the scope of this implementation plan and will not be addressed in this document.

An assumption has been made by the BLM field managers that, with few possible exceptions, the implementation needed for the regulatory fallback standards and guidelines will essentially be the same as for any anticipated set of final approved standards and guidelines implemented pursuant to this Record of Decision (ROD). Consequently, the categorization of allotments under the standards in this ROD is likely to be the same as the categorization under the fallback standards and guidelines. Existing allotment assessments and their resulting determinations as to category will be reviewed to ensure that the determination is correct under the standards set in place by this ROD.

New allotment assessments, reviews of existing allotment assessments, and determination of allotment category will be conducted in full consultation, coordination, and cooperation with permittees and other interests.

We intend to conduct rangeland health assessments on all allotments within the next 5 years. First priority for these assessments will be given to those allotments where we already know or suspect one or more of the standards is not being met. These include those allotments placed in Category 1 under the fallback standards and those allotments currently in Category 3 that we have reason to believe may not be meeting standards. After these allotments have been assessed, the remaining allotments will be assessed using the BLM I, M, and C priority management system, with first priority to I, second to M, and last to C.

For those allotments where the standards are not being met (Category 1), management actions will be implemented to correct the situation prior to the next grazing season turn-out period for the allotment. The management options will be determined in full coordination, consultation, and cooperation with permittees and other interests.

Monitoring will be conducted to evaluate the progress towards improving rangeland health and to evaluate the success of the specific management measures applied (see Guideline 17).

APPLICATION OF GUIDELINES

Once the guidelines are approved by the Secretary of the Interior, they will be applicable to the management of livestock grazing on all allotments not meeting the health standards. Some guidelines will be applicable regardless of the specific rangeland health condition, as they are designed to help protect and sustain rangeland health and are not intended to be applied only to remedy problems. Many of the guidelines will need to be more specifically identified and then applied as terms and conditions of a permit or lease, based upon the specific needs for meeting rangeland health standards. There will be instances where specific terms and conditions will be applied to grazing use authorizations for reasons other than those directly related to rangeland health, such as to accommodate other resource needs and land uses or to meet administrative requirements. Examples of this may include protecting cultural resource sites, requiring a specific breed of livestock to be used that is compatible with the needs of other permittees or lessees using the same allotment, or for meeting various regulatory requirements for grazing
administration purposes. In some instances, existing terms and conditions will be carried over from previously made plans and commitments, such as those identified in allotment management plans or coordinated management plans. In these instances, the terms and conditions may or may not be related to rangeland health needs.

Any terms or conditions specified for a permit or lease must be consistent with and support appropriate BLM land use plans or other land use plans applicable to the public lands. BLM will also adhere to requirements such as those identified as terms or conditions from a biological opinion for protecting the habitat of a plant or animal under the Endangered Species Act.

Terms and conditions will be applied to grazing permits, leases, or other grazing authorizations as the authorized officer (Field Manager) determines the need. The determination of what terms and conditions will be applied will be made in full consultation, coordination, and cooperation with the respective permittees/lessees and other interested parties involved in the particular allotment. The same process will be used for making needed changes to any existing terms and conditions. Information from assessments and evaluations of monitoring data will be used to determine the management changes needed. Management options that would be expected to move allotments toward meeting the standards will be determined in full coordination, consultation, and cooperation with permittees/lessees and other interested parties.

Alternative management changes will be considered and evaluated through the NEPA process prior to making final determinations. It is anticipated that in most instances, the terms and conditions will be identified cooperatively and be agreed upon by the affected permittee/lessee and all interested parties. Where an agreement cannot be reached, then a formal decision (which is appealable) will be issued.

If reductions in permitted use are necessary to achieve the standards or meet the guidelines, the animal unit months (AUMs) by which the permitted use is reduced will be held in suspension. Once the authorized officer determines that rangeland health has recovered to an extent that all or part of the suspended permitted use can be restored, this suspended permitted use shall first be apportioned

in satisfaction of suspended permitted use to the permittee(s) or lessee(s) authorized to graze in the allotment in which the forage is available (this is in accordance with 43 CFR 4110.3-1(b)).

REPORTING PROGRESS IN RANGELAND HEALTH ACHIEVEMENTS

Rangeland health conditions will be reported annually for each grazing allotment. This information will include the determinations of rangeland health conditions through assessments and monitoring and the progress made towards meeting rangeland health standards. At a minimum the report will identify, by allotment: (1) what standards, if any, are not being met; (2) whether significant progress is being made toward meeting those standards that are not currently being met; (3) the magnitude of those standards not being met, in terms such as acres, miles of stream, number of sites, etc.; (4) the progress that has been made in determining and implementing needed management changes; and (5) the results of making the management changes as determined from monitoring and assessment information. Additionally, any
changes in the management categories of the allotments will be identified, accompanied by an explanation of the reasons for the change.

The above information will be gathered at the field office which administers the respective allotment(s). A summary of this information will be consolidated for all of the allotments within the EIS area and made available to the public annually.

Tables were provided in the Final EIS that showed all allotments in the State and the category to which they were assigned in 1997. Since that list was compiled, management changes have been implemented and additional assessment and monitoring work has been completed that makes those lists obsolete. When the annual report is compiled each year, an updated list of all allotments, by category, will be provided as part of the report.

Throughout all processes the public is encouraged to participate in the identification of rangeland health conditions, developing management remedies, monitoring results, and reviewing progress towards achieving rangeland health standards.

Appendix F: Regulatory Authority and Enforcement Guidelines Including Introductions Transplants & Re-establishment/ Augmentation

Sage-grouse are a California Species of Special Concern and harvest species in California. The California Department of Fish and Game administers sage-grouse populations including take, setting permit recommendations, investigation and citing poachers, and other laws and regulations concerning sage-grouse through the California Code of Regulations (CCR) Title 14.

Memorandum of Understandings, Regulations, and Policy Effecting Translocations Onto or From BLM Administered Lands

Master Memorandum of Understanding between The CALIFORNIA DEPARTMENT OF FISH AND GAME and The BUREAU OF LAND MANAGEMENT DEPARTMENT OF THE INTERIOR. BLM Manual Supplement 6521.11, State Director – California, Release Number 6 – 18, 5/10/84.

B. THE DEPARTMENT AGREES:

2. *To annually submit by July 1, to the Bureau, a list of wildlife transplants and reintroductions proposed for public lands for the period beginning 12 months after submission. Such transplants or reintroductions must be approved by the Bureau's State Director and the Department's Director prior to implementation. Emergency situations may necessitate relocations to public lands. These will require the same approval authority as described above.*

C. THE DEPARTMENT AND THE BUREAU MUTUALLY AGREE:

10*. It is expressly stipulated and agreed by both parties that each and every provision in this Memorandum of Understanding is subject to the laws of the State of California, the laws of the United States, and to the delegated authority assigned in each instance.* NOTE: This means NEPA is a requirement for transplants and reintroductions. As will be cited later NEPA is also required for augmentations.

BLM Manual 1745 – Introduction, Transplant, Augmentation, and Reestablishment of Fish, Wildlife, and Plants. Release 1-1603, 3/26/92.

NOTES: 1.This entire Manual provides policy and direction for the title activities. The following three segments provide clear policy for how sage-grouse translocations should be approached.
2. Development of the activity plan also requires monitoring or inventory data sufficient to support the proposed action.

06 B. *The restoration and maintenance of native, naturalized, and exotic species and their habitats shall be conducted in accordance with approved land use plans. All proposed introductions, transplants, reestablishments, or augmentation / restocking shall be in conformance with management direction and decisions in an applicable Resource Management Plan (RMP) (see BLM Manual Sections 1601 and 1622).* NOTE: These

sections have been replaced by Appendix C, Section E. Fish and Wildlife of BLM Manual Handbook H-1601-1, Release 1-1693, 03/11/05. *A site-specific activity plan must be prepared, using and interdisciplinary planning process, for all proposed introductions, transplants, and reestablishments, unless waived by the State Director.*

C. *Appropriate State and/or Federal agency (ies) must coordinate with and when applicable approve or sponsor introductions, transplants, augmentations/restocking, or reestablishment of species. State level Memorandum of Understanding (MOU's) or Cooperative Agreements with cooperating agencies provide the basis for identifying roles and responsibilities for releases. Field level agreements or operational plans outline the specifics for each release effort.*

D. *The NEPA compliance is required before introductions, transplants and reestablishments can be approved.* NOTE: Based on discussions with the authors of this Manual the presumption is the augmentations will be covered by the initial reintroduction NEPA document.

Appendix G: Sage-Grouse Lek and Other Habitat Informational Signs for Public Lands and Private Lands

Public Viewing Lek Flyer

WHERE CAN I SEE SAGE-GROUSE STRUT?

WHEN? Sage-grouse attend leks usually from March though early May. Most activity starts at first light each morning and is over by about 2 hours after sunrise. Some grouse may strut in the evening and even under a full moon but it's mostly an early morning show. For best viewing, arrive 30-45 minutes BEFORE sunrise.

HOW DO I GET THERE?

NON-PAVED ROADS MAY BE IMPASSIBLE IN WET WEATHER. Please don't rip the road!

HOW? A dirt/gravel road is just south of the lek. Grouse usually strut within 100 to 150 yards of this road and you can align your vehicle and watch them from the front seat. Besides, you can rest binoculars (7X or>) or a spotting scope (20X or>) on a part-way down window. Grouse are more comfortable when you are in your vehicle than if you are on foot. Please arrive no later than 30-45 minutes BEFORE sunrise.

WHAT'S GOING ON HERE? Sage-grouse strutting grounds are called "leks". This is a word that means "A place where members of a population come to display and breed" Sage-grouse (and species of prairie grouse, but not forest grouse) come to leks each spring to display and breed. These sites are critical for reproduction. They are usually low, open places in sagebrush flats, valleys or benches, and may persist for a hundred or more years. Leks are closely linked to adequate nesting habitat which is located mostly within 3 to 6 miles of each lek. Sage-grouse will fly or walk from the lek to roosting areas about 2 hours after sunrise unless they are disturbed.

TIPS & PROTOCOL

* Please do not walk out to where grouse are strutting; they will leave.
    If they leave, they won't strut elsewhere.
    NO strutting = NO breeding = NO eggs = NO MORE GROUSE- Period.
*Keep noise and talking low and be mindful of other people's viewing opportunities.

Site is private land; please DON'T LITTER or burn anything. Please let us know what day you were there and how many (males) you saw. For more information, we can be reached at 530-254-6678, email at sgproject@dfg.ca.gov or mail at Sage-grouse Project, 728-600 Fish & Game Rd., Wendel, California 96136. Other informative links are www.nwf.org , www.ca.dfg.gov, and www.ndow.org. For BLM road conditions 530-257-0456.
Revised 3-1-04 (FAH)

Appendix H: Clear Lake / Devil's Garden Sage-Grouse Working Group and Technical Sub-Committee Members

Clear Lake / Devil's Garden Sage-Grouse Working Group

Agency / Group and Representatives

Technical Sub-Committee

Agency / Group and Representatives*

UC Cooperative Extension	Don Lancaster
California Department of Fish and Game	Richard Shinn
USDA-Natural Resources Conservation Service	Marc Horney
	Gene Kelley
USDI-Fish & Wildlife Service	John Beckstrand
USDA-Forest Service	Patty Buettner
USDI-Bureau of Land Management	

Persons with special technical skills will be consulted as needed.

Appendix I: Incentive Programs for Sage-grouse Habitat Enhancement on Private Lands

Developing actions for sage-grouse conservation on private land needs the full support of the landowner and won't work without it. The most important type of incentive for private landowners is to involve them early in the planning process, and to include their suggestions and interests. Ask them what they think would work for them on their land with their operation. This done early and sincerely is the first step, followed by continued involvement.

The goals for sage-grouse conservation on private lands in the Buffalo - Skedaddle CS are focused on landowner education and incentives, which differs from the administrative approach taken on the public lands. Regulations on public lands managed as part of an allotment could easily influence how the landowner uses the associated private lands. For instance, the landowner with restrictions on their allotments may choose to attempt more intensive agriculture on the private lands, which is likely to fail and create further habitat loss. The Buffalo - Skedaddle CS attempts to find a workable balance for sage-grouse conservation on both public and private lands.

Educational information is available to landowners concerning the habitat needs of sage-grouse: The Nevada Wildlife Federation publishes a booklet entitled *"Enhancing Sage-grouse Habitat…A Nevada Landowners Guide"*. A copy of the booklet is available on-line at www.nvwf.org/sagegrouse/guide or by calling (775) 885-0405 or (775) 677-0927.

Farm Bill 2000: The Natural Resources Conservation Service (NRCS) is a federal agency under the United States Department of Agriculture. www.nrcs.usda.gov/programs/ NRCS offers landowners financial, technical, and educational assistance to implement conservation practices on privately owned land. Using this help, farmers, ranchers, and forest landowners apply practices that reduce soil erosion, improve water quality, and enhance cropland, forestland, wetlands, grazing lands, and wildlife habitat. Conservation plans are developed with individual landowners to suit their specific situation. The landowner is the decision-maker, but conservation practices must meet NRCS standards and specifications. Participation in a cost-share program is not required to receive assistance. Landowners interested in technical assistance or cost-share programs are encouraged to contact the local NRCS field office for assistance. Contact Allison Pierce, biologists, at Allison.Pierce@ca.usda.gov. Listed below are the two most utilized NRCS programs.

- Environmental Quality Incentives Program (EQIP) was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.
- Wildlife Habitat Incentives Program (WHIP) is a voluntary program for people who want to develop and improve wildlife habitat primarily on private land. Through this program the Natural Resources Conservation Service (NRCS) provides both technical assistance and up to 75 percent cost-share assistance to establish and improve fish and wildlife habitat. WHIP agreements between NRCS and the participant generally last from 5 to 10 years from the date the agreement is signed. WHIP has proven to be a highly effective and widely accepted program across the country. By targeting wildlife habitat projects on all lands and aquatic areas, WHIP provides assistance to

conservation minded landowners who are unable to meet the specific eligibility requirements of other USDA conservation programs.

Conservation Easements: A conservation easement is a legal agreement a property owner makes to restrict the type and amount of development that may take place on his or her property. Each easement's restrictions are tailored to the particular property and to the interests of the individual owner. The purchaser/recipient is required to make periodic inspections to assure the conditions of the easement are being applied. For properties where long term protection is important but where private ownership and management make sense, easements can be the right tool. The easement can be donated by the landowner (usually with a tax benefit for the value of development that is precluded), or purchased by a public or non-profit entity. Presently, easements may not be a popular option for most landowners simply because there is a critical lack of information for them to feel confident in what the "fair" value of the easement actually is and any type of regulatory tool that includes a "perpetuity" clause is not likely to be popular with private landowners.

The **Endangered Species Act** includes components, such as the Candidate Conservation Agreements with Assurances and Safe Harbor Agreements, that can be used as incentive mechanisms for landowners. Most importantly, these include contractual assurance agreements. These essentially specify what land use practices the landowner will adhere to in return for assurance that the land will continue to be used for production purposes as outlined in the agreement. Getting these agreements in place assures the landowner that there will be no changes in their use of the land, water, or other resources. These are likely to be important incentives for traditional ranchers. There needs to be adequate support for landowners to negotiate these agreements with the U S Fish and Wildlife Service and the time to negotiate these agreements is sooner than later. John Beckstrand is the contact at (530) 667-2231. www.FWS.gov

The **United States Fish & Wildlife Service** Joint Venture and Partners for Fish & Wildlife programs, traditionally directed at wetlands improvement, have expanded to include all birds. Small grants of $10,000-$50,000 are available for habitat improvement. Applications for these funds require partnerships and shared costs. The improvements should be tied to increased numbers of Sage-grouse. Information on grants and partnerships is available at www.FWS.gov.

National Fire Plan: This plan is the US Congress response to the severe wildfires of 2000 with the intent of reducing their impacts on rural communities and enhancing the firefighting capabilities in the future. The National Fire Plan assists in the implementation of five key areas: firefighting resources, rehabilitation and restoration, hazardous fuels reduction, accountability, and community assistance. In California, funding is administered through the Bureau of Land Management. Where sage-grouse habitat improvement can also be tied to fuels reduction projects and Multi-Resource Stewardship, funding through the BLM may be available. (Contact: California BLM mmorrill@ca.blm.gov .)

Additional landowner incentive options for conservation of sage-grouse in California include the following which was excerpted and modified from a portion of the California Department of Fish and Game home page http://www.dfg.ca.gov/habitats/private.html

Conservation Banking: A Conservation Bank (may also be called a Mitigation Bank) is a biological bank account. Instead of dollars in the bank, the "bank" owner has biological mitigation credits to sell to developers, agencies, or organizations. Under state and federal laws, projects that propose to remove or harm biological resources must assess the level of impact. If adverse impacts to resources need to be offset (compensated/mitigated), the project proponent can utilize conservation banks in their region, if available. . These conservation banks are established to set aside larger blocks of natural habitat needed for long term conservation of the subject resource(s) to minimize the occurrence of small, isolated preserves that yield negligible benefits. A recent report on conservation banking is available. Contact the Department of Fish and Game for more information.

Enhancement and Management of Fish and Wildlife and their Habitat on Private Lands (PLM program): The PLM program offers ranchers and farmers an opportunity to increase their profits by improving habitat for wildlife. Through 1996, there were 52 PLM properties encompassing approximately 645,000 acres. The economic incentive provided is in the form of offering fishing and hunting opportunity to the public beyond the traditional seasons, and issuing tags or permits directly to individuals you allow to hunt or fish on your land. The landowner sets and collects whatever access and service fees they wish. The landowner pays a fee to be in the program, pays for the tags/permits, develops an approved management plan, and implements the agreed upon wildlife habitat improvements. While most of the habitat enhancements under this program are for increased hunting opportunity for big game animals, many of the enhancements and protections can be designed to benefit other species of wildlife including sage- grouse.

The specific laws for the program are described in *Sec 3400-3409 Fish and Game Code*. Contact the Department of Fish and Game's PLM coordinator for more information and a brochure on the program (916) 653-7203.

The following 3 are primarily wetlands programs but could have some application to sites that include habitat for sage-grouse populations, especially when brood-rearing in summer:

The *California Wetlands Information System* is a program of the California Resources Agency. The Wetlands Information System is designed to provide comprehensive wetlands information to the general public, the educational community, and government agencies. It is a compilation of public and private sector information, including maps, environmental documents, agency roles in wetlands management, restoration and mitigation activities, regulatory permitting, and wetland policies.

The Department's role in wetlands management is to meet the wetlands protection, restoration, and enhancement goals of the Intermountain Habitat Joint Venture, a component of the North American Waterfowl Management Plan. These habitat goals are achieved on state-administered wildlife areas and on private land enrolled in the Department's voluntary wetland incentive or easement program:

California Waterfowl Habitat Program: This program pays private landowners for following practices in department approved management plans. Activities include increasing food supplies, providing optimal water depth for foraging birds, and offering summer wetlands for breeding birds.

A guidebook- *Farming for Wildlife: Voluntary Practices for Attracting Wildlife to your Farm* is a collaborative effort and wonderful resource available from the Department.

- The *Inland Wetlands Conservation Program* of the Wildlife Conservation Board has made significant contributions toward achieving the specific objectives outlined in the CVHJV Plan. These contributions will ultimately result in the restoration, enhancement and protection of critical habitat necessary to support the millions of migratory waterfowl dependent upon the Central Valley of California. The language establishing the program is available. A similar program, focusing specifically on riparian areas is the WCB's recently established California Riparian Habitat Conservation Program (CRHCP).

- *Natural Communities Conservation Program* (NCCP): The Natural Community Conservation Program (NCCP) of the California Resources Agency and the Department of Fish and Game is an unprecedented effort by the State of California, and numerous private and public partners, that takes a broad-based ecosystem approach to planning for the protection and perpetuation of biological diversity. A NCCP identifies and provides for the regional or area-wide protection of plants, animals, and their habitats, while allowing compatible and appropriate economic activity. The program seeks to involve public and private landowners/administrators in large-scale conservation planning efforts to ensure the long-term integrity of natural communities and accommodate compatible land use.

- *Riparian Habitat Joint Venture:* RHJV is a statewide, cooperative endeavor to enhance, conserve, and restore riparian habitats. It is part of Partners in Flight, an international bird conservation effort. The RHJV program works to provide information and education on riparian conservation projects, restoration efforts, and local planning efforts in working towards a goal to increase the amount of riparian habitat for wildlife, in particular songbirds. Contact the Department of Fish and Game's RHJV coordinator for more information.

- The widely known *Williamson Act* lands program also supports maintaining agricultural lands and wildlife habitat in California by providing incentives decreasing property tax liability for private land owners.

- *National Fish and Wildlife Foundation*: NFWF supports projects that conserve the nation's wetland resources, in particular habitat for wetland-dependant fish and wildlife. NFWF generally funds three program types: acquisition of wetland resources, both in fee-title and conservation easements; wetland restoration and enhancement projects, particularly those on private lands; and applied research on wetland management techniques, restoration or enhancement practices, or other wetlands-related applied conservation.

- *Partners for Wildlife:* A program in the U.S. Fish and Wildlife Service that started in the Midwest. This link provides some background, but contact the Fish and Wildlife Service for information related to California. Also, a map and text description of USFWS facility locations is online.

- This link provides information about Conservation Programs offered by the USDA's *Farm Service Agency* along with links to associated news releases and Program Fact Sheets. One program, the *Conservation Reserve Program* (CRP) is the Federal Government's single

largest environmental improvement program -- and one of its most effective. Today, the CRP is safeguarding millions of acres of American topsoil from erosion, increasing wildlife habitat, and protecting ground and surface water by reducing water runoff and sedimentation. Countless lakes, rivers, ponds, and streams are cleaner and more vital in part because of the CRP.

Conservation Easements and Acquisition through the Wildlife Conservation Board: In close cooperation with the California Department of Fish & Game, this board provides oversight for acquisitions and easements to protect important and threatened wildlife habitats in California. Acquisitions are generally more common than easements and most have targeted listed species or complex habitats with many high value species (i.e., coastal wetlands, critical habitats, etc. Funding of various bond measures passed under the California Initiative process intermittently provide very large increases in the funds available for such easements and acquisitions.

Specific types of incentives for landowner that will be sought within the PMU include:

1. Conservation Easements
   California Wildlife Conservation Board (WCB)

2. Incentives for maintenance (protection) and management (enhancement)
   California Private Lands Wildlife Management Program (PLM)
   Farm Bill 2000:
      EQIP Program
      WHIP Program
   Section 6 funding under the USFWS administered Endangered Species Act
   USFWS Joint Venture Program
   National Fire Plan
   Conservation Banking options (CDFG)
   California Wetlands Information System
   California Waterfowl Habitat Program
   Inland Wetlands Conservation Program (CDFG/WCB)
   Riparian Habitat Joint Venture (CDFG, under Partners in Flight (PIF)
   Williamson Act (Modoc County / CDFG)
   National Fish and Wildlife Foundation (NFWF)
   Partners for Wildlife
   WHIP (see above but under the 2000 Farm Bill)
   USDA Conservation Reserve Program (CRP)

Appendix J: Summary of Sage-Grouse Reports for Clear and Klamath Lake National Wildlife Refuges – 1944-1999.

SUMMARY

1999.
Lower Klamath NWR (LK) – No sage-grouse report.
Clear Lake NWR (CL) –
Surveys:
Ground survey; April 13th; 11 males observed at the "U" lek; 3 males and 2 of unknown sex observed at the North "U" lek.
Ground survey; May 6th; 6 males observed at the "U" lek.

Estimated refuge population = 36 to 42.

Lake Level: High.

Notes: "This location [North "U" lek] last used in 1997. Grouse sign (fresh) also seen at the lek location used in 1998 ~ 1 mile to east." (Sage-grouse Lek Observation Data Sheet, 1999).

1998.
LK – No sage-grouse report.
CL – Surveys:
Ground survey; March 17th; 8 males observed at the "U" lek.
Ground survey; April 22nd; 15 males observed at the "U" lek; 13 males and 3 females observed at the North "U" lek.
Aerial survey; April 17th; no additional leks observed between Doublehead Mountain and Pinnacle Lake south of the refuge.

Estimated refuge population = 73 to 84.

Lake Level: Very high. "U" lek flooded.

1997.
LK – No sage-grouse report.
CL – Surveys:
Ground survey; March 19th; 14 males and 8 females observed at the "U" lek.
Ground survey; April 2nd; none observed at the "U" lek.
Ground survey; April 11th; 8 males observed at the "U" lek; none observed at the North "U" lek.

Estimated refuge population = 36 to 42.

Lake Level: Very high. "U" lek flooded. North "U" lek flooded.

Weather: Snowstorm in April.

Actions: Fencing of north shoreline completed.

Notes: "This spring California Dept. of Fish and Game personnel reported that their lek count numbers had nearly doubled in the past year, however, ours continue to decline." (KBNWR Narrative, 1997).

1996.
LK – No sage-grouse report.
CL – Surveys:
Ground survey; March 18th; 12 males and 6 females observed at the "U" lek.
Ground survey; March 27th; 19 males and 1 female observed at the "U" lek.
Ground survey; April 5th; 9 males observed at the "U" lek.
Ground survey; April 15th; 17 males observed at the "U" lek.
Ground survey; April 25th; 13 males observed at the "U" lek; 5 males observed at the North "U" lek.

Estimated refuge population = 62 to 72.

Lake Level: Very high. "U" lek flooded.

Actions: Fencing of north shoreline begun.

1995.
LK – No sage-grouse report.
CL – Surveys:
Three ground surveys; April 4th – May 5th; none observed at the "U" lek.
Aerial survey; April 25th; no additional leks observed between Doublehead Mountain and Pinnacle Lake south of the refuge, nor along the east and north sides of the refuge.

Estimated refuge population = 50 to 60.

Lake Level: High. "U" lek flooded.

Actions: 800 acres of low sagebrush habitat in the "U" burned in August to eliminate brush and stimulate production of forbes and grasses. Practice of allowing private groups viewing access to sage-grouse leks discontinued.

1994.
LK – No sage-grouse report.
CL – Surveys:
Three ground surveys; March 17th – April 1st; 34 males observed at the "U" lek.
Aerial survey; April 12th; no additional leks observed between Doublehead Mountain and Pinnacle Lake south of the refuge, nor along the east and north sides of the refuge.

Estimated refuge population = 88 to 102.

Lake Level: Low.

Actions: Fencing of east and southeast shores completed. Low-water land bridges to colonial bird nesting grounds fenced.

1993.
LK – No sage-grouse report.
CL – Surveys:
Ground survey; March 31st; 39 males observed at the "U" lek.
Ground survey; April 8th; 35 males observed at the "U" lek.

Estimated refuge population = 101 to 117.

Lake Level: Above average. "U" lek flooded.

Weather: Cold and wet in June.

Actions: 13,020 acres of the lake obtained by KBNWR from Bureau of Reclamation. Fencing of east and southeast shores begun.100 acres of the "U" burned.

1992.
LK – No sage-grouse report.
CL – Surveys:
Ground survey; March 22nd; 59 males and 11 females observed at the "U" lek.
Ground survey; March 26th; 60 males and 2 females observed at the "U" lek.
Ground survey; late March; 60 males and 35 females observed at the "U" lek.

Estimated refuge population = 156 to 180.

Lake Level: Very low. East lobe of lake dried completely.

Weather: Virtually no precipitation during spring or summer. 6th year of drought. Heavy snowfall late in year.

Actions: Fencing of Negro Bend Springs completed. Low-water land bridges to colonial bird nesting grounds fenced.

1991.
LK – No sage-grouse report.
CL – Surveys:
Unknown effort. Unknown number of sage-grouse observed at the "U" lek.

Lake Level: Low.

Actions: Fencing of Mammoth Springs completed.

Notes: "Sage-grouse continued to use the "U" for their lek this spring. This area is one of the few leks in the vicinity of Clear Lake." (KBNWR Narrative, 1991).

1990.
LK – No sage-grouse report.
CL – Surveys:
Ground surveys; March; 61 males observed at the "U" lek.

Estimated refuge population = 159 to 183.

Lake Level: Low.

Actions: Fencing of Willow Creek / Mammoth springs begun.

1989.
LK – No sage-grouse report.
CL – Surveys:
Ground surveys; March; 46 males and "a number" of females observed at the "U" lek.

Estimated refuge population = 120 to 138.

Lake Level: Average.

Notes: "Other strutting areas in the vicinity of Clear Lake are now reported as being unused." (KBNWR Narrative, 1989).

1988.
LK – No sage-grouse report.
CL – Surveys: One; April 13th; 51 males seen on the "U" lek.

Lake level: Low. "U" lek not flooded.

Notes: "He [E. J. O'Neill] related that with the exception of the "U" most of the other strutting grounds in the area had either no or minimal sage-grouse use." (KBNWR Narrative, 1988).

1987.
LK – No sage-grouse report.
CL – Surveys: Unknown effort. No sage-grouse observed.

Lake Level: Above average. "U" lek flooded.

Weather: Dry spring, wet July.

Notes: "The strutting area for sage-grouse was under water in early spring and no strutting grouse were noted elsewhere on the refuge." (KBNWR Narrative, 1987).

1986.
LK – No sage-grouse report.
CL – Surveys: Unknown effort. No sage-grouse observed.

Lake Level: Above average. "U" lek flooded.

Weather: "Drier than previous years" (KBNWR Narrative, 1986).

Notes: "No strutting grouse or broods have been noted during the past year." (KBNWR Narrative, 1986).

1985.
LK – No sage-grouse report.
CL – Surveys: Unknown effort. No sage-grouse observed.

Lake Level: High. "U" lek flooded.

Weather: "extremely dry spring and early summer" (KBNWR Narrative, 1985).
Notes: "The high water has displaced the sage-grouse on the "U" and no strutting grouse or broods were noted again this year." (KBNWR Narrative, 1985).

1984.
LK – No sage-grouse report.
CL – Surveys: Unknown effort. No sage-grouse observed.

Lake Level: Record high. "U" peninsula an island. "U" lek flooded.

Weather: Precipitation slightly above average.

Notes: "No strutting grouse or broods were seen this year." (KBNWR Narrative, 1984).

1983.
LK – No sage-grouse report.
CL – Surveys: Unknown effort. No sage-grouse observed.

Lake Level: Very High. "U" peninsula an island. "U" lek flooded.

Weather: "extremely wet year" (KBNWR Narrative, 1983).

Notes: "No strutting grouse or broods observed." (KBNWR Narrative, 1983).

1982.
LK – No sage-grouse report.
CL – Surveys: Unknown effort. Production down 40%; breeding population similar to previous years.

Lake Level: Above average.

Weather: "mid-summer rains" (KBNWR Narrative, 1982).

Notes: "Although the breeding population of sage-grouse was about the same as preceding years, production was down 40% on the Clear Lake "U." The cool, wet summer had a negative impact on brood survival." (KBNWR Narrative, 1982).

1981.
LK – No sage-grouse report.
CL – Surveys: Unknown effort. Population stable.

Lake Level: Very low.

Weather: Near record precipitation September through December.

Actions: 1 ½ miles of woven wire fence across the south "U" was replaced with barbed wire by the U.S. Forest Service (USFS).

Notes: "Sage-grouse occur in good numbers on the Clear Lake "U," and the population has remained rather stable for the last three years. Other areas around Clear Lake, which years ago had grouse, now have none." (KBNWR Narrative, 1981).

1980.
LK – No sage-grouse report.
CL – Surveys: Unknown effort. Production down 65%.

Lake Level: Low.

Weather: May and June wet and cold.

Notes: "The sage-grouse carried over through the winter in good numbers due to the mild winter with little snow. The very wet and cold months of May and June severely affected nesting success and production was down 65% from the previous year." (KBNWR Narrative, 1980).

1979.
LK – No sage-grouse report.
CL – No sage-grouse report.

Lake Level: Low.

Weather: Overall precipitation above average.

1978.
LK – No sage-grouse report.
CL – No sage-grouse report.

Lake Level: Low.

Weather: Wet spring. Overall precipitation average.

1977.
LK – No sage-grouse report.
CL – Surveys: Unknown effort. No broods observed.

Lake Level: Low

Weather: Dry through April, wet through December. Overall precipitation above average.

Notes: "The remnant population of sage-grouse apparently overwintered well and used the refuge tracts similar to previous years, however we failed to locate usual broods and were led

to believe production was down despite very favorable spring weather. The only decimating factor noticed in 1977 was evidence of nest predation by badgers in three instances." (KBNWR Narrative, 1977).

1976.
LK – No sage-grouse report.
CL – Surveys: Unknown effort. Only 2 birds observed during production census.

Lake Level: Low.

Weather: Wet August. Overall precipitation below average.

Notes: "Apparently the combination of dry range and cool weather caused sage-grouse to shift somewhat from usual haunts and ground transects turned up only two birds during production census." (KBNWR Narrative, 1976).

1975.
LK – No sage-grouse report.
CL – No sage-grouse report.

Lake Level: Unknown.

Weather: Overall precipitation below average.

1974.
LK – No sage-grouse report.
CL – Surveys:
Three; January – April; peak population = 400. Four; May – August; production = 25; peak population = 425.

Lake Level: "surprisingly good" (KBNWR Narrative, 1974).

Weather: Overall dry.

1973.
LK – No sage-grouse report.
CL – Surveys: Five; May – August; production = 210; peak population = 450.

Lake Level: Unknown.

1972.
LK – No sage-grouse report.
CL – Surveys:
Unknown effort; January – April; estimated population = 350.
Unknown effort; May – August; 4 broods observed; estimated production = 250; estimated population = 550.
Unknown effort; September – December; estimated population = 150.

Lake Level: High.

Actions: Two day sage-grouse hunting season in September on lands adjacent to refuge.

Notes: "The sage-grouse transects are still partly underwater. Broods again were found widely scattered during surveys. Spring weather was quite favorable for production, however, efforts were offset by a very marked increase in nest predation (badger) in transect areas." (KBNWR Narrative, 1972).

1971.
LK – Surveys:
Unknown effort; January – April; none observed.
Unknown effort; May – August; none observed; estimated population = 10.

CL – Surveys:
Unknown effort; January – April; estimated population = 350.
Unknown effort; May – August; 3 broods observed; estimated production = 150; estimated population = 500.
Unknown effort; September – December; estimated population = 400.

Lake Level: Very high.

Actions: Two day sage-grouse hunting season in September on lands adjacent to refuge.

Notes: "Areas used normally by sage-grouse were a blank and difficult to locate for census work." (KBNWR Narrative, 1971). "Broods of grouse and quail were scattered and not located in their usual or expected habitat. We estimated good production increases and hunter bag (young birds) checks confirmed improved production (established transects were underwater). There has been less sage-grouse activity in wintering areas at Dry Lake near Perez."(KBNWR Narrative, 1971).

1970.
LK – Surveys:
Unknown effort; May – August; estimated sex ratio = 1:1; estimated population = 20.
Unknown effort; September – December; estimated population = 5.

CL – Surveys:
Unknown effort; January – April; estimated population = 300.
Unknown effort; May – August; 9 broods observed; estimated production = 110; estimated sex ratio = 1:1; estimated population = 400.
Unknown effort; September – December; estimated population = 300.

Lake Level: Unknown.

Actions: Two day sage-grouse hunting season in September on lands adjacent to refuge.

Notes: Good conditions for nesting, but nest predation was high.

1969.
LK – Surveys:

Unknown effort; May – August; estimated population = 10.
Unknown effort; September – December; estimated population = 30.

Notes: "occurred on an on-off basis along the Chalk Banks Road [southwest refuge border]" (KBNWR Narrative, 1969).

CL – Surveys:
Unknown effort; January – April; estimated population = 600.
Unknown effort; May – August; average brood size = 4+; estimated production = 300; estimated population = 600.
Unknown effort; September – December; estimated population = 500.

Lake Level: Unknown.

Notes: "Sage-grouse population and production were up again this year. This, coupled with no hunting in 1968, has permitted the breeding population to grow to the present numbers."(KBNWR Narrative, 1969).

1968.
LK – Surveys:
Unknown effort; May – August; two observations of small groups; estimated population = 15.

Notes: "occurred on an on-off basis along the Chalk Banks Road." (KBNWR Narrative, 1968).

CL – Surveys:
Unknown effort; January – April; estimated population = 350.
Unknown effort; May – August; 14 broods observed; average brood size = 4.0; estimated production = 350; estimated population = 600.
Unknown effort; September – December; estimated population = 600.

Lake Level: Low.

Actions: No sage-grouse hunting season in 1968.

Notes: "Sage-grouse, once again, had a good nesting season and showed a substantial population gain for the second consecutive year. The extreme drought conditions did not appear to affect their normal behavior and may have caused outside birds to move closer to the lake."(KBNWR Narrative, 1968).

1967.
LK – No sage-grouse report.
CL – Surveys:
Unknown effort; January – April; estimated population = 350.
Unknown effort; May – August; 4 broods observed; estimated production = 250; estimated population = 500.
Unknown effort; September – December; estimated population = 500.

Lake Level: Low.

Weather: 2 – 3 feet of snow in mid March.

Actions: No sage-grouse hunting season in 1967. "The Forest Service carried out sage control east of Mammoth aerial spraying 1,100 acres with 2,4-D and plowing some 800 acres of the same for seeding and range improvement work during 1968. It will be of interest to watch the response since both antelope and sage-grouse depended on the area in past years." KBNWR Narrative, 1967).

Notes: "Sage-grouse were observed very little during the spring-summer periods because of rank vegetation over much of their habitat. Unfavorable spring weather, at time of aircraft schedule, also prevented air-ground census correlation this year. ...Watering places as well as food production held up well and we estimate slight population gains over 1966." "...Sometime in late December at least two parties of hunters tried their luck of poaching sage-grouse south of Negro Bend and along Mowitz Creek..." (KBNWR Narrative, 1967).

1966.
LK – No sage-grouse report.
CL – Surveys:
Unknown effort; January – April; none observed; estimated population = 250.
Unknown effort; May – August; 6 broods observed; estimated production = 200; estimated population = 550.
Unknown effort; September – December; estimated population = 500.

Lake Level: Unknown.

Actions: Two day sage-grouse hunting season in September on lands adjacent to refuge.

Notes: "Best nesting weather in several years; area surrounding refuge very dry and lacking watering sites." "Transect study areas showed a substantial gain in population on the refuge. Aerial census of strutting males showed a population gain also." (KBNWR Narrative, 1966).

1965.
LK – No sage-grouse report.
CL – Surveys:
Unknown effort; January – April; estimated population = 300.
Unknown effort; May – August; 1 brood observed; estimated production = 50; estimated population = 250.
Unknown effort; September – December; estimated population = 300.

Lake Level: High. "U" lek flooded.

Weather: June cold and wet.

Actions: Two day sage-grouse hunting season in September on lands adjacent to refuge.

Notes: "No broods seen on the area. Regular census-survey transects were not accomplished...Encounter of summer flocks confirmed the belief reproduction was low judging from number of immatures seen." (KBNWR Narrative, 1965).

1964.
LK – No sage-grouse report.
CL – Surveys:
Unknown effort; January – April; estimated population = 250.
Unknown effort; May – August; 3 broods observed; estimated production = 100; estimated population = 500.
Unknown effort; September – December; estimated population = 200.

Lake Level: Low.

Weather: Prolonged rain and cold in June.

Actions: Two day sage-grouse hunting season in September on lands adjacent to refuge.

Notes: "Sage-grouse were hit hard by the prolonged wet, cold conditions of early June. It is conservatively estimated nesting was off 75 to 80 percent in the general area. Transect areas of population sampling gave almost negative nesting results..." (KBNWR Narrative, 1964).

1963.
LK – Notes: “Nine sage-grouse were observed one-half mile south of Unit 12 in early November.” (KBNWR Narrative, 1963).
CL – Surveys:
Unknown effort; January – April; estimated population = 250.
Unknown effort; May – August; estimated production = 190; estimated population = 400.
Unknown effort; September – December; estimated population = 300.

Lake Level: Very low.

Actions: The “U” closed to the public March 1st to July 1st. “The U.S. Forest Service burned, plowed, and seeded to Intermediate wheat grass approximately 1,600 acres in the Holbrook area on the west side of Clear Lake. This included approximately 100 acres of shoreline within the refuge.” (KBNWR Narrative, 1963). Two day sage-grouse hunting season in September on lands adjacent to refuge.

Notes: "Sage-grouse showed a slight gain over last year." (KBNWR Narrative, 1963).

1962.
LK – No sage-grouse report.
CL – Surveys:
Unknown effort; January – April; estimated population = 300.
Unknown effort; May – August; estimated production = 175; estimated population = 350.
Unknown effort; September – December; estimated population = 300.

Lake Level: Near record low.

Weather: Wet fall.

Actions: Two day sage-grouse hunting season in September on lands adjacent to refuge.

Notes: "The population of sage-grouse appears to have undergone no significant change in status. During range survey and reconnaissance work a total of five nests were located. Only one (1) of the total apparently hatched successfully with good indications all others were destroyed by coyotes and skunks." (KBNWR Narrative, 1962).

1961.
LK – No sage-grouse report.
CL – Surveys:

Unknown effort; May – August; 82 adults and 49 young observed on the “U” and at Mowitz Springs; estimated production = 175; estimated population = 300.
Unknown effort; September – December; estimated population = 300.

Lake Level: Very low.

Actions: Sage-grouse hunting season closed.

Notes: "Sage-grouse use the refuge ‘off and on.’ The population seems to be at a relatively low level. Many spring areas frequented by these birds have dried up during the last two years tending to concentrate the flocks." (KBNWR Narrative, 1961).

1960.
LK – Surveys:

Unknown effort; January – April; approximately 20 birds observed along the south edge of Units 12 and 12A.

Unknown effort; May – August; none observed.

CL – Surveys:
Unknown effort; January – April; over 300 birds observed on the east and south sides of the refuge.

Lake Level: Very low.

Actions: Sage-grouse hunting season closed.

Notes: "Sage-grouse production was the poorest for many years; as a conservation measure, California Fish and Game Department closed the hunting season." (KBNWR Narrative, 1960).

1959.
LK – Surveys:
Unknown effort; January – April; approximately 20 birds observed on and off south Units 12 and 12A.
Unknown effort; May – August; 18 to 20 birds observed along south shore Unit 12A.

CL – Surveys:
Unknown effort; January – April; 144 birds observed on the "U"; 15 birds observed at Negro Bend Springs.
Unknown effort; May – August; 144 birds observed total, 60 on the north side of the refuge.

Lake Level: Low.

Weather: Dry throughout summer.

Notes: "Most springs dried up late in the period and the [sage-grouse] shifted territory with water." (KBNWR Narrative, 1959).

1958.
LK – Surveys:
Unknown effort; May – August; 18 birds observed at southwest corner Unit 12A.

CL – Surveys:
Unknown effort; January – April; none observed.
Unknown effort; May – August; 70 birds observed along north shore near Fiddler's Green; 200 birds observed near Negro Bend Springs.
Unknown effort; September – December; 70 birds observed along north shore near Fiddler's Green; 200 birds observed near Negro Bend Springs.

Lake Level: Very high.

Weather: Above average precipitation through August with one severe thunderstorm in July.

Notes: "Sage-grouse made good production this year." "Sage-grouse is the only abundant upland bird on the area." (KBNWR Narrative, 1958).

1957.
LK – Surveys:
Unknown effort; January – April; none observed.
Unknown effort; May – August; none observed.

CL – Surveys:
Unknown effort; November 1st; 76 birds observed near Negro Bend Springs.

Lake Level: Very high.

Weather: Wet in September.

Actions: Two day sage-grouse hunting season in September on lands adjacent to refuge.

Notes: "Sagehen are abundant." (KBNWR Narrative, 1957).

1956.
LK – Surveys:
Unknown effort; January – April; estimated population = 30.

Unknown effort; May – August; none observed.
Unknown effort; September – December; none observed.

CL – Surveys: Unknown effort.

Lake Level: Record high.
Actions: Two day sage-grouse hunting season in September on lands adjacent to refuge.

Notes: "In the few areas where upland habitat was observed from the ground sage-grouse appeared to be abundant and production excellent." (KBNWR Narrative, 1956).

1955.
LK – Surveys:
Unknown effort; January – April; estimated population = 50.
Unknown effort; May – August; estimated population = 75.
Unknown effort; September – December; estimated population = 50.

Notes: "Sage-grouse not so much in evidence this year as last. Down in numbers a little." (KBNWR Narrative, 1955).

CL – Surveys: Unknown effort.

Lake Level: Unknown.

Weather: Precipitation well below average through October.

Notes: "...[sage-grouse] have not reached the abundance of former years, but quite a few broods were seen this year." (KBNWR Narrative, 1955).

1954.
LK – Surveys:
Unknown effort; January – April; estimated population = 100.
Unknown effort; May – August; estimated population = 170.
Unknown effort; September – December; estimated population = 15.

Notes: "Sage hen. Production was up on the uplands south and east of the refuge." (KBNWR Narrative, 1954).

CL – Surveys: Unknown effort.

Lake Level: Unknown.

Actions: "Roadways were beaten through the sage and rocks by both the deer and goose hunters, to permit access on the area [northwest refuge]." (KBNWR Narrative, 1954).

Notes: "Based on the increased number of broods seen this year on the few ground surveys, production was higher." (KBNWR Narrative, 1956).

1953.
LK – Surveys:
Unknown effort; January – April; estimated population = 100.
Unknown effort; May – August; estimated population = 40.
Unknown effort; September – December; estimated population = 140.

Notes: "Sage hen – on and off use was much greater this year along the south side. Several flocks of 30-40 were seen during hunting season." (KBNWR Narrative, 1953).

CL – Surveys:
Aerial survey; May 5th; 340 birds observed in groups of 20-60 on the "U."
Ground survey; July 17th; 2 broods, one with 3 young, the other with 6 young observed; several small groups of male adults observed.

Lake Level: Unknown.

1952.
LK – Surveys:
Unknown effort; January – April; estimated population = 100.
Unknown effort; September – December; estimated population = 100.

CL – Surveys:
Unknown effort; January – April; 25 birds observed on south side of refuge; sign observed on south and east sides.
Three sightings; early May; 30 males observed.

Lake Level: Unknown.

Weather: Hard frosts and snow in mid-June.

Notes: "Sight records and sign indicated that sage hens were fairly common along the south shore of the lake and rare at the north end." (KBNWR Narrative, 1952).

1951.
LK – Surveys:
Unknown effort; September – December; estimated population = 100.

Notes: "Almost no observation records were made for sage-grouse, indicating the population is low." (KBNWR Narrative, 1951).

CL – No sage-grouse report.

Lake Level: Unknown.

1950.
LK –

Notes: "Sage hens were less frequently observed at the south end of the refuge than in 1949, with refuge use down appreciably." (KBNWR Narrative, 1950).

CL – No sage-grouse report.

Lake Level: Unknown.

Actions: USFS drift fence continuation in area west of refuge.

1949.
LK – Surveys:
Unknown effort; January – April; estimated population = 200.
Unknown effort; May – August; estimated production = 50; estimated population = 300.
Unknown effort; September – December; estimated population = 100.

Notes: “A few sagehens were on and off the south end of the refuge. A flock of about 20 were present on the north part of Unit 4 late in the period [May – August].” KBNWR Narrative, 1949).

CL – Surveys: Unknown effort.

Lake Level: Low.

Weather: “most severe winter since 1937…It also made conditions dangerously severe for upland game birds.” KBNWR Narrative, 1949).

Notes: "Approximately 100 Sagehens occupied the refuge, mainly on the peninsula and east side of the lake. Food and cover conditions were somewhat less favorable than in 1948." (KBNWR Narrative, 1949).

1948.
LK – Surveys:
Unknown effort; January – April; estimated population = 50-100.
Unknown effort; May – August; estimated production = 50; estimated population = 250.
Unknown effort; September – December; none observed.

CL – Surveys: Unknown effort.

Lake Level: Low.

Notes: "The sagehen population was much reduced from 1947, especially on the peninsula. A few more birds than usual were seen along the south and east parts of the area." (KBNWR Narrative, 1948).

1947.
LK – Surveys:
Unknown effort; January – April; estimated population = 100.
Unknown effort; September – December; no birds observed; estimated population = 40.

Notes: “There were reported to be at least 100 [sage-grouse] in the flock and it was further reported that there was a strutting ground just inside the refuge which was being used in late March.” KBNWR Narrative, 1947).

CL – Surveys:
Unknown effort; May – August; several broods observed; average brood size = 7 young; estimated population = 250-300.

Lake Level: Low.

Weather: Heavy rains in May and June.

1946.
LK – Surveys:
Unknown effort; January – April; none observed; estimated population = 0.
Unknown effort; May – August; 2 broods observed; estimated production = 16; estimated population = 50.
Unknown effort; September – December; none observed.

CL – Surveys: Unknown effort.

Lake Level: Unknown.

Notes: "Sagehens in small numbers were seen on the south and on the east sides of the refuge. No young birds were seen.” (KBNWR Narrative, 1946).

1945.
LK – Surveys:
Unknown effort; May – August; estimated population = 20.
Unknown effort; September – December; none observed; estimated population = 20.

Notes: “About 14 sage-grouse were observed…near the state line dike.” KBNWR Narrative, 1945).

CL – Surveys: Unknown effort.

Lake Level: Unknown.

Weather: Heavy late spring rains.

Actions: “There was a rather large range fire south and west of Clear Lake in August.” “Part of the area continued to be used as a bombing and machine gun range.” KBNWR Narrative, 1945).
Notes: "A very few sagehens ranged on and off the refuge.” (KBNWR Narrative, 1945).

1944.
LK – Surveys:
Unknown effort; January – April; none observed.
Unknown effort; May – August; estimated population = 85.

Unknown effort; September – December; estimated population = 80.

CL – Surveys: None

Lake Level: Unknown.

Appendix K. Habitat Conservation Prioritization (DRAFT)

Essential components of the Conservation Strategy include protection, restoration, monitoring, research, and ongoing adaptive management. These efforts will be designed to secure current populations against extirpation and to increase their numbers; to expand the current distribution into historic habitat; to sustain existing and newly established populations over the long-term; and direct future management actions through adaptive responses informed by monitoring and research. The following actions provide the necessary support for the CS and its goals and objectives. Criteria used to prioritize these actions are shown below:

1. Concentrate maintenance and enhancement on seasonal use areas depicted in the table below.

Seasonal Use Priorities and Areas

Priority	Maintenance	Enhancement
1	L, N	B, N
2	W	W
3	B	L

L= Leks
N = Nesting
B= Brood Rearing
W = Winter

2. Concentrate on maintaining healthy habitats that support the most birds. Enhancement will focus on areas that are declining in productivity. Declining habitats will be addressed as opportunities allow.

3. Can the projects be implemented: (from PECE)
   - □ Legal authority
   - □ Legal procedural requirements
   - □ Necessary authorizations obtained or will be obtained
   - □ Type and level of voluntary participation
   - □ Regulatory mechanisms are in place
   - □ Adequate funding available
   - □ Implementation schedule is provided
   - □ Plan is approved by all parties

4. Will the projects be effective?
   - □ The expected success will be based on experience of local resource managers and the scientific literature for habitat improvement
   - □ Threats are described and efforts to reduce the threat are described
   - □ Appropriate steps to reduce threats to the species are identified
   - □ Explicit objectives for conservation effort and dates for achieving them are stated.
   - □ Quantifiable performance measures to monitor for both compliance and effectiveness are included, i.e. plant community characteristics, sage-grouse use patterns, and lek counts

5. Take advantage of appropriate project opportunities when they present themselves. Some include:

- LIP Grant – Landowner Incentive Program Grant
- CDFG – California Department of Fish and Game
- GBH – Game Bird Heritage
- BLM CCS – Bureau of Land Management Challenge Cost Share
- BLM CCI – Bureau of Land Management Cooperative Conservation Initiative
- GBRI – Great Basin Rehabilitation Initiative
- NFWF – National Fish and Wildlife Foundation

Protect and maintain active leks and nesting habitats.

Continue yearly lek counts during strutting season to determine peak lek activity. Determination of peak activity requires at least a total of four visits to the lekking site separated by eight to ten days.

Protect currently inactive and historical leks that are in R-0 status to support potential expansion of sage-grouse back into those areas. Maintain R-0 value nesting habitat to support potential expansion of sage-grouse back into these areas. As funds become available, enhance nesting habitats within the inactive and historical lek complexes.

Develop site-specific management/action plans for brood-rearing, nesting, and winter habitats.

A fundamental element of coordinating the conservation effort for sage-grouse and sagebrush ecosystems is collective planning. All participants are expected to lend their knowledge and experience to help other partners in formulating restoration plans. Plans will change as more is learned about conservation needs and management techniques. Activities will focus on maintaining R-0 habitat within nesting and brood-rearing habitats. Restoration will be focused on those areas of R-1 (herbaceous understory with inadequate sagebrush canopy) and R-3 (juniper encroached) value. A preliminary list of actions is provided in Appendix A.

Plan development will further the cooperative process between agencies. This process will not only help increase the effectiveness of conservation efforts but will result in streamlining of projects. The Technical Sub-Committee (TSC) will provide technical assistance for each site plan, and in the spirit of collaboration each public agency will implement projects consistent with their authorities and available resources.

Through the incentive programs (Appendix L), assistance may be available to private landowners whose properties include high priority habitat restoration sites. Guidance will be provided, if requested, on development of site-specific plans, and the TSC members from regulatory agencies will assist with the regulatory requirements for landowners participating in the incentive programs.

Manage all currently occupied habitats.

On public lands, unoccupied but potentially suitable habitats will be surveyed at least once every two years to look for signs that grouse may have begun using the sites. Newly

occupied habitats would be managed as currently occupied habitat (see above). In addition the following set of rules applies for unoccupied potentially suitable habitat:

- No alterations of R-0 value habitat, soil/site stability, biotic integrity, and hydrologic function without project review and protection of potentially suitable habitat;
- Consider management actions that encourage occupation;
- Restore R-1 (herbaceous cover but sagebrush overstory lacking), R-3 (juniper encroachment) to benefit sage-grouse occupation; and
- Avoid introduction of noxious weeds, and control these species, if present.

The focus of management will be to encourage good stewardship of sage-grouse and their habitat. It is desired that, private landowners will voluntarily protect sage-grouse and their habitat, and indeed the evidence is that many have been doing so for some time already. The TSC will be available to provide assistance to private landowners whose properties support high priority restoration sites.

Appendix L. Memorandum of Understanding/Conservation Agreement

This Memorandum of Understanding/Conservation Agreement (MOU/CA) is made between California Department of Fish and Game, an agency under the California Resource Agency; the Bureau of Land Management, an agency of the U.S. Department of the Interior; the U.S. Fish and Wildlife Service, an agency of the U.S. Department of the Interior; the Lava Beds National Monument, National Parks Service, an agency of the U.S. Department of the Interior; the Northeast California Resource Advisory Council; the U.S. Forest Service, an agency of the U.S. Department of Agriculture; the Natural Resources Conservation Service, an agency of the U.S. Department of Agriculture; Modoc County, CA; the Lava Beds/Butte Valley Resource Conservation District; the OR-Cal Resource Conservation & Development District; and Individual Property Owners. The above entities are collectively known as "the Parties."

Recitals

WHEREAS, sage-grouse is a wildlife species endemic to sagebrush ecosystems in the Clear Lake / Devil's Garden Population Management Unit (PMU); and

WHEREAS, a reduction in the distribution and number of sage-grouse populations across the West caused the USFWS to be petitioned to list the species as endangered under the Endangered Species Act of 1973, as amended (ESA); and

WHEREAS, the conservation of sage-grouse requires a coordinated effort of all the Parties; and

WHEREAS, it is the intent of the Parties to prevent the need to list and promote the recovery and conservation of sage-grouse through coordinated management and cost sharing; and

WHEREAS, the Devil's Garden / Clear Lake Sage-grouse Working Group (DG/CLSGWG) was formed to participate in the preparation of a Conservation Strategy (CS) for the for the conservation and recovery of sage-grouse; and

WHEREAS, the Technical Sub-Committee (TSC) was formed to implement the CS on-the-ground; and

WHEREAS, the CS coordinates conservation efforts between the Parties to adaptively manage the species and coordinate monitoring to provide for the conservation and recovery of this species; and

WHEREAS, the actions described within the CS for sage-grouse are grounded in a rigorous review and analysis of the knowledge of this species and the Devil's Garden / Clear Lake PMU; and

WHEREAS, the key aspect of the biology of sage-grouse is their dependency upon specific leks for reproduction and healthy sagebrush ecosystems, which makes it necessary to consider both occupied, historical, and potentially suitable habitat for management; and

WHEREAS, the role of the private landowners in the stewardship of sage-grouse is crucial and this critical role is reflected within the CS and this MOU/CA; and

WHEREAS, the Parties desire to formalize their commitments to implementation of the CS.

NOW, THEREFORE, the Parties agree as follows:

A. Purposes

1. To ensure the implementation of conservation measures and management activities identified in the CS to provide long-term conservation benefits and achieve long-term survival of sage-grouse and healthy sagebrush ecosystems; and

2. To facilitate voluntary cooperation between the Parties to provide long-term protection for sage-grouse and their habitat; and

3. To describe a process to be undertaken if a Party is unable to perform a conservation measure or management activity set forth in the CS; and

4. To set forth the miscellaneous provisions of the Parties' agreement to implement the CS.

B. Commitment to the Sage-Grouse Conservation Strategy

1. Subject to the provisions of this MOU/CA, each Party agrees to implement the CS, including but not limited to actions specified for that Party in Table 3 for fiscal years 2006, 2007, and 2008 and the adaptive management strategy outlined in Chapter II.G of the CS. Table 3 will be reviewed and revised after 5 years. Each Party shall also designate individuals to serve on the CLSGWG and TSC. Any action taken by an individual Party must be consistent with that Party's governing authority and decision making processes.

2. The Parties incorporate by reference into this MOU/CA the sage-grouse CS, attached hereto as Exhibit 1, and any future revisions to that document pursuant to Paragraph G.7 of this MOU/CA.

C. Annual Reports

1. The TSC shall prepare all annual reports describing the status of sage-grouse and sagebrush ecosystems following each survey year. This report will be a primary source of resource information for decision making for entities involved in conservation efforts.

2. The report shall include the following information:

    a. Number of population/lek complexes identified during the most recent survey.
    b. Population numbers and persistence estimated during the most recent survey.
    c. Copies of annual data sheets.
    d. Graphical representation of the population trend.
    e. Conservation activities undertaken in the previous year.

f. Recommended conservation activities for the upcoming year.
g. Number of projects allowed within potentially suitable habitat.
h. Number of significant disturbances to the species or its habitat inconsistent with the CS and subsequent responses.
i. Brief summary of any reported research findings.
j. Estimate of staff time spent in past year.

3. When preparing the annual report, the TSC shall, among other things, explore the following questions:

   a. To what degree is each goal of the CS being achieved?
   b. Are conservation efforts effective in conserving the species and the sagebrush ecosystem?
   c. Should the monitoring scheme be altered and why?
   d. Should management activities be changed and why?
   e. What regulatory changes should be made to ensure the survival of the species?
   f. What research questions are important to answer?

4. The TSC's production of the annual report and data analysis of the 2004 survey data shall initiate the adaptive management process described in the CS.

5. The TSC shall also develop a list of recommended actions to be to be undertaken in each successive year by each land management agency, State Wildlife Agency and regulatory agency that are integral to the conservation effort. This list shall be prioritized in order of importance of protecting the species. Each recommended action item shall include a rough cost, schedule, and rationale to allow the DG/CLSGWG to make decisions or recommendations to Governing Authorities for the coming year's work program.

6. To the extent permitted by law, all Parties agree to provide to each other all relevant information in its possession or control related to implementation of the CS within 30 days of a request by another party.

7. The TSC shall prepare the annual report prior to December 1 of each year. The NCSGWG shall approve the annual report or request specific modifications within 60 days of the TSC delivering the report to the Parties. BLM, CDFG, USWFWS and USFS shall post an electronic copy of the final report on its web page for general access.

D. Funding

1. The Parties warrant necessary funds exist to implement the CS for Fiscal Year 2006-2007 and commit to seek funding necessary to implement the CS in succeeding years. However, implementation of this MOU/CA and the CS is subject to the requirements of the Anti-Deficiency Act and availability of appropriate funds. Nothing in this MOU/CA

will be construed by the Parties to require obligation, appropriation, or expenditure of any money from the U.S. Treasury or from state or local funds. Any Party will promptly notify the Parties of any material changes in a Party's financial ability to fulfill its commitments.

2. This instrument is neither a fiscal nor funds obligation document. Any endeavor or transfer of anything of value involving reimbursement or contribution of funds between the Parties to this instrument will be handled in accordance with applicable laws, regulations, and procedures including those for Government procurement and printing. Such endeavors will be outlined in separate agreements that shall be independently authorized by appropriate statutory authority. This instrument does not provide such authority. Specifically, this instrument does not establish authority for noncompetitive award to the cooperator of any contract or other agreement. Any contract or agreement for training or other services must fully comply with all applicable requirements for competition.

E. Enforceability of This MOU/CA

1. Successful implementation of the MOU/CA, CS, and adaptive management process should remove the threats to the species and ensure the long-term survival of sage-grouse by maintaining and enhancing existing and historical habitat in the Devil's Garden / Clear Lake PMU and integrating new information on the biology of the species into future conservation and management activities. As a result, the need to list the species under the ESA should be avoided. If conservation and management practices are effective in removing the threats and long-term protection of the species and its habitat are achieved, the USFWS may remove the sage-grouse from candidate status under the ESA. When or if it becomes known that there are threats to the survival of sage-grouse that are not or cannot be resolved through the CS, the USFWS may choose to resign candidate status, an appropriate listing priority, and list the species. The sole consequence of failure by a Party or Parties to implement this MOU/CA shall be a consideration by the USFWS to list the greater sage-grouse under the ESA if it is not already done so.

2. Without limiting the applicability of rights granted to the public pursuant to any law, this MOU/CA or the CS shall not create any right or interest in the public, or any member thereof, as a third-party beneficiary hereof, nor shall it authorize anyone not a Party to this MOU/CA to maintain a suit for enforcement of the MOU/CA or CS, personal injuries or damages. The duties, obligations, and responsibilities of the Parties to this MOU/CA with respect to third parties shall remain as imposed under existing law.

F. Duration of MOU/CA and Termination Clause

1. This MOU/CA shall terminate 10 years from the date of the last signature of the Parties hereto ("the initiating date"). The Parties shall meet and assess this MOU/CA after 5 years from the initiating date. After this 5-year meeting, a Party may affirmatively withdraw from the MOU/CA. If more than one party remains, this MOU/CA shall automatically extend for the remainder of the 10-year term.

2. If any Party determines that some portion of the CS cannot be carried out by their agency as a Party to the MOU/CA, then that Party must notify other Parties in writing

within 60 days after their knowledge of their inability to carry out action. Within that same time frame, the remaining Parties will meet to discuss alternatives to the implementation of the unfulfilled action.

3. Any Party may suspend or terminate its participation in this MOU/CA and CS by providing 90 days written notice to all other Parties. Suspension or termination by one or more Parties shall not alter this MOU/CA between the remaining Parties.

G. Miscellaneous Provisions

1. Notices

Any notice permitted or required pursuant to this MOU/CA or CS shall be in writing, delivered personally to the appropriate persons listed in Section III.A hereto, or shall be deemed to be given five (5) days after deposit in the United States mail, certified and postage prepaid, return receipt requested, and addressed as follows, or at such address any Party may from time to time specify to the other Parties in writing. Notices may be delivered by facsimile or other electronic means, provided that they are also delivered personally or by certified mail. Notices shall be transmitted so that they are received within the specified deadlines.

2. Entire agreement

This MOU/CA, together with the CS, constitutes the entire agreement among the Parties. It supersedes any and all other agreements, either oral or in writing, among Parties with respect to the subject matter hereof and contains all the covenants and agreements among them with respect to said matters, and each Party acknowledges that no representation, inducement, promise or agreement, oral or otherwise, has been made by any other party or anyone acting on behalf of any other party that is not embodied herein.

3. Elected officials not to benefit

No member of or delegate to the U.S. Congress or California legislatures shall be entitled to any share or part of this MOU/CA, or to any benefit that may arise from it.

4. Relationship to Legal Authorities

a. The terms of this MOU/CA and the CS shall be governed by and constructed in accordance with the federal ESA, the California ESA (CESA) and other applicable federal and state laws.

b. Nothing in the MOU/CA or CS is intended to limit the authority of the USFWS, CDFG, USFS, and BLM to seek penalties or otherwise fulfill their responsibilities under the ESA, CESA, NRS, and CFR Code, respectively. Moreover, nothing in the MOU/CA or CS is intended to limit or diminish the legal obligations and responsibilities of the USFWS, CDFG, USFS, and BLM as agencies of the federal and state governments. Nothing in this MOU/CA or CS limits the right or obligation

of any state or private entity to engage in appropriate consultation or permitting process required under any applicable federal or state law; however, it is intended that the rights and obligations of the Parties under the MOU/CA and CS may be considered in any consultation affecting a Party's use of specified lands.

5. Successors and assigns

This MOU/CA and each of its covenants and conditions shall be binding on and shall ensure to the benefit of the Parties and their respective successors and assigns. Assignment or other transfer of the MOU/CA shall be governed by the USFWS, CDFG, USFS, and BLM regulations in force at the time.

6. Public documents

Information provided to any governmental agency pursuant to this MOU/CA and CS may be subject to release to members of the public under either state or federal law including but not limited to information furnished to the USFWS under the Freedom of Information Act (5 U.S.C. 552).

7. Modification

The MOU/CA and CS may be modified by mutual written consent of the Parties.

8. Participation in similar activities

This instrument in no way restricts the Parties from participating in similar activities with other public or private agencies, organizations, and individuals.

9. No regulatory approvals

Neither this MOU/CA nor CS constitutes regulatory approval by any Party of any projects mentioned in the MOU/CA or CS. All projects and actions must follow the otherwise applicable regulatory process for all necessary permits or approvals.

IN WITNESS WHEREOF, the Parties hereto have caused this agreement to be executed as of the day and year first written above.

CALIFORNIA DEPARTMENT OF FISH AND GAME

By: _____ _____
Gary Stacey, Regional Manager Date

U.S. FOREST SERVICE

By: _____ _____
Stanley G. Sylva, Forest Supervisor Date

U.S. FISH AND WILDLIFE SERVICE

By: _____ _____
Field Supervisor Date
California Fish and Wildlife Office

LAVA BEDS NATIONAL MONUMENT, NATIONAL PARKS SERVICE

By: _____ _____
David F. Kruse, Superintendent Date
Lava Beds National Monument

USDI BUREAU OF LAND MANAGEMENT

By: _____ _____
Tim Burke, Field Manager Date
Alturas Field Office

NORTHEAST CALIFORNIA RESOURCE ADVISORY COUNCIL

By: _____ _____
Nancy Huffman, Chairperson Date
Northeast California Resource Advisory Council

USDA NATURAL RESOUCES CONSERVATION SERVICE

By: _____ _____
Ed Burton, State Conservationist Date

COUNTY OF MODOC

By: _____ _____
David Bradshaw, Chairman Date
Board of Supervisors

UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION

By: _____ _____
Don Lancaster, Natural Resources/Livestock Advisor Date
Cooperative Extension, Lassen County

MODOC COUNTY FARM BUREAU

By: _____ _____
Bekki Ingraham Date
Modoc County Farm Bureau

LAVA BEDS / BUTTE VALLEY RESOURCE CONSERVATION DISTRICT

By: _____ _____
Mike Byrne, Chairman Date
LBBV RCD Board of Directors

OR-Cal RESOURCE CONSERVATION & DEVELOPMENT DISTRICT

By: _____ _____
Rennie Cleland, Chairman Date
OR-Cal RC&D Board of Directors

PRIVATE INTERESTS

By: _____ _____,
Date

By: _____ _____,
Date

By: _____ _____,
Date

By: _____ _____,
Date

By: _____ _____
Date

III.A. Parties

The following entities and individuals are collectively referred to as the Parties:

California Department of Fish and Game (CDFG)
Region 1
601 Locust Street
Redding, CA 96001

U.S. Department of the Interior (USDI)
Fish and Wildlife Service, Nevada Fish and Wildlife Office (USFWS)
1340 Financial Boulevard, Suite 234
Reno, NV 89502

United States Department of Agriculture (USDA)
U.S. Forest Service
Modoc National Forest
800 West 12th Street
Alturas, California 96101

U.S. Department of the Interior (USDI)
Bureau of Land Management
Alturas Field Office
708 West 12th Street
Alturas, CA 96101

U.S. Department of the Interior (USDI)
National Park Service
Lava Beds National Monument
1 Indian Well Hqtrs.
Tulelake, CA 96134

Modoc County
Board of Supervisors
114 E. North St.
Alturas, CA 96101

UC Cooperative Extension
202 W. 4th St.
Alturas, CA 96101

United States Department of Agriculture
Natural Resources Conservation Service
USDA Service Center
Tulelake, CA River Basin Project Office
611 Main St.
Tulelake, CA 96134

Lava Beds/Butte Valley Resource Conservation District
USDA Service Center
611 Main St.
Tulelake, CA 96134

OR-Cal Resource Conservation & Development District
USDA Service Center
611 Main St.
Tulelake, CA 96134