BI-STATE SAGE-GROUSE CONSERVATION ACTION PLAN

2016 PROGRESS REPORT

Bi-State Local Working Group
BLM – Bishop Field Office
BLM – Carson City District
California Department of Fish and Wildlife
Natural Resources Conservation Service
Nevada Department of Wildlife
U.S. Fish and Wildlife Service
U.S. Forest Service – Humboldt-Toiyabe National Forest
U.S. Forest Service – Inyo National Forest
United States Geological Survey

Table of Contents

List of Tables

List of Figures

Executive Summary

The Bi-State Action Plan, completed in 2012, summarized prior conservation activities and established a roadmap for future conservation of the Bi-State sage-grouse. The plan fostered federal, state and other partner agencies to commit over $45 million in funding over 10-years to complete over 70 projects that were identified in the plan. In 2016, $8.4 million was expended implementing habitat improvement projects, conducting research, and monitoring projects on various sage-grouse populations, and monitoring habitat response to existing and proposed treatments. The 2016 activities are summarized below.

During 2016, 17,901 acres of conifer were removed in all Bi-State PMUs except for the White Mountains. In addition to the implementation of these projects, NEPA was completed for 4,654 acres of future conifer removal in the Bodie Hills and Mount Grant PMUs. NEPA was also initiated across 14,116 acres for future conifer removal within the Desert Creek and Mount Grant PMUs. The California Department of Fish and Wildlife acquired 2,036 acres of sage-grouse habitat in the Bodie Hills that ensure future conservation. Six miles of fences were either modified, removed or marked within the Bi-State across five PMUs. In the Mount Grant PMU, 703 acres of sage-grouse habitat were inventoried for invasive and noxious weeds and 11.4 acres were treated in the Bodie Hills and South Mono PMUs.

Other accomplishments that are noteworthy include the approval of $8 million through the RCPP Grant that was received by the Eastern Sierra Land Trust. The Humboldt-Toiyabe National Forest completed their Forest Plan Revision (IRM 1-6) and the Bi-State Sage-grouse Record of Decision was signed by the BLM within the Carson City District and the Tonopah Field Office. Aside from these actions, a considerable amount of planning and coordination took place between the CDFW, LADWP, USFWS, USGS and BLM to initiate a sage-grouse translocation effort into Parker Meadows.

Sage-grouse lek counts conducted in 2016 exhibited a decreasing population trend within the Bi-State planning area. This year represented the third year in a row of declines, which is likely attributable to extreme drought conditions experienced since the winter of 2011. In Nevada, the average male attendance rate for comparable leks declined 2.8% from 2015 and was down 17.8% from the 15-year average. The number of strutting males decreased 18.3% from 745 males to 595 males in Mono County, California, in 2016. The decrease was attributed to declines in the core populations of Bodie Hills and Long Valley, which were down 19.0% and 17.5% respectively from 2015.

Movement and demographic data were collected in the Bodie Hills, Desert Creek, Mount Grant, South Mono and White Mountains Population Management Units. In California, average cumulative adult survival was 65.6% (95% CE, 46.9 – 79.3%) in the Bodie Hills compared to 61.6% (95% CI, 40.8 – 77.1%) in Long Valley. Cumulative nest survival for the 37-day egg laying and incubation phase was 50.8% (95% CI, 31.2 – 67.5%) in the Bodie Hills while Long Valley nest survival was 28.3% (95% CI, 8.9 – 52.1%) during 2016. In Nevada, annual adult survival probability was 71.7% (95% CI, 56.5 – 82.5%) for the Mount Grant and Desert Creek PMUs during 2015 – 2016. Nest survival for the 37 day egg-laying and incubation period was 28.5% (95% CI, 9.7 – 51.0%) while brood survival to the 50-day age period was 63.3% (95% CI, 33.3 – 82.7%).

The Nevada Partners for Conservation and Development (NPCD) continued vegetation monitoring in the Bi-State planning area. Through 2016, the NPCD has surveyed approximately 500 plots within all Bi-State PMUs, including California. In addition to these direct vegetation monitoring efforts, grazing assessments were also conducted. For grazing year 2016, 64% of the allotments in the Bi-State were grazed. Within upland habitats, 100 allotments were meeting standards while 12 were not and 37 allotments had no assessment. For riparian portions of allotments, 59 allotments were meeting standards while 29 were not and 61 allotments had no evaluation. Of those 29 allotments, 27 were making significant progress towards meeting those objectives while two were not.

Accomplishment Summary

Background

In 2004, the first conservation plan for the Bi-State DPS was released. This plan identified conservation actions to be completed while also summarizing the status of the bird and the relevant threats. This stakeholder-driven plan was developed by members of the Local Area Working Group (LAWG) including; California BLM, California Department of Fish and Wildlife, Nevada Department of Wildlife, U.S. Fish and Wildlife Service, Nevada BLM, the Forest Service and the Natural Resources Conservation Service. From 2004 to 2011, members of the LAWG implemented the plan, completing thousands of acres of habitat improvement projects.

An interagency effort in 2011 resulted in an updated "Bi-State Conservation Action Plan" (Action Plan) that was released in March of 2012. The Action Plan summarized prior conservation activities and provided a roadmap to future conservation of the Bi-State Distinct Population Segment (DPS) of greater sage-grouse. Since publication, many of the conservation actions detailed in the Action Plan have been completed. The purpose of this report is to summarize these conservation actions on an annual basis.

On October 28, 2013, the U.S. Fish and Wildlife Service (FWS) proposed to list the Bi-State distinct population segment (DPS) of greater sage-grouse as threatened under the Endangered Species Act. At that same time, the FWS proposed to designate 1.8 million acres of critical habitat for the DPS. The FWS announced in April 2015 that the Bi-State DPS was no longer warranted for listing under the Endangered Species Act of 1973.

In June of 2014, NRCS, USFS, BLM and other Bi-State partners announced a $45 million dollar commitment to implement the 2012 Action Plan over a 10 year period to complete the highest priority actions in the Action Plan (originally composed of 76 projects).

Table 1 provides a summary of the on-the-ground conservation actions that have been implemented from the Action Plan to improve habitat for the Bi-State DPS in **2016**. Table 2 summarizes other actions such as research and monitoring as well as planning and coordination between agencies.

Table 1. Conservation Actions completed for the Bi-State DPS 2016.

RISK ADDRESSED Project Type	**# of Projects**	**Miles, Acres or Sites Treated**	**Project Locations[1]**	**PMU: High/ Moderate Threat**
CONIFER EXPANSION				**ALL PMUs**
Conifer removal to restore sagebrush	19	17,901 acres	BH, DC, MG, PN, SM	
Pile-burning in conifer removal areas	1	84 acres	MG	
NEPA for future conifer removal complete	2	4,654 acres	BH, MG	
NEPA for future conifer removal in progress	1	14,116 acres	DC, MG	
WILDFIRE				**ALL PMUs**

Wildfire: rehabilitation	2	30 Acres	BH, SM	
Conifer Removal or Fuels Reduction	5	271 acres	BH, DC, PN	
URBANIZATION				**ALL** (except MG)
Land Acquisition: California Department of Fish and Wildlife	1	2,036 acres	BH	
INFRASTRUCTURE				**ALL** (except WM)
Fences: modification, removal, marking	6	6 miles	BH, DC, MG, SM, WM	
Roads: permanent closures, seasonal and improvements	4	3 miles, 4 seasonal closures	SM	
GRAZING				
Livestock Management (exclosures)	14	360 acres, existing exclosures maintained	BH	Permitted grazing: Low for all PMUs
Livestock exclusion (fence construction)	1	20 acres, new exclosure built	MG	
INVASIVE AND NOXIOUS SPECIES				**PN, MG**
Invasive and noxious weed control- mechanical and chemical	2	11.4 acres	BH, SM	
Invasive and noxious weed inventory	1	703 acres	MG	
HABITAT-BASED				**DCF**
Irrigation of wet meadows	2	370 acres yearly	BH, DC, MG	
Restoration of sagebrush habitat: Trash removal	1	23 acres	BH	

1. Population Management Unit (PMU) abbreviations: PN – Pine Nut; DCF – Desert Creek-Fales; B – Bodie; MG – Mount Grant; WM – White Mountains; SM – South Mono

Table 2. Action Plan accomplishments not included in Table 1.

OTHER ACTION PLAN ACCOMPLISHMENTS	DESCRIPTION / MEASURES
Coordinated interagency approach (CIA 1)	• Mono County received national award for their conservation work for the Bi-State DPS o https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd496125.pdf • $8 Million RCPP Grant received by Eastern Sierra Land Trust o http://www.eslt.org/pages/documents/ESLTPressRelease-Bi-StateRCPPFund.pdf

	• Tribal intern program coordinated between HTNF, Bishop BLM, Bridgeport Piute Tribe • 7 Executive Oversight Committee (EOC) meetings • 2 Tribal Natural Resource Committee (TNRC) meetings • 2 Local Area Working Group (LAWG) meetings • 1 Technical Advisory Committee (TAC) meeting • Staffed new permanent position in Bishop through FWS Partners for Wildlife Program
Science-based adaptive management plan (SAM 1 & 2)	• Funding for Science Advisor has been provided from 2012-2016 (SAM 1) • Conservation Planning Tool (CPT) has been implemented and continues to be refined (SAM 2)
Improve regulatory mechanisms (IRM 1 & 2)	• Humboldt-Toiyabe National Forest completed Forest Plan Revision (IRM 1-6). • BSSG ROD was signed for BLM land managed by the Carson City District and the Tonopah Field Office. This land use plan amendment provides goals, objectives, actions and best management practices to protect BSSG habitat (IRM 1-5 and 1-7). • The INF is currently updating its Land and Resource Management Plan (Forest Plan). (IRM 1-8).
Small populations (MER 7)	• Development of a translocation plan for the Parker population is in progress. Agreements between DWP, USGS and CDFW were completed. Parker translocation planned to start spring of 2017 (MER 7-1).
Research and Monitoring (RAM 1 thru 5)	• Coates, P. S., K. M. Andrle, P. T. Ziegler, and M. L. Casazza. 2016. Monitoring and Research on the Bi-State Distinct Population Segment of Greater Sage-Grouse (Centrocercus urophasianus) in the Pine Nut Mountains, California and Nevada—Study Progress Report, 2011−15. U. S. Geological Survey Open-File Report 2015-1222, 40 p., http://dx.doi.org/10.3133/ofr20151222. • Coates, P. S., M. A. Ricca, B. G. Prochazka, M. L. Brooks, K. E. Doherty, T. Kroger, E. J. Blomberg, C. A. Hagen, and M. L. Casazza. 2016. Wildfire, climate, and invasive grass interactions negatively impact an indicator species by reshaping sagebrush ecosystems. Proceedings of the National Academy of Sciences 113:12745-12750. • Coates, P. S., B. E. Brussee, K. B. Howe, K. B. Gustafson, M. L. Casazza, and D. J. Delehanty. 2016. Landscape characteristics and livestock presence influence common ravens: relevance to greater sage-grouse conservation. Ecosphere 7:e01203. • Doherty, K. E., J. S. Evans, P. S. Coates, L. M. Juliusson, and B. C. Fedy. 2016. Importance of regional variation in conservation planning: a rangewide example of the Greater Sage-Grouse. Ecosphere 7(: e01462.
Maintain and improve stakeholder involvement	• Field tour for Department of Interior (DOI) Principal Deputy Assistant Secretary of Bi-State Projects • Education: presented talks about sage-grouse in Nevada classrooms • Presented sage-grouse biology and management talk to LA Audubon.

(MSI 1 & 2)	• Traditional Ecological Knowledge summit held, summary can be found here:
	  ○ http://www.fs.fed.us/spf/tribalrelations/documents/news/Summer2016TribalRelationsNewsletter.pdf
	  ○ https://www.fws.gov/cno/newsroom/highlights/2016/Traditional_Knowledge/?utm_medium=email&utm_source=govdelivery
	• PBS video highlighting the Bi-state DPS produced http://video.vegaspbs.org/video/2365670744/

Minimize and Eliminate Risks: Wildfire (MER 1-1 thru 1-9)	• Resource Advisor Kits were updated with relevant grouse data • Sage-grouse presentations at all fire refreshers for the INF/Bishop BLM/HTNF • Fire prevention patrols focused in Bodie and Long Valley • Bodie State Park completed a fire plan to include sage-grouse SOPs • FWS provided technical assistance to private landowner (200 acres) for post fire restoration

76 Projects and the Action Plan

In 2014 the Bi-State Technical Advisory Committee evaluated projects in the Action Plan and created a list of 76 projects that were the highest priorities to complete. At this time the boundaries of the conifer projects were drawn as a best guess. In 2014, the USGS produced the Conservation Planning Tool, which ranked the potential conifer projects based on benefit to grouse and cost effectiveness. In 2015, subcommittees of the TAC in the north and south Bi-State used the CPT rank as the basis for re-prioritizing the conifer projects that included other information, such as on-the-ground knowledge of an area, logistics of planning and implementing, and professional expertise. At every step, it was assumed that 1) priorities would change based on new information; and 2) new priorities might occur that were unknown at the time of the 76 projects.

The projects summarized in this report represent the 2016 completion of the highest priority projects in the Bi-State based on the CPT, TAC reranking, input from the LAWG and common sense realities of implementing projects. Figure 1 provides a regional view of project type and placement throughout the Bi-State planning area.

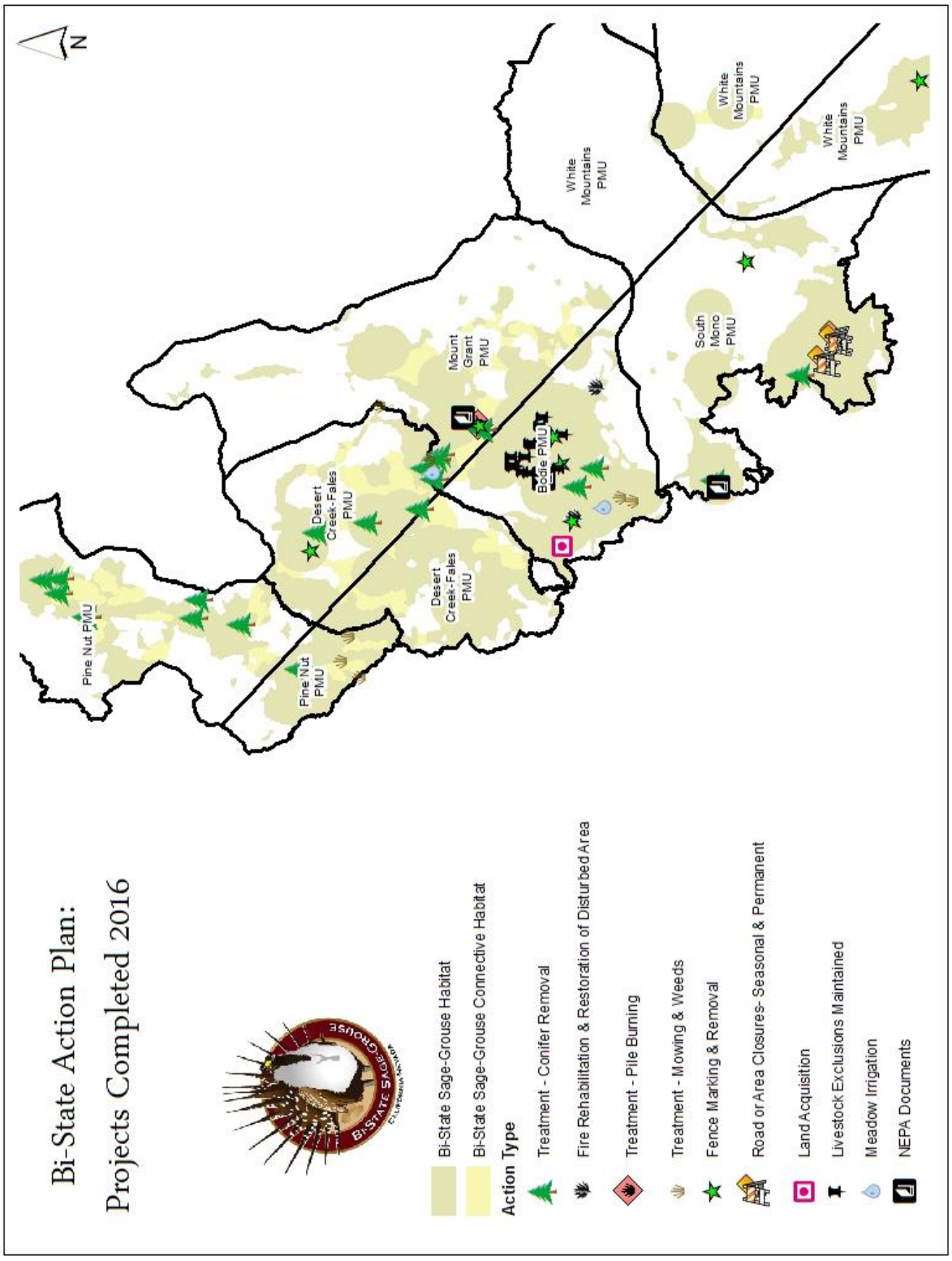

Figure 1. Projects completed in 2016 with direction from the 2012 Bi-State Action Plan.

2016 Bi-State Sage-grouse Lek Monitoring Report

Overview

There are six Population Management Units (PMUs) within the Bi-State planning area including the Bodie Hills, Desert Creek/Fales, Mount Grant, Pine Nut, South Mono and White Mountains PMUs. Connectivity is evident between all PMUs except for the White Mountains, where there is little available data from radio-marked birds; however, information is currently being collected from birds captured during the summer of 2016 that were outfitted with GPS-satellite transmitters. The largest population of sage-grouse occurs in the Bodie Hills PMU while the smallest populations reside in either the Pine Nut or the White Mountains PMUs. Lek counts conducted in 2016 show a decreasing population within the Bi-State planning area as a whole. This is the third year in a row of declining population trends which are likely attributable to extreme drought conditions experienced since 2011-2012.

Lek Status

Between California and Nevada, there are 101 known lek locations within the Bi-State conservation area, of which 48 are considered currently active [2 or more males observed during two years over a five year period (Connelly et al. 2003)] (Table 1). In California there are 58 known leks with 31 leks considered active; however, the active lek status definition is sometimes difficult to apply to smaller satellite leks. In Nevada, 43 lek locations are known of which 18 are considered active according to the Connelly et al. (2003) definition. Lek locations in the Pine Nut PMU need continued refinement because many locations are one or two time observations of very few sage-grouse from aerial survey due to on-the-ground access limitations.

The total known number of leks may be somewhat misleading due to the presence of several leks considered "satellite leks" within California, particularly within the Bodie and South Mono PMUs as well as a few locations that need to either be followed up on or eliminated from the database. It is recommended that NDOW, CDFW and other agencies work to clarify satellite lek autonomy or incorporation of data in the next year. Table 3 describes our knowledge of sage-grouse leks within each PMU currently.

Table 3. Known leks, activity and average lek size within the Bi-State sage-grouse conservation planning area. (*The Stringer Headwaters Meadow has not been counted since 2013 and has been active).

PMU Name	Known Lek Locations	Active Leks	Average Lek Size
Pine Nut	12	2	5.0
Desert Creek/Fales	20	8	16.4
Mount Grant	15	8	17.3
Bodie Hills	20	14*	36.9
South Mono	30	14	14.6
White Mountains	4	2	2.5
Totals:	101	48	21.2

Population Performance

Nevada Lek Counts

During the 2016 breeding season, 25 leks were surveyed in the Nevada portion of the Bi-State planning area. Thirteen of those leks had two or more males in attendance with the largest lek being

the Rough Creek lek which had a peak attendance of 48 males. A total of 73 lek visits were made during 2016 of which volunteers performed 48 of those visits. Average male attendance for leks with greater than two males (active leks by definition) was 14.6 males in 2016. The attendance rate was slightly higher (6%) than that in 2015 (n=13.8). For comparison purposes, the greatest average lek attendance from 2000 through 2016 was 29.4 males in 2012, while the lowest attendance rate was 10.5 males in 2008. The 2016 average male attendance was 16.7% lower than the overall average for 2000-2016, which was 17.6 males per lek.

To obtain a more accurate depiction of population trends, lek counts from a subset of leks (n=7) with the most consistent data were used. Data from these leks indicate a slightly declining population from the previous year. Average male attendance for this subset of leks was 17.7, while the 2015 average was 18.2, representing a 2.8% decline. The long-term population trend is slightly declining for the Nevada portion of the Bi-State planning area (Figure 2). The 15-year average male attendance for this subset of leks was calculated at 21.5 males per lek and the 2016 attendance rate was 17.8% below that figure. Last year's lek attendance represented the fourth straight year of below average attendance.

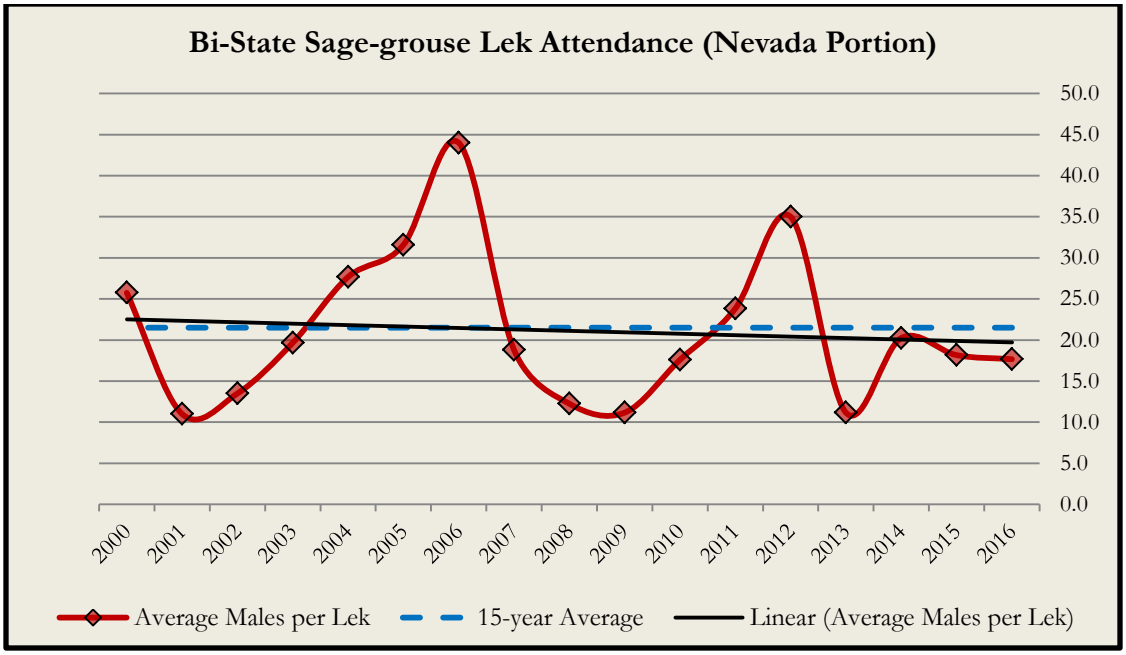

Figure 2. Male lek attendance within the Nevada portion of the Bi-State planning area from 2000-2016.

California Lek Counts

From March 10– May 5, 2016, sage-grouse lek surveys were conducted from the ground throughout Mono County by personnel from the Department of Fish and Wildlife (Department), the Nevada Department of Wildlife (NDOW), the Bureau of Land Management (BLM), the U. S. Forest Service, the Los Angeles Department of Water and Power (LADWP), California State Parks, the Mono County Community Development Department, as well as several volunteers. Leks were surveyed from the ground in Long Valley, Granite Mountain, Parker Meadows, the Bodie Hills, and Fales Hot Springs. The Jackass Flat lek was surveyed from a helicopter by NDOW. Sage-grouse leks in the California portion of White Mountains were not surveyed.

The methodology for obtaining lek counts involved the simultaneous survey of all leks within a breeding complex on a minimum of three separate days spaced over the duration of the survey period. The peak male count was the survey having the highest cumulative number of grouse counted on all leks within a breeding complex on any one day.

Table 4 provides the results of peak counts conducted during 2016 in the areas identified above, as well as the number of leks counted and the dates that the peak counts occurred. Weather conditions during the survey period were variable, although most surveys were conducted on days with good weather conditions.

From peak counts, a total of 609 male sage-grouse were counted on 30 leks surveyed in Mono County during spring 2016 (Table 4). Of the 609 males counted, 66.9% were observed in the Bodie Hills on April 6 and 25.9% were observed in Long Valley on March 17. Thus, 92.8% of all male sage- grouse counted during peak surveys was observed within the core breeding complexes of the Bodie Hills and Long Valley (Table 4).

Table 4. Results of Sage-grouse Lek Counts Conducted in Mono County, CA. (Spring 2016)

Strutting Area/ Complex Name	Date of Peak High Count	Number of Leks w/ Males	Peak High Male Count	Percent of Total Males	Percent Change From 2015
Fales/DC PMU					
• Fales	3/01/16	2	33	5.4	-10.8
• Jackass Flat	4/04/16	1	14*	2.3	-41.7
South Mono PMU					
• Long Valley	3/17/16	12	158	25.9	-18.9
• Parker	3/30/16	2	4	0.67	0.0
• Granite Mtn.	3/4-4/29	1	5	0.83	-10.7
Bodie PMU					
• Bodie Hills	4/06/16	12	395	66.9	--17.5
Mono All		**30**	**609**	**100.0**	**-18.3**

*NDOW helicopter survey

South Mono PMU

A total of 4 lek count surveys were conducted in Long Valley between March 17 and April 7, 2016. In all, a total of 17 strutting grounds, including 9 trend leks and 8 satellite grounds were monitored during the 5 surveys (Table 4). The peak number of males counted in Long Valley was 158 on March 17. Grouse were counted on 12 of the 17 leks monitored on that day. The 2016 peak count of 158 males represent an 18.9% decrease from the number of grouse counted in 2015 and a 62% decrease from the historic peak high count in 2012 of 418 males (Figure 3). The 2016 peak count of 158 males is about 22% below the long-term average (LTA) number of males counted in Long Valley since 1953 (Figure 3).

A total of 5 male sage-grouse were consistently observed strutting on private property at Sagehen Meadow in the Granite Mountain portion of the South Mono PMU. These birds were observed with up to 14 other sage-grouse by the property owner between March 4 and May 9, 2016 (Bill Crum, pers. comm.). Prior to 2015, there is no previous record of males strutting at Sagehen Meadow. There were no sage-grouse observed lekking this year at the other two Granite Mountain leks at Gaspipe Springs or Adobe (Table 4). Grouse leks at Parker were monitored by both LADWP and CDFW personnel. A total of 4 lek surveys were conducted at Parker and the peak high male count was just 4 birds on March 30 and April 5.

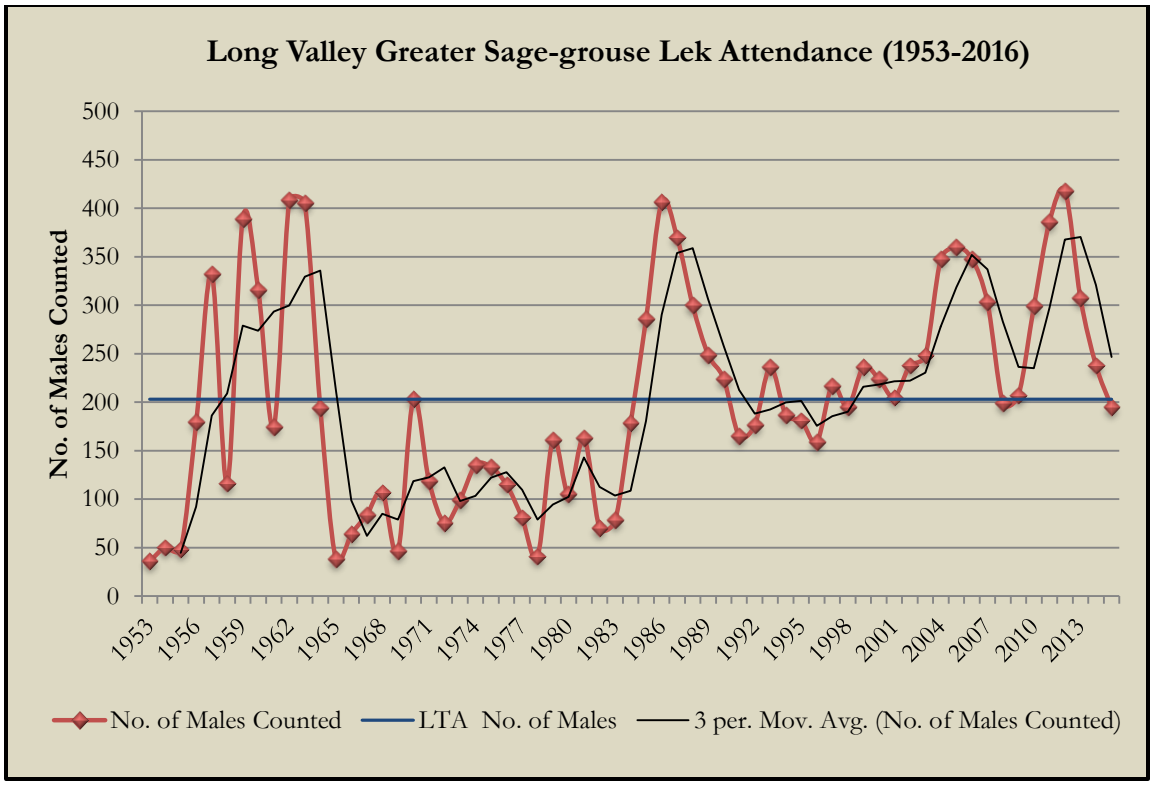

Figure 3. Long Valley peak male sage-grouse lek attendance (1953-2016).

Bodie PMU

A total of 3 lek counts were conducted in the Bodie Hills between April 6 and April 20, 2016. In all, a total of 18 strutting grounds, including 8 trend leks, were monitored during the surveys. The peak number of male sage-grouse counted was 395 on April 6 (Table 4). Grouse were counted on 12 of the 18 leks visited on that day. The 2016 peak count of 395 males represents a 17.5% decrease from 2015 when 479 males were recorded. The 395 males recorded in 2016 were approximately 106% above the LTA number of males counted in the Bodie Hills since 1953 (Figure 4).

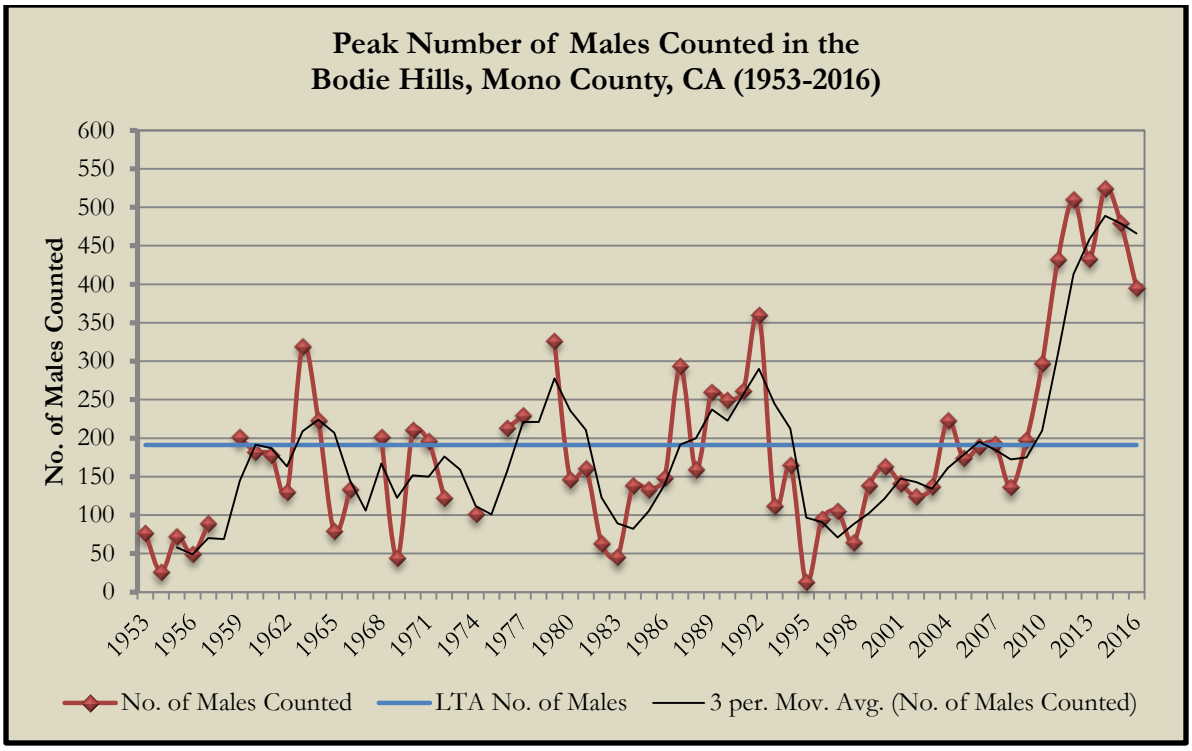

Figure 4. Male sage-grouse lek attendance within the Bodie Hills PMU in Mono County, CA. from 1953-2016.

Fales/Desert Creek PMU

A peak total of 33 male sage-grouse were counted on the two remaining active leks located within the Fales breeding complex (Table 4). The number of males counted at Fales in 2016 was 10.8% fewer than in 2015. A total of 24 males were counted on Wheeler Flat lek #3, and 9 males were counted on Burcham Flat lek #2; no grouse were observed on Burcham Flat lek #4. The number of lekking males at Fales remains very low but stable. On April 14, 2016, the Nevada Department of Wildlife (NDOW) conducted a helicopter survey and 14 male sage grouse were counted on the Jackass Flat lek.

Mono County 2016 Lek Count Summary

Overall, the total number of strutting males counted in Mono County in spring 2016 decreased 18.3% from 745 males to 595 males. This decrease was attributed to declines in the Long Valley and Bodie Hills core populations, which were down approximately 19.0% and 17.5%, respectively, from 2015.

Bi-State Sage-grouse Movement and Demographic Report

A cooperative effort to intensively monitor sage-grouse populations throughout the Bi-State planning area was essentially "kicked off" during the fall of 2015 and a full year of demographic data was collected in 2016. This involved a collaborative and coordinated effort between several agencies including the U.S. Geological Survey – Western Ecological Research Center (USGS-WERC), Bureau of Land Management (BLM), U.S. Forest Service (USFS), California Department of Fish and Wildlife (CDFW) and the Nevada Department of Wildlife (NDOW) to implement a before-after-control-impact (BACI) study design to monitor sage-grouse response to management actions. In 2016, movement and demographic data were collected in the Bodie Hills, Desert Creek, Mount Grant, South Mono (Long Valley) and White Mountains Population Management Units (PMUs).

Bodie Hills/Long Valley

Research and monitoring crews with the USGS-WERC began capturing and radio-marking sage-grouse during the fall of 2015. These crews captured and radio-marked 61 sage-grouse at Bodie Hills (n = 29) and Long Valley (n = 32) during the fall (September – November) months. A sufficient sample size of VHF-marked females was established in 2015 to preclude the need to continue trapping at these sites during the spring months (March – May) of 2016. When trapping resumed during the fall months of 2016, research technicians captured and radio-marked 27 female sage-grouse at Bodie Hills (n =14*)* and Long Valley (n = 13). During the 2016 spring and summer field season at Bodie Hills, crews monitored two active leks; 19 nests, and 12 broods, and obtained 198 ground telemetry locations from radio-marked grouse. At Long Valley, crews identified and monitored 16 nests and 7 broods, and obtained 268 ground telemetry locations from radio-marked grouse.

Space Use

In 2016, USGS research crews monitored a total of 53 female sage-grouse within the Bodie Hills (n = 26) and Long Valley (n = 27). The BLM – Bishop Field Office monitored the seven sage-grouse at Sagehen Summit. The USGS obtained 466 telemetry locations: 198 at Bodie Hills and 268 at Long Valley (Figure 5). Research crews monitored an additional two GPS-marked females at Bodie Hills and BLM personnel monitored a third GPS marked female at Sagehen Summit. The VHF transmitters on the two Bodie Hills GPS units failed and we were unable to monitor those individuals in the field throughout the season. A total of 12,952 GPS-PTT locations have been obtained since 2014 in these populations.

USGS-WERC calculated utilization distributions by season for VHF and GPS-marked grouse in Bodie Hills, Long Valley, and Sagehen Summit. In Bodie Hills, the core area of sage-grouse activity [50% Utilization Distribution (UD)] and population level home range (95% UD) during winter encompassed 1,529 and 7,325 ha, respectively. The core area of sage-grouse activity (50% UD) during spring and summer was 881 and 183 ha, respectively, and the population level home range (95% UD) was 8,491 and 1,568 ha, respectively. During fall, the core area of sage-grouse activity (50% UD) and population level home range (95% UD) encompassed 428 and 3,060 ha, respectively.

In Long Valley, the core area of sage-grouse activity (50% UD) and population level home range (95% UD) during winter encompassed 1,270 and 11,456 ha, respectively. The core area of sage-grouse activity (50% UD) during spring and summer was 683 and 971 ha, respectively, and the population level home range (95% UD) was 3,317 and 5,302 ha, respectively. During fall, the core

area of sage-grouse activity (50% UD) and population level home range (95% UD) encompassed 1,060 and 7,142 ha, respectively.

In Sagehen, the core area of sage-grouse activity (50% UD) and population level home range (95% UD) during winter encompassed 354 and 1,714 ha, respectively. The core area of sage-grouse activity (50% UD) during spring and summer was 317 and 766 ha, respectively, and the population level home range (95% UD) was 2,788 and 4,665 ha, respectively. During fall, the core area of sage-grouse activity (50% UD) and population level home range (95% UD) encompassed 214 and 1,338 ha, respectively.

During the spring, core usage areas for Bodie Hills and Sagehen birds were concentrated at Hunewill Hills and Granite Mountain, respectively. In the summer, Bodie Hills sage-grouse dispersed throughout the Hunewill Hills and utilized smaller core areas while Sagehen birds shifted south-west and utilized a slightly larger continuous core area. Sage-grouse within the Long Valley study area primarily used the area west of Lake Crowley and displayed a different distribution pattern than those at Bodie Hills. Long Valley sage-grouse used small fragmented core areas during the spring but congregated to a large continuous core area during the summer.

Survival

Average monthly adult survival probability in Bodie Hills was 96.6% (95% CI, 93.9 – 98.1%) and cumulative average adult survival probability was 65.6% (95% CI, 46.9 – 79.3%) during 2016. For study years 2014 – 2016, we located 15 sage-grouse mortalities in Bodie Hills. Carcass remains are used to infer the cause of mortality; however, evidence of the initial predator's identity may be obscured due to scavenging by other carnivores. Assumed causes of death for the Bodie Hills birds included depredation by avian (n = 5), mammalian (n = 2) or unknown (n = 4) predators. Four cases lacked sufficient evidence to speculate cause of death. In 2016, eight sage-grouse mortalities were located. Assumed causes of death were depredation by avian (n = 1), mammalian (n = 1) or unknown (n = 4) predators. Two cases lacked sufficient evidence to speculate cause of death.

Average monthly adult survival probability in Long Valley was 96.0% (95% CI, 92.8 – 97.9%) and cumulative average adult survival probability was 61.6% (95% CI, 40.8 – 77.1%) during 2016. For study years 2015 – 2016, we located seven sage-grouse mortalities in Long Valley. Assumed causes of death were depredation by avian (n = 3), mammalian (n = 1) or unknown (n = 2) predators and one case lacked sufficient evidence. In 2016, five sage-grouse mortalities were located. Assumed causes of death included depredation by avian (n = 2), mammalian (n = 1) or unknown (n = 2) predators. However, identification was based on diagnostic sign and should be interpreted with caution.

Nest Survival

Research technicians located 35 nests this season in Bodie Hills (n = 19) and Long Valley (n = 16). In the Bodie Hills, 12 nests were successful and seven failed. In Long Valley, seven were successful and nine failed. Causes of failure were apparent nest depredation (n = 10), nest abandonment (n = 4), and female mortality (n = 2). Cumulative average nest survival probability for the 37-day egg laying and incubation phase in Bodie Hills was 50.8% (95% CI, 31.2 – 67.5%) during 2016. In Long Valley, cumulative average nest survival probability for the 37-day egg laying and incubation phase was 28.3% (95% CI, 8.9 – 52.1%) during 2016. Cumulative average nest survival probability in

Sagehen for the 37-day egg laying and incubation phase was 32.1% (95% CI, 6.6 – 62.5%) during 2016.

Brood Survival

USGS-WERC research crews monitored twelve broods in Bodie Hills, of which nine were successful (≥1 chick survived to 50-days post-hatch). One brood was confirmed unsuccessful. Two broods had at least one chick at the 40-day brood check but we were unable to obtain the subsequent 50-day location, so their final fates are unknown. Brood-rearing and non-brood rearing females at Bodie Hills were observed moving towards the higher elevation areas northeast of Potato Peak. Three females successfully raised broods and moved to this area in straight line distances of approximately 8 km, 8.5 km, and 6 km from their nest sites. The 10-day interval brood survival probability was 92.9% (95% CI, 83.9 – 97.0%) and the cumulative average brood survival probability for the 50-day brood rearing phase (probability of success through the brood rearing period) was 69.3% (95% CI, 41.5 – 85.9%) during 2016.

Seven broods were monitored in Long Valley of which six were successful and one failed. Brood-rearing females at Long Valley moved towards grassy areas, or the brush immediately adjacent to them, north and west of Lake Crowley. The 10-day interval brood survival probability was 97.5% (95% CI, 83.8 – 99.6%) and the cumulative average brood survival probability for the 50-day brood rearing phase was 88.3% (95% CI, 41.4 – 98.3%) during 2016.

Daily brood survival probability and cumulative average brood survival probabilities were not calculated at Sagehen due to a very small sample size. These results remain preliminary. We need multiple years of data collection and brood monitoring in order to estimate accurate brood survival probability in Bodie Hills, Long Valley, and Sagehen.

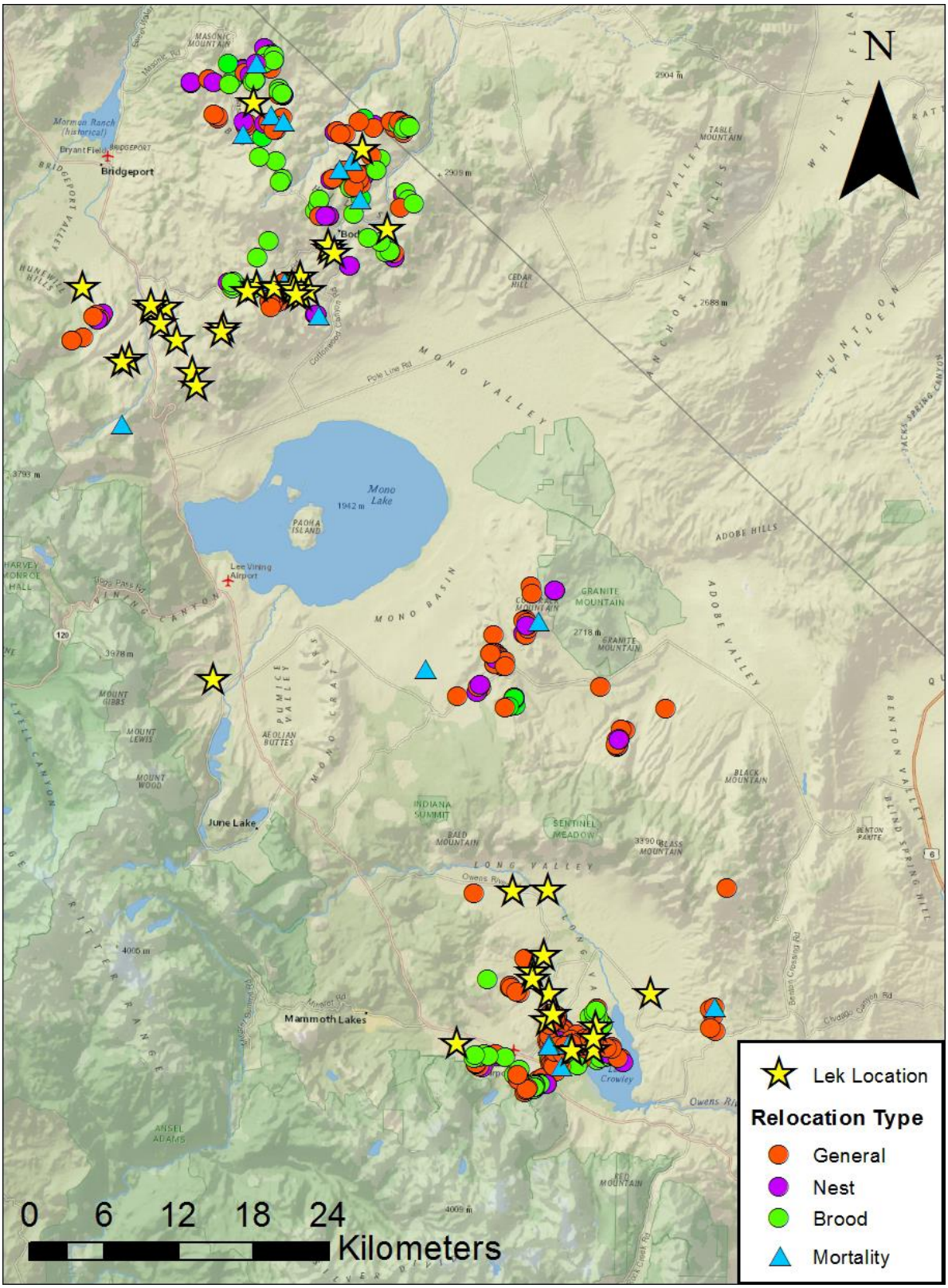

Figure 5. Nest, brood, mortality, and general telemetry locations (n=466) in the Bodie Hills, Sagehen Summit, and Long Valley, CA study areas, 2016.

Desert Creek/Mount Grant

A total of 20 sage-grouse were captured and radio-marked in the Desert Creek (n=8) and Mount Grant PMUs during the fall of 2015 to activate monitoring within these two PMUs over a three-year period. In addition to this complement of radio-marked birds, USGS research crews also captured and radio-marked 10 sage-grouse in Mount Grant and 13 in Desert Creek in the spring of 2016. During the 2016 field season, USGS research crews monitored 17 females in Mount Grant and 21 females in Desert Creek. We investigated population vital rates, space use, habitat selection, and predator community composition. The object of this research is to provide the most accurate science to guide management decisions.

Space Use

We calculated utilization distributions by season (same months as outlined in above paragraph) for GPS and VHF-marked sage-grouse. The utilization distributions for Mount Grant and Desert Creek were calculated separately however, both are featured on the same map. At Mount Grant, the core area of sage-grouse activity (50% UD) during spring, summer, fall, and winter was 480, 868, 1347, and 1756 ha. respectively, and the population level home range (95% UD) was 3270, 7110, 8654, and 15624 ha. respectively. At Desert Creek, the core area of sage-grouse activity (50% UD) during spring, summer, and winter was 1221, 988, and 264 ha. respectively, and the population level home range (95% UD) was 5482, 5541, and 1309 ha. respectively. Desert Creek has not had any data from birds in the fall to date.

At the Desert Creek field site, the majority of sage-grouse in the northern portion near Desert Creek and Taylor leks remained within a kilometer of the lek where they were originally collared and have moved to irrigated agricultural lands, such as alfalfa fields and cow pastures, and ranches. In the southern portion of the field site, females moved several kilometers to higher elevation sagebrush steppe in the mountains to the west. Collared females in the valley of the Mount Grant field site moved short distances from their leks to ranch land adjacent to rivers and streams or high elevations, while collared females in Aurora remained close to where they were originally collared.

Survival

Adult survival probabilities were calculated for Mount Grant and Desert Creek combined. Average monthly adult survival probability was 97.3% (95% CI, 95.4 – 98.4%) and annual adult survival probability was 71.7% (95% CI, 56.5 – 82.5%) during 2015 – 2016. We recovered seven mortalities from VHF (n = 6) or GPS (n = 1) marked sage-grouse in 2016. Assumed causes of mortality include depredation by avian (n = 2), mammalian (n = 2), or unknown predators (n = 1), and unknown causes (n = 1). The seventh mortality tested positive for West Nile Virus.

Nest Survival

In 2016, we located 12 nests by 11 females in Mount Grant and 15 nests by 13 females in Desert Creek (Figure 6). In Mount Grant, eight nests hatched and four failed. One female had a successful second attempt. In Desert Creek, nine nests hatched and six failed. One female had two successful hatches (the first brood failed before the 10-day post-hatch check) and one female had two nest failures. Daily nest survival was 96.7% (95% CI, 93.9 – 98.2%) and cumulative average nest survival probability for the 37-day egg laying and incubation phase was 28.5% (95% CI, 9.7 – 51.0%).

Brood Survival

In 2016, we monitored nine broods in Desert Creek and eight in Mount Grant. Of the Desert Creek broods, two were successful, two failed and five had unknown fates: one female slipped her collar while nesting and the other broods moved onto private property. In Mount Grant, one brood was successful, three failed, and four had unknown fates due to difficulty getting access to the Mount Grant mountain, and one brood moved onto private property. The 10-day interval brood survival probability was 91.3% (95% CI, 80.3 – 96.3%), and the cumulative average survival probability for the 50-day brood rearing period was 63.3% (95% CI, 33.3 – 82.7%). In Desert Creek, one female's first brood failed before the 20-day check. The female was observed on a second nest attempt during the 20-day check and the second nest hatched and became a successful brood. In Mount Grant, one female had a failed first nest attempt but successful second nest attempt, however, the brood failed.

In the Desert Creek study area, brood-rearing females near Desert Creek lek and Sweetwater #2 moved their broods onto private land. There were no known successful hatches near Wiley Ditch #2 and Wiley Ditch #3, however one collared female in that area was found with a successful brood at Jackass Flat. In the Mount Grant study area, the female with the only known successful brood was collared near China Camp #2. The female nested and reared a brood a short distance southwest of the lek. Two broods were located at Aurora and both failed. One brood was located near Nine-mile Ranch and also failed.

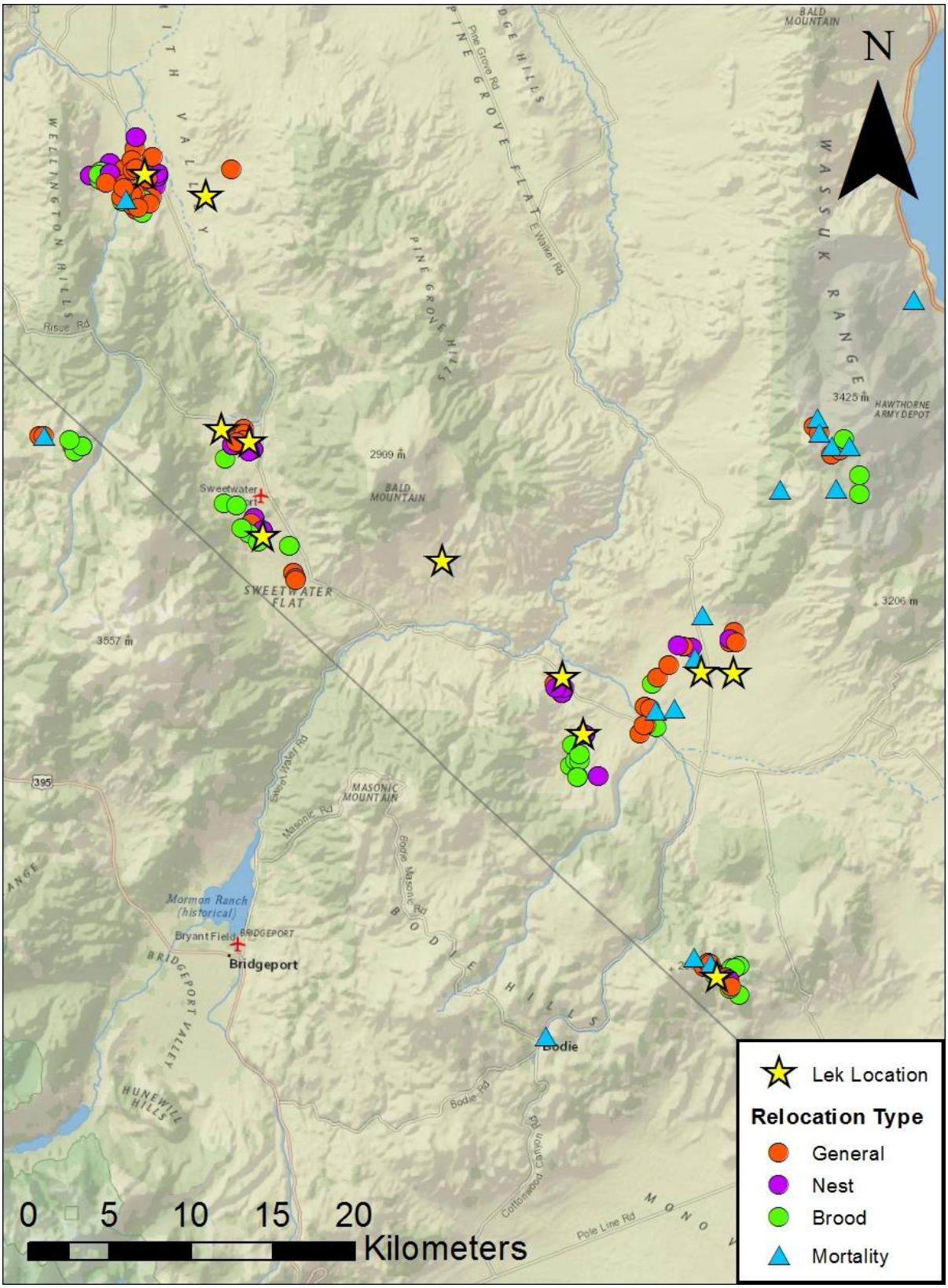

Figure 6. General, nest, brood and mortality locations of radio-marked sage-grouse in the Desert Creek and Mount Grant PMUs in Lyon and Mineral Counties, NV.

Sagehen Summit

In 2012, the Bureau of Land Management (BLM) Bishop Field Office initiated a monitoring effort of radio-collared Bi-State Greater Sage-grouse (SAGR) in order to better understand habitat use and population trends. The 2016 field season continued efforts to trap and monitor SAGR in multiple Population Management Units (PMU's) across the Bishop Field Office. This report is to focus on the Sagehen Summit population in the South Mono PMU. Other PMU monitoring reports for the Bodie PMU and Long Valley population of the South Mono PMU are available from the USGS for their monitoring efforts and field crews.

The 2016 field season of monitoring radio-collared SAGR began in mid-March and ended early-August. During this time of year critical data on breeding, nesting and brooding are collected but efforts are continued year round with aerial and ground monitoring as well. Ground monitoring efforts from March to August consisted of frequent visits to Sagehen Summit for location information. Monitoring efforts were implemented by one seasonal BLM employee, Ryan Spaulding and one full time BLM employee, Sheena Waters. Monitoring occurred predominantly on Bishop BLM land, as well as land owned by the Inyo National Forest. Again, radio-collared SAGR were monitored in several populations in the Bishop Field Office including Bodie, Long Valley and Sagehen but this report will focus only on the Sagehen Summit population.

Monitoring

Monitoring efforts for the radio-collared hens in Sagehen Summit took place using the collection and monitoring techniques established by the USGS in the 2015 General Information and Protocols for Field Operations and Monitoring by Coates et al. Equipment used during monitoring included Yagi 3-element antennas and CSI receivers. Radio-collared individuals were located weekly during the spring and summer season to determine hen status (location, nesting, active brood or mortality). In order to help augment ground based monitoring efforts, fixed-wing aerial telemetry monitoring took place monthly.

Nest Survival

Ground based radio telemetry was used to locate nests and brood during the spring season (Figure 7). The nest and brood success were measured across the Sagehen Summit PMU for radio-marked females during the 2016 field season.

Of the 9 collared hens, 6 initiated nests (67%). Two hens had failed nests, but reinitiated (14NV3932, 14NV3958, see table below). The hen collared with 14NV3932 initially failed but her re-nest was successful. Bird 14NV3958 was unsuccessful on initial nest where she abandoned all 8 eggs for unknown reasons; her re-nest of 7 eggs was depredated within 50 meters of her initial nest. Three of the nine collared hens had initial nest success (their first nest was successful) (525153, 14NV3954 and 14NV3937). The collar on 525153 died while she was sitting on her nest; once she hatched successfully, we were unable to track brood fate. Bird 14NV3934 was unsuccessful on her initial nest and never re-nested. Overall, apparent nest success in 2016 was 50% (4 of 8).

Nesting Habitat

A total of 7 nest plots were completed in 2016 in order to measure nest site habitat composition. Three of the 7 nests were located under mountain big sagebrush (43%), with another 2 nests (29%) occurring under mountain big sagebrush and antelope bitterbrush species mix and 1 nest found under antelope bitterbrush (14%) only. The majority of nesting habitat was the Mountain big

sagebrush; however, none of the hens that nested in mountain big sagebrush were successful. One individual (Band ID 14NV3954) successfully nested under dead shrub cover.

We followed the USGS sage-grouse habitat protocol for vegetation sampling. This protocol includes taking measurements at the nest and along three 25 meter transects. In these vegetation plots, random shrub heights were recorded along each transect line totaling 30 random heights per nest site. The average percent cover using the line intercept method was calculated. The Daubenmire method was also used, but this data was not summarized.

Discussion

The successful trapping in 2014 provided Bishop Field office with continued monitoring this season and provided new insight on sage-grouse use in the Sagehen Summit area. An aerial flight was conducted at sunrise in April 2016 in an effort to locate any new leks but the flight provided points of leks that were already in the database, no new areas were observed. In the future we plan to collar several more sage-grouse in an effort to locate other leks and collect further needed data to analyze their movements. Seven collared female sage-grouse remain in Sagehen Summit for collecting aerial data over winter.

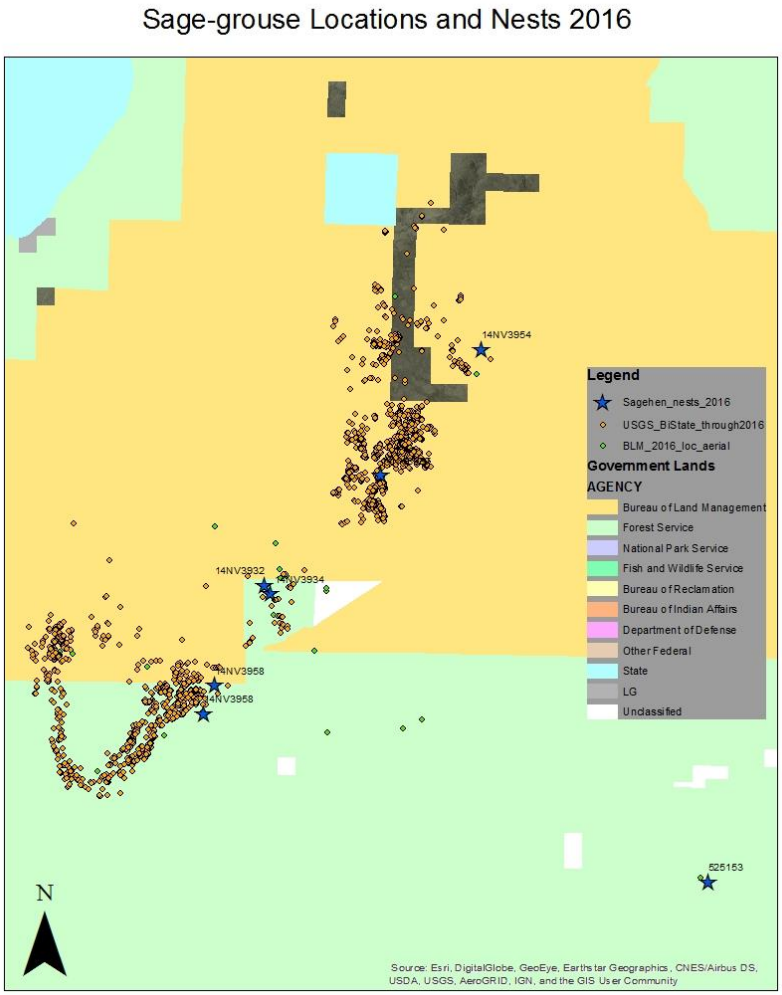

Figure 7. Sagehen Summit sage-grouse locations and nest sites (2016).

White Mountains

Initial capture and monitoring work took place during the early fall period of 2016. The USFS – Inyo NF personnel worked closely with USGS sage-grouse technicians to capture five female and three male sage-grouse and outfitted them with GPS/Satellite backpack transmitters (Figure 8). The birds were captured in the vicinity of Crooked Creek at an elevation of approximately 10,500 feet. Efforts were also made to locate and capture sage-grouse on the eastern foothills of the White Mountains (Trail Creek and also along the top of White Mountains from Wyman to Barcroft Research Laboratory), but were unsuccessful.

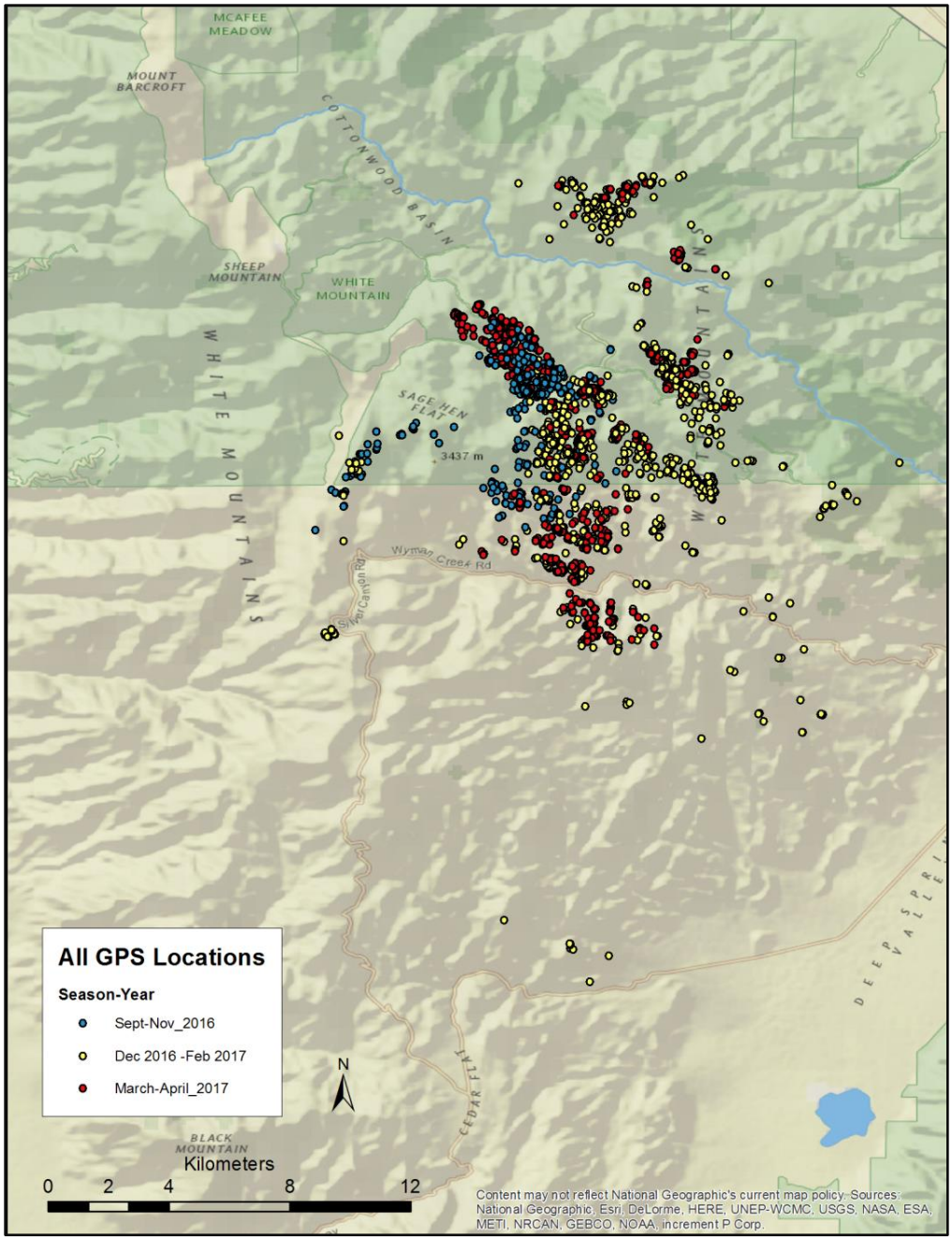

Figure 8. GPS locations of sage-grouse in the White Mountains during various seasonal periods in 2016 – 2017.

Vegetation Monitoring within the Bi-State Conservation Planning Area

The Nevada Partners for Conservation and Development (NPCD) is housed in and coordinated from the Nevada Department of Wildlife (NDOW). The mission of the NPCD is to implement habitat restoration projects and demonstrate the effectiveness of the projects. Currently, the NPCD is working on numerous habitat projects across northern Nevada and in the Bi-State sage-grouse PMUs. At a given habitat project site, the NPCD establishes numerous vegetation sampling locations both within the treatment and also in adjacent areas not intended to be treated. The non-treated sites serve as control sites against which the projects' results may be judged. Sampling is conducted prior to treatments to establish baseline conditions for as many years as possible in an effort to account for interannual climate variation, then the same sites are visited following treatments. The various comparisons between pre and post treatment sites as well as comparisons of treated-to-control sites allows for project effects to be determined.

Methods

In order to show project effects to the vegetation, the NPCD is implementing a statistically rigorous and ecologically meaningful monitoring protocol (Laycock 1987; Elzinga et al. 2000; Bestelmeyer et al. 2005; Forbis et al. 2007; Turner et al. 2010). The methods NPCD employs are consistent with the BLM's Assessment, Inventory and Monitoring (AIM) (Taylor et al. 2014), the USGS Chronosequence (Knustson et al. 2009), the BLM's Emergency Stabilization and Rehabilitation (ES&R) and the USFS's Burn Area Emergency Response (BAER) (Robichaud, Beyers and Neary 2000). The NPCD's methods are designed to be simple to replicate and require little or no expensive equipment in an effort to increase the likelihood for ongoing resampling of vegetation survey sites into the future. One requirement is that all personnel know the plant species in the area very well and the NPCD hires crews each year with these skills.

Survey crews navigate to sampling locations using GPS and GIS. Sampling sites consist of three 50 meter transects oriented at 0, 120 and 240 degree compass bearings. Once at the sampling location, all plants found within the perimeter of the site are identified to species. Photographs are taken along each 50-meter transect (Bonham 1989), foliar cover by species is measured via line point intercept along 50-meter transects (Canfield 1941) and the height of shrubs and perennial grasses/forbs is measured along each transect. Gaps in the perennial vegetation canopy are measured and a 2-meter X 50-meter belt transect is measured to count shrubs and trees and place individuals into various size categories (Elzinga, Salzer and Willoughby 2000). The measures employed provide a complete picture of the vegetation including species at each site, all noxious or other nonnative plants, percent cover of all species, structure (height) of the shrubs, and perennial understory and density by species (Daubenmire 1959; Elzinga, Salzer and Willoughby 2000; Bestelmeyer et al. 2005; Forbis et al. 2007).

2016 Results

Through 2016, the NPCD has surveyed approximately 500 plots across the Bi-State PMUs (Figure 9). Sampling was initiated in 2011 for the Pine Nut Mountains, Long Doctor Spring and the China Camp project sites. These project locations now have rich data sets showing pre- and post-treatment effects. Figures 10 and 11 show pre- and post-treatment photos in the Pine Nut and China Camp project areas. Preliminary analyses indicate an increase in perennial grass cover and abundance. 2014 and 2015 were drier winters and there has not been a change in perennial forb cover abundance. The relatively wet 2015-2016 winter provided sufficient moisture to show small increases in perennial

forb and grass cover and abundance. The 2016-2017 winter was record-setting in the nearby Sierra and it is likely the increases in perennial vegetation will continue. Since 2011, numerous projects have been proposed and are in various stages of planning and implementation. The NPCD is working to provide project effectiveness monitoring at as many projects as is practical. New sampling locations will be added in summer 2017 for upcoming treatments.

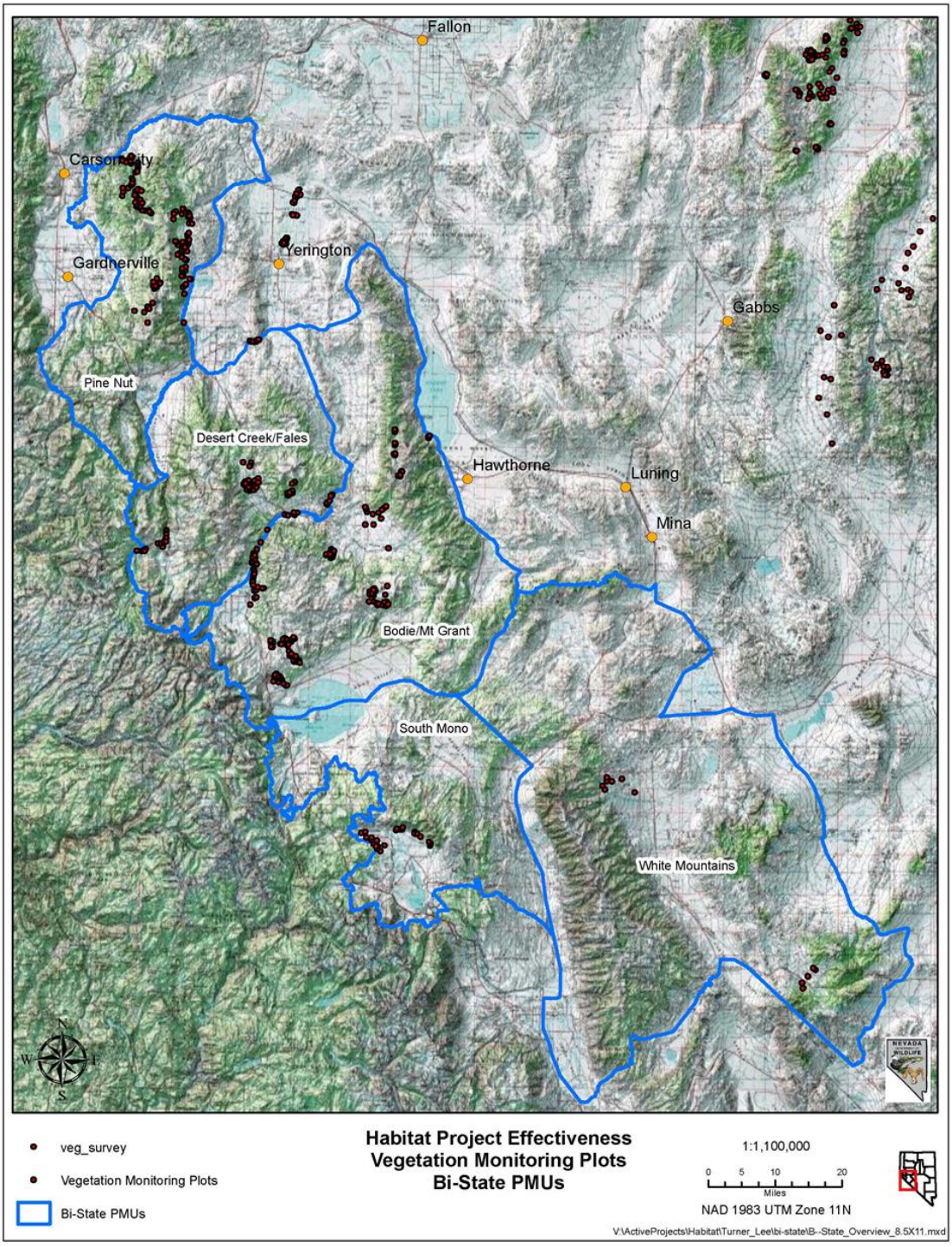

Figure 9. Habitat project effectiveness monitoring plots within Bi-State PMUs.

Figure 10. Pine Nut Mountains pinyon-juniper removal (PJ) project. Top photo shows Plot #18 in 2011 pre-treatment with phase II PJ. Lower photo is post-treatment from 2015 showing Plot#18. Preliminary analyses indicate an increase in perennial grass cover with little change in perennial forbs. It is likely there will be increases in both perennial grass and forb cover following the wet winters of 2015-2016 and 2016-2017.

Figure 11. China Camp Lek sites pinyon-juniper removal project. Top photo shows Plot #1 in 2011 pre-treatment with phase II PJ. Lower photo is post-treatment from 2016 showing Plot#1. Preliminary analyses indicate an increase in perennial grass, perennial forb and shrub cover.

Bi-State Livestock Grazing Assessment

For Grazing Year 2016 (March 1, 2016 - February 28, 2017) 64% of the grazing allotments in the Bi-State were grazed. Of the allotments grazed, 57% of the allotments are grazed by cattle and 43% grazed by sheep. A summary of the most current grazing allotments in the Bi-State indicates the following with respect to determinations as to whether or not allotments are meeting standards or equivalent (Table 5):

Table 5. Allotment evaluation results for upland and riparian portions.

	Meeting (Yes)	Not Meeting (No)	NA	% Meeting	% Not Meeting
UPLAND	100	12	37	89%	11%
RIPARIAN	59	29	61	67%	33%

There was a 1% increase in meeting standards on uplands and a 4% increase in meeting standards in riparian areas from last year.

Of those allotment not meeting upland rangeland health standards (n=12), 8 were making significant progress towards meeting those standards and 4 were not making progress. Of the 29 allotments where the riparian portion was not meeting rangeland health standards, 27 were making significant progress towards meeting those objectives while two were not. Not meeting standards included impacts from wild horses, PJ encroachment, current and historic livestock use, ongoing gully erosion issues, wildfire and land ownership. Management actions implemented to make progress included change in livestock management, wild horse gather, fence installation, and erosion control structures. Of those allotments not meeting standards for the upland, 58% have not had livestock grazing on them recently. Of those allotments not meeting standards in the riparian areas, 24% have not had livestock grazing on them recently.

References Cited

Bestelmeyer, B., Trujillo, D., Tugel, A., Havstad, K. 2002. A multi-scale classification lf vegetation dynamics in arid land: What is the right scale for models, monitoring and restoration. *Journal of Arid Environments* 65:296-318.

Bonham, C. 1989. Measurements for Terrestrial Vegetation, John Wiley and Sons, 338 p.

Canfield, R.H. 1941. Application of the line interception method in sampling range vegetation. J. Forestry 39:388-394.

Daubenmire, R. 1959. A Canopy-Coverage Method of Vegetational Analysis. Northwest Science 33;43-64.

Elzinga, C., Salzer, D. and Willoughby, J. 2000. Measuring and Monitoring Plant Populations. BLM Technical Reference 1730-1. BLM/RS/ST-98/005+1730.

Forbis, T., Provencher, L., Turner, L., Medlyn, G., Thompson, J. and Jones, G. 2007. A Method for Landscape-Scale Vegetation Assessment: Application to Great Basin Rangeland Ecosystems. *Rangeland Ecology and Management* 60:209-217.

Knutson, K., Pyke, D., Wirth, T., Pilliod, D., Brooks, M., and Chambers, J.2009. A chronosequence feasibility assessment of emergency fire rehabilitation records within the Intermountain Western United States—Final Report to the Joint Fire Science Program—Project 08-S-08: U.S. Geological Survey Open-File Report 2009-1099, 20 p.

Laycock, W.A. 1987. Setting Objectives and Picking Appropriate Methods for MonitoringVegetation on Rangelands. Rangeland Monitoring Workshop Proceedings. U.S. Department of Interior. Bureau of Land Management. Golden, CO.

Robichaud, P., Beyers, J. and Neary, D. 2000. Evaluating the effectiveness of postfire rehabilitation treatments. Gen. Tech. Rep. RMRS-GTR-63. Fort Collins: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 85 p.

Taylor, J., Kachergis,E., Toevs, Karl, G., Bobo, M., Karl,M., Miller,S., and Spurrier, C. 2014. AIM-Monitoring: A Component of the BLM Assessment, Inventory, and Monitoring Strategy. Technical Note 445. U.S. Department of the Interior, Bureau of Land Management, National Operations Center, Denver, CO.

Turner, L., Pellant, M., Pyke, D., Swanson, S., Chambers, J., Forbis, T. and Herrick, J. 2010. Nevada Partners for Conservation and Development Pre and Post Habitat Treatment Vegetation Sampling Protocol.