2019 BI-STATE SAGE-GROUSE ACCOMPLISHMENT REPORT

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PHOTO CREDIT

Photos provided by the following Bi-State partners: UC Davis-Gail Patricelli, Andrew Halloran. USGS-Mary Meyerpeter, Corrina Sanchez, Sam Lei, Hansen Tsai, Brooklyn Gingras, Santina Gallegos-Asimos, Brittany Hansey, Trent Binford-Walsh. USFS-Thomas Torres. GBI-Jessica Saenz. NDOW-Bobby Jones. Bi-State Coordinator Amy Sturgill. ESLT-Sus Danner. Bishop BLM Field Office.

Bi-State sage-grouse in flight during the spring of 2019

EXECUTIVE SUMMARY:

The 2012 Bi-State Action Plan (Action Plan) summarized prior conservation activities and established a road-map for the future conservation of the Bi-State sage-grouse. In 2014, federal, state, and other partner agencies established a $45 million-dollar commitment to ensure Action Plan implementation over 10 years. Each year, projects are implemented by the Bi-State Local Area Working Group (Bi-State LAWG), a diverse group of stakeholders made up of federal, state, and local government agencies, Tribal members and representatives, nonprofit organizations, and private landowners. In 2019, Bi-State LAWG partners allocated approximately $3.4 million dollars to Bi-State sage-grouse conservation efforts.

The objectives, strategies, and actions outlined in the Action Plan include population monitoring, habitat monitoring, and the implementation of a wide variety of conservation actions to maintain healthy sage-grouse populations and habitat in the Bi-State conservation planning area. Population monitoring includes sage-grouse capture, demographic and vital rate collection, and annual lek monitoring. The collection of these data provides information on habitat selection and utilization as well as factors influencing sage-grouse population trends. Vegetation monitoring is completed by the Nevada Partners for Conservation and Development (NPCD), their efforts aim to evaluate habitat quality and the effectiveness of completed conservation actions including post-fire restoration and conifer treatment. Finally, Action Plan directed conservation projects are carried out to address the following threats to Bi-State sage-grouse and their habitats:

- Wildfire
- Urbanization
- Conifer expansion
- Invasive species
- Infrastructure
- Loss of sagebrush/meadows
- Human disturbance
- Wild horse grazing
- Permitted livestock grazing
- Predation

In 2019, the U.S. Geological Survey (USGS) updated their Bi-State sage-grouse Integrated Population Model (IPM). This model predicted Bi-State sage-grouse abundance to be approximately 3,305 birds. The IPM analyzed three time periods representing various cycles. While populations have seen declines in the last 6 years, those declines were essentially offset by a previous period of growth between 2008 and 2011. Results indicate there is not evidence of population decrease or increase, suggesting a stable population of sage-grouse within the Bi-State. It is believed a majority of the Bi-State population occupies the Bodie Hills and Long Valley areas while populations in other PMUs may be experiencing declines (Coates 2019).

USGS research and population monitoring activities continued to better understand habitat use, seasonal movement, and demography. In 2019, a total of 73 birds were captured and fitted with VHF transmitters or GPS transmitters to aid in monitoring efforts in the Bodie Hills, South Mono, and White Mountains PMUs. Apparent annual survival for Bi-State sage-grouse was 75.2%, apparent nest success was 64.9%, and apparent brood success was 67.9%. Sage-grouse population vital rates for individual PMUs are detailed in this report.

A third year of translocation efforts was completed to bolster the Parker Meadow subpopulation of the South Mono PMU. A total of 20 sage-grouse (15 females, 5 males) were translocated from the Bodie Hills PMU. 10 females were translocated with broods while 5 were pre-nesting. Dispersal rate for birds translocated in 2019 was 15% and the survival rate increased to 80% compared to 50% in 2018. Probability of nest initiation for pre-nesting females was 40%, nest success was 100%, and brood success increased from 20% and 38% during the previous two years of translocation efforts to 83% in 2019.

Annual lek counts were conducted in all Bi-State PMUs. A total of 501 males were counted on 44 of the 78 leks surveyed in 2019. Lek attendance was down in each PMU, overall Bi-State lek attendance saw a 33.2% decrease compared to 2018 results. The majority of sage-grouse were observed in the Bodie Hills PMU and the Long Valley portion of the South Mono PMU. The highest lek attendance was observed at the Dry Lakes complex in the Bodie Hills (n=53), followed by Long Valley lek 2 (n=49), and Pine Grove lek in Desert Creek (n=46). Lek trends are reported for both the California and Nevada portions of the Bi-State and summaries are provided for individual PMUs. 2019 lek monitoring results were likely affected by above-average snowfall during the winter of 2018/2019. Late snow lingered into the spring season, creating access issues during the survey period. Some leks could not be viewed during their peak attendance period, this is especially true for the Bodie Hills PMU which accounts for the majority of birds observed on leks.

Vegetation monitoring of treatment and control sites was implemented by the NCPD through the Nevada Department of Wildlife (NDOW). In 2019, the NPCD monitored 93 plots across the Bi-State PMUs. Preliminary analysis suggests that species richness, sagebrush, perennial grass, and forb cover are elevated in treatment sites compared to control plots (Turner et al 2019).

Conservation actions to address identified threats to Bi-State sage-grouse and their habitats were carried out on approximately 13,000 acres in the Bi-State area. Projects completed by a wide variety of Bi-State partners are summarized in the following section.

Accomplishments completed to limit the loss of habitat resulting from wildfire include:

- targeted wildfire prevention and suppression
- post-fire rehabilitation,
- and fuel break maintenance.

To address the threat of urbanization and to maintain high quality, intact habitat conditions:

- the Wilderness Land Trust acquired two private parcels near Mormon Meadows totaling 960 acres in the Bodie Hills PMU.

To address the threat of conifer expansion into sagebrush systems:

- 8,704 acres of conifer treatment were completed in the Pine Nut, Desert Creek-Fales, and South Mono PMUs,
- 82 acres of conifer treatment maintenance was completed on previously treated sites in the Pine Nut PMU,
- and NEPA analysis was completed for a 4,600-acre project in the Mount Grant PMU that will be implemented in 2020.

To maintain healthy sagebrush and meadow systems numerous projects were implemented including:

- stream restoration, meadow irrigation,
- Proper Functioning Condition (PFC) surveys and assessments,
- and the development of a water allocation strategy for the Long Valley portion of the South Mono PMU.

To limit invasive and noxious weeds:

- 321 acres of chemical and mechanical treatment were completed in the Pine Nut, Desert Creek-Fales, Mount Grant, and South Mono PMUs.

Infrastructure and impacts from human disturbance were addressed through the following efforts:

- 14.3 miles of fencing removed, converted, marked, or mapped in the Pine Nut, Mount Grant, South Mono, and Bodie Hills PMUs,
- and recreation monitoring and restoration projects were completed in the Long Valley portion of the South Mono PMU.

To address habitat degradation associated with wild horse and permitted livestock grazing:

- the Carson City BLM District Office organized and implemented a wild horse gather of 404 horses to maintain Appropriate Management Levels (AML) in the Pine Nut Mountains Wild Horse Herd Management Area (HMA),
- and grazing management tactics to improve sage-grouse habitat were employed across 1,127 acres of private land in the Bodie Hills PMU.

In addition to these conservation projects aimed at alleviating threats, several accomplishments were completed that provided support to the Bi-State sage-grouse conservation effort. Some highlights include:

- four Executive Oversight Committee (EOC) meetings,
- six Technical Advisory Committee (TAC) meetings,
- 12 Bi-State Tribal Natural Resource Committee (BTNRC) meetings,
- one Bi-State LAWG meeting,
- volunteer stewardship days,
- public education and outreach efforts,
- and improved regulatory mechanism through the completion of Inyo National Forest's Land Use Management Plan revision.

Completed monitoring and conservation actions often build upon efforts completed in previous years. They expand our knowledge of population demographics, measure ecosystem health, improve collaborative efforts, and provide ecological benefits to Bi-State sage-grouse. The 2019 Bi-State Accomplishment Report will summarize population monitoring, habitat monitoring, and conservation action efforts implemented during the year to benefit sage-grouse populations and the habitats they depend on. Understanding what has been completed each year aids Bi-State partners in developing a plan of work and prioritizing projects for the upcoming year.

Bi-State habitat, partners, and sage-grouse

INTRODUCTION

The Bi-State Local Area Working Group (Bi-State LAWG) was formed in 2002 to establish a landscape-level approach to conservation and management of the Bi-State greater sage-grouse distinct population segment (Bi-State DPS). This diverse group of stakeholders includes, federal, state, and local government agencies, Tribal members and representatives, non-profit organizations, and private landowners.

This group has been striving to implement a collaborative approach to sage-grouse conservation and management for nearly twenty years and has been lauded nationally as a model of collaborative conservation success. Together they developed the first Bi-State sage-grouse conservation plan in 2004. In 2012, the Bi-State LAWG organized a planning and strategy approach to build and improve upon the multi-pronged effort to affect the conservation of the Bi-State DPS. While an important milestone, it was not the beginning of the Bi-State LAWG's effort but a continuation of efforts that began a decade before. Encouraged by a potential listing of the species under the Endangered Species Act, the Bi-State LAWG set out to re-evaluate threats to Bi-State sage-grouse and identify tangible on-the-ground actions to alleviate these concerns. This effort culminated in the 2012 Bi-State Conservation Action Plan (Action Plan), which provides a 10-year adaptable scope of work, grounded in the best available science and supported by funding commitments provided by local, state, and federal agency partners. The Action Plan summarized relevant threats and prior conservation efforts and outlined a comprehensive set of strategies, objectives, and actions designed to achieve conservation of sustainable populations and habitats for the Bi-State DPS (Bi-State TAC, 2012).

In 2019, Bi-State sage-grouse were designated as proposed threatened and 1.3 million acres of their habitat designated proposed critical habitat under the Endangered Species Act (ESA) after a 2018 court ruling overturned the 2015 decision not to list the bird. As a result of this ruling, USFWS was required to re-analyze their previous decision and to post a final decision in the Federal Register by April 1, 2020. Despite the uncertainty regarding the designated status of the bird, Bi-State partners continued to put into effect the strategies and objectives outlined in the Action Plan. The purpose of this report is to provide an annual summary of Bi-State Action Plan implementation in 2019, which includes population monitoring, vegetation monitoring, and the implementation of a wide variety of habitat improvement and conservation projects.

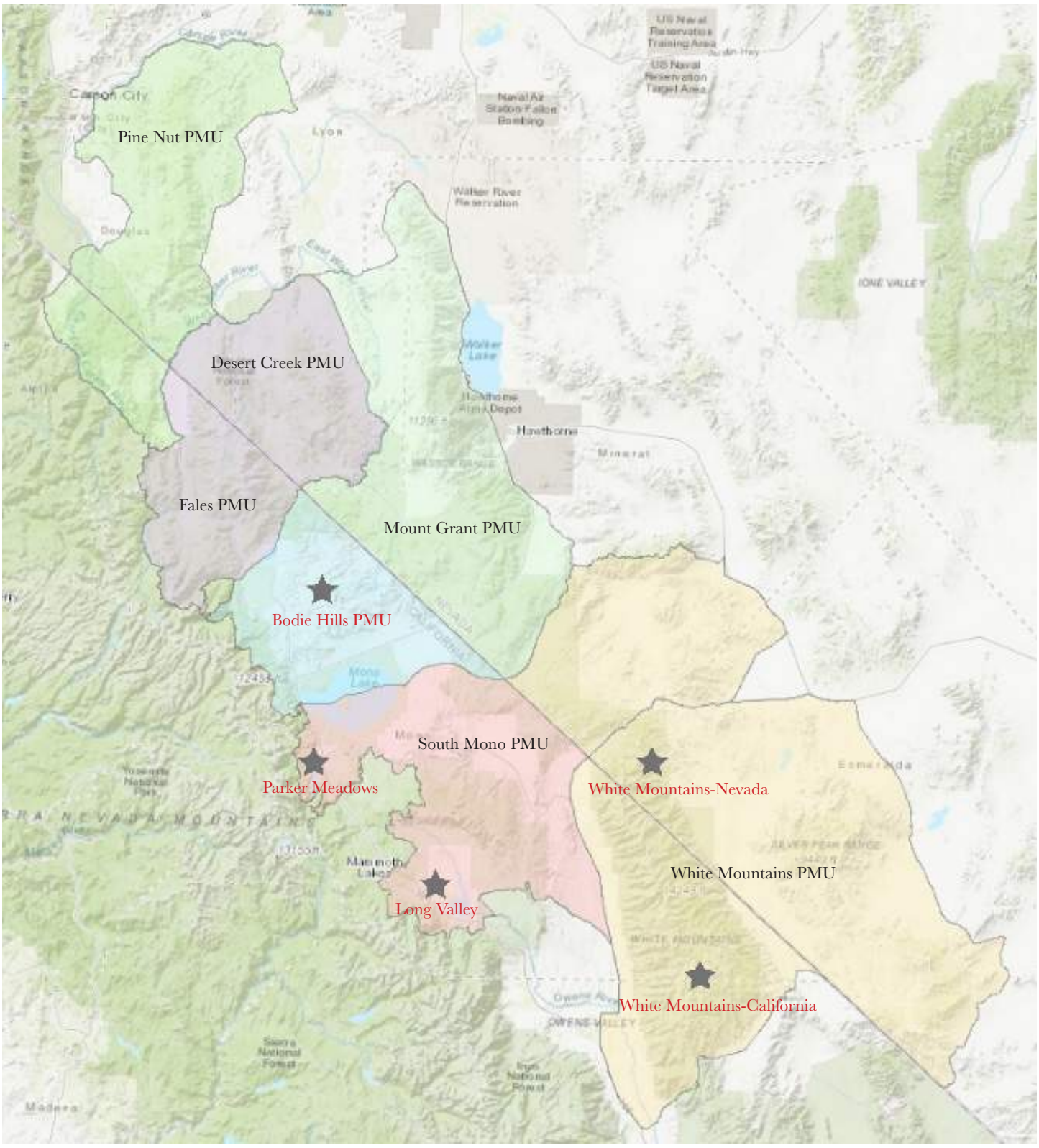


Figure 1: Bi-State Population Management Units. Populations monitored in 2019 are in red

Parker Meadow monitoring efforts

POPULATION MONITORING

There are six Population Management Units (PMUs) within the Bi-State, including the Bodie Hills, Desert Creek/Fales, Mount Grant, Pine Nut, South Mono, and the White Mountains. Research and monitoring projects detailed in the Action Plan include telemetry, habitat, and vital rate data collection and the coordination of annual lek counts to better understand population demographics and improve predictive models and adaptive management capabilities.

Through an established monitoring plan, birds from scheduled PMUs are captured each year in the spring and fall seasons and fitted with Very High Frequency (VHF) transmitters or Global Positioning Satellite (GPS) transmitters. Body measurement data is collected during capture and sage-grouse movement and survival is tracked in the consecutive years. Intensive monitoring is conducted during the nesting and brood-rearing periods to track reproduction and recruitment (Mathews et al., 2018).

In 2019, capture and monitoring efforts took place in the Bodie Hills, South Mono, and White Mountains PMUs. A total of 73 birds were captured and monitored throughout the year (Table 1). This report includes vital rate summaries for the individual populations monitored as well as the Bi-State population as a whole (Table 2). Vital rates summarized include apparent survival rate, apparent nest success (at least one egg hatching), and apparent brood success (at least one chick surviving to 35 days post-hatch). A third year of translocations to strengthen the Parker Meadows population was completed and subsequent monitoring was conducted to measure the efficacy of these efforts. Additionally, annual lek counts were completed in all PMUs within the Bi-State area. Finally, the USGS completed analyses that include an integrated population model (IPM) that summarizes demographic rates and factors affecting sage-grouse populations in individual PMUs. This report will summarize the results of these annual research, monitoring, and management efforts.

Please note these data are preliminary, and subject to revision. The authors of these data require that users direct any questions on appropriate use or assistance with understanding the limitations and interpretation of the data to the USGS.

PMU	Total Capture	Male	Female	GPS	VHF
Bodie Hills	37	6	31	6	31
South Mono	10	0	10	0	10
White Mountains-CA	17	2	15	3	14
White Mountains-NV	9	1	8	1	8
2019 Total	**73**	**9**	**64**	**10**	**63**

Table 1: 2019 Monitoring, bird capture, and collar deployment summary

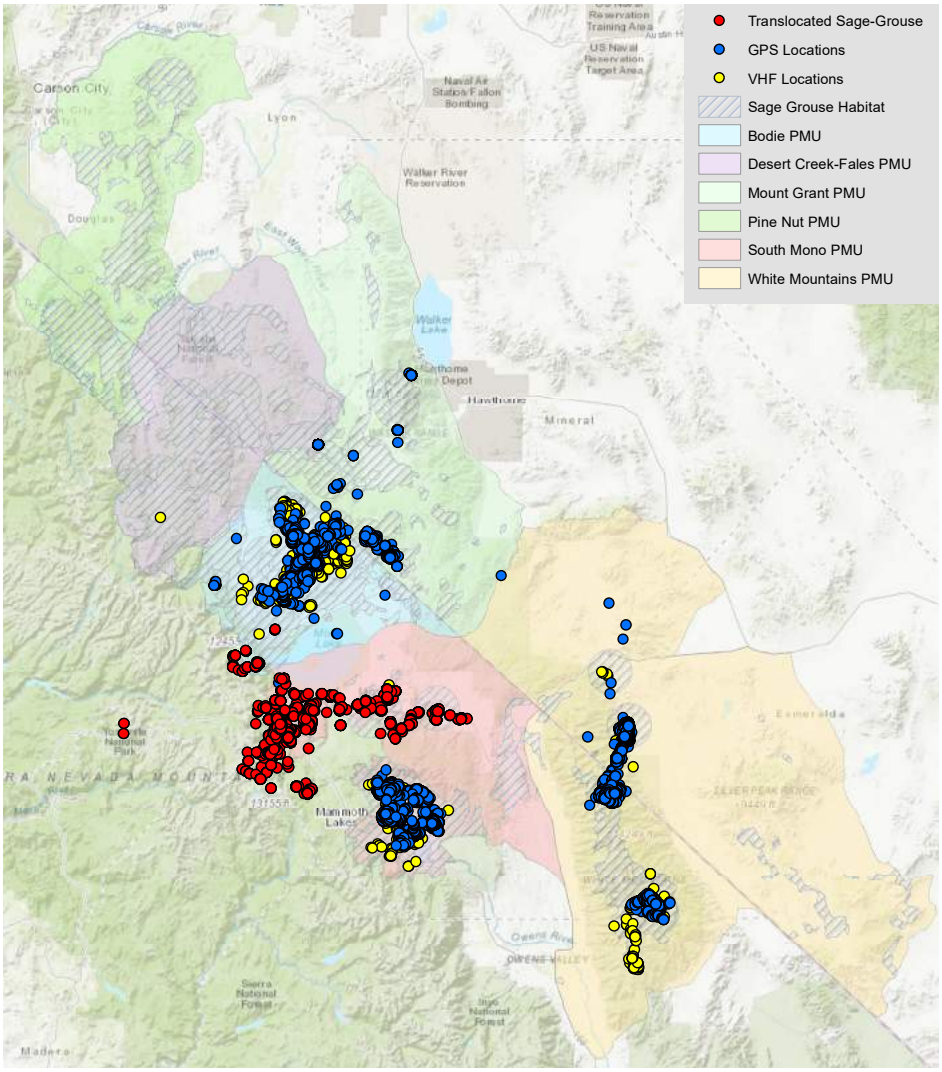


Figure 2: Key habitat identified by utilization distribution and resource selection function models and VHF and GPS locations of all captured birds in 2019

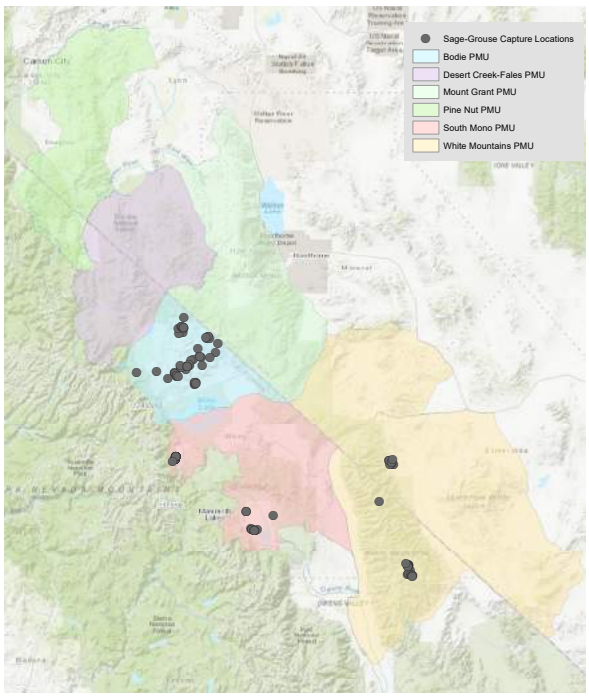


Figure 3: 2019 sage-grouse capture locations

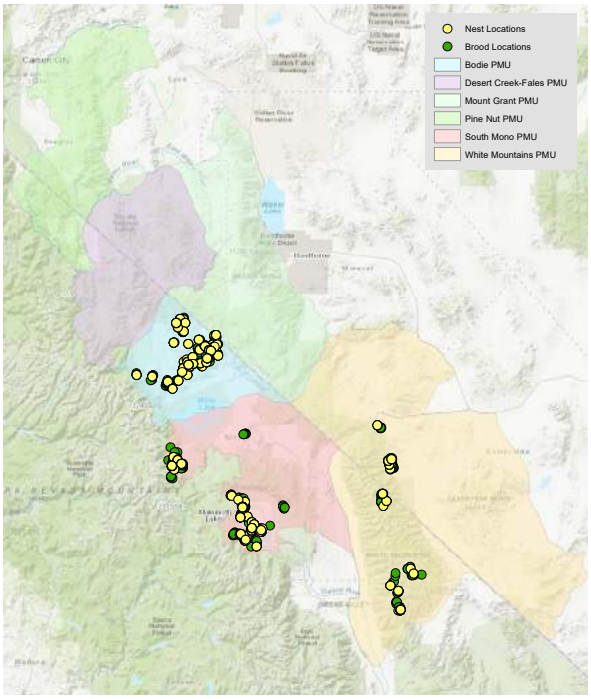


Figure 4: 2019 nest and brood locations

Bi-State sage-grouse telemetry efforts

Bodie Hills Capture & Monitoring Summary

The following summary represents capture and monitoring results from data collected during the 2019 field season within the Bodie Hills PMU. A total of 37 birds (31 females/6 male) were captured during the spring season, 31 were outfitted with VHF transmitters and 6 with GPS transmitters to track movement and monitor survival (Table 1). Ten of these birds (5 females/5 males) were translocated from the Bodie Hills PMU to Parker Meadows immediately after capture. An additional 10 females that had been captured before 2019 were translocated to Parker Meadows with their broods (a total of 70 chicks). There were 57 birds monitored in 2019, which includes birds captured before 2019 still wearing functioning transmitters.

Apparent annual survival within this PMU was 56.1%. Forty four nests were monitored, apparent nest success was 61.4%. Eighteen broods where monitored, apparent brood success to 35 days was 44.4%. (Table 2). Annual mortalities totaled 25. At the time of this report, there are 32 collared sage-grouse in the Bodie Hills to assist in future population monitoring efforts.

PMU	Annual Survival	Nest Success	Brood Success
Bodie Hills	56.1%	61.4%	44.4%
South Mono (Long Valley)	81.4%	60.6%	73.9%
South Mono (Parker Meadow)	70.3%	75.0%	83.3%
White Mountains-CA	90.9%	87.5%	44.4%
White Mountains-NV	90.5%	64.3%	77.8%
All Bi-State PMUs	**75.2%**	**64.9%**	**67.9%**

Table 2: 2019 Bi-State sage-grouse apparent vital rates

White Mountains Capture & Monitoring Summary

The following summaries represent capture and monitoring results from data collected during the 2019 field season within the White Mountains PMU. Monitoring in the White Mountains PMU is divided into two sub-populations: White Mountains-California and White Mountains-Nevada. The White Mountains-California sub-population includes birds monitored in the southwestern portion of the White Mountains within the state of California, while the White Mountains-Nevada sub-population includes birds monitored in the northern portion of the White Mountains on both sides of the California-Nevada state line (Figure 1). Sage-grouse movement between these two sub-populations has been documented but capture and monitoring results will be summarized separately.

California

A total of 17 birds (15 females/2 males) were captured during the fall season, 14 were outfitted with VHF transmitters and 3 with GPS transmitters to track movement and monitor survival (Table 1). There were 44 birds monitored in 2019, which includes birds captured before 2019 still wearing functioning transmitters.

Apparent annual survival within this PMU was 90.9%. Eight nests where monitored, apparent nest success was 87.5%. Nine broods where monitored, apparent brood success to 35 days was 44.4% (Table 2). In the 2019 field season, more broods (n=9) were monitored than nests (n=8) in the White Mountains-California sub-population. This is attributed to a delayed field season start date due to access issues resulting from above average winter precipitation. By the time field crews were able to access monitoring sites, many nests had hatched and birds were noted to be with broods. There were four known mortalities in 2019. At the time of this report, there are 40 collared sage-grouse in the White Mountains-California sub-population to assist in future population monitoring efforts.

Nevada

A total of 9 birds (8 females/1 male) where captured during the spring season, 8 were outfitted with VHF transmitters and 1 with a GPS transmitter to track movement and monitor survival (Table 1). In total 21 birds were monitored in the White Mountains-Nevada sub-population in 2019, which includes birds captured before 2019 still wearing functional transmitters.

Apparent annual survival within this PMU was 90.5%. Fourteen nests where monitored, apparent nest success was 64.3%. Nine broods were monitored, apparent brood success to 35 days was 77.8%. (Table 2). Annual mortalities totaled 2. At the time of this report, there were 19 collared sage-grouse in the White Mountains-Nevada sub-population to assist in future population monitoring efforts.

South Mono Capture & Monitoring Summary

The following summaries represent capture and monitoring results from the Long Valley sub-population of the South Mono PMU as well as translocation and monitoring results from the Parker Meadow sub-population of the South Mono PMU.

Long Valley

A total of 10 birds (all female) were captured during the spring season and outfitted with VHF transmitters to track movement and monitor survival (Table 1). In total 43 birds were monitored in Long Valley in 2019, this includes birds captured before 2019 still wearing functioning transmitters.

Apparent annual survival within this PMU was 81.4%. Thirty three nests where monitored, apparent nest success was 60.6%. Twenty three broods where monitored, apparent brood success to 35 days was 73.9%. (Table 2). Annual mortalities totaled 8. At the time of this report, there are 35 collared sage-grouse in the Long Valley sub-population to assist in future population monitoring efforts.

Parker Meadows

One management action outlined in the Action Plan is the addition of birds through translocation from other PMUs to critically small and isolated sub-populations. Translocations are designed to 1) bolster population size to reduce the likelihood of local extinction that would negatively impact the overall stability and persistence of the Bi-State DPS; and 2) infuse genetic variation to rescue this population from the harmful effects of low genetic diversity and inbreeding depression. Population monitoring highlighted the ongoing decline of the Parker Meadow sub-population within the South Mono PMU. After three years of planning, initial translocation efforts began in 2017. 2019 marked the third year of completed translocation efforts to strengthen the Parker Meadows sub-population.

Through this effort to increase genetic diversity and to augment the Parker Meadows sub-population, a total of 169 sage-grouse have been translocated from the Bodie Hills PMU to Parker Meadows. This includes adult sage-grouse and chicks translocated as brood members. Translocation success varies year to year as demographic rates and dispersal rates vary annually (Table 3).

In 2019 a total of 20 birds (10 females with broods/5 pre-nesting females/5 males) were translocated from the Bodie Hills PMU. Fifteen were outfitted with VHF transmitters and 5 with GPS transmitters to track movement and monitor survival. In total there were 37 birds monitored in Parker Meadows in 2019, which includes birds translocated in previous years still wearing functioning transmitters. Apparent annual survival within this PMU was 70.3%. Twleve nests where monitored, apparent nest success was 75.0%. Nineteen broods where monitored, apparent brood success to 35 days was 83%. Annual mortalities totaled 11. At the time of this report, there were 26 collared sage-grouse in the Parker Meadow sub-population to assist in future population monitoring efforts.

Parker Meadow brood translocation

2017	2018	2019
28 (20 FEMALES/8 MALES) TRANSLOCATED SAGE-GROUSE	20 (13 FEMALES/7 MALES) TRANSLOCATED SAGE-GROUSE	20 (15 FEMALES/5 MALES) TRANSLOCATED SAGE-GROUSE
37% (13 STAYED/14 LEFT) DISPERSAL RATE	13% (17 STAYED/3 LEFT) DISPERSAL RATE	15% (16 STAYED/4 LEFT) DISPERSAL RATE
19% ANNUAL SURVIVAL	50% ANNUAL SURVIVAL	80% ANNUAL SURVIVAL
21% PROBABILITY OF NEST INITIATION	46.2% PROBABILITY OF NEST INITIATION	40% PROBABILITY OF NEST INITIATION
100% NEST SUCCESS	100% NEST SUCCESS	100% NEST SUCCESS
20% BROOD SUCCESS	38% BROOD SUCCESS	83% BROOD SUCCESS
6 MALES ON LEK	18 MALES ON LEK	8 MALES ON LEK

Table 3: Parker Meadow translocation results summary

Long Valley lek survey in the South Mono PMU

LEK MONITORING

Overview

Each spring Bi-State partners collaborate to monitor known leks to count sage-grouse when they congregate and visibly display on lekking grounds. These counts generate annual population estimates which help Bi-State partners understand population trends over time. These population trends are cyclical and count results fluctuate year to year. To determine long-term trends, annual lek count data is incorporated into an Integrated Population Model which accounts for low counts or leks not counted and generates modeled population estimates.

Lek Status

Within the Bi-State area, there are a total of 101 documented lek locations between California and Nevada, of which 49 are considered currently active (Figure 5). The active lek status is defined by two or more males present for at least two of five recorded years (Connelly et al., 2003). The total number of documented leks may be somewhat misleading due to the presence of "satellite leks" within many of the PMUs. Satellite leks are small leks that often occur near larger active leks during years of relatively high abundance. The "active" definition is sometimes difficult to apply to satellite leks that are utilized sporadically and do not persist each year. State agencies including NDOW and CDFW are currently working on delineating satellite leks as autonomous or connected, thereby removing some uncertainty surrounding lek counts as an index of population change.

2019 Lek Survey Summary

In 2019, 78 leks were surveyed across the Bi-State area. Males were detected on 44 of the 78 leks surveyed. A total of 501 males were counted on surveyed leks compared to 754 in 2018. This represents a 33.6% decrease in male lek attendence compared to 2018 counts. In California, peak day counts were down 41.2% from peak day counts conducted in 2018 (Figure 6). In Nevada, average males on lek declined 5.9% from the 2018 average and 34.1% from the long term average (Figure 7).

2019 lek monitoring results were likely affected by an above average snowfall during the winter of 2018/2019. In many areas snow pack persisted into the spring in depths higher than average shrub height. Some leks, especially in the Bodie Hills PMU, were inaccessible until late in the spring due to lingering snow and may have been surveyed outside of the peak period. Therefore, 2019 reported results may misrepresent the actual number of males on leks in the Bi-State area.

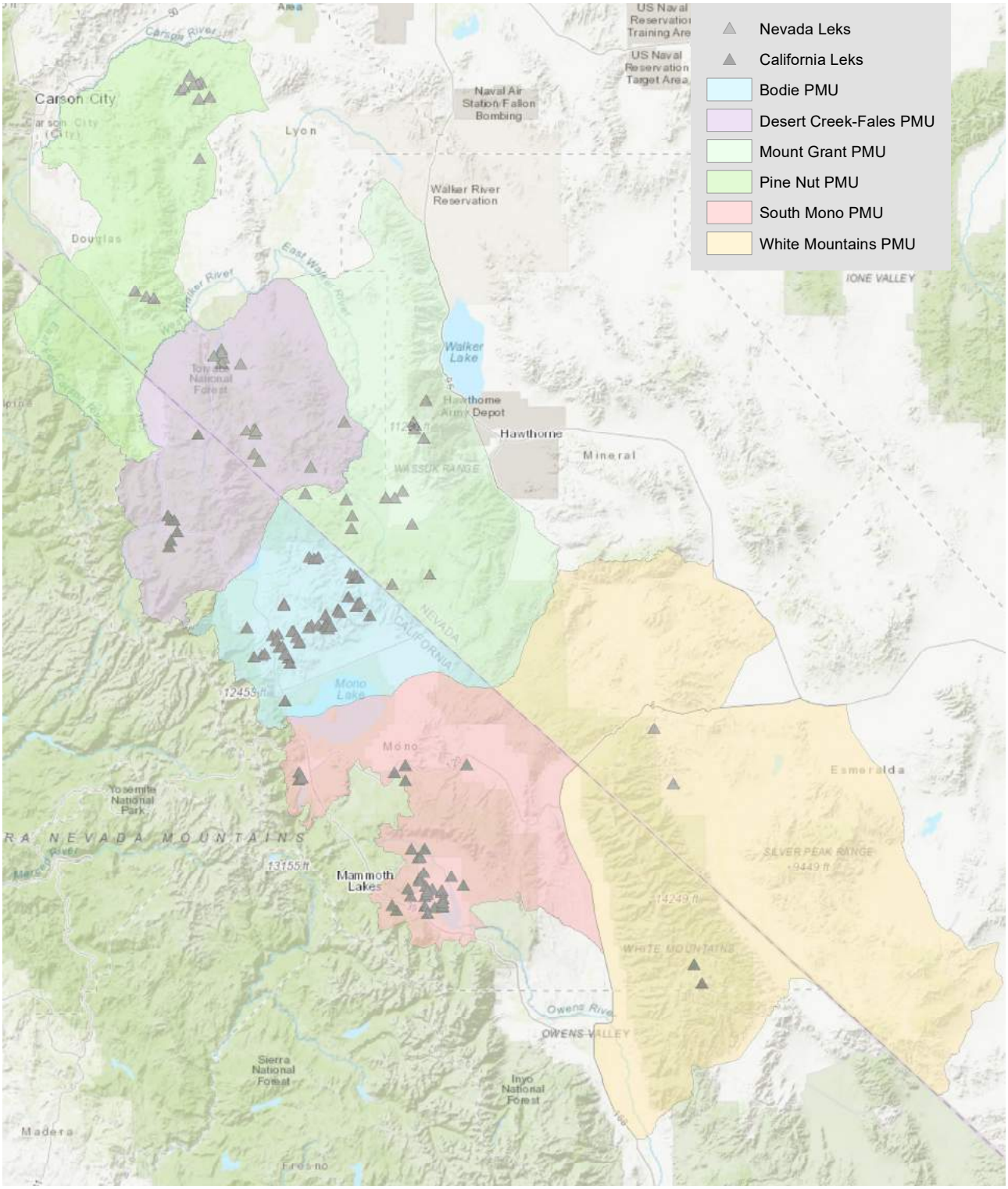


Figure 5: Known Bi-State lek locations

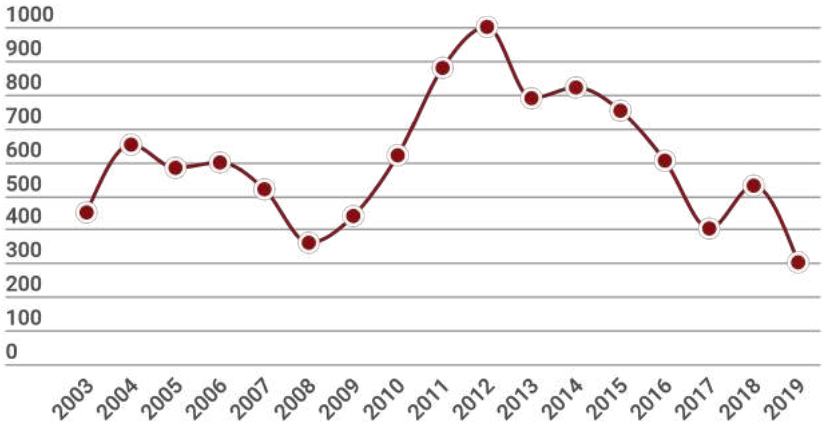


Figure 6: Male lek attendance in the California portion of the Bi-State

California Lek Surveys

California sage-grouse lek counts were conducted from March 14-May 29, 2019 via ground survey methods conducted by personnel from CDFW, USFS, USGS, LADWP, BLM, Mono County, and others. The primary method used to obtain lek count data in California involves saturation counts which is the simultaneous survey of all leks within a breeding complex on a minimum of three separate days spaced throughout the survey period. The peak male count is represented by the survey having the highest cumulative number of grouse counted on all leks within a breeding complex on any one day.

In 2019, 50 leks were monitored in the California portion of the Bi-State. Males were observed on 27 of the 50 leks surveyed. From peak counts, a total of 301 males were observed on leks. Most birds (95%) were observed in the Bodie Hills (60.1%) and the Long Valley (34.9%) breeding complexes. 2019 counts represent a 41.2% decrease from 2018 peak day counts and a 24.8% decrease from peak day counts in 2017 (Figure 6). However, 2019 peak counts may misrepresent the actual number of males on leks since some leks could not be viewed at their peak due to heavy snow and access issues during the survey period, especially in the Bodie Hills PMU which accounts for the majority of birds observed on leks. The following section summarizes lek count information for individual Population Management Units in the California portion of the Bi-State.

Bodie Hills

Lek counts occurred in the Bodie Hills PMU between April 23 and May 29, 2019. During March and most of April, upper elevation leks were mostly inaccessible due to snow. Therefore, saturation counts only took place in the Bodie Hills PMU on April 25, May 9 and May 15. Birds observed in the Bodie Hills PMU account for 60.1% of all males counted in the Bi-State. A total of 19 leks were surveyed in the Bodie Hills, 12 of which had birds present. Peak lek counts occurred on May 9th when a total of 181 males were observed on surveyed leks. This is a 43.3% decrease from 2018 counts (319 males) and a 5.7% decrease from the long-term average in the Bodie Hills PMU (192 males).

Fales

In 2019, four leks were surveyed between April 11 and Arpil 30, 2019. Peak count occurred on April 22 when 5 birds were observed on two leks in the Fales PMU. 2019 counts represent a decrease of 83.9% from counts completed in 2018 (21 males). This decrease is cause for concern and has sparked conversations among members of the Technical Advisory Committee regarding the need to consider future translocation efforts in the Fales PMU.

Long Valley

Lek counts occurred in the Long Valley portion of the South Mono PMU between April 3 and May 15, 2019. Birds were detected on 10 of the 22 surveyed leks. Six saturation counts were completed during the survey period. Peak count occurred on April 17 when 105 males were counted. 2019 counts represent a 45% decrease from 2018 counts (152) and a 48.5% decrease from the long-term average in the Long Valley breeding complex (216 males).

Parker Meadow

There is one known lek in the Parker Meadow sub-population of the South Mono PMU. This lek was surveyed from March 14 to May 21, 2019. Peak count was observed on April 5 when 8 males were counted. Total males on lek in 2019 represents a 55.6% decrease from 2018 counts (18 males).

South Mono

Four additional leks in the South Mono PMU were surveyed outside of the Long Valley and Parker Meadows areas, all were inactive during the 2019 lek season.

White Mountains-California

Lek counts were not completed on the California portion of the White Mountains-California PMU in 2019 due to heavy snow and an inability to access lek sites during the lekking season.

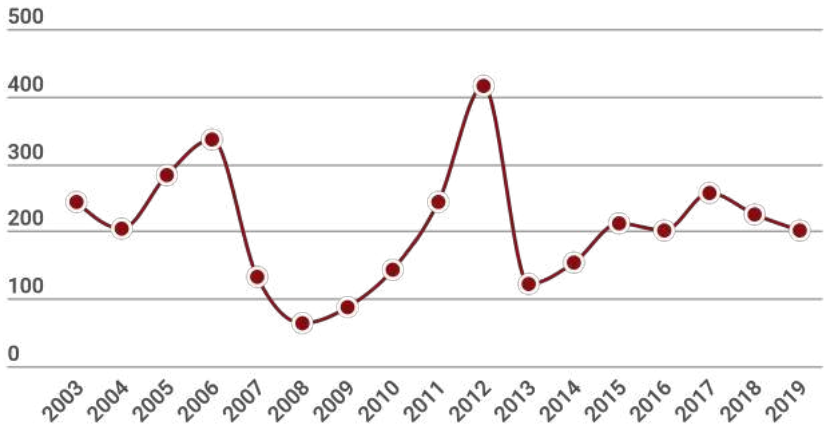


Figure 7: Male lek attendance in the Nevada portion of the Bi-State

Nevada Lek Surveys

Lek counts in the Nevada portion of the Bi-State were completed during the months of March, April, and May in 2019. Counts were conducted by NDOW, USFS, BLM, USGS personnel, and volunteers using on-the-ground survey and aerial survey methods. Because many leks in Nevada are remote in nature and difficult to access, saturation counts are not attempted.

There are 44 known active leks in the Nevada portion of the Bi-State area. In 2019, 28 were surveyed through 75 counts, 7 of which were conducted by helicopter. Males were detected on 17 of the 28 leks surveyed. The largest number of males were observed at the Pine Grove lek in the Desert Creek PMU (n=46). Average male attendance for active leks in 2019 was 11.8 males per lek. This average is down 5.9% from the 2018 attendance rate (12.8 males per active lek) and down 34.1% from the long-term average recorded since 2000 (17.9 males per active lek) (Figure 7). Heavy snow pack is suspected to have influenced counts and peak lek period may have been missed at some sites. The following section summarizes lek count information for individual Population Management Units in the Nevada portion of the Bi-State.

Pine Nut

There are 13 known possible lek locations with 3 leks classified as active and 1 lek in "pending" active status in the Pine Nut PMU. In 2019, NDOW conducted aerial infrared surveys on March 31 and April 1. Two additional aerial surveys were completed in April. Twelve females were located near the South Pine lek #1; however, no birds were detected around Mill Canyon or Mill Canyon dry lake. Between on-the-ground and aerial surveys, there were a total of 5 birds documented around the Buckskin lek 1 and lek 2.

Mount Grant

There are 15 known lek sites in the Mount Grant PMU, consisting of 9 active and 2 pending active leks. In 2019, 12 leks were surveyed. A total of 62 birds were documented on 7 leks. The Aurora lek had zero males in attendance during the aerial survey, which could be attributed to the heavy snow cover that remained into the spring season. Additionally, the Rough Creek lek high count was 31 males, which is down from 41 in 2018.

Desert Creek

There are 16 known lek sites within the Desert Creek PMU consisting of 7 active and 3 pending active status leks. In 2019, 11 were surveyed. A total of 129 birds were documented on 7 leks. Interestingly, Sweetwater lek #2, which previously had no males detected in 2010, 2012 and 2015, had a count of 31 males in 2019 which is the highest count recorded since 2006. The Pine Grove lek #1 count was 46 males, which is down from 58 in 2018 but remains higher than counts in 2016 and 2017. The Wiley Ditch lek #1 count was 19 males, which is equal to high counts from the previous two years and remains the highest counts recorded since counts completed in 1987.

White Mountains-NV

Monitoring efforts in the White Mountains-Nevada PMU have only begun recently. There are two known lek locations. Both were monitored, with a total of 3 birds documented on one lek.

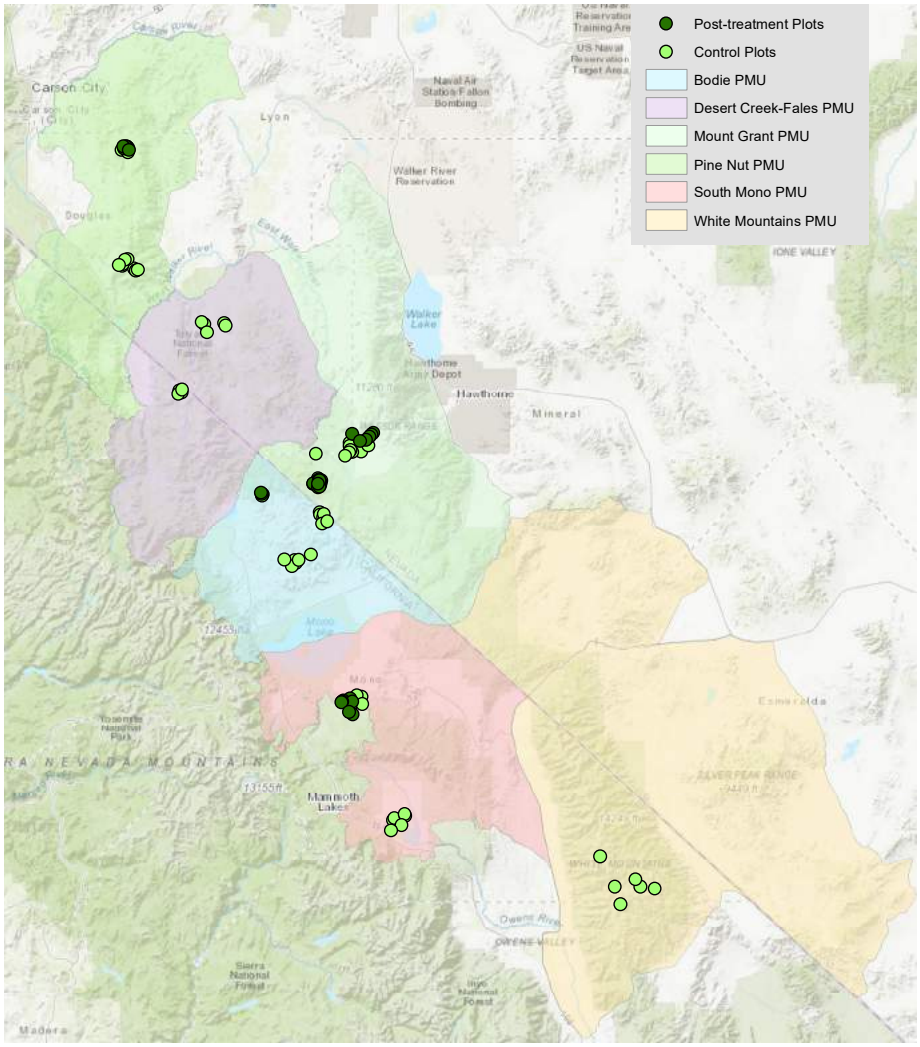
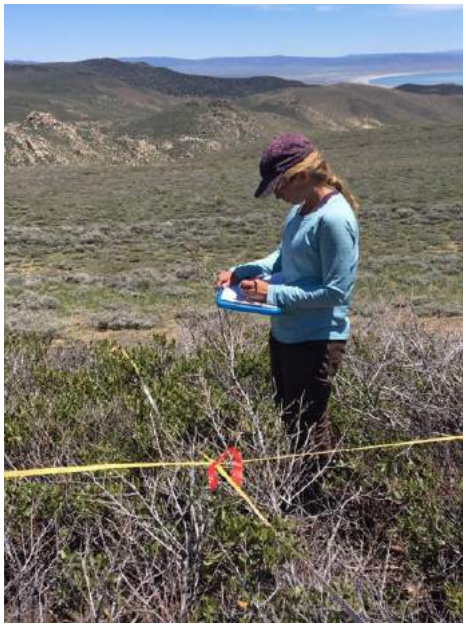


Figure 8: Vegetation monitoring plots completed in 2019



Bi-State vegetation monitoring

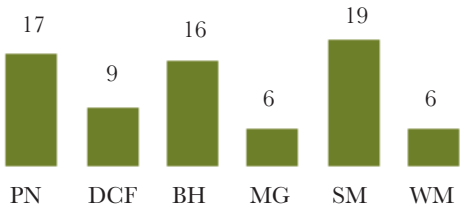


Figure 9: Completed vegetation monitoring plots

HABITAT MONITORING

In 2011, the Nevada Partners for Conservation and Development (NPCD), housed within the Nevada Department of Wildlife (NDOW), initiated a long-term habitat restoration and monitoring project across the Bi-State to quantify the effects of conifer removal and fire restoration treatments on overall habitat health. Since then, they have collected vegetation data across numerous sites within the Bi-State sage-grouse PMUs.

In areas identified for conifer removal and at sites that have experienced episodes of wildfire, the NPCD establishes monitoring plots both within and outside of treatment and wildfire boundaries. Sampling is conducted before treatment to establish baseline conditions and sites are revisited post-treatment to determine conifer treatment and fire restoration effectiveness. Plots outside of treatment and wildfire boundaries serve as controls against which the restoration projects' effectiveness can be compared.

In 2019, 93 vegetation plots (60 control plots/33 treatment plots) were monitored across the Bi-State in all PMUs, 73 of which were newly established this year (Figures 8 and 9). Each year the NPCD implements a statistically rigorous and ecologically meaningful protocol to measure vegetation response to treatment including changes in sagebrush cover, perennial grass cover, species richness and presence of non-native and invasive species. Vegetation response to treatment is often slow and continued analyses are needed; however, preliminary results reported in the Bi-State Habitat Restoration Monitoring Report suggest that species richness, sagebrush, perennial grass, and forb cover are often elevated in treatment plots compared to control plots. Nonnative cheatgrass cover and abundance have been variable where conifer removal or wildfire has occurred. Long and short-term studies following restoration efforts have shown that seasonal variation in cheatgrass is tied to the previous 1-3 years precipitation totals (Holmgren 2006; Pilloid et al 2017).

The NPCD will continue to monitor plots to collect data in all areas that have been identified for treatment or restoration. Future analyses are expected to provide strong evidence that sagebrush restoration techniques, such as conifer treatment and wildfire rehabilitation, provide ecological benefits to sage-grouse.

Bi-State conservation efforts

CONSERVATION ACTION IMPLEMENTATION

Background

The Action Plan was written in 2012 to provide a road-map to conservation for the Bi-State DPS. It called out priority actions deemed necessary to protect both sage-grouse populations and their habitats. In each Population Management Unit, threats were identified and ranked. Projects in the Action Plan sought to implement a coordinated interagency approach, incorporate science-based adaptive management, increase regulatory mechanisms, minimize and eliminate risk, improve and restore habitat, monitor populations and maintain stakeholder involvement. At every step it was assumed that projects would be altered or added as 1) priorities change based on new information; and 2) new priorities occur that were unknown when the Action Plan was written. Since the establishement of this plan, Bi-State LAWG members have been working to implement the outlined strategies, objectives, and actions.

In 2014, agency partners announced a $45 million dollar commitment to implement the Action Plan over a 10-year period. These letters were updated in 2019 to extend an additional five years, an act that demonstrates the ongoing commitment to the conservation of Bi-State sage-grouse and their habitats. In 2019, partners spent approximately $3.4 million dollars in Action Plan implementation efforts

2019 Accomplishment Summary

Much has been accomplished since the implementation of the Action Plan in 2012. Each year projects outlined in the Action Plan are implemented utilizing a science-based adaptive management and collaborative conservation approach. In 2019, Bi-State partners completed numerous projects to address various threats to Bi-State sage-grouse (Figure 11). Identified threats include:

- Wildfire
- Urbanization
- Conifer expansion
- Invasive species
- Loss of sagebrush/meadows
- Infrastructure
- Human disturbance
- Predation
- Wild horse grazing
- Permitted livestock grazing

Work completed each year often builds upon accomplishments from previous years. Annual work plans are developed to guide project implementation efforts. Completed projects represent the highest priority actions in the Bi-State informed by research, a Conservation Planning Tool (CPT) developed by USGS, input from the Bi-State LAWG, and common sense realities of implementing projects.

The following pages outline actions completed in 2019 to address identified threats to Bi-State sage-grouse and their habitats as well as actions taken to implement a coordinated interagency approach, increase regulatory mechanisms, and maintain stakeholder involvement.

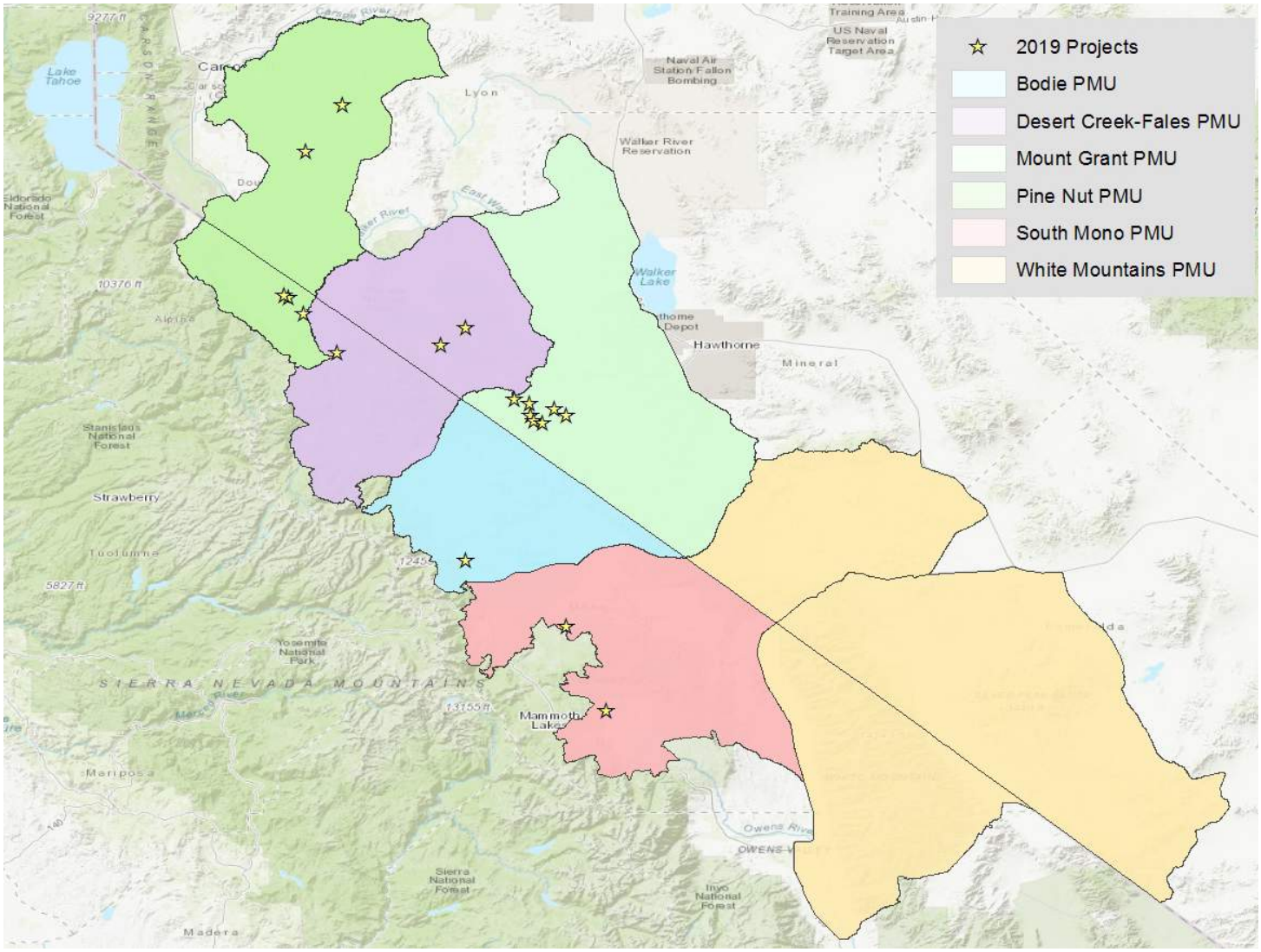


Figure 10: Completed conservation projects (projects containing spatial data only)

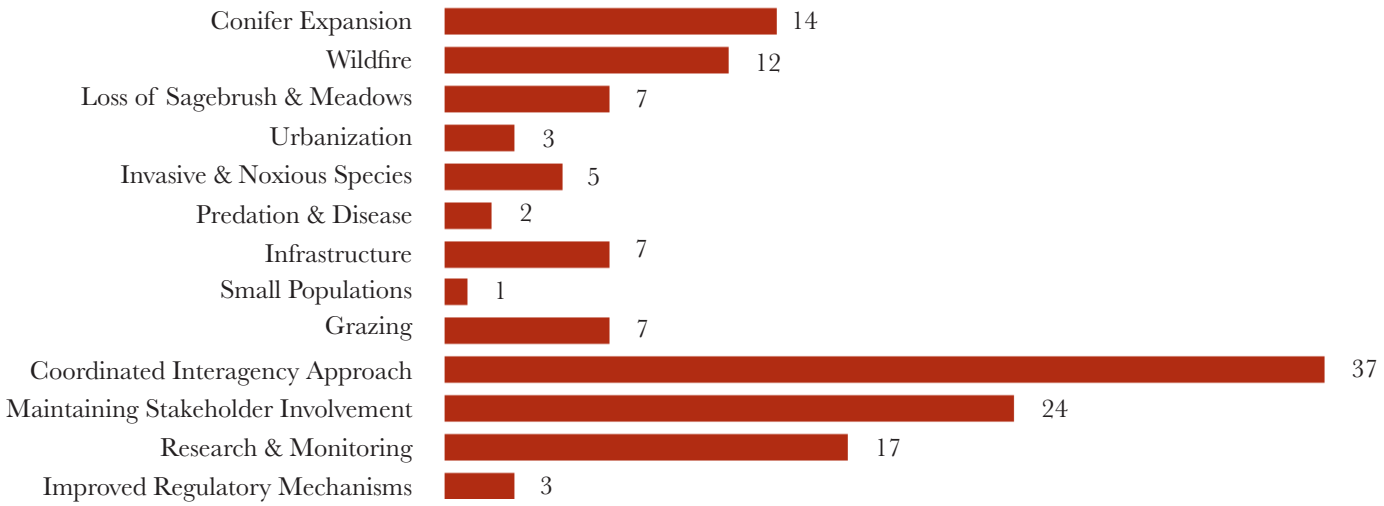


Figure 11: Number of projects completed in 2019

Post-fire rehabilitation efforts in the Lyon Fire. Pine Nut PMU

Wildfire

Addressing wildfire is identified as a high priority threat in the Pine Nut, Desert Creek-Fales, Mount Grant, Bodie Hills, and South Mono PMUs. Bi-State LAWG partners communicate across jurisdictional boundaries to implement coordinated fire-management strategies that minimize the loss of suitable sage-grouse habitat. Interagency fire management and suppression agreements were established between the BLM and USFS and existing fire management plans were updated to include conservation measures identified by the National Sage-Grouse Technical Team to reduce the long-term loss of sagebrush. Targeted wildfire suppression actions are taken in identified sage-grouse habitat and fire rehabilitation efforts are implemented to decrease post-fire habitat loss.

In 2019 the following actions were implemented to address the threat of wildfire in the Bi-State:

- 71 acres of fuel breaks were maintained in the Pine Nut, Bodie Hills, and Desert Creek-Fales PMUs
- Early fire detection and suppression in key sage-grouse habitat limited three fires to 162 combined acres burned in the Pine Nut and South Mono PMUs
- Post-fire rehabilitation efforts include 99 acres of sagebrush seedling planting within the Hot Creek and Lyon fire scars and installation of wind fences in the area burned in the Indian fire to increase soil stability and vegetation recovery
- The Bishop BLM office hired a targeted wildfire prevention technician to increase fire patrols in areas of concern including sage-grouse habitat. This technician maintained seasonal signage, increased public contact, monitored field conditions, managed and reported illegal activities, carried out firefighting duties and collaborated with field staff and management to increase the efficacy of fire prevention efforts

Privately owned lands in the Bi-State

Urbanization

Maintaining high quality, intact habitat conditions into the future and addressing the risks associated with urbanization is a high priority in the Desert Creek-Fales, Pine Nut and South Mono PMUs. Conservation easements are voluntary but legally binding agreements between a landowner and a qualified organization, like a land trust, which places some restrictions on the use of a property to protect its natural values. These agreements provide benefits to both landowners and wildlife. They protect large quantities of suitable habitat from further development and allow landowners to pursue available funding to implement conservation projects on their land.

In addition to conservation easements on private lands, land purchases or exchanges have occurred that resulted in public, state or federal ownership of occupied sage-grouse habitat. These acquisitions ensure that land remains intact for generations and are managed in a way that will maintain quality habitat and provide conservation value to Bi-State sage-grouse.

The following projects were completed in 2019 to address the threat of urban development and habitat loss in the Bi-State:

- Wilderness Land Trust acquired two parcels near Mormon Meadows totaling 960 acres. Next steps for this parcel include partnering with the Eastern Sierra Land Trust (ESLT) on sage-grouse habitat restoration before transferring this land to public ownership under the management of the Bishop BLM Field Office

- ESLT worked with multiple private landowners and public funding partners to pursue conservation easements and land donations located in the South Mono, Bodie Hills, and Desert Creek-Fales PMUs

- NRCS offers $8 million in funding through the Regional Conservation Partnership Program for conservation easements and habitat improvements on private lands in the Bi-State

Pinyon pine expansion into sagebrush habitat

Conifer Expansion

The loss and fragmentation of high-quality, intact sage-grouse habitat to encroaching conifer is a high priority threat in the Pine Nut, Desert Creek-Fales, Mount Grant, Bodie Hills, and White Mountains PMUs.

Pinyon pine, juniper, and Jeffery pine are native species in the Bi-State but expansion beyond historical limits due to fire suppression, historic overgrazing by domestic livestock, and favorable climate conditions has become problematic (Baruch-Mordo, 2013). Across the Bi-State area, it is estimated that approximately 40 percent of the historically available sagebrush habitat has been usurped by woodland succession over the past 150 years (USGS, 2012).

Conifer projects within the Bi-State are ranked using the CPT and the TAC's expertise regarding areas of occupied sage-grouse habitat being impacted by conifer encroachment. Conifer removal projects aim to improve habitat, increase connectivity, and reduce predation risk to sage-grouse. Phase I conifer cover is targeted to provide the most benefit at the lowest cost. Post-treatment maintenance is often required in the years following initial treatment to ensure that small seedlings were not missed in the original treatment.

In 2019 the following actions were completed to address the threat of conifer expansion into sagebrush ecosystems:

- 8,704 acres of conifer treatment completed in the Pine Nut, Desert Creek-Fales, and South Mono PMUs
- 82 acres of conifer treatment maintenance on previously treated sites in the Pine Nut PMU
- NEPA analysis completed for a 4,600-acre conifer treatment project in the Mount Grant PMU to be initiated in 2020

Sagebrush and meadow habitat

Loss of Sagebrush and Meadows

Healthy sagebrush and meadow conditions are necessary components of sage-grouse habitat, crucial to supporting sage-grouse throughout their life cycle. Land managers make every effort to implement best management practices to avoid the degradation of intact sage-grouse habitat through adopted regulatory mechanisms. When sagebrush and meadow conditions are compromised, improvements are made through installation of check dams to stabilize stream head-cuts, prescribed fire, irrigation, and fencing areas to allow recovery from livestock grazing.

The following projects were completed in 2019 to improve sage-grouse habitat in the Bi-State:

- Bishop BLM completed ongoing head cut stabilization efforts in Aurora Canyon
- Walker River Conservancy collected stream flow and water temperature information at three sites originally established in 2018 to better understand the hydrology of the associated meadow habitat
- Walker River Conservancy collaborated with permitees to irrigate disconnected meadows along Rough Creek and improve existing irrigation infrastructure in the Walker River State Recreation Area within the Mount Grant PMU
- The Carson BLM completed meadow Proper Functioning Condition surveys as well as spring inventories within the Mount Grant PMU
- 128 acres of meadow restoration work was completed on private land through mechanical treatment methods
- Stakeholders including LADWP, CDFW, USFWS, and Audubon began to develop a water allocation strategy for the Long Valley portion of the South Mono PMU that will determine how to best allocate water, especially during periods of drought, to meet the needs of LADWP customers, Bi-State Sage-grouse, local ranching, and recreational fisheries interests

Invasive and Noxious Species

Non-native plants are not overly abundant in the Bi-State area, except for cheatgrass, which occurs in all PMUs. It is most prevalent in the Pine Nut PMU where it is identified as a high priority threat and in the Mount Grant PMU where it is listed as a moderate threat. In 2019:

- 321 acres of chemical and mechanical weed treatment in Pine Nut, Desert Creek-Fales, Mount Grant, and South Mono PMUs

Fences converted to let down and fence marking completed during volunteer stewardship days

Infrastructure

Infrastructure was identified as a high priority threat in the Pine Nut, Desert Creek-Fales, and Mount Grant PMUs. Infrastructure features impacting sage-grouse in the Bi-State region include linear features such as roads, power lines, and fences and location-specific features like landfills, communication towers, and windmills. Work completed to address potential infrastructure impacts include:

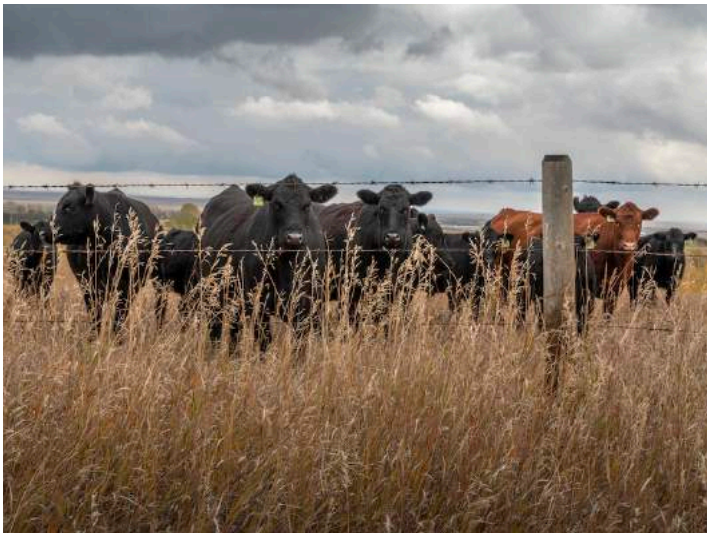
- 1.6 miles of fence removal in the South Mono PMU
- 4 miles of fence converted to let down in the Bodie Hills PMU
- 1 mile of fence marking in the Pine Nut PMU
- 7.7 miles of fences mapped to determine future management efforts including fence removal conversion, or marking in the Mount Grant PMU

Human Disturbance

Threats associated with human disturbance include illegal hunting and recreational use impacts to sage-grouse habitat. Human disturbance and impacts from recreation were identified as a high priority threat in the Pine Nut and South Mono PMUs. These threats have been addressed through increased law enforcement, public education and the adoption of land management policies that restrict access to key habitat through road closures, regulation of new road development, and seasonally enforced regulations.

The following action was implemented in 2019 to address the threat of human disturbance:

- Bishop BLM hired a technician to monitor recreation in the Long Valley portion of the South Mono PMU and to initiate restoration projects to address recreational use impacts in sage-grouse habitat. This technician monitored recreational use trends, dispersed camping areas, removed approximately 175 pounds of trash, and increased public awareness through visitor contacts and educational outreach efforts
- Planning meetings were held to develop informational kiosks that will be installed in heavily utilized recreation sites in 2021



Wild horse and permitted livestock gazing in the Bi-State area

Grazing

Wild Horses

Grazing of wild horses and burros is listed as a moderate threat in the Pine Nut, Mount Grant, and White Mountains PMUs and a low priority threat in the Bodie Hills and South Mono PMUs. Each year the USGS documents the presence of wild horses and burros through the completion of raptor, raven, horse, and livestock (RRHL) surveys. Land management agencies make efforts to monitor Bi-State wild horse and burro populations to establish and maintain Appropriate Management Levels (AML) to protect their health as well as that of the habitat they and other species rely upon. In 2019 the following actions were completed to address the habitat degradation associated with wild horse grazing:

- Carson City BLM District Office organized and implemented a wild horse gather in the Pine Nut Mountain PMU to meet AML, a total of 404 horses were gathered
- Animals gathered were made available for adoption at Palomino Valley Wild Horse and Burro Center in Reno through the Wild Horse and Burro Adoption Program. Those that were not adopted are cared for in off-range pastures, where they retain their "wild" status and protection under 1971 Wild Free-Roaming Horses and Burros Act
- Bi-State USFS and BLM employees attended the Wild Horse and Burro National Overview meeting, held in Reno, Nevada, to discuss new science and facts, public involvement, ongoing and future planning regarding the management of wild horses and burros
- The Inyo National Forest filled a vacant rangeland specialist position whose duties include the management of wild horse and burro territories on National Forest lands

Permitted Livestock

The grazing of permitted livestock is listed as a low priority threat in all PMUs across the Bi-State. To address the threat of habitat degradation caused by grazing and to implement beneficial livestock management strategies, the following actions were completed:

- USGS completed horse and livestock surveys
- Grazing management tactics to improve sage-grouse habitat were employed across 1,127 acres in the Bodie Hills PMU
- Fences were erected around the area burned during the Hot Creek Fire in the South Mono PMU to limit grazing impacts to recovering resources

Long Valley raven egg oiling study

Predation

The Action Plan provides direction to monitor, and quantify where possible, the extent of predation risks to greater sage-grouse populations in the Bi-State area. Partners are advised to take appropriate management action where causal effects can be identified and effectively mitigated. Raven populations are believed to have a direct negative impact on Bi-State sage-grouse in the South Mono PMU. Previous studies utilizing raven egg-oiling techniques have been proven to limit raven recruitment by maintaining raven territoriality and by lowering raven nest success.

To address predation concerns in the South Mono PMU:

- USGS biologists established a raven egg-oiling study in an attempt to increase sage-grouse nest success and to improve population growth

Methods include coating raven eggs with an impermeable oil. Changes in raven incubation behavior, egg hatchability, raven population density, as well as sage-grouse nest survival, and sage-grouse population growth were monitored. In the first year of this study, three impact sites and three control sites were established. Technicians used extension poles or drones to coat raven eggs at impact sites. A total of four nests were oiled. All oiled eggs failed to hatch and ravens continued to incubate inviable eggs for up to three weeks longer than their predicted hatch dates. Subsequently, sage-grouse nest success in the Long Valley subpopulation increased from 40.6% in 2018 to 60.6% in 2019.

Preliminary findings from the pilot year of this study suggest these techniques may decrease raven egg hatchability and raven population density while increasing sage-grouse nest survival and improving sage-grouse population success. A second year of raven nest monitoring and egg oiling is planned for 2020 to determine if nest survival and population success can further be improved utilizing these methods.

Bi-State stakeholder collaboration in action

COLLABORATIVE CONSERVATION

Additional actions to improve sage-grouse conservation efforts are completed each year to implement a coordinated interagency approach, maintain stakeholder involvement, incorporate a science-based adaptive management plan, and carry out research and monitoring efforts. The following section highlights actions completed in 2019 to achieve these goals.

Coordinated Interagency Approach

The Executive Oversight Committee (EOC) includes resource agency directors from state and federal land and wildlife management agencies. The EOC works to leverage collective resources, assemble the best technical talent to direct and prioritize future conservation actions, maintain consistent regulatory oversight, and to ensure a coordinated conservation effort across jurisdictional boundaries to achieve the long-term conservation of the Bi-State DPS.

In 2019, four Executive Oversight Committee meetings were held. EOC partners accomplished the following:

- Renewal of Service First Agreements
- Agency funding commitment letters extended 5 years
- Support provided for USFWS species status assessment
- Fostered Bi-State partnership collaboration and growth

The Technical Advisory Committee (TAC) is made up of agency biologists who provide technical assistance to guide sage-grouse conservation efforts. This year the TAC convened six times to:

- Provide scientific support for the upcoming listing decision
- Review the 2012-2018 Action Plan Accomplishment Report
- Develop conservation strategies
- Establish an annual program of work for the upcoming year

Maintaining Stakeholder Involvement

Maintaining a foundation of trust and cooperation through stakeholder involvement is essential to the success of this collaborative conservation effort. In 2019, partners came together at the Bi-State LAWG meeting held in June. During this meeting stakeholders:

- Received updates from EOC regarding agency coordination
- Heard science updates from the USGS and the TAC
- Shared sage-grouse conservation-related information

The Bi-State Natural Resource Committee (BTNRC), made up of official Tribal representitives, individual Tribal members, and land and wildlife management agency officers, held 12 meetings to fill committee leadership roles and plan for the upcoming Traditional Ecological Knowledge Summit.

Additional actions completed to maintain current stakeholder involvement and to increase public knowledge around sage-grouse and sagebrush ecosystem conservation include the following:

- Volunteer stewardship days
- Public education and outreach presentations
- Audubon lek viewing field trips
- Distribution of information through Bi-State newsletters and website updates

2019 Land management and research publications

Science-Based Adaptive Management

Each year, Bi-State partners utilize a science-based adaptive management approach to generate a strategic process for guiding sage-grouse management. This approach integrates the best available science to inform local and landscape-level management and conservation decisions. Science-based adaptive management guides decisions based on data-driven models, implementation of actions, outcome evaluation, and modification of management practices based on this iterative learning process (Bi-State Action Plan, 2012).

Improved Regulatory Mechanisms

Bi-State land management agencies have adopted plan amendments to incorporate best management practices, standardize operating procedures, implement conservation measures, and mitigate threats to sage-grouse. These actions provide consistent land management direction across jurisdictional boundaries. In 2019, these regulatory mechanisms were improved through:

- Completion of Inyo National Forest's Land Management Plan revision

Research and Monitoring

Ongoing research and monitoring efforts aid the development of a science-based adaptive management plan. 2019 research and monitoring efforts include:

- Sage-grouse capture and monitoring in the Bodie Hills, South Mono, and White Mountains PMUs
- USGS published Population and Habitat Analyses for the Greater Sage-Grouse in the Bi-State Distinct Population Segment: 2018 Update
- USGS completed raptor, raven, horse, and livestock surveys
- UC Davis PhD. candidate Eric Tymstra completed his final year of data collection for his diet and reproductive success study in the Bodie Hills PMU
- Vegetation plots were sampled throughout the Bi-State conservation area
- NDOW published a Habitat Monitoring Report that summarized habitat monitoring efforts and preliminary findings regarding the impact of these efforts

Risk Addressed	Project Description	Projects Completed	Measure	Project PMUs
Conifer Expansion				
	Conifer treatment	10	8,704 acres	PN, DCF, SM
	Treatment maintenance	1	82 acres	PN
	NEPA completed	1	~4,600 acres	MG
	Pre-NEPA planning	2	4 sites	SM
Wildfire				
	Fuels reduction	3	71 acres	PN, DCF, BH
	Strategic fire suppression	3	162.5 acres	PN, SM
	Fire rehabilitation	4	99 acres/2 sites	PN, SM
	Wildfire prevention	1	1 position hired	Multiple PMUs
	Restoration planning	1	1 contract secured	SM
Urbanization				
	Land acquisition	1	960 acres	BH
Loss of Sagebrush and Meadows				
	Stream flow monitoring	1	3 sites	MG
	Meadow surveys	1	38 sites	MG
	Meadow irrigation	2	2 sites	MG, BH
	Meadow restoration	2	128 acres/1 site	BH
Infrastructure				
	Fence removal, modification & marking	5	14.3 miles	PN, BH, MG, SM
Invasive and Noxious Species				
	Weed treatment	5	380.9 acres	PN, DCF, MG, SM
Disease and Predation				
	Egg oiling efforts	1	4 sites	SM
	West Nile prevention	1	1 site	SM
Grazing-Wild Horses				
	Pine Nut horse gather	2	404 horses gathered	PN
Grazing Permitted Livestock				
	Exclosure fence	1	2 sites	SM, BH
	Targeted grazing	1	1,227.4 acres	BH
Small Populations				
	Parker Meadow translocation	1	1 site	SM

Table 4: 2019 conservation actions completed

Other Action Plan Accomplishments	Description/Measure
Coordinated Interagency Approach	Agency funding commitment letters updated
	Service First agreement renewed
	4 Executive Oversight Committee meetings
	6 Technical Advisory Committee meetings
	12 Tribal Natural Resource Committee meetings
	1 Local Area Working Group meeting
Science-Based Adaptive Management	Funding for USGS Science Advisor
	Conservation Planning Tool implemented in project implementation
Improve Regulatory Mechanisms	USFWS Coordination and Conferencing
	Inyo National Forest Land Management Plan Revision completed
Research and Monitoring	Capture and monitoring efforts in the BH, SM and WM PMUs
	Diet and reproductive success study in the BH PMU
	Raptor, raven, horse and livestock surveys
	Vegetation surveys
	NDOW Habitat Restoration Monitoring Report
	USGS Publication of Population and Habitat Analyses for Greater Sage-Grouse in the Bi-State Distinct Population Segment: 2018 Update
	Publication in Journal of Environmental Management: Long Term Vegetation Response to Pinyon Juniper Reduction Treatments in NV
Maintain and Improve Stakeholder Involvement	Bi-State specific conference presentations
	Interpretive and education presentations
	8 Volunteer work days
	12 Bi-State newsletters and website updates
	Lek viewing programs for the Los Angeles and San Diego Audubon chapters

Table 5: 2019 collaborative conservation actions completed

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