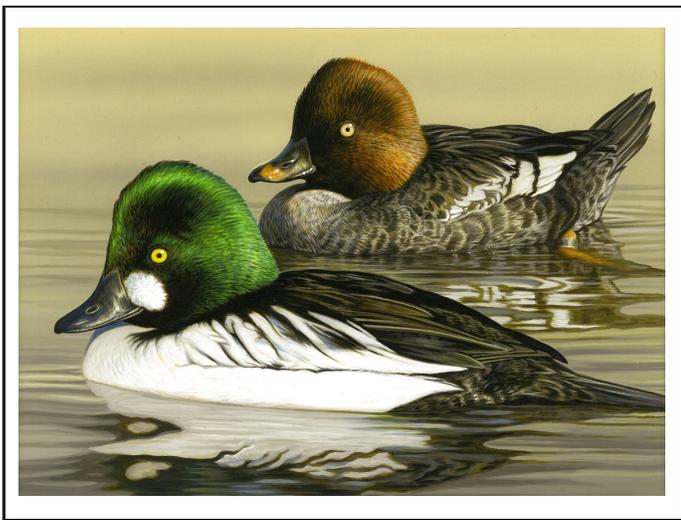


Nevada Department of Wildlife

Restricted Reserve Account Program Summaries



Common Golden-eye Duck Stamp Art by Richard Clifton (2018)



East Schell Mountains Aerial Seeding



Redband Trout - Photo by Pat Clayton, Fish Eye Guy Photography



State Fiscal Years
2017 & 2018

**Nevada Department of Wildlife
Restricted Reserve Account Program Summaries
State Fiscal Years 2017 and 2018**

Table of Contents

<i>Program or Account</i>	<i>Page</i>
Upland Game Bird Stamp	1
Duck Stamp	62
Operation Game Thief	77
Elk Damage Mitigation Fee	81
Habitat Conservation Fee	82
Industrial Development Fee	124

Progress Report on Upland Game Bird Stamp Projects Funded in FY 2017

Project Name: Columbian Sharp-tailed Grouse Restoration Project

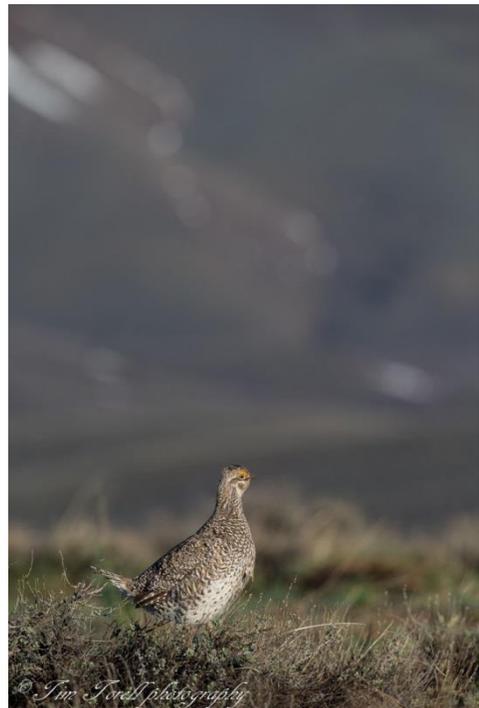
Other Funding Sources: Upland Game Management Grant (75%)

Project Start Date: April 2013

Estimated Completion Date: The first year of translocations took place in 2013. We anticipate completing the effort in 2017; however, two more augmentations may be necessary to establish a self-sustaining population.

Project Accomplishments:

Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*; hereafter CSTG) historically occupied the Intermountain West, including northern Nevada where they were considered abundant in Elko County. However, populations were extirpated from Nevada by the mid-20th century and now occupy less than 10% of their historic range. The Nevada Department of Wildlife has worked collaboratively with the U.S. Geologic Survey, Idaho Department of Fish and Game and Elko Land and Livestock to reestablish a viable population of CSTG in northeastern Nevada. Through April of 2017, 212 CSTG have been translocated to Elko County, NV from southeastern Idaho. Of these, 133 females and 41 males were marked with VHF transmitters and were monitored by ground and aerial telemetry. In addition, a subsample of female CSTG were artificially inseminated prior to translocation to promote nesting and the rearing of broods at the release site ($n = 6$, 2014; $n = 9$, 2015; $n = 9$, 2016).



Capture and Known Fate Results

During 2016, a total of 50 CSTG consisting of 15 males and 35 females were captured and translocated to the Bull Run Basin in Elko County, NV. Additionally, in 2017, 24 females were captured and moved to Nevada; however, two died in the release boxes prior to their actual release (see Table 1).

Table1. Summary of Translocations from 2013 to 2017

Year	Males (Radio Marked)	Females (Radio Marked)	Total Released
2013	14 (8)	35 (35)	49
2014	15 (13)	27 (27)	42
2015	15 (10)	34 (29)	49
2016	15 (10)	35 (30)	50
2017	0 (0)	22 (12)	22
Totals:	59 (41)	153 (133)	212

Telemetry

USGS research crews obtained 419 locations on 60 CSTG during 2016. Of those, 20 were birds translocated in 2014 (n=8 grouse) or 2015 (n=12 grouse). The average distance that a bird was located from the release location in 2016 was 2.7 (± 4.6 km) km (see Figure 1).

Survival

An increase in mortality during the weeks immediately following release was observed by USGS research crews in 2016. Fourteen mortalities were located during the first 50 days following release. Four other mortalities were found during the remainder of the field season (≈ 90 days). A total of 19 mortalities were recorded from April – August (n=1 female translocated in 2015; n=18 males and females translocated in 2016). This represented the highest number of deaths recorded in a field season during the four years of the project. Fifteen more mortalities were recorded during telemetry flights conducted from September – November of 2016, which also represented the largest number of fall mortalities recorded during the project. By December of 2016, 32 of the 40 radio-marked birds released during 2016 had perished.

Nest Survival

During the first four years of this project, 2015 was the most successful year in terms of number of nests (n=36), nests that successfully hatched (n=24) and the probability that a nest would survive the entire 37-day nesting period [0.64 (95% CI 0.47 – 0.77)]; Table 2. The least successful year statistically was the first year; however, that was largely expected because CSTG were subjected to a novel area and habitat type.

Table 2. Nesting information accumulated from 2013 through 2016.

Year	# of Nests	Successfully Hatched	Daily Nest Survival	Incubation Period Survival	Clutch Size
2013	14	7	0.97	0.29	10.9
2014	26	17	0.98	0.51	10.5
2015	36	24	0.99	0.64	10.9
2016	21	10	0.98	0.40	9.5
Averages:	24.3	14.5	0.98	0.46	10.5

Brood Survival

As with nest survival, the best year for brood survival during the project was 2015 with 16 successful broods recorded and a 50-day brood survival (≥ 1 chick survived to 50 days post hatch) of 0.64. A minimum of 44 chicks survived the brood rearing period in 2015, which was greater than the combined totals of 2013 and 2014. The lowest 50-day brood survival rate was 0.45 recorded in 2016. Likewise, the lowest number of chicks surviving the entire brood rearing period was also recorded in 2016 (n=8).

Table 3. Brood information accumulated from 2013 through 2016.

Year	# of Broods	# of Successful Broods	Daily Brood Survival	50-day Brood Survival	Est. # of Chicks Surviving
2013	7	4	0.99	0.55	17-20
2014	17	7	0.99	0.58	20-23
2015	24	16	0.99	0.64	44
2016	10	4	0.98	0.45	8
Total or Average:	58	31	0.99	0.58	89-95

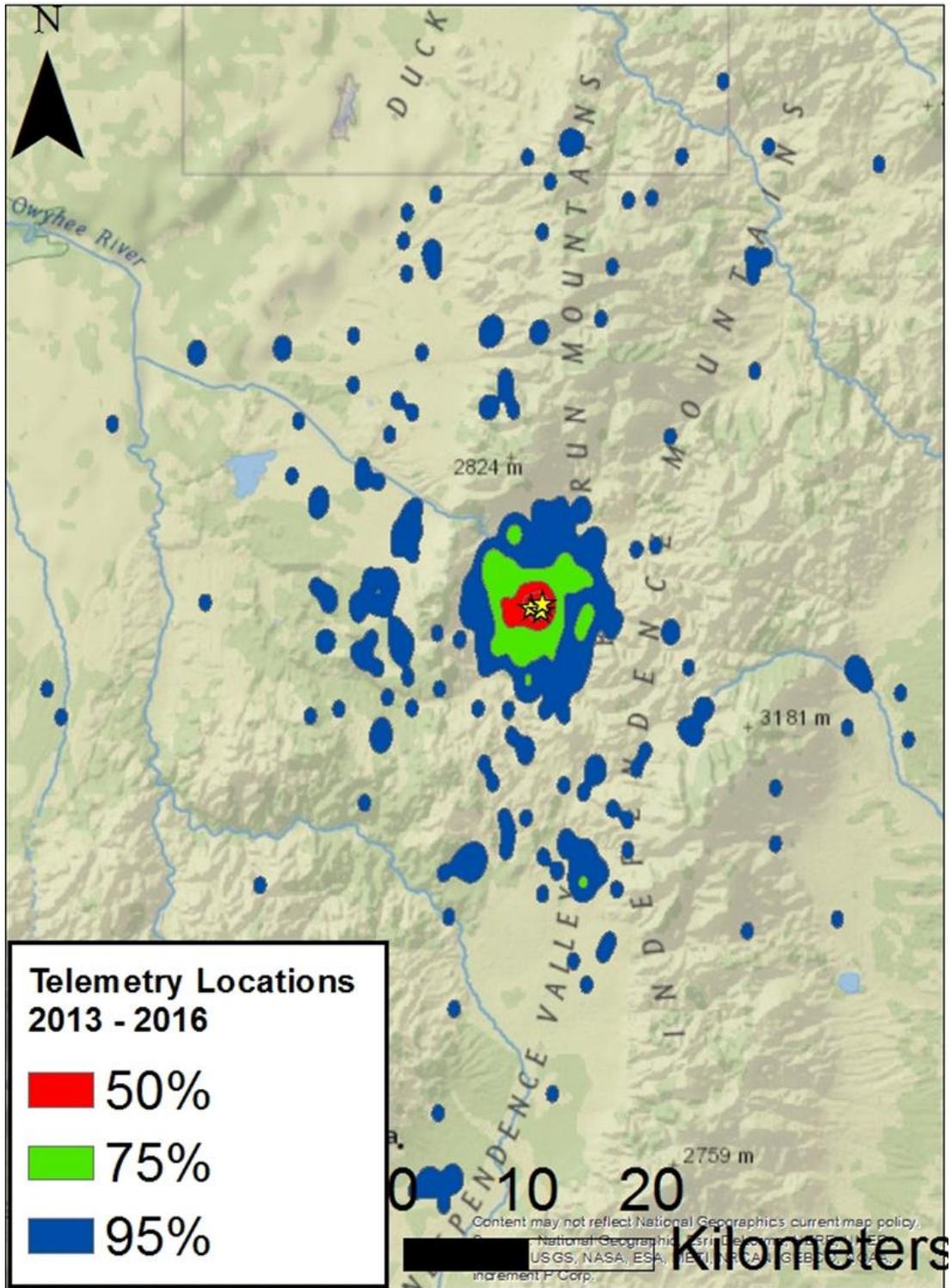


Figure 1. Utilization distribution of translocated Columbian sharp-tailed grouse from 2013-2016. Fifty percent of all telemetry locations are within the red area, 75% of all locations are within the green area and so forth. The yellow stars represent both the release location and the active lek locations.

Project Name: Mountain Quail and Ruffed Grouse Translocation

Other Funding Sources: Upland Game Management Grant (75%)
Carson Valley Chukar Club

Project Start Date: December 2016

Estimated Completion Date: March 2018 [for Fish Creek Range Mountain Quail Release]

Mountain Quail Restoration Project

On March 14, 2017, a total of 88 mountain quail were released into the Fish Creek Mountains in Lander County located approximately 32 air miles south of Battle Mountain. The birds were originally captured from areas surrounding Myrtle Creek, Oregon during December of 2016. A total of 100 mountain quail were obtained from Oregon and delivered to the brooder house at Mason Valley Wildlife Management Area (WMA) in early January of 2017 where they spent the winter months. Two mortalities were recorded during the almost two and a half month stay at Mason Valley WMA. It is not known what happened to the ten other birds that should have been in the pen upon collection for release in the Fish Creek Mountains. The release was conducted in mid-March to take advantage of early spring growth of forbs, emerging buds and insect availability. A subsequent release of approximately 100 mountain quail is scheduled for the Fish Creek Mountains in 2018.



Mountain quail photograph taken by Victor Trujillo of Hawthorne, NV.

Ruffed Grouse Establishment Project

Although fairly substantial efforts were made to locate and determine the status of ruffed grouse populations throughout northern Nevada during the summer of 2016, no ruffed grouse were translocated. This was largely due to few birds being detected at potential in-state source populations, thus capture efforts were canceled, or at least postponed, until ruffed grouse populations recover or are deemed healthy enough to remove birds for translocation purposes.

Project Name: Greater Sage-grouse Population Monitoring
Other Funding Sources: Nevada Sage-grouse Conservation Grant (75%)
Project Start Date: July 1, 2016
Estimated Completion Date: June 30, 2017

Lek Count Technicians

Two seasonal survey technicians were used to assist with sage-grouse lek counts in the Eastern Region during late March, April and early May of 2017. One seasonal was stationed in Ely and worked in White Pine County while the other was stationed in Elko and worked in Elko County. The survey technician stationed in Ely spent 22 days in the field conducting lek counts during the spring of 2017 while the seasonal stationed in Elko spent 7 days conducting lek counts.

Aerial Lek Survey

Aerial helicopter lek surveys were performed during the spring of 2017; however, no upland game stamp funds were used to pay for these surveys. Supplementary funding was obtained from the Bureau of Land Management and U.S. Forest Service to conduct sage-grouse monitoring in 2017. Helicopter lek surveys were conducted in the Bilk Creek, Black Rock, Montana Mountains and Santa Rosa Ranges in Humboldt County; Sonoma and Tobin Ranges in Pershing County; Pine Grove and Bodie Hills and Wassuk Range of Mineral County; Pine Nut Mountains in Lyon County; Wilson Creek Range in Lincoln County; Diamond, Cortez and Roberts Creek Mountains in Eureka County; and the Monitor, Toiyabe and Toiyabe Ranges of Nye County.

Fixed Wing Infrared Surveys

We contracted with Owyhee Air Research to conduct aerial infrared surveys to detect undocumented leks and survey known lek locations at high elevations and largely inaccessible by vehicle. Technological advancements and vendor experience have improved the capabilities of this methodology. We used the U.S. Geological Survey's Spring Habitat Suitability map to initially identify potential search areas and then

developed a sage-grouse lek habitat suitability model in-house to develop search polygons and subsequent transects. Surveys were conducted during three periods in the spring of 2017 in central, northwestern and northeastern Nevada.

Central Nevada Survey

Owyhee Air Research conducted four days of fixed wing infrared surveys in the Monitor, Toquima and Toiyabe Ranges located in Nye County from March 29th through April 4th. As many as 13 new lek locations may have been found during this survey; however, further follow-up is needed on these detections to classify them as active leks. Two new leks were found in the Monitor Range with 34 birds located at one location and 13 birds at another. As many as seven new leks may have been discovered in the Toquima Range; however, some of those detections may have been small groups of hens simply foraging or loafing. In the Toiyabe Range, four new leks may have been documented of which at least one is very likely a lek with 9 birds observed.

Aside from detecting new lek locations, several unknown status leks were also surveyed in the Toquima and Toiyabe Ranges. Two unknown status leks in the Toquima Range were surveyed with 63 birds documented on the Corral Canyon lek (Figure 2) and 38 birds observed on the Boulder Canyon lek. In addition, two high elevation leks were surveyed in the Toiyabe Range with nine birds observed on each (Toiyabe 1 and Toiyabe 2).



Figure 2. A screenshot of video infrared imagery of displaying sage-grouse obtained from a portion of the Corral Canyon lek located in the Toquima Range in Nye County, Nevada (April 3, 2017).

Northwestern Nevada Survey

The Jackson Mountains in Humboldt County were surveyed on March 29, 2017. Survey transects gridded the northeastern portion of the mountain range, but no detections were made during this survey. Infrared surveys were also conducted in the Black Rock Range, also located in Humboldt County, on April 20th and 25th. The survey on the 20th was cut short due to cloud cover. No new lek detections were made during either of these surveys; however, four known lek locations were surveyed with numbers of sage-grouse observed at three of the four locations.

Northeastern Nevada Survey

One day of lek detection survey was conducted in the northern Tuscarora Range on April 19th, 2017. No detections of new leks or birds were detected during the survey.

In addition to these surveys, aerial infrared lek counts were conducted during a two day period on April 29th and 30th working in conjunction with USGS research crews that were stationed at leks and were conducting simultaneous counts as the aircraft flew over. This is the third year in a row that these data have been collected in order to compare the two methodologies and develop a correction factor.

Fixed Wing Telemetry Surveys

Fixed wing telemetry surveys were contracted through Owyhee Air Research services and conducted during the fall and winter months when research and monitoring crews have left the field. The surveys are conducted to obtain location and mortality information to help determine monthly and annual survival rates. Through the end of April of 2017, 34 hours of aerial telemetry survey have been conducted. The areas where populations have been aerially monitored in FY17 include the following:

- Boulder Mountain to Massacre Bench (northern Washoe County);
- Sheldon National Wildlife Refuge (Washoe/Humboldt County);
- Santa Rosa Range/western Owyhee Desert (Humboldt County);
- Monitor Valley/Range (Nye County).

Approximately \$11,840 of upland game stamp funding was spent on these flights in State Fiscal Year 2017.

Project Name: Estimating Greater Sage-grouse Vital Rates within Nevada's Most Novel Habitats

Other Funding Sources: Nevada Sage-grouse Conservation Grant (75%)
Ruby Pipeline Mitigation Funding (12.5%)

Project Start Date: September 2015

Estimated Completion Date: December 2018

Project Accomplishments:

The Nevada Department of Wildlife, U.S. Geological Survey - Western Ecological Research Center (WERC) and Bureau of Land Management (BLM) initiated a study design to evaluate habitat use, movement patterns, and population dynamics (i.e. nest, brood, and adult survival) of sage-grouse populations within the Monitor Range and Santa Rosa Mountains study sites over a three year period (2016 – 2018). This study serves as a control for comparison to eight ongoing study areas across Nevada and California where the USGS is monitoring sage-grouse response to some type of actual or potential disturbance (e.g. transmission lines, geothermal facilities, mines, etc.). During 2016, 43 birds were radio-marked in Monitor Valley, and 45 birds were captured and radio-marked in the Santa Rosa Range. Six nest locations were documented in Monitor Valley (1 successful, 5 failed), and 13 nests were located in the Santa Rosas (4 successful, 9 failed). We obtained 222 ground telemetry locations from March – July in both study areas. Primary data collection efforts include gathering baseline data on space-use, habitat selection, and population vital rates. Reported results should be interpreted with caution as they are preliminary, and further data are required to draw any conclusions.

Capture and Monitoring Results (2015 and 2016)

Monitor Valley

During the fall of 2015, we deployed 27 VHF collars on female sage-grouse, and 4 GPS backpacks on two male, and two female grouse. During spring 2016, we deployed 16 VHF collars on female sage-grouse. In the fall of 2016, we deployed 10 more radio collars. We obtained 109 ground telemetry locations from 35 of 43 radio-collared birds in 2016.

Population level utilization distributions by season were calculated for all marked birds. In the spring, sage-grouse distributed farther north, up to the area south of Grimes Hills near Highway 50. During the summer, collared females tended to move east, out of the valley, and into the mountains. In the fall, birds moved back into the lower elevation areas in Monitor Valley north of Blackrock Canyon. Sage-grouse used a very small area in Monitor Valley north of Blackrock Canyon during the winter months.

Santa Rosa

During spring 2016, 30 females were captured and radio-marked with VHF transmitters and in the fall of 2016, research crews captured and marked 12 females with VHF transmitters. We obtained 118 telemetry locations from 28 collared females during the spring and summer. Three aerial telemetry flights were conducted to help the field crew find missing birds.

Population level utilization distributions by season were calculated for VHF-marked birds. Earlier in the spring, female grouse were observed utilizing lower elevation areas. Birds were more localized in the area between Coyote Mountain and the Little Humboldt River. In the summer, females began to distribute over a wider range and began using higher elevation areas near Hinkey Summit and Table Mountain. Females utilized a much greater area during summer, resulting in some individuals relocating near the Oregon border.



Nest Survival

Monitor Valley

Six nests were discovered during 2016. One nest was successful and five failed. The average daily nest survival probability was 95.5% (95% CI, 88.7 – 98.3%) and the cumulative nest survival probability was 18.6% (95% CI, 1.2 – 53.5%). One failed nest showed evidence of avian depredation and one female had abandoned her nest. Due to low sample sizes the confidence intervals are very large, and multiple years of data collection are needed in order to estimate nest survival in the Monitor Valley study area.

Santa Rosa

Thirteen nests were discovered during the 2016 breeding season. Four nests were successful and nine failed. The daily nest survival probability during the incubation phase was 94.4% (95% CI, 89.6 – 97.1%), and the cumulative nest survival probability was 12% (95% CI, 17.2 – 33.6%), which is considered extremely low for Greater sage-grouse.

All of the nest failures appeared to be the result of depredation. Six of the nest remains had egg shells with holes in them, indicating avian depredation. The other three nests were found with crushed and fragmented egg shells, indicating possible mammalian depredation. None of the nesting females attempted to re-nest after their first nests failed.

Brood Survival

Monitor Valley

Only one of the monitored nests successfully hatched in the spring, which left the crew with one brood to track. The brood survived to the 50-day brood check with three chicks. There are not enough data to estimate the brood survival probability; additional years of monitoring are necessary to calculate brood survival in Monitor Valley.

Santa Rosa

The 10-day interval brood survival probability for the 50-day brood-rearing period was 77.8% (95% CI, 46.1 – 92.3%) during 2016. The cumulative brood survival probability was 28.5% (95% CI, 2.1 – 67.0%). Thirteen brood-rearing females were monitored in 2016. One brood was successful, three failed, and one was unknown. The successful brood was found at a lower elevation near a stream in an area of lush vegetation. One brood failed before the 40-day check. The other two broods failed before the 10-day check.

Project Name: **Bi-State Greater Sage-grouse Monitoring**
Other Funding Sources: Nevada Sage-grouse Conservation Grant (75%)
Project Start Date: September 2015
Estimated Completion Date: This is a 3-year monitoring effort.

Project Accomplishments:

The 2016 field season represented the second year of a three year monitoring period for Greater sage-grouse within the Bi-State Distinct Population Segment or planning area. Research and monitoring is being conducted by U.S. Geological Survey field crews that are actively monitoring birds in the Desert Creek and Mount Grant Population Management Units (PMUs) located in Lyon and Mineral Counties in Nevada. Collected data are used to evaluate habitat selection and areas of utilization, estimate vital rates (e.g., nest, brood and individual survival), and relate those vital rates to environmental factors, including the presence of specific predators including avian species such as ravens and raptors.

Capture and Monitoring Results (2015 and 2016)

A total of 43 sage-grouse were captured and radio marked during the fall of 2015 and spring of 2016. Initial capture efforts began in the fall of 2015 with 12 sage-grouse captured and radio marked in the Mount Grant PMU and eight sage-grouse in the Desert Creek PMU. During the spring of 2016, 10 sage-grouse were captured and radio-marked in the Mount Grant PMU and 13 in the Desert Creek PMU.

USGS research crews obtained 191 telemetry locations from 38 birds throughout the 2016 season (Figure 3). Seventeen females out of 22 active radio-marked individuals were located in Mount Grant and all 21 radio-marked females were located in the Desert Creek PMU.

Adult Survival

Survival probabilities were calculated for the two PMUs combined. The average monthly survival probability was calculated at 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. Seven mortalities were recovered in 2016. Assumed causes of mortality included depredation by avian (n=2), mammalian (n=2) or unknown (n=1) predators, and unknown causes (n=1). The seventh mortality tested positive for West Nile virus.

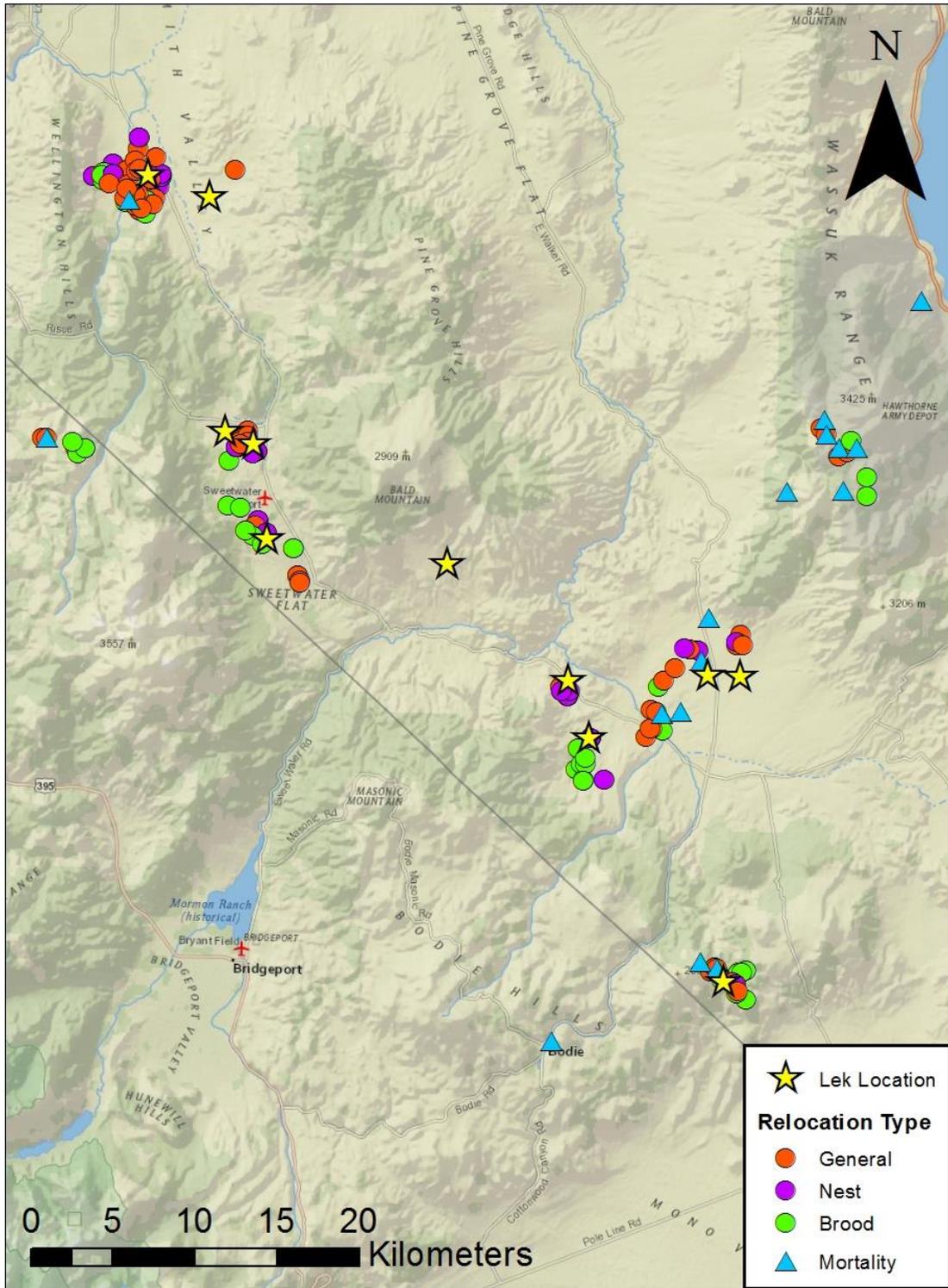


Figure 3. General, nest, brood and mortality telemetry location ($n=191$) in the Mount Grant/Desert Creek study area.

Nest Survival

A total of 27 nests were located in 2016 by USGS research crews. In the Mount Grant PMU, 8 nests hatched, four failed and one female had a successful second nesting attempt. Nine nests hatched and six failed in the Desert Creek PMU. 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 period was 28.5% (95% CI, 9.7 – 51.0%).

Brood Survival

Seventeen broods were monitored during 2016 within the Desert Creek (n=9) and Mount Grant (n=8) PMUs. Within the Desert Creek PMU, two broods were successful, two failed and five had unknown fates. In Mount Grant, one brood was successful, three failed and four had unknown fates due to difficulty accessing the Hawthorne Army Depot lands. The cumulative 50-day brood survival probability for both PMUs was 63.3% (95% CI, 33.3 – 82.7%).

Project Name: Monitoring the Effects of Pinyon and Juniper Removal on Greater Sage-grouse in Southeastern Nevada

Other Funding Sources: Nevada Sage-grouse Conservation Grant (75%)

Project Start Date: September 2015

Estimated Completion Date: June 30, 2018

Project Accomplishments:

The Nevada Department of Wildlife (NDOW) and the Bureau of Land Management – Ely District (BLM) are partnering on a Greater Sage-grouse (hereafter referred to as “sage-grouse”) monitoring project to determine the efficacy of various vegetative treatments, particularly pinyon and juniper removal, on small to moderately sized sage-grouse populations within portions of Lincoln and southern White Pine County. Population level impacts to sage-grouse can occur at very low levels of conifer encroachment. For example, in a study conducted in south-central Oregon, Baruch-Murdo et al. (2013), found that no sage-grouse leks remained active when conifer canopy exceeded 4%. The BLM and NDOW, along with various other partners including private landowners, are working to address this issue throughout Sage-grouse Management Zone III within south-central Nevada and southern Utah. Sage-grouse monitoring work is currently ongoing in southern Utah in the Skutumpah, Dog Valley and Hamlin Valley areas by Dr. Nicki Frey with Utah State University. We have expanded upon her ongoing efforts by including study sites in Lincoln and southern White Pine Counties. Some of Dr. Frey’s monitoring work in southern Utah has taken place in Nevada as Hamlin Valley is virtually bisected between Nevada and Utah and sage-grouse use habitats in both states.

Hamlin Valley Study Area

There were five active GPS-PTT transmitters on sage-grouse in the Hamlin Valley study area during the fall and early winter of 2016. These birds delivered 1,512 locations from October through December of 2016; however, two males died during this timeframe. Birds from this study area used three main areas including Table Mountain, White Rock Mountain, and Mount Wilson, which provide some of the best sage-grouse summer habitat in Lincoln County.

Cave Valley Study Area

In Cave Valley, 14 sage-grouse outfitted with GPS-PTT transmitters delivered 3,852 GPS locations from October through December 2016. Three birds died during this period including one juvenile female and two adult males. Sage-grouse in the southern Cave Valley population spent most of their time near Cave Valley Ranch and Sawmill Well. However, we had one bird move down to the Lewis Well area during the October-December timeframe.

Future Plans

Additional capture efforts occurred during the spring of 2017; however, the graduate student working on the project resigned during the spring field season. Results of those efforts were not available for this report. With larger sample sizes at both field sites, we hope to better document and assess use of treatment areas by sage-grouse in the future.

Project Name: **Monitoring the Effects of Landscape-Level Treatment on Greater Sage-grouse within the Desatoya Mountains of Central Nevada**

Other Funding Sources: Nevada Sage-grouse Conservation Grant (75%)
 Carson Valley Chukar Club

Project Start Date: September 2013

Estimated Completion Date: June 30, 2018

Project Accomplishments:

The Nevada Department of Wildlife (NDOW) and the U.S. Geological Survey Western Ecological Research Center (USGS) initiated a before-after study design in the fall of 2013 to investigate the potential effects of landscape scale habitat enhancement and restoration projects on sage-grouse population vital rates, habitat selection, movement patterns, as well as effects on predator community composition, in the Desatoya Mountains located in central Nevada. The Bureau of Land Management (BLM), in collaboration with NDOW and Smith Creek Ranch, have been implementing a landscape-scale, multi-year integrated habitat restoration and maintenance project (also

known as the Desatoya Mountains Habitat Resiliency, Health and Restoration Project) to improve wildlife habitat and restore degraded vegetation communities within the Desatoya Mountains through singleleaf pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*; hereafter PJ) removal treatments and restoration of sagebrush communities, wet meadows, and other riparian complexes over a ten year period (BLM 2012). Proposed habitat enhancement and restoration actions that will directly impact approximately 32,000 acres include various PJ removal treatments (20 – 100% removal), fencing to protect wet meadows and riparian areas, stabilizing stream channels, and wild horse removal.

Capture and Monitoring Results

From 2013–2016, USGS research and monitoring crews have captured 110 sage-grouse and outfitted them with either VHF radio or GPS – Satellite PTT devices. Research crews obtained 134 telemetry locations from 28 collared females in 2014, 238 telemetry locations from 46 marked sage-grouse in 2015, and 298 telemetry locations from 57 marked sage-grouse in 2016 (Figure 4). A total of 42,887 GPS locations have been obtained during all years of the study (Figure 5).

Movement Patterns

Two general patterns of sage-grouse movement have been observed from spring breeding areas to summer habitat. Sage-grouse moved to either lowland riparian and agricultural complexes, or to high elevation areas within the Desatoya Mountains. Sage-grouse congregated in the valley near Smith Creek and the surrounding agricultural fields. Some GPS-marked individuals moved from the Smith Creek valley to higher elevations near Edwards Creek. Two GPS-marked females captured at the Rock Creek lek on the west side of the Desatoya Mountains moved from the valley to the mountains after their broods failed in 2014. In the Desatoya Mountains, it appears that birds are using springs and other ephemeral water sources near Edwards Creek, Haypress, and Topia Creek. During fall, sage-grouse activity was highly concentrated around Smith Creek, Edwards Creek, Haypress Meadow and along Smith Creek Valley towards the

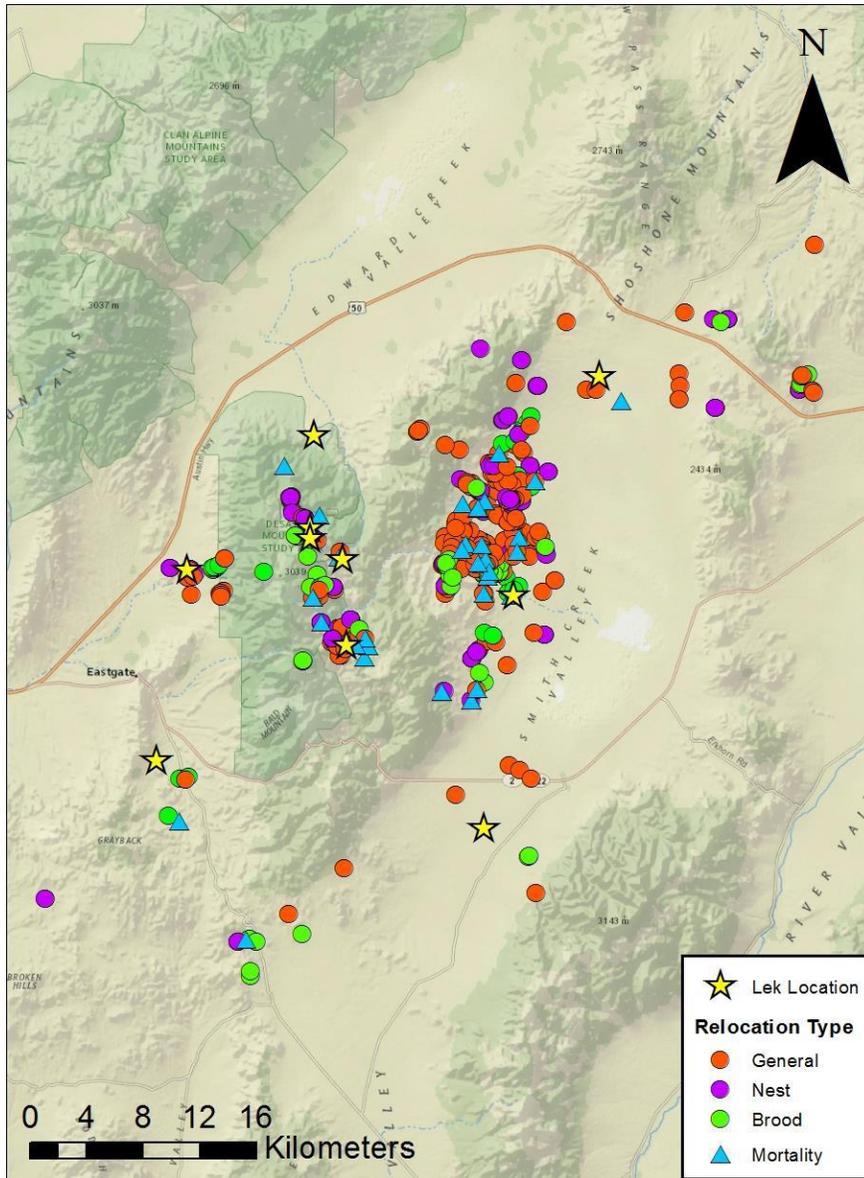


Figure 4. Nest, brood, mortality and general telemetry locations in the Desatoya Mountains, NV, 2014-2016.

New Pass lek. However, during winter, sage-grouse began to congregate around lek sites and away from Smith Creek and high elevation areas.

Nest Survival

In 2014, 14 nests were located of which four were successful and 10 failed. Twenty nests were located in 2015 of which eight were successful and 12 failed. In 2016, 25 nests were located of which 17 were successful and eight failed. Daily nest survival was estimated at 97.2% (95% CI, 96.0 – 98.1%), and cumulative average nest survival probability for the

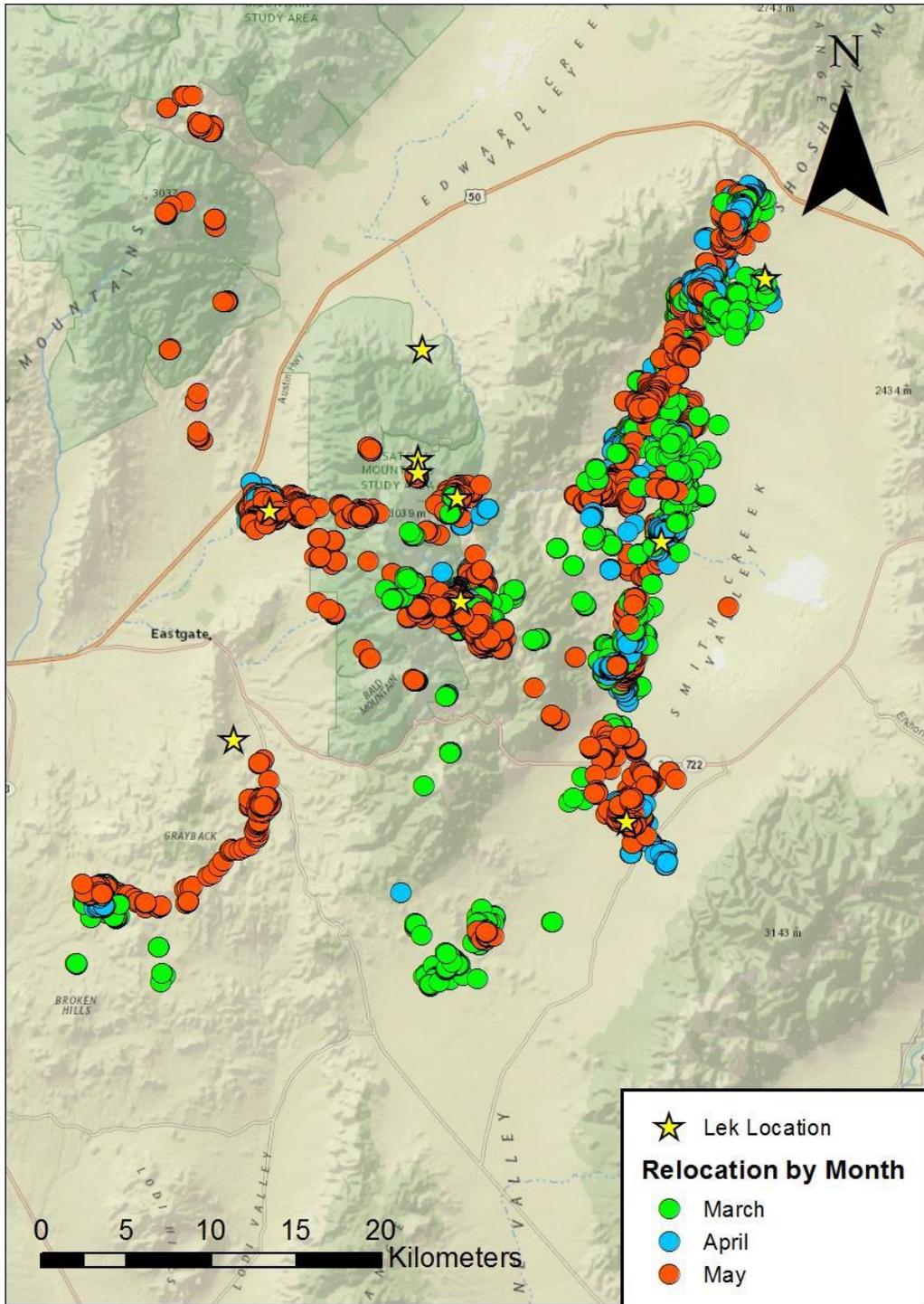


Figure 5. GPS locations by month during the spring in the Desatoya Mountains, NV from 2014-2016.

37-day egg laying and incubation phase was 35.4% (95% CI, 22.5 – 48.7%) over the course of the study.

Brood Survival

All five broods monitored in 2014 failed. In 2015, eight broods were monitored of which two were successful, five failed, and one was unknown. In 2016, 17 broods were monitored of which four were successful, 10 failed, and three had unknown fates. The 10-day interval brood survival probability was 77.4% (95% CI, 66.9 – 85.0%) and the cumulative average survival probability for the 50-day brood rearing period during 2014 – 2016 was 27.8% (95% CI, 13.4 – 44.3%).

Project Name: **Predicting the Value of Greater Sage-grouse Late Brood Rearing Habitats in Nevada**

Other Funding Sources: Nevada Sage-grouse Conservation Grant (75%)

Project Start Date: July 2016

Estimated Completion Date: January 2018

Project Accomplishments:

Identifying quality habitat is a critical step in the conservation and management of populations. Species often select habitat that maximizes their fitness in terms of reproduction and survival. For Greater sage-grouse, the presence of protein rich forbs is required for chicks to persist on the landscape. In the Great Basin, many of these forbs are abundant in spring, but die during dry summers, with the exception of forbs found in moisture-rich refuges. These refuges can be either in the form of wet meadows or elevations that are high enough to receive more precipitation than the surrounding landscape. Using known locations of sage-grouse during July and August from 2013 to 2015, we built a year-specific resource selection model to identify these refuges as high quality late summer habitat (Figure 6). We assessed how the location of sage-grouse on the landscape relative to the predicted late summer habitat quality, affected survival of pre-fledged chicks and adults. We found that chicks in predicted lower quality habitat did not survive as well as chicks in higher quality habitat. Alternatively, adults that spent more time in the high quality habitat did not survive as well as adults that were located in habitat of lower quality. These results suggest that moisture rich refuges are essential for successful reproduction but attending these refuges likely comes at a cost in terms of adult survival. We attribute these costs to biotic processes such as density dependence and predation. We fit the habitat model to a validation dataset located 260 km (Eureka County) from where the data used to train the model were collected, and found that the model accurately predicted where the birds were through both space and time. A predicted surface was



High elevation riparian habitat

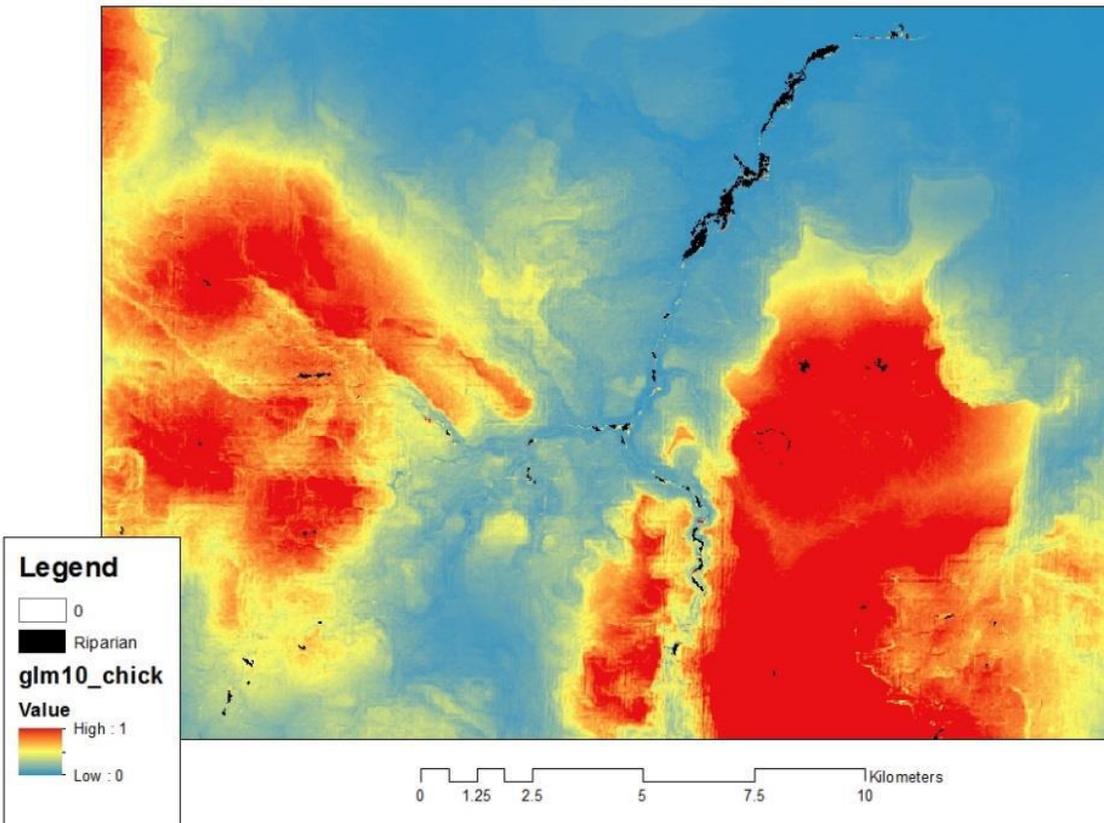


Figure 6. Predicted surfaces for known sage-grouse breeders, from portions of the training dataset for late summer habitat in 2015. Riparian vegetation is plotted in black on the map, and represents areas with water. This is the predicted surface for the Blowout Mountain (left side of figure) and Rock Springs Table (right side of figure) portions of the Sheldon National Wildlife Refuge. The larger riparian areas identified in black is the lower reaches of Virgin Valley Creek, which is largely surrounded by salt-desert shrub type communities.

created for the entire state of Nevada for this limiting resource. Identifying these areas will help the Nevada Department of Wildlife (NDOW) make recommendations to federal land management agencies to balance grazing pressure, mining, and energy development in the Great Basin with the long term persistence of sage-grouse.

These results were completed in the spring of 2016, and presented at the Biannual Columbian Sharp-tail and Sage-grouse Symposium, the joint meeting of the North American Ornithological Society and American Ornithologist Union, and the Western Section of the Wildlife Society. The results garnered interest, additional funding, and additional data from the Oregon Department of Fish and Wildlife, Bureau of Land Management, and United States Fish and Wildlife Service with the goal to extend the model to the state of Oregon. NDOW provided additional funding to extend these

models into the past, and predict an independent surface for every year from 1985 through 2016. We have incorporated additional data, collected during the summer of 2016 to help train our model. We have gathered all of the spatial data needed to make these projections for both Nevada and Oregon, and are in the finishing stages of updating the habitat model and reevaluating its effect on survival and recruitment. Our next step is to evaluate how well changes in the annual predicted surfaces can explain variation in lek counts from both Nevada and Oregon. NDOW and the University of Nevada-Reno expect the completion of this analysis by January 2018. Understanding these relationships, will not only identify areas of conservation need, but it will allow us to predict the effectiveness of each conservation strategy into the future.



Project Name: Effects of Conventional Raven Control on Greater Sage-grouse Vital Rates within the Virginia Mountains

Other Funding Sources: Nevada Sage-grouse Conservation Grant (75%)

Project Start Date: September 2015

Estimated Completion Date: December 2020

Project Accomplishments:

Few studies have quantified the effects of raven removal on sage-grouse nest survival, which is a specific life-history stage, but studies that evaluate evidence on the how predator removal influences population growth rates are lacking. This information would be beneficial in guiding management decisions. For example, raven removal might improve nesting success, but this improvement may not influence population growth rates because of compensatory mortality effects (e.g., limiting factors influencing chick survival).

We are currently investigating raven predation and the effects of raven removal on this sage-grouse population by employing a before-after-control-impact (BACI) study design. Specifically, we have collected baseline data on space-use, habitat selection, and population vital rates over eight years, which encompasses five years (2009-2013) of pre-raven control and three years of raven control efforts (2014-2017). Our goal is to develop an integrated population model using the lek count and demographic data to investigate the effects of raven removal on nest survival, as well as population growth rates. In addition, we have collected videography at nest sites ($n = 58$) and conducted avian predator surveys ($n = 2474$) to identify sage-grouse nest predators common to this study site. Therefore, we will also investigate raven predation rates and evaluate potential effects of compensatory predation (e.g., removing ravens increases badger predation).

Sage-grouse Monitoring

A total of 204 sage-grouse with VHF transmitters have been monitored during 2009–2016. The total number of males and females tracked by radio telemetry were 13 and 191, respectively. Most sage-grouse were relocated in the Spanish Flat area (Figure 7). The population level home range (95% UD) encompassed 10,835 ha during spring and 4261 ha during summer. In each year, the core area was located at Spanish Flat. Sage-grouse captured from both the Sheep Springs and Spanish Flat lek sites used this area before moving to wintering areas. The majority of individual home ranges throughout spring and summer overlapped within the Spanish Flat area, indicating relatively less use of the Sheep Springs area.

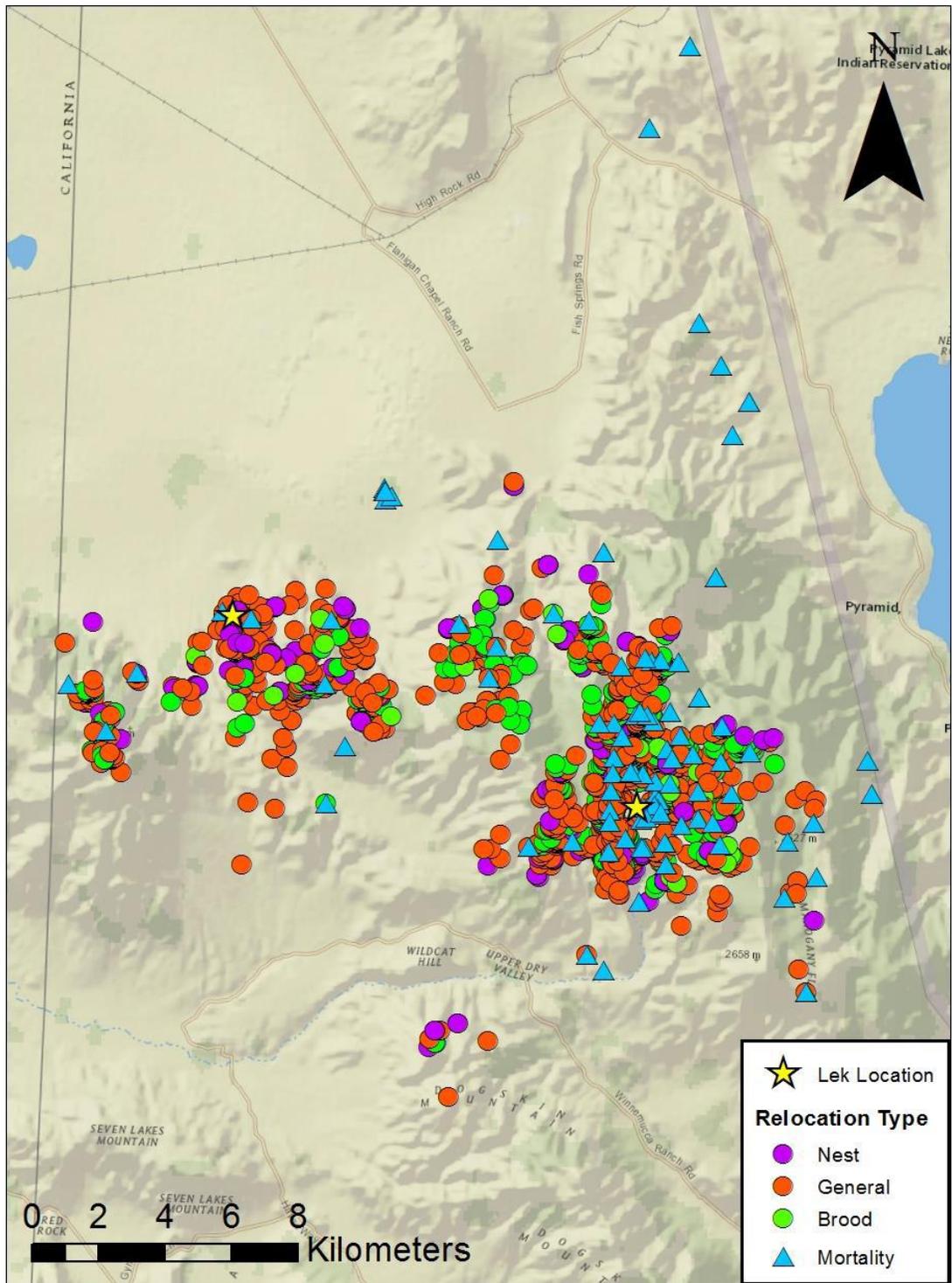


Figure 7. Locations of general radio-marked birds, nests, broods and leks in the Virginia Mountains from 2009-2016.

Sage-grouse Survival

Monthly adult survival probability was 95.6% (95% CI, 94.6 – 96.4%) and cumulative annual adult survival probability was 58.1% (95% CI, 51.5 – 64.1%) during 2009 – 2016. For study years 2009 – 2011, 19 marked sage-grouse mortalities were found. Presumed causes of death included mammalian predators ($n = 6$), avian predators ($n = 4$), unknown predators ($n = 1$), anthropogenic structure collisions ($n = 2$), and unknown causes ($n = 6$). During 2012, five dead marked sage-grouse were located. All mortalities were located to the east of the Spanish Flat lek within the foothills of Tule Ridge. The average distance of the mortalities to the lek site was 2.4 ± 0.3 km (mean \pm SE). Three mortalities appeared to be caused by mammalian predators, and one mortality appeared to be caused by an avian predator. Carcass remains are used to infer the cause of mortality; however, carcasses are often scavenged by other carnivores, thus obscuring evidence of the initial predator's identity.

Thirty-eight radio-marked sage-grouse mortalities were located during study years 2013 – 2015. Assumed cause of death included depredation by mammalian predators ($n = 13$), avian predators ($n = 3$), and unknown causes ($n = 22$). In 2016, 13 marked sage-grouse mortalities were recovered. Assumed cause of death included depredation by avian predators ($n = 2$), mammalian predators ($n = 1$), and unknown causes ($n = 10$). A majority of the unknown causes were transmitters identified as mortalities during fall through spring aerial telemetry monitoring, from which very little evidence remained to help identify the cause of mortality.

Nest Survival

Cumulative average nest survival probability for the 37-day egg-laying and incubation phase for study years 2009 – 2011 and 2013 – 2016 was 28.6% (95% CI, 20.6 – 37.0%). Data from 2012 were not used in this survival estimation because very few nests were found in 2012 and nests were initially located during later stages of incubation due to field logistic constraints.

Sage-grouse Nest Videography

Fifty-eight nests were video-monitored during 2009 ($n = 6$), 2010 ($n = 16$), 2011 ($n = 17$), 2014 ($n = 2$), 2015 ($n = 10$), and 2016 ($n = 7$). Nest depredations, partial nest depredations, and successful hatches were recorded. Nest survival for video-monitored nests was calculated in the same manner as described for all nests. The reason for calculating survival of video-monitored nests both together and separately from all nests was to determine if video-monitored nests are more or less likely to fail. Nest survival across all video-monitored nests for 2009 – 2011 was $43.7 \pm 0.1\%$ (means \pm SE), with yearly survival rates of: $22.2 \pm 0.1\%$ (2009), $35.0 \pm 0.1\%$ (2010), and $60.6 \pm 0.1\%$ (2011). Successful hatching was recorded at 22 nests. Predator activity was recorded at 19 nests, of which

16 nests were depredated, two nests were partially depredated, and one nest hatched with no eggs apparently lost directly due to removal by the predator. Both partially depredated nests still hatched ≥ 1 egg following the event. Depredation was the primary cause of sage-grouse nest failure. Nest predators were avian, mammalian, and reptilian. Predation of both eggs and chicks were recorded at the nest. Ravens were the most frequent sage-grouse nest predator in the Virginia Mountains, accounting for 38.9% of nest depredations. Equipment failure occurred at the remaining three nests, and nest fate was not recorded. Of the two nests that were video-monitored in 2014, one was successful and one was depredated by a coyote. In 2015, eight video-monitored nests successfully hatched, one was depredated by a coyote, and one was abandoned. In 2016, six video-monitored nests successfully hatched and one was abandoned. Video recordings for the 2014 – 2016 nests have not been analyzed, so the following results do not contain detailed descriptions of nest fate.

Brood Survival

During 2009 – 2016, 79 broods were monitored. Thirty-five females with broods were confirmed successful (≥ 1 chick survived to 50-days post-hatch) and 35 broods failed. Of the 35 unsuccessful females, 22 were confirmed as failed on or before the 25-day post-hatch interval. The remaining nine broods could not be relocated to determine survival at 50-day post-hatch; therefore, their fate is unknown. The 10-day interval brood survival probability was 88.8% (95% CI = 84.4 – 92.0%) during 2009 – 2016. The cumulative average brood survival probability for 50-day brood rearing phase (probability of success through the brood rearing period) was 55.1% (95% CI = 42.9 – 65.8%) for 2009 – 2016.

Project Name: Conservation Principles for Greater Sage-grouse in the Great Basin (book and related guidelines handbook)

Other Funding Sources: Nevada Sage-grouse Conservation Grant (75%)

Project Start Date: April 2016

Estimated Completion Date: December 2017

Project Accomplishments:

A sub-grant agreement was completed and is in place through December 31, 2017 that directs and provides funding for the U.S. Geological Survey, working in cooperation with various universities and sage-grouse researchers, to develop a comprehensive, scientifically reviewed and edited book focused on the population ecology of Greater sage-grouse in the Great Basin ecoregion. The agreement also identifies the development of an accompanying, easy to follow, management guidelines handbook specifically focused on the Great Basin to inform management decisions and be

incorporated in land use planning documents in the future. The book will include five main sections including: 1) the nesting phase; 2) the brood rearing phase; 3) juvenile survival; 4) adult survival; 5) integrated population modeling techniques. Each section will have one to many chapters depending on contributions from sage-grouse researchers across the Great Basin.

To date, a final draft of the first section of the book has been completed and is under review. This section, titled “Nest Site Selection of Greater sage-grouse in the Great Basin” identifies factors that affect nest site selection at various spatial scales. This section is essentially a synthesis of nesting habitat data collected across nine study sites in Nevada and northeastern California over seven field seasons from 2009-2015. Succinctly put, this analysis found that horizontal cover was a significant contributing factor to sage-grouse nest site selection and that land use practices that reduce any component of horizontal cover, such as grasses (live or residual), forbs (live or residual), or shrubs in recognized nesting habitat would like by detrimental to nesting sage-grouse and cause females to nest in sub-optimal locations.

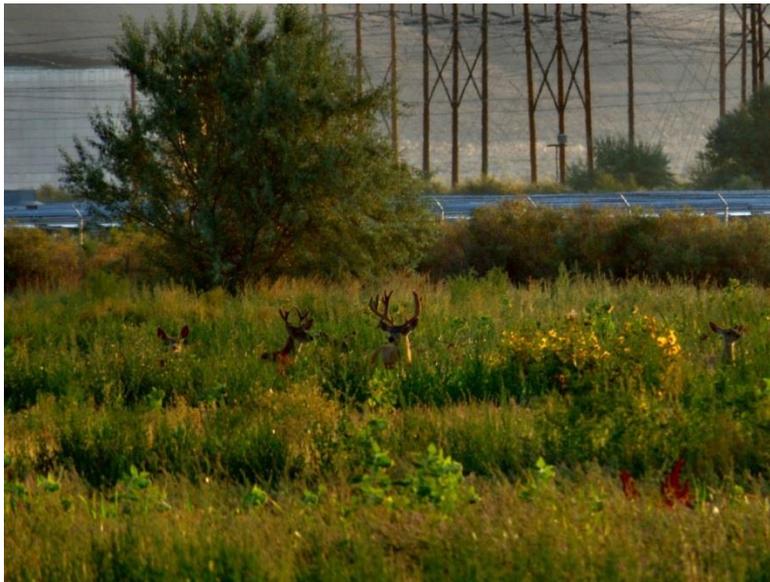


Kirch WMA Food Plots

The purpose of this project was to enhance habitat for waterfowl, upland game birds, and mule deer. Forty acres of the lower dove field were planted with Siberian wheat in September, 2016. Forty acres of the upper dove field were planted with a mixture of cereal grains and sunflowers in May, 2017. Forty acres of the Old Place unit will be planted in June, 2017. The moist-soil units within the Old Place unit will be planted with a summer seed mix composed of millets and cereal grains.

Mason Valley WMA Upland Wildlife Food Plot

The Mason Valley WMA crew planted 140 acres of upland food plots during the fall of 2016 and spring of 2017. Water from the Bolster Well was used to irrigate wheat fields in the fall. Irrigation water from the Walker River was used to irrigate the spring plantings of millets, sorghums and sunflowers.



Mason Valley WMA Food Plot

Key Pittman WMA Food Plots

A total of \$3,900 was expended from Upland Stamp funds and \$2,600 from Duck Stamp funds on seed. Approximately 60 acres were planted in October with winter wheat, fall cereal rye, barley, alfalfa, Austrian winter pea and hairy vetch as a winter cover crop and to enhance hunter success while hunting the fields on the Key Pittman WMA. An additional 40 acres were planted in January with intermediate wheat grass, sand dropseed and sandberg bluegrass to enhance desirable vegetation in areas where the removal of noxious weeds left areas that were lightly vegetated or in areas where improved vegetation cover and variety is needed. Approximately 70 acres were over seeded in late February with Spring wheat, oats, Sainfoin, Ladak Alfalfa, Rocky Mountain bee plant and native annual sunflower. The annual seeding projects is

completed to increase forage production in feeding areas on the WMA and to enhance hunter opportunities. This project was completed by in-house personnel.

Eastern Region WMA Weed Control

With increased funding levels and the addition of a new position, NDOW enhanced its efforts during FY17 to control noxious and invasive species on NDOW's unmanned WMAs and State-owned properties. The Eastern Region is responsible for management of nearly 30,000 acres of designated WMA and State-owned properties. Emphasis in FY 17 was placed on the

Stowell properties and the Mink Ranch associated with the Bruneau WMA.

The Eastern Region amassed a multi-divisional effort targeting tall whitetop, Canada thistle, and Scotch thistle along the Bruneau

Riparian corridor and on old agricultural fields. Crews from the Western and Eastern Fisheries Division in addition to Eastern Region Game and Habitat Divisions worked for a week to conduct



Tall Whitetop Control. Bruneau Wildlife Management Area. Stowell Property. 2016.

weed control and cleanup efforts on the Stowell property. Additional weed control efforts were applied to Forest Service (FS)-administered lands in the Ruby Mountains. The Forest Service has been attempting to control a medusa head infestation along Green Mountain Creek at an administrative site for several years without much success. Concerns with the increase and distribution of medusa head provided an opportunity for NDOW to initiate additional treatments on the property with FS approval utilizing a private contractor. The infestation has spread from FS- administered lands to County and private lands. The Green Mountain area is a wildlife rich region providing habitat for the State's largest deer herd, sage grouse and Lahontan cutthroat trout, a listed species. Two additional follow up treatments are planned and NDOW has been able to enter into a cost sharing agreement with the FS for future treatments.



Herbicide Application - Medusahead Treatment. Green Mountain Admin Site, Ruby Mountains. 11/2016.

Cricket Springs Restoration

In the fall of 2017, the water development portion of the project was implemented and completed. This portion of the project consisted of a French drain installed at lower Cricket Springs that was then piped to a 1,200 gallon tire trough. At the trough, a float valve was installed as well as an output drain that was piped to re-route overflow back to the riparian area. A valve was installed in line between the French drain and the trough so that the development can be winterized and water can be diverted back to the spring when the permittee does not have livestock using the allotment. Funding from this phase of the project totaled \$6,255 with \$1,999 and \$4,256 being contributed by the Upland Game Bird Stamp and Habitat Conservation Fee programs, respectively.

Presently, a scope has been submitted to prospective contractors to complete the fencing portion of the project. There will be two spring sources and their respective wet meadow complexes fenced, with a total of 2,268 feet of pipe rail fence. The bid tour with

contractors took place May 22nd, 2017 with an implementation start date of June 15th, 2017. The work performance period ends October 31, 2017.



Cricket Springs, Elko County, Nevada; Pre-Project Conditions, Fall 2016

Medusahead Mapping in Buffalo Hills

This project is oriented around mapping and treatment of medusahead and other noxious invasive species in the Buffalo-Skedaddle Greater Sage-grouse Population Management Unit. A contractor has been awarded a sub-grant to conduct the work and has currently expended \$5,000 of the \$10,000 awarded to this project. Project work is currently underway and funds should be spent by September 30, 2017. During the 2016 fiscal year, approximately 93 days were spent on-site, with 450 acres of land treated on those days. It is expected that approximately 350-400 acres will be treated between May 1 and September 30, 2017.

Post-Fire Upland Habitat Restoration near Guzzlers

During the late fall of calendar year 2016 through the spring of calendar year 2017, this project spent approximately \$23,500 on a number of restoration activities near small game guzzler sites in NDOW's Southern Region. These activities include repairing road access to Guzzler #37, and planting 440 plants at five Kane Springs Valley guzzler sites. Monitoring of 10 restoration sites previously restored and located in Lincoln County's Kane Springs Valley has shown a high survival rate of plantings ($\geq 75\%$) due to

subsequent manual watering and timely precipitation events. An increase in quail and chukar populations has also been observed near restored guzzler sites.

Additional repairs and maintenance to access roads may be necessary after significant precipitation events and additional plantings, watering and monitoring will occur at guzzler sites during the remainder of FY17. Work to be completed during the remainder of FY17 is listed below:



Kane Springs Valley Post-fire Restoration near Small Game

- Guzzler road access maintenance/repair.
- Preparation of sites and planting of native plant stock at specified guzzlers.
- Installation of Dri-Water irrigation, herbivore proof plant cages, and hand watering.
- Subsequent plant replacement, watering, Dri-Water replacement, plant cage repair.
- Project monitoring.

Southern Nevada Small Game Water Developments

The majority of the FY14 and FY15 Southern Nevada Small Game Water Development funding was allocated towards the purchase of materials to be used in the repair of existing small game water developments (*hereafter*, guzzlers). A lesser degree of funding was allocated towards tools needed to complete repairs, and maintenance of a state-owned ATVs/UTVs used by state personnel to access remote sites where small game guzzlers are located. From 1 July 2016 to 30 June 2017, NDOW water development staff conducted 231 inspections on existing guzzlers in Clark, Lincoln, and Nye Counties and performed minor maintenance procedures on 71 of those units. Most of the maintenance activity included repair or replacement of exclusionary fencing, storage tanks, frames, collection aprons, and plumbing. A total of 2,700 gallons of water was hauled to 9 existing guzzlers in the Bullfrog Hills after it was reported that all the small game guzzlers in the region of the Bullfrog Hills were dry.

Progress Report on Upland Game Bird Stamp Projects Funded in FY 2018

Columbian Sharp-tailed Grouse Restoration Project

Other Funding Sources: NDOW’s Game Management Grant (75%)

Project Start Date: April 2013

Estimated Completion Date: The fifth and final year of originally agreed upon translocations with the Idaho Department of Fish and Game was completed in April of 2017. We feel that it may be necessary to conduct additional augmentations of between 5-10 hens with broods each year for two years to establish a self-sustaining population. It would be preferable to collect birds from British Columbia; however, this may be too logistically challenging to implement.

In a collaborative, multi-agency effort to reestablish a viable population of CSTG in northeastern Nevada, 215 Columbian sharp-tailed grouse (CSTG) from 15 lek sites in southeastern Idaho were translocated to the Bull Run Basin in Elko County, NV, during April 2013 – 2017. Of these, 134 females and 41 males were marked with VHF transmitters and were monitored by ground and aerial telemetry. In addition, a subsample of female CSTG were artificially inseminated prior to translocation to promote nesting and the rearing of broods at the release site ($n = 6$, 2014; $n = 9$, 2015, $n = 9$, 2016). A CSTG lek survey conducted on April 18, 2018 found 14 males and 1 female were at the known main lek. Additionally, 2 males were observed to the north, 7 males were observed to the east and another 3 males were observed on a potential satellite lek further south of the main lek. In all, a minimum of 26 male CSTG were observed compared to 18 males at the main lek and associated satellite leks in 2017. A follow up survey conducted on May 5, 2018 documented 29 male CSTG at the lek sites described above.

Capture and Known Fate Results

During April of 2017, 24 females were captured and translocated to Nevada; however, two died in the release boxes prior to their actual release. Table 1 shows the complete release history for this five-year restoration effort.

Table 1. Summary of CSTG translocations from 2013-2017.

Year	Males (Radio Marked)	Females (Radio Marked)	Total Released
2013	14 (8)	35 (35)	49
2014	15 (13)	27 (27)	42
2015	15 (10)	34 (29)	49
2016	15 (10)	35 (30)	50
2017	0 (0)	22 (12)	22
Totals:	59 (41)	153 (133)	212

Telemetry

In 2017, research crews obtained 108 locations from 24 CSTG ($n = 1$ translocated in 2015; $n = 11$ translocated in 2016; $n = 12$ translocated in 2017). However, many of these were mortality locations from CSTG which perished overwinter. The average distance from the release location that a CSTG was found during the field season was 5.7 (± 9.0) km, and 95% of all locations were located within 3.9 (± 5.8) km of the release location. These values are larger than in previous seasons because the sample size in 2017 was smaller, and a few grouse were routinely located well away from the release site (e.g. one nest was located ~ 34 km from the release site). All telemetry locations are used to develop utilization distribution models which categorize high and low use areas (Figure 1).

Survival

Research crews radio-marked 14 of 24 translocated female grouse in 2017. Of those, two died during transport from the source site prior to release, and 6 died within the first 60 days post-release. In 2017, translocated female grouse had a 10-day probability of survival of 0.93 (95% CI 0.84 – 0.96), and a 0.32 (95% CI 0.08 – 0.55) cumulative probability of surviving the entire 150-day field season (April – September). In 2017, translocated grouse had a 0.80 (95% CI 0.60 – 0.89) monthly survival probability, and a 12-month annual probability of survival of 0.06 (95% CI 0.0 – 0.23). Through the end of October, 2017, there were an estimated 2 – 5 VHF collared CSTG alive at the release site.

When all grouse were pooled into one analysis regardless of release date, the monthly survival probability from April 2013 – October 2017 was 0.88 (95% CI 0.86 – 0.89; Table 1), and the cumulative annual survival probability for this period was 0.20 (95% CI 0.15 – 0.25).

Nest Survival

Six nests ($n =$ two hatch; $n =$ four failure) from six grouse ($n =$ two translocated in 2016; $n =$ four translocated in 2017) were monitored. While only two nests hatched, three of the four failures survived for 30+ days before failing. Two of those females were killed while on nest recess, and the third nest presumably failed while hatching. Because each nest survived for several weeks before failure, the modeled probability of nest survival is higher than the apparent nest survival of 33%. In 2017, CSTG nests had a daily survival rate of 0.98 (95% CI 0.95 – 0.99) and a cumulative probability of nest survival of 0.46 (95% CI 0.13 – 0.75).

Since the beginning of the project, 103 CSTG nests have been located within, near, and outside of the release area. Of these, 60 successfully hatched (58% apparent nest success). The cumulative daily survival probability of a CSTG nest across all years of the project was 0.98 (95% CI 0.97 – 0.98, Table 2) and the cumulative probability that a nest would survive the nesting season across all years was 0.46 (95% CI 0.35 – 0.56, Table 2).

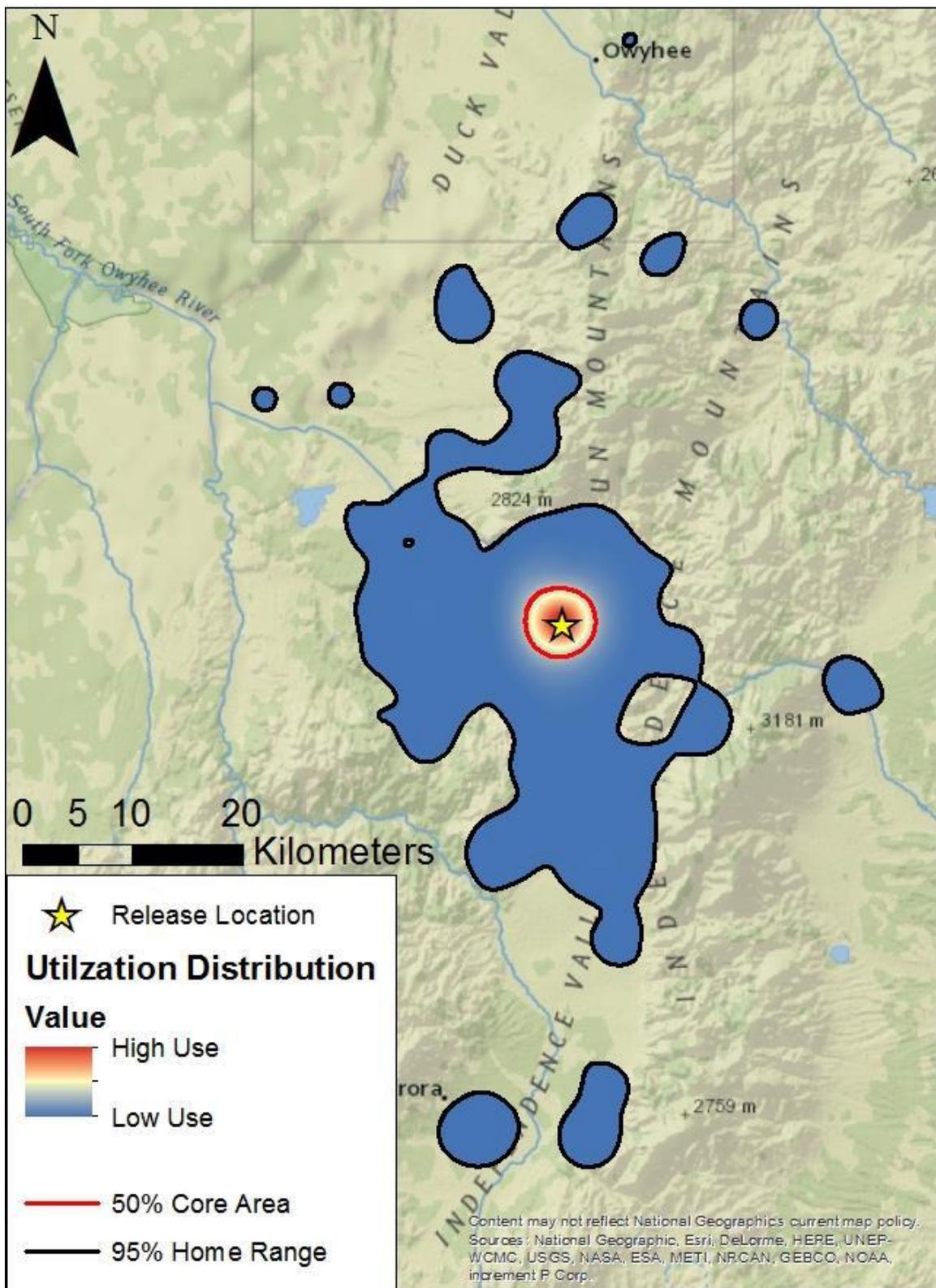


Figure 1. Utilization distribution of translocated Columbian sharp-tailed grouse from 2013-2017. Fifty percent of all telemetry locations are within the red line (high use area) and 95% are within the black line. This information is preliminary and subject to revision.

Table 2. Nesting survival statistics accumulated from 2013-2017.

Year	# of Nests	Successfully Hatched	Daily Nest Survival	Incubation Period Survival*	Clutch Size
2013	14	7	0.97	0.29	10.9
2014	26	17	0.98	0.51	10.5
2015	36	24	0.99	0.64	10.9
2016	21	10	0.98	0.40	9.5
2017	6	2	0.98	0.46	9.2
Average:	20.6	12.0	0.98	0.46	10.2

*The laying and incubation period is estimated to be 37 days.

Brood Survival

Only two broods were tracked in 2017, one succeeded, and one failed. The failed brood occurred when the female was killed, approximately nine days after hatch. The successful brood rearing female raised one chick to an age of 50-days post hatch. In 2017, broods had a daily survival rate of 0.98 (95% CI 0.88 – 0.99), and a cumulative probability of brood survival of 0.4 (95% CI 0.0 – 0.86). Cumulative brood survival statistics are provided in table 3.

During 2013 – 2017, 57 females with broods were tracked. Of these, 32 successfully reared a minimum of one chick to 50-days old (56% apparent brood success) bringing a minimum of 90 juveniles into the population. The daily survival probability of a CSTG brood across all years of the project was 0.99 (95% CI 0.98 – 0.99), and the cumulative survival probability that a brood would reach 50 days post-hatch across all years was 0.58 (95% CI 0.42 – 0.70).

After five years of translocations, initial modeling of population persistence indicates that while brood survival is within the normal range of established populations, the chick-survival rate is low. That is, the number of females that successfully reared ≥ 1 chick to an age of 50-days is normal, but in this population, each of those females is rearing on average 1 – 3 chicks, when on average they should be rearing at least 3 – 5 chicks according to published literature. However, many STG and CSTG projects perform their chick-counts at 35 days post-hatch, while we perform our chick counts on day 50. This discrepancy in methodology might account for lower chick survival rates reported.

Table 3. Cumulative brood survival statistics from 2013-2017.

Year	# of Broods	# of Successful Broods	Daily Brood Survival	50-day Brood Survival	Est. # of Chicks Surviving
2013	7	4	0.99	0.55	17-20
2014	17	7	0.99	0.58	20-23
2015	24	16	0.99	0.64	44
2016	10	4	0.98	0.45	8
2017	2	1	0.98	0.40	1
Total or Average:	12	32	0.99	0.58	90-96

Mountain Quail and Ruffed Grouse Translocation

Other Funding Sources: NDOW's Game Management Grant (75%)
Project Start Date: November 2017
Estimated Completion Date: March 2018 [for Fish Creek Range Mountain Quail release]

Mountain Quail Establishment Project

Over the last two years, the Nevada Department of Wildlife (NDOW) has been releasing mountain quail into the Fish Creek Mountains located in Lander County. During this period, 234 mountain quail have been released into a drainage on the western slope of the Fish Creek Mountains (Figure 2).

The first release occurred during the late winter of 2017 when 88 mountain quail were released after being held over at the Mason Valley Wildlife Management Area (MVWMA) for a period of about 2.5 months. This release was followed by two releases in 2018. The first group of mountain quail, which consisted of 100 banded birds, were retrieved from Oregon in November of 2017 and transported to the holding pens for overwintering at MVMWA. The second group of quail, consisting of 55 birds (all banded), were collected from Oregon on January 12, 2018 and released the next day. These birds were released more immediately due to limited remaining holding space at the MVWMA and the mild winter conditions that northern Nevada was experiencing during December and January. Subsequent to this release, 91 mountain quail that remained at MVWMA were released on February 6, 2018.

Quail call routes will be conducted at least twice during May and June of each year following release for a period of three years to help determine the sustainability of this population. Based on the habitat suitability compared to the Desatoya Range and the Clan Alpine Range, mountain quail should do well in the Fish Creek Mountains.



Figure 2. Fish Creek Mountains mountain quail release site in Lander County, NV.

Ruffed Grouse Establishment Project

A fairly intensive effort was conducted to locate and determine the status of ruffed grouse populations throughout northern Nevada during the spring and summer of 2017. Due to suppressed population sizes at potential source sites as indicated through various surveys, no birds were translocated during the fall of 2017. Drumming counts and summer brood surveys conducted in 2017 indicate that populations of ruffed grouse have still not recovered from lower numbers observed during 2015 and 2016. The status of the population has also been reflected in harvest data that indicated low overall harvest in 2016 ($n=131$ in 2016 compared to 10-year average of 385) and number of birds taken per hunter day ($n=0.3$ in 2016 compared to 10-year average of 0.5). Capture and translocation efforts will remain on hold until populations recover.



Figure 3. Strutting ruffed grouse photo taken by Sue Fox.

Greater Sage-grouse Population Monitoring

Other Funding Sources: NDOW’s Sage-grouse Conservation Grant (75%)
 USFS Good Neighbor Agreement
 Project Start Date: July 1, 2017
 Estimated Completion Date: June 30, 2018

Lek Count Technicians

We employed three seasonal lek count technicians from March through May of 2018 to assist with sage-grouse lek counts. Two technicians were assigned to the Western Region, but also contributed time to the Southern Region and one technician was assigned to the Eastern Region. Initially, two technicians were also to be assigned to the Eastern Region, but finding a candidate to fulfill that roll proved challenging. These technicians surveyed 7 leks in the Desatoya PMU, 5 leks in the Reese River PMU, 32 leks in Humboldt County (conducted 52 counts) and XX leks in Washoe County. Final data is not yet available to summarize for this report.

Aerial Lek Survey

Eight mornings of aerial helicopter lek surveys were conducted during the spring breeding season in 2018. Including ferry time, a total of 21.8 hours of helicopter time was expended. The areas surveyed include the following:

Humboldt County	Elko County
<ul style="list-style-type: none"> • Sonoma Range • Black Rock Range • Montana Mountains • Pine Forest Range • Santa Rosa Range 	<ul style="list-style-type: none"> • Gollaher Mountain • O’Neil Basin

No survey results were available during this report writing period to summarize. Helicopter surveys allow biologists to survey several leks in an efficient manner and get to leks that would otherwise be inaccessible by vehicle.

Fixed Wing Infrared Surveys

Surveys to discover sage-grouse leks and to monitor existing known leks were conducted over two periods: late March (3/23 – 3/29) and mid-April (4/10 – 4/11) of 2018 using a fixed wing aircraft outfitted with an Integrated Infrared Imaging Supersystem (IRIS) contracted with Owyhee Air Research. Surveys were conducted during the early morning hours within the following areas:

Nye County	White Pine County	Elko County	Humboldt County	Washoe County
Monitor Range Toquima Range Toiyabe Range	Snake Range Schell Creek Range	Owyhee Desert	Jackson Mountains	Nut Mountain

Methods:

Lek Habitat Suitability Model

We used a Maxent model (version 3.3.3k) to evaluate the effects of various environmental variables contributing to sage-grouse lek habitat suitability. We used 716 active or pending active lek sites in Nevada as presence records for training while 238 leks were used for testing to determine which environmental variables were most predictive of sage-grouse lek sites. The environmental variables considered included aspect, vegetation type, elevation, herbaceous vegetation, shrub cover, shrub height, distance to wet vegetation, distance to flat water and distance to flowing water. The overall effect of each of these variables individually plus any correlations between a selected variable and other variables were presented as response curves by the Maxent model.

Lek Detection Surveys

Surveys were conducted with a P68 Observer aircraft (Figure 4) outfitted with an Integrated InfraRed Imaging Supersystem (IRIS). There are four integrated subsystems that constitute IRIS including 1) a multi-spectral imager mounted to the outside of the aircraft which is made up of a long-range cooled infrared camera, HD daylight camera, low-light camera, and electro-optical system, and a vibration isolator; 2) an augmented reality system computer which provides mapping information and incorporation of satellite and synthetic imagery, digital elevation models, etc.; 3) an Imaging System Interface (ISI) which houses the augmented reality system computer housed inside the aircraft which is equipped with digital video recorders, video converters, data downlink equipment, etc. and 4) high performance touchscreen monitors.



Figure 4. P68 Observer aircraft outfitted with multi-spectral camera.

Lek Detection and Count Results – 2018

Monitor Range

- No new detections during survey

Toiyabe Range

- No new detections during survey

Toquima Range

- Surveyed 5 known leks (2 active with 7 males total)
- Two new possible lek detections (or satellite leks) with 10 males total

North Snake Range

- One likely new lek detection (13 males, 9 females; Figure 5)

North Schell Creek Range

- No detections during survey

Jackson Mountains

- No detections during survey

Nut Mountain (northern Washoe County)

- Surveyed four known leks (1 active with 10 males, Wall Canyon Ranch);
- One new potential lek detection with 22 males (Hanging Rock Canyon)

East Owyhee Desert (Elko County)

- Surveyed 20 known leks (7 active with 68 males total)

Diamond A/Islands (Elko County)

- Surveyed 9 leks on the Diamond A Desert (1 active with 4 males)
- Surveyed 9 leks east of Jarbidge (Islands) (3 active with 48 males)



Figure 5. Potential new lek discovered in the north Snake Range north of Rye Grass Canyon.

Fixed Wing Telemetry Surveys

Fixed wing telemetry surveys are conducted during the fall and winter months when research crews have left the field. These surveys were contracted through Owyhee Air Research located in Murphy, Idaho. The surveys are conducted to not only determine the location of radio-marked sage-grouse, but also to determine whether or not birds are alive or have perished. This allows us to determine monthly, seasonal and annual survival rates. Through the end of April 2018, 23.3 hours of fixed wing flight time had been devoted to aerial survey. The areas surveyed include the following:

- Boulder Mountain - Hayes Canyon Range to Massacre Bench (Washoe County);
- Sheldon National Wildlife Refuge (Humboldt County);
- Santa Rosa Range/western Owyhee Desert (Humboldt County)

Bi-State Sage-grouse Monitoring

Other Funding Sources: NDOW's Sage-grouse Conservation Grant (75%)

Project Start Date: September 2015

Estimated Completion Date: Estimated completion date is 2018 for this initial phase of monitoring. A subsequent phase will begin again after a three year reprieve in 2022.

This monitoring project was designed to measure the effectiveness of management actions developed in the Bi-State Action Plan (2012) and Monitoring Plan (2015) on Bi-State Greater sage-grouse populations. Sage-grouse population vital rates, space-use, habitat selection, and predator community composition are being measured across several study sites within the Bi-State region. Monitoring efforts in the Mount Grant and Desert Creek (hereafter, MG and DC, respectively) populations from 2015–2017 are summarized here, with an emphasis on efforts in 2017. During the fall of 2016, 19 grouse at DC and 23 grouse at MG were captured and radio-marked. In the spring of 2017, an additional 10 grouse at DC and 11 at MG were captured and radio-marked. Including surviving grouse from previous seasons, research crews tracked 40 grouse at DC, and 38 grouse at MG during the 2017 field season. Vital rates measured in 2017 as well as cumulatively across all years of the study are summarized here as well. The object of this research is to provide the most accurate science to guide management decisions.

Capture and Monitoring Results (2015-2017)

The following summarizes the capture and radio-marking work completed during each year of this project:

- Fall 2015 - 12 females captured and radio-marked in MG and 8 in DC;
- Spring 2016 - 10 females captured and radio-marked in MG and 13 in DC;
- Fall 2016 - 21 females captured and radio-marked in MG and 18 in DC;
- Spring 2017 - 9 females and one male were captured and marked at DC while 10 females and one male were captured and radio-marked at MG.
- Fall 2017 - 9 females were captured and marked at DC and an additional 15 females and one male were marked at MG.

During spring (March–May), summer (June–August), fall (September–November), and winter (December–February) of 2013–2017, we obtained 16,916 GPS locations or marked grouse at MG and DC. Utilization distributions were calculated by season for GPS and VHF-marked sage-grouse. The utilization distributions for MG and DC were jointly calculated and are presented on the same map (Figure 7). During the spring, DC and MG sage-grouse concentrated at Nine-mile Flat, a valley southeast of Bald Mountain and southwest of Mt. Grant. Many birds utilized the area surrounding the East Walker River and Rough Creek and some remained on Mt. Grant. Sage-grouse were primarily located at Nine-mile Flat during the summer as well, with the highest concentrations located near Rough Creek. During the fall, sage-grouse once again primarily used Nine-mile Flat, but also used Bald Mountain and the Wassuk Range. Sage-grouse again mainly congregated in Nine-mile Flat during the winter; they made less use of Bald Mountain, but made more use of areas within and around the Wassuk Range.

Adult Survival

In 2017, grouse at MG had a monthly probability of survival of 0.98 (95% CI 0.93–0.991), and a cumulative probability of annual survival of 0.75 (95% CI 0.42–0.90). In 2017, none of the female grouse captured in spring ($n = 10$) died; the only deaths known to occur in 2017 at MG were survivors from previous seasons. At DC, grouse had a monthly probability of survival of 0.98 (95% CI 0.95–0.99) and a cumulative probability of annual survival of 0.67 (95% CI 0.39–0.83).

Cumulatively (from 2015–2017), grouse at MG had a monthly probability of survival of 0.98 (95% CI 0.96–0.994), and an annual probability of survival of 0.80 (95% CI 0.60–0.93). At DC, the cumulative (from 2015–2017) monthly probability of survival of sage-grouse was 0.98 (95% CI 0.96–0.991) with an annual probability of survival of 0.75 (95% CI 0.56–0.86).

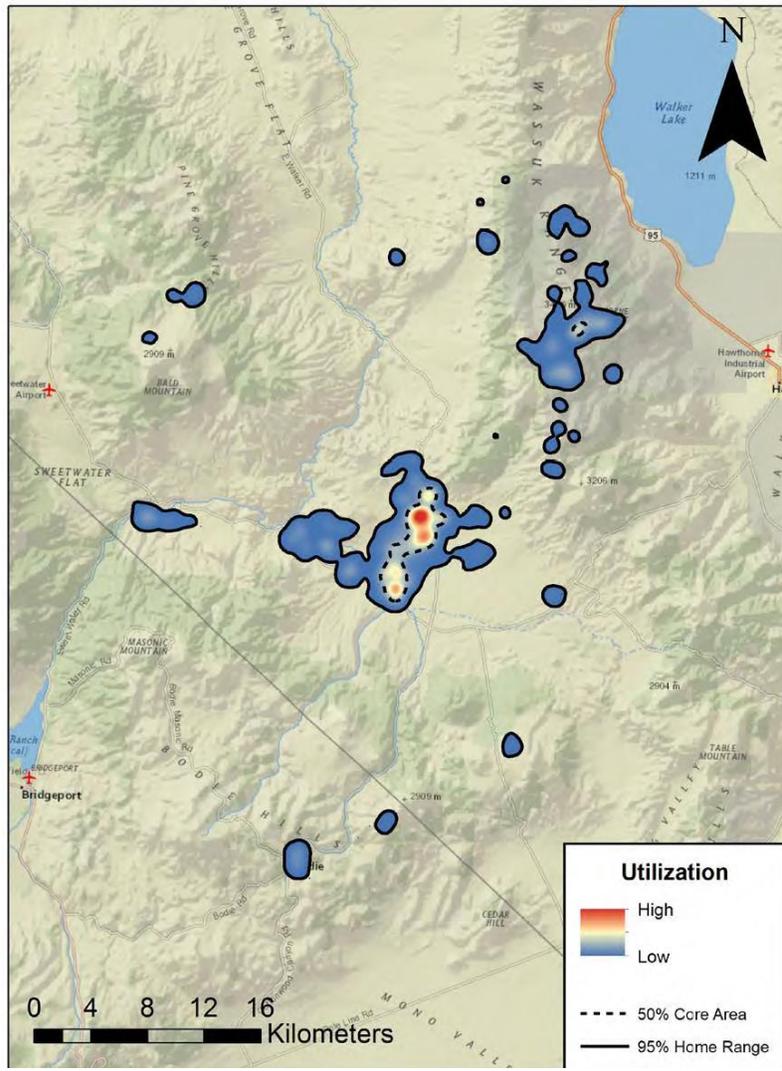


Figure 7. Cumulative utilization distribution of greater sage-grouse at the Mount Grant and Desert Creek study areas, NV/CA, during 2015–2017. Preliminary and subject to revision.

Nest Survival

In 2017, 10 nests were located at MG and 24 nests by 21 females at DC. At MG, nine nests hatched, while ten nests hatched at DC. Nests at MG had a daily probability of survival of 0.996 (95% CI 0.97–0.999) and a cumulative probability of nest survival of 0.86 (95% CI 0.32–0.96). At DC, nests in 2017 had a daily probability of nest survival of 0.95 (95% CI, 0.92–0.97) and a cumulative nest survival probability for the 37-day egg laying and incubation period of 0.17 (95% CI, 0.05–0.36).

Cumulatively (2016–2017), nests at MG had a daily probability of nest survival of 0.98 (95% CI 0.96–0.99), and a 37-day probability of nest survival of 0.47 (95% CI 0.20–0.69; Figure15A). At DC, the cumulative daily probability of nest survival was 0.96 (95% CI 0.94–0.97) with a cumulative 37-day probability of nest survival of 0.21 (95% CI 0.09–0.38).

Brood Survival

In 2017, nine broods at MG and nine broods at DC were monitored. Of the MG broods, five broods were successful, and four failed. At DC, four broods were successful and five failed. The daily probability of brood survival at MG was 0.99 (95% CI 0.97–0.996; Table 6) and the cumulative probability of brood survival for the 50-day brood rearing period was 0.58 (95% CI 0.24–0.82). At DC, females with broods had a daily probability of brood survival of 0.99 (95% CI 0.97–0.995) and a cumulative probability of brood survival across the 50-day brood rearing period of 0.52 (95% CI 0.18–0.78).

Cumulatively (2016–2017), females with broods at MG had a daily probability of brood survival of 0.99 (95% CI 0.97–0.993), and a cumulative 50-day probability of brood survival of 0.49 (95% CI 0.23–0.70). At DC, cumulatively (2016–2017), females with broods had a daily probability of brood survival of 0.99 (95% CI 0.98–0.996) and a cumulative probability of surviving the entire 50-day brood rearing period of 0.64 (95% CI 0.38–0.82).



Figure 8. The Mount Grant study site after a March 2018 snowstorm. Photo by Chris Wemmer.

Monitoring the Effects of Pinyon and Juniper Removal on Greater Sage-grouse in Southeastern Nevada

Other Funding Sources: NDOW's Sage-grouse Conservation Grant (75%)
Project Start Date: September 2015
Estimated Completion Date: December 31, 2019

NDOW and the BLM – Ely District have partnered on a monitoring project to determine the efficacy of various vegetative treatments, particularly pinyon and juniper removal, on small to moderately sized Greater sage-grouse populations within portions of Lincoln County and southern White Pine County. Population level impacts to sage-grouse can occur at very low level of conifer encroachment. For example, in a study conducted in south-central Oregon, Baruch-Murdo et al. (2013) found that no sage-grouse leks remained active when canopy cover exceeded 4%. The BLM and NDOW, along with various other partners including private landowners, are working to address this issue throughout Sage-grouse Management Zone III within south-central Nevada and southern Utah. Similar monitoring work is also ongoing in southern Utah in the Skutumpah, Dog and Hamlin Valley areas by Dr. Nicki Frey with Utah State University. Information collected from Lincoln County in Nevada will help augment sample sizes and provide more robust results from the southern portion of the species range.

Hamlin Valley Study Area

There were four females with GPS satellite PTT transmitters in the southern end of Hamlin Valley in March 2018. Cursory investigation suggests most of their movements at the valley edges were in the evening and overnight, likely roosting. Each of those four females spent a substantial amount of time in the center of Hamlin Valley at known leks there. The male in the northern end of the valley also concentrated his movement at a lek in the center of the valley, with some possible diurnal pattern in when he was nearer the edges.

Cave Valley Study Area

In Cave Valley, there are two sage grouse with active transmitters—one male and one female. Both stayed fairly close to the center of Cave Valley near a lek site for most of the month, especially during the last week; neither had more than one sequential point more than about a mile from the center of their movements.

Steptoe Valley

During March of 2018, capture crews experienced suboptimal trapping conditions, yet trapped one female and one male in Steptoe Valley. Since then, the female has moved between several different leks within about 4 miles and in the eastern half of south Steptoe Valley. The male has stayed on one lek, though in the last week of the month may have dropped the transmitter or died, as all the points were within 30m.

Future Plans

Trapping efforts will continue this April in Steptoe and Hamlin valleys. It is important that we establish a sufficient sample size in this new study area to detect movements there and how it does or does not differ from others in the study.

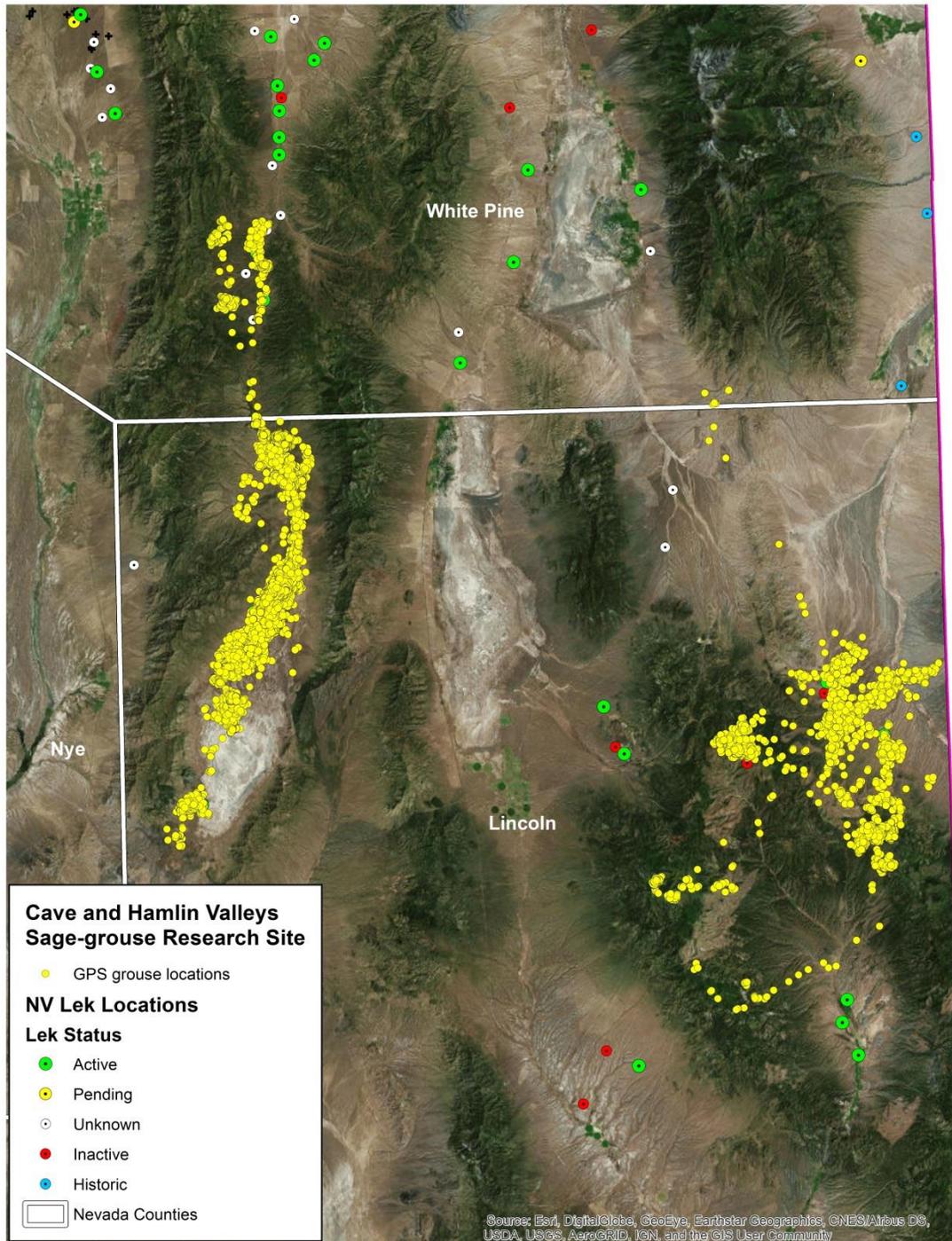


Figure 9. Greater sage-grouse GPS-PTT locations within the Cave and Hamlin Valley study areas (through November of 2017).

Monitoring the Effects of Landscape-Level Treatment on Greater Sage-grouse within the Desatoya Mountains of Central Nevada

Other Funding Sources: NDOW's Sage-grouse Conservation Grant (75%)
Carson Valley Chukar Club

Project Start Date: September 2013

Estimated Completion Date: December 31, 2019

NDOW, the USGS - Western Ecological Research Center and the BLM initiated a before-after study design to investigate potential effects of habitat enhancement and restoration on sage-grouse population vital rates, habitat selection, and movement patterns, as well as effects on predator community composition, in the Desatoya Mountains in central Nevada. During 2013–2017, 157 sage-grouse have been captured and radio- or GPS-marked within the study area. During 2014–2017, 78 nests were located, 43 broods were monitored, and 1,174 telemetry locations were obtained. A total of 1,686 raptor, raven, and livestock surveys were conducted and 1,523 ravens were detected during 668 surveys. Primary data collection efforts include gathering baseline data on space use, habitat selection, and population vital rates.

Capture and Monitoring Results

In the spring and fall of 2016, 32 sage-grouse were captured and marked 32 sage-grouse with VHF ($n = 20$; 20 females, 0 males), Dummy GPS ($n = 4$; 0 females, 4 males), or GPS ($n = 8$; 3 females, 5 males) transmitters. Finally, during the spring and fall of 2017, 39 sage-grouse were captured and marked with VHF ($n = 34$; 34 females, 0 males) or GPS ($n = 5$; 1 female, 4 males) transmitters.

In 2014, 168 telemetry locations from 29 collared females were obtained in 2014, 378 telemetry locations from 45 marked sage-grouse in 2015, 312 telemetry locations from 41 marked sage-grouse in 2016, and 316 telemetry locations from 45 marked sage-grouse in 2017. A total of 56,732 GPS locations were obtained during all years of study.

Movement Patterns

Two general patterns of sage-grouse movement were observed from spring breeding areas to summer habitat: grouse moved to either lowland riparian and agricultural complexes or to high-elevation areas within the Desatoya Mountains (Figures 10). Sage-grouse were observed congregating in the valley near Smith Creek and the surrounding agricultural fields. Grouse utilized resources near the creek during the day and roosted in the surrounding hills at night; they were regularly observed flying or walking back and forth at dawn and dusk. Some GPS-marked individuals moved from the Smith Creek Valley to higher elevations near Edwards Creek. Two GPS-marked females captured at the Rock Creek lek moved from the valley to the mountains in 2014 following failure of their broods. In the Desatoya Mountains, it appears that birds use springs and other ephemeral water sources near Edwards Creek, Haypress, and Topia Creek leks.

During fall, sage-grouse activity was highly concentrated around Smith Creek, Edwards Creek, the Haypress lek, and along Smith Creek Valley toward the New Pass lek. However, during winter, sage-grouse began to congregate around lek sites and away from Smith Creek and high elevation areas. There may have been an undocumented or satellite lek between Smith Creek and New Pass leks, as a majority of sage-grouse marked during the spring of 2014 were approximately 8–10 km away from both of these leks. Females were captured at New Pass, Smith Creek, Haypress, and Rock Creek leks during all years of the study.

Nest Survival

The distribution of sage-grouse nest survival estimates for each year of the study is summarized in Table 4. During 2017, cumulative daily nest survival probability was 0.974 (95% CI, 0.951–0.986), and cumulative nest survival probability for the 37-day egg laying and incubation phase was 0.377 (95% CI, 0.154–0.603). During 2014–2017, cumulative daily nest survival probability was 0.972 (95% CI, 0.962–0.980), and cumulative nest survival probability for the 37-day egg laying and incubation phase was 0.356 (95% CI, 0.242–0.472).

In 2017, three of the failed nests showed signs of raven depredation, and four showed signs of depredation by an unknown predator. One failed nest presented evidence of depredation of both the eggs and female, and the final failed nest had intact eggs that appeared to be abandoned by the female.

Table 4. Estimated daily probability of nest survival, and estimated probability of a nest surviving the 37-day laying and incubation period.

Year	Daily Survival Probability	95% CI	Incubation Period Survival	95% CI
2014	0.963	0.930-0.981	0.248	0.069-0.485
2015	0.968	0.944-0.982	0.305	0.118-0.519
2016	0.980	0.961-0.989	0.468	0.233-0.674
2017	0.974	0.951-0.986	0.377	0.154-0.603
Average:	0.972	0.962-0.980	0.356	0.242-0.472

Brood Survival

The distribution of sage-grouse brood survival estimates for each year of the study is summarized in Table 5. During 2017, cumulative daily probability of brood survival was 0.986 (95% CI, 0.968–0.994), and cumulative survival probability for the 50-day brood rearing period was 0.504 (95% CI, 0.193–0.752). During 2014–2017, cumulative daily probability of brood survival was 0.979 (95% CI, 0.968–0.986), and cumulative survival probability for the 50-day brood rearing period was 0.338 (95% CI, 0.198–0.484).

In 2017, of the five known failed broods, one failed between the 10- and 20-day check and one failed between the 30- and 40-day checks. The remaining three failed between the 40- and 50-day checks.

Table 5. Estimated daily probability of brood survival, and estimated probability of a brood surviving the 50-day brood rearing period.

Year	Daily Survival Probability	95% CI	Brood Survival to 50-days	95% CI
2014	0.963	0.913-0.985	0.151	0.011-0.461
2015	0.978	0.942-0.992	0.324	0.051-0.657
2016	0.977	0.958-0.988	0.314	0.116-0.537
2017	0.986	0.968-0.994	0.504	0.193-0.752
Average:	0.979	0.968-0.986	0.338	0.198-0.484



Photo by David Parker

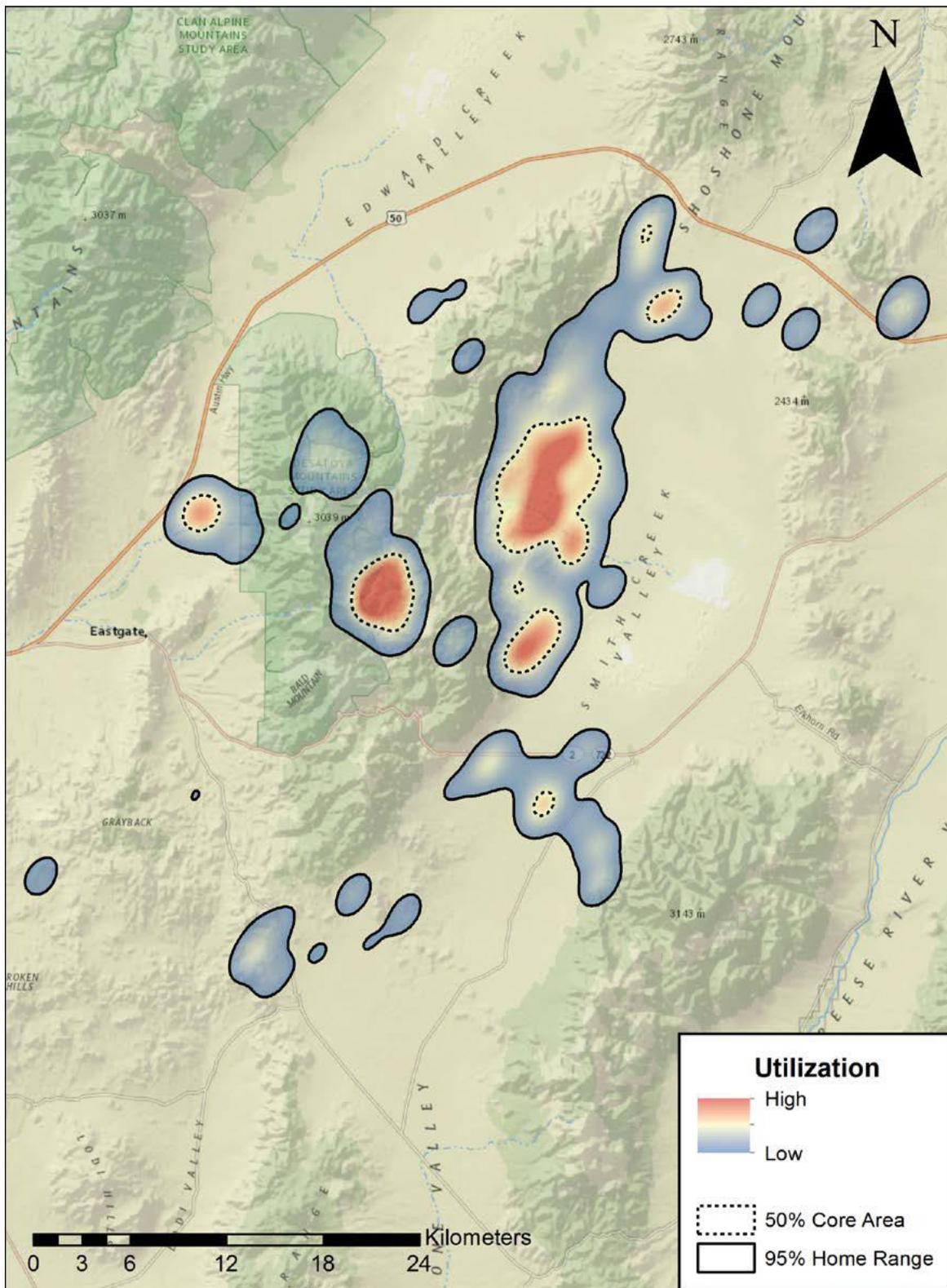


Figure 10. Utilization distribution for sage-grouse in the Desatoya Mountains, NV during spring (March – May) 2014-2017. Preliminary and subject to revision.

Effects of Conventional Raven Control on Greater Sage-grouse Vital Rates within the Virginia Mountains

Other Funding Sources: NDOW's Sage-grouse Conservation Grant (75%)
Project Start Date: September 2015
Estimated Completion Date: December 2020

Common ravens (*Corvus corax*, hereafter ravens) are an important nest predator of sage-grouse, and raven nest sites have been shown to be associated with energy infrastructure. The Virginia Mountains study area of northwestern Nevada is a potential site for future solar energy and other developments. An option often considered by wildlife managers to reduce raven numbers is lethal removal. However, the success of this management action is often debated. Few studies have quantified the effects of raven removal on sage-grouse nest survival, which is a specific life-history stage, but studies that evaluate evidence on how predator removal influences population growth rates are lacking. This information would be beneficial in guiding management decisions. For example, raven removal might improve nesting success, but this improvement may not influence population growth rates because of compensatory mortality effects (e.g., limiting factors influencing chick survival).

Raven predation and the effects of raven removal on sage-grouse are currently being investigated within the Virginia Mountains through a before-after-control-impact (BACI) study design. Specifically, baseline data has been collected on space use, habitat selection, and population vital rates over eight years, which encompasses five years of pre-raven control and three years of post-raven control efforts. Recent large wildfires in parts of the study area partially coincide with raven control, and allow for a more complex experimental design. Our ultimate goal is to develop an integrated population model using the lek count and demographic data to investigate the effects of raven removal and interactions with wildfire on nest survival and population growth rates. In addition, we have collected videography at nest sites ($n = 62$) and conducted avian predator surveys ($n = 2606$) to identify sage-grouse nest predators common to this study site. These data will allow eventual investigation of raven predation rates and potential effects of compensatory predation (e.g., does removing ravens increase coyote predation?). The results summarized here are preliminary and further data are required before conclusions can be reached concerning this population of sage-grouse. Because this is an ongoing study and has not been finalized, the purpose of this document is to provide a project update and summary of data.

Sage-grouse Monitoring

From 2009 through 2017, a total of 298 sage-grouse with VHF transmitters have been monitored. The total number of males and females tracked by radio-telemetry were 7 and 291, respectively. Most sage-grouse were relocated in the Spanish Flat area (Figure 1). In each year, the core area was located at Spanish Flat in the Virginia Mountains. Sage-grouse captured from both the Sheep Springs and Spanish Flat lek sites used this area before moving to wintering areas. The majority of individual home ranges throughout spring and summer overlapped within the Spanish Flat area, indicating relatively less use of the Sheep Springs area.

Sage-grouse Survival

Cumulative annual adult survival probability was 0.674 (95% CI, 0.585–0.748) during 2008–2017. Adult survival was lowest in 2017. For study years 2009–2011, 19 marked sage-grouse mortalities were found. Presumed causes of death included mammalian predators ($n = 6$), avian predators ($n = 4$), unknown predators ($n = 1$), anthropogenic structure collisions ($n = 2$), and unknown causes ($n = 6$). The average distance of the mortalities to the lek site was 2.4 ± 0.3 km (mean \pm SE). One mortality was located on the eastern slope of Tule Ridge at a relatively high elevation. No mortalities were located near the Sheep Springs lek. Three mortalities appeared to be caused by mammalian predators, and one appeared to be caused by an avian predator. Carcass remains are used to infer the cause of mortality; however, carcasses are often scavenged by other carnivores, thus obscuring evidence of the initial predator's identity.

Nest Survival

Cumulative average nest survival probability for the 37-day egg-laying and incubation phase for study years 2009–2011 and 2013–2017 was 0.25 (95% CI, 0.18–0.33). The highest estimated nest survival probability was 0.56 in 2011 (95% CI, 0.35–0.73) and the lowest was 0.06 in 2009 (95% CI, 0.01–0.18). 2012 data was not used in this survival estimation because very few nests were found which were initially located during later stages of incubation due to field logistic constraints. Including these nests into the analysis may have biased the estimation high because daily nest survival probabilities have been shown to increase as incubation progresses (Coates and Delehanty, 2010).

During 2009–2017, 154 sage-grouse nests were monitored. Of these, 73 nests were successful (first attempt = 66, second attempt = 7) and 81 nests failed (first attempt = 73, second attempt = 8), of which 63 were depredated (first attempt = 58, second attempt = 5). Four nests were partially depredated with ≥ 1 chick hatched. Signals were lost for several female sage-grouse during the study, possibly due to radio failure or movement away from the region. Third nesting attempts were not documented during the study period.

Sage-grouse Nest Videography

Sixty-two nests were video-monitored during 2009 ($n = 6$), 2010 ($n = 16$), 2011 ($n = 17$), 2014 ($n = 2$), 2015 ($n = 10$), 2016 ($n = 7$), and 2017 ($n = 4$). Nest depredations, partial nest depredations, and successful hatches were recorded. Nest survival rates for video-monitored nests were calculated in the same manner as described for all nests. The reason for calculating survival of video-monitored nests both together and separately from all nests was to determine if video-monitored nests are more or less likely to fail. Nest survival across all video-monitored nests for 2009–2011 was 0.44 ± 0.10 (means \pm SE), with yearly survival rates of: 0.22 ± 0.10 (2009), 0.35 ± 0.10 (2010), and 0.61 ± 0.10 (2011). Successful hatching was recorded at 22 nests. Predator activity was recorded at 19 nests, of which 16 nests were depredated, two nests were partially depredated, and one nest was not depredated and successfully hatched. Both partially depredated nests still hatched ≥ 1 egg following the predator event. Depredation was the primary cause of sage-grouse nest failure. Nest predators were avian, mammalian, and reptilian. Predation of both eggs and chicks were recorded at the nest.

Ravens were the most frequent sage-grouse nest predator in the Virginia Mountains, accounting for 38.9% of nest depredations. Equipment failure occurred at the remaining three nests, and nest fate was not recorded. Of the two nests that were video monitored in 2014, one was successful and one was depredated by a fox. In 2015, eight video-monitored nests successfully hatched, one was depredated by a coyote, and one was abandoned. In 2016, six video-monitored nests successfully hatched and one was abandoned. Four nests were monitored in 2017 with three being depredated. Of the four nests recorded, two nests were depredated by coyotes, one partially depredated by a raven, and the final nest successfully hatched. Video recordings for the 2017 nests have not been completely analyzed.

Brood Survival

During 2009–2017, 83 broods were monitored. Thirty-seven females with broods were confirmed successful (≥ 1 chick survived to 50-days post-hatch) and 36 broods failed. Of the 36 unsuccessful females, 23 were confirmed as failed on or before the 25-day post-hatch interval. The remaining ten broods could not be relocated to determine survival at 50-day post-hatch; therefore, their fate is unknown. The 10-day interval brood survival probability was 0.88 (95% CI, 0.84–0.91) during 2009–2017. The cumulative average brood survival probability for 50-day brood rearing phase (probability of success through the brood rearing period) was 0.53 (95% CI, 0.41–0.64) for 2009–2017. The highest brood survival was in 2013, 0.83 (95%CI, 0.28–0.98) while 2016 had the lowest brood survival with 0.21 (95% CI, 0.05–0.44).

Recent Fires

The 2016 Virginia Mountains Fire Complex burned approximately 59,727 acres, and the 2017 Long Valley Fire burned approximately 83,733 acres, totaling 143,460 acres burned within the Virginia Mountains study area. The proportion of pre-fire nest sites in burned areas totaled 60.1% (2016, 17.2%; 2017, 52.6%). The Virginia Mountains Fire Complex impacted nest survival, brood survival, and adult survival. Preliminary results are as follows: pre-fire nest survival was 0.34 (95% CI, 0.10–0.65), and post nest survival was 0.13 (95% CI, 0.00–0.47); pre-fire adult survival was 0.69 (95% CI, 0.50–0.89), and post fire adult survival 0.65 (95%CI, 0.36–0.88); pre-fire brood survival was 0.69 (95% CI, 0.50–0.89), and post fire adult survival 0.65 (95% CI, 0.36–0.88). The impact of the 2017 Long Valley Fire is unknown at this time.

Dusky Grouse Ecology and Management in Eastern Nevada

Other Funding Sources: NDOW's Game Management Grant (75%)
Project Start Date: March 2018
Estimated Completion Date: December 2021

This project is officially underway as Stephanie Landry was hired in January of 2018 as a Ph.D. student at Utah State University to research the ecology and management of dusky grouse in east-central Nevada. Stephanie received her bachelor's degree from Louisiana State University and master's degree from West Virginia University; where she conducted research on bobcats working closely with the West Virginia Division of Natural Resources.

On April 18, 2018, Stephanie and her field crew of technicians (Connor White, Andrew Byers and Macrae Windous) began their field season by getting to know the study areas and learning breeding survey protocols during their first week. The study area was divided into four sub-areas – 3 in the Schell Creek Range (i.e., Kalamazoo Creek, Indian Creek, Duck Creek) and one in the Egan Range (Bothwick Creek). Once technicians were fully trained, breeding surveys officially began. Male dusky grouse make three different sounds that can be detected by observers. Most frequently, males make a low, barely audible (to the human ear) booming or hooting sound. However, this call can only be detected within short distances (< 100 m). Males also make a much louder single note hoot that can be detected hundreds of meters away. When displaying males are very excited, usually when they detect the presence of a female dusky grouse, they jump in the air and make a loud wing clap that can also be detected hundreds of meters away. We have tailored our survey design to our study area by randomly delineating 4 separate breeding survey routes with 4 stops per route. Stops are a minimum of 500 m apart. Due to the topographic relief throughout the study area, only four stops per route are attainable before the grouse cease displaying.

Breeding surveys require the observer to arrive at the first stop 30 minutes before sunrise. At the first stop weather data (temp, cloud cover, etc.) is recorded. Each stop location is recorded for consistency. Listening intervals last 4 minutes each and are performed consecutively 4 times.

The first 3 intervals are listening only, and the fourth interval is a callback survey where the cantus of a female dusky grouse is repeated twice at the top of each minute. If a grouse is detected during any interval, mapping software is used to estimate the location of the bird. If individual birds are detected multiple times they keep the same identification between intervals. Ambient noise is recorded after each interval, and the survey ends with an update



Photo by Teri Slatauski, NDOW 2013.

on weather data. Our protocols will allow us to estimate detection rates and abundance. The locations of individual males can be used for further habitat selection analysis to help identify likely areas for displaying males in the future. Without having further analyzed the data, one thing is clear – males like to call for females from high vantage points, such as the top of rocks, jetties, or hill peaks. This is not surprising given the terrain they live in.

Thus far, we have had an apparent detection rate of 46% for male and/or female Dusky Grouse between all survey stops. This detection rate is relatively high compared to limited research on past dusky grouse breeding surveys. It is uncertain if the dusky grouse density is higher or if calling rates are more frequent, but we have been pleasantly surprised by the number of birds

we are detecting. All dusky grouse, both male and female, flushes and sightings are recorded, and male point locations are taken.

A behavioral observation that the field crew witnessed is that males may become territorial when another male approaches their vantage point, especially when a female is nearby. This is typical behavior for males of many species during breeding season. However, the team also noticed an increase in Dusky Grouse hen hostility while playing interval survey callbacks, especially near areas with a male present. Females will call back, and some will even begin to approach the observer (i.e., the “intruding female”). This aggressive territorial behavior has been noted by past researchers (i.e., Zwickle and Bendell) most notably on Vancouver Island, BC, Canada. They believed that hens were being territorial over available space for nesting habitat and that some subordinate hens did not nest in a given year because of this behavior.

Another behavior not well recognized in literature is the regular use of mountain mahogany (*Cercocarpus ledifolius*) by dusky grouse. Generally, dusky grouse are thought to use conifers over winter and into early spring as they transition to using lower-elevation hardwoods, such as aspen (*Populus tremuloides*) and maple (*Acer negundo*), prior to and during the breeding season. However, these habitat types are limited in east-central Nevada, and both sexes have been found roosting, displaying, and/or calling from the ground or tree limbs of mountain mahogany. Although, we have found them in other habitat (e.g., conifers and aspen) mahogany seems to be preferred. The mahogany stands seem to offer protective cover, shade, and access to a foraging source during early spring. It will be interesting to further analyze dusky grouse use and selection of mahogany stands, which may be unique to Nevada dusky grouse populations.

Walk-in traps have been set in areas with multiple displaying males. Locations have generally been in mahogany stands and available “pinch points” between conifer stands. Dogs have been used, primarily in aspen stands, to locate grouse and flush them into nearby trees. We have attempted noosing twice, but both grouse managed to remain just out of reach. In open areas, we have also tried net-gunning. We have caught 1 grouse with a net gun that somehow managed to carry the net to the nearest tree and walk out of it. Other attempts were halted by vegetation catching the net and providing a gap for grouse to escape.

Trapping in mahogany stands has proven the most difficult thus far. The mahogany provides the grouse with protective over story cover while allowing them to watch for ground predators. If a predator is observed, the grouse simply jump up into the mahogany, then flush out of the top and fly downhill to another mahogany or aspen. This makes capture very difficult, especially since the birds have been very flighty thus far. Capturing Dusky Grouse in such unique habitat types as found in east-central Nevada may require additional creativity and ingenuity compared to typical forest grouse capture methodology.

Bi-State Conifer Removal Project

This project consisted of hand cutting, lopping, and scattering all phase 1 and phase 2 pinyon pine and juniper trees on approximately 1,747 acres to improve sage-grouse habitat conditions and connectivity to previously completed sage-grouse projects in the Pine Nut Mountains of western Nevada. All of the work has been completed, resulting in greater connectivity for Bi-State sage-grouse movement. This project was part of BLM's Pine Nut Land Health Initiative, and was a collaborative effort between NDOW, BLM, NRCS, and the State of Nevada Smith Valley Conservation District. Fifty thousand dollars of Upland Game Bird Stamp funds were spent on this project and it is anticipated that follow up maintenance work will be needed in FY 2023.

Key Pittman WMA Wildlife Food Plots

A total of \$3,900 of Upland Game Bird Stamp funds and \$2,600 of Duck Stamp funds were spent on seeds for the food plots at the Key Pittman WMA. Approximately 60 acres were planted in October with winter wheat, fall cereal rye, barley, alfalfa, Austrian winter pea and hairy vetch as a winter cover crop and to enhance hunter success while hunting the fields at the WMA. An additional 40 acres were planted in January with intermediate wheat grass, sand dropseed and sandberg bluegrass to enhance desirable vegetation in areas where the removal of noxious weeds left areas that were lightly vegetated or in areas where improved vegetation cover and variety is needed. Approximately 70 acres were over-seeded in late February with spring wheat, oats, Ladak alfalfa, and native annual sunflower. The annual seeding projects were completed to increase forage production in wildlife feeding areas on the WMA and to enhance hunter opportunities. This project was completed by NDOW staff.

Cricket Springs Restoration

Phase one of the Cricket Springs Restoration Project was implemented in the spring of 2017 with the construction of a water development and the successive construction of two pipe rail fences around two spring sources. The water development was constructed as a part of the agreement with the private land owner in order to gain permission to preclude access by livestock to the spring sources after the fences were constructed.

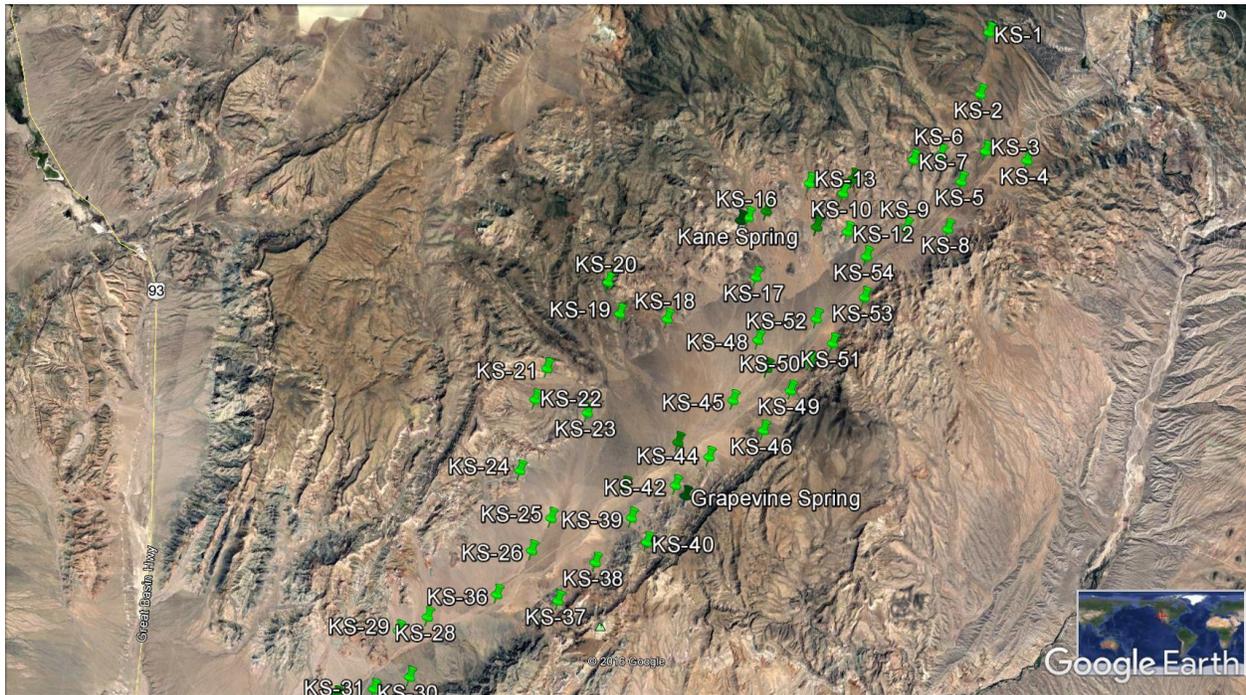
Phase two of the project will include upland restoration within the fenced area that has been heavily disturbed and impacted by livestock overuse. Weed treatments and seeding will be implemented during the fall of 2018 and spring of 2019.



Cricket Springs - Lower Spring Site Pipe Rail Fence Enclosure

Post-Fire Upland Habitat Restoration - Kane Springs Valley

During the late fall of calendar year 2017 through the spring of calendar year 2018, this project spent approximately \$11,500 on restoration activities near small game guzzler sites located in Lincoln County's Kane Springs Valley. Monitoring of the restoration sites revealed significant drought damage, including up to 40% mortality rates on the plantings for FY18 due to higher than normal temperatures, limited rainfall and cattle grazing. To replace drought-stricken plantings, restoration efforts included the replanting of 900 plants divided between three separate small game guzzler site locations, KS42, KS44 and KS46. Cattle grazing damage had occurred at KS42 and KS44 guzzler sites with impacts on plants and plant cages as well. Additional plant replacement, repairs and maintenance to plant cages may be necessary. Watering and monitoring are planned at all 10 project guzzler sites during the remainder of FY18. Work during FY18 included preparation of sites, planting of native plant stock at specified guzzler sites, installation of new cages and repair of existing plant cages, hand watering and project monitoring.



Location of Kane Springs Valley Small Game Water Developments

Eastern Nevada Properties Weed Control

Removal of noxious and other undesirable weeds enhances wildlife habitat, improves the appearance of an area and its public access, and limits the spread of weeds to other areas. The goal of this annual project is to remove noxious/invasive weeds such as Russian knapweed, hoary cress, perennial pepperweed (also known as tall whitetop), and Canada thistle found on several state-owned properties. The project is co-funded by the Duck Stamp and Upland Game Bird Stamp accounts since it benefits both waterfowl and upland species.

In the fall of 2017, NDOW hired the Tri-County Cooperative Weed Management Area to treat 330 acres on the Steptoe Valley and Wayne E. Kirch WMAs. An additional 387 acres were treated on these properties by NDOW staff, using herbicides purchased with Duck Stamp funds and funds from NDOW's Federal WMA grant.

Projects also were implemented on the Bruneau River WMA to treat bull thistle, Canada thistle, scotch thistle, perennial pepperweed, hoary cress, and black henbane. All treatments were implemented by NDOW biologists and fisheries Conservation Aids. Approximately 150 acres of thistle were treated in the Taylor Springs enclosure.

A week long treatment of a multitude of target species at the meadows on the state-owned Kingston Canyon property was treated in July of 2017, and a historic equine fence was removed. A contracted treatment of approximately 85 acres of meadow habitat on the Kingston

Canyon property will be conducted during the summer of 2018 and the target species will be perennial pepperweed.

Corners for Quail - Quinn River Valley – Van Der Hoek

In the fall of 2017, NDOW and the Van Der Hoek family formalized an agreement to have several of their pivot corners planted with a Canada wildrye (*Elymus canadensis*) and Blue flax (*Linum lewisii*) to provide additional cover and food resources for pheasant and quail. The seed mix used was ninety percent Canada wildrye and ten percent Blue flax purchased for \$4777.50 through the Nevada Division of Forestry. The seed was delivered to Michael Van Der Hoek in late November and was drill seeded by him at approximately ~12 PLS lbs./acre at the end of November. The planting effort resulted in approximately 40 planted acres. This project has served as the first completed Corners for Quail project and will serve as a baseline for successfully partnering with landowners on habitat improvement on private lands.

It is too early in the growing season determine establishment and overall success but we can confirm some of the Canada wildrye has germinated and is taking, albeit there is a significant cheatgrass presence. Vegetation monitoring will be initiated summer 2018 to determine establishment and if further management efforts can be implemented to increase perennial grass and forb cover in the planted area.

Southern Nevada Small Game Water Developments

The majority of the Upland Game Bird Stamp funds spent on southern Nevada small game water developments (*hereafter*, guzzlers) during FY18 were allocated towards the purchase of materials to be used in the repair of existing small game guzzlers. A lesser degree of funding was allocated towards tools needed to complete repairs, and maintenance of a state-owned ATVs/UTVs used by state personnel to access remote sites where small game guzzlers are located. NDOW water development staff conducted 122 inspections on existing guzzlers in Clark, Lincoln, and Nye Counties and performed minor maintenance procedures on 25 of those units. Most of the maintenance activity included repair or replacement of exclusionary fencing, storage tanks, frames, collection aprons, and plumbing.



Gambel's quail and chukar partridge in the Mormon Mountains of Lincoln County, Nevada

Mason Valley WMA Upland Wildlife Food Plots

The work conducted as part of this project during FY18 was the same as that described in the FY17 Upland Game Bird Stamp Projects section above.

Upland Game Bird Stamp Projects with FY17 Expenditures

Name of Project	\$ Spent in FY17*
Columbian Sharp-tailed Grouse Restoration Project	\$24,969
Mountain Quail and Ruffed Grouse Translocation	\$7,000
Greater Sage-grouse Population Monitoring	\$81,321
Estimating Greater Sage-grouse Vital Rates within Nevada's Most Novel Habitats	\$22,275
Bi-State Greater Sage-grouse Monitoring	\$19,505
Monitoring the Effects of Pinyon and Juniper Removal on Greater Sage-grouse in Southeastern Nevada	\$4,115
Monitoring the Effects of Landscape-Level Treatment on Greater Sage-grouse within the Desatoya Mountains of Central Nevada	\$15,000
Predicting the Value of Greater Sage-grouse Late Brood Rearing Habitats in Nevada	\$8,377
Effects of Conventional Raven Control on Greater Sage-grouse Vital Rates within the Virginia Mountains	\$17,500
Conservation Principles for Greater Sage-grouse in the Great Basin	\$14,981
Kirch WMA Food Plots	\$2,486
Mason Valley WMA Upland Wildlife Food Plots	\$7,400
Key Pittman WMA Food Plots	\$3,900
Eastern Region WMA Weed Control	\$6,506
Cricket Springs Restoration	\$3,479
Medusahead Mapping in Buffalo Hills	\$2,331
Post-Fire Upland Habitat Restoration Near Guzzlers	\$10,519
Southern Nevada Small Game Water Developments	\$4,205
Total	\$255,868*

* Note: totals do not match due to rounding

Upland Game Bird Stamp Projects with FY18 Expenditures

Name of Project	\$ Spent in FY18*
Columbian Sharp-tailed Grouse Restoration Project	\$5,610
Mountain Quail and Ruffed Grouse Translocation	\$12,000
Greater Sage-grouse Population Monitoring	\$86,908
Bi-State Greater Sage-grouse Monitoring	\$19,505
Monitoring the Effects of Pinyon and Juniper Removal on Greater Sage-grouse in Southeastern Nevada	\$3,643
Monitoring the Effects of Landscape-Level Treatment on Greater Sage-grouse within the Desatoya Mountains of Central Nevada	\$15,000
Effects of Conventional Raven Control on Greater Sage-grouse Vital Rates within the Virginia Mountains	\$20,000
Dusky Grouse Ecology and Management in Eastern Nevada	\$3,279
Bi-State Conifer Removal Project	\$50,000
Key Pittman WMA Wildlife Food Plots	\$3,900
Cricket Springs Restoration	\$10,001
Post-Fire Upland Habitat Restoration - Kane Springs Valley	\$11,669
Eastern Nevada Properties Weed Control	\$3,107
Corners for Quail - Quinn River Valley – Van Der Hoek	\$4,778
Southern Nevada Small Game Water Developments	\$2,901
Mason Valley WMA Upland Wildlife Food Plots	\$3,599
Total	\$256,632*

* Note: totals do not match due to rounding

Progress Report on Duck Stamp Projects Funded in FY 2017

Ducks Unlimited Wetlands Conservation Support

A total of \$10,000 was donated to Ducks Unlimited to help them implement the migratory bird projects that were developed as a result of the North American Waterfowl Management Plan. The projects primarily consist of wetland restoration, forage establishment and production, and the purchase of conservation easements in the prairie potholes regions of Saskatchewan and Alberta. Band return data show that these two Canadian provinces are the sources of a significant number of waterfowl that pass through Nevada each year.

Overton WMA Irrigation System Repair

Project funds were used to purchase parts and supplies to repair broken sections of the irrigation pipe at the Overton Wildlife Management Area (WMA). Repairs were made on three different irrigation lines that experienced failure due to the age of the pipe and fittings. This project created more efficient water flows to the moist-soil units that waterfowl and other shorebirds utilize on the WMA. The project repairs were completed by Overton WMA staff.

Overton WMA Weed Control

A total of \$1,544 was spent on herbicides for treatment at the Overton WMA. Cattail, Malta starthistle, puncturevine, field sandburs, cocklebur and arrowweed have been or will be treated to improve valuable waterfowl habitat. This effort will aid in future weed encroachment at the treated sites and help prevent the spread of noxious and other invasive weeds to other areas.



Photo by Steve Siegel

Northern Shoveler

Overton WMA Farming

Fertilizer was purchased and applied to approximately 100 acres of agricultural fields. This helped increase productivity of crops and improved the degraded condition of the soil in those fields. Herbicides were also purchased and applied around the irrigation valves for invasive weed control. This project was completed by the Overton WMA cooperators under the terms of the current farming and agricultural lease agreement. A total of \$3,499 was spent on fertilizers and herbicides.

Kirch WMA Food Plots

The purpose of this project was to enhance habitat for waterfowl, upland game birds, and mule deer. Forty acres of the lower dove field were planted with Siberian wheat in September, 2016. Forty acres of the upper dove field were planted with a mixture of cereal grains and sunflowers in May, 2017. Forty acres of the Old Place unit will be planted in June, 2017. The moist-soil units within the Old Place unit will be planted with a summer seed mix composed of millets and cereal grains.

Carson Lake Pond Improvements

Habitat Division staff completed a wetland enhancement project with Ducks Unlimited and the U.S. Bureau of Reclamation at Carson Lake and Pasture. The project rehabilitated portions of the Rice Drain to improve water conveyance to the Rice and Sprig Units. This work included cleaning sediments and vegetative growth from areas with poor conveyance capacity, replacing worn-out structures and adding a new weir. The project enhanced wildlife habitat on approximately 1,700 acres in the Sprig and Rice units when water resources are available.

Overton and Key Pittman WMAs Wetland Enhancements (Phase 2)

Funding was used to purchase water control structures, HPDE pipe, and other materials that will be used in the wetland enhancement projects at Key Pittman and Overton WMAs. The future leveling of Pintail and Wilson ponds at Overton WMA will be a cut and fill balance that will result in more uniform pond bottoms that eliminate overly deep areas and spread water to areas that in the present state do not support shallow ponded conditions. The project will also improve water delivery and drainage and will thus improve the ability of WMA staff to manage waterfowl habitat at the WMA. These improvements will also allow NDOW to increase production of preferred waterfowl food plants. In addition to the habitat improvements, and with deeper areas within the two ponds filled, less water will be required to manage the units and provide optimal habitats for both waterfowl and hunters. Approximately \$10,000 was expended at Overton WMA for these materials. At Key Pittman WMA, the enhancement plan is

intended to provide better habitat conditions for waterfowl, better hunting opportunities for area users in the northern ponds of the WMA and would alleviate the situation under which the private neighbor's pasture gets flooded. Approximately \$4,500 was expended at Key Pittman WMA for these materials.

Waterfowl Banding with Emphasis on Cinnamon Teal

Much of the waterfowl banding gear used in Nevada was purchased in 2009 and much of it needs to be replaced. The following supplies were purchased with this project's funding: two rocket nets, a set of three rockets, a supply of corn for duck banding efforts, dial calipers, digital scales, rolls of 1" by 2" welded wire, and 3/4" galvanized poles. These supplies will be shared among the duck banding efforts in the Lahontan and Mason Valleys in the future.



Canvasbacks fitted with the nasal saddle type of geolocator (leg band geolocators are also used)

Tracking Canvasbacks throughout the Great Basin

NDOW has provided funds for purchasing geolocators over a four year period thus far. Geolocators are a cheap alternative for following movements of individual ducks by recording daily light curves. In concert with a clock, geolocators can be used like a sailor's sextant by using midday and midnight times, along with daylight length to calculate longitude and latitude. The stored data has to be physically downloaded.

A total of 64 geolocators were purchased in 2013; 16 for mallards and 48 for wood ducks. A total of 150 geolocators were purchased in 2014: 50 for mallards, 50 for canvasbacks, and 50 for wood ducks. A total of 150 geolocators were purchased in 2015: 50 for mallards, 50 for canvasbacks, and 50 for wood ducks. A total of 63 geolocators were purchased in 2016 to attach to canvasbacks; and were supplemented by an additional 21 provided by Manitoba Department of Conservation. The primary use of these geolocators is to monitor what proportion of the annual cycle these three species spend in Nevada for purposes of informing habitat managers. A secondary benefit of geolocators is they take advantage of the behavior of incubating hens in that the hens lay on their legs where a geolocator is attached. This allows the geolocator to record nesting activity.

Field Technician and Analysis Support for Waterfowl Projects

For the past four years, NDOW has supported the attachment of more than 400 geolocator devices to 3 species of ducks: wood ducks, mallards, and canvasbacks. The attachment and subsequent retrieval of these devices have been more successful than initially planned. Given that, a proposal was awarded to support an MS student at University of Nevada Reno to continue to retrieve these devices, analyze the data, write-up results, and participate in the May breeding waterfowl survey. Nathan Cook began work on the project in February 2017. He has retrieved numerous geolocators from wood ducks, helped install 63 geolocators on canvasbacks, conducted the 2017 spring breeding waterfowl survey, is taking classes at UNR, and has analyzed some of the geolocator data.

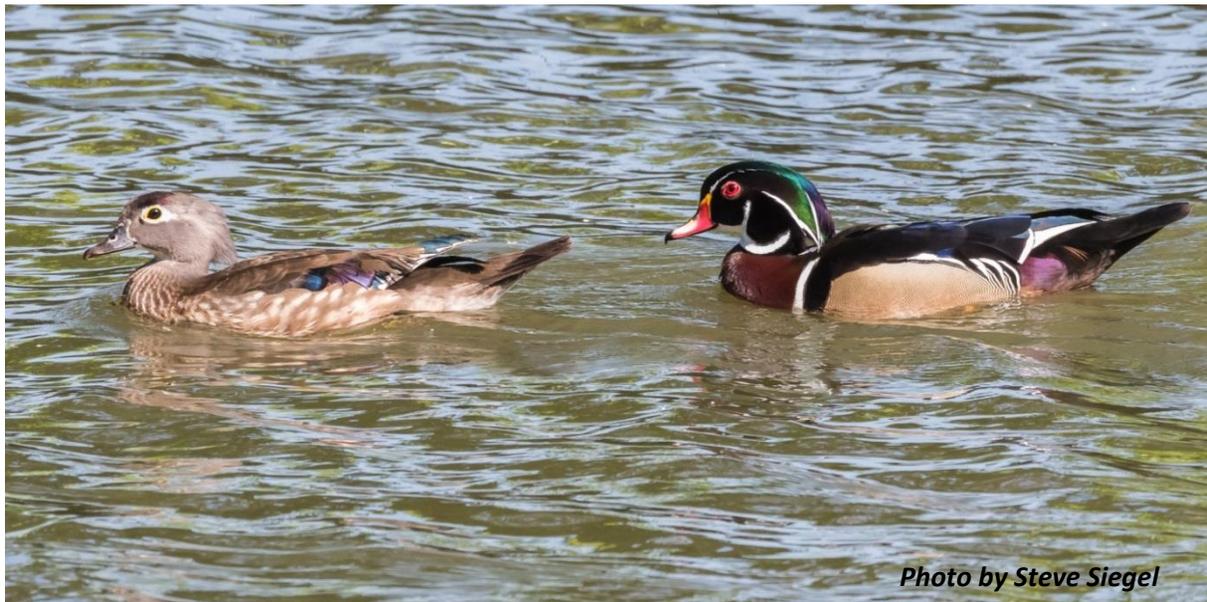


Photo by Steve Siegel

Wood Ducks

Fallon Wood Duck Project

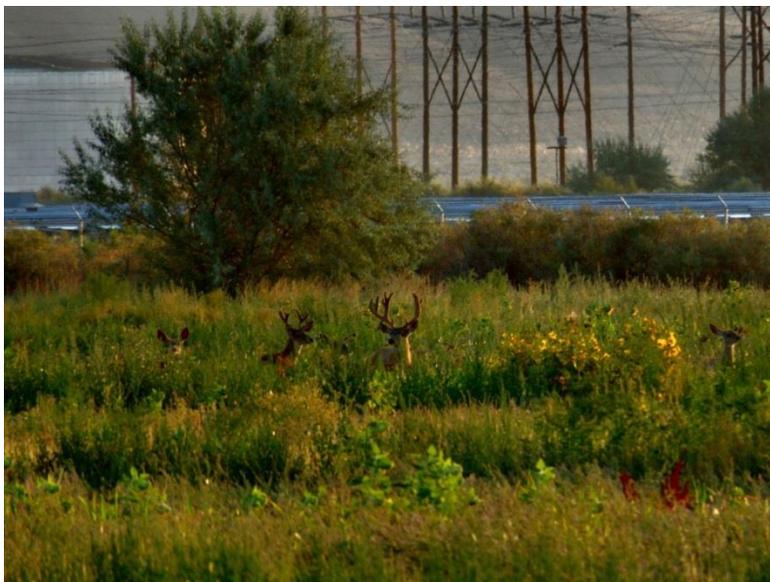
Using FY16 Duck Stamp funds, field work for this project continued during 2017 and will continue into the future via other funding sources, including Nevada Waterfowl Association donations. A total of 57 wood duck nests were found and monitored in 2016. In 2017, we have found 70 nests as of May 1, 2017 and expect to find additional nests through July 1, 2017. A total of 228 wood ducks were banded, 109 were recaptured, and 113 were re-sighted from July 1, 2016 to May 1, 2017, which is down 70% from the prior year. A PhD student, Ben Sedinger, was supported from July 1, 2016 through June 30, 2017. Ben was recently awarded the Dave Ankney Award from Delta Waterfowl for his work on this project.

Mason Valley WMA Redhead Pump Station

A total of \$5,600 from the Duck Stamp account was used to help pay the electrical power bill for the Redhead Pump Station. The water from this well was used to irrigate over eighty acres of moist-soil units and to fill and maintain over one-hundred acres of waterfowl nesting and hunting locations on the eastern portion of the WMA.

Mason Valley WMA Upland Wildlife Food Plot

The Mason Valley WMA crew planted 140 acres of upland food plots during the fall of 2016 and spring of 2017. Water from the Bolster Well was used to irrigate wheat fields in the fall. Irrigation water from the Walker River was used to irrigate the spring plantings of millets, sorghums and sunflowers.



Mason Valley WMA Food Plot

Mason Valley WMA Joggles Pump Station

A total of \$5,800 was expended to pay for electrical costs of pumping at the Joggles well. This pump was used to irrigate eighty acres of moist-soil vegetation in the millet plots and Goldeneye Pond. The irrigation water from this well provided forage and cover for waterfowl and shorebirds during the migration months as well as providing waterfowl hunting and viewing opportunities to WMA users.

Mason Valley WMA Prescribed Burns

A total of \$3,436 was spent last fall on aquatic approved herbicide that was applied through aerial applications from a private contractor. The treatments were conducted to help improve waterfowl habitat conditions following prescribed burning.

Mason Valley WMA Moist-Soil Units

Approximately 140 acres of millets, rice and smartweed were planted on the eastern portion of the Mason Valley WMA. The planting occurred during mid-June and those ponds will be flooded periodically to establish germination of moist-soil vegetation and flooded in the fall prior to waterfowl hunting. The moist-soil units will provide forage for waterfowl and shorebirds as well as provide WMA users with wildlife viewing and hunting opportunities.



Mason Valley WMA Moist Soil Unit

Carson Lake Prescribed Burn

Aquatic approved herbicide was purchased to treat eighty acres of emergent vegetation in the Big Water unit. The Greenhead Hunting Club was able to hire a private contractor to treat the vegetation by aerial application.

Key Pittman WMA Food Plots

A total of \$3,900 was expended from Upland Stamp funds and \$2,600 from Duck Stamp funds on seed. Approximately 60 acres were planted in October with winter wheat, fall cereal rye, barley, alfalfa, Austrian winter pea and hairy vetch as a winter cover crop and to enhance hunter success while hunting the fields on the Key Pittman WMA. An additional 40 acres were planted in January with intermediate wheat grass, sand dropseed and sandberg bluegrass to enhance desirable vegetation in areas where the removal of noxious weeds left areas that were lightly vegetated or in areas where improved vegetation cover and variety is needed. Approximately 70 acres were over seeded in late February with Spring wheat, oats, Sainfoin, Ladak Alfalfa, Rocky Mountain bee plant and native annual sunflower. The annual seeding projects are completed to increase forage production in feeding areas on the WMA and to enhance hunter opportunities. This project was completed by in-house personnel.

Eastern Region WMA Weed Control

With increased funding levels and the addition of a new position, NDOW enhanced its efforts during FY17 to control noxious and invasive species on NDOW's unmanned WMAs and State-owned properties. The Eastern Region is responsible for management of nearly 30,000 acres of designated WMA and State-owned properties. Emphasis in FY 17 was placed on the Stowell properties and the Mink Ranch associated with the Bruneau WMA. The Eastern Region amassed a multi-divisional effort targeting tall whitetop, Canada thistle, and Scotch thistle along the Bruneau Riparian corridor and on old agricultural fields. Crews from the Western



Tall Whitetop Control. Bruneau Wildlife Management Area. Stowell Property. 2016.

and Eastern Fisheries Division in addition to Eastern Region Game and Habitat Divisions worked for a week to conduct weed control and cleanup efforts on the Stowell property. Additional weed control efforts were applied to Forest Service (FS)-administered lands in the Ruby Mountains. The Forest Service has been attempting to control a medusa head infestation along Green Mountain Creek at an administrative site for several years without much success. Concerns with the increase and distribution of medusa head provided an opportunity for NDOW to initiate additional treatments on the property with FS approval utilizing a private contractor. The infestation has spread from FS- administered lands to County and private lands. The Green Mountain area is a wildlife rich region providing habitat for the State's largest deer herd, sage grouse and Lahontan cutthroat trout, a listed species. Two additional follow up treatments are planned and NDOW has been able to enter into a cost sharing agreement with the FS for future treatments.



Herbicide Application - Medusahead Treatment. Green Mountain Admin Site, Ruby Mountains. 11/2016.

Progress Report on Duck Stamp Projects Funded in FY 2018

Ducks Unlimited Wetlands Conservation Support

The Nevada Department of Wildlife (NDOW) donated \$10,000 to Ducks Unlimited (DU) during FY18 to help them implement the migratory bird projects that were developed as a result of the North American Waterfowl Management Plan. The projects primarily consist of wetland restoration, forage establishment and production, and the purchase of conservation easements in the prairie potholes regions of Saskatchewan and Alberta. Band return data show that these two Canadian provinces are the sources of a significant number of waterfowl that pass through Nevada each year. The prairie potholes region has the highest density of breeding ducks in all of North America.

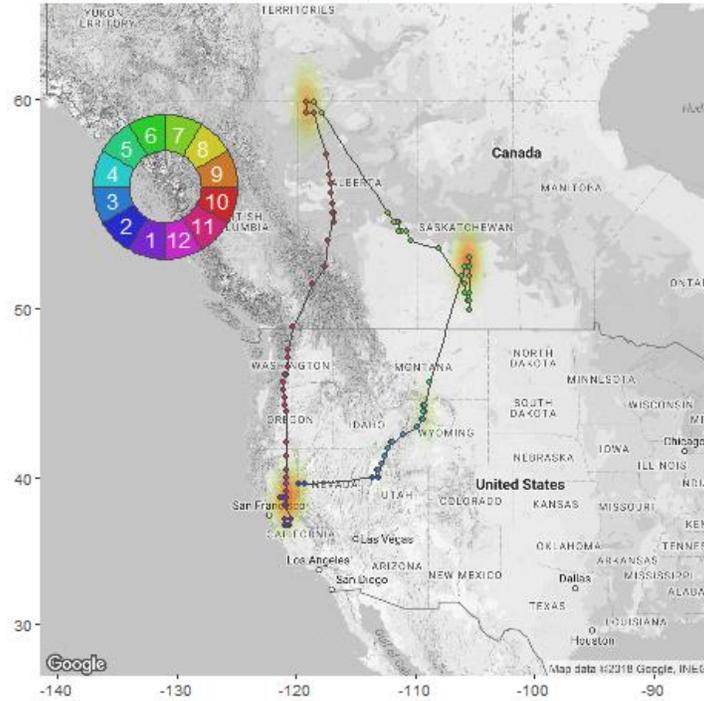


Technician Support for Nevada Waterfowl Projects

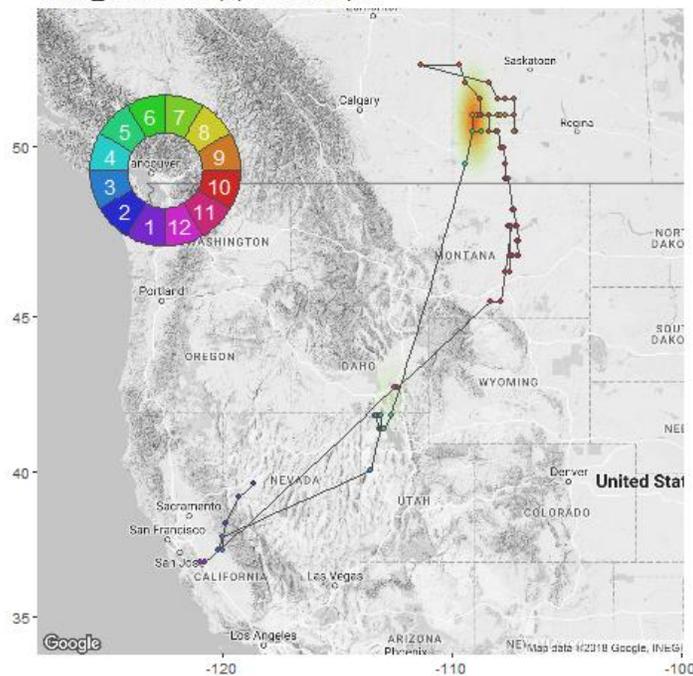
For the past five years, NDOW has used Duck Stamp funds to help pay for the attachment of more than 400 geolocator devices to 3 species of ducks: wood ducks, mallards, and canvasbacks. (FY19 will be the last fiscal year that NDOW will fund a graduate student technician for this project.) The attachment and subsequent retrieval of these devices has been more successful than initially planned. Given that, NDOW funds were also used to support a graduate student at the University of Nevada, Reno to continue to retrieve these devices, analyze the data, and write-up the results. The student, Nathan Cook, began work on the project in February 2017. He has retrieved numerous geolocators from wood ducks, helped install 63 geolocators on canvasbacks, conducted the 2017 spring breeding waterfowl survey, is taking classes at UNR, and has made excellent progress on the analysis of these geolocator data. He is expecting to

graduate in December 2018. Two examples of the maps being produced by this project are included below. They show canvasback movements after being fitted with these devices in western Nevada. The analysis of these tracking devices will help inform waterfowl habitat and population managers on stay duration and subsequent habitat requirements for conservation management.

CANV_208739809 (M) Locations plot



CANV_210701439 (F) Locations plot



Overton and Key Pittman WMAs Wetland Enhancement (Phase 2)

Funding was used to purchase water control structures, high-density polyethylene (HDPE) pipe, and other materials that will be used in the wetland enhancement projects at Key Pittman and Overton Wildlife Management Areas (WMAs). The future leveling of Pintail and Wilson ponds at Overton WMA will be a cut and fill balance that will result in more uniform pond bottoms that eliminate overly deep areas and spread water to areas that in their present state do not support shallow ponded conditions. The project will also improve water delivery efficiencies and drainage, thus improving the ability of WMA staff to manage waterfowl habitat at the WMA. These improvements will also allow NDOW to increase production of preferred waterfowl food plants. With the deeper areas within the two ponds filled, less water will be required to manage the units and NDOW will be able to provide better wildlife habitat for both waterfowl and hunters. At Key Pittman WMA, the enhancement project was completed and details are provided below.

Key Pittman WMA Wetlands Enhancement (Phase 3)

Duck Stamp program funds (\$34,053) were used to perform a wetland enhancement project at the Key Pittman WMA. NDOW partnered with Ducks Unlimited on this project to rehabilitate portions of the north units. This work resulted in more uniform wetlands that eliminated overly deep areas and increased the amount of shallow ponded conditions. Additional coordination took place with the U.S. Fish and Wildlife Service's Southern Nevada Field Office prior to construction regarding Ridgway's rails. These endangered rails were detected on the WMA for the first time during the 2017 spring surveys. After a review of the plans and location of the project, it was determined that adverse effects to the rails could be avoided. The project also replaced water control structures to improve water delivery and drainage, providing NDOW with an improvement in its overall ability to manage habitat at the WMA. This project enhanced approximately 40 acres of wetland and upland habitats on the WMA.



Wetland enhancement project at the Key Pittman WMA

Overton WMA Irrigation System Repair

Duck Stamp funds (\$2,649) were spent to replace pipe, fittings and valve parts that had failed in a main irrigation line that supplies water for multiple moist soil units on the north end of the Overton WMA. The valve and pipe had settled during prior year flood events and caused the failure. The repair enabled the staff at Overton to get water to the affected moist soil units that are used by migrating waterfowl. The repair was completed using WMA staff and equipment.

Overton WMA Water Outlet and Pipe Replacement

Concrete water outlet structures and galvanized culvert pipe were installed on moist soil units at the Overton WMA approximately 30 years ago. Due to the moisture and alkalinity of the soil at the WMA, the galvanized pipe deteriorated causing the pipe to collapse under the dikes. A total of \$2,178 was spent to purchase PVC pipe that the Overton WMA staff used to replace the failed culvert pipes.



Overton WMA

Overton WMA Farming

A total of \$3,500 was spent to purchase herbicides that were applied to the agricultural fields at Overton WMA. The treatments helped enhance the fields that provide forage for migrating waterfowl, turkeys, dove and various non-game birds that frequent the area. The application of herbicides also helps control the spread of noxious and other types of evasive weeds. This project was completed by the Overton WMA cooperator under the terms of the current farming and agricultural lease agreement.

Overton WMA Pipe Replacement Project (Phase 1)

The purpose of this project was to replace approximately 1,800 feet of pipeline that had collapsed in multiple locations on the A-series irrigation system. The replacement of the pipeline allows for a consistent flow of water into multiple moist soil units and ponds creating quality habitat for migrating waterfowl and shorebirds. The funds were used to purchase 18" PVC pipe, valves, glue and related parts needed for the replacement project. A total of \$29,591 was spent, including \$14,569 of Duck Stamp funding and \$15,022 of Habitat Conservation Fee funding. The pipeline was replaced by Overton WMA staff using WMA equipment.

Key Pittman WMA Wildlife Food Plots

A total of \$3,900 was expended on seed from Upland Game Bird Stamp funds and \$2,600 from Duck Stamp funds. Approximately 60 acres were planted in October with winter wheat, fall cereal rye, barley, alfalfa, Austrian winter pea and hairy vetch as a winter cover crop and to enhance hunter success while hunting the fields on the Key Pittman WMA. An additional 40 acres were planted in January with intermediate wheat grass, sand dropseed and sandberg bluegrass to enhance desirable vegetation in areas where the removal of noxious weeds left areas that were lightly vegetated or in areas where improved vegetation cover and variety is needed. Approximately 70 acres were over seeded in late February with spring wheat, oats, Ladak alfalfa, and native annual sunflower. The annual seeding projects are completed to increase forage production in wildlife feeding areas on the WMA and to enhance hunter opportunities. This project was completed by NDOW staff.

Eastern Nevada Properties Weed Control

Removal of noxious and other undesirable weeds enhances wildlife habitat, improves the appearance of an area and its public access, and limits the spread of weeds to other areas. The goal of this annual project is to remove noxious/invasive weeds such as Russian knapweed, hoary cress, perennial pepperweed (also known as tall whitetop), and Canada thistle found on several state-owned properties. The project is co-funded by the Duck Stamp and Upland Game Bird Stamp accounts since it benefits both waterfowl and upland species.

In the fall of 2017, NDOW hired the Tri-County Cooperative Weed Management Area to treat 330 acres on the Steptoe Valley and Wayne E. Kirch WMAs. An additional 387 acres were treated on these properties by NDOW staff, using herbicides purchased with Duck Stamp funds and funds from NDOW's Federal WMA grant.

Projects also were implemented on the Bruneau River WMA to treat bull thistle, Canada thistle, scotch thistle, perennial pepperweed, hoary cress, and black henbane. All treatments were implemented by NDOW biologists and fisheries Conservation Aids. Approximately 150 acres of thistle were treated in the Taylor Springs enclosure.

A week long treatment of a multitude of target species at the meadows on the state-owned Kingston Canyon property was treated in July of 2017, and a historic equine fence was removed. A contracted treatment of approximately 85 acres of meadow habitat on the Kingston Canyon property will be conducted during the summer of 2018 and the target species will be perennial pepperweed.



Steptoe Valley WMA

Carson Lake Vegetation Management

During FY18 \$1,620 was spent on the purchase of chemicals to treat various types of invasive weeds at the Carson Lake and Pasture (CL&P) property managed by NDOW. Approximately 100 acres of tall white top was treated on the CL&P and surrounding state parcels. Herbicide chemicals were also used to spray the new salt cedar growth in areas that were previously flooded. Emergent vegetation was also treated along ditches, dikes and structures at the CL&P.

Duck Stamp Projects with FY17 Expenditures

Name of Project	\$ Spent in FY17*
Ducks Unlimited Wetlands Conservation Support	\$10,000
Overton WMA Irrigation System Repair	\$1,383
Overton WMA Weed Control	\$1,493
Overton WMA Farming	\$3,499
Kirch WMA Food Plots	\$1,920
Carson Lake Pond Improvements	\$45,579
Overton and Key Pittman WMAs Wetland Enhancements (Phase 2)	\$24,509
Waterfowl Banding with Emphasis on Cinnamon Teal	\$4,679
Tracking Canvasbacks throughout the Great Basin	\$9,491
Field Technician and Analysis Support for Waterfowl Projects	\$6,301
Fallon Wood Duck Project	\$4,528
Mason Valley WMA Redhead Pump Station	\$34
Mason Valley WMA Upland Wildlife Food Plot	\$4,650
Mason Valley WMA Joggles Pump Station	\$3,277
Mason Valley WMA Prescribed Burns	\$5,829
Carson Lake Prescribed Burn	\$4,056
Key Pittman WMA Food Plots	\$2,600
Eastern Region WMA Weed Control	\$7,500
Total	\$141,328*

* Note: totals do not match due to rounding

Duck Stamp Projects with FY18 Expenditures

Name of Project	\$ Spent in FY18*
Ducks Unlimited Wetlands Conservation Support	\$10,000
Technician Support for Nevada Waterfowl Projects	\$24,117
Overton and Key Pittman WMAs Wetland Enhancements (Phase 2)	\$5,491
Key Pittman WMA Wetlands Enhancement (Phase 3)	\$34,053
Overton WMA Irrigation System Repair	\$2,974
Overton WMA Water Outlet and Pipe Replacement	\$2,178
Overton WMA Farming	\$3,500
Overton WMA Pipe Replacement Project (Phase 1)	\$14,569
Key Pittman WMA Wildlife Food Plots	\$2,600
Eastern Nevada Properties Weed Control	\$22,790
Carson Lake Vegetation Management	\$1,620
Total	\$123,893*

* Note: totals do not match due to rounding

Status Report on Nevada Operation Game Thief Program Revenue, Expenditures and Projects Undertaken During Fiscal Years 2017 and 2018

Overview

The Operation Game Thief (OGT) Program was established during the 1981 legislative session. The program is similar to a Secret Witness program and is designed to allow individuals to call and report wildlife crimes while remaining anonymous and collect rewards for the information.

Since OGT's inception, there has been tremendous public support for the program. From the onset, it was believed that a majority of the program could be supported through public donations. Equally important was the notion that wildlife criminals should shoulder some of the financial burden of investigating and prosecuting the crimes they commit. This was to be accomplished by the courts assessing civil penalties on convicted poachers to ensure that NDOW kept its promise to the courts and the thousands of individuals that make cash donations to OGT. To accomplish this, an obligated account was established to track donated monies and court-ordered monies destined for this specific use.

OGT is primarily a self-funded program within NDOW. It continues to provide resources to game wardens in the field to investigate and successfully prosecute wildlife crimes. This is accomplished through a variety of mechanisms such as active promotion of the program in community events, providing training to officers, providing specialized equipment as technology improves, and the interaction and participation in state coordination and planning for law enforcement activities.

The activities and accomplishments of the OGT Program during state fiscal years 2017 (FY17) and 2018 (FY18) are summarized below.



Highlights of Operation Game Thief Projects Funded in FY17

- Maintained the 1-800 OGT tip line (1-800-992-3030).
- Provided continued cell phone coverage to field officers.
- Participated in patrol activities to enhance regional coverage including uniformed patrols in the eastern and western regions for big game, as well as unmarked patrols.
- Promotion & marketing of the OGT Program.

- Enhancement of the OGT public education trailers.
- Participation in conservation group fundraising banquets such as the banquet held by the Wild Sheep Foundation.
- Set up the trailer at sporting goods retail stores such as Cabela's and Sportsman's Warehouse to promote the program and NDOW.
- Travel associated with these activities.
- Purchased promotional items for distribution at events and patrols such as license holders, pens and pencils.
- Participated in events held by national organizations such as the International Wildlife Crimestoppers Association (IWC). Game Warden Captain Eller was 1st Vice President of the IWC.
- A third display trailer was purchased through funds (\$10,700) received from the IWC.
- Membership in the Rocky Mountain Information Network (RMIN) - a regional law enforcement information network.
- The use of our Reserve Game Warden in place of a Fulltime Warden at trailer events saved the Department approximately \$11,000.
- Volunteers put in approximately 771 hours participating in events (3 Volunteers).
- Participated in 25 events, directly contacting approximately 7,265 people.
- The OGT Program spent a total of \$24,666.9 during FY17.





Highlights of Operation Game Thief Projects Funded in FY18

- Enhancing our field officers' ability to respond to OGT calls and meet public expectations.
- The OGT Program spent a total of \$23,769.21 during FY18.
- Updating the OGT page at http://www.ndow.org/Laws/Operation_Game_Thief/ and working on a new form to be filled out to report wildlife violations to augment the available options for citizens to report wildlife crime violations.
- Maintained the 1-800 OGT tip line (1-800-992-3030).
- Provided continued cell phone coverage and satellite phone service for field officers.
- Specialized patrol activities such as plain clothes patrol and uniformed patrol for big game and special saturation patrols. (Unit watches)
- Promotion & marketing of the OGT Program.
- Participation in conservation and sporting goods conventions, or events such as the Wild Sheep Foundation, and retail events at Cabela's and Sportsman's Warehouse.
- Participated in 24 events with the OGT public education "Wall of Shame" trailers, contacting approximately 14052 people. (Elko and Reno based trailers)
- Had 2 unit watches for a total of nine days with the OGT trailer. (Elko County) The trailer was taken to Wildhorse Reservoir and Spring Creek NV locations at prominent road access points to promote the program and answer hunter questions. Reserve Game Wardens participated in patrols. OGT volunteers participated in "ride alongs" with Game Wardens.
- Purchased license holders and mini calendars to distribute to sportsmen. These items displayed the OGT logo and phone number.
- Purchased NDOW wildlife coloring books for handing out to kids. The coloring books are an educational tool featuring Nevada's wildlife.
- Promotion of the OGT/Law Enforcement Program and other agency programs.

- Participation in RMIN, Rocky Mountain Information Network
- Participation in regional law enforcement events, such as National Night Out.
- Participated in career days and outdoor educational trips to schools.
- Received Donations from Barrick Gold Elko and Elko Bighorns Unlimited to fund repairs and a new wrap for the OGT trailer stationed in Elko.
- Maintained membership in IWC (International Wildlife Crimestoppers). Game Warden Captain Eller was elected President of the IWC. The IWC conference will be hosted by NDOW and held in South Lake Tahoe in July of 2019. (<https://wildlifecrimestoppers.org>)
- The OGT program is looking into the possibility of getting either a texting application so individuals can text the 1-800 number to report violations or getting an app that can be downloaded to a phone for reporting wildlife violations.
- The program received a donation of \$25,000 to go towards a truck for the program from the Shikar Safari Club International.
- Our Reserve Game Warden put in 60 days of volunteer work. With participation from the Reserve Game Warden Program and volunteers, we were able to save the department approximately \$19,000 in hourly wages.
- Four volunteers put in approximately 1,134 hours participating in the OGT program.
- Several poached animals have been mounted for display in the new OGT trailer and work is underway to have it up and running soon.

At its core, OGT has the basic mission of protecting Nevada’s wildlife resources and supporting those efforts that will successfully lead to the apprehension and prosecution of violators and promote the program to encourage and obtain greater public participation in the protection of a valuable resource that belongs to all citizens of Nevada.

With continued public support for this mission demonstrated by continued and voluntary financial support from the public, the support of the OGT Citizens Board providing rewards, the public support of district attorneys prosecuting wildlife cases, and the judicial application of our civil penalty statutes, OGT will continue to play a critical role in protecting the wildlife resources of this state.



Elk Damage Mitigation Program Revenue, Program Expenditures and Projects Undertaken During Fiscal Years 2017 and 2018

Background

This program summary is submitted to the 80th Session of the Nevada State Legislature pursuant to NRS 504.175. During the 65th Session, a bill was enacted that mandates that the Department maintain a fund for the prevention and mitigation of damage caused by elk (NRS 504.155, 504.165). The Nevada Board of Wildlife Commissioners (Commission) adopted NAC 504.350 through 504.440 to enable the Department to administer an Elk Damage Mitigation Program. The Commission amended NAC 502.331 to charge a \$5 application fee to all elk tag applicants to be used exclusively for the mitigation of elk damage.

Program Summary

The balance in the Elk Damage Mitigation Account at the beginning of state fiscal year 2017 (FY17) was \$815,074.42, up substantially from two years prior. While revenues into this account have been growing, expenditures have been limited in the last two fiscal years. Elk distribution and numbers are no longer increasing dramatically, and many persistent challenges have been addressed in recent years. Expenditures and revenues during FY17 allowed the account's balance to increase to \$1,008,893.46 and at the end of FY18 the balance was \$1,166,649.91.

During FY17, the Department constructed at least 3.5 miles of exclusionary fence to reduce a persistent issue with one landowner and paid damage payments on two separate claims. In FY18, over 9 miles of exclusionary fence was constructed on three properties, with a single damage payment on a separate property. All fencing projects were completed through cooperative work agreements with the Nevada Division of Forestry. Due to the steady revenue and reduced expenditures, the Elk Damage Mitigation Program is currently well-funded and adequate to cover anticipated expenses that may develop in the near future.

Progress Report on Habitat Conservation Fee Projects Funded in FY 2017

East Schell Mountains Habitat Restoration

The East Schell Mountains Habitat Restoration project has been a multiyear project done in conjunction with the Ely District of the Bureau of Land Management (BLM). The East Schell Bench located on the west side of North Spring Valley has been dramatically altered by wildfire over the past 30 years with a total of 15,781 acres burned. The loss of almost 16,000 acres of crucial winter habitat for mule deer has drastically reduced the mule deer carrying capacity along the East Schell Bench, and is directly related to reduced number of mule deer that currently are able utilize the area. Three leks along the East Schell Bench have been lost following the fires: McCoy Creek, Vivipoint Creek, and Stephens Creek. Previous attempts have been made at restoring these burned areas. However, shrub and forb recovery is minimal. In 2016, the BLM in coordination with the Nevada Department of Wildlife (NDOW) performed an aerial seeding of perennial grass, shrubs, and forbs in the area of the 1984 and 1987 fires. This seeding was an attempt to bolster natural recovery in these areas. Visual observations of the areas show that many of the seeded species have taken. The Habitat Conservation Fee (HCF) fund dollars were used for additional aerial seedings to increase available browse for mule deer and improve habitat conditions for sage grouse through the restoring a functional shrub and forb community.



Wildlife Diversity Summer Conservation Aid

In FY17, the small amount of funds remaining for this project were used to help pay two Great Basin Institute (GBI) seasonal aids who continued assisting with nongame wildlife surveys. The overall purpose of their work was to increase the coverage, efficiency, and amount of surveys and data collected for the NDOW's Diversity Division that would in turn contribute to our understanding of species distributions, population status, and conservation needs. These surveys focused primarily on shrew and bat Species of Conservation Priority. Data collected from these surveys is being used to refine species distribution models, improve understanding of habitat affinities, and inform survey protocols.

Bi-State Sage Grouse Habitat Restoration

The East Walker Landscape Habitat Improvement Project (EWLHIP) component of this project is a critical part of the Bi-State Action Plan, a comprehensive interagency strategy to provide for the long-term conservation of the Bi-State sage-grouse and its habitat through implementation of habitat improvement treatments. The primary goal of the EWLHIP is to remove encroaching Pinyon (or pinion; *Pinus monophyla*) and juniper (*Juniperus osteosperma*) trees across 20,400 acres to improve sage-grouse habitat. (These trees are hereafter referred to as PJ.) Funding for the Bi-State Sage-Grouse Habitat Restoration (\$34,100) and Longdoctor Pinyon-Juniper Thinning and Bald Mountain Prescribed Fire (\$47,265) projects during FY17, and additional HCF funding from FY16 (\$37,925) was used to treat Units B, C, and D totaling 2,032 acres treated.



Pre- and post-treatment PJ removal photos from work in the Bi-State region

The Pine Nut Mountains component of this project was initiated in 2016 with partners including NDOW, Natural Resources Conservation Service (NRCS), BLM, the Smith Valley Conservation District, and the BLM allotment permittee, with the goal of restoring and maintaining sagebrush habitats for sage-grouse through the complete removal of PJ trees in sagebrush areas in order to create additional sage-grouse habitat and movement corridors. This project removed 1,750 acres of PJ in the Pine Nut Mountain Range where sage-grouse have been identified as present by telemetry studies.

PJ encroachment has occurred in shrub-steppe communities in the Pine Nut Mountains due to natural and past management actions (e.g. lack of fire, fire suppression, overgrazing, etc.). PJ encroachment degrades the quality and reduces the quantity of suitable wildlife habitat by altering vegetation community dynamics and results in heavy accumulations of fuel that greatly increase the potential for large, high-intensity wildfires. In shrub-steppe communities, a reduction in the shrub understory is typically the first vegetation shift that occurs. As PJ cover increases with time, grass and forb species diversity and cover also declines. To combat habitat loss and degradation, the Big Lake PJ Removal Project will remove 100% of the PJ cover from approximately 1,750 acres in the Pine Nut Mountains in Lyon County, Nevada. Overall, the Big Lake PJ Removal Project will directly treat 1,750 acres across the landscape over two years to address degradation of sage-grouse habitat in the Pine Nuts and improve connectivity and movement throughout sage-grouse habitat in this area.

Monitor and Little Fish Lake Valleys Habitat Improvement

The Monitor and Little Fish Lake Valleys Habitat Improvement project was a joint project between the U.S. Forest Service (USFS), Rocky Mountain Elk Foundation and NDOW. The project was located in Little Fish Lake Valley and was focused on improving sagebrush habitats for sage-grouse, year-round elk habitat, winter range for mule deer, and other sagebrush-obligate wildlife species. This area supports the Danville Lek Complex. Currently, the project area is experiencing conifer encroachment by PJ trees due to a combination of past fire suppression and vegetation succession. The majority of the area is still dominated by sagebrush with associated grasses and forbs, but small trees (Phase 1 trees) have become established. Without the completed treatment, these trees would have continued to grow in size and number initially disrupting ecological function and eventually replacing the sagebrush ecosystem and the wildlife it supports.



Little Fish Lake Valley pre- and post-treatment photos

NPCD Data Analyst & Project Implementation Specialist

The Nevada Partners for Conservation and Development (NPCD) program hired a data analyst and vegetation survey supervisor partly with HCF funding. The NPCD provides crews to survey and monitor pre- and post-project conditions at selected habitat restoration sites. The data collected help NDOW staff better understand the success or deviation from success of particular projects. The person hired has been able to take the data set collected since 2010 and provide information summaries. The summaries and project results have been used to help establish new project sites and have helped influence the methods to be applied on future projects.

Virginia Lake Fishery Improvement

As the state of Nevada grows, its population continues to become increasingly urbanized. Urban sprawl is making it more difficult for people to find fishing opportunities near town. Nevada's urban ponds are an invaluable means of providing angling opportunities to people living in an urban setting. Recent studies and anecdotal accounts show that carryover of stocked fish in urban fisheries is extremely limited. Lack of available food sources during certain times of the year, inability of hatchery raised trout to adapt to a new environment, high temperatures during the summer months, and predation from both avian and aquatic predators are all factors that contribute to this limited carryover. Virginia Lake is particularly challenged due to a man-made island which provides nesting/roosting habitat to the region's largest concentration of cormorants which predate heavily on the fish in Virginia Lake. HCF funding was used to improve the productiveness of the Virginia Lake fishery by installing artificial habitat structures that provide protective cover from avian and aquatic predators. A total of 15 artificial habitat structures were placed in three separate habitat clusters at depths ranging from 9' to 11.5'. It is believed that this habitat enhancement in Virginia Lake will benefit both the naturally reproducing warm water species (channel catfish, largemouth bass) and the hatchery-raised rainbow trout that are stocked occasionally in the spring and fall. Wildlife and Sportfish Restoration funding was also used to accomplish this project. This project was part of a larger effort in cooperation with the City of Reno to identify and complete actions to improve water quality and other aspects of this popular urban pond to increase its aesthetic and recreational value for the citizens of Reno.



Examples of habitat structures placed in Virginia Lake

Condor Canyon Tributary Habitat Restoration

Condor Canyon contains designated critical habitat for the federally threatened and state-protected Big Spring Spinedace. In November 2012, the BLM reconnected a perched spring to the main channel of the stream for the purpose of increasing water flow into critical habitat for Big Spring Spinedace; however, a large head cut formed where the spring water empties into the main channel. This head cut created a barrier to Big Spring Spinedace and prevented their use of the new spring channel. The purpose of this project was to restore the stream and eliminate and prevent head cutting. A gentler slope was created and a series of grade control

structures (i.e., riffles and pools) was incorporated to allow fish passage and stream stabilization. This was a cooperative interagency project with the BLM. The BLM provided in-kind match through National Environmental Policy Act (NEPA) and other permitting requirements, heavy equipment, and staff assistance with the physical restoration activities. NDOW HCF funds were used to obtain rock material and hire an independent company specializing in geomorphology for project engineering and on-site technical assistance.



Restoration of the perched spring outflow at Condor Canyon. NDOW and BLM staff are excavating the channel, and installing liner and rock material for grade control.



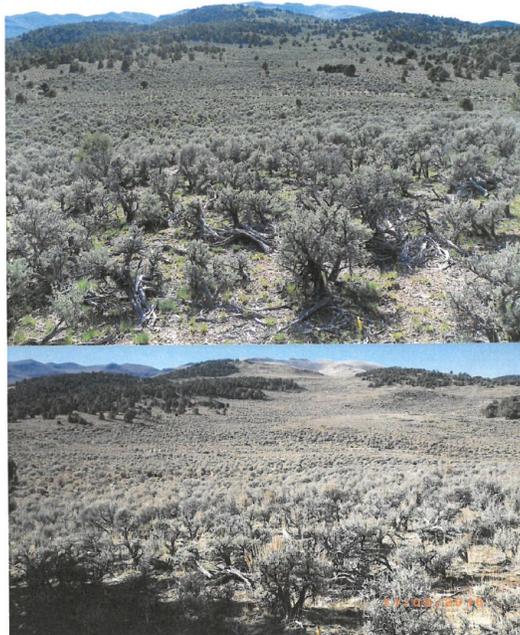
Fill material has been placed and stream re-graded with rock material positioned to create pools and slow stream velocity



The new channel right after it was connected to the spring

Desatoya Mountains Habitat Resiliency, Health, and Restoration Project

The Desatoya Mountains Habitat Resiliency, Health, and Restoration Project is a 10 to 15 year landscape scale habitat improvement project in the Desatoya Mountains of central Nevada with many different management actions to ensure wildlife habitat is improved and sustained. The Edwards Creek Lek pinion and juniper removal treatment is one piece aimed at improving sage-grouse habitat by removing encroaching trees. The \$19,067 was used along with \$30,000 of Heritage dollars to fund this project which treated 606 acres of a 789-acre treatment unit using Great Basin Institute (GBI) hand crews.



Pre- and post-treatment photos from the Desatoya Mountains Project

Santa Rosa Green Strip Maintenance

The Santa Rosa Green Strip Maintenance project turned into an experimental planting project to help address post-fire rehabilitation questions in the Santa Rosas. We worked with the USFS and University of Nevada, Reno (UNR) to design an experimental planting featuring replicates of multiple post-fire grass seed mixes, as well as a host of methodologies for planting bitterbrush to determine relative seeding and planting success. Collecting local bitterbrush seed using Nevada Division of Forestry (NDF) conservation crews and purchasing containers to help grow-out bitterbrush plants in the Winnemucca greenhouses totaled \$5,108 in 2017. In 2017 the USFS dispatched their weeds crew to apply herbicide to reduce the cheatgrass 2018 crop. Subsequently in 2018 the herbicide application was deemed a success and a total of \$1,334 was spent on seed purchases and bare root stock bitterbrush plants. That fall in October NDOW, USFS, and UNR employees completed the project planting all of the containerized bitterbrush, the grass mixes and seed caches. Vegetation monitoring data will be collected and reported on by UNR on an annual basis, helping inform future post-fire rehabilitation management decisions.



October 2018 Planting



No-till drill used for planting seed mixes

Lake Mohave Aquatic Habitat Development

Lake Mohave is an aging reservoir suffering from a lack of aquatic habitat. Installation of artificial habitat structure is a proven method to promote habitat complexity, which attracts fish and thereby increasing spawning potential and angler opportunity. Cover provided by the habitat structures improves recruitment success and leads to greater fish abundance. Construction and installation of 37 habitat structures was completed with assistance from the Bureau of Reclamation, National Park Service (NPS), Arizona Game and Fish Department, and NDOW volunteers. NDOW staff performed routine maintenance of underwater habitat throughout the year, maintained SCUBA certifications and annual equipment maintenance, purchased habitat materials, and maintained the habitat barge.



What looks like small specks in the water is actually a ball of black bass fry from a recent spawn. Fish fry often are found hanging out near the edge of the habitat structures where they can easily dart in and utilize the small interstitial spaces in the habitat structures for cover to escape predation.



A channel catfish utilizing habitat structures in Lake Mohave.

City of Henderson Bird Viewing Preserve Habitat Restoration

In conjunction with the City of Henderson, U.S. Fish and Wildlife Service (USFWS), NPS, Audubon Society, NDF and public volunteers, NDOW has continued restoration at the City's popular bird viewing preserve. The 140-acre preserve has nine ponds surrounded by paths used by bird watchers. Thousands of migratory waterfowl use the preserve along with bald eagles, roadrunners, Gambel's quail and peregrine falcons. Restoration efforts have included the removal of invasive tamarisk and phragmites, which congest the pond banks and islands. Other accomplishments include the rehabilitation of the newly cleared areas with the planting of perennial native nursery stock and willow cuttings, followed with protective plant cages and mulch, all of which produce high quality wildlife habitat. Monitoring of the planting sites has shown a high survival rate of the new plantings due to the proximity of available water and subsequent manual watering. Additional clearing of tamarisk and phragmites are planned for the remainder of FY19 for completion of the project.



One of the ponds at the City of Henderson's Bird Viewing Preserve

Lockes Ranch Invasive Species Control

The funds awarded to this project were spent on the removal of invasive Russian olive on the Lockes Ranch property in Railroad Valley, Nye County. Russian olive is a major impediment to habitat restoration on both upland and spring outflow areas of the property. Because of their location in sensitive or difficult to access areas the invasive species stands cannot be adequately controlled using mechanical equipment. This project funded NDF work crews to hand cut olive and treat the stumps with approved herbicides.

Bilk Creek Reservoir Habitat and Recreation Enhancement

The purpose of the Bilk Creek Reservoir Habitat and Recreation Enhancement project is to improve the fishery and recreation experience at Bilk Creek Reservoir through reservoir dredging. Project by-products include improved waterfowl and other wildlife habitat associated with the reservoir. Land and crude bathymetric surveys have been completed to date. NDOW is waiting to receive preliminary dam drawings and dredging estimates from a contractor before proceeding with the project.



Bilk Creek Reservoir

Lake Mead Aquatic Habitat Development

Lake Mead is an aging reservoir that lacks aquatic vegetation and has suffered long-term drought conditions resulting in continuous lowering of lake elevations which prevents periodic inundation of shoreline vegetation. The development and installation of habitat structures will provide escape cover for young fish and also attract large fish to provide more angling opportunities and angler success. Developing strategies for the movement of habitat structures is also necessary to demonstrate the suitability of such an approach in reservoirs with annually declining lake elevations like Lake Mead. Two different types of habitat structures were installed: 61 Fishhiding structures and 2 PVC structures. Staff attempted various methods to move the structures within the reservoir, monitored angler use through creel surveys, and assessed fish use via SCUBA surveys.



Experimental artificial habitat structure design

Dalton Canyon Meadow Restoration

The Desatoya Mountains Habitat Resiliency, Health, and Restoration Project is a 10 to 15 year landscape scale habitat improvement project in the Desatoya Mountains of central Nevada with many different management actions to ensure wildlife habitat is improved and sustained. The Dalton Canyon Meadow Restoration project is one piece of the larger project and includes PJ removal, fencing, weed treatments, and headcut repair among other treatments aimed at improving meadow function and wildlife habitat values (e.g. sage-grouse habitat). The BLM has contracted the mastication of high density tree (PJ) removal within an 819-acre treatment unit. Due to the high density of trees and lack of understory species, we wanted to test whether seeding was necessary in such a treatment so NDOW seeded approximately half of the site (479 acres) and will monitor to see if aerial seeding prior to the mastication has habitat benefits.



Seeding for the Dalton Canyon Project was conducted out of Smith Creek Ranch Meadow with the help of Smith Creek Ranch employee Sam Lossing.

Churchill Canyon Conservation Easement

This project was initiated in 2016 with partners including NDOW, BLM, The Nevada Land Trust, and a private landowner. The project goal was to acquire a Conservation Easement, located in Douglas County, Nevada. This property had been identified as being priority habitat for the Bi-State sage-grouse distinct population segment, as well as for numerous additional wildlife species, and included additional natural resources including natural spring sites crucial to wildlife in the area.

The Nevada Land Trust and NDOW worked closely with the landowner to address resource concerns, potential development in the future, and worked toward an appraisal of the

Conservation Easement. Ultimately the landowner determined that a Conservation Easement would not be the best action moving forward and the project was cancelled.

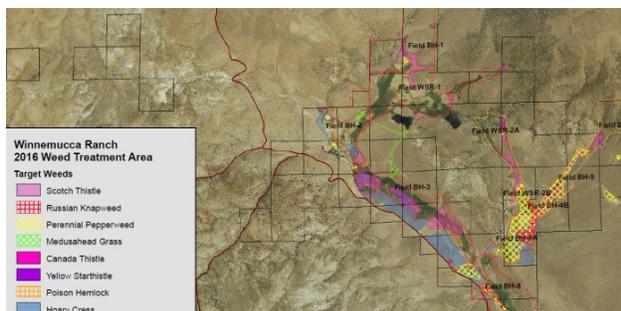
Western Region Invasive Weed Treatments

The Western Region Invasive Weed Treatment project is made up of a few smaller projects. Noxious and invasive weed problems are prevalent throughout the West, and western Nevada is no exception. Resources are limited so we strategically pursue opportunities to combat weeds in areas that are high-value wildlife habitats and are threatened to be degraded due to weeds that have not gotten too far out of hand that can be controlled and/or eradicated entirely. The sub-components of this project are described below.

Wall Canyon Weed Spraying – It was identified that Wall Canyon had a budding weeds problem and in 2017 we paid for 60 acres to be treated at a cost of \$7,000, which was completed by the Vya Conservation District.

Black Canyon / Winnemucca Ranch – This project has been a multi-year effort utilizing various funding sources as well as cost-share from private landowners to help address noxious weeds outbreaks found throughout Black Canyon area and the meadow complexes associated with Winnemucca Ranch. Species targeted include Scotch Thistle, Russian Knapweed, Yellow Starthistle, Medusahead, Poison Hemlock, and Hoary Cress. In 2017, NDOW funded \$12,669 worth of weed spraying and \$5,331 additionally in 2018. Through the course of that work over 450 acres of habitat have been treated for noxious weeds and much of that area was treated multiple times over the course of the last two years.

Squaw Valley Weed Control – Vegetation that was growing on top of the earthen dam was threatening the integrity of the dam and thus the fishery, and in light of that, we spent \$1,990 on chemical and labor costs associated with clearing unwanted vegetation away from the dam.



Treatment Map – Winnemucca Ranch



2018 – Meadow on Winnemucca Ranch

Cricket Springs Restoration

Water Development Component

In the fall of 2017, the water development portion of the Cricket Springs Restoration project was implemented and completed. This portion of the project consisted of a French drain installed at lower Cricket springs that was then piped to a 1,200 gallon tire trough approximately 500 yards away. At the trough, a float valve was installed as well as an output drain that was piped to re-route overflow back to the riparian area. A valve was installed in line between the French drain and the trough so that the development can be winterized and water can be diverted back to the spring when the permittee does not have livestock using the allotment. Funding from this phase of the project totaled \$6,255 with \$1,999 and \$4,256 being contributed by the Upland Game Bird Stamp and HCF funds respectively.



Cricket Springs, Elko County; Fall 2017

Fence Construction Component

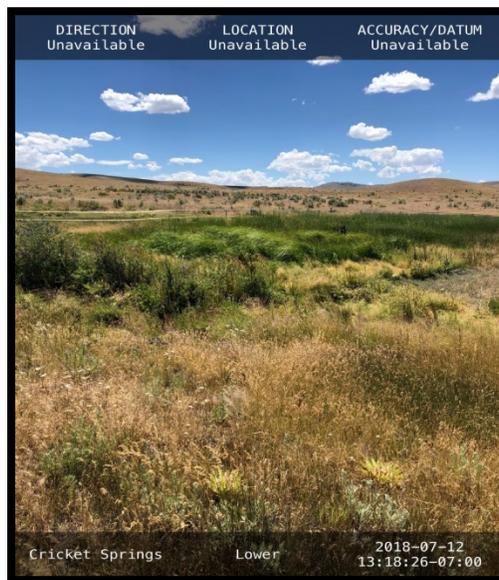
The construction of a fence to aid in the passive restoration of Cricket Springs was completed in the summer of 2017. Fences were constructed of wildlife-friendly pipe rail materials; this type of fence construction limits the amount of maintenance necessary and is structurally sound enough to stand up to livestock pressure (See the picture below).



Lower Cricket Springs fence enclosure; 7-12-18

Restoration Progress

The Cricket Springs site is well on its way to recovery as shown in the photo below. Overall, densities of both obligate and facultative riparian vegetation have increased significantly allowing for better water retention and forage for wildlife species. During the construction of the water development, some light re-contouring of the heavily disturbed spring site was completed and is now slowly re-establishing as wet meadow habitat. Remaining funds will be used in 2019 for weed treatments and water development maintenance.



Summer 2018 photo taken at Cricket Springs

Stowell Property Cultural Resources Documentation

This project was conducted to satisfy the requirements of the Nevada State Historic Preservation Office (SHPO) pertaining to the assessment of potential historic sites to determine whether or not they should be protected under the National Historic Preservation Act (NHPA). Ten structures on the Stowell Ranch, which is now part of NDOW's Bruneau River WMA, were assessed. It was determined by the cultural resources consultant that did the analysis that only one of the structures, Chauncey's Cabin, was eligible for protection and preservation under the NHPA. They also recommended NDOW add signage to the property to help educate the public about the historic values of the ranch. Given the notable public safety and sanitary concerns associated with the structures that are not protected under the NHPA, and NDOW's desire to manage the area for wildlife benefits, it was decided to remove the structures that are not protected.

Winz Creek Wildlife Corridor

The Winz Creek project was a joint project with the Nevada State Conversation Commission, Meadow Valley Wildlife Unlimited, NDF, and the Lincoln County Conservation District. The project consisted of removing encroaching PJ from several locations on private land near Pioche, NV. The removal helped improve habitat connectivity and reduced fire hazards in the area for protection of both human residences and wildlife habitat. The site possessed a viable community of desirable shrubs, grass, and forbs, which are expected to rebound in the next several years.

Humboldt River Watershed Weed Control

Throughout the last several years, NDOW has financially assisted the Humboldt Watershed Cooperative Weed Management Area (HWCMA) to allow for the treatment of noxious weeds throughout the Humboldt River watershed. The funding NDOW provides enables HWCMA to continue working with landowners/managers to identify and reduce the number of acres infested by noxious weeds. In both funding years, FY17 and FY18, the HCF funds were used to treat noxious weeds by way of aerial herbicide application, mist spraying, and ATV or hand herbicide applications. Mechanical removal of Tamarisk was also conducted along with ATV- and no-till drill-applied seedings in order to allow native vegetation to outcompete noxious weeds on approximately 500 acres of the Humboldt River watershed.

Pheasants Forever Positions

NDOW is helping fund two Sage Grouse Initiative positions in Elko, Nevada. (One of these positions will soon be moved to Winnemucca.) These positions are also being funded by the NRCS and the non-profit organization Pheasants Forever to develop and implement on-the-ground projects in Greater Sage-grouse habitat. The staff has been working with private landowners to facilitate understanding of habitat needs and the relationship of such needs to private land management and production practices. Projects such as noxious weed abatement, meadow restoration and PJ removal have been completed and have increased the level of trust with private land owners while implementing beneficial wildlife projects.

Eastern Nevada Weed Control with the Cooperative Weed Management Areas

The funds for this project were spent on noxious weed control on non-federal lands in the nine Cooperative Weed Management Areas (CWMAs) that the Eastern Nevada Landscape Coalition (ENLC) facilitates. The nine CWMAs that used these funds were: Steptoe Valley, Spring Valley, Snake Valley, Newark and Long Valley, Railroad Valley, White River Valley, Upper Meadow Valley, Pahrangat Valley, and the Southern Nevada CWMA.

Additional funds in the amount of \$35,000 were awarded to the ENLC for weed treatment through a USFWS grant. This grant was combined with HCF funds and nearly \$60,000 of in-kind donations by CWMA members. Over 5,500 acres were treated in FY17 and FY18.

White Rock Aspen and Riparian Exclosures

As part of this project, GBI employees constructed liberty pipe-rail fences around small aspen stands and their associated riparian areas in northeastern Nevada. The fencing will provide protection from horse and cattle grazing with the intent of promoting aspen sucker growth. This should provide a benefit to a myriad of wildlife species, including sage grouse. A total of seven sites were fenced, which included 1.59 miles of fencing. Materials were hiked in, so new roads would not be established to the sites. Thirty-one GBI students contributed 2,412 hours to the project. BLM fire crews contributed to the project and funds from the Ruby Pipeline Mitigation Account also were used.



Wet Meadow and Spring Enhancement and Protection

The Wet Meadow and Spring Enhancement and Protection project consisted of the following components:

Mitchell Bank Stabilization - In 2017, NDOW coordinated with the Mason Valley Conservation District (MVCD) to help complete a stream restoration project called the Mitchell Bank Stabilization. The purpose of the project is to restore riparian habitat as well as re-establish access to the area on the West Walker River since the access road was washed out in 2017. MVCD started developing a restoration plan along with completion of the cultural resources survey which in total cost \$3,300 in 2017. This plan and survey work was required before pre-restoration work could commence and was completed with some help from Great Basin Consulting Group LLC. Work on the project has continued into 2019.

Tom Biebighauser Wetland Creation/Restoration Workshop – Multiple funding sources including the HCF account were pooled to bring Tom Biebighauser to Northern Nevada to help identify wetland creation and restoration projects. In August 2017, Tom traveled to Cottonwood Ranch (Elko Co.), Gibbs Ranch (Elko Co.), and visited a number of sites owned by the Saval Company (Lander Co.). NDOW, USFWS, and NRCS employees were trained how to assess potential projects and as part of the workshop completed pre-work outlines of projects at each of the locations. The HCF account contributed \$3,192 to host this workshop.

Black Canyon / Winnemucca Ranch – Multiple funding sources including the HCF account were pooled to help address noxious weed outbreaks found throughout Black Canyon and the meadow complexes at Winnemucca Ranch. Both areas are high wildlife value areas at risk of being degraded due to noxious weed invasion and transmission. In total, \$4,669 was used from the HCF account to pay for labor and chemicals used at these sites in 2018. See the Western Region Weed Treatments project description for more information.



West Walker River - 2016



West Walker River - 2017

Longdoctor Pinyon-Juniper Thinning and Bald Mountain Prescribed Fire

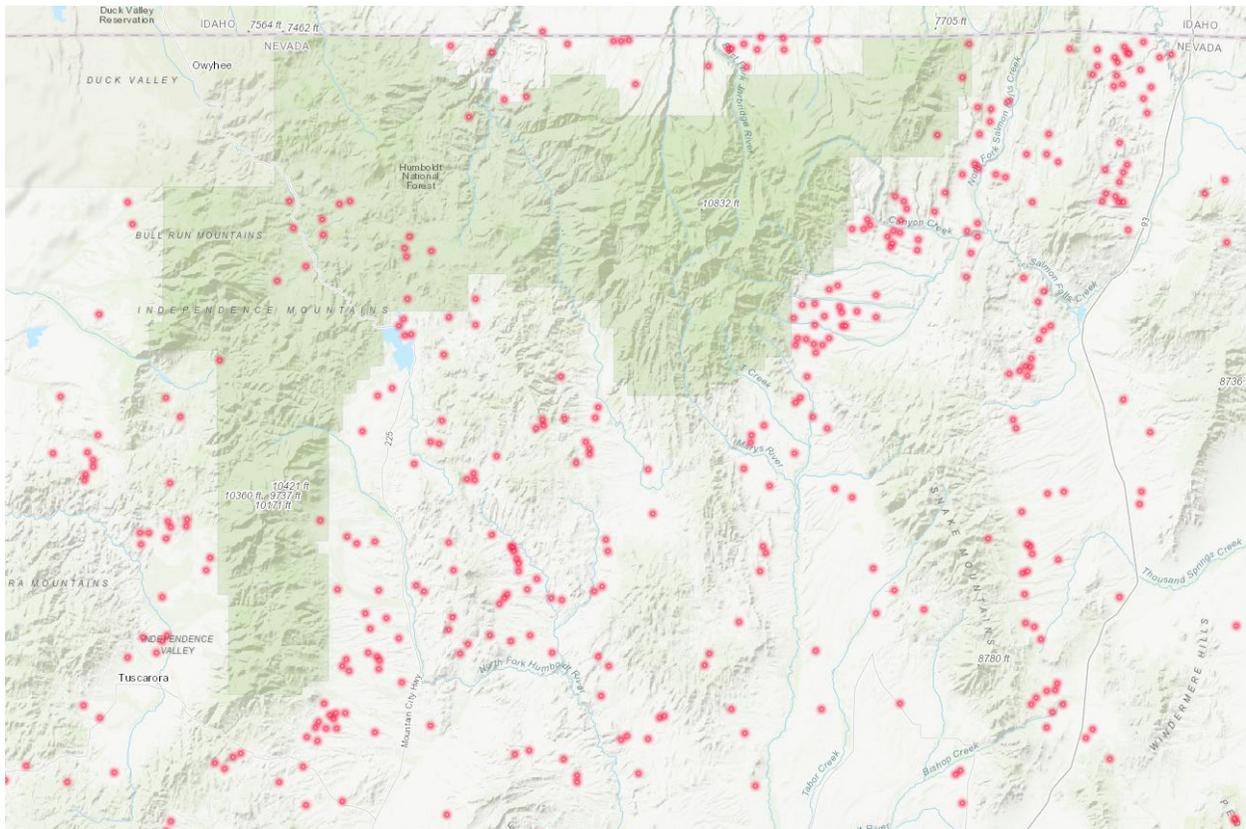
The work conducted for this project is summarized above in the FY17 Bi-State Sage Grouse Habitat Restoration project description. The funds awarded to this project were combined with the funds from other projects to complete habitat improvement work in the Bi-State area.

GIS Support and Wildlife Monitoring Services

The capacity to analyze information in a spatial context is essential to effective resource management and planning for the modern wildlife agency. NDOW's Geographic Information System (GIS) provides tools and technology for collecting, organizing, analyzing, and presenting wildlife species and habitat data throughout the state. Having this information in a centrally located and accessible data system allows managers to quickly and effectively recognize trends in population dynamics, identify migratory corridors, and recognize crucial habitats, thus improving the efficiency and effectiveness of management strategies.

During FY17 and FY18, the NDOW GIS program used HCF funds and funds from other sources to continue to improve its spatial data management system used to help inform land use development decisions and habitat restoration priorities. In addition to sustaining the Nevada Crucial Habitat Assessment Tool (NVCHAT), the GIS team made significant strides towards the development of a central, robust data management system that will one day house all of NDOW's wildlife data. Substantial time and resources went towards building and deploying mobile field data entry options using ESRI software. Several new surveys were launched that provided a

means to record data in the field using a cellphone or tablet. This created an accessible, efficient way of entering and storing data digitally for efforts such as greater sage-grouse lek counts (see an example of a map that was prepared using this data below), big game harvest check-ins, guzzler inspections, raptor surveys, and others. Moreover, GIS staff produced a number of high-quality maps and reports for publication and continued ongoing improvements to existing wildlife resource databases, providing both NDOW staff and the public with proper access to the best quality information necessary for maintaining and protecting Nevada’s rich biodiversity and wildlife habitats.



Sage-grouse lek locations within Northeastern Nevada.

Patterson Pass Habitat Improvement

The Patterson Pass Habitat Improvement project occurred on lands administered by the Ely District of the BLM in the south end of Cave Valley. Approximately 3,200 acres have been treated by removing PJ. The Ely BLM in cooperation with NDOW and the Nevada Partners for Conservation and Development identified the Patterson Pass area as needing treatments to remove PJ from riparian spring sources, sagebrush and mountain brush sites to improve habitat for greater sage-grouse, mule deer, rocky mountain elk and other wildlife species.

The primary vegetation to benefit from the project is Wyoming and mountain sagebrush (*Artemisia tridentata* ssp. *Wyomingensis* and *Artemisia tridentata* ssp. *vaseyana*), and other native mountain shrub species amongst both open and dense stands of PJ. The shrub and riparian communities are valuable wildlife habitats.

Progress Report on Habitat Conservation Fee Projects Funded in FY 2018

East Schell Mountains Habitat Restoration

The work conducted for this project is described in the section above on FY17 HCF projects.

Bi-State Sage Grouse Habitat Restoration

The work conducted for this project is described in the section above on FY17 HCF projects.

Monitor and Little Fish Lake Valleys Habitat Improvement

The work conducted for this project is described in the section above on FY17 HCF projects.

Humboldt River Watershed Weed Control

The work conducted for this project is described in the section above on FY17 HCF projects.

Warm Water Fish for the Western Region

Prior to 2017, western Nevada experienced an extended drought which left many ponds and reservoirs either dry or extremely low. The historic winter of 2016/2017 brought record snowpack throughout northern Nevada which filled our lakes and ponds to capacity. HCF funding was used to augment the Fisheries Division warm water fish budget in order to fulfill stocking recommendations for waters within the Western Region. In the fall of 2017, channel catfish, wipers and walleye were purchased from Colorado Catch LLC and delivered to Nevada where they were distributed to waters throughout the Western Region. Channel catfish were stocked in Virginia Lake (1,000), Paradise Ponds (1,000), Sparks Marina (2,000), Washoe Lake (5,000), Mitch Park Pond (500), Chimney Reservoir (2,000) and Rye Patch Reservoir (2,000). Walleye were stocked in Rye Patch Reservoir (3,000) and Lahontan Reservoir (2,000). Wiper were stocked in Lahontan Reservoir (3,000) and Rye Patch Reservoir (4,375). The HCF account funding supplemented Wildlife and Sport Fish Restoration funding used to purchase warm water fish that were stocked in the spring of 2017.

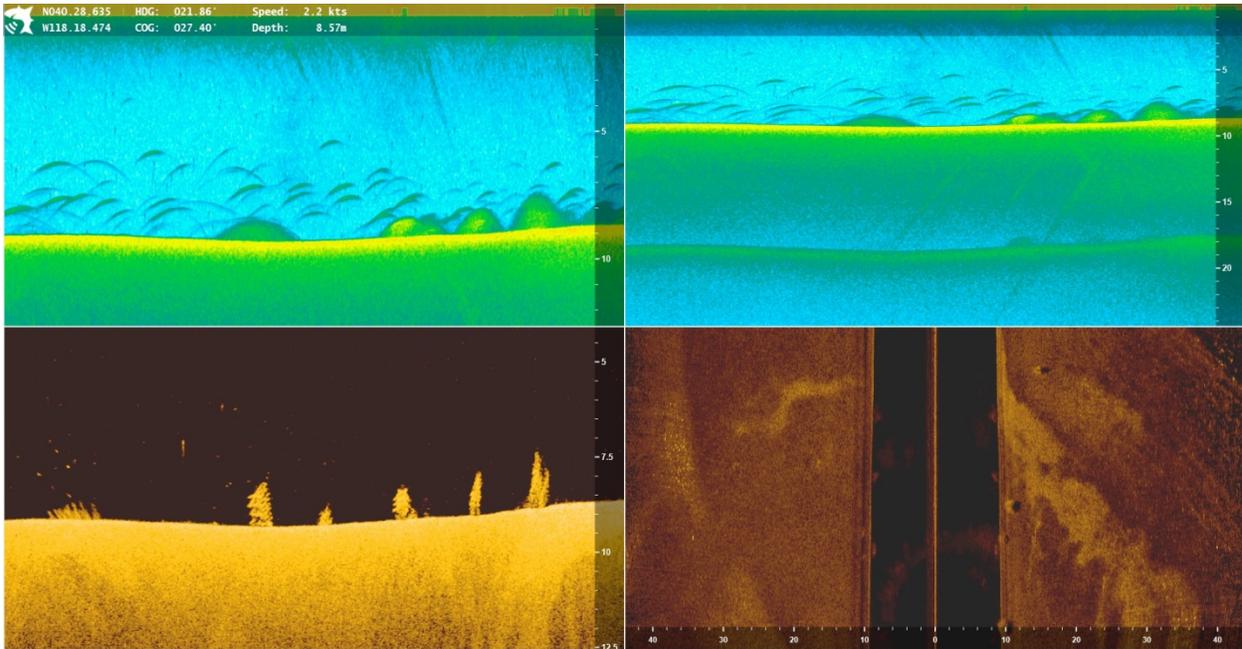


Example of a channel catfish stocked in western Nevada reservoirs

Western Region Artificial Aquatic Habitat Development and Improvement

Complex aquatic habitat promotes healthy and abundant populations of many fish species through protection from predation and production of invertebrate food sources. Available habitat also attracts larger fish and in turn increases opportunities for anglers. Many of the region's reservoirs and ponds lack beneficial habitat for fish, especially during period of low water. The purpose of the project is to install artificial habitat structures in fisheries where complex habitat is lacking. Each individual structure consists of a PVC trunk with composite limbs which simulate sunken trees or root structures that would be found in a natural environment. A total of 57 habitat structures were placed in Rye Patch Reservoir (15), Sparks Marina (16), Lahontan Reservoir (9), Baily's Pond (2), Mitch Park Pond (1), Liberty Pond (2), Topaz Lake (6), and Rose Creek Reservoir (6). The structures will not only increase survival of stocked fish by providing protection from aquatic and avian predators, but will also improve natural recruitment of warm water fish species and forage fish by providing protection for young fish. HCF funding was also used to purchase sonar and underwater camera equipment to facilitate ongoing monitoring to evaluate the effectiveness of the structures in attracting juvenile and adult fishes compared to coves with no complex habitat or those having natural

aquatic vegetation. Funding from the Wildlife and Sport Fish Restoration program was also used to complete this project.



Pictures of sonar screens depicting structures and fish using the structures in Rye Patch Reservoir

Eagle Valley Reservoir Eurasian Milfoil Treatment

Eagle Valley Reservoir provides a coldwater fishery (Rainbow and Tiger Trout) in the cool months and a warmwater fishery (Largemouth Bass and Crappie) in the warm months. The reservoir is located in Spring Valley State Park and is infested with the invasive aquatic weed Eurasian Milfoil. This plant is highly invasive and has grown thick enough that has eliminated access to shore anglers and hinders boating abilities, especially at the launch ramp. The purpose of this project was to spread an aquatic herbicide throughout the reservoir to control milfoil growth, which would increase shore angling opportunities and promote boating access. Two treatments were performed; the first treatment used 360 pounds of the herbicide Sonar One, which was spread throughout the reservoir using a modified leaf blower secured to the deck of NDOW's electroshocking boat. Three weeks later the second treatment was completed, using an additional 140 pounds of herbicide.

The treatment was performed with assistance from Spring Valley State Park staff. This initial treatment proved to be effective at eliminating and controlling milfoil. We estimated an approximate 40% reduction in milfoil throughout the reservoir. Additional monitoring will be performed to determine if or how often additional treatments are required.



Pre-treatment picture near the docks at Eagle Valley Reservoir during the peak of milfoil growth in the summer

Pine Nut Mountains Habitat Restoration Project

The work conducted for this project is summarized above in the FY17 Bi-State Sage Grouse Habitat Restoration project description. The funds awarded to this project were combined with the funds from other projects to complete habitat improvement work in the Bi-State area.

Santa Rosa Green Strip Maintenance

The work conducted for this project is described in the section above on FY17 HCF projects.

Lockes Ranch Invasive Species Control

The work conducted for this project is described in the section above on FY17 HCF projects.

Pass Creek Meadow Habitat Enhancement Project

The purpose of the Pass Creek Meadow Habitat Improvement Project is to improve the meadow and its associated riparian habitat to benefit sage-grouse, chukar, mule deer and other wildlife species by installing a pipe-rail fence around the meadow to control livestock grazing. In the summer months this area naturally draws substantial livestock use that could not be controlled without additional infrastructure.

In the early winter of 2017 the fence was completed by spending \$16,315 on fencing materials and labor for installation to complete the project which had originally started in 2016. Road repairs that were necessitated by high-run off delayed completion of the project into 2017. Grazing will continue to occur on Pass Creek Meadow, but under strict control with utilization not exceeding a 4 inch stubble height. This project was completed in conjunction with the NRCS as they are developing a prescribed grazing plan and are pursuing additional habitat improvement projects in the area adjacent to this meadow.



December 2017 – Pass Creek Meadow Fence Completion



June 2018 – Pass Creek Meadow

Lake Mohave Aquatic Habitat Development

The work conducted for this project is described in the section above on FY17 HCF projects.

Ruby Lake NWR Collection Ditch and Associated Ponds Habitat Improvement Project

This project will significantly improve trout habitat in the Ruby Collection Ditch and associated ponds. Waterfowl will also benefit and the project will allow flow efficiencies and water management practices to improve. Excess sediment and vegetation in the Collection Ditch and ponds will be removed by dredging. Approximately 1.5 miles of the ditch will benefit from the dredging along with two ponds, totaling 1 acre in size. The Collection Ditch is managed as a trophy trout fishery and this project will improve aquatic habitat and angling opportunities. Additionally, the Collection Ditch and the two affected ponds are used by multiple waterfowl species year round, with the availability of deep water in the winter being critical. Often times

these deeper, spring fed areas of the Collection Ditch are the only open water sources during the coldest parts of winter. The bulk of the work on this project will start during the spring of 2019.

City of Henderson Bird Viewing Preserve Habitat Restoration

The work conducted for this project is described in the section above on FY17 HCF projects.

Western Region Invasive Weed Treatments

The work conducted for this project is described in the section above on FY17 HCF projects.

Cricket Springs Restoration

The work conducted for this project is described in the section above on FY17 HCF projects.

Stowell Property Cultural Resources Documentation

The work conducted for this project is described in the section above on FY17 HCF projects.

Restoration and Conservation of Great Basin Wet Meadows and Riparian Ecosystems

This ongoing, collaborative project is developing a strategic approach for conservation of wet meadows and riparian ecosystems and the species they support in upland watersheds with perennial streams in the Great Basin. The analyses focus on threats caused by natural and anthropogenic disturbance, including climate change, on wet meadow and riparian ecosystems and their resilience to a warming climate at watershed, meadow or riparian ecosystem scales. The project is currently developing a web-based Geographic Information System tool that will allow managers to visualize, organize, and extract a wide range of geomorphic, hydrologic, and climatic data, along with range maps and habitat models for species of conservation concern. Field guides will guide managers through the process of evaluating watershed, stream system, and riparian ecosystem and meadow resilience to natural and anthropogenic disturbance and then determining the most appropriate management strategies. Educational materials and a field workshop are also being developed for managers to facilitate use of the tools.

The overall project budget is approximately \$240,000, with approximately \$200,000 being contributed from partners including the USFS and the Great Basin Landscape Conservation Cooperative (USFWS).

Winz Creek Wildlife Corridor

The Winz Creek project was a joint project with the State Conversation Commission, Meadow Valley Wildlife Unlimited, NDF, and the Lincoln County Conservation District. The project consisted of removing encroaching PJ from several locations on private land near Pioche, NV. The removal helped improve habitat connectivity and reduced fire hazards in the area for protection of both human residences and wildlife habitat. The site possessed a viable vegetation community of desirable shrubs, grasses, and forbs, which are expected to rebound in the next several years.

Kern Mountain Aspen Restoration

The Kern Mountain Habitat Restoration was a joint project between the Ely Distirct of BLM, Rocky Mountain Elk Foundation, and NDOW. The purpose of this restoration effort is to increase regeneration of aspen and introduce a new age cohort of stems. These efforts will move aspen resources closer toward the desired range of 14% for sapling phase and 40% of immature woodland phase, as detailed in the BLM Ely District Resource Management Plan (RMP). In regards to aspen stands, objectives are for regeneration of 350 aspen shrub phase stems per acre and 175 saplings per ace greater than 1.5 inches in diameter at breast height (DBH). This project restored the aspen stands through hand cutting of conifers in order to increase the amount of light in the stand and thereby increase regeneration of the clone. Slash from cut conifers was piled to burn at a later date. The aspen stands within the proposed project area are located in critical summer habitat for both elk and mule deer. Aspen stands have high biodiverstiy and provide habitat for a variety of birds and small mammals. Aspen stands provide forage, nesting and protective habitat to upland game birds, like the dusky grouse. To date, two aspen stands have been treated totaling approximatley 70 acres. The BLM has conducted pile burning on one of the aspen stands in the winter of 2018 and is planning on burning the remain piles in 2019.



Piles ready to be burned in Mallory Canyon



Slash burning in Upper Blue Mass

Eastern Nevada Weed Control with Cooperative Weed Management Areas

The work conducted for this project is described in the section above on FY17 HCF projects.

Mount Moriah Pinyon-Juniper Chaining Maintenance

The Mt. Moriah PJ thinning project, located in the North Snake Range, was a joint project with the USFS. Past fire suppression and other factors have allowed PJ to encroach into the mountain brush and sagebrush communities. The original Mt. Moriah chaining was put in place during the 1980's to help provide more quality habitat for mule deer and elk. These areas provide valuable summer and winter range for elk, mule deer, antelope, and many other wildlife species. Over the past 30 years, PJ has started filling into the Mt. Moriah chaining area, thus decreasing the quality of habitat available. The removal of these trees at an early stage is a cost-effective way to maintain and enhance old chaining areas that originally created these sagebrush and mountain brush communities. The mountain brush, forb, and grass species were still present, having not yet been outcompeted by the encroaching trees. PJ cutting was completed over the entirety (484 acres) of the chaining area.



Mt. Moriah PJ Project pre-treatment photo



Mt. Moriah PJ Project post-treatment photo

White Rock Aspen and Riparian Exclosures

The work conducted for this project is described in the section above on FY17 HCF projects.

Wet Meadow and Spring Enhancement and Protection

The work conducted for this project is described in the section above on FY17 HCF projects.

Ferruginous Hawks Habitat Use

This project is designed to study a breeding population of ferruginous hawks in proximity to a PJ woodland treatment plot to benefit sagebrush-obligate species in central Nevada. In early April 2018 we aerially surveyed 157 km² of the PJ/sagebrush ecotone in Newark and Long valleys, White Pine County; identifying a total of 23 ferruginous hawk nests and confirmed 5 breeding pairs of adults. For comparison, we also assessed a nesting pair in Spring Valley approximately 92 km to the east. We conducted ground-based surveys (based on aerial survey results) at all breeding territories from April – June, using spotting scopes and binoculars to monitor breeding success. Each breeding pair successfully produced 1–4 young per nest. NDOW banded 13 ferruginous hawk nestlings and 1 adult in June, deploying 8 satellite transmitters with an operational life expectancy of at least 3 years. NDOW will continue monitoring the breeding population as long as the transmitters are functioning, and redeploy any retrieved transmitters in future years.

The project was funded to purchase four satellite transmitters, but we leveraged other NDOW Wildlife Diversity projects to obtain an additional four transmitters representing an additional \$12,800 value to the project. Additionally, funding from the State Wildlife Grant from the USFWS was used to pay for personnel time, per diem, and mileage, which contributed nearly \$11,800 of outside funding to the project. It is expected the results of this study will inform land management decisions for sagebrush and PJ habitat types, with particular importance to planned habitat treatment and wildfire restoration efforts.



Ferruginous hawk nestlings with satellite transmitters

Harrison Pass Medusahead Restoration Project Phase 2

In the spring of 2018, a site on USFS land near Harrison Pass was treated with two successive applications of low rate glyphosate in order to affectively treat the differential timing of germination of medusahead. During this period NDOW personnel monitored the site for the correct phenology and conditions appropriate for two applications implemented within a month of one another. This treatment was largely successful in limiting medusahead seed production.

During the late summer of 2018, two different herbicides were applied to the site treating with Aminopyralid along the USFS road and the perimeter of the infestation. In recent studies Aminopyralid has proven highly successful at similar sites however there are limitations in using this herbicide at the rate necessary to be effective on medusahead in large scale projects. These limitations required the use of Imazapic in order to treat the remaining area of the infestation. As shown in the picture below, this project successfully controlled medusahead at the project site.



Picture of a control plot (left) and a treated area (right) - Spring 2018 Treatment

Pahranagat Valley Restoration Project

Funds for this project were used to treat over 20 acres of Russian olive in the Pahranagat Valley CWMA. Treated Russian olive trees were hand cut and an appropriate herbicide was applied to the stumps. The CWMA members generated an additional \$9,000 in labor and equipment match to go along with the awarded HCF funds.

Range Fire Brown and Green Stripping

The Range Fire Brown and Green Stripping was a joint project completed in FY18. The project was completed in two phases. The initial phase was brown stripping all fuel breaks that intersect the Range Fire in the spring/early summer of 2017. Herbicide was applied by a qualified applicator in compliance with the label specifications and all applicable laws regulations and policies.

The second phase was mowing the green strips that are outside of the burned area in late summer of 2017. All of the strips were seeded with a mixture of forage kochia, crested wheatgrass and other desirable species at a rate of approximately 20 lbs. per acre to be applied in 2 to 3 passes of the drill. Following the completion of the drilling, the strips were treated with the pre-emergent herbicide Imazapic to prevent the growth of cheatgrass. Imazapic was applied an additional 50 feet beyond the width of the green strip for a total of a 300 foot strip. Imazapic may be re-applied as deemed necessary to accomplish the objectives and in compliance with the label.

Southern Nye County Conservation District - Beatty Restoration

In cooperation with the Southern Nye County Conservation District, USFWS, BLM, The Nature Conservancy, and other partners, NDOW has continued rehabilitating the Lower Indian Springs site near Beatty, Nye County, Nevada. The purpose of this rehabilitation project is to re-establish surface water at the spring sites, restoring them back to their original function and enhancing habitat for the threatened Amargosa toad (*Anaxyrus nelsoni*). This project is also beneficial for other species of concern, including the Oasis Valley speckled dace, Oasis Valley pyrg, Southwestern Willow Flycatcher, and Western Yellow-billed Cuckoo. Native vegetation and natural soil buildup have almost completely blocked the springs from running and it was determined excavation was necessary. Accomplishments included excavation of the #1, #2, and #3 spring sites with removal of vegetation, debris, and soils. Native leach rock was installed for lining on the excavated springs. Additionally, a manifold and piping were installed to augment water flow to create reliable Amargosa toad breeding habitat. Continued restoration efforts are planned for the #4 spring site during the spring of FY19.



Amargosa toad

GIS Support and Wildlife Monitoring Services

The work conducted for this project is described in the section above on FY17 HCF projects.

Analysis of Nevada's Winter Raptor Survey Data

The HCF account was used to fund a FY18 project to conduct a detailed analysis of the Nevada Winter Raptor Survey dataset. The associated database comprises more than 11,000 raptor observations from the last 22 years with more than 5,000 reported hours of survey time by state biologists, federal biologists, and volunteers. Boise State University Intermountain Bird Observatory was contracted to work with NDOW to summarize and analyze the data set, including identifying wintering hot spots and habitat associations, examining species distribution, status and trends over time, and reviewing detection probabilities and survey methodologies for potential improvements. Reported results included estimated densities from 2013-2018 and predicted presence maps for ten raptor species, five of which are Nevada Species of Conservation Priority. A report summarizing this analysis was finalized in May 2018. A webinar presentation for NDOW and assisting agencies (including the BLM, USFS, and USFWS) was held in August 2018 and this provided an opportunity to discuss the utility of these results for managing species and habitats. Furthermore, a manuscript of the results is in preparation. This project resulted in the first in-depth, state-wide estimated density of wintering raptors in Nevada and provided a better understanding of wintering distributions and habitat associations for these species within the state. This information will assist land management agencies when considering future land development projects.

Bruneau WMA Irrigation Diversion Removal

The Bruneau River is approximately 50 miles in length and originates from the north slope of Stag Mountain in northern Elko County, Nevada and flows in a northerly direction towards the Snake River in Idaho. The project area is within the lower reach of the Bruneau River in Nevada. Two of the diversions are wholly located within NDOW's Bruneau River WMA. A third diversion is located half on BLM-administered land and half on the Bruneau River WMA.

The three diversions are the last fish passage barriers present in the redband trout-occupied reach of the Bruneau River in Nevada. In addition to allowing fish passage, the removal of the barriers would prevent any future entrapment of redband trout and other endemic species during droughts and low water events. Additionally, the diversions are primarily on state-owned land which simplifies the permitting and NEPA compliance process. One half of one diversion is located on BLM land. The Twin Falls District of the BLM is aware of the project and has agreed to perform any permit-required analyses that are needed.

HCF funds were used to hire a contractor to perform the initial technical analysis and determine the feasibility of removing the three barriers and restoring the stream after diversion removal. A Design Basis Report was completed by the contractor in 2018. Additional funding will be required to advance the engineering plans to final design, remove the diversions, and restore the river channel to a naturally functioning condition.



Redband trout – photo taken by Pat Clayton, Fish Eye Guy Photography

Bi-State Conifer Removal Project – Pine Nut Mountains

The work conducted for this project is summarized above in the FY17 Bi-State Sage Grouse Habitat Restoration project description. The funds awarded to this project were combined with the funds from other projects to complete habitat improvement work in the Bi-State area.

Chimney Reservoir Tiger Muskie

Since 2015, the Fisheries Division has been stocking Chimney Reservoir (Humboldt County) with sterile tiger muskie with the intent of establishing a managed population of this highly predatory fish. Tiger muskies are hybrids between muskies and northern pike. Their presence in the reservoir will likely reduce the abundance of common carp thereby improving the sport fishery for walleye, wiper, channel catfish, crappie and black bass. In addition, the establishment of tiger muskie in Chimney Reservoir would provide anglers with a unique opportunity to catch tiger muskie in Nevada. Intensive monitoring is ongoing in the reservoir to determine their growth rate and food preferences. In FY 2018, HCF funding was used to purchase individually numbered Floy tags which were attached to over 1,000 tiger muskie prior to being stocked into Chimney Reservoir in 2018. Floy tags are an external tag which is permanently affixed to the fish which allows for positive identification of that individual fish in the event they are recaptured. The Floy tags allow biologists to identify the age class of a fish and to determine exactly how much the fish has grown since being stocked. Funding from the USFWS's Wildlife and Sport Fish Restoration program was also used to complete this project.



Example of a tiger muskie stocked in Chimney Reservoir

Overton WMA Pipe Replacement Phase 1

The purpose of this project was to replace approximately 1,800 feet of pipeline that had collapsed in multiple locations on the A-series irrigation system. The replacement of the pipeline allows for a consistent flow of water into multiple moist soil units and ponds creating quality habitat for migrating waterfowl and shorebirds. The funds were used to purchase 18" PVC pipe, valves, glue and related parts needed for replacement. A total of \$29,591 was spent using \$14,569 of Duck Stamp funding and \$15,022 of HCF funding. The pipeline was replaced by Overton WMA staff and equipment.

Eastern Region Artificial Habitat for Larger Reservoirs

Complex aquatic habitat promotes healthy, abundant populations of many fish species through protection from predation and production of invertebrate food sources. Available habitat also attracts larger fish and in turn increases angler opportunity. South Fork, Wildhorse and Wilson Sink Reservoirs in NDOW's Eastern Region lack beneficial habitat for fish during periods of low water. Minimal amounts of terrestrial vegetation exist at Wildhorse and Wilson Sink Reservoirs when water levels are low and it only becomes inundated for short periods of time, providing limited protection for juvenile and small species fish.

HCF funds were used to purchase artificial aquatic habitat structures for use in South Fork and Wildhorse Reservoirs. The PVC structures are made of nontoxic “scuffed” PVC trunks with composite limbs, poly pipe limbs and PVC flats that simulate shrubs, trees or root structures that would be found in a natural environment. Suitable locations were determined based on bathometric maps and then ground-proofed using depth measuring devices. All structures were placed in at least 6’ of water and not more than 15’ in order to target areas where all species would be most vulnerable to predation. The placement of the structures in the reservoirs will benefit anglers and fish in the region. The structures will be monitored moving forward to analyze the effectiveness and use by different species, product longevity and product preference. This will be accomplished through sonar readings, snorkeling opportunities and or underwater photography of habitat locations and associated fish behavior/use when possible. Examples of some of the artificial habitat structures are shown in the photos below.



Examples of artificial aquatic habitat structures placed in South Fork and Wildhorse Reservoirs

Habitat Conservation Fee Projects with FY17 Expenditures

Name of Project (and Project Manager)	\$ Spent in FY17*
East Schell Mountains Habitat Restoration	\$13,344
Wildlife Diversity Summer Conservation Aid	\$3,873
Bi-State Sage Grouse Habitat Restoration	\$34,100
Monitor and Little Fish Lake Valleys Habitat Improvement	\$20,625
NPCD Data Analyst & Project Implementation Specialist	\$5,708
Virginia Lake Fishery Improvement	\$4,382
Condor Canyon Tributary Habitat Restoration	\$6,077
Desatoya Mountains Habitat Resiliency, Health, and Restoration Project	\$19,067
Santa Rosa Green Strip Maintenance	\$5,108
Lake Mohave Aquatic Habitat Development	\$15,089
City of Henderson Bird Viewing Preserve Habitat Restoration	\$32,745
Lockes Ranch Invasive Species Control	\$8,453
Bilk Creek Reservoir Habitat and Recreation Enhancement	\$20,756
Lake Mead Aquatic Habitat Development	\$5,397
Dalton Canyon Meadow Restoration	\$4,925
Churchill Canyon Conservation Easement	\$2,860
Western Region Invasive Weed Treatments	\$19,669
Cricket Springs Restoration	\$4,256
Stowell Property Cultural Resources Documentation	\$6,104
Winz Creek Wildlife Corridor	\$16,671
Humboldt River Watershed Weed Control	\$23,500
Pheasants Forever Positions	\$40,000
Eastern Nevada Weed Control with the Cooperative Weed Management Areas	\$21,921
White Rock Aspen and Riparian Enclosures	\$1,913
Wet Meadow and Spring Enhancement and Protection	\$3,300
Longdoctor Pinyon-Juniper Thinning and Bald Mountain Prescribed Fire	\$47,265
GIS Support and Wildlife Monitoring Services	\$12,148
Patterson Pass Habitat Improvement	\$7,500
Total	\$406,757*

* Note: totals do not match due to rounding

Habitat Conservation Fee Projects with FY18 Expenditures

Name of Project	\$ Spent in FY18
East Schell Mountains Habitat Restoration	\$7,140
Bi-State Sage Grouse Habitat Restoration	\$11,232
Monitor and Little Fish Lake Valleys Habitat Improvement	\$39,375
Humboldt River Watershed Weed Control	\$37,002
Warm Water Fish for the Western Region	\$39,080
Western Region Artificial Aquatic Habitat Development and Improvement	\$23,111
Eagle Valley Reservoir Eurasian Milfoil Treatment	\$16,333
Pine Nut Mountains Habitat Restoration Project	\$50,000
Santa Rosa Green Strip Maintenance	\$1,334
Lockes Ranch Invasive Species Control	\$9,547
Pass Creek Meadow Habitat Enhancement Project	\$16,315
Lake Mohave Aquatic Habitat Development	\$12,261
Ruby Lake NWR Collection Ditch and Associated Ponds Habitat Improvement Project	\$3,900
City of Henderson Bird Viewing Preserve Habitat Restoration	\$23,377
Western Region Invasive Weed Treatments	\$7,321
Cricket Springs Restoration	\$4,238
Stowell Property Cultural Resources Documentation	\$8,792
Restoration and Conservation of Great Basin Wet Meadows and Riparian Ecosystems	\$20,537
Winz Creek Wildlife Corridor	\$14,030
Kern Mountain Aspen Restoration	\$17,669
Eastern Nevada Weed Control with Cooperative Weed Management Areas	\$30,807
Mount Moriah Pinyon-Juniper Chaining Maintenance	\$12,254
White Rock Aspen and Riparian Exclosures	\$22,487
Wet Meadow and Spring Enhancement and Protection	\$7,861
Ferruginous Hawks Habitat Use	\$13,726
Harrison Pass Medusahead Restoration Project Phase 2	\$6,210
Pahranagat Valley Restoration Project	\$6,528
Range Fire Brown and Green Stripping	\$27,380
Southern Nye County Conservation District- Beatty Restoration	\$10,860
GIS Support and Wildlife Monitoring Services	\$7,000
Analysis of Nevada's Winter Raptor Survey Data	\$7,610

Habitat Conservation Fee Projects with FY18 Expenditures (cont.)

Name of Project	\$ Spent in FY18*
Bruneau WMA Irrigation Diversion Removal	\$34,366
Bi-State Conifer Removal Project – Pine Nut Mountains	\$15,000
Chimney Reservoir Tiger Muskie	\$1,593
Overton WMA Pipe Replacement Phase 1	\$15,022
Eastern Region Artificial Habitat for Larger Reservoirs	\$6,233
Total	\$587,531*

* Note: totals do not match due to rounding

Projects Awarded Funds from the Industrial Development Fee Account

The Industrial Development Fee (IDF) Account is funded through a portion of the annual assessment fees collected by NDOW's Industrial Artificial Pond Permit Program. Before 2017, this account was referred to as the Mining Assessment Fee Account. Due to a lack of funding, this program has been very limited for several years, but after changes to the related regulations were made during the 2017 state legislative session, NDOW is once again able to fund projects through this account. The updated regulations are found in NAC 502.460 to NAC 502.495, inclusive. Funding priorities for this account include habitat improvements and other wildlife projects in Nevada. This program is supported by and coordinated with representatives from the Nevada Mining Association.

The projects that have been awarded funds from the IDF account are described below.

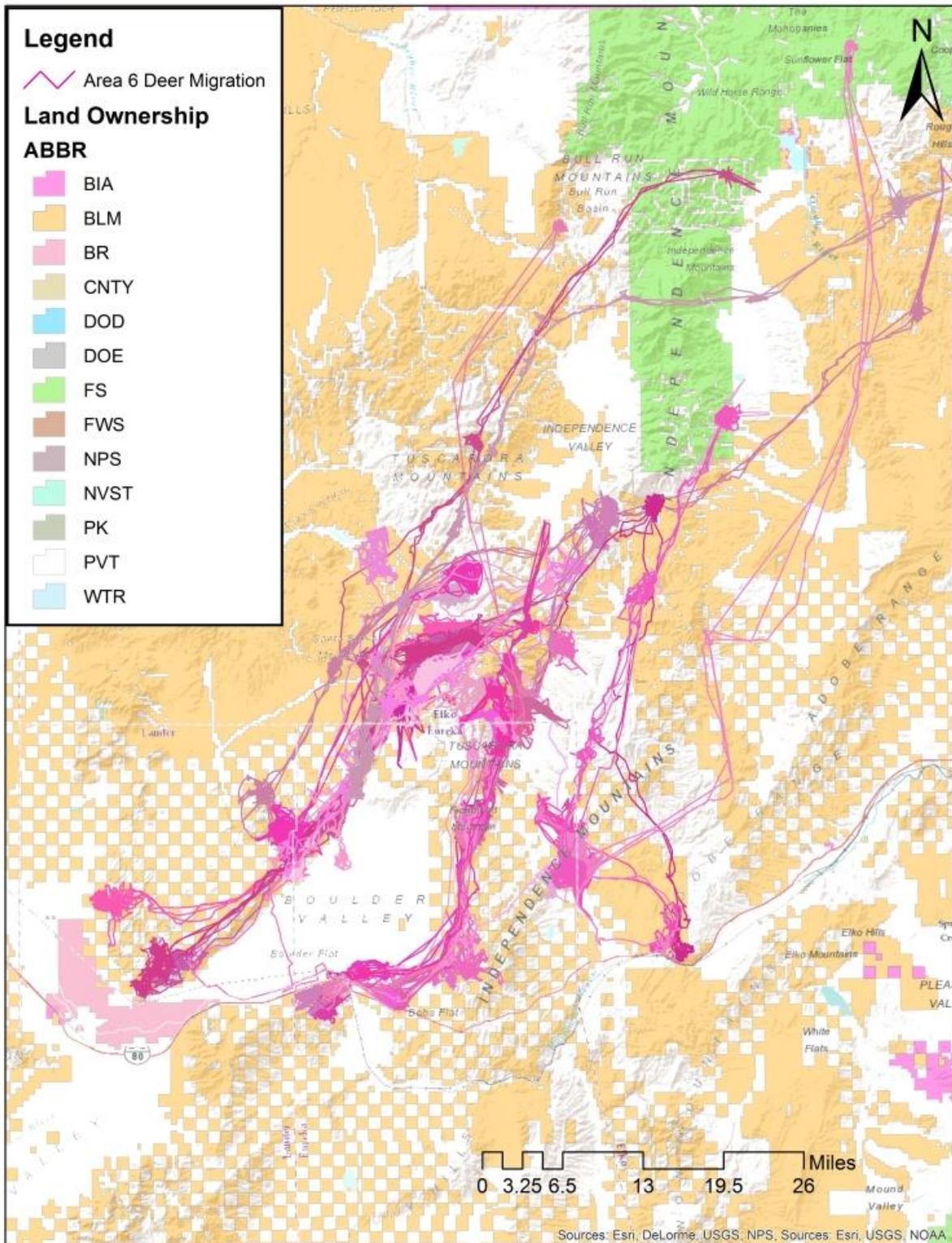
Area 6 Mule Deer Migration Corridors and Habitat Selection; Award Amount: \$115,000

Habitat for the Area 6 mule deer population is characterized by high quality summer range and poor-quality winter range as a result of habitat fragmentation and vegetation conversion from sagebrush steppe to annual grasslands. The Area 6 Mule Deer Plan highlights the importance of maintaining mule deer migration corridors through the Carlin Trend and prioritizing habitat rehabilitation and restoration on winter range to ensure the long-term survival of this deer population. This project will use GPS collars on mule deer to help answer how, when, and where mule deer use critical seasonal habitats (summer and winter) as well as identify key migration routes, especially through mining development in the Carlin Trend. As habitat fragmentation and available forage and cover change, NDOW and its partners will have the ability to prioritize key areas relative to mining development and post-fire habitat rehabilitation/restoration.

The figure on the next page is an example of the type of mapping NDOW can prepare by using GPS collar data collected by projects like this one.

Goshawk Habitat Use and Movements in Northeast Nevada; Award Amount: \$15,000

The northern goshawk is a Species of Conservation Priority in the Nevada Wildlife Action Plan and a BLM/USFS Sensitive Species. Goshawks in northeastern Nevada are of particular concern as very little research has been completed, but limited studies suggest a statistically significant decline in occupancy of nesting territories from 1992-2003, potentially due to increased mining and exploration activity in the area (Bechard et al. 2006). NDOW biologists have monitored



Example of a Deer Migration Map Prepared with GPS Collar Data

goshawk nest sites via aerial and ground surveys since 2013, but an understanding of habitat use outside of the breeding season is unknown but essential to recommending potential conservation actions. This is a multi-year project using GPS transmitters fitted on up to ten adult goshawks to obtain location data year-round to improve our understanding of goshawk habitat use and movement patterns in the state. Goshawks are known to be sensitive to human disturbance and development. Results of this study will improve NDOW's ability to evaluate potential impacts from anthropogenic development and beneficial effects from habitat improvement projects such as pinyon-juniper removal and restoration of aspen stands.



Northern goshawk (Wikipedia image)

**Southern Nye County Conservation District Beatty Restoration; Award Amount:
\$36,500**

This project will provide funding to the Southern Nye County Conservation District to support conservation actions around Beatty, which provides important habitat for several Species of Conservation Priority, including the Amargosa toad, Oasis valley speckled dace, Oasis Valley pyrg, Southwestern Willow Flycatcher, and Western Yellow-billed Cuckoo. The Southern Nye County Conservation District will work in cooperation with landowners and the BLM to complete projects on public and private lands. Project work includes tamarisk control, replanting of native vegetation, installation of wildlife-friendly fencing, and annual monitoring and inventory to assess project success. This is a multi-year project with several on-the-ground efforts that are planned and permitted. This project will also draw on funding from NDOW's Habitat Conservation Fee.

Nevada Seed Collection and/or Purchase; Award Amount: \$78,500

This project will fund the collection and purchase of seed for use in habitat restoration in northern and southern Nevada. The 2017 fire season burned over one million acres of wildlife habitat in Nevada, including habitat for Greater sage-grouse and mule deer. NDOW will use these funds (along with significant funding from BLM, non-profit sportsman-conservation groups, and NDOW Federal Grant funding) to purchase seed or fund seed collection for use in habitat restoration and rehabilitation over the fall and winter months. In some cases, if adequate seed cannot be collected and purchased to cover all the targeted areas, herbicide application may be used to temporarily suspend succession and limit cheatgrass growth. Areas receiving herbicide application would be targeted for seed application at an appropriate time next year.

Sodium Toxicity and Evaporation Pond Research; Award Amount: \$5,000

Evaporation ponds used in industrial operations often attract migratory birds and wildlife that mistake the ponds for suitable habitat. As ponds age, chemical constituents such as sodium evapo-concentrate and create an increasing risk of wildlife mortality. Birds are unable to recognize the risk associated with these waterbodies and can be injured or killed when salt accumulates feathers or is ingested during drinking and feeding behaviors. This project will consist of a pathology study to assess brain sodium levels in birds recovered from industrial evaporation ponds compared to birds recovered from natural saline waterbodies. Ultimately, the objective is to clarify the etiology of eared grebe mortality and provide a decision-making tool for monitoring and managing artificial evaporation pond systems.