#17

Upland Game Bird Stamp Program Report

Nevada Department of Wildlife

June 2020

Table of Contents

Page

Progress Report on Upland Game Bird Stamp Projects Funded in FY 2020 …….. 1

Summary of Proposed FY 2021 Upland Game Bird Stamp Projects (table) ……... 34

Upland Game Bird Stamp Account Budget Status (table) …… 36

Proposed FY 2021 Upland Game Bird Stamp Projects …….. 38

Progress Report on Upland Game Bird Stamp Projects Funded in FY 2020

Greater Sage Grouse State-Wide Monitoring

Project Accomplishments:

Lek Count Technicians

We were in the process of hiring seasonal lek count technicians when the Covid-19 pandemic established itself in the U.S. By mid-March, all hiring, including seasonal employees had been frozen for all state agencies. Thus, no seasonal technicians were hired for sage-grouse lek counts during the 2020 spring breeding season.

Aerial Lek Survey

Only one aerial sage-grouse lek survey was performed during the spring of 2020 before the Covid-19 pandemic caused a cease in field activities. This survey was conducted in the Pine Nut Mountains in the Bi-State sage-grouse conservation area. Unfortunately, no birds were detected during this flight, which occurred in early March.

Fixed Wing Infrared Surveys

Owyhee Air Research, Inc. (OAR) began a multi-point Aerial Infrared (AIR) mission for Greater sage grouse (*Centrocercus urophasianus)* lek search and survey, as contracted by the Nevada Department of Wildlife (NDOW), on April 8, 2020. Eleven distinct survey polygons were surveyed, 7 of which were designated as sage-grouse lek search areas, two were designated as sage-grouse lek census areas and another two were designated as Columbian sharp-tailed grouse lek census and search areas, but contained sage-grouse leks.

Methods:

Lek search areas were surveyed using a transect method in which linear transects spaced 0.25 miles apart were flown over the survey area in a directional manner that followed the terrain as closely as possible. Transects were flown between 1,000 and 1,200 feet above ground level. Any known, pre-existing lek location in the survey area was circled to check for grouse presence. Any observed new lek or potential satellite lek was also circled while data was recorded to include the geographical location of the lek and the total number of grouse present, classified by sex when possible. For the lek census areas, known lek locations were circled while the lek and surrounding landscape up to 1.0 mile in all directions were surveyed for grouse. All flights were conducted in the early morning hours beginning approximately 45 minutes before sunrise and concluding 1.5 – 2 hours after sunrise. Each detection of sage-grouse was documented with real-time counts, geographical coordinates and a video clip of the observed birds.

Survey Areas and Results:

Santa Rosa:

The Santa Rosa survey polygon contained 20 known lek locations that were also surveyed via aerial IR in 2019 when heavy snow impacted the area and persisted well into lekking season. During that survey, very few grouse were detected. It was believed that the heavy snowpack was a possible explanation as to the lack of lek attendance within the area. During the 2019-2020 winter, snowpack in the Santa Rosa mountains was not as severe as it had been the previous year. The 2020 survey of this area was conducted on the morning of April 9th. Despite the reduced snow level, sage-grouse were only detected on two of the 20 leks including Big Spring (n = 5) and Coyote Mountain 9 (n = 7). Big Spring was last listed as "active" in 2018. In 2019, it was covered with deep snow and no grouse were observed. Holloway Meadow 7 was the most active lek surveyed in 2019, with more than 20 grouse in attendance; however, during the present survey, no grouse were detected on or near Holloway Meadow 7. A second pass over this lek was conducted on April 11, 2020 at 0810 with identical results.

Montana Mountains:

The Montana Mountains area consisted of approximately 34,600 acres located south of the Oregon border. This area was designated for lek census only and contained 28 known lek locations. Similar to the Santa Rosa survey in 2019, survey results in the Montana Mountains were significantly lower than expected with only 6 leks having sage-grouse on or near them. Of those, only 4 had birds that were actively strutting. It was believed that the lack of lek attendance during the 2019 survey was due largely to the previously mentioned snow levels that persisted throughout the survey area at the time of the flights. The 2020 survey flight of the Montana Mountains leks was conducted on April 11th and sage-grouse were detected on or near 10 of the 28 lek sites. A total of 121 grouse were observed consisting of 113 males. Display rates were low with many of the males sitting on leks and not strutting which may have been attributable to high ground winds.

Willow Creek:

The Willow Creek search area consisted of approximately 29,200 ac. approximately two miles northeast of Austin, Nevada in the northern Toiyabe Range. The polygon contained 3 previously identified lek locations: Emigrant, Emigrant 2, and Willow Creek and was surveyed on April 8, 2020. Most of the suitable breeding habitat was located on or near the ridgelines or on the shallow slopes near the bottom of the foothills where the landscape begins to flatten out.

In total, 39 sage-grouse were detected consisting of 27 males and 12 females. Of these, only six (6) were located on a pre-existing lek location (Emigrant 2). No birds were detected at the Willow Creek lek at the time of the survey flight; however, two potential satellite leks were detected on either side of the provided lek location. Both satellite locations contained actively strutting males and females in attendance. Similarly, no grouse were detected at the Emigrant lek; however, a single lone male was detected strutting 0.5 miles north of the Emigrant lek location and three males were detected strutting 0.25 miles east of the Emigrant lek location. Additionally, one potential new lek was detected high in the foothills on a flat portion of a ridgeline. Strutting males and females were also in attendance at that location as well.

Corral Canyon
The Corral Canyon survey area consisted of approximately 33,800 acres of rolling sagebrush covered foothills approximately 26 miles northeast of Austin, Nevada. The search area contained 9 previously identified leks. Only one, Cowboy Rest, was listed as active in 2019. The survey of the Corral Canyon search area was conducted in a single flight on the morning of April 10, 2020. During the flight 11 male grouse were detected on the Cowboy Rest lek with no females in attendance. No other grouse were detected.

Little Fish Lake:
The Little Fish Lake search area consisted of approximately 29,240 acres of sagebrush habitat located approximately 60 miles northeast of Tonopah, Nevada and was surveyed on April 14, 2020. The area contained three previously known lek locations, all of which were surveyed during 2019. Of those leks, only the Danville Creek lek was listed as being active in 2019 while the other two, Lower Danville and Clear Creek, had not been active since 2008 and 2015 respectively. No grouse were detected on any of the lek locations or anywhere within the search area.

East Diamonds:
The East Diamonds search area consisted of approximately 32,400 acres located on the eastern slopes of Christina Peak roughly 23 miles northeast of Eureka, Nevada. The area contained 3 previously identified lek locations, all of which were surveyed in 2019. The last recorded grouse activity occurred at the Conner Creek 2 lek in 2017. The area was surveyed on April 15, 2020 and no sage-grouse were detected on any of the known lek locations or within the search area.

West Diamonds:
The West Diamonds search area consisted of approximately 26,600 acres directly northeast of the town of Eureka, Nevada. The search area was bracketed by mountainous terrain to the east and agricultural development to the west. Three previously identified lek locations were present within the search area, two of which were surveyed and listed as active during 2019. This survey was conducted on April 16, 2020 and sage-grouse were observed on both of the leks that were listed as active in 2019, however counts were low with a total of only five (5) grouse (4-males and 1-female) detected within the search area.

West Sulphur:
The West Sulphur area consisted of approximately 29,300 acres located approximately 26 miles northwest of the town of Eureka, Nevada. This area contained two previously identified lek locations, both of which were surveyed during 2019. Only one of the leks, Pine Field #1, was active in 2019. This area was during a single flight on April 17th and 5 sage-grouse were observed on the Pine Field #1 lek location. In addition, a total of 30 sage-grouse were detected at 4 different locations throughout the center of the search area. Those sites will need to be inspected further in 2021 to determine if they are new lek locations.

Denay Valley:
The Denay Valley search area consisted of approximately 27,600 acres located approximately 30 miles northwest of the town of Eureka, Nevada. This search area contained two previously

identified lek locations, only one of which, Tonkin Road, was surveyed and listed as active during 2019 while the other, Red Hills 1, was last listed as active in 1991. No grouse were detected during this survey, conducted on April 18th, at either of the known lek locations or within the search area.

Bull Run Basin:

While surveying the Bull Run Basin polygon for Columbian sharp-tailed grouse, OAR also performed infrared surveys for sage-grouse at three known lek locations: IL Summit, Bailey Creek 35 and Bull Run 3-5. Surveys were performed on April 28th. Fourteen males and one female were detected on the IL Summit lek. No sage-grouse were detected on the Bull Run 3-5 lek; however, two sharp-tailed grouse were detected and were thought to be females. At the Bailey Creek 34 lek, 75 males and 14 males were counted (figures 1 and 2). This lek is normally one of the larger leks in Nevada. In addition to surveying these leks, OAR also located a potential new lek with 12 total birds. This location will be surveyed in 2021 to determine re-visitation by grouse.

South Independence Valley:

This polygon was also surveyed in conjunction with Columbian sharp-tailed grouse surveys. There were five previously known lek locations provided to OAR; however, no birds were observed on any of these leks. Like the Bull Run polygon though, a potential new lek locations was discovered with 13 birds. Further survey work will be needed in 2021 to verify activity.

Discussion and Conclusions

In total OAR surveyed 11 search areas totaling approximately 260,000 acres of sagebrush-steppe and mountain shrub communities for active sage grouse lek sites. Detections of new leks were lower than expected with the exception of the West Sulphur and Willow Creek sage-grouse search areas where as many as 4 to 6 potential new lek sites may have been discovered. Results in other portions of central Nevada (e.g., Little Fish Lake Valley and Corral Canyon) and the lek census surveys within the Santa Rosa Range were of particular concern. However, the timing of the surveys and abnormally dry winter could have contributed to these findings. A dry and warm January and February may have led to an earlier start to the breeding period and the dry conditions could have affected breeding activity (active strutting) whereas plant communities may have not met energetic demands of sage-grouse. During the surveys, many male sage-grouse were observed simply loafing around lek sites or basically roosting in place as the aircraft circled overhead. Depending on weather patterns and precipitation during the winter of 2020-2021, it may be appropriate to initiate surveys at an earlier date in late March.

Figure 1. Infrared video view of the Bailey Creek 34 lek in the Bull Run Basin in Elko County. A total of 92 sage-grouse were detected on this lek on 4/28/2020 consisting of 75 males and 17 females.

Figure 2. Screenshot of non-infrared, or visible light spectrum, of the Bailey Creek 34 lek indicating dual capability of the camera system used for these surveys.

Upland Game Translocation and Monitoring

Project Accomplishments:

Mountain Quail Establishment

Through a contract with The Relocator, LLC (a private capture vendor) over 130 mountain quail were captured west of Myrtle Creek, Oregon during November and December of 2019. The capture vendor is located in the area and has an extensive knowledge of mountain quail habitat and capture techniques. As birds were captured, they were being held at the Oregon Department of Fish and Wildlife office in Roseburg, Oregon in holding pens constructed specifically for mountain quail. Prior to retrieval, birds were tested for several different diseases such as Salmonella pullorum, Mycoplasma gallisepticum, avian influenza and coccidiosis. On January 17, 2020, 128 mountain quail were retrieved from Roseburg and transported to Nevada.

Forty birds were taken to the Fish Creek Mountains in Lander County to augment the existing population. Upon release, all 40 birds flew from the crates to heavy willow cover and dispersed juniper trees and began calling and re-grouping. Follow-up call surveys will be conducted periodically to determine the persistence and dispersal of the population into adjacent canyons over the next three to five years.

Meanwhile, the remaining 88 mountain quail were transported to the Mason Valley Wildlife Management Area where they were held and cared for by WMA staff until late February. On February 24, 2020, birds were transported to Hendry's Creek in the northern portion of the Snake Range in White Pine County for release. Birds were released the next day near the site where 105 mountain quail were liberated the previous year. Over the course of two years, 193 mountain quail were released into the Hendry's Creek watershed. Follow up monitoring consisting of call routes will be conducted periodically to determine the success of these releases over the next three to five-year period.

Wild Turkey Establishment

Over the past two years, the Nevada Department of Wildlife has been coordinating with the Idaho Department of Fish and Game regarding opportunities for capturing wild turkeys from southeastern Idaho. During the winter of 2019-2020, high numbers of turkeys were reported by private landowners and observed in the Cub River watershed within the Bear River Range east of Preston, Idaho. This afforded an excellent source stock of wild turkeys for the southern portion of the Ruby Mountains, which was an area identified for augmentation within the Biennial Upland Game Release Plan for several years.

After extensive outreach with private landowners along the foothills of the Bear River Range, baiting and trapping equipment were set up in mid-January of 2020. Two capture days yielded 104 Merriam's turkeys consisting of 42 male and 62 female birds. Birds were released on two separate occasions on February 12th and 22nd, 2020 at the Cowboy's Rest Ranch in Hunt Unit 103 (figures 3 and 4). No mortalities were reported during the two release operations. Necklace

style VHF transmitters were attached to 11 female turkeys to assist with identifying dispersal areas, survival and nesting areas.

Figure 3. Volunteers and NDOW personnel releasing Merriam's turkeys at the Cowboy's Rest Ranch in the southern portion of the Ruby Mountains in Elko County, NV.

Figure 4. Merriam's turkey release at the Cowboy's Rest Ranch in Elko County.

Columbian Sharp-tailed Grouse Aerial Infrared Surveys

In a continuing effort to monitor the success of the translocated Columbian sharp-tailed grouse (CSTG) population in the Bull Run Mountains of northeastern Nevada, we asked Owyhee Air Research (OAR) to conduct an aerial infrared survey in two polygons, one in the Bull Run Basin and one in southern Independence Valley near Tuscarora. These surveys were performed on four different occasions from April 28th through May 4th, 2020. Due to the overlap with Greater

sage-grouse habitat and known lek locations, this species was also included in the survey; however, those results are provided in the Statewide Greater Sage-grouse Monitoring project report.

The initial survey on April 28th was performed using the same protocols as surveys for sage-grouse and no CSTG were located. This caused OAR to modify their search protocol by flying transects at a slightly steeper camera angle, decreasing the line-of-sight distance to the ground, and panning the camera to meet ¼ mile transect spacing. This ensured higher-resolution scanning with the same coverage while also providing a more overhead view to investigate clearings in the taller sagebrush to detect CSTG.

Bull Run Basin Search Area

OAR detected CSTG at three of four previously identified lek sites. The high count of birds for April 29th was 32 CSTG while the high count on May 4th was 35 birds. Figure 5 depicts CSTG detected with infrared imagery at the BURU-003 lek on April 29, 2020. Additionally, two CSTG were detected on the Bull Run 3-5 sage-grouse lek the next day, but were not displaying any sort of lekking behavior. Using peak counts from each lek, regardless of day, the high count was 39 CSTG. Complete survey results from the Bull Run Basin release area are provided in Table 1.

Table 1. Daily results from CSTG surveys conducted within the Bull Run Basin in late April/early May of 2020. High counts from each lek are depicted in italicized and bold font.

CSTG Lek Name	Date	Time	Total Birds
BURU-003	4/29/2020	5:07 a.m.	12
BURU-002	4/29/2020	5:20 a.m.	0
BURU-001	4/29/2020	5:20 a.m.	*11*
BURU-004	4/29/2020	6:19 a.m.	*9*
Bull Run 3-5 (sage-grouse lek)	4/30/2020	7:06 a.m.	2
BURU-003	5/4/2020	5:20 a.m.	*19*
BURU-002	5/4/2020	5:23 a.m.	0
BURU-004	5/4/2020	5:30 a.m.	8
BURU-001	5/4/2020	6:14 a.m.	8

Independence Valley Search Area

The Independence Valley search area was surveyed in a single morning flight on May 1, 2020. The search area contained less topography and significantly more agricultural hay meadows and wetland coverage than the Bull Run Basin. No detections of either species were recorded, including the survey of 5 previously known sage-grouse lek locations. However, OAR detected 13 sage-grouse in the northern portion of this search area.

Figure 5. A screenshot from video provided by Owyhee Air Research shows Columbian sharp-tailed grouse detected at the BURU-003 lek within the Bull Run Basin on April 29, 2020. Notice that many of the males are "paired" (indicated by circles) as they establish and defend their territory on the lek.

Dusky grouse Ecology and Management in Nevada

Project Accomplishments:

Population surveys

Surveys for breeding dusky grouse began on April 23rd and continued until June 10th, 2019. Sixty locations were surveyed which included four stop locations per site, 2-4 survey sites per field site, and 5 total field sites. Each survey location was sampled twice for a total of 120 survey stops completed in 2019. The amount of snowpack at each of the sites prevented field crews from safely accessing survey locations in March. Additional 'field sites' were identified and some previous survey sites were relocated to increase survey counts due to inaccessibility to some of the previous year's sites that remained inaccessible for the extent of the 2019 breeding season.

During the breeding surveys, approximately 28 male dusky grouse were detected, with peak activity occurring from May 9 – May 26. Overall, only 1/3 of the total male dusky grouse were detected compared to 2018.

Habitat use, survival, and reproduction

During the 2019 field season, 20 dusky grouse were captured consisting of 16 adults and four chicks (two chicks were large enough to band). Two of those were recaptures from 2018 where Lotek PinPoint GPS units (one backpack, one necklace) were exchanged for new Argos-enabled solar backpack 22 g GPS-PTT radios from GeoTrak™. Five new males and 11 new females were banded, and all 11 of those newly captured females received the GeoTrak Argos GPS backpacks. Despite two radio-telemetry flights, one in April and one in July, only two of the Lotek PinPoint GPS solar backpacks (one exchanged, one still in the field) were relocated and two of the Lotek PinPoint GPS necklace-style transmitters (one exchanged, one was a later mortality) that remained on surviving dusky grouse. Two Lotek Argos solar backpacks, two of the Lotek PinPoint store-on-board backpacks, and one of the Lotek PinPoint necklace-style transmitters from mortalities that occurred between the end of the 2018 and beginning of the 2019 field seasons were recovered. Unfortunately, data that would have been obtained from the 13 missing Lotek transmitters will likely remain undetermined. Lotek is aware of this issue and is working with Utah State University to obtain transmitters that will provide better data in the future.

Location data obtained from birds that survived an annual cycle provided important information regarding seasonal habitat use. In several cases, there was a geographic disparity between breeding and brood rearing sites and winter habitats (figure 6). These habitats seem to be separated by a distance of approximately 4 to 6 miles. In many cases, birds elected to use higher elevation habitat in rough terrain that included limber pine, subalpine fir and mountain mahogany.

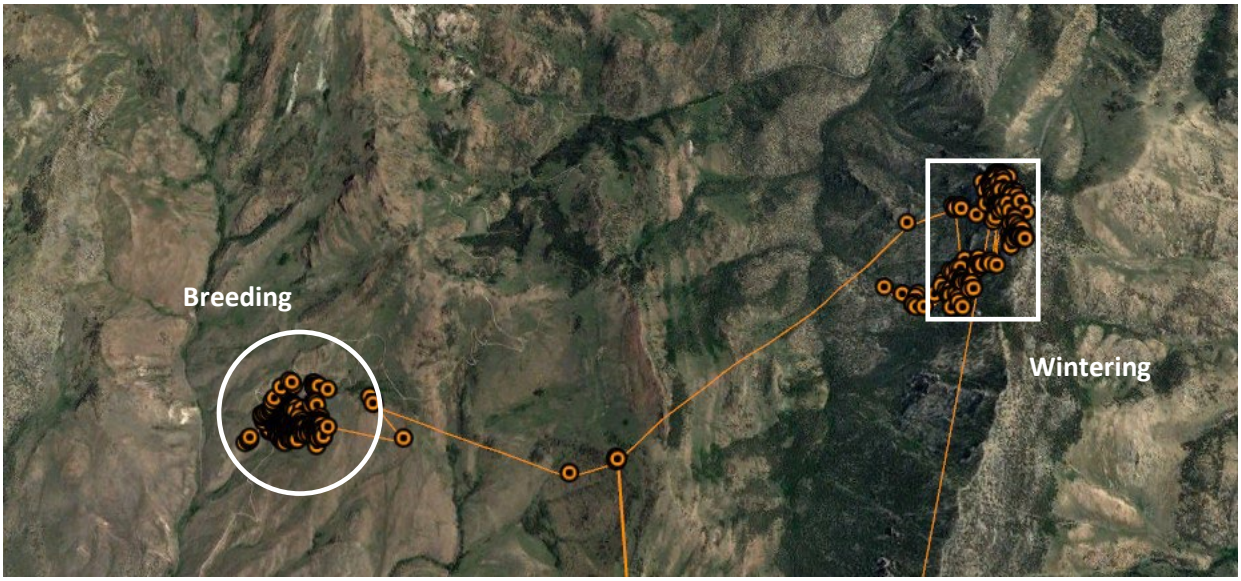


Figure 6. This aerial view captures the movements of an adult hen captured on July 2, 2019 showing a distinction between breeding and wintering habitat use areas. This bird spent most of the winter between 9,255′ and 9,470′ in elevation.

There were no incidental mortalities from capture and handling over the 2019 field season, likely due to less capture opportunities and cooler weather with higher humidity (likely from snowmelt) compared to the 2018 season. Capture protocols have been modified to minimize risk by eliminating trapping in temperatures above 78° F during July and August. Two known radio-marked individuals experienced mortality and one slipped its transmitter prior to the beginning of the 2019 hunting season. To our knowledge, there have been no band or transmitter returns from harvested dusky grouse from the 2019 hunting season. Since location data can be readily accessed from the individuals with the GeoTrak Argos GPS backpacks, we know that two of the individuals were lost to fall mortalities (Sept 1–Nov 1) and none have been lost to winter mortalities (Nov 1–present).

Five dusky grouse nests were located in 2019, two of which belonged to unmarked birds. Three of the nests were in sagebrush, one was behind a chokecherry (*Prunus virginiana*) in a rocky cliff area, and one was in brushy downfall under a pine tree. Three of the nests failed, and two of them successfully hatched all of their eggs. Unfortunately, one of the hens was killed (likely by a raptor) within 3 days after hatch, thus brood survival is unknown. However, experience gained from sage-grouse research that includes radio-marked chicks suggests orphaned chicks are quickly adopted into new broods, as all known sage-grouse brood hen mortalities have resulted in chicks being mixed into other broods within 48 hours (Dahlgren et al. 2010). The other successful nest also resulted in a successful brood, of which 4 chicks survived to 50 days. Fifteen nest searches were also performed, which involved walking with a pointing dog in a line transect shaped like a rectangle that is 500 x 250 m^2. The dogs located male and female dusky grouse while searching the transects, though no nests were identified during these surveys.

In late June of 2019 the first dusky grouse hen was found with a brood at 7 days old. The next broods were found in early July, nearly a month later than the 2018 field season. Overall, ~38

brooding dusky grouse hens (including marked and unmarked hens) were located, with broods ranging from 1–6 chicks per hen. Locations were recorded for each brood.

Habitat selection

Five vegetation surveys were performed at nest locations, 23 surveys at brooding locations, 5 surveys at random nest-associated locations (i.e., within 500 m), and 30 surveys at random brood-associated locations (i.e., within 500 m). Random vegetation surveys were also conducted in each of the major habitat types (i.e., pinyon-juniper, sagebrush, mahogany, conifer, and aspen) for each study area for a total of 15 random vegetation surveys. Each vegetation survey also included an iButton, which recorded ambient temperature variations at the microsite for ~2 weeks.

Thermal Mapping

In addition to placing iButtons at every vegetation survey, a total of 100 iButtons were deployed across the various study sites, with 16-19 per major habitat type (i.e., pinyon-juniper, sagebrush, mahogany, conifer, and aspen), with a total of 33 in the Egan Range, 34 in the Schell Creek North Range, and 33 in the Schell Creek South Range. There was an exception for the major habitat types in the Egan Range, which is quite different from the habitats of the Schell Creek range. Thus, we deployed 13 in serviceberry and 2 in meadows/grasslands of the Egan Range. Ambient temperatures were recorded at all microsite locations for 4-5 weeks, and each microsite was described by a brief vegetation survey to determine amount of cover and dominant species in the radius (~2-5 feet) of the iButton location.

Baseline and Chronic Stress Hormone Levels

Seventy fecal samples and 43 feather samples were collected from dusky grouse over the 2019 field season. We collected 10 fecal and 7 feather samples from adult males, 40 fecal and 27 feather samples from adult females, and 20 fecal and 9 feather samples from unknowns (including chicks).

Monitoring the Effects of Landscape-Level Treatments on Greater Sage-grouse within the Desatoya Mountains

Project Accomplishments Summary

Sage-grouse demographic rates and spatial use were measured at the Desatoya study area from 2014 to 2019 as part of a broad, long-term collaborative research program. General goals of this project are aimed at providing managers with information on population trajectories and threats to sage-grouse across the Great Basin. Identified goals for this project include evaluating the potential effects of habitat restoration and enhancement (e.g. riparian restoration, removal of single-leaf pinyon pine and Utah juniper (PJ)) on sage-grouse demographic rates, movement patterns, and predator community composition. To date, 194 sage-grouse have been fitted with very high frequency (VHF) and Global Positioning System (GPS) transmitters. Annual population rate of change (λ) derived from an integrated population model utilizing vital rates measured during this study and longer lek count data starting in 2011 was estimated at 0.94 (95 percent CRI 0.79–1.11). This estimate was largely reflective of drought-like conditions.

Introduction

The U.S. Geological Survey (USGS) along with agency and stakeholder partners that include NDOW, BLM, Smith Creek Ranch, and Great Basin Bird Observatory, are collaborating on an intensive effort to monitor populations of sage-grouse in the Desatoya Range. Large expanses of pinyon and juniper woodlands within the Desatoya Mountains may inhibit sage-grouse movement and act as barriers between seasonally used habitats. Loss of sagebrush, wet meadows, and riparian habitats also may contribute to population decreases. Therefore, a before-after study was designed to investigate potential effects of habitat restoration and enhancement (e.g. P-J removal, riparian restoration) on sage-grouse population vital rates, habitat selection, and movement patterns, as well as effects on predator community composition.

This report presents updated findings regarding the Desatoya study area from 2011– 2019, and incorporates data reported by Coates and others (2016*b*) as part of an ongoing long-term research effort. Intensive field studies of radio-marked sage-grouse span 2014–2018, while lek counts span the entire study period. Specific to this report are demographic and population growth rate estimates derived from the integrated population model (hereafter, "IPM"), as well as summarized statistics describing sage-grouse space use and avian predator abundance throughout the study site. The findings contained in this report are preliminary and are meant to provide managers with timely science from this ongoing research effort and are subject to change.

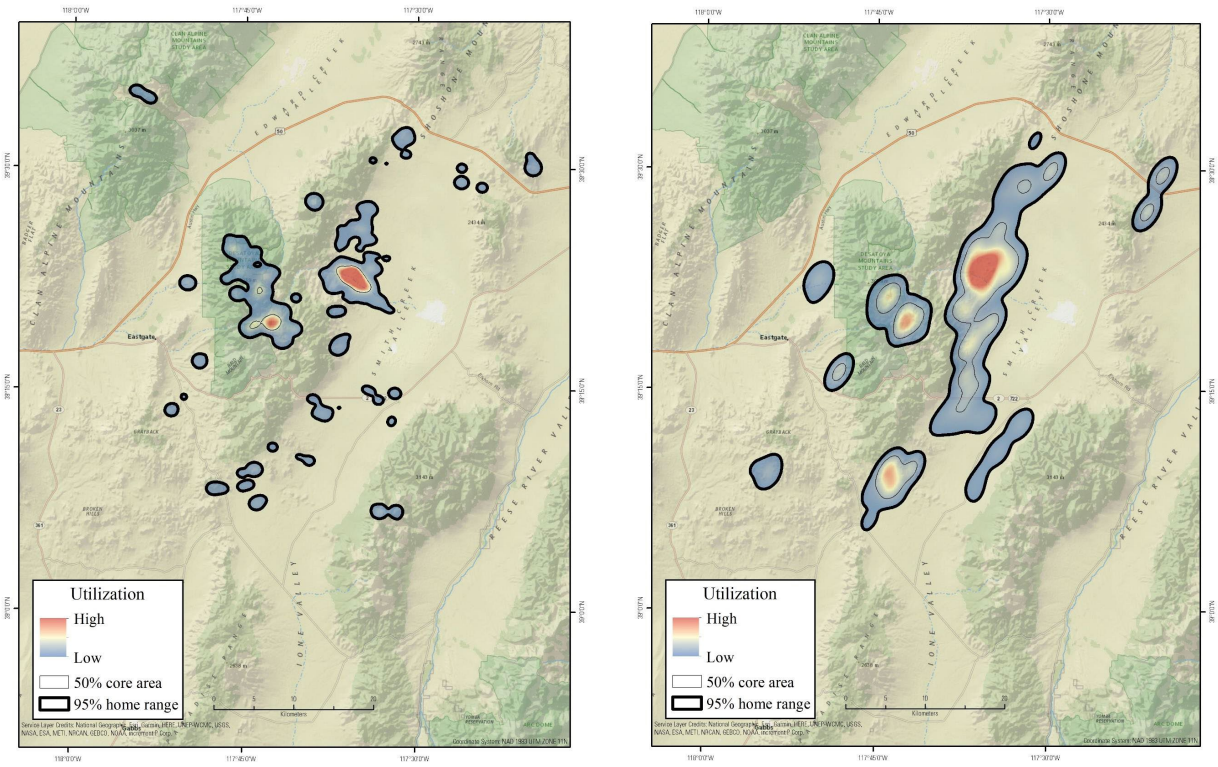
Preliminary Results

From fall 2013 to fall 2019, 194 sage-grouse were captured at the Desatoya study area (n=109 fall, n=85 spring captures). Of those, 175 were female and 19 were male. From 2014 to 2019, 60,209 Global Positioning System locations of marked sage-grouse were obtained in the study area.

Seasonally, sage-grouse use of the landscape changed as marked individuals utilized distinctly different areas throughout different seasons. Sage-grouse were found to be most concentrated during the summer months using a 50 percent core area of only 1,395 hectares (figure 7). Conversely, sage-grouse used approximately 13,095 hectares during the winter months (figure 8).

Avian Predator Monitoring

Research technicians completed 232 Raven, Raptor, Horse and Livestock (RRHL) surveys throughout the Desatoya study area in 2019. From 2014 through 2019 a total of 2,224 surveys have been conducted during the March–August timeframe. In 2019, a total of 131 ravens were observed during the which was 0.49 ravens per survey. At sage-grouse nest sites, 0.32 ravens were detected per RRHL survey, which was lower than the number of ravens detected per each random survey (n=0.80). Livestock were encountered at 61 RRHL surveys, and raven detections per survey were lower during surveys in which livestock were detected (n=0.23), compared with surveys in which livestock were not detected (n=0.57). When ravens were detected in 2019, the median number of observed ravens was 1 per survey, and the maximum number of ravens detected in any survey was 30.



Figures 7 and 8. Cumulative utilization distribution of greater sage-grouse during the summer (left) and winter seasons (right) from 2014-2019. Utilization distribution approximated using kernel density estimators.

Population Growth Estimated from an Integrated Population Model

Estimated population demographic rates, IPM-derived estimates of N, λ, and probability that the population is increasing versus decreasing (i.e., odds ratios) for the Desatoya study area,

cumulatively and annually, from 2011–19 is provided in figure 9. Derived parameters were averaged across years to evaluate overall averages of recruitment (*R*) and all subcomponents for adult (α) and yearling (γ) sage-grouse when estimation by age was appropriate. Some parameters did not have enough data to derive annual estimates (e.g., clutch size), and those parameters were pooled with data from other sites across central and northern Nevada to produce estimates. From 2011–19, the Desatoya study area had a median λ estimate of 0.94 (95 percent credible interval=0.79–1.11; hereinafter, CRI). Estimated declines in population sizes are reflected by a trend of decreasing lek counts. At the Desatoya study area, the 8-year log of the odds ratio indicates that there is more evidence of population decrease than that of population increase. Adult sage-grouse had similar median annual survival (0.65, 95 percent CRI=0.57–0.71) as yearlings (0.62, 95 percent CRI=0.54–0.70), but lower recruitment (0.31, 95 percent CRI=0.24–0.39) than yearlings (0.41, 95 percent CRI=0.30–0.53).

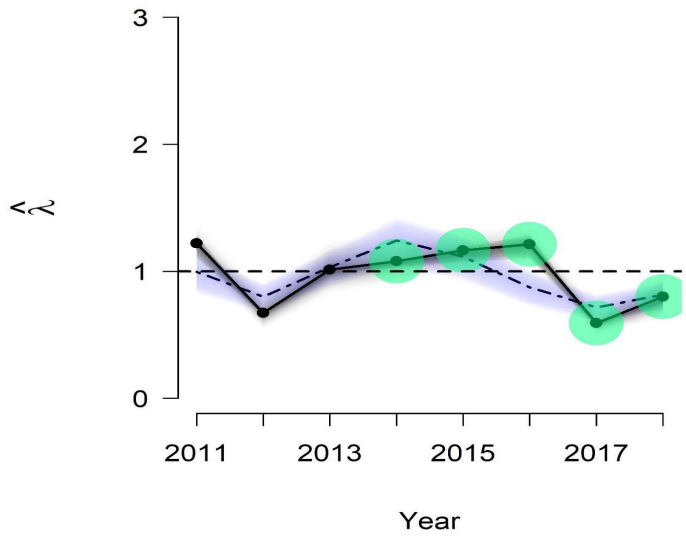


Figure 9. Annual sage-grouse population growth rates estimated from 2011-2018 in the Desatoya study area. Shading represents the 95% credible interval. Green shading around points represents years that lek count and demographic data were collected. The horizontal dashed line represents a stable population with no increase or decrease.

While the overall estimate of λ across the study period (2011–18) reflects population decrease, results need to be interpreted with the following caveats. Sage-grouse populations in the Great Basin are known to exhibit population cycles, which typically range in duration from 10–12 years (Row and Fedy, 2017) and are strongly correlated with annual changes in precipitation (Coates and others, 2018). Accordingly, the 9-year duration of this research primarily spanned periods of drought, so reported λ estimates are most reflective of long-term drought conditions.

Measuring Corticosterone Metabolites in Greater Sage-grouse

Project Accomplishments

This project was suspended in 2020 due to the COVID-19 pandemic. We were not able to survey sage-grouse lek sites and obtain fecal samples for future analysis with the ultimate objective of obtaining corticosterone (cortisol) levels (stress hormone). We were in the process of developing a contract with either Utah State University or the University of Memphis to conduct the analysis; however, during the Nevada "stay home" order, we were not able to process any sub-grants or contracts. Sound monitoring devices were placed at several lek sites in central and northeastern Nevada to obtain ambient noise levels at those leks. Fecal samples will be collected from those leks in 2021.

Estimating Sage-grouse Vital Rates within Nevada's Most Novel Habitats

Project Accomplishments Summary

Demographic rates and spatial use of greater sage-grouse (*Centrocercus urophasianus*; hereinafter, sage-grouse) were measured in the Monitor Range during 2016-2019 as part of a broad, long-term collaborative research program. General goals of this project are to provide a control site with low anthropogenic disturbance that will allow comparisons of demographic trends in sage-grouse populations with elevated levels of anthropogenic surface disturbances. To date, 127 sage-grouse have been captured and outfitted with very high frequency or global positioning system transmitters. Annual population rate of change (λ) derived from an integrated population model utilizing vital rates measured during this study and longer lek count data was estimated at 0.93 (95 percent CRI 0.77 – 1.11) from 2011 to 2019.

Introduction

In the Great Basin, understanding how relationships between habitat selection and population vital rates are altered by threats from anthropogenic surface disturbance (e.g. mine, geothermal, oil and gas, or infrastructure development) is important to help facilitate effective management of primary threats to sage-grouse populations (Connelly and others, 2000). However, effectiveness of management actions aimed at ameliorating these threats cannot be fully evaluated without information collected over a longer duration on population performance and habitat associations in areas that are relatively undisturbed and exhibit relatively intact sagebrush ecosystems. For example, increased development of energy infrastructure within sage-grouse habitat can alter vegetation communities that may change predator composition, particularly common ravens, as transmission lines and other tall structures used for nesting and perching become more prevalent across the landscape (Howe and others, 2014). Evaluating metrics of sage-grouse population performance, spatial utilization, and predator abundance at control sites can better help quantify relative impacts of anthropogenic disturbance.

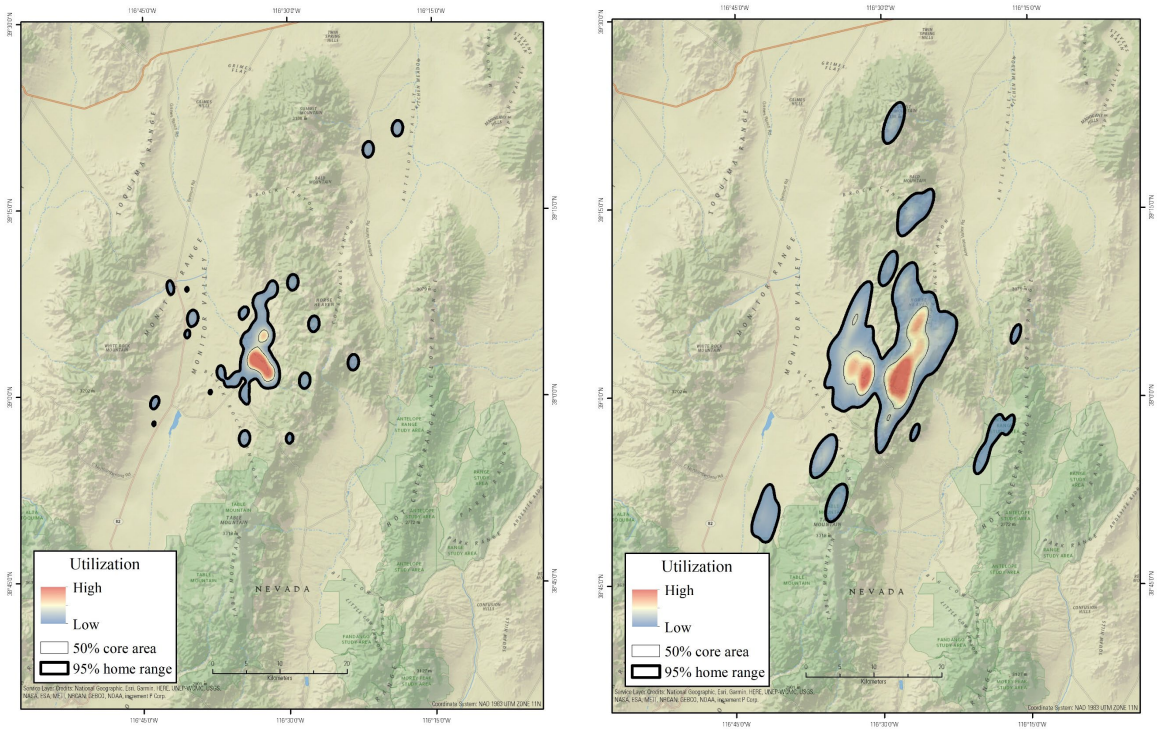
The Monitor Valley study area is located approximately 110 kilometers southeast of Austin, Nevada and includes the mountainous terrain of the Monitor Range. The area represents a

valuable control site with a paucity of anthropogenic disturbance and infrastructure compared to other field sites in Nevada monitored by USGS and collaborators. Moreover, data obtained from Monitor Valley can provide a baseline for comparing effects of energy development on sage-grouse monitored at the McGinnis Hills and Tuscarora study sites where geothermal energy is being developed.

This report presents updated findings regarding the Monitor Valley study area from 2015-2019 and incorporates data reported by Coates and others (2016*b*) as part of an ongoing long-term research effort. Intensive field studies of radio-marked sage-grouse span 2015–2019, while lek counts span the entire study period (2011-2019). Demographic and populations growth rate estimates have been derived from an integrated population model (hereafter, "IPM").

Preliminary Results

From fall 2015 to fall 2019, 127 sage-grouse were captured in the fall (n=71) and spring seasons (n=56) consisting of 122 female and 5 male sage-grouse. GPS marked individuals provided 13,013 locations over this time frame. Seasonally, sage-grouse use of the landscape changed as marked individuals utilized distinctly different areas across seasons. Sage-grouse were most concentrated during the winter (December–February) where sage-grouse were localized to a 50 percent core area of only 1,418 ha (figure 10). This is in contrast so summer use areas where sage-grouse used approximately 6,821 ha (figure 11).



Figures 10 and 11. Seasonal utilization distributions for winter (left) versus habitat use during the summer months (right) and a shift in elevation from the valley bottom of east Monitor Valley to Butler Basin in the upper elevations of the Monitor Range.

Information collected from radio and GPS marked grouse also allows researchers to estimate several different demographic rates that not only provide important insights into certain life stages (e.g. nesting, brood rearing and survival rates), but also factors into integrated population models. Various demographic parameters for both adults and yearlings are provided in Table 2.

Table 2. Summary of population demographic parameters for greater sage-grouse at the Monitor Range study area from 2016-2019. Values reported are cumulative estimates across all years of the study.

Population Vital Rate	Age	Median Estimate	Credible interval (CRI)	
			Lower -0.025	Upper -0.975
Annual growth rate	NA	0.93	0.77	1.11
Nest propensity (1)	Adult	0.96	0.91	0.98
	Yearling	0.91	0.86	0.95
Clutch size – First Nest	Adult	7.56	7.19	7.95
	Yearling	7.89	7.28	8.55
Clutch size – Second Nest	Adult	7.23	6.24	8.78
	Yearling	7.53	6.46	8.78
Nest survival – First Nest	Adult	0.25	0.17	0.35
	Yearling	0.29	0.19	0.41
Nest survival – Second	Adult	0.29	0.19	0.41
	Yearling	0.32	0.19	0.47
Hatchability	Adult	0.89	0.85	0.93
	Yearling	0.92	0.88	0.95
Chick survival	Adult	0.39	0.30	0.47
	Yearling	0.44	0.35	0.53
Annual survival	Adult	0.57	0.46	0.66
	Yearling	0.55	0.43	0.64

Avian Predator Monitoring

During the 2019 field season, 234 Raven, Raptor, Horse and Livestock (RRHL) surveys were conducted throughout the Monitor Range for a total of 1,235 surveys during March–August 2016–19. A total of 67 ravens were observed during these surveys, equating to 0.27 ravens per survey. At sage-grouse nest sites, 0.11 ravens were detected per RRHL survey, which was less than the number of ravens that were detected per random survey (n=0.51). Livestock were encountered at 56 RRHL survey sites, and raven detections per survey were higher during surveys in which livestock were detected (n=0.54), compared with surveys in which livestock were not detected (n=0.19). When ravens were detected in 2019, the median number of observed ravens was 1 per RRHL survey, and the maximum number of ravens detected in any survey area was 12.

Population Growth Rates Estimated from an Integrated Population Model

From 2011–19, the Monitor Range had a median λ estimate of 0.93 (95 percent credible intervals=0.77–1.11; hereinafter, CRI; figure 12). Estimated declines in population sizes are reflected by a trend of decreasing lek counts. The eight-year log of the odds ratio indicates that there is more evidence of population decrease than that of population increase or neutrality. Median estimates of adult annual survival were slightly higher (0.57, 95 percent CRI=0.46–0.66) than those of yearlings (survival=0.55, 95 percent CRI=0.43–0.64) while recruitment of chicks by adult hens was lower (0.31, 95 percent CRI=0.24-0.39) than that of yearlings (0.41, 95 percent CRI=0.30-0.53). In essence, while adults tend to live longer, yearlings may contribute more to the population by producing more chicks.

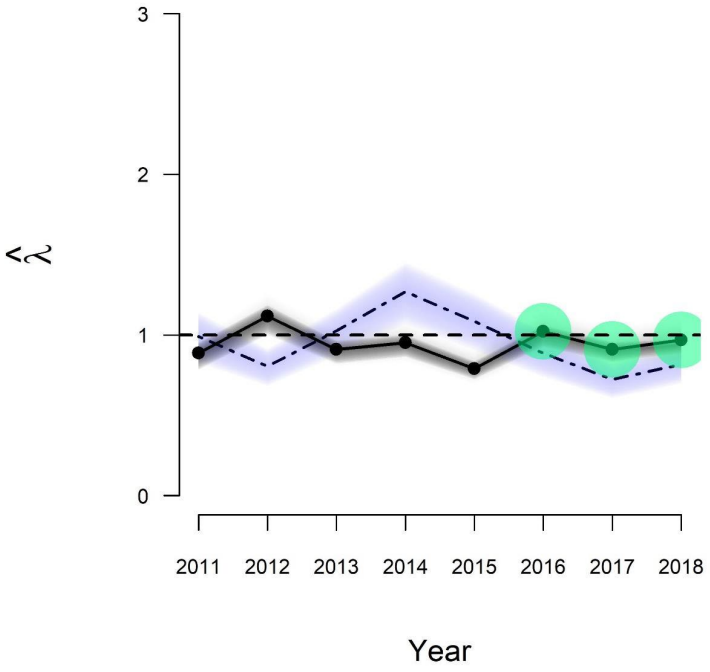


Figure 12. Annual population growth rates of sage-grouse within the Monitor study site from 2011-2018 (x=0.94, 95 percent credible intervals = 0.82-1.07). Shading represents the 95 percent credible interval of the integrated population model. Green shading represents years that lek count and demographic data were collected. The solid line in the integrated population model derived estimate and the dashed line is the derived estimate for the Great Basin.

While the overall estimate of λ across the study period (2011–19) reflects a population decline, results need to be interpreted with the following caveats. Sage-grouse populations in the Great Basin are known to exhibit population cycles, which typically range in duration from 10–12 years (Row and Fedy, 2017) and are strongly correlated with annual changes in precipitation (Coates and others, 2018). Accordingly, the nine-year duration of our study to date primarily spanned periods of drought, so reported lambda estimates are most reflective of long-term drought conditions. While current sage-grouse population cycles in the Great Basin may be decreasing in both duration and amplitude (Row and Fedy, 2017), longer term lambda estimates may increase when future years that could experience above average precipitation, fueling bursts of population growth, are incorporated into the IPM time series.

Effects of Conventional Raven Control and Wildfire on Greater Sage-grouse within the Virginia Mountains

Project Accomplishments Summary

Demographic rates and spatial use of greater sage-grouse (*Centrocercus urophasianus*) were measured in the Virginia Mountains during 2008–19 as part of a broad, long-term collaborative research program. General goals of this project are aimed at providing managers with information on population trajectories and threats to sage-grouse across the Great Basin. Goals of this project include an evaluation of the effect of common raven (*Corvus corax*) removal and wildfire effects on sage-grouse demographic rates. To date, 349 sage-grouse have been outfitted with very high frequency or Global Positioning System transmitters. The average annual population rate of change (λ) derived from an integrated population model, which utilized demographic and lek count data measured during this study from 2011 to 2019, was estimated to be 0.94 (95 percent credible interval 0.81–1.09).

Introduction

The Virginia Mountains in northwestern Nevada consists of exurban areas, which include sporadic ranching operations and numerous anthropogenic structures. Ravens were reported as an important nest predator at this study site (Lockyer and others, 2013). Raven numbers are thought to be moderately high at this site compared to other areas in Nevada (Tyrell pers. comm, 2018) so reducing raven numbers using lethal techniques was considered an appropriate management action. Although a few studies have quantified the effects of raven removal on sage-grouse nest survival (for example, Dinkins and others, 2016), we are currently unaware of any studies that evaluate evidence of whether raven removal influences population growth rates. Scientific findings regarding effects on specific life-stages, such as nesting, as well as population growth would be beneficial to help guide decisions regarding lethal removal. Furthermore, we are unaware of any studies that have empirically evaluated the impacts of ravens on sage-grouse populations in years after removal activities have concluded. Recent fires at this study site (Virginia Mountains Fire Complex - 59,727 acres, 2016; and Long Valley Fire - 83,733 acres, 2017) may also provide additional research opportunities to examine interactions between ravens and wildfire.

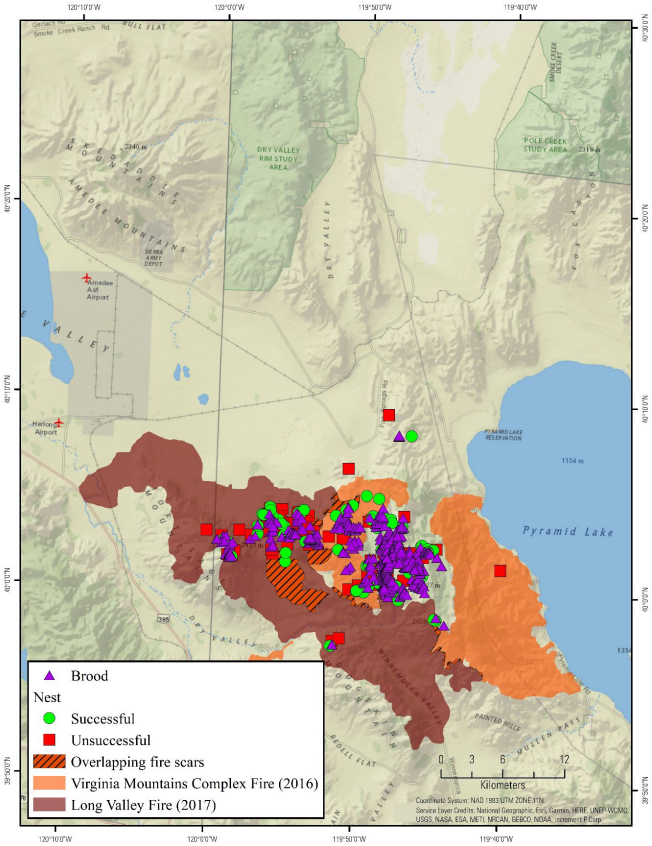
The USGS has been collecting data at the study site since 2008 while the United States Department of Agriculture Animal and Plant Health Inspection Service initiated raven removal activities using the pesticide DRC-1339 during 2014–18 with an extension through 2019. Research objectives are therefore focused on the effects of ravens and raven removal on sage-grouse populations within the Virginia Mountains. Specifically, we are conducting a before-after-control-impact study design to investigate potential effects of raven removal on sage-grouse population vital rates, population growth, and effects on predator community composition. This report presents updated findings regarding the Virginia Mountains from 2008–18 and is part of an ongoing long-term research effort. Specific to this report are demographic and populations growth rate estimates derived from the integrated population model (hereinafter, "IPM"), a summary of sage-grouse space use throughout the study site, and an overview of avian predator surveys. The findings contained in this report are preliminary

and are meant to provide managers with timely science from this ongoing research effort and are subject to change.

Preliminary Results

Over a 12-year period from 2008 to 2019, 349 sage-grouse were captured in the fall (*n*=222) and spring seasons (*n*=127). Of those, 319 were female and 30 were male. VHF locations collected over the years allowed researchers to identify nest sites, determine success or failure of those nests and follow up on brood locations (figure 13). From 2017 to 2019, 5,644 GPS locations of marked sage-grouse were obtained at the Virginia Mountains study site, assisting with the development of seasonal habitat utilization distribution surfaces. During the spring (March–May, i.e. nesting) season, the 50 percent core area of sage-grouse activity and the 95 percent population level home-range were 2,759 and 15,040 ha. respectively. Sage-grouse within the Virginia Mountains used much smaller areas during the summer (June–August, i.e. brood-rearing) where the 50 percent core area and the 95 percent population level home-range were 1,111 and 7,025 ha, respectively. Sage-grouse were further concentrated during the fall season where they were localized to a 50 percent core area of only 605 ha.

Figure 13. Nest and brood locations of sage-grouse in the Virginia Mountains study area from 2009-2019. Nest Videography



Remote video-cameras were placed at 79 nests from 2009—11 and from 2014—19, during which all depredations and successful hatches were recorded. Identified predators associated with partial and complete depredations were ravens (*n*=8), coyotes (*Canis latrans*; *n*=9), American badgers (*Taxidea taxus*; *n*=2), long-tailed weasel (*Mustela frenata*; *n*=1), bobcat (*Lynx rufus*; *n*=1), and fox (*Vulpes spp.*; *n*=1). Successful hatches were recorded at 47 nests while six nests were abandoned, one of which was due to a female that was killed during an incubation recess and one nest that was infertile.

Avian Predator Monitoring

Throughout the study area, 164 Raven, Raptor, Horse and Livestock (RRHL) surveys were conducted in 2019 for a total of 3,127 surveys during March–August 2009–11 and 2013–19. In 2019, 26 ravens were detected during the 164 surveys completed equating to 0.15 ravens per survey. At sage-grouse nest sites, 0.11 ravens per RRHL survey were detected, which was lower than the number of ravens detected per random survey (n=0.22). Livestock were encountered at 48 RRHL surveys and raven detections per survey were higher during surveys in which livestock were detected (n=0.19) compared with surveys in which livestock were not detected (n=0.14).

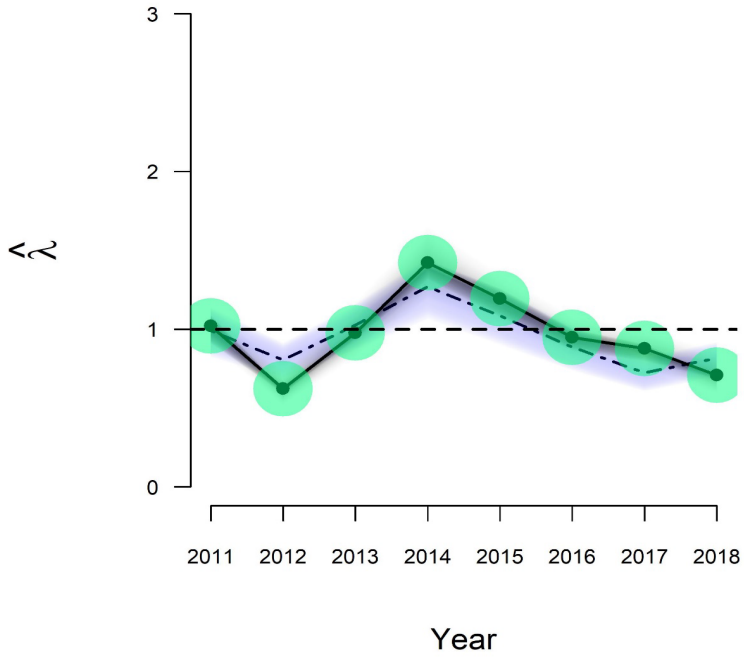
Population Growth Rates

Summary information for observed lek counts, population vital-rate estimates, IPM-derived estimates of N, λ, and probabilities of increasing population growth versus declining population growth (that is, the odds ratios) for the Virginia Mountains cumulatively (table X). Derived parameters were averaged across years to evaluate overall averages of recruitment (R) and all subcomponents for adult (a) and yearling (y) sage-grouse when estimation by age was appropriate. Some parameters did not have enough data to derive annual estimates (for example, clutch size), and those parameters were pooled with data from other sites across central and northern Nevada to produce estimates.

From 2011–19, the Virginia Mountains had a median λ of 0.94 (95 percent credible interval=0.81–1.09; hereinafter, CRI; figure 14). Estimated declines in population sizes are reflected by a trend of decreasing lek counts. The 8-year log of the odds ratio indicates that there is more evidence of population decrease than that of population increase. Median estimates for adult sage-grouse survival (0.56, 95 percent CRI=0.48–0.64) was similar to yearlings (0.62, 95 percent CRI=0.51–0.71), but adults exhibited lower recruitment (adult R=0.36, 95 percent CRI=0.22–0.54; yearling R=0.50, 95 percent CRI=0.32–0.72).

While the overall estimate of lambda across the study period (2011–19) reflects population decline, results need to be interpreted with the following caveats. Sage-grouse populations in the Great Basin are known to exhibit population cycles, which typically range in duration from 10–12 years (Row and Fedy, 2017) and are strongly correlated with annual changes in precipitation (Coates and others, 2018). Accordingly, λ estimated derived from the last 9 years primarily spanned periods of drought and are most reflective of long-term drought conditions.

Figure 14. Population growth rates estimated within the Virginia Mountains study are from 2011-2018. Shading represents the 95 percent credible interval and green highlighting (circles) represents years in which both lek and demographic data were collected. The dashed line represents population growth rates for all monitored sage-grouse population in the Great Basin.



Monitoring Greater Sage-grouse Population Demography and Habitat Post Martin Fire

The monitoring effort at this study area was reinitiated in fiscal year 2020, largely in response to the 2018 Martin Fire which consumed 440,000 acres of mostly sagebrush shrublands that served as priority sage-grouse habitat. During the fall of 2019, USGS research crews captured and attached VHF transmitters to 29 female sage-grouse and attached two GPS transmitters each to female and male sage-grouse. During March of 2020, the research crews were able to capture and deploy an additional 5 VHF transmitters to female sage-grouse while also deploying an additional GPS transmitter on one female and one male sage-grouse. The crews were also able to conduct 8 lek counts at 8 different leks of which four were active and conducted 8 raptor, raven, horse and livestock surveys.

In response to the COVID-19 pandemic and concerns for the health and safety of the crews, field work was suspended and personnel vacated the study area on April 1, 2020. The suspension of work has continued into early May and it is unknown at this time when field work will resume.

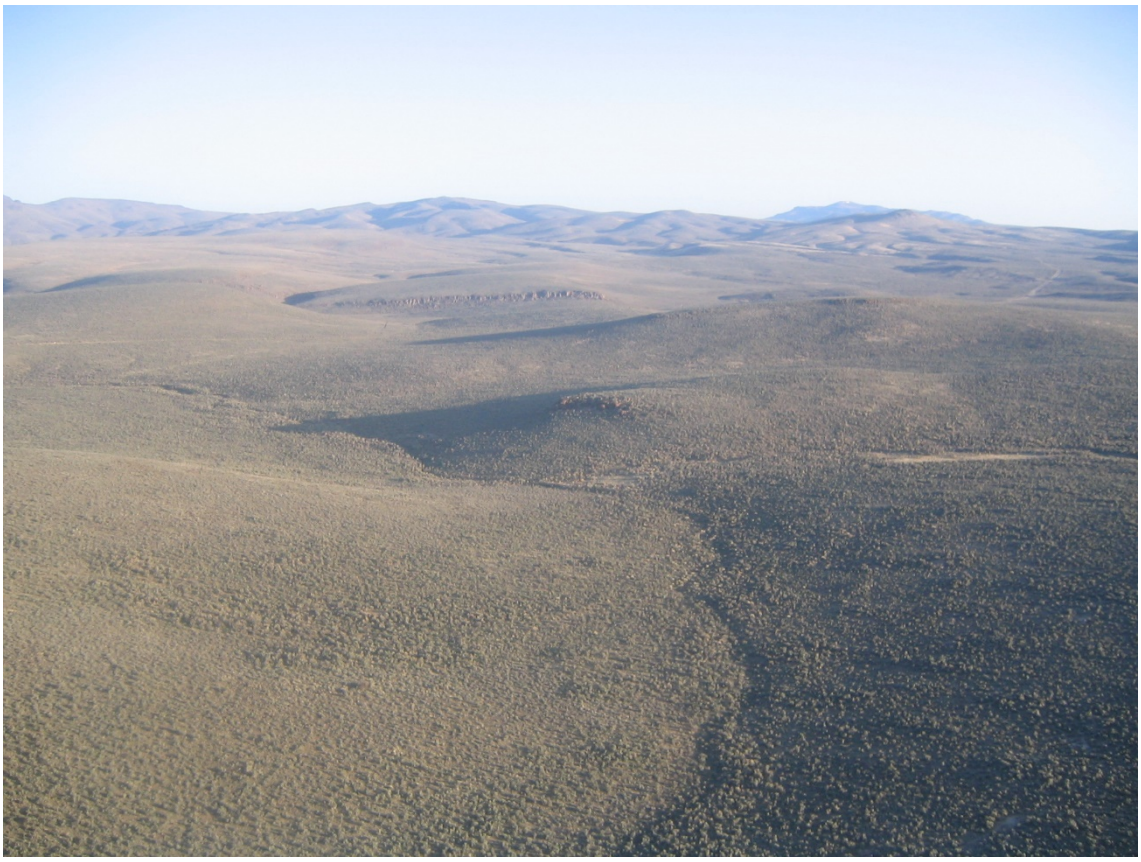


Figure 15. The Santa Rosa study area looking north from Goat Corral Mountain prior to the Martin Fire. The Calico Mountains can be seen in the distance in the upper right-hand portion of the photo.

Bi-State Sage-grouse Coordinator

Project Accomplishments:

The Bi-State Sage-grouse Coordinator position has been in place since 2016 with an office located in Bishop, California. Amy Sturgill has been in the position since its inception. One of the main tasks of this position is to develop an progress report each year that outlines the accomplishments of the Bi-State Sage-grouse Working Group (relative to the 2012 Bi-State Action Plan) along with maintaining and updating the website specific to this population of sage-grouse (www.bistatesagegrouse.com) (figure 17), and coordinating meetings of the Bi-State Local Area Working Group, Bi-State Technical Advisory Committee (TAC), Bi-State Executive Oversight Committee (EOC) and any relevant subcommittees.

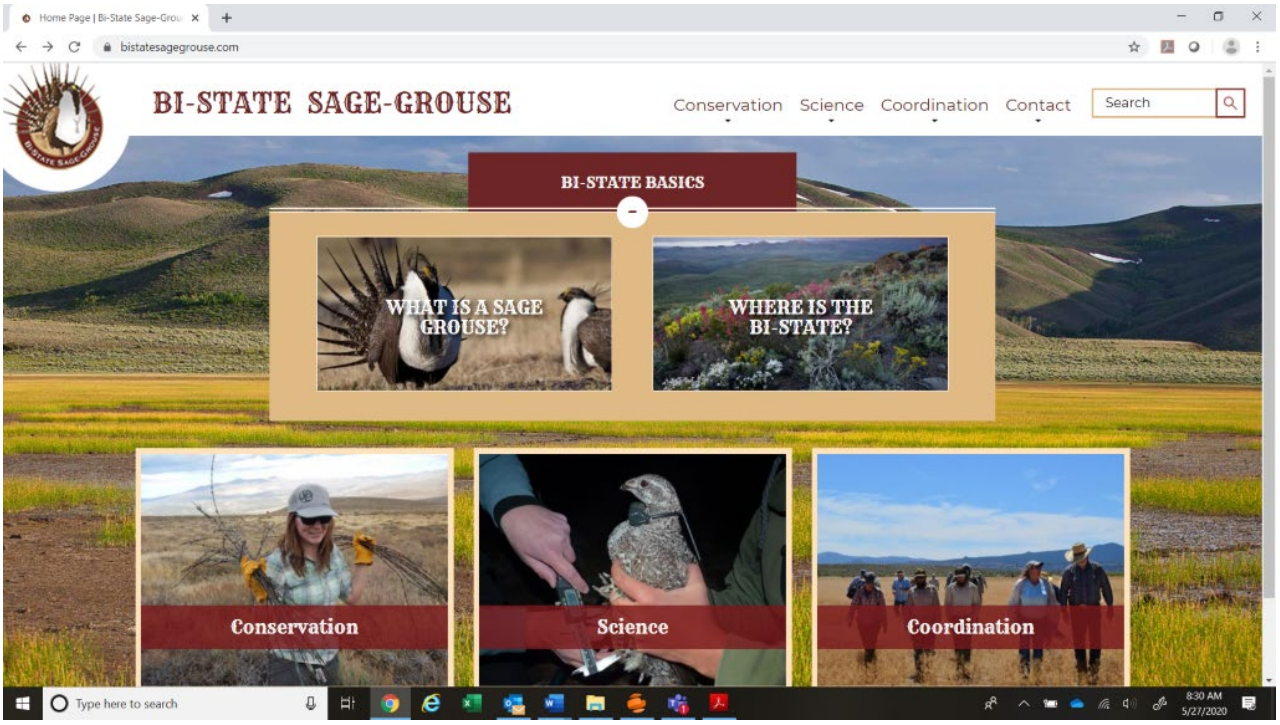


Figure 17. A screenshot of the homepage of the Bi-State Sage-grouse website.

During the 2019 calendar year, Amy organized the following meetings along with the development of the 2019 Bi-State Accomplishment Report, which is summarized below.

- Four Bi-State EOC meetings;
- Six Bi-State TAC meetings;
- One Bi-State LAWG meeting;
- Various public education and outreach efforts;
- Volunteer stewardship days;
- Assisted with and participated in 12 Bi-State Tribal Natural Resource Committee (BTNRC) meetings

2019 Bi-State Accomplishment Report Summary:

The 2012 Bi-State Action Plan (Action Plan) summarized prior conservation activities and established a road-map for the future conservation of the Bi-State sage-grouse. In 2014, federal, state, and other partner agencies established a $45 million-dollar commitment to ensure Action Plan implementation over 10 years. In 2019, Bi-State LAWG partners allocated approximately $3.4 million dollars to Bi-State sage-grouse conservation efforts.

Columbian Sharp-tailed Grouse Restoration Project – Population Modeling and Publications

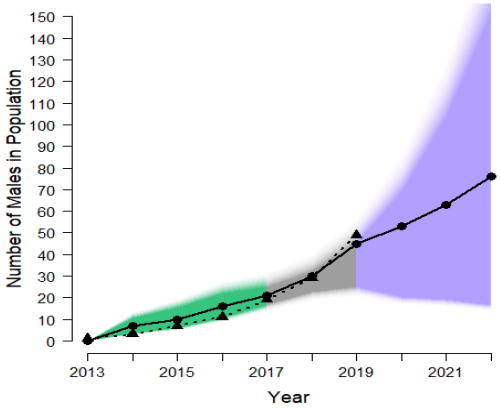
Project Accomplishments:
Currently, there are three different publications being developed with respect to the Columbian sharp-tailed grouse restoration effort that was conducted from 2013-2017 in northeastern Nevada. This project was a five-year translocation effort that involved the movement of approximately 220 CSTG from southeastern Idaho to the Bull Run Basin in Elko County, Nevada. Summaries from these three different publications are included below; however, the results within them should be considered preliminary at this time until final publication.

Refining population trajectory estimates by accounting for offspring recruitment after translocation: successful reintroduction of Columbian sharp-tailed grouse to Nevada, USA

Authors: Steven R. Mathews, Peter S. Coates and David J. Delehanty

Translocations of North American prairie and sage-grouse often fail to restore populations because translocated individuals experience high mortality and depressed reproduction. From 2013- to 2017, 215 Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*) were translocated from Idaho to Nevada, USA. Through the use of an integrated population model (IPM) population persistence was projected through 2020, denoting success or failure of the population during the 'establishment phase' of the reintroduction. The analysis revealed that IPMs derived solely from estimated demographic vital rates of translocated individuals failed to predict population rate of change and can erroneously predict population failure. More accurate predictions of population rate of change were only achieved by modelling the non-monitored cohort of the offspring of translocated individuals, hatched and reared at the translocation release site using vital rate priors from previous studies on CSTG. While translocated individuals exhibit diminished demographic vital rates, their offspring appear to be demographically normal. Offspring of translocated individuals constituted the core of the restored population. By managing to maximize a cohort of native offspring, managers can improve the success of sage and prairie grouse translocation projects. These results provide evidence for the population process by which population restoration occurs in successful conservation projects.

Figure 16. Preliminary integrated population model depicting actual and predicted population growth rates of Columbian sharp-tailed grouse within the Bull Run Basin.



Nest-site selection and survival: micro-habitat decisions by translocated female Columbian sharp-tailed grouse

Authors: Steven R. Mathews, Peter S. Coates, Shawn P. Espinosa, and David J. Delehanty

This study provides an in-depth analysis of the micro-habitat covariates which translocated female Columbian sharp-tailed grouse (CSTG) select while making nest-site decisions and it provides novel insights into which covariates impact nest survival within a demographically fragile, reintroduced population of CSTG. Insights gained regarding habitat covariate influences on nest survival, from both a habitat selection and an SR perspective, will improve the potential of restoration success in future CSTG translocation projects.

Recent studies indicate that vegetation influences on nest survival are best measured at the predicted hatch date of both successful and unsuccessful nests (Gibson et al. 2016; Smith et al. 2017). We chose instead to measure the daily growth of herbaceous plants and analyzed vegetative influences on nest survival at the time of highest nest-failure within our study. This provides novel insights into vegetative conditions at the 'tipping' point when nests become more likely to survive than fail. However, our results should be interpreted with caution because our understory-cover analyses all incorporated Daubenmire frame measurements, which can yield underestimates of herbaceous cover (Thacker et al. 2015), possibly due to the somewhat subjective nature of the measurement. While we utilized methods to minimize subjectivity between observers (i.e. in-depth training, very few individuals performing surveys, etc.), potentially using a different measurement technique like the line-point-intercept method might provide more precise measurements (Herrick et al. 2006). Regardless, we observed clear trends within the vegetative characteristics of successful and failed nests compared with random surveys across the study site.

Taller perennial forb heights were identified in all three analyses as being important for successful nesting by translocated female CSTG. Therefore, when selecting release sites for future translocations, reintroduced populations may benefit if managers select release locations

with an abundance of tall perennial forbs. Despite minimal effects on nest survival, translocated females strongly selected nest-site locations with high levels of horizontal cover, and strongly avoided locations with high percentages of annual grass and high percentages of rock/bare-ground. Potentially, future releases locations would seek to maximize horizontal cover in the form of perennial forbs and minimize the percentage of annual grass and rock/bare-ground.

The Response of Greater Sage-grouse to Vegetation Treatments in South Cave, Hamlin, and Steptoe Valleys

Project Accomplishments:
The Nevada Department of Wildlife (NDOW) and Bureau of Land Management – Ely District (BLM) have partnered on a monitoring project to determine the efficacy of various vegetative treatments, particularly pinyon and juniper removal via several different treatment methodologies (e.g. chaining, mastication, hand thinning, etc.), 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 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 canopy cover exceeded 4 percent. 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 Skutempah, 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.

Habitat Use Summary
The areas of most concentrated use in Steptoe Valley south of Highway 6 were generally nearer the valley's edges than its center, despite that often bringing sage-grouse closer to pinyon-juniper forest. Much of the year, they were more likely to be west of Williams Creek lek or between the Cold Springs and Lower Horse Camp Wash leks (and often east of Cold Springs) than to be in the center of the valley. That includes using the patchy sagebrush and pinyon-juniper mosaic that rings the valley between the forest and the open sagebrush-grassland mixture in the valley's center. In some cases, that meant that some sage-grouse spent significant periods within 100 m of trees, despite the mortality risks. The risk of mortality may have been especially true for the grouse in the area of the Cattle Camp Wash Well and Lund Group Well leks, where the valley is narrow and the four sage-grouse tracked recorded in the area were likelier to be less than 200 m from trees than further away. That may have contributed to seemingly higher mortality in this study area. We have theorized that an extremely dry 2018 may have led to sage-grouse being in poorer condition in 2019, perhaps forcing them to make riskier decisions early in the year and exploit somewhat mesic habitat rather than the more xeric center of the valley farther from trees. In contrast, the female in Cave Valley stayed in the dense sagebrush of central Cave Valley until early July, possibly because a wet 2019 meant she could afford to stay in that (often) xeric habitat longer than the previous year. She then made the same

move many Cave Valley grouse have in years past to the springs and relatively mesic habitat near the Cave Valley Ranch.

Seasonality

Cave and Steptoe Valleys were notably wetter in 2019 than 2018, and while many sage-grouse made significant moves from breeding season into summer and again as fall and winter came on, fewer did so in 2019 than 2018. In 2018, many sage-grouse moved to sagebrush patches above 7,500 feet in elevation in May. In 2019, no individual made a large summer movement until the end of June. We had fewer transmitters on sage-grouse in 2019 so we cannot describe this as a pattern with certainty, but it may explain the difference between years. There was one sage-grouse that even moved more than 27 km from Lower Horse Camp Wash to an open area above 8,400 feet in the hills west of Robber's Roost. Similar to the female's movements in Cave Valley, it was likely to exploit more mesic habitat despite the risk of crossing or being near woodlands. One other sage-grouse made a large movement at around the same time, but it only crossed Steptoe Valley to the lower end of Williams Creek.

Thermal Ecology

Thermal data loggers that had been in the field for the previous year were collected in July 2019. New data loggers were also placed, but mostly in different locations. Rather than having a single data logger at sites, an array of five loggers each 10 m apart were deployed, but at fewer locations. This will help analyze variation in temperature at both small and large scales across the landscape. Because this project is ongoing, a full analyses of the data from loggers collected last year has not been conducted. However, it was clear from a basic assessment that there were notable differences in temperature across the valley, especially in how some areas appeared to experience more extreme temperature swings than others. With the data collected this year we will be able to better quantify those differences, but it seems that dense vegetation and (to a lesser extent) protected topography fosters more stable microclimates.

Habitat Selection Analysis

Preliminary findings suggest that while trees have a strong impact on sage-grouse habitat selection, that impact can likely be moderated by dense sagebrush and protective terrain. Being low on the landscape compared to surrounding terrain or using dense sagebrush likely breaks predator sightlines and lets sage-grouse use areas nearer to trees than if the terrain were, for example, open and flat grassland. Further analysis is necessary to determine the potential costs of using these habitats when conditions are dry.

Wildfire and Geomorphology Effects on Riparian Habitats and Related Restoration Implications

This project is continuing to develop predictive geomorphic and hydrologic process models for Great Basin watersheds, with the intent to use the combined outputs of these models to develop tools used in management of these systems across the Great Basin. The project is actively building into the "Multi-scale Resilience-based Framework for Restoring and Conserving Great Basin Wet Meadows and Riparian Ecosystems" project on-going with RMRS. To-date, a Field Guide has been developed and is in the last stages of finalization.

No money has been spent to-date due to COVID-19 pandemic. We anticipate an invoice prior to close of FY20.

Deliverables currently in-progress include additive components to the Multi-scale Resilience-based Framework for Restoring and Conserving Great Basin Wet Meadows and Riparian Ecosystems. These components are comprised of:

- Developing predictive geomorphic and hydrologic process models for Great Basin watersheds. Use the combined outputs of these models to develop tools used in management of these systems across the Great Basin.
- Identifing at-risk wildlife species for inclusion in the framework in collaboration with NDOW Wildlife Staff Specialists and Wildlife Biologists. Examine the relationships among species distributions and/or populations, watershed and meadow ecosystem characteristics, and relative resilience. WCU will map species distribution and/or population data in conjunction with watershed and meadow ecosystem resilience.
- Mapping the predominant threats to the watersheds and meadow ecosystems in relation to their relative resilience and the distributions/populations of the focal species. Assess potential effects of wildfire and geomorphology on individual watersheds using hydrologic models.
- Developing management strategies for watersheds and meadows based on their underlying characteristics, relative resilience, and capacity to support focal species and habitats.

A Framework for Restoring and Conserving Great Basin Wet Meadows and Riparian Ecosystems

This project is continuing to develop predictive geomorphic and hydrologic process models for Great Basin watersheds, with the intent to use the combined outputs of these models to develop tools used in management of these systems across the Great Basin. The project is actively incorporating the "Effects of Geomorphology and Wildfire on Riparian and Watershed Health and Restoration Implications in the Great Basin" project on-going with Western Carolina University. To-date, a Field Guide has been developed and is in the last stages of finalization.

This is an on-going project. Deliverables currently in-progress include:

- Developing predictive geomorphic and hydrologic process models for Great Basin watersheds. Use the combined outputs of these models to develop tools used in management of these systems across the Great Basin.
- Identifying at-risk wildlife species for inclusion in the framework in collaboration with NDOW Wildlife Staff Specialists and Wildlife Biologists. Examine the relationships among species distributions and/or populations, watershed and meadow ecosystem characteristics, and relative resilience. WCU will map species distribution and/or population data in conjunction with watershed and meadow ecosystem resilience.
- Mapping the predominant threats to the watersheds and meadow ecosystems in relation to their relative resilience and the distributions/populations of the focal species. Assess potential effects of wildfire and geomorphology on individual watersheds using hydrologic models.
- Developing management strategies for watersheds and meadows based on their underlying characteristics, relative resilience, and capacity to support focal species and habitats.

Eastern WMA Complex Weed Control

To date 907 acres of invasive weeds have been treated on the Eastern Wildlife Management Area Complex. The removal of these weeds has improved wildlife habitat, increased user accessibility, and improved aesthetics on the Complex. It is anticipated this project will be completed by 6/30/2020. All remaining funds held in reserve for spring weed treatments will be used as described in the project proposal. It is estimated an additional 100-200 acres will be treated this May and June. The NDA grant has contributed $16,885 so far. It is anticipated that grant will contribute an additional $10,000 towards the project this fiscal year. WMA staff have utilized the Federal WMA grant to fund $29,163 of in house weed treatment.

Post-Fire Upland Habitat Restoration - Tule Springs

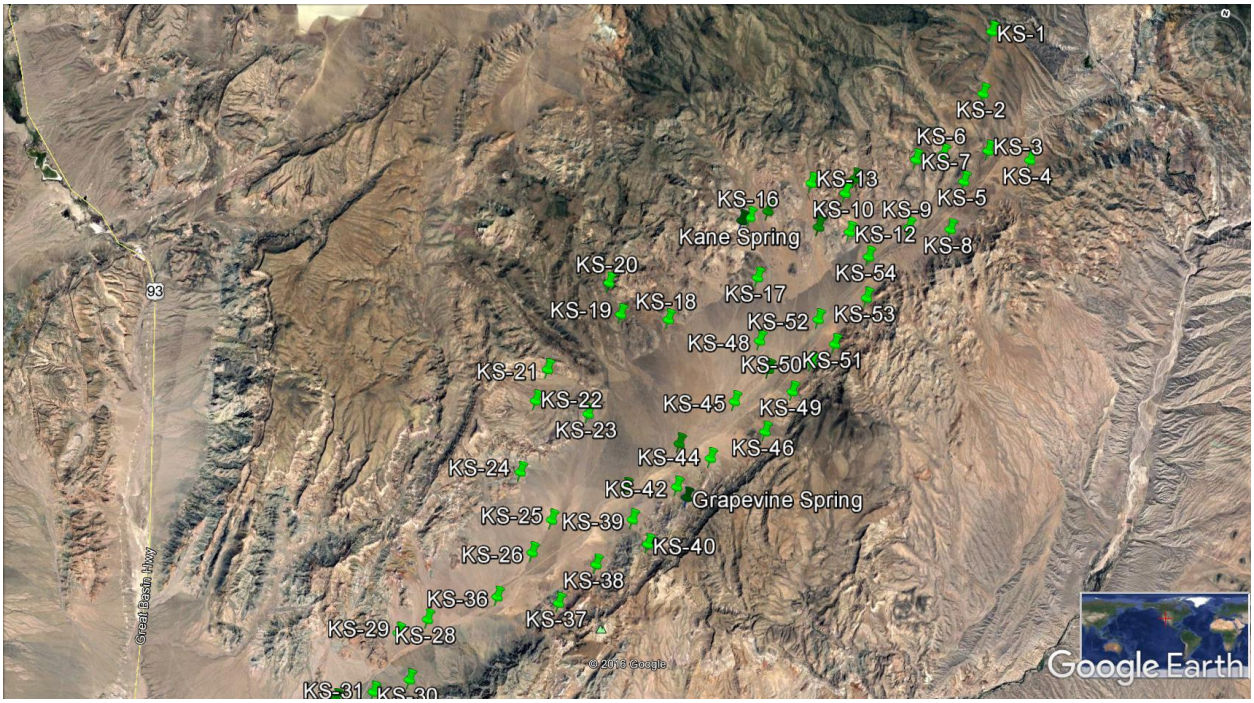
In 2005 wildfire severely burned the vegetation species in the Meadow Valley and Tule desert portions of the Southern Nevada Complex. During the early spring of calendar year 2020 approximately $6,200 was spent on this project for restoration at Mormon #5 small game guzzler site located in Lincoln County's Tule Springs Desert within NDOW's Southern Region. A Great Basin Institute crew was contracted by NDOW Habitat Division resulting in 250 native plants out planted and caged for herbivore protection. Follow-up watering and photo point monitoring will occur during the FY20-21 fiscal year period.

Tule Desert - Mormon #5 small game guzzler restoration site. March 2020

Post-Fire Upland Habitat Restoration – Kane Springs Valley

During the late fall of calendar year 2019 through early spring of calendar year 2020, this project spent approximately $10,000 on restoration efforts at and adjacent to small game guzzler sites located in Lincoln County's Kane Springs Valley within NDOW's Southern Region. Monitoring of the restoration sites revealed significant drought damage up to 80% mortality of the plantings for the FY20 year due to the higher than normal temperatures, limited rainfall, and cattle grazing. However, previous year plantings that have survived are showing good establishment. To replace drought-stricken and cattle damaged plantings, restoration efforts included the replanting of 400 plants divided between four separate small game guzzler site locations, KS37, KS42, KS44 and KS46. Like last year, cattle grazing damage had occurred at KS42 and KS44 guzzler sites with impacts on plants and plant cages. In the future, additional plant replacement, repairs and maintenance to plant cages may be necessary. Planting, watering, maintenance, and monitoring are planned for project guzzler sites during the remainder of FY20 and into FY21 and beyond. Work completed during FY20 is listed below:

- Preparation of sites and out planting of 500 native plant stock at specified guzzler sites.
- Installation of new cages and repair of existing plant cages, replacement of dead or damaged plants and hand watering.
- Project monitoring.



Kane Springs Valley

Quinn River Valley Habitat Enhancement – Vanderhoek

Pivot corners were drill seeded with blue flax and Canada wildrye two years ago. with FY18 funding. The seedling establishment was poor likely due to 1) too much competition and 2) a lack of timely precipitation / amount of precipitation that fall/winter. Since there is still funding left and the landowner is open to it follow-up herbicide treatment this coming fall and re-seeding the following fall would be recommended. That is why funding was applied for in 2020; unfortunately, this slipped off my plate this last fall. The same opportunity should still be available to pursue this project in fall 2021 with herbicide and seeding fall 2022.

Proposed Upland Game Bird Stamp Projects for State Fiscal Year 2021

Title of Proposed Project	**Project Manager**	**$ Requested from UGBS Account**	**Other Funding Sources** (only quantified in-kind contributions included)
Bi-State Sage Grouse Coordinator (526)	Shawn Espinosa	$5,000	Intermountain West Joint Venture ($52,775); BLM ($5,000); USFS ($5,000)
Dusky Grouse Ecology and Management in Nevada (518)	Shawn Espinosa	$22,003	NV Chukar Foundation ($6,552); Carson Valley Chukar Club ($6,551); USFWS Wildlife Restoration Grant ($86,030)
Eastern Complex Weed Control (510)	Adam Henriod	$10,000	DS ($10,000); HCF ($10,000); NV Department of Agriculture ($25,000); WMA System Grant ($45,000)
Estimating Greater Sage-grouse Vital Rates within Nevada's Novel Habitats (529)	Shawn Espinosa	$21,250	USFWS ($63,750); Carson Valley Chukar Club ($5,000); USGS ($22,684 in-kind)
Estimating the Effects of Large Ungulate Grazing on Greater Sage-grouse in Northwestern Nevada (530)	Shawn Espinosa	$18,397	USFWS State Wildlife Grant ($54,293); USFWS Wildlife Restoration Grant ($38,453)
Greater Sage-grouse Statewide Monitoring (525)	Shawn Espinosa	$47,640	USFWS State Wildlife Grant ($163,400); Carson Valley Chukar Club ($7,500); Nevada Chukar Foundation ($7,500)
Key Pittman WMA Wildlife Food Plots (527)	Andrew Coonen	$3,900	WMA System Grant ($15,100); Duck Stamp ($2,600)
Monitoring Greater Sage-grouse Response to the Martin Fire (528)	Shawn Espinosa	$12,750	USFW Wildlife Restoration Grant ($63,750); Nevada Chukar Foundation ($8,500); USGS ($22,684, $27,684 in-kind)
Monitoring the Effects of Landscape Level Treatments on Greater Sage-grouse in the Desatoya Mountains (524)	Shawn Espinosa	$19,500	USFWS Wildlife Restoration Grant ($63,750); Carson Valley Chukar Club ($6,750); USGS ($18,242 in-kind)
Soil Health Restoration on WMAs (541)	Brittany Tremble	$10,000	HCF ($10,000)

Proposed Upland Game Bird Stamp Projects for State Fiscal Year 2021

Title of Proposed Project	**Project Manager**	**$ Requested from UGBS Account**	**Other Funding Sources** (only quantified in-kind contributions included)
Upland Game Translocation and Monitoring (523)	Shawn Espinosa	$12,400	USFWS State Wildlife Grant ($29,000); Carson Valley Chukar Club ($4,000); Nevada Chukar Foundation ($4,000)
Using Hunter and Population Survey Data to Investigate Drivers of Upland Game Bird Populations and Forecast Harvest in Nevada (533)	Shawn Espinosa	$24,600	Carson Valley Chukar Club ($9,000); Nevada Chukar Foundation ($9,000)
Genette Creek Conservation Easement (537)	Madi Stout & Caleb McAdoo	$30,000	NDOW Habitat Conservation Fee ($40,000); NDOW IAPP ($43,000); NAS-Fallon REPI ($627,250); Kinross Gold ($75,000); RMEF-NFWF ($150,000)
Toiyabe PMU (Bates, Hickison, and Wolf Ranch) Pinyon Juniper Thinning Project (536)	Jeremy Lutz	$25,000	BLM ($120,000); Wildlife Heritage Trust ($75,000); NDOW Habitat Conservation Fee ($50,000)
A Multi-scale Resilience-based Framework for Restoring and Conserving Great Basin Wet Meadows and Riparian Ecosystems (542)	Jasmine Kleiber	$2,400	NDOW Habitat Conservation Fee ($20,000)
Totals		**$264,840**	**$1,711,548**

Upland Game Bird Stamp Account Budget Status

Balance in the Account at Start of FY 2020	$ 98,889.03
Plus Estimated Revenue Accrued During FY 2020	$ 260,829.66
Less Estimated Total FY 2020 Expenditures	($ 133,675.63)
Less Estimated Administrative Costs (10% of Revenue)	($ 26,082.97)
Estimated Balance at End of FY 2020 / Start of FY 2021	$ 199,960.09
Plus Estimated Revenue to be Accrued During FY 2021	$ 260,829.66
Less Estimated Administrative Costs (10% of Revenue)	($ 26,082.97)
Less Proposed New Project FY 2021 Expenditures	($264,840)
Estimated Balance at End of FY 2021	$ 169,866.78

Notes: The budget information in this table is preliminary and subject to change. The amount of Upland Game Bird Stamp revenue accrued during FY 2020 was not available when this report was prepared; therefore, the FY 2019 revenue number was used for both FY 2020 and 2021.

Wildlife Reserve Account Project Proposal

Project Summary

Project Name: Bi-State Sage-grouse Coordinator

Project Manager: Shawn Espinosa Phone: 775-688-1523 Email: sespinosa@ndow.org

Project Monitor: Shawn Espinosa Start Date: 7/1/2020

Implementation Lead: Bureau of Land Management End Date: 6/30/2021

Partners: Bureau of Land Management, Intermountain West Joint Venture, Bureau of Land Management, US Forest Service, Nevada Department of Wildlife

Project Category: Habitat Restoration

Project Category: Upland Habitat Improvement

Project Actions:

Priority Resource: Small game

Priority Species: Sage grouse

County Location: Lyon, Mineral, Esmeralda

General Location: Bi-State Sage-grouse Conservation Area

Project Funding Request

Funding Source	Amount Requested	Existing Budget Approval	In Kind Contribution
Bureau of Land Management	$5,000		
Intermountain West Joint Venture	$52,775		
NDOW Upland Game Stamp	$5,000		
US Forest Service	$5,000		
Project Totals:	**$67,775**		

Project Proposal

1. Brief Purpose and Goal of the Project

Creating and filling a Bi-State Communication and Data Coordinator position will increase our effectiveness and efficiency in meeting reporting and accountability requirements. It will allow us to broaden our outreach to more of our community, and it will free up precious time for our professionals allowing them to focus on their primary job of getting conservation done on the ground. Also, because

much of this work is happening across agency, private and nonprofit ownership boundaries, having a person who is not tied to a specific agency would help improve the seamlessness of the communication effort.

2. Project Approach and Tasks

Base of operation: Bishop, CA, but frequent travel throughout the Bi-State and to Reno
Duties, responsibilities and type of work to be performed
The Bi-State Sage-grouse Executive Oversight Committee has agreed that the communication and outreach coordinator could be responsible for the following duties:
- Development and completion of annual and 5 year accomplishment reports;
- Develop template for reports;
- Compile information and data from LAWG members, and write and editing of reports;
- Coordinate the annual data call;
- QA/QC of data
- Facilitate and schedule LAWG meetings and Conferences (e.g. conifer workshop, Traditional Ecological Knowledge (TEK) Forum);
- Create and manage files related to the Bi-State such as meeting notes, agendas, research, news etc.
- Manage the Bi-State Website
- Communicate to LAWG and public about BSSG accomplishments and ongoing work
- Website posts and updates;
- Newsletter/mailchimp for relevant projects;
- Leading and coordinating volunteer projects and field trips;
- Writing success stories and developing outreach products (brochures, videos, merchandise, posters, giveaways, etc.);
- Giving or scheduling for others presentations about sage-grouse/sagebrush systems
- Staffing booths at local events such as Earth Day;
- Photographic projects, events and gatherings.

The position would facilitate the reporting on all the actions identified in the Bi-State Action Plan (BSAP) and through reducing these outreach and communication tasks for agency staff, would increase completion of on the ground accomplishments. Specific actions this position would help achieve in the action plan are:

•Action CIA1-1: Implement a "Sage-Grouse Service Team" approach to support sage-grouse conservation and management in Bi-State area. Provide cross-jurisdictional staff support to facilitate coordinated interagency effort to conserve Bi-State DPS and its habitat.
•Action CIA1-2: Provide multi-jurisdictional funding to support sage-grouse conservation and management in Bi-State area. Establish process to identify and support cross-jurisdictional funding opportunities to facilitate coordinated interagency effort to conserve Bi-State DPS and its habitat.
•Action CIA1-3: Annually engage Bi-State Local Area Working Group (LAWG) via Technical Advisory Committee (TAC) to develop proposed program of work for upcoming calendar year based on available staff and funding. Proposed annual program of work should be completed by January 31 each calendar year.
•Action MSI1-3: Conduct Bi-State LAWG planning meetings on semi-annual basis to review status of greater sage-grouse populations and habitats in Bi-State area and to identify, prioritize, and coordinate implementation of annual conservation actions. Continue University of NV Cooperative Extension facilitation of Bi- State LAWG meeting.
•Action MSI2-1: Conduct workshops to provide information about programs available to assist ranchers/ private landowners that may be interested in implementation of sage-grouse conservation projects and to explore opportunities for cooperative conservation of sage-grouse in Bi-State area.
•Action MSI2-2: Develop and publish a Bi-State LAWG sage-grouse conservation newsletter.
•Action Action MSI2-3: Develop and implement a publically accessible Bi-State LAWG Sage- Grouse Conservation webpage to facilitate the sharing and distribution of information specific to greater sage-

grouse conservation efforts in Bi-State area.

3. Anticipated Beneficial Effects of the Project

Up to now, we have had remarkable support for scheduling and running our meetings from our UNCE facilitator, Steve Lewis, who will be moving out of the area in June 2018. The LAWG will need find someone to replace the duties he has been doing which include facilitating at least 2-4 meetings or field trips a year for the LAWG, keeping the email list, sending emails about meetings, action items, and important Bi-State news, and keeping meeting notes and agendas.

Annual reporting and record keeping and is currently completed by agency biologists. The Bi-State has its own project database which requires yearly data entry and analysis. Every partner in the LAWG with work to report currently enters data into this database. Having one person who is dedicated to managing this database would improve data quality and consistency. The Bi-State completes yearly accomplishment reports and is working on a 5 year accomplishment report for 2018. Taking the information from the project database and using it to more effectively communicate the accomplishments of the LAWG would improve accountability for the funding that is received in the Bi-State and help more effectively tell the conservation success story. Additionally, staffing this position would allow agency biologists more time to design rehabilitation projects and monitor treatment results and management actions.

Despite a decade of success in conservation work, the LAWG finds that many people in the communities near Bi-State sage-grouse habitat remain unaware of the LAWG's efforts and the importance of the sagebrush ecosystem. Communication and outreach duties fall to members of the LAWG who lack both the time and expertise to do a good job. A new communications and outreach coordinator would allow all LAWG members and staff to use their skills more effectively to contribute to conservation success. The coordinator would improve internal and external communication,y. This work includes updating the Bi-State website, developing success stories, leading field trips and volunteer events, and coordinating among partners about current projects. Also, at every LAWG meeting in the last 2 years, there have been new people attending who are interested in the Bi-State and have a lot of questions. These new potential partners need an orientation to the LAWG to ensure that they understand the purpose of the group and then can hopefully become invested in this work.

Improved communication about the Bi-State sage-grouse and the sagebrush ecosystem (both outside and inside the LAWG) would lead to more community support, a better appreciation for the sagebrush ecosystem, and more on the ground accomplishments. The importance of accountability to ourselves and to our supporting agencies cannot be overstated. Regular reporting to the LAWG, the public, and state and federal agencies on grant spending, future budgeting, and monitoring results for effectiveness and implementation takes more time than one would think, but is imperative for the long-term conservation of the Bi-State sage-grouse.

4. Project Schedule

Initially, this is expected to be a 3-year position; however, given the output and value added, the position term is likely to persist beyond the three-year horizon.

5. Monitoring Plan

See above.

6. Relationship to NDOW Plans, Policies, and Programs

This project fits within the 1st Edition of the Greater Sage-grouse Conservation Plan for Nevada and Eastern California (2004). The project also assists with objectives outlined in the Bi-State Action Plan (2012).

Special Reserve Account Project Cost Estimate Table

Name of Proposed Project: **Bi-State Sage-grouse Coordinator**
Name of Proposed Project Manager: **Shawn Espinosa**
Project ID: **526**

Please provide a breakdown of your project's costs in the table below. Only include costs for the upcoming fiscal year for which you are applying. Only include in-kind services under item 7. NDOW personnel and travel expenses may not be covered by any of our Special Reserve Accounts - you must use alternative funding sources to cover these types of costs.

Project Components	*Costs to be Paid by NDOW Special Reserve Account(s)*	*Costs to be Paid by Other Sources*
1. Land Acquisitions		
2. Personnel Costs		
A. NDOW Personnel		
B. Other Personnel	$ 5,000.00	$ 58,138.00
C. Total Personnel Costs	$ 5,000.00	$ 58,138.00
3. Travel Costs		
A. Per Diem		$ 3,887.00
B. Mileage		
C. Total Travel Costs	$ -	$ 3,887.00
4. Equipment		
A.		
B.		
C. Total Equipment Costs	$ -	$ -
5. Materials		
A.		
B.		
C.		
D. Total Materials Costs	$ -	$ -
6. Miscellaneous		
A. Training		$ 750.00
B.		
C.		
D.		
F. Total Miscellaneous Costs	$ -	$ 750.00
7. In-Kind Services		
A.		
B.		
C. Total In-Kind Services	$ -	$ -
Subtotals	$ 5,000.00	$ 62,775.00
Total Project Costs	$	67,775.00

Wildlife Reserve Account Project Proposal

Project Summary

Project Name: Dusky Grouse Ecology and Management in Nevada

Project Manager: Shawn Espinosa Phone: 775-688-1523 Email: sespinosa@ndow.org

Project Monitor: Shawn Espinosa Start Date: 7/1/2020

Implementation Lead: Utah State University End Date: 6/30/2021

Partners: Utah State University, US Forest Service

Project Category: Wildlife Population Protection or Enhancement

Project Category: Wildlife Monitoring and Research

Project Actions: Small game collaring

Priority Resource: Small game

Priority Species: Dusky Grouse

County Location: White Pine

General Location: Schell Creek Range and northern Egan Range, White Pine County

Project Funding Request

Funding Source	Amount Requested	Existing Budget Approval	In Kind Contribution
Carson Valley Chukar Club	$6,551		
NDOW Upland Game Stamp	$22,003		
Nevada Chukar Foundation	$6,552		
USFWS Wildlife Restoration Grant	$86,030		
Project Totals:	**$121,136**		

Project Proposal

1. Brief Purpose and Goal of the Project

Dusky grouse (Dendragapus obscurus) are currently an important upland game resource in Nevada whose ecology is not well understood. Several years ago, blue grouse were split into two distinct species; dusky grouse (interior) and sooty grouse (Dendragapus fuliginosus; coastal) (Barrowclough et al. 2004). Both species of blue grouse currently occupy Nevada, with sooty grouse occurring in the extreme western portion of the state in the Carson, Wassuk and Sweetwater Ranges while dusky grouse occupy relatively

isolated mountain ranges in the central and eastern portions of the state.

The vast majority of past research on blue grouse occurred several decades ago, mostly on the sooty variety. A general lack of research-based information on dusky grouse biology and life history remains, especially the effects of management actions (e.g., hunter harvest, livestock grazing, fire, and timber management) to guide future conservation efforts. Based on the limited knowledge we have, dusky grouse use multiple vegetation cover types to meet their seasonal needs including sagebrush (Artemisia spp.), aspen (Populus tremuloides), and conifer areas from low to high elevations in mountainous terrain (Stauffer and Peterson 1985, Pekins et al. 1989). There are few dusky grouse nesting studies, which would illuminate habitat use and key nest survival factors, although anecdotal information suggests sagebrush may be an important nesting habitat type for dusky grouse (Weber 1975). This lack of ecological information is particularly acute in the isolated populations of central and eastern Nevada, where habitat types are unique to these mountain ranges with relatively low proportions of aspen and relatively high proportions of mahogany (Cercocarpus spp.) and limber pine (Pinus flexilis). Apparently, dusky grouse show some flexibility in habitat use based on their wide range across the forested landscapes of the Intermountain West.

Dusky grouse are known to exhibit a 'reverse migration' strategy, moving up in elevation to winter exclusively in conifer forests (Cade 1985, Stauffer and Peterson 1985, Cade and Hoffman 1990, Pekins et al. 1991, Cade and Hoffman 1993). For other forest grouse species, such as ruffed and spruce grouse (Falcipennis canadensis), winter diets and use areas are influenced by secondary plant compounds in aspen and spruce trees, respectively (Bryant and Kuropat 1980, Hewitt and Messmer 2000). These relationships are currently unknown for dusky grouse.

There is also a lack of life history and population trend information on dusky grouse throughout their range, particularly in Nevada, leaving the species vulnerable to critique if/when future conservation concerns arise. For example, Greater sage-grouse (Centrocercus urophasianus) populations currently have an abundance of data-based information because of past collaborative monitoring and research efforts. These data have been critical to current conservation efforts for sage-grouse in Nevada, and across their range. Our proposed research herein would provide an initial step to gaining a scientific knowledge base for future management (e.g., harvest, population monitoring, habitat management etc.) of dusky grouse in Nevada.

This project is proposed to be a 4-year project (3 field seasons and a year of analysis) focused on the highest priority conservation information needs of the Nevada Department of Wildlife (NDOW) concerning dusky grouse. Needed information includes, but may not be limited to, harvest rates, population monitoring, survival and reproductive rates, and habitat selection. We are particularly interested in the use of limber pine and sub-alpine fir (Abies lasiocarpa) patches during the winter in relation to beetle kill, and overall use of mountain mahogany.

Our goal for this research project is the long-term conservation of dusky grouse populations through increased knowledge of the species.
Our specific objectives for this study are:
•Survival, Reproductive, and Harvest Rates – determine life stage annual and seasonal survival rates, including harvest rate during the fall hunting season, and female reproductive (i.e., nest initiation, clutch size, nest success, and brood success) rates of dusky grouse for radio-marked and banded dusky grouse and assess environmental factors that affect these vital rates.
•Population Surveys - develop a rigorous protocol to index breeding populations of dusky grouse and use male display location information to help characterize breeding habitats.
•Habitat Selection – utilize location data of individually radio-marked dusky grouse to perform resource selection functions (RSFs) to characterize annual and seasonal habitat use. Specifically, to assess use of limber pine sub-alpine fir habitats during winter months and year-round use of mountain mahogany habitats. We will also characterize micro-habitats (within 50 m) for nest and brood locations.

2. Project Approach and Tasks

Survival, Reproductive, and Harvest Rates – we will use walk-in traps and noose poles to catch, band (aluminum leg bands), radio-mark and release dusky grouse throughout the spring, summer, and early fall (Zwickle and Bendell 1967, Schroeder 1986, Pelren and Crawford 1995). Dogs will be used to help locate dusky grouse for trapping efforts (Dahlgren et al. 2012). We expect to radio-mark and maintain a sample of approximately 25-30 female dusky grouse. We will use GPS rump-mount style radios (Ecotone - http://www.ecotone-telemetry.com; Harrier L and M models) that employ store-on-board location data logger and UHF long range remote download. A small 3.5 gram VHF radio will be attached to the GPS radio to help track individual dusky grouse to perform remote downloads. Once our radio sample is exhausted we will continue to trap dusky grouse and mark them with an aluminum leg band. All captured male dusky grouse will be banded with an aluminum leg band. We will use standard modeling (e.g., program RMARK) to estimate seasonal and annual survival. We will track females to nest and brood sites to estimate reproductive rates. Nest and brood success will be defined as 1 or more egg or chick hatching or surviving to > 35 days. Although we will attempt to estimate harvest based on hunter band returns, it will likely take more than three years of data to estimate harvest rate. Band recovery rates will need to be adjusted for pre-season mortality rates, crippling loss, and non-reported bands (see example in DeStefano and Rusch 1986). We will use the multiple-recapture method to estimate pre-hunting season survival (Seber 1973). Having a radio-marked sample may also help us understand factors that may influence harvest rate, such documenting the annual variation in onset of fall migration (see Appendix A; Mussehl 1960). Crippling loss will be estimated with radio-marked sample if available, or assumed from reported literature of other grouse species. Non-reporting rates for bands will be assumed from available game bird literature.

Population Surveys - we will use past research and our own experience to develop spring breeding surveys to index population change. Currently, there are no published methods or guidelines for dusky grouse population surveys. We will establish breeding season walking and roadside routes in several locations across the study area. Hierarchical modeling procedures which incorporate occupancy and abundance estimates will be our primary breeding season index. Points along routes will be established and detection of male dusky grouse will occur in three 5 minute consecutive intervals. We will also employ female electronic calls following the 15 minute sampling interval to increase detection rates of dusky grouse males. These methods allow for occupancy estimates which provide detection probabilities and then counts of each species will provide the abundance information (Alldredge et al. 2007). We will conduct a power analysis following data collection to better understand the effort needed to obtain reliable information for each survey type (Steidl et al. 1997). Protocols will be reassessed over time based on our findings.

Habitat Selection – we will use radio-marked and non-marked grouse flush locations to assess seasonal habitat characteristics. We will use standard techniques to assess tree cover, shrub cover, herbaceous cover, and other ground cover characteristics to assess micro-site information for brood and nest sites. We will use GPS location data and spatial vegetation cover data to conduct RSF analysis to determine general (2nd order) and seasonal habitat (3rd order) use at the landscape scale. We will ensure that analyses include limber pine, sub-alpine fir, other conifers, aspen, sagebrush, and mountain shrub communities, including mountain mahogany, are included in the analysis.
We will use the "Guidelines to the use of Wild Birds in Research" for this research project (Fair et al. 2010). We will work through USU's Institutional Animal Care and Use Committee (IACUC) to obtain an IACUC permit for all trapping, handling, and field research activities. This study will begin April 2018 and continue through June 2021. We anticipate developing a capture and banding database for dusky grouse. We will also develop a monitoring database for both spring breeding and late summer surveys. All databases will be housed at Utah State University but shared openly with NDOW Upland Game Program Managers.

3. Anticipated Beneficial Effects of the Project

Gaining a better understanding of dusky grouse demographic parameters and habitat use will help

resource managers potentially improve habitat conditions or conserve important use areas through management actions or projects. Noticeable limber pine and sub-alpine fir die-offs have occurred in several central and eastern Nevada mountain ranges and we need to gain a better understanding of whether or not this is contributing to mortality during the winter months, when dusky grouse rely on pine needles as a food source, or if grouse are able to use other resources such as mountain mahogany to supplement their diet. If pine and fir die offs are contributing to elevated mortality levels in dusky grouse, perhaps actions such as limber pine plantings in key locations would provide habitat in future years.

4. Project Schedule

This project was initiated with the hiring of a graduate student (Stephanie Landry) in January of 2018 followed by trapping in April of that year. Breeding surveys were conducted from mid to late April and continued through early June in 2018. Trapping efforts will continue throughout the field season from April to September (2019-2021). Marked grouse will be monitored during the spring and summer field seasons. Aerial (fixed-wing or helicopter) monitoring of radio-marked birds will occur regularly during the fall and winter and periodically through the spring and summer, especially when ground tracking fails to keep track of radio-marked birds. Bands will be collected throughout the 2018, 2019, and 2020 dusky grouse hunting seasons. Data analysis and writing will be conducted from September 2021 to June 2022. The graduate student will complete and defend their dissertation by June 30, 2022.

5. Required Clearance Activities and Schedule (NEPA, other permits, authorizations)

6. Monitoring Plan

See above approach and tasks.

7. Relationship to NDOW Plans, Policies, and Programs

This project was identified as a population management need identified in the 2008 Nevada Upland Game Species Management Plan

Special Reserve Account Project Cost Estimate Table

Name of Proposed Project: **Dusky Grouse Ecology and Management**
Name of Proposed Project Manager: **Shawn Espinosa**
Project ID: **518**

Please provide a breakdown of your project's costs in the table below. Only include costs for the upcoming fiscal year for which you are applying. Only include in-kind services under item 7. NDOW personnel and travel expenses may not be covered by any of our Special Reserve Accounts - you must use alternative funding sources to cover these types of costs.

Project Components	*Costs to be Paid by NDOW Special Reserve Account(s)*	*Costs to be Paid by Other Sources*
1. Land Acquisitions		
2. Personnel Costs		
A. NDOW Personnel		
B. Other Personnel	$ 14,606.00	$ 43,819.00
C. Total Personnel Costs	$ 14,603.25	$ 43,809.75
3. Travel Costs		
A. Per Diem	$ 250.00	$ 750.00
B. Mileage		
C. Total Travel Costs	$ 250.00	$ 750.00
4. Equipment		
A. GPS Radios (4 @ $3,525 ea.)	$ 3,525.00	$ 10,575.00
B. GPS Refurbs (5 @ $500 ea.)	$ 625.00	$ 1,875.00
C. Total Equipment Costs	$ 4,150.00	$ 12,450.00
5. Materials		
A. Trapping Materials (nets, nooses)		$ 250.00
B. Other Materials (tools, repair kits)		$ 3,000.00
C.		
D. Total Materials Costs	$ -	$ 3,250.00
6. Miscellaneous		
A. Truck - Monthly Fee (2 trucks, 5 mo./ea. @ $2,000)	$ 3,000.00	$ 17,000.00
B. ARGOS Satellite Data Download Fees		$ 4,800.00
C.		
D. Indirect Costs (17.5%)		$ 17,073.44
F. Total Miscellaneous Costs	$ 3,000.00	$ 38,873.44
7. In-Kind Services		
A.		
B.		
C. Total In-Kind Services	$ -	$ -
Subtotals	$ 22,003.25	$ 99,133.19
Total Project Costs	$	121,136.44

Wildlife Reserve Account Project Proposal

Project Summary

Project Name: Eastern Complex Weed Control

Project Manager: Adam Henriod Phone: 775-289-1690 Email: ahenriod@ndow.org

Project Monitor: Adam Henriod Start Date: 7/1/2020

Implementation Lead: Nevada Department of Wildlife End Date: 6/30/2021

Partners: Nevada Department of Wildlife

Project Category: Habitat Restoration

Project Category: Riparian, Spring or Meadow Habitat Improvement

Project Actions: Herbicide application

Priority Resource: General Habitat Improvement

Priority Species:

County Location: White Pine, Lincoln, Nye

General Location: Steptoe WMA, Kirch WMA, Key Pittman WMA

Project Funding Request

Funding Source	Amount Requested	Existing Budget Approval	In Kind Contribution
NDOW Duck Stamp	$10,000		
NDOW Habitat Conservation Fee	$10,000		
NDOW Upland Game Stamp	$10,000		
Nevada Department of Agriculture	$25,000		
ildlife Management Area System Gra	$45,000		
Project Totals:	**$100,000**		

Project Proposal

1. Brief Purpose and Goal of the Project

NDOW is mandated by state law to control listed noxious weeds found on our property. Removal of noxious and undesirable weeds improves appearance, public access, limits the spread of these weeds to

other areas and enhances wildlife habitat. The goal of this project is to remove noxious/invasive weeds such as Russian knapweed, hoary cress, perennial pepperweed, phragmites and Canada thistle found on the Steptoe Valley, Wayne E. Kirch and Key Pittman Wildlife Management Areas. This will be accomplished through the application of herbicides to noxious and invasive weeds in upland areas, riparian areas, parking lots and right of ways.
WMA staff has engaged heavily in efforts to eradicate invasive vegetation on these properties; however the magnitude of weed infestations currently outweighs employee's ability to provide the treatments needed to make long term impacts. This project seeks reserve account funding for additional resources to apply herbicide on Kirch WMA, Key Pittman WMA and Steptoe WMA.

2. Project Approach and Tasks

Awarded funds will be used to purchase herbicides and hire contract labor to maintain and enhance current weed control efforts on NDOW-managed wildlife management areas. In order to address increasing issues with weeds and given the substantial duties of NDOW staff related to tasks other than fighting weeds, we are in need of additional monies to contract out additional weed spraying to improve the effectiveness of weed control efforts. Tri-County Weed Control is most likely to be contracted to conduct the spraying.
Examples of specific tasks to be accomplished by this project are provided below.
A. Perennial pepperweed (Lepidium lotifolium), and hoary cress (Cardaria draba) will be treated in the spring and summer of 2021 by applying appropriate herbicides from ATV, truck, and backpack sprayers. The chemicals chosen for control of these species will be determined by the characteristics of the site and the life stage of the plant; all chemicals are applied according to their labels.
B. Ditches, water control structures, boating access points, parking lots and right-of-ways will be treated, as needed, in the summer of 2021 by applying glyphosate herbicide from ATV, truck, and backpack sprayers. Control of undesirable vegetation in ditches and water control structures is essential for water delivery to reservoirs, wetland impoundments, and irrigation of food plots.
C. Russian knapweed (Acroptilon repens), and Canada thistle (Cirsium arvense) will be treated in the fall of 2020 and spring of 2021 by applying appropriate herbicides from ATV, truck, and backpacksprayers.
D. Vegetation on wetland impoundments and reservoirs will be treated, as needed, with aquatic approved herbicides. Primary focus will be on phragmites (Phragmites australis) removal on the Key Pittman WMA. Treatments on reservoirs will be completed using a boat mounted sprayer, wetland impoundments will be treated with an ATV sprayer. Treatment of emergent vegetation in these areas will improve feeding, resting, nesting, and brood rearing habitat for waterfowl.

3. Anticipated Beneficial Effects of the Project

There will be a major reduction in noxious and other types of invasive weed species at the treated areas, thus improving the quality of wildlife habitat.

Monitoring through yearly inspections will determine the effectiveness of treatments. Treated sites will be evaluated after application of herbicides to determine the effectiveness of the timing, method and chemicals chosen for the treatment. Effective treatments will show a significant die-off of targeted vegetation after treatment and reduced regrowth the following growing season. The vegetation control will improve habitat values and public access.

4. Project Schedule

This project is an ongoing, yearly habitat management activity. Herbicide treatments to vegetation on the WMAs will primarily occur in the late summer and fall of 2020 and the spring and summer of 2021. Please see the proposed tasks above for the timing of treatment for each type of targeted vegetation.

5. Required Clearance Activities and Schedule (NEPA, other permits, authorizations)

6. Monitoring Plan

Monitoring through yearly inspections will determine the effectiveness of treatments. Treated sites will be evaluated after application of herbicides to determine the effectiveness of the timing, method and chemicals chosen for the treatment. Effective treatments will show a significant die-off of targeted vegetation after treatment and reduced regrowth the following growing season. The vegetation control will improve habitat values and public access.

7. Relationship to NDOW Plans, Policies, and Programs

This program certainly falls within NDOW's general goal of maintaining and enhancing habitats. More specifically, the Conceptual Management Plans for the WMAs all contain goals and objectives such as the following: "Goal: Habitat is the key to the success of all wildlife populations. Effective habitat is an integral function of the Department of Wildlife. NDOW will preserve and protect quality habitat and enhance deficient habitats. Objective: Maintain, protect and enhance wildlife habitats on wildlife management areas (WMA's) by applying good science and best management practices through implementation of Comprehensive Management Plans."

Special Reserve Account Project Cost Estimate Table

Name of Proposed Project: **Eastern Complex Weed Control**
Name of Proposed Project Manager: **Adam Henroid**
Project ID: **510**

Please provide a breakdown of your project's costs in the table below. Only include costs for the upcoming fiscal year for which you are applying. Only include in-kind services under item 7. NDOW personnel and travel expenses may not be covered by any of our Special Reserve Accounts - you must use alternative funding sources to cover these types of costs.

Project Components	*Costs to be Paid by NDOW Special Reserve Account(s)*	*Costs to be Paid by Other Sources*
1. Land Acquisitions		
2. Personnel Costs		
A. NDOW Personnel		$ 45,000.00
B. Other Personnel		
C. Total Personnel Costs	$ -	$ 45,000.00
3. Travel Costs		
A. Per Diem		
B. Mileage		
C. Total Travel Costs	$ -	$ -
4. Equipment		
A.		
B.		
C. Total Equipment Costs	$ -	$ -
5. Materials		
A. Herbicide	$ 4,000.00	
B.		
C.		
D. Total Materials Costs	$ 4,000.00	$ -
6. Miscellaneous		
A. Tri-County Weed Control	$ 26,000.00	
B. NDA Grant Contributions		$ 25,000.00
C.		
D.		
F. Total Miscellaneous Costs	$ 26,000.00	$ 25,000.00
7. In-Kind Services		
A.		
B.		
C. Total In-Kind Services	$ -	$ -
Subtotals	$ 30,000.00	$ 70,000.00
Total Project Costs	$ 100,000.00	

Wildlife Reserve Account Project Proposal

Project Summary

Project Name: Estimating Greater Sage-grouse Vital Rates within Nevadas Novel Habitats

Project Manager: Shawn Espinosa Phone: 775-688-1523 Email: sespinosa@ndow.org

Project Monitor: Shawn Espinosa Start Date: 7/1/2020

Implementation Lead: U.S. Geological Service End Date: 6/30/2021

Partners: U.S. Geological Service, Great Basin Bird Observatory, Nevada Department of Wildlife, US Forest Service

Project Category: Wildlife Population Protection or Enhancement

Project Category: Wildlife Monitoring and Research

Project Actions:

Priority Resource: Small game

Priority Species: Sage grouse

County Location: Nye, Eureka,

General Location: North Monitor Valley and Monitor Range

Project Funding Request

Funding Source	Amount Requested	Existing Budget Approval	In Kind Contribution
Carson Valley Chukar Club	$5,000		
NDOW Upland Game Stamp	$21,250		
U.S. Geological Service			$22,684
US Fish and Wildlife Service	$63,750		
Project Totals:	**$90,000**		**$22,684**

Project Proposal

1. Brief Purpose and Goal of the Project

Much of the recent research that has been conducted on Greater sage-grouse in Nevada has been in response to some form of anthropogenic structure or disturbance such as the development of utility scale transmission lines, geothermal energy facilities, or mine development and processing. Some of these

developments have offered a classic Before, After, Control, Impact (BACI) study design, but many have not. In order to better understand how sage-grouse are responding to anthropogenic disturbances and habitats that are in less than desirable condition, we feel that it is important to gain a more comprehensive knowledge base of demographic parameters and habitat use in areas that are considered in relatively good ecological condition, free from anthropogenic structures (utility scale) and associated noise, and offer contiguous habitat (large, uninterrupted blocks).

This project is intended to determine key demographic parameters and gain a better understanding of habitat utilization and movement patterns within otherwise healthy and un-fragmented sagebrush habitats. Areas that have been selected for research and monitoring generally contain a diverse array of sagebrush species and mountain shrub community with an understory of perennial grasses and forbs. Additionally, little in the way of anthropogenic development has been realized in these areas. Research efforts are expected to lead to the identification of habitat associations and estimation of vital rates over a period of three years. The following describe the objectives and demographic parameters for the project:

1. Capture approximately 25-30 female sage-grouse and place VHF radio transmitters and leg bands on the birds at each study site. At a minimum, maintain that number of radio marked females annually;
2. Capture at least 5 female sage-grouse and place GPS/Satellite transmitters to determine seasonal movement patterns and determine home range at each study site;

This work will assist with determining the following:
a) Determination of survival rates of adults and juveniles (both male and female); and
b) Identification of nest sites and nest initiation rates;
c) Determination of nest survival rates;
d) Examination of nest-site vegetative characteristics and if differences exist between successful and unsuccessful nest sites;
e) Determination of differences of seasonal survival rates; and
f) Understand and map movement patterns, seasonal distribution and key habitats.

2. Project Approach and Tasks

Field work for this project will be conducted by the USGS Western Ecological Research Center in Dixon, California through field technicians working for the Great Basin Bird Observatory. Match funding for this project is being provided by the Nevada Upland Game Stamp program ($21,250) allowing for the expenditure of $63,750 of WSFR-PR funds and a donation of $5,000 from the Carson Valley Chukar Club for a total project cost of $90,000. This will be a multi-year effort (up to 8 years) in order to gain enough data from a large enough sample of birds to mitigate the influences of natural variability due to factors such as weather, climate and predation.

Radio-Telemetry. We are proposing to capture approximately 20-30 female and up to 10 male sage-grouse annually over an eight-year period and maintain at least 20 live females during each reproductive season. Sage grouse movement, survivorship, and reproduction will be monitored following release. Portable receivers (Communication Specialist Inc., Orange, CA; Advanced Telemetry Systems Inc., Isanti, MN) will be used along with 3-element Yagi antennas to monitor radio-marked grouse. Throughout the nesting and brood-rearing period, researchers will attempt to locate female grouse ≥2 times per week.

Space-Use. Relocation coordinates will be transferred into a GIS (ArcMap 9.2, ESRI Products, Redlands, CA) for space-use analysis. Kernel density (50, 90, and 95%) is calculated for all radio locations and for each grouse separately (95%). Kernel density is also calculated for brood-rearing females. Kernel calculations are carried out in multiple steps. First, relocation points are weighted to account for biases associated with non-equivalent relocation intervals. Second, robust estimates of smoothing parameters (h) are generated using Animal Space Use 1.3 (Horne and Garton 2009). Last, those parameters are used in Hawth's Tools (ArcMap 9.2) to calculate fixed kernel densities. Kernel density maps are generated

based on the estimated densities for 2009 and 2010.

Nests and vegetation. If a grouse is found at the same location during the nesting period, researchers will visually determine if a grouse is nesting. Nests are monitored ≥3 times per week until fate is determined. Successful nests are classified as ≥1 chick hatched. Nests are also scored as depredated, partially depredated, or abandoned.

Following nest fate, understory cover is recorded at the nest bowl using a coverboard (Jones 1968), Robel pole (Robel 1970), and digital photography method. Vegetation composition cover is measured at multiple subplots (20 X 50 cm) located ≤25 m of each nests using Daubenmire method (Daubenmire 1959). Canopy cover is measured along two 25-m transects, one 50-m transect, and one 100-m transect extending from the nest bowl every 90°. The orientation of the quadrants is randomized. Shrub species are recorded and measured. Width (cm) and heights (cm) of a random sample of individual shrubs along the line are recorded. These shrub widths are measured within 5, 10, and 25 m from the nest for all four transect lines, within 50 m for two transect lines, and 100 m for one transect line. The purpose of the different transect lengths is to identify the scale of use for shrub cover within 100 m radius of a nest site.

To identify vegetation factors selected by grouse, defined as the disproportionate use to availability, measurements of vegetation characteristics are compared at nests to those at random points. Thus, the same habitat measurements are conducted at random points to represent available habitat. Evidence for multi-scale selection generating two random points for each nest is evaluated. One point is within 200 m of the nest (dependent) and the other is within the study area (independent). The preliminary results are reported as means (±SE) of vegetation characteristics for random points and nests. However, multiple a priori generalized mixed effects models with a binomial error distribution at multiple spatial scales will be compared for strength of evidence. Researchers will use an information-theoretic approach, including ΔAIC, Akaike's weights, evidence ratios, likelihood-based R2, and likelihood ratio tests to evaluate models. Model averaged parameter estimates will be used to develop resource selection functions.

Brood-rearing and vegetation. Following the completion of a successful nest, female grouse with broods are monitored closely by obtaining >2 locations per week. Spotlights are used every 10 days following nest hatch during night hours to count the number of chicks in the brood. Broods are considered unsuccessful if no chicks are found during spotlight surveys. To confirm unsuccessful broods (prevent false negative), females are rechecked within 48 hours. A similar habitat measurement protocol is conducted at brood sites as that at nest sites. However, transects maximum extent is 25 m for broods sites. Canopy cover is measured along three 25 m transects, which extended from the brood location every 120° with random orientation. The width (cm) of each shrub species is measured along the three transect lines within 5, 10, and 25 m from the brood location. Because habitat changes through time and broods are mobile, measurements are collected at each 10-day interval. Differences in vegetation use between night (roosting) and day (foraging) hours are also investigated. These surveys included one day and one night observation of habitat used by broods (within a 24 hour period), as well as, one observation of a random location within 200 m of the brood (dependent) to estimate disproportionate use to availability.

Predator Monitoring

Raven and Raptor Surveys. Surveys are conducted for Common Ravens (Corvus corax; hereafter ravens) and raptors during nesting and following nest fate. Surveys are conducted using binoculars at each nest for 15 minutes searching all four quadrants around the nest equally. Time of sighting, bearing, distance (using a rangefinder) of each raptor and corvid is tallied and birds are identified to species when possible.

Additional surveys are used to estimate raven and raptor densities using Program Distance (Thomas et al. 2009) across the landscape and relate it to nest survival parameters. Survey points are randomly generated within the study area. Points are generated on and off roads. No points are assigned to paved roads. Surveys are completed between mid-May and late-July. The time of survey is randomized between one half hour our before sunrise to one half hour following sunset. The same protocol for nest surveys is

carried out at points. These data will provide valuable information on factors that influence raven and raptor numbers before and after energy development throughout the study area.

Fall and winter location. During the fall and winter months (September – February), flights will be conducted every 3-4 weeks to determine location and survivorship. Attempts will be made to locate each individual radio-marked sage-grouse and determine its status (alive or dead).

These approaches are subject to change based on improved data collection techniques and improved technologies.

3. Anticipated Beneficial Effects of the Project

Over the course of this monitoring effort we will be able to estimate sage-grouse vital rates (e.g. nest initiation rates, nest survival rates, male and female survival rates, adult and juvenile survival rates, and brood survival rates) as well as determine important seasonal use areas, movement corridors, and potential connectivity with other adjacent sage-grouse populations within Nevada's most undisturbed and intact sagebrush landscapes. These data can be used for comparison purposes for other ongoing research projects that are currently investigating various forms of anthropogenic disturbance or development such as utility scale transmission lines, geothermal energy development and mining activities/associated infrastructure.

4. Project Schedule

Capture and radio-marking efforts for this project will take place during the spring of each year from early March through April beginning in 2016 and concluding in 2023. Follow-up work will extend from this period through August of each year. Monthly flights to locate radio marked individuals will occur from November through February.

5. Required Clearance Activities and Schedule (NEPA, other permits, authorizations)

6. Monitoring Plan

Over the course of this monitoring effort we will be able to estimate sage-grouse vital rates (e.g. nest initiation rates, nest survival rates, male and female survival rates, adult and juvenile survival rates, and brood survival rates) as well as determine important seasonal use areas, movement corridors, and potential connectivity with other adjacent sage-grouse populations within Nevada's most undisturbed and intact sagebrush landscapes. These data can be used for comparison purposes for other ongoing research projects that are currently investigating various forms of anthropogenic disturbance or development such as utility scale transmission lines, geothermal energy development and mining activities/associated infrastructure.

7. Relationship to NDOW Plans, Policies, and Programs

This project fits within the 1st Edition of the Greater Sage-grouse Conservation Plan for Nevada and Eastern California (2004).

Special Reserve Account Project Cost Estimate Table

Name of Proposed Project: **Estimating sage-grouse vital rates in Nevada's most novel habitats**
Name of Proposed Project Manager: **Shawn Espinosa**
Project ID: **529**

Please provide a breakdown of your project's costs in the table below. Only include costs for the upcoming fiscal year for which you are applying. Only include in-kind services under item 7. NDOW personnel and travel expenses may not be covered by any of our Special Reserve Accounts - you must use alternative funding sources to cover these types of costs.

Project Components	*Costs to be Paid by NDOW Special Reserve Account(s)*	*Costs to be Paid by Other Sources*
1. Land Acquisitions		
2. Personnel Costs		
A. NDOW Personnel		
B. Other Personnel	$ 11,625.00	$ 39,875.00
C. Total Personnel Costs	$ 11,625.00	$ 39,875.00
3. Travel Costs		
A. Per Diem	$ 250.00	$ 750.00
B. Mileage	$ 500.00	$ 1,500.00
C. Total Travel Costs	$ 750.00	$ 2,250.00
4. Equipment		
A. VHF transmitters (30 units @$230/ea.)	$ 1,725.00	$ 5,175.00
B.		
C. Total Equipment Costs	$ 1,725.00	$ 5,175.00
5. Materials		
A. Trapping supplies	$ 400.00	$ 1,200.00
B.		
C.		
D. Total Materials Costs	$ 400.00	$ 1,200.00
6. Miscellaneous		
A. Field Housing	$ 500.00	$ 1,500.00
B. Vehicles (4WD truck lease: 2 @ $10,500 ea.	$ 5,500.00	$ 16,500.00
C. ATVs (1 ATV @ $2,000)	$ 500.00	$ 1,500.00
D. ATV Fuel and Vehicle Maitenance	$ 250.00	$ 750.00
F. Total Miscellaneous Costs	$ 6,750.00	$ 20,250.00
7. In-Kind Services		
A. USGS Research Wildlife Biologist (Permanent, 0.2 FTE)		$ 12,834.00
B. USGS Wildlife Biologist (Term, 0.2 FTE)		$ 9,850.00
C.		
D. Total In-Kind Service	$ -	$ 22,684.00
Subtotals	$ 21,250.00	$ 91,434.00
Total Project Costs	$	112,684.00

Wildlife Reserve Account Project Proposal

Project Summary

Project Name: Estimating the effects of large ungulate grazing on Greater sage-grouse in northwestern Nevada

Project Manager: Shawn Espinosa Phone: 775-688-1523 Email: sespinosa@ndow.org

Project Monitor: Shawn Espinosa Start Date: 7/1/2020

Implementation Lead: University of Nevada, Reno End Date: 6/30/2021

Partners: Nevada Department of Wildlife, University of Nevada, Reno, Bureau of Land Management, US Fish and Wildlife Service

Project Category: Wildlife Population Protection or Enhancement

Project Category: Wildlife Monitoring and Research

Project Actions:

Priority Resource: Small game

Priority Species: Sage grouse

County Location: Washoe, Humboldt,

General Location: Northwestern Nevada including northern Washoe County (Massacre PMU) and the Sheldon National Wildlife Refuge

Project Funding Request

Funding Source	Amount Requested	Existing Budget Approval	In Kind Contribution
NDOW Upland Game Stamp	$18,397		
USFWS State Wildlife Grant	$54,293		
USFWS Wildlife Restoration Grant	$38,453		
Project Totals	**$111,143**		

Project Proposal

1. Brief Purpose and Goal of the Project

The purpose of this proposal is to facilitate the completion of the "Effects of large ungulate grazing on Greater sage-grouse" research project through final data analysis and publication development. This would conclude this project, which has spanned seven field seasons (2013-2019). The ultimate goal of the project is to assess the relative effects of grazing by livestock and wild horses on sage-grouse habitats,

demographic rates and population dynamics.

2. Project Approach and Tasks

This project includes seven field seasons (2013-2019). Over the course of fieldwork, 1,108 sage-grouse were captured consisting of 775 female and 333 males. This large sample of birds has allowed University of Nevada, Reno graduate students to estimate various sage-grouse vital rates such as monthly and annual survival rates, nest initiation and chick survival.

Daily nest survival will be modeled using a Bayesian hierarchical model with nest age, study area and year as a three-way interaction. This will allow for estimates of a nest surviving the entire nest period from the start of laying to hatching (mean = 37 days). Chick survival will also be modeled using the Bayesian hierarchical modeling technique using double observer counts through witnessing a radio-marked hen. This will allow for estimates of chick survival through time.

Over the course of seven field seasons, vegetation data was measured at 3,517 locations consisting of used and random locations (see habitat measurements and analysis section below). Specific parameters measured included metrics such as shrub cover, shrub height, grass cover, grass height, forb cover, forb height and species composition. The interaction of these data (co-variates) with specific vital rates is crucial to this project.

In addition, from 2013-2016, wild horse and cattle fecal matter was sampled by walking one kilometer transects and counting feces on both sides of the transect. During 2017 and 2018, the protocol was altered to sample 20 points, spaced 50m apart along one kilometer transects and every feces was counted within a 10m radius. The alteration allows for finer spatial resolution in estimated densities but is comparable to previous years. The Bayesian hierarchical model was used to simultaneously model abundance and detection of feces along transects and point counts. Preliminary results indicate that the highest density of horses on the Sheldon NWR occurred in 2013, while densities of horses have been increasing within the Massacre portion of the study area and were highest in 2017. Horses were all but completely removed from the Sheldon NWR in 2015.

While the interaction of vegetation measurements and vital rate data are important to understanding the ecology of sage-grouse in this particular region of the Great Basin, the integration of wild horse and cattle use data is paramount to this project in terms of hypothesis testing and overall goals of the project. Once these models are completed, several dissertation chapters can be completing allowing for the publication of results in scientific journal articles.

Habitat Measurements and Analyses

•Within 48 hours of predicted nest hatch, measure multiple microhabitat characteristics at each nest site, including total shrub cover, sagebrush cover, perennial and annual grasses, perennial and annual forbs, vertical cover, and horizontal cover (measured at 5m from nest site);

•Place two perpendicular transects centered at the nest and record the percent shrub cover for each meter along the transect at scales of 5 m;

•In addition, place ten 20 X 50 cm Daubenmire plots along each transect and one at the nest center where percent cover is estimated and all plants are measured and keyed as annual or perennial;

•Use maps of vegetation types derived from remote sensing data in a Geographical Information System (GIS) to measure habitat characteristics at larger spatial scales;

•Measure the habitat characteristics (field and GIS) at random points that are spatially dependent and independent from the nest site;

•Develop a cover class layer of conifers using 30m resolution NAIP and NDVI data (Monitor study site);

•Conduct multi-scale habitat selection analysis using random and used points;

•Estimate the effects of grouse age and body condition on nest survival rates;
•Conduct habitat measurements (field and GIS) at a subsample of brood locations during day and night and dependent random locations for each 7-day interval;
•Develop and compare brood survival models that include vegetation characteristics as covariates to identify the effects of vegetation factors.

3. Anticipated Beneficial Effects of the Project

The University of Nevada, Reno (Sedinger Lab) has provided three annual progress reports as well as annual presentations and meetings regarding the accomplishment and preliminary findings from the research effort. This has provided an adequate mechanism for NDOW to monitor this project.

4. Project Schedule

Field work for this project has been completed (2013-2019). Some data analysis has also been completed up to this point, but further modeling and interaction of specific variable on seasonal vital rates is yet to be completed. Most of the analysis work is expected to be completed by December of 2020, while chapter completion and publication development (in draft form) are expected to be completed by June 30, 2021. Additional journal article publication will likely occur after this date due to peer review processes.

5. Required Clearance Activities and Schedule (NEPA, other permits, authorizations)

6. Monitoring Plan

See above. This is a sage-grouse research and monitoring project.

7. Relationship to NDOW Plans, Policies, and Programs

This project addresses long-standing questions within the Great Basin regarding the effects of wild horses and cattle during two important life stages (nesting and brood rearing). This research effort was identified in the 1st Edition of the Nevada and northeastern California Greater Sage-grouse Conservation Plan (2004) and the Washoe-Lassen-Modoc Sage-grouse Conservation Plan.

Special Reserve Account Project Cost Estimate Table

Name of Proposed Project: **Estimating effects of large ungulate grazing on sage-grouse in northwestern Nevada**
Name of Proposed Project Manager: **Shawn Espinosa**
Project ID: **530**

Please provide a breakdown of your project's costs in the table below. Only include costs for the upcoming fiscal year for which you are applying. Only include in-kind services under item 7. NDOW personnel and travel expenses may not be covered by any of our Special Reserve Accounts - you must use alternative funding sources to cover these types of costs.

Project Components	*Costs to be Paid by NDOW Special Reserve Account(s)*	*Costs to be Paid by Other Sources*
1. Land Acquisitions		
2. Personnel Costs		
A. NDOW Personnel		
B. Other Personnel	$ 15,772.00	$ 67,238.00
C. Total Personnel Costs	$ 15,772.00	$ 67,238.00
3. Travel Costs		
A. Per Diem	$ 750.00	$ 2,250.00
B. Mileage		
C. Total Travel Costs	$ 750.00	$ 2,250.00
4. Equipment		
A.		
B.		
C. Total Equipment Costs	$ -	$ -
5. Materials		
A.		
B.		
C.		
D. Total Materials Costs	$ -	$ -
6. Miscellaneous		
A. Publication costs	$ 1,875.00	$ 5,625.00
B. Tuition		$ 1,269.00
C. Indirect Costs		$ 16,364.00
D.		
F. Total Miscellaneous Costs	$ 1,875.00	$ 23,258.00
7. In-Kind Services		
A.		
B.		
C. Total In-Kind Services	$ -	$ -
Subtotals	$ 18,397.00	$ 92,746.00
Total Project Costs	$	111,143.00

Wildlife Reserve Account Project Proposal

Project Summary

Project Name: Greater Sage-grouse Statewide Monitoring

Project Manager: Shawn Espinosa Phone: 775-688-1523 Email: sespinosa@ndow.org

Project Monitor: Shawn Espinosa Start Date: 7/1/2020

Implementation Lead: Nevada Department of Wildlife End Date: 6/30/2021

Partners: Nevada Department of Wildlife, US Forest Service

Project Category: Wildlife Population Protection or Enhancement

Project Category: Wildlife Monitoring and Research

Project Actions:

Priority Resource: Small game

Priority Species: Sage grouse

County Location: Statewide

General Location: Range of Greater Sage-grouse in Nevada

Project Funding Request

Funding Source	Amount Requested	Existing Budget Approval	In Kind Contribution
Carson Valley Chukar Club	$7,500		
NDOW Upland Game Stamp	$47,640		
Nevada Chukar Foundation	$7,500		
USFWS State Wildlife Grant	$163,400		
Project Totals:	**$226,040**		

Project Proposal

1. Brief Purpose and Goal of the Project

This project supports various NDOW specific monitoring efforts throughout the range of Greater Sage-grouse in Nevada. Monitoring activities include ground surveys to conduct lek related work (e.g. counts, routes and searches) using seasonal technicians, fixed-wing aircraft outfitted with infrared telephoto capabilities, and fixed-wing telemetry (VHF) follow-up surveys. As of 2019, there were 1,991 known lek locations identified in the Nevada Statewide Sage-grouse Database (Nevada portion only), of which 718

were considered active (defined as 2 or more males observed during 2 years in a 5 year period), 254 were considered "pending active", meaning that an additional year of observing 2 or more males is necessary to be considered an active lek, 332 were considered "inactive" status, and 552 were considered "unknown" status leks. This volume of lek locations requires that some part-time seasonal, volunteer and aerial resources are dedicated to support on the ground efforts.

2. Project Approach and Tasks

Lek Count Technicians
Assistance with lek counts, in the form of part-time technicians, allows us to achieve our objectives of surveying at least 40% of known lek locations throughout Nevada (n=796). This is a somewhat lofty objective considering the number of field biologists in each region and the availability of volunteers and federal agency personnel available to conduct lek survey work. The use of part time technicians dedicated solely to lek surveys alleviates some of the workload on agency field biologists at a time of the year when surveys for other species (e.g. big game animals) are taking place and big game quota recommendations are being made.

Fixed Wing Infrared Surveys
This relatively new survey technique has proven to be effective over the last four years given advancements in the system and the use of sage-grouse lek habitat modeling using maximum entropy (MaxEnt) methods. This survey technique allows for documenting presence or absence of birds at known leks, number of males and females, and has been effective at detecting undiscovered lek locations without disturbing birds as the elevation of the aircraft is generally about 1,000 above ground level. This technology may also be utilized to survey areas for wintering sage-grouse. Very little comprehensive work has been conducted to document winter use areas and delineate this important seasonal habitat.

Aerial Telemetry Surveys
In addition to the lek survey work described above, this project will also cover fixed wing aerial telemetry surveys to follow-up on radio-marked grouse in several project areas. These flights will largely occur once each month from October through February in various study areas and roughly involve approximately 45 hours of work. These surveys not only provide locations of birds, but are also able to document mortality which is important for estimating monthly, seasonal and annual survival rates. Additionally, telemetry information obtained from sage-grouse throughout Nevada has been utilized to inform a statewide resource selection function model (RSF) and mapping product for the species.

3. Anticipated Beneficial Effects of the Project

Lek Count Technicians:
Assistance with lek counts, in the form of part-time technicians, allows us to achieve our objectives of surveying 40% of known lek locations throughout Nevada (n=796). This is a somewhat lofty objective considering the number of field biologists in each region, volunteers and federal agency personnel available to conduct lek survey work. Additionally, this alleviates some of the workload on agency field biologists at a time of the year when surveys for other species (e.g. big game animals) are taking place.

Fixed Wing Infrared Lek Detection and Wintering Ground Survey:
Cooled infrared camera technology with a telephoto lens mounted on a fixed wing aircraft platform has the ability to detect the presence/absence of sage-grouse at leks without invoking disturbance. The technique allows observers to obtain counts of individuals at leks and potentially detect new lek locations. Accurate counts of numbers of birds at a lek can also be determined. This tool allows for efficient survey of multiple leks or suspected wintering grounds each morning.

Fixed Wing Telemetry Surveys:
These surveys greatly increase the strength of our telemetry location dataset and can assist with the development of a resource selection function model being developed by the USGS. Additionally, beyond locating radio-marked sage-grouse, these surveys allow us to determine monthly survival and periods of

elevated mortality which could help influence management decisions.

4. Project Schedule

Lek count work conducted via ground/vehicle surveys would take place during the spring breeding season which is typically defined as March 1 – May 15 of each year.

Fixed wing infrared work would be conducted during the winter or spring breeding season depending on the purpose of the survey.

Fixed wing telemetry surveys would be conducted throughout the fiscal year, with emphasis on locating radio-marked birds during late fall and winter periods on a monthly basis when research crews are out of service.

5. Required Clearance Activities and Schedule (NEPA, other permits, authorizations)

6. Monitoring Plan

This projects is a monitoring project.

7. Relationship to NDOW Plans, Policies, and Programs

This project fits within the 1st Edition of the Greater Sage-grouse Conservation Plan for Nevada and Eastern California (2004). The project also assists with objectives outlined in the Bi-State Action Plan (2012).

Special Reserve Account Project Cost Estimate Table

Name of Proposed Project: **Greater Sage-grouse Statewide Monitoring**
Name of Proposed Project Manager: **Shawn Espinosa**
Project ID: **525**

Please provide a breakdown of your project's costs in the table below. Only include costs for the upcoming fiscal year for which you are applying. Only include in-kind services under item 7. NDOW personnel and travel expenses may not be covered by any of our Special Reserve Accounts - you must use alternative funding sources to cover these types of costs.

Project Components	*Costs to be Paid by NDOW Special Reserve Account(s)*	*Costs to be Paid by Other Sources*
1. Land Acquisitions		
2. Personnel Costs		
A. NDOW Personnel		$ 121,400.00
B. Other Personnel (Lek Count Technicians - 2 @ $18/hr for 6 weeks)	$8,640	$ 5,000.00
C. Total Personnel Costs	$ 8,640.00	$ 126,400.00
3. Travel Costs		
A. Per Diem		$ 2,000.00
B. Mileage		$ 32,000.00
C. Total Travel Costs	$ -	$ 34,000.00
4. Equipment		
A.		
B.		
C. Total Equipment Costs	$ -	$ -
5. Materials		
A.		
B.		
C.		
D. Total Materials Costs	$ -	$ -
6. Miscellaneous		
A. Infrared Imagery Flights (Lek search & survey - 32 hrs. @ $825/hr.)	$ 26,400.00	$ 8,000.00
B. Fixed-wing Telemetry Survey (36 hrs. @ $350/hr)	$ 12,600.00	$ 10,000.00
C.		
D.		
F. Total Miscellaneous Costs	$ 39,000.00	$ 18,000.00
7. In-Kind Services		
A.		
B.		
C. Total In-Kind Services	$ -	$ -
Subtotals	$ 47,640.00	$ 178,400.00
Total Project Costs	$	226,040.00

Wildlife Reserve Account Project Proposal

Project Summary

Project Name: Key PittmanWMA Wildlife Food Plots

Project Manager: Andrew Coonen Phone: Email: acoonen@ndow.org

Project Monitor: Adam Henriod Start Date: 7/1/2020

Implementation Lead: Nevada Department of Wildlife End Date: 6/30/2021

Partners: Nevada Department of Wildlife

Project Category: Habitat Restoration

Project Category: Upland Habitat Improvement

Project Actions: Drill seeding

Priority Resource: Small game

Priority Species: Waterfowl

County Location: Lincoln

General Location: Key Pittman WMA

Project Funding Request

Funding Source	Amount Requested	Existing Budget Approval	In Kind Contribution
NDOW Duck Stamp	$2,600		
NDOW Upland Game Stamp	$3,900		
ildlife Management Area System Gra n	$15,100		
Project Totals:	**$21,600**		

Project Proposal

1. Brief Purpose and Goal of the Project

The goal of this project is a measurable increase of wildlife use with increased hunter and public use and hunter success. This will be achieved by completing annual plantings and vegetation manipulation, in order to enhance existing habitat on the management area for the benefit of wildlife.

2. Project Approach and Tasks

On October first the food plot fields are mowed, disked, seed drilled (fall/winter cereal grains and legumes) and irrigated. At the same time the NW corner of the Frenchy Unit is mowed. In December and

January grass seed is broadcast or drilled in deficient habitats mostly created by noxious weed treatments or other mechanical disturbances such as fuel/fire breaks. In February or March the food plots are drilled again with additional cereal grains, forbs, legumes and sunflower. At this time the northern impoundments are drained. In June millet, sorghum, and sunflower is broadcast or drilled along portions of the pond edges. In mid-July grazing begins. In mid-August the desirable native vegetation (goose foot and alkali bulrush) has matured and the northern impoundments are mowed and filled with water. During the last week of August the food plots are strip mowed for the dove season. At the end of September the dove season ends and the grazing lease ends and the cycle starts again. Due to the extended dove season conflicting with the waterfowl season opener, the food plots have to be mowed, disked, seeded and irrigated prior to the waterfowl opener starting around October 1st. Approximately 60 acres of fields will be mowed, disked, drilled, and irrigated. Approximately 4 acres of wetland edge habitat will be seeded.

3. Anticipated Beneficial Effects of the Project

Benefits: The food plot program incorporates forbs, grasses, nitrogen fixing plants and cereal grains to provide forage for wildlife and maintain and/or improve the soil for better production, reduce noxious and invasive weeds and eliminate the need for commercial fertilizer. Results: Increased documented use of waterfowl, quail, dove, cottontail rabbit, and deer, improved harvest of game species and a reduced need for noxious and invasive weed control. Benefits to non-game species such as small mammals, raptors, song birds, reptiles and other species is another benefit of this project. The KPWMA Food Plot program is an ongoing, yearly habitat management activity. The results of food plots in FY21 will be evaluated for their effectiveness and benefit to wildlife and sportsmen.

4. Project Schedule

Schedule outlined in the poject approach

5. Required Clearance Activities and Schedule (NEPA, other permits, authorizations)

None

6. Monitoring Plan

The KPWMA Food Plot program is an ongoing, yearly habitat management activity. The results of food plots in FY21 will be evaluated for their effectiveness and benefit to wildlife and sportsmen.

7. Relationship to NDOW Plans, Policies, and Programs

Annual habitat maintenance and enhancement is identified in all of the current WMA Conceptual Management Plans.
Desired Outcome: Wildlife habitats that are in good ecological condition, capable of supporting a diverse array of wildlife species.
Goal: Habitat is the key to the success of all wildlife populations. Effective habitat is an integral function of the Department of Wildlife. NDOW will preserve and protect quality habitat and enhance deficient habitats.
Objective: Maintain, protect and enhance wildlife habitats on wildlife management areas (WMA's) by applying good science and best management practices through implementation of Comprehensive Management Plans on all WMA's (Comprehensive Strategic Plan). Achieve an overall goal of no net loss of wetland area or function and the long-term goal to enhance and increase wetland quantity and quality within the WMA (Wetland Conservation Plan).

Special Reserve Account Project Cost Estimate Table

Name of Proposed Project: **Key Pittman Wildlife Food Plots**
Name of Proposed Project Manager: **Andrew Coonen**
Project ID: **527**

Please provide a breakdown of your project's costs in the table below. Only include costs for the upcoming fiscal year for which you are applying. Only include in-kind services under item 7. NDOW personnel and travel expenses may not be covered by any of our Special Reserve Accounts - you must use alternative funding sources to cover these types of costs.

Project Components	*Costs to be Paid by NDOW Special Reserve Account(s)*	*Costs to be Paid by Other Sources*
1. Land Acquisitions		
2. Personnel Costs		
A. NDOW Personnel		$ 13,850.00
B. Other Personnel		
C. Total Personnel Costs	$ -	$ 13,850.00
3. Travel Costs		
A. Per Diem		
B. Mileage		
C. Total Travel Costs	$ -	$ -
4. Equipment		
A. Estimated Fuel and Maintenance		$ 1,250.00
B.		
C. Total Equipment Costs	$ -	$ 1,250.00
5. Materials		
A. Seed - Upland account	$ 3,900.00	
B. Seed - Duck stamp account	$ 2,600.00	
C.		
D. Total Materials Costs	$ 6,500.00	$ -
6. Miscellaneous		
A.		
B.		
C.		
D.		
F. Total Miscellaneous Costs	$ -	$ -
7. In-Kind Services		
A.		
B.		
C. Total In-Kind Services	$ -	$ -
Subtotals	$ 6,500.00	$ 15,100.00
Total Project Costs	$	21,600.00

Wildlife Reserve Account Project Proposal

Project Summary

Project Name: Monitoring Greater Sage-grouse Response to the Martin Fire

Project Manager: Shawn Espinosa Phone: 775-688-1523 Email: sespinosa@ndow.org

Project Monitor: Shawn Espinosa Start Date: 7/1/2020

Implementation Lead: U.S. Geological Service End Date: 6/30/2021

Partners: U.S. Geological Service, Great Basin Bird Observatory, Nevada Department of Wildlife, Bureau of Land Management

Project Category: Wildlife Population Protection or Enhancement

Project Category: Wildlife Monitoring and Research

Project Actions:

Priority Resource: Small game

Priority Species: Sage grouse

County Location: Humboldt

General Location: Martin Creek Basin and western Owyhee Desert

Project Funding Request

Funding Source	Amount Requested	Existing Budget Approval	In Kind Contribution
NDOW Upland Game Stamp	$12,750		
Nevada Chukar Foundation	$8,500		
U.S. Geological Service	$22,684		$27,684
USFWS Wildlife Restoration Grant	$63,750		
Project Totals:	**$107,684**		**$27,684**

Project Proposal

1. Brief Purpose and Goal of the Project

This project is intended to determine key demographic parameters and gain a better understanding of habitat utilization and movement patterns after the 2018 Martin Fire. Pre-fire data was collected from 2016-2018 within this study area as it served as a representative control site within the Great Basin that exhibited characteristics of quality sage-grouse habitat free from moderate to significant anthropogenic

disturbances. Further monitoring at this study sites provides a great opportunity to determine the effects of fire on sage-grouse population and also help determine the recovery of habitat under varying treatment scenarios (e.g. herbicide/fallow/seed, seed only, and natural recovery). The following describe the objectives and demographic parameters for the project:

1. Capture approximately 25-30 female sage-grouse and place VHF radio transmitters and leg bands on the birds at each study site. At a minimum, maintain that number of radio marked females annually;
2. Capture at least 5 female sage-grouse and place GPS/Satellite transmitters to determine seasonal movement patterns and determine home range at each study site;

This work will assist with determining the following:
a) determination of survival rates of adults and juveniles (both male and female); and
b) identification of nest sites and nest initiation rates;
c) determination of nest survival rates;
d) examination of nest-site vegetative characteristics and if differences exist between successful and unsuccessful nest sites;
e) determination of differences of seasonal survival rates; and
f) understand and map movement patterns, seasonal distribution and key habitats.

2. Project Approach and Tasks

Field work for this project will be conducted by the USGS Western Ecological Research Center in Dixon, California using field technicians employed by the Great Basin Bird Observatory.

Radio-Telemetry
We are proposing to capture approximately 20-30 female and up to 10 male sage-grouse annually over a three-year period and maintain at least 20 live females during each reproductive season. Sage grouse movement, survivorship, and reproduction will be monitored following release. Portable receivers (Communication Specialist Inc., Orange, CA; Advanced Telemetry Systems Inc., Isanti, MN) will be used along with 3-element Yagi antennas to monitor radio-marked grouse. Relocation error is minimized by circling around each grouse 30 – 50 m. Using the approximated distance and a compass bearing, the location coordinates (Universal Transverse Mercator) are obtained using GPS. Throughout the nesting and brood-rearing period, researchers attempted to locate female grouse ≥2 times per week.

Space-Use. Relocation coordinates will be transferred into a GIS (ArcMap 9.2, ESRI Products, Redlands, CA) for space-use analysis. Kernel density (50, 90, and 95%) is calculated for all radio locations and for each grouse separately (95%). The purpose of using all locations is to estimate area used at the population level. Kernel density is also calculated for brood-rearing females. Kernel calculations are carried out in multiple steps. First, relocation points are weighted to account for biases associated with non-equivalent relocation intervals. Second, robust estimates of smoothing parameters (h) are generated using Animal Space Use 1.3 (Horne and Garton 2009). Last, those parameters are used in Hawth's Tools (ArcMap 9.2) to calculate fixed kernel densities. Kernel density maps are generated based on the estimated densities for 2009 and 2010.

Nests and Vegetation
If a grouse is found at the same location during the nesting period, researchers visually determined if a grouse is nesting. Nests are monitored ≥3 times per week until fate is determined. Successful nests are classified as ≥1 chick hatched. Nests are also scored as depredated, partially depredated, or abandoned.

Following nest fate, understory cover is recorded at the nest bowl using a coverboard (Jones 1968), Robel pole (Robel 1970), and digital photography method. Vegetation composition cover is measured at multiple subplots (20 X 50 cm) located ≤25 m of each nests using Daubenmire method (Daubenmire 1959). Canopy cover is measured along two 25-m transects, one 50-m transect, and one 100-m transect extending from the nest bowl every 90°. The orientation of the quadrants is randomized. Shrub species

are recorded and measured. Width (cm) and heights (cm) of a random sample of individual shrubs along the line are recorded. These shrub widths are measured within 5, 10, and 25 m from the nest for all four transect lines, within 50 m for two transect lines, and 100 m for one transect line. The purpose of the different transect lengths is to identify the scale of use for shrub cover within 100 m radius of a nest site.

To identify vegetation factors selected by grouse, defined as the disproportionate use to availability, measurements of vegetation characteristics are compared at nests to those at random points. Thus, the same habitat measurements are conducted at random points to represent available habitat. Evidence for multi-scale selection generating two random points for each nest is evaluated. One point is within 200 m of the nest (dependent) and the other is within the study area (independent). The preliminary results are reported as means (±SE) of vegetation characteristics for random points and nests. However, multiple a priori generalized mixed effects models with a binomial error distribution at multiple spatial scales will be compared for strength of evidence. Researchers will use an information-theoretic approach, including ΔAIC, Akaike's weights, evidence ratios, likelihood-based R2, and likelihood ratio tests to evaluate models. Model averaged parameter estimates will be used to develop resource selection functions.

Brood-rearing and vegetation. Following the completion of a successful nest, female grouse with broods are monitored closely by obtaining >2 locations per week. Spotlights are used every 10 days following nest hatch during night hours to count the number of chicks in the brood. Broods are considered unsuccessful if no chicks are found during spotlight surveys. To confirm unsuccessful broods (prevent false negative), females are rechecked within 48 hours. A similar habitat measurement protocol is conducted at brood sites as that at nest sites. However, transects maximum extent is 25 m for broods sites. Canopy cover is measured along three 25 m transects, which extended from the brood location every 120° with random orientation. The width (cm) of each shrub species is measured along the three transect lines within 5, 10, and 25 m from the brood location. Because habitat changes through time and broods are mobile, measurements are collected at each 10-day interval. Differences in vegetation use between night (roosting) and day (foraging) hours are also investigated. These surveys included one day and one night observation of habitat used by broods (within a 24 hour period), as well as, one observation of a random location within 200 m of the brood (dependent) to estimate disproportionate use to availability.

Predator Monitoring

Raven and Raptor Surveys. Surveys are conducted for Common Ravens (Corvus corax; hereafter ravens) and raptors during nesting and following nest fate. Surveys are conducted using binoculars at each nest for 15 minutes searching all four quadrants around the nest equally. Time of sighting, bearing, distance (using a rangefinder) of each raptor and corvid is tallied and birds are identified to species when possible.

Additional surveys are used to estimate raven and raptor densities using Program Distance (Thomas et al. 2009) across the landscape and relate it to nest survival parameters. Survey points are randomly generated within the study area. Points are generated on and off roads. No points are assigned to paved roads. Surveys are completed between mid-May and late-July. The time of survey is randomized between one half hour our before sunrise to one half hour following sunset. The same protocol for nest surveys is carried out at points. These data will provide valuable information on factors that influence raven and raptor numbers before and after energy development throughout the study area.

Fall and winter location. During the fall and winter months (September – February), flights will be conducted every 3-4 weeks to determine location and survivorship. Attempts will be made to locate each individual radio-marked sage-grouse and determine its status (alive or dead).

These approaches are subject to change based on improved data collection techniques and improved technologies.

3. Anticipated Beneficial Effects of the Project

Over the course of this monitoring effort, we will be able to estimate sage-grouse vital rates (e.g. nest initiation rates, nest survival rates, male and female survival rates, adult and juvenile survival rates, and brood survival rates) in response to the Martin Fire. These data can be used for comparison purposes for other ongoing research projects that are currently investigating sage-grouse and habitat response to mega-fires.

4. Project Schedule

Capture and radio-marking efforts for this project will take place during the spring of each year from early March through April beginning in 2020. Follow-up work will extend from this period through August of each year. Monthly flights to locate radio marked individuals will occur from November through February.

5. Required Clearance Activities and Schedule (NEPA, other permits, authorizations)

6. Monitoring Plan

Over the course of this monitoring effort, we will be able to estimate sage-grouse vital rates (e.g. nest initiation rates, nest survival rates, male and female survival rates, adult and juvenile survival rates, and brood survival rates) in response to the Martin Fire. These data can be used for comparison purposes for other ongoing research projects that are currently investigating sage-grouse and habitat response to mega-fires.

7. Relationship to NDOW Plans, Policies, and Programs

This project fits within the 1st Edition of the Greater Sage-grouse Conservation Plan for Nevada and Eastern California (2004).

Special Reserve Account Project Cost Estimate Table

Name of Proposed Project: **Monitoring Greater Sage-grouse Response to the Martin Fire**
Name of Proposed Project Manager: **Shawn Espinosa**
Project ID: **528**

Please provide a breakdown of your project's costs in the table below. Only include costs for the upcoming fiscal year for which you are applying. Only include in-kind services under item 7. NDOW personnel and travel expenses may not be covered by any of our Special Reserve Accounts - you must use alternative funding sources to cover these types of costs.

Project Components	*Costs to be Paid by NDOW Special Reserve Account(s)*	*Costs to be Paid by Other Sources*
1. Land Acquisitions		
2. Personnel Costs		
A. NDOW Personnel		
B. Other Personnel	$ 7,125.00	$ 40,375.00
C. Total Personnel Costs	$ 7,125.00	$ 40,375.00
3. Travel Costs		
A. Per Diem	$ 150.00	$ 850.00
B. Mileage	$ 300.00	$ 1,700.00
C. Total Travel Costs	$ 450.00	$ 2,550.00
4. Equipment		
A. VHF transmitters (30 units @$230/ea.)	$ 1,035.00	$ 5,865.00
B.		
C. Total Equipment Costs	$ 1,035.00	$ 5,865.00
5. Materials		
A. Trapping supplies	$ 240.00	$ 1,360.00
B.		
C.		
D. Total Materials Costs	$ 240.00	$ 1,360.00
6. Miscellaneous		
A. Field Housing	$ 300.00	$ 1,700.00
B. Vehicles (4WD truck lease: 2 @ $10,500 ea.)	$ 3,150.00	$ 17,850.00
C. ATVs (1 ATV @ $2,000)	$ 300.00	$ 1,700.00
D. ATV Fuel and Vehicle Maitenance	$ 150.00	$ 850.00
F. Total Miscellaneous Costs	$ 3,900.00	$ 22,100.00
7. In-Kind Services		
A. USGS Research Wildlife Biologist (Permanent, 0.2 FTE)		$ 12,834.00
B. USGS Wildlife Biologist (Term, 0.2 FTE)		$ 9,850.00
C.		
D. Total In-Kind Service	$ -	$ 22,684.00
Subtotals	$ 12,750.00	$ 94,934.00
Total Project Costs	$	107,684.00

Wildlife Reserve Account Project Proposal

Project Summary

Project Name:	Monitoring the effects of landscape level treatments on Greater sage-grouse in the Desatoya Mountains		
Project Manager:	Shawn Espinosa	Phone: 775-688-1523	Email: sespinosa@ndow.org
Project Monitor:	Shawn Espinosa	Start Date:	7/1/2020
Implementation Lead:	Nevada Department of Wildlife	End Date:	6/30/2021
Partners:	Nevada Department of Wildlife, U.S. Geological Service, Great Basin Bird Observatory, Smith Creek Ranch		
Project Category:	Wildlife Population Protection or Enhancement		
Project Category:	Wildlife Monitoring and Research		
Project Actions:			
Priority Resource:	Small game		
Priority Species:	Sage grouse		
County Location:	Lander, Churchill,		
General Location:	Desatoya Mountains		

Project Funding Request

Funding Source	Amount Requested	Existing Budget Approval	In Kind Contribution
Carson Valley Chukar Club	$6,750		
NDOW Upland Game Stamp	$19,500		
U.S. Geological Service			$18,242
USFWS Wildlife Restoration Grant	$63,750		
Project Totals:	**$90,000**		**$18,242**

Project Proposal

1. Brief Purpose and Goal of the Project

For over a decade, federal and state resource agencies have partnered with the Smith Creek Ranch to improve habitat conditions in the Desatoya Range located in central Nevada (Churchill/Lander County border). The Bureau of Land Management, Smith Creek Ranch, Nevada Department of Wildlife, University

of Nevada, Reno and Natural Resources Conservation Service are all engaged in supporting various habitat and management related projects for vegetative and wildlife health. To better understand the effectiveness of these projects, we have been actively monitoring demographic parameters and habitat selection of the sage-grouse population within the Desatoya Range since 2014. As habitat related projects are implemented, it is important to continue monitoring to determine to what degree these management actions and treatment are influencing the species.

Measuring how intended landscape improvement projects ultimately affect target species such as sage-grouse is critically important with respect to adaptive management. Information gained from this project will not only identify important seasonal use areas, movement and potential connectivity corridors to other adjacent populations of sage-grouse, but also help understand the response to various treatments or management actions including pinyon/juniper removal, meadow enhancement and wild horse removal.

Being that the primary purpose of the proposed action is to improve availability, quantity, and quality of sage-grouse habitat, in particular late brood rearing habitat that is dependent upon springs/wet meadows that support abundant and diverse forb and insect populations, continued monitoring of the sage-grouse population within this area will ultimately be the measure of success, failure or neutral effect of the overall project.

This project is intended to better understand habitat utilization, identify key habitats and determine movement patterns of sage-grouse between these areas and determine vital rates within the Desatoya Population Management Unit. The greatest threat to this population of sage-grouse is pinyon and juniper encroachment and the degradation of small meadows and spring complexes that serve as late brood rearing habitat. Research efforts are expected to lead to the identification of factors limiting this population and habitat associations including:

1. Capture/maintain approximately 20-30 female sage-grouse marked with VHF radio transmitters per year;
2. Capture at least 10 female sage-grouse and place GPS/Satellite transmitters to determine seasonal movement patterns and determine home range;

This work will assist with determining the following:
a) identification of nest sites and nest initiation rates;
b) examination of nest-site vegetative characteristics and if differences exist between successful and unsuccessful nest sites;
c) determination of nest survival rates;
d) determination of survival rates of adults and juveniles (both male and female); and
e) determination of differences of seasonal survival rates

2. Project Approach and Tasks

Sage grouse movement, survivorship, and reproduction will be monitored following release. Portable receivers (Communication Specialist Inc., Orange, CA; Advanced Telemetry Systems Inc., Isanti, MN) are used along with 3-element Yagi antennas to monitor radio-marked grouse. Relocation error is minimized by circling around each grouse 30 – 50 m. Using the approximated distance and a compass bearing, the location coordinates (Universal Transverse Mercator) are obtained using GPS. Throughout the nesting and brood-rearing period, researchers attempted to locate female grouse ≥2 times per week.

Relocation coordinates are transferred into a GIS (ArcMap 9.2, ESRI Products, Redlands, CA) for space-use analysis. Kernel density (50, 90, and 95%) is calculated for all radio locations and for each grouse separately (95%). The purpose of using all locations is to estimate area used at the population level. Kernel density is also calculated for brood-rearing females. Kernel calculations are carried out in multiple steps. First, relocation points are weighted to account for biases associated with non-equivalent

relocation intervals. Second, robust estimates of smoothing parameters (h) are generated using Animal Space Use 1.3 (Horne and Garton 2009). Last, those parameters are used in Hawth's Tools (ArcMap 9.2) to calculate fixed kernel densities. Kernel density maps are generated based on the estimated densities for 2009 and 2010.

If a grouse is found at the same location during the nesting period, researchers visually determined if a grouse is nesting. Nests are monitored ≥3 times per week until fate is determined. Successful nests are classified as ≥1 chick hatched. Nests are also scored as depredated, partially depredated, or abandoned.

Following nest fate, understory cover is recorded at the nest bowl using a coverboard (Jones 1968), Robel pole (Robel 1970), and digital photography method. Vegetation composition cover is measured at multiple subplots (20 X 50 cm) located ≤25 m of each nests using Daubenmire method (Daubenmire 1959). Canopy cover is measured along two 25-m transects, one 50-m transect, and one 100-m transect extending from the nest bowl every 90°. The orientation of the quadrants is randomized. Shrub species are recorded and measured. Width (cm) and heights (cm) of a random sample of individual shrubs along the line are recorded. These shrub widths are measured within 5, 10, and 25 m from the nest for all four transect lines, within 50 m for two transect lines, and 100 m for one transect line. The purpose of the different transect lengths is to identify the scale of use for shrub cover within 100 m radius of a nest site.

To identify vegetation factors selected by grouse, defined as the disproportionate use to availability, measurements of vegetation characteristics are compared at nests to those at random points. Thus, the same habitat measurements are conducted at random points to represent available habitat. Evidence for multi-scale selection generating two random points for each nest is evaluated. One point is within 200 m of the nest (dependent) and the other is within the study area (independent). The preliminary results are reported as means (±SE) of vegetation characteristics for random points and nests. However, multiple a priori generalized mixed effects models with a binomial error distribution at multiple spatial scales will be compared for strength of evidence. Researchers will use an information-theoretic approach, including ΔAIC, Akaike's weights, evidence ratios, likelihood-based R2, and likelihood ratio tests to evaluate models. Model averaged parameter estimates will be used to develop resource selection functions.

Following the completion of a successful nest, female grouse with broods are monitored closely by obtaining >2 locations per week. Spotlights are used every 10 days following nest hatch during night hours to count the number of chicks in the brood. Broods are considered unsuccessful if no chicks are found during spotlight surveys. To confirm unsuccessful broods (prevent false negative), females are rechecked within 48 hours. A similar habitat measurement protocol is conducted at brood sites as that at nest sites. However, transects maximum extent is 25 m for brood sites. Canopy cover is measured along three 25 m transects, which extended from the brood location every 120° with random orientation. The width (cm) of each shrub species is measured along the three transect lines within 5, 10, and 25 m from the brood location. Because habitat changes through time and broods are mobile, measurements are collected at each 10-day interval. Differences in vegetation use between night (roosting) and day (foraging) hours are also investigated. These surveys included one day and one-night observation of habitat used by broods (within a 24 hour period), as well as, one observation of a random location within 200 m of the brood (dependent) to estimate disproportionate use to availability.

3. Anticipated Beneficial Effects of the Project

This project will help understand sage-grouse habitat use prior to and during landscape scale treatments that the Bureau of Land Management is conducting in the Desatoya Range of central Nevada. There are several collaborators on the project including, but not limited to, the Nevada Department of Wildlife, the U.S. Fish and Wildlife Service and the Smith Creek Ranch. The BLM project area is approximately 230,000 acres within the Porter Canyon and Edwards Creek grazing allotments. There are 192,700 acres of the Desatoya sage-grouse Population Management Unit (PMU) and 34,195 acres of the Desatoya Wilderness Study Area within the project area.

Approximately 30,000 acres of various treatments are proposed within the project area. While the project's primary focus is to enhance sage-grouse habitat, multiple wildlife species dependent upon healthy forests and sagebrush communities will benefit. Treatments will include piñon/juniper removal and thinning, wet meadow and spring rehabilitation/protection, potential rabbitbrush control using herbicide treatment and seeding, and excess wild horse removal. It will be important to monitor sage-grouse movement and demographic parameters before, during and after project implementation.

4. Project Schedule

Initial capture efforts were conducted in early fall of 2013 and re-commenced during the spring months of 2014. Follow-up of radio marked individuals has taken place each year since the inception of the project. More intensive monitoring has occurred during the spring breeding period through late brood rearing (August/September). During the late fall and winter months, follow-up monitoring has been conducted using a contracted fixed-wing aircraft to monitor locations and mortality. State fiscal year 2020 will be the seventh year of this monitoring effort. We anticipate this research effort to last eight to ten years with field work likely concluding in 2023 while analysis and publications development will take place during 2024.

5. Required Clearance Activities and Schedule (NEPA, other permits, authorizations)

6. Monitoring Plan

See above.

7. Relationship to NDOW Plans, Policies, and Programs

This project fits within the 1st Edition of the Greater Sage-grouse Conservation Plan for Nevada and Eastern California (2004).

Special Reserve Account Project Cost Estimate Table

Name of Proposed Project: **Monitoring the effects of landscape treatment on sage-grouse in the Desatoya Range**
Name of Proposed Project Manager: **Shawn Espinosa**
Project ID: **524**

Please provide a breakdown of your project's costs in the table below. Only include costs for the upcoming fiscal year for which you are applying. Only include in-kind services under item 7. NDOW personnel and travel expenses may not be covered by any of our Special Reserve Accounts - you must use alternative funding sources to cover these types of costs.

Project Components	*Costs to be Paid by NDOW Special Reserve Account(s)*	*Costs to be Paid by Other Sources*
1. Land Acquisitions		
2. Personnel Costs		
A. NDOW Personnel		
B. Other Personnel	$ 12,250.00	$ 49,000.00
C. Total Personnel Costs	$ 12,250.00	$ 49,000.00
3. Travel Costs		
A. Per Diem		
B. Mileage		
C. Total Travel Costs	$ -	$ -
4. Equipment		
A. VHF Transmitters (30 @ $225 ea.)	$ 1,750.00	$ 5,000.00
B.		
C. Total Equipment Costs	$ 1,750.00	$ 5,000.00
5. Materials		
A.		
B.		
C.		
D. Total Materials Costs	$ -	$ -
6. Miscellaneous		
A. Field Housing	$ 250.00	$ 750.00
B. Vehicles (2 @ $10,500/6 mo. lease)	$ 5,250.00	$ 15,750.00
C.		
D.		
F. Total Miscellaneous Costs	$ 5,500.00	$ 16,500.00
7. In-Kind Services		
A. USGS Research Wildlife Biologist		$ 6,417.00
B. USGS Wildlife Biologist (term)		$ 4,925.00
C. Travel (per-diem)		$ 1,500.00
D. Additional equipment (radio receivers, antennaes, banding supplies, etc.)		$ 5,400.00
C. Total In-Kind Services	$ -	$ 18,242.00
Subtotals	$ 19,500.00	$ 88,742.00
Total Project Costs	$	108,242.00

Wildlife Reserve Account Project Proposal

Project Summary

Project Name: Soil Health Restoration on Wildlife Management Areas

Project Manager: Brittany Trimble Phone: Email: btrimble@ndow.org

Project Monitor: Caleb McAdoo Start Date: 8/1/2020

Implementation Lead: Nevada Department of Wildlife End Date: 6/30/2023

Partners: Nevada Department of Wildlife, Nevada Division of Forestry, Conservation District

Project Category: Habitat Restoration

Project Category: Upland Habitat Improvement

Project Actions: Drill seeding, Herbicide application

Priority Resource: General Habitat Improvement

Priority Species: Mule Deer

County Location: White Pine, Nye,

General Location: Steptoe Valley WMA & Wayne E. Kirch WMA

Project Funding Request

Funding Source	Amount Requested	Existing Budget Approval	In Kind Contribution
HCF	$10,000		
NDOW Upland Game Stamp	$10,000		
Project Totals:	**$20,000**		

Project Proposal

1. Brief Purpose and Goal of the Project

Wildlife Management Areas across the state have reclaimed agricultural fields that have experienced fallowing, weed infestation, and subsequent topsoil degradation. Despite multiple herbicide and seeding efforts, these fields are largely bareground with interspersed weeds and virtually no evidence of seeded species or any desirable vegetation for wildlife habitat. An initial soil analysis at Steptoe Valley WMA and Kirch WMA during the summer of 2019 revealed that these soils are severely compacted and have almost zero nutrients in the surface horizon, indicating that these soils have lost most, if not all, of the organic matter from the surface horizon that is vital for retaining soil nutrients, soil water holding capacity, and soil structure.

This project aims to utilize different soil amendments to restore soil function and establish a desirable

vegetation community for wildlife on reclaimed agricultural fields at Steptoe Valley WMA and Wayne E. Kirch WMA. These methods include the use of biochar, compost and/or manure, and cover crops to incorporate organic matter into the surface horizon. The funding requested will cover approximately 6 acres total between both WMAs for experimenting with different amendment combinations and application rates as a proof of concept.

2. Project Approach and Tasks

The 6-acre project area includes 3 acres at Steptoe Valley WMA and 3 acres at Kirch WMA, which will allow for quarter-acre plots for each crossed treatment at each WMA, allowing for replication and crossed experimental design for meaningful statistical analysis. Crossed treatments will include control plots with zero amendments adjacent to treatment plots, plots with different application rates of biochar with no additional compost/manure, plots with different application rates of compost/manure with no additional biochar, and plots with varying combinations of biochar and compost/manure. All plots will be drill seeded with a seed mix including native grasses, shrubs, and forbs to develop a productive upland community for wildlife utilization. Herbicide will be applied as needed, with extra consideration for potential harm to seeded species.

Biochar will be sourced from a commercial biochar developer or through a partnership with Nevada Division of Forestry (NDF), who has kilns that can be used to convert pinyon-juniper slash into biochar locally. NDF has expressed interest in the project and is willing to try developing biochar with their kilns and incorporating biochar development into their normal operations, but with the uncertainty of when their field season will begin due to the Covid-19 crisis, they are currently unable to commit any specific amount of time to the project. Compost and/or manure will be sourced from Nevada composters or ranchers, depending on availability, accessibility, and best price. Cost estimates for these materials include purchase, freight, and labor costs that may be associated with the different source options. Due to the relatively small treatment acreage, seed and herbicide will be acquired from general NDOW stock.

Biochar, compost/manure, seed, and herbicide would be applied to the designated treatment areas using existing WMA equipment - including dump trailer, front-end loader, disk tiller, drill seeder, and herbicide spraying equipment. Adam Henriod, the Eastern Complex Wildlife Area Supervisor, has agreed to the use of the various methods and amendments mentioned for this project and has committed his staff to assisting with project implementation.

If NDF is able to fit biochar production into their regular schedule (i.e., no site trips needed past what was already planned), they would be willing to the work as an in-kind match at no cost. This is still to be determined. Jake Tibbitts with Eureka County and Eureka Conservation District has done similar work in recent years and has committed to providing in-kind services through consultation, volunteer work, and/or materials. I will also be contacting White Pine Conservation District, Lincoln County Conservation District, and Tonopah Conservation District to see if they would be interested in providing any in-kind services for the project.

3. Anticipated Beneficial Effects of the Project

Research shows that amending soil with biochar can increase soil carbon, soil nutrient holding, capacity, soil water holding capacity, soil microbial activity, and soil structure. However, nutrients need to be supplied in combination with the biochar in order to increase the nutrient supply in the soil. Compost and manure are both organic-rich amendments that provide additional nutrients to the soil. These amendments will restore soil function and allow for the growth of a desirable vegetation community for wildlife utilization. The experimental design of this project will allow us to analyze the different application rates of the various amendments and whether combinations of amendments are even necessary. We can use this information to create the most cost-effective approach to restoring soil health across the fields as a whole, and ultimately across state properties with similar problems.

4. Project Schedule

Project would take place during FY 2021, FY 2022, and potentially into FY 2023.

5. Required Clearance Activities and Schedule (NEPA, other permits, authorizations)

N/A

6. Monitoring Plan

A plot design and map will be finalized once project funding is known and plot sizes have been adjusted. Prior to any amendment additions, surface horizon soils will be sampled and vegetation will be monitored in each individual plot for pre-treatment data for all treatment types. Soil bulk density, texture, water holding capacity, and root biomass will be measured at the NDOW office and samples will be sent to a laboratory for analysis of pH, macronutrients, and micronutrients. Soil and vegetation monitoring would be repeated at least once each year for 3 years following treatments. Monitoring will be done by NDOW staff or partners depending on availability. Brittany Trimble will be responsible for implementing all soil monitoring and will also be responsible for ensuring completion of vegetation monitoring for the span of the project.

7. Relationship to NDOW Plans, Policies, and Programs

Wildlife Management Areas have been acquired by the state to enhance habitat for wildlife and provide recreational opportunities to the public, and in this case, soil restoration is absolutely necessary to achieve these goals. Habitat enhancement on Steptoe Valley WMA and Kirch WMA would benefit resident and migratory birds, upland game species, and small mammals.

Special Reserve Account Project Cost Estimate Table

Name of Proposed Project: **Soil Health Restoration on Wildlife Management Areas**
Name of Proposed Project Manager: **Brittany Trimble**
Project ID:

Please provide a breakdown of your project's costs in the table below. Only include costs for the upcoming fiscal year for which you are applying. Only include in-kind services under item 7. NDOW personnel and travel expenses may not be covered by any of our Special Reserve Accounts - you must use alternative funding sources to cover these types of costs.

Project Components	*Costs to be Paid by NDOW Special Reserve Account(s)*	*Costs to be Paid by Other Sources*
1. Land Acquisitions	$ -	$ -
2. Personnel Costs		
A. NDOW Personnel		
B. Other Personnel - NDF		
C. Total Personnel Costs	$ -	$ -
3. Travel Costs		
A. Per Diem		
B. Mileage		
C. Total Travel Costs	$ -	$ -
4. Equipment		
A. WMA ag equipment fuel		
B. NDF Kiln Rental?		
C. Total Equipment Costs	$ -	$ -
5. Materials		
A. Biochar	$ 11,000.00	
B. Compost	$ 6,000.00	
C.		
D. Total Materials Costs	$ 17,000.00	$ -
6. Miscellaneous		
A. Soil lab analysis	$ 3,000.00	
B.		
C.		
D.		
F. Total Miscellaneous Costs	$ 3,000.00	$ -
7. In-Kind Services		
A.		
B.		
C. Total In-Kind Services	$ -	$ -
Subtotals	$ 20,000.00	$ -
Total Project Costs	$ 20,000.00	

Wildlife Reserve Account Project Proposal

Project Summary

Project Name:	Upland Game Translocation and Monitoring		
Project Manager:	Shawn Espinosa	Phone: 775-688-1523	Email: sespinosa@ndow.org
Project Monitor:	Shawn Espinosa	Start Date:	7/1/2020
Implementation Lead:	Nevada Department of Wildlife	End Date:	6/30/2021
Partners:	Nevada Department of Wildlife		
Project Category:	Wildlife Population Protection or Enhancement		
Project Category:	Species Introduction		
Project Actions:	Trap and transplant		
Priority Resource:	Small game		
Priority Species:	Ruffed Grouse		
County Location:	Humboldt, White Pine,		
General Location:	Pine Forest Range, Humboldt County (Ruffed Grouse). Northern Snake Range, White Pine County (Merriam's turkey)		

Project Funding Request

Funding Source	Amount Requested	Existing Budget Approval	In Kind Contribution
Carson Valley Chukar Club	$4,000		
NDOW Upland Game Stamp	$12,400		
Nevada Chukar Foundation	$4,000		
USFWS State Wildlife Grant	$29,000		
Project Totals:	**$49,400**		

Project Proposal

1. Brief Purpose and Goal of the Project

The overall goal of this project is to increase population redundancy and resiliency of certain upland game species, particularly mountain quail, ruffed grouse, and wild turkey within suitable and appropriate habitats across Nevada's landscape. Since 2008, the Nevada Department of Wildlife has released approximately 1,200 mountain quail (Churchill, Humboldt, Lander, Washoe and White Pine Counties),

203 ruffed grouse (Elko, Humboldt, Lander and Nye Counties), 251 Rio Grande turkeys (Douglas, Lander and Lincoln Counties) and 246 Merriam's turkeys (Lander and Elko Counties). These translocations, and subsequent augmentations, are conducted to fulfill the objective of expanding certain upland game species distribution and abundance within Nevada as stated in the Nevada Upland Game Species Management Plan developed in 2008. These efforts have also led to increased sportsmen opportunity and have contributed to non-consumptive uses as well (e.g. wildlife watching and photography).

2. Project Approach and Tasks

The capture and translocation of either species is highly dependent on habitat conditions, both at the capture site and the proposed release site. If adequate habitat conditions are not experienced, it is likely that these efforts will be re-scheduled.

Ruffed Grouse
We propose to capture 20-30 ruffed grouse, likely from the Santa Rosa Range to augment a prior release in the Pine Forest Range of Humboldt County. If the existing population in the Santa Rosa Range is not capable of providing a reliable source stock, alternative sites could be selected such as the Merritt Mountain area of northern Elko County.

A subset of captured and translocated birds (up to 10) may be radio-marked with VHF telemetry units to help determine habitat usage and survival rates. Fixed wing telemetry surveys will be conducted intermittently for the life of the individual or the units to monitor for survival and dispersal from the release site. Drumming counts will take place at specific locations during May and early June to document presence and density of birds.

Merriam's Turkey
Source stock of Merriam's turkeys have been made available to Nevada through the Colville Confederated Tribe located in eastern Washington for the past two years. Ninety-nine turkeys were released into the northern Toiyabe Range in 2017 and 2018. The majority of capture work has been conducted by the Colville Confederated Tribal personnel with partial transportation of birds to a "halfway point" in eastern Oregon. We hope to continue this relationship into 2020 and 2021.

Monitoring activities will include aerial telemetry surveys of radio-marked birds within both the northern Snake Range and radio-marked birds released into the south Ruby Mountains in early 2020. In addition, intermittent ground follow-up monitoring will take place following flights, especially during the nesting season to determine nest location and habitat selection.

3. Anticipated Beneficial Effects of the Project

Expanding the distribution of mountain quail and ruffed grouse populations addresses concerns of population decline and loss of redundancy (numbers of populations) across the range of the species. This provides assurances that populations will persist over the long-term and enable resiliency in case of stochastic events. Ultimately, if successful, the establishment of these populations also increases recreational opportunities for sportsmen and wildlife watchers.

Likewise, expanding wild turkey populations in Nevada meets sportsman demand for this species. Only 186 turkey tags were issued for the spring 2019 hunt and the number of applicants far exceeds availability of tags. Providing sportsmen with alternative hunt areas and expanded opportunity would help alleviate the demand deficit.

4. Project Schedule

Ruffed grouse capture efforts would commence in late summer or early fall of 2019 (August/September) if habitat conditions and bird numbers are deemed appropriate. This type of effort normally takes approximately 10-14 days to complete. However, this is highly dependent on habitat conditions and productivity of ruffed grouse populations from potential source stock areas.

Merriam's turkey capture efforts normally begin in December or January of each year. Capture work would likely begin in December of 2020 or January of 2021 and releases would take place immediately after that. As in years past, two or three capture efforts and bird translocations are necessary to achieve the release complement objective of between 50 and 100 birds.

5. Required Clearance Activities and Schedule (NEPA, other permits, authorizations)

Ruffed grouse releases would take place on private lands within the Pine Forest Range of Humboldt County.

6. Monitoring Plan

See above.

7. Relationship to NDOW Plans, Policies, and Programs

The following documents were used while developing this proposal:
•Nevada Upland Game Species Management Plan (2008);
•Upland Game Release Plan for FY2020-2021;
•NDOW's W-48 and W-64 Federal Assistance Grants (Pittman-Robertson);

Special Reserve Account Project Cost Estimate Table

Name of Proposed Project: **Upland Game Translocation and Monitoring**
Name of Proposed Project Manager: **Shawn Espinosa**
Project ID: **523**

Please provide a breakdown of your project's costs in the table below. Only include costs for the upcoming fiscal year for which you are applying. Only include in-kind services under item 7. NDOW personnel and travel expenses may not be covered by any of our Special Reserve Accounts - you must use alternative funding sources to cover these types of costs.

Project Components	*Costs to be Paid by NDOW Special Reserve Account(s)*	*Costs to be Paid by Other Sources*
1. Land Acquisitions		
2. Personnel Costs		
A. NDOW Personnel		$ 25,416.00
B. Other Personnel		
C. Total Personnel Costs	$ -	$ 25,416.00
3. Travel Costs		
A. Per Diem		$ 3,584.00
B. Mileage		
C. Total Travel Costs	$ -	$ 3,584.00
4. Equipment		
A. VHF radio transmitters (20 @ $200/ea.)	$ 2,000.00	$ 2,600.00
B.		
C. Total Equipment Costs	$ 2,000.00	$ 2,600.00
5. Materials		
A. Capture materials (ruffed grouse and turkey)		$ 1,000.00
B.		
C.		
D. Total Materials Costs	$ -	$ 1,000.00
6. Miscellaneous		
A. Telemetry flights (40 hrs. @ $350/hr.)	$ 10,000.00	$ 4,000.00
B. Disease testing kits and lab analysis (approx. 30 turkey samples)	$ 400.00	$ 400.00
C.		
D.		
F. Total Miscellaneous Costs	$ 10,400.00	$ 4,400.00
7. In-Kind Services		
A.		
B.		
C. Total In-Kind Services	$ -	$ -
Subtotals	$ 12,400.00	$ 37,000.00
Total Project Costs	$	49,400.00

Wildlife Reserve Account Project Proposal

Project Summary

Project Name:	Using Hunter and Population Survey Data to Investigate Drivers of Upland Game Bird Populations and Forecast Harvest in Nevada		
Project Manager:	Shawn Espinosa	Phone: 775-688-1523	Email: sespinosa@ndow.org
Project Monitor:	Shawn Espinosa	Start Date:	8/3/2020
Implementation Lead:	Nevada Department of Wildlife	End Date:	2/28/2022
Partners:	Nevada Department of Wildlife, Nevada Chukar Foundation, Carson Valley Chukar Club		
Project Category:	Wildlife Population Protection or Enhancement		
Project Category:	Wildlife Monitoring and Research		
Project Actions:			
Priority Resource:	Small game		
Priority Species:	Chukar		
County Location:	Statewide		
General Location:	State of Nevada		

Project Funding Request

Funding Source	Amount Requested	Existing Budget Approval	In Kind Contribution
Carson Valley Chukar Club	$9,000		
NDOW Upland Game Stamp	$24,600		
Nevada Chukar Foundation	$9,000		
Project Totals:	**$42,600**		

Project Proposal

1. Brief Purpose and Goal of the Project

We propose to use a statistical modeling approach to 1) investigate patterns in upland game bird harvest and hunter effort and ask whether each covaries among species; 2) relate species-specific population survey data with measured weather conditions; 3) link species-specific harvest data with population-weather relationships, taking advantage of interspecific covariance patterns; and 4) ask whether harvest or populations have changed over the last 40+ years in Nevada. Based on these results, we will 5) develop

a predictive model that can forecast likely annual populations and hunter success based on conditions experienced prior to the hunting season.

Objectives:
1. Determine how annual harvest of upland game species covary through time.
A. Establish the extent to which the number of animals harvested each year is driven by variation in hunter numbers relative to the underlying population dynamics of the species. I.e., if we can control for variation in numbers of hunters, can total harvest be used as representative of population abundance?
B. Evaluate how similar species are to one another with respect to annual harvest trends. If there are shared patterns (covariance) in number of birds harvested or total hunter effort among species, then this suggests that when more detailed information is available for one species, it can be useful to inform patterns in other species.
2. Evaluate predictive relationships between environmental conditions and population dynamics for species with robust historic population survey data (e.g. chukar).
A. In semi-arid systems like the Great Basin, we assume that annual variation in temperature and moisture drive drought conditions, and these in turn affect upland game populations. Variables that measure moisture availability (e.g. drought severity indices) should thus be predictive of annual changes in abundance.
B. Based on long-term data on chukar abundance from helicopter surveys, we can determine how annual abundance varies based on prevailing conditions.
3. Link species-specific patterns in annual harvest with patterns in survey data for species in which these data are available (e.g., chukar).
A. If the harvest of species tends to be similar year to year (i.e. the covariances measured in objective 1) then the predictive relationships from well-surveyed species (objective 2) should be useful for informing predictions of harvest success and fall population size for species that lack survey data.
B. Our approach will integrate across these two data types (hunter and population surveys) to determine the extent to which chukar populations, and the environmental conditions associated with them, can inform estimates of harvest for other species.
4. Evaluate long-term changes in species abundance based on hunter survey data.
A. Because hunter survey data has been collected for as much as 40 years, once we establish a functional model it will provide the first opportunity to evaluate long-term trends in many upland game species while controlling for variation in hunter effort.
5. Develop a predictive tool to forecast fall populations and expected hunter success.
A. As traditional methods for offering hunters a fall population forecast have been resource-intensive and dangerous (e.g. helicopter surveys for chukars), a forecast tool informed by our models offers a more efficient and safer alternative.
B. This tool could be implemented as a web-based application and updated to improve accuracy as additional years of information are collected for validation.

2. Project Approach and Tasks

Upland game birds are popular quarry among hunters, but have traditionally received less monitoring attention than other game such as waterfowl or big game. The dynamics of many upland game populations are poorly understood as a result, which both complicates management and provides a dearth of information to stakeholders, including hunters, about population status. In Nevada, annual surveys of hunters provide information on hunter effort and total harvest for each of the state's upland game species. For a few species, specifically chukar and greater sage-grouse, detailed historic population survey data also exist. If upland game bird populations respond similarly to background environmental factors (e.g. presence of drought conditions) among species, it is likely this suite of data can be used to infer historic population dynamics and predict future patterns based on environment-covariate relationships and shared variance among data sources. Here, we propose to use a Bayesian Structural Equation Modelling (SEM) approach to 1) investigate patterns in upland game bird harvest and hunter effort and ask whether each covaries among species; 2) to relate species-specific population survey data with measured weather conditions; 3) to link species-specific harvest data with population-weather

relationships, taking advantage of interspecific covariance patterns; and 4) ask whether harvest or populations have changed over the last 40+ years in Nevada. Based on these results, we will 5) develop a predictive model that can forecast likely annual populations and hunter success based on conditions experienced prior to the hunting season. This work will take advantage of existing data sources and use information on the shared, latent linkages among species to provide novel insights into harvest and population trends, and with this information will provide a tool for more efficiently communicating hunting season forecasts and long-term population trends. This will provide a tremendous benefit over traditional approaches that relied on labor-intensive, and in some case dangerous, surveys (e.g. chukar helicopter flights) to track populations and predict hunting season conditions.
This project will focus on using existing harvest and population survey data to establish patterns in the harvest and abundance of upland game species in Nevada over the last 40 years (1980-2019). We will focus on species with relatively large overlapping distributions, and plan to include grouse (greater sage-grouse, blue, and ruffed grouse), quail (California, and mountain quail), dove (mourning and white-winged dove), partridges (chukar and Hungarian partridge), and rabbits (cottontail, pygmy, and white-tailed jack rabbits). We plan to focus on the western and eastern regions of Nevada given the greater degree of similarity in species composition, habitat, and broad climate patterns in those regions.

The main data for the work will take two forms: existing harvest data (estimates of number of birds shot) collected from Nevada upland hunters through mail and web-based surveys, and existing population survey data for chukar collected using helicopter surveys since the early 1990s. Hunter harvest reports provide the most spatially and temporally extensive data describing population trajectories for most upland game species. However, there are issues with using hunter-generated indices as reflective of underlying population dynamics. Hunters, like the animals they hunt, vary in behavior, abundance, and effort through time, making it sometimes difficult to understand whether changes in the number of birds harvested reflects changes in the number of birds, or changes in the numbers or success rates of hunters. Correcting for estimates of harvest using only the observed numbers of hunters only partially disentangles these processes. For example, if chukar respond negatively to drought, and hunters are similarly less likely to hunt during drought if they perceive their success will be low, the association between hunter activity and chukar harvest will be biased and hunter harvest data will under-estimate abundance. During years of good conditions, we might expect the opposite to be true. A method is needed to separate true population processes from noise.

Our approach to disentangle the extent to which shifts in harvest are related to ecological variation in species dynamics versus patterns in hunter activity is to integrate multiple sources of data into a single model structure that can take advantage of information contained in each. We propose to use a Bayesian implementation of a Structural Equation Model to do so, and the model structure is conceptualized in Figure 2. Our approach benefits from the underlying beliefs that 1) patterns in hunting, harvest, and population dynamics covary among upland game species through space and time; 2) patterns in survey data are partially predictive of patterns in harvest. Sub-components of the model exist to 1) separate the variation in harvest for upland game species into two quantities — the variation explained by patterns in hunter activity and the variation explained by patterns in abundance; and 2) integrate harvest and population dynamics together to allow for predictions into the future using either projections of hunters or weather, as well as serve as an adaptive management tool allowing for data to be added in the future for continued projections and model validations.

A benefit from the proposed structural equation modeling approach is that the underlying connections (conceptualized in Figure 2) provides the mechanism for information to flow between, and among, estimated population parameters (e.g., species-specific population growth) and multiple environmental variables (e.g., hunter effort, drought severity). Given that some of the predictor variables are measurable or otherwise predictable prior to hunting season, this model should allow for 1) forecasting upland population trajectories for each upcoming fall; and 2) provide a mechanism to update model predictions, annually, as new data are acquired (e.g., population surveys, harvest reports, and weather conditions) and information is gained. Additionally, this model may be able to serve as a demographic bridge between previous population survey efforts (e.g., helicopter survey counts for chukar coveys) and future survey

efforts (e.g., ground-based brood flushes) due to integration of multiple data sources in the estimation of the underlying population dynamics of individual upland species. In other words, if the latent trend in chukar growth was being captured in both the harvest and helicopter survey data, it may be recoverable through comparisons between harvest data and ground-based brood flush surveys allowing for a seamless transition from one survey approach to the next.

3. Anticipated Beneficial Effects of the Project

Traditionally NDOW has provided chukar hunters with an assessment of the hunting season outlook based on surveys collected via helicopter during late summer. These surveys are expensive to conduct and also expose biologists to risks associated with low-altitude helicopter flight. Nevertheless, they provide among the only information on long-term chukar population dynamics and have traditionally offered hunters important insights into their upcoming season. For most other species, no such information exists. At the same time, NDOW has collected an impressive volume of data on hunter success through annual surveys of a subset of small game hunters. These data remain largely unexplored, but offer great potential to inform the department on long-term patterns in populations of game species that have received little attention. Our project takes advantage of these previously under-utilized datasets to develop a product that simultaneously provides valuable information to a major stakeholder group (upland game hunters) and will maximize use of existing data to inform status assessments for Nevada's upland game populations. Ultimately this seeks to increase information availability at a lower cost and with less risk to staff compared to traditional methods.

We anticipate this project will result in a web application, a project database, and at least one peer-reviewed publication. We will also present the work to local, national, and international professional and public audiences as opportunities present.

4. Project Schedule

Initial work on the project will likely begin in August of 2020 and extend for approximately 18 months. Final products should be available in January or February of 2022.

5. Required Clearance Activities and Schedule (NEPA, other permits, authorizations)

Not applicable.

6. Monitoring Plan

See above.

7. Relationship to NDOW Plans, Policies, and Programs

This project was recommended in the 2008 Upland Game Species Management Plan.

Special Reserve Account Project Cost Estimate Table

Name of Proposed Project: **Using Hunter and Population Survey Data to Develop Population & Season Forecasts**
Name of Proposed Project Manager: **Shawn Espinosa**
Project ID: **533**

Please provide a breakdown of your project's costs in the table below. Only include costs for the upcoming fiscal year for which you are applying. Only include in-kind services under item 7. NDOW personnel and travel expenses may not be covered by any of our Special Reserve Accounts - you must use alternative funding sources to cover these types of costs.

Project Components	*Costs to be Paid by NDOW Special Reserve Account(s)*	*Costs to be Paid by Other Sources*
1. Land Acquisitions		
2. Personnel Costs		
A. NDOW Personnel		
B. Other Personnel	$ 24,600.00	$ 7,400.00
C. Total Personnel Costs	$ 24,600.00	$ 7,400.00
3. Travel Costs		
A. Per Diem		$ 500.00
B. Mileage		$ 1,000.00
C. Total Travel Costs	$ -	$ 1,500.00
4. Equipment		
A.		
B.		
C. Total Equipment Costs	$ -	$ -
5. Materials		
A.		
B.		
C.		
D. Total Materials Costs	$ -	$ -
6. Miscellaneous		
A. Publication Fees (FY22)		
B. Indirect (Overhead Costs)		$9,100
C.		
D.		
F. Total Miscellaneous Costs	$ -	$ 9,100.00
7. In-Kind Services		
A.		
B.		
C. Total In-Kind Services	$ -	$ -
Subtotals	$ 24,600.00	$ 18,000.00
Total Project Costs	$ 42,600.00	

Wildlife Reserve Account Project Proposal

Project Summary

Project Name:	Genette Creek CE Conservation Easement		
Project Manager:	Madi Stout	Phone: 775-777-2392	Email: mstout@ndow.org#mail to:mstout@ndow.org#
Project Monitor:	Caleb McAdoo	Start Date:	7/1/2020
Implementation Lead:	Nevada Department of Wildlife	End Date:	7/1/2030
Partners:	Tom Barnes, RMEF- Aaron Swift, NAS-Fallon - Rob Rule, Nevada Department of Wildlife		
Project Category:	Habitat Protection		
Project Category:	Conservation Easement		
Project Actions:			
Priority Resource:	General Habitat Improvement		
Priority Species:	Mule Deer		
County Location:	Elko		
General Location:	The project is in the Ruby Mountains just north of Jiggs, NV and southeast of Elko NV on Smith Creek. The project is in the Ruby Mountains just north of Jiggs, NV and southeast of Elko NV on Smith Creek.		

Project Funding Request

Funding Source	Amount Requested	Existing Budget Approval	In Kind Contribution
HCF	$40,000		
IAPP	$43,000		
Kinross Gold	$75,000		
NAS-Fallon - Rob Rule	$627,250		
RMEF-NFWF	$150,000		
UGS	$30,000		
Project Totals:	**$965,250**		

Project Proposal

1. Brief Purpose and Goal of the Project

The purpose of this project is to facilitate the purchase of a Conservation Easement of Genette Creek Ranch. The Genette Creek Ranch provides significant wildlife values in the sagebrush ecosystem and the species that rely upon it. This easement will ensure long-term protection of critical habitats. Situated on the toe slope of the Ruby Mountains southeast of Elko, Nevada the Genette Creek Ranch is positioned in premier wildlife habitat. The 2,200-acre ranch encompasses critical mule deer habitat and serves as transition habitat for Nevada's largest mule deer herd, connecting critical seasonal habitats for thousands of migrating mule deer moving between their seasonal ranges. The Genette Creek Ranch area is of the foremost mule deer habitat priorities for the Nevada Department of Wildlife. It also serves as priority habitat for the Greater Sage-grouse, which has recently been identified as warranted but precluded from listing by the United States Fish and Wildlife Service (USFWS). Sage-grouse habitat values including a Greater sage-grouse lek (breeding area) and Priority Habitat Management Area (PHMA) make the property very valuable to NDOW from a Greater sage-grouse conservation perspective. Smith Creek, which flows through the Genette Creek Ranch, has been identified by NDOW and the USFWS as the highest priority perennial stream system for recovery of Lahontan cutthroat trout (LCT) in the Humboldt Watershed. A conservation easement on the Genette Creek Ranch would help facilitate these recovery actions and would aid towards the de-listing of Lahontan cutthroat trout from its Federally Threatened status. Additionally, the Genette Creek Ranch provides habitat for elk, mule deer, and pronghorn, as well as a myriad of non-game species. Due to its high-profile location, this conservation easement was valued at $965,000.

2. Project Approach and Tasks

Improving and maintaining riparian/wet meadow habitats through potential projects such as removal of invading upland species,etc. Improving upland sage habitats through potential projects such as controlling invasive plant species, and repairing and replacing infrustructure making it wildlife friendly to assist mule deer, grsg, and lct populations.

3. Anticipated Beneficial Effects of the Project

Improving/mainting wildlife habitat, especially on private lands, is vitally important to improving wildlife populations, especially where sage-grouse and mule deer occur. The proposed project area contains active sage-grouse leks and is identified as PHMA. Similarly, it is also a part of the largest mule deer migration corridor in the state of Nevada and has been identified as LCT habitat.

4. Project Schedule

This will be a 10 year project. Project implementation will be prioritized and conducted based on proper conditions.

5. Required Clearance Activities and Schedule (NEPA, other permits, authorizations)

None as it is on private lands.

6. Monitoring Plan

This project will occur over a 10 year period. Monitoring will be done via photopoints and site visits once projects are complete.

7. Relationship to NDOW Plans, Policies, and Programs

This project coincides with our mission statement to protect, conserve, manage and restore wildlife and its habitat for the aesthetic, scientific, educational, recreational, and economic benefits to citizens of Nevada and the United States by restoring important wildlife habitat.

Special Reserve Account Project Cost Estimate Table

Name of Proposed Project: **Genette Creek CE Private Lands Habitat Improvement Projects**
Name of Proposed Project Manager: **Madi Stout**
Project ID: 537

Please provide a breakdown of your project's costs in the table below. Only include costs for the upcoming fiscal year for which you are applying. Only include in-kind services under item 7. NDOW personnel and travel expenses may not be covered by any of our Special Reserve Accounts - you must use alternative funding sources to cover these types of costs.

Project Components	*Costs to be Paid by NDOW Special Reserve Account(s)*	*Costs to be Paid by Other Sources*
1. Land Acquisitions		
A. Conservation Easement Purchase	$113,000	$ 852,250.00
2. Personnel Costs		
A. NDOW Personnel		
B. Other Personnel		
C. Total Personnel Costs	$ -	$ -
3. Travel Costs		
A. Per Diem		
B. Mileage		
C. Total Travel Costs	$ -	$ -
4. Equipment		
A.		
B.		
C. Total Equipment Costs	$ -	$ -
5. Materials		
A.		
B.		
C.		
D. Total Materials Costs	$ -	$ -
6. Miscellaneous		
A.		
B.		
C.		
D.		
F. Total Miscellaneous Costs	$ -	$ -
7. In-Kind Services		
A.		
B.		
C. Total In-Kind Services	$ -	$ -
Subtotals	$ -	$ -
Total Project Costs	$965,250	

Wildlife Reserve Account Project Proposal

Project Summary

Project Name:	Toiyabe PMU -Bates Hickison and Wolf Ranch- Pinyon Juniper Thinning Project		
Project Manager:	Jeremy Lutz	Phone: 775-635-5070	Email: jlutz@ndow.org
Project Monitor:	Jeremy Lutz	Start Date:	10/1/2020
Implementation Lead:	Nevada Department of Wildlife	End Date:	2/28/2021
Partners:	Nevada Department of Wildlife		
Project Category:	Habitat Restoration		
Project Category:	Conifer Removal: Phase 1		
Project Actions:			
Priority Resource:	Small game		
Priority Species:	Sage grouse		
County Location:	Lander		
General Location:	Work will take place north east of Austin in Grass Valley and Big Smokey Valley		

Project Funding Request

Funding Source	Amount Requested	Existing Budget Approval	In Kind Contribution
Bureau of Land Management	$120,000	$120,000	
NDOW Habitat Conservation Fee	$50,000		
NDOW Heritage Trust Account	$75,000		
NDOW Upland Game Stamp	$25,000		
Project Totals:	**$270,000**	**$120,000**	

Project Proposal

1. Brief Purpose and Goal of the Project

The proposed project would thin or substantially remove encroaching pinyon pine and juniper trees from as much as 2,700 acres of important wildlife habitat located within the Toiyabe PMU using a contracted hand thinning crew.

The Toiyabe PMU encompasses approximately 1,126,956 acres throughout Central Nevada and has the highest density of sage grouse and its associated habitat found in Lander County. In the last 10 years the Toiyabe PMU has seen a 39 % decrease in lek attendance which has resulted in a substantial population decline. Many factors can be attributed to this decline including PJ encroachment, habitat fragmentation, habitat type conversions, riparian and spring degradation as well as geothermal development in high value habitat.

In an effort to help protect this valuable habitat, over 29,000 acres of pinyon/juniper has been thinned or greatly reduced in sage grouse habitat within the Toiyabe PMU since 2012. This has been a collaborative effort with the Battle Mountain BLM, the University of Nevada Cooperative Extension, the Austin Ranger Forest District as well as the Nevada Department of Wildlife. This funding will help to continue the restoration activities needed to enhance and protect valuable sage grouse habitat within this PMU as well as the collaborative efforts put forth by all federal land management agencies.

Thinning pinyon/juniper from native sage brush steppe habitat has shown to have a positive impact for a myriad of sage brush obligate species including mule deer, pronghorn antelope and the many endemic bird species, including the sage thrasher and sage sparrow, that depend on healthy sage brush plant communities. As pinion/juniper stands increase in size and density, the grass, forb and brush community start to die off due to the trees ability to out compete these fragile plant communities for water and sunlight. Once this threshold has been crossed it is very hard to bring it back to a productive sage brush steppe ecosystem again.

2. Project Approach and Tasks

Once funding is secure a Scope of Work will be released where the Department will award the contract to the lowest bidder. All work will be conducted according to the specifications outlined in the NEPA documents pertinent to that federal land management agency. All work at the site will be implemented outside of the migratory bird, and sage-grouse lekking and early brood rearing seasons.

3. Anticipated Beneficial Effects of the Project

Large amounts of wildlife habitat, particularly mountain big sagebrush sites are at risk of PJ encroachment within the Toiayabe PMU. As trees begin to take over a site, the shrub, grass understory is essentially lost or greatly reduced through competitive exclusion. Sage grouse generally avoid areas largely dominated by trees as well as non functioning sage brush steppe ecosystems. This project will specifically help to reduce PJ encroachment in high value wildlife habitat before it is lost.

Since 2008 NDOW, USGS and BLM has collared over 120 sage grouse within the Toiaybe PMU. This collaring data has helped identify winter and summer habitat as well as crucial brood rearing and nesting areas. This data also showed areas being avoided by sage grouse due to Phase 1 and Phase 2 PJ encroachment within crucial habitat. This data will be used to prioritize thinning areas found in the PMU to maximize the overall benefit of this project.

4. Project Schedule

Project would take place from October 2020 till February 2021.

5. Required Clearance Activities and Schedule (NEPA, other permits, authorizations)

All NEPA requirements have been completed and are covered under the Eagle Butte Wildlife Habitat Enhancement EA (DOI-BLM-NV-B010-2011-0021-EA) and the Toiyabe West Wildlife Habitat Enhancement EA (DOI-BLM-NV-B010-2013-0020-EA). Work will also be conducted on Forest Service administered land under an existing CE.

6. Monitoring Plan

NDOW staff will calculate acres thinned after the field season is complete to assure objectives were met.

Special Reserve Account Project Cost Estimate Table

Name of Proposed Project: **Bates, Hickison and Wolf Ranch PJ Thinning**
Name of Proposed Project Manager: **J. Lutz**
Project ID: **536**

Please provide a breakdown of your project's costs in the table below. Only include costs for the upcoming fiscal year for which you are applying. Only include in-kind services under item 7. NDOW personnel and travel expenses may not be covered by any of our Special Reserve Accounts - you must use alternative funding sources to cover these types of costs.

Project Components	*Costs to be Paid by NDOW Special Reserve Account(s)*	*Costs to be Paid by Other Sources*
1. Land Acquisitions		
2. Personnel Costs		
A. NDOW Personnel		
B. Other Personnel		
C. Total Personnel Costs	$ -	$ -
3. Travel Costs		
A. Per Diem		
B. Mileage		
C. Total Travel Costs	$ -	$ -
4. Equipment		
B.		
C. Total Equipment Costs	$ -	$ -
5. Materials		
A.		
B.		
C.		
D. Total Materials Costs	$ -	$ -
6. Miscellaneous		
A. PJ Removal Contract	$25,000.00	$245,000
B.		
C.		
D.		
F. Total Miscellaneous Costs	$ 25,000.00	$ 245,000.00
7. In-Kind Services		
A.		
B.		
C. Total In-Kind Services	$ -	$ -
Subtotals	$ 25,000.00	$ 245,000.00
Total Project Costs	$	270,000.00

Wildlife Reserve Account Project Proposal

Project Summary

Project Name: A Multi-scale Resilience-based Framework for Restoring and Conserving Great Basin Wet Meadows and Riparian Ecosystems

Project Manager: Jasmine Kleiber Phone: 775-688-1444 Email: jkleiber@ndow.org

Project Monitor: Jasmine Kleiber Start Date: 5/1/2020

Implementation Lead: Nevada Department of Wildlife End Date: 12/31/2020

Partners: Nevada Department of Wildlife, USFS Rocky Moutain Research Station

Project Category: Habitat Restoration

Project Category: Riparian, Spring or Meadow Habitat Improvement

Project Actions:

Priority Resource: General Habitat Improvement

Priority Species:

County Location: Statewide

General Location: Great Basin

Project Funding Request

Funding Source	Amount Requested	Existing Budget Approval	In Kind Contribution
NDOW Habitat Conservation Fee	$20,000		
NDOW Upland Game Stamp	$2,400		
Project Totals:	**$22,400**		

Project Proposal

1. Brief Purpose and Goal of the Project

Riparian and wet meadow ecosystems provide critical habitats for both terrestrial and aquatic wildlife in the semiarid Great Basin. Many of these ecosystems have been degraded by various anthropogenic activities and are further threatened by climate warming. Successful restoration and conservation requires prioritizing areas for management and determining the best management strategies. This ongoing, collaborative project is developing a strategic approach for conservation of wet meadows and riparian ecosystems and the species they support for mountain 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 disturbances, such as wildfires and climate change at watershed and meadow or riparian ecosystem scales. Products include a web-based GIS that will allow managers to visualize, subset, 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 step 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 will be developed for managers to facilitate use of the tools. All products will be made available on Forest Service webpage and linked to NDOW and other agency websites.

2. Project Approach and Tasks

This ongoing project is developing a strategic, multi-scale framework for assessing resource values, climate vulnerability, and other threats to Great Basin riparian and meadow ecosystems using resilience science. Products will provide the capacity to (1) prioritize riparian ecosystems for management based on watershed and riparian ecosystem characteristics and sensitivity to disturbance, and (2) determine effective management strategies based on ecosystem resilience and resource values. Prior funding has been used to develop data collection protocols, collect data, develop a database, and analyze and categorizing watershed and riparian meadow characteristics. Additional funding is needed to finalize the analyses and develop the necessary tools for managers to effectively use this information in targeting areas for management and determining appropriate conservation and restoration strategies. The remaining analyses and tools to be developed include:

(1) Web Product and Data Archive. A database of geomorphic, hydrologic, and climatic characteristics (Germanoski et al. 2004, Miller et al. 2011, Engelhardt et al. 2012), threats, and range maps and habitat models for species of conservation concern is being developed for most upland watersheds with third order or greater streams in the Great Basin (see Figure 1, Table 1). Projected changes in baseflow for the watersheds based on geomorphic, hydrologic and climatic characteristics will also be included. The web-based product and data archive are in the final stages of development. These will allows users to (1) select one or more focal watersheds within the assessment area for analysis, and (2) subset and extract data from the watersheds in order to prioritize them for management based on their geomorphic characteristics, current and future baseflows, dominant threats, and at-risk species. The intent is for this large-scale assessment to be followed by field assessments of resilience to disturbance and determinations of the appropriate management strategies using the field guides described below. The additional funding will be used to help develop Forest Service Web Pages that explain and provide links to the databases, publications, and field guides and tools being provided by the project.

(2) Assessment of Watershed and Riparian Ecosystem Sensitivity to Disturbance. A process-based classification of the watersheds has been developed based on their resilience to disturbance. The classification builds on our prior work (Germanoski et al. 2004, Miller et al. 2011, Engelhardt et al. 2011), is based on the geomorphic and hydrologic characteristics of the watersheds and stream systems and was verified during field visits in summer 2017. It considers the watershed type, the dominant processes within the watershed, and the relative tendency of stream channels to remain stable, avulse (move outside of their channel) or incise (downcut) (Table 2, Figure 2). A field guide is being developed that describes (1) the differences in watershed responses to disturbance and the causes of those differences, (2) the linkages between the watershed geomorphic and hydrologic characteristics and reach-scale response(s), (3) the linkages between the geomorphic and hydrologic characteristics and vegetation characteristics, and (4) the process of collecting and interpreting the necessary data to describe watershed and riparian ecosystem resilience to disturbance. Selecting appropriate management strategies based on the relative resilience of the systems will be emphasized. Additional funding will be used to offset the publication costs for the field guides and to host a field tour in 2020.

(3) Assessment of Meadow Ecosystem Sensitivity to Disturbance. Data are being collected on the processes that determine meadow ecosystem resilience to disturbance for 56 focal systems in the central Great Basin described in Trowbridge et al. (2011). The types of meadows are being categorized according to their hydrogeologic setting, hydrology, vegetation, and stream connections. A field guide is being developed for evaluating (1) the differences in meadow responses to disturbance and the causes of those

differences and (2) the process of collecting and interpreting the necessary data to describe meadow resilience to disturbance. Selecting appropriate management strategies based on the relative resilience of the systems will be discussed. Additional funding will be used to offset the publication costs for the field guides and to host a field tour in 2020, pandemic permitting.

3. Anticipated Beneficial Effects of the Project

This project is being conducted in collaboration with a diverse management and research group with knowledge of Nevada watersheds and conservation issues to ensure that it will have strong utility for management. Stakeholders/project participants include the former Great Basin Landscape Conservation Cooperative with USFWS (John Tull), Bureau of Land Management (Karen Prentice, Sarah Peterson), National Forest Systems (R4 and Humboldt-Toiyabe National Forest; Mark Muir and John McCann), US Fish and Wildlife Service (Chad Mellison), Nevada Department of Wildlife (Shawn Espinosa), and The Nature Conservancy (Laurel Saito). Research partners include Rocky Mountain Research Station (Jeanne Chambers, David Board), Western Carolina University (Jerry Miller, Mark Lord), University of Nevada, Reno (Peter Weisberg, Tom Dilts, Anna Knight), Desert Research Institute (Rosemary Caroll), Agricultural Research Service (Kierith Snyder), UC Davis (Erica Fleishman), and USGS (Jason Dunham). The project has face-to-face meetings once a year in addition to monthly calls and webexs. In January 2018, we organized a symposium on the results and management applications of the project that was held at the Society for Range Management meeting in Reno, Nevada, and we plan to look for similar opportunities in the future. In July 2017, we held a field tour of the study watersheds and meadows and we hope to hold a second field tour in spring/summer 2020, pandemic permitting. Also, we will develop educational materials and hold a workshop for managers on using the tools we are developing for assessing watershed and meadow ecosystem resilience in 2020. Specific products from additional funding will include:

- lzA web-based GIS that allows managers to visualize and download all available data for the watersheds and that has tutorials describing how to use the data and maps (University of Nevada, Reno – Tom Dilts, Anna Knight and Peter Weisberg).
- lzA field guide designed to provide an understanding of differences in watershed resilience to disturbance and that steps managers through the process of assessing resilience to disturbance and determining management strategies (Western Carolina University – Jerry Miller; RMRS – Jeanne Chambers; University of Nevada, Reno – Peter Weisberg). This is developed but in the finalization stages.
- lzA similar field guide to the one for the watersheds for meadow ecosystems (Western Carolina University – Mark Lord and Jerry Miller; RMRS – Jeanne Chambers).
- lzA Forest Service Web Page that explains anhouses the databases, field guides and tools being provided by the project.

4. Project Schedule

Winter/Spring 2019/2020 - Develop Forest Service Web Pages and manager tutor.
Spring 2020 - Finalize management field guides on determining watershed and meadow resilience and developint strategies.
Summer/Fall 2020 - Hold field work (pandemic permitting); finalize field guide.

5. Required Clearance Activities and Schedule (NEPA, other permits, authorizations)

NA

6. Monitoring Plan

7. Relationship to NDOW Plans, Policies, and Programs

NDOW strives to work with multiple stakeholders to assess key habitats and species likely to be affected by varying stressors, including habitat degradation and/or loss, and to develop effective strategies and plans for managing Nevada's wildlife resources. This project aims to finalize development of a strategic,

multi-scale framework for assessing resource values and threats to Great Basin riparian and meadow ecosystems using resilience science that includes capacity to (1) prioritize riparian ecosystems for management based on ecosystem characteristics and sensitivity to disturbance, and (2) determine effective management strategies based on ecosystem resilience and resource values. Focal species identification is guided by the State of Nevada Wildlife Action Plan, with benefits to species managed within NDOW Upland Game, Big Game, Diversity and Fisheries programs. Outcomes from this work will benefit and help guide the Nevada Partners for Conservation and Development program's restoration activities on riparian and meadow systems.

Special Reserve Account Project Cost Estimate Table

Name of Proposed Project: **A Multi-scale Resil-based Frmwrk for Rest and Cons GB Mdw/Rprn**
Name of Proposed Project Manager: **Jasmine Kleiber**
Project ID: **542**

Please provide a breakdown of your project's costs in the table below. Only include costs for the upcoming fiscal year for which you are applying. Only include in-kind services under item 7. NDOW personnel and travel expenses may not be covered by any of our Special Reserve Accounts - you must use alternative funding sources to cover these types of costs.

Project Components	*Costs to be Paid by NDOW Special Reserve Account(s)*	*Costs to be Paid by Other Sources (over entire project duration)*
1. Land Acquisitions		
2. Personnel Costs		
A. NDOW Personnel		
B. Other Personnel	$ 14,000.00	$ 150,000.00
C. Total Personnel Costs	$ 14,000.00	$ 150,000.00
3. Travel Costs		
A. Per Diem		
B. Mileage		
C. Total Travel Costs	$ 7,000.00	$ 34,000.00
4. Equipment		
A.		
B.		
C. Total Equipment Costs	$ 200.00	$ -
5. Materials		
A.		
B.		
C.		
D. Total Materials Costs	$ 200.00	$ 10,000.00
6. Miscellaneous		
A. RMRS Overhead	$ 700.00	
B. RMRS Pass-through	$ 300.00	
C.		
D.		
F. Total Miscellaneous Costs	$ 1,000.00	$ -
7. In-Kind Services		
A.		
B.		
C. Total In-Kind Services	$ -	$ -
Subtotals	$ 22,400.00	$ 194,000.00
Total Project Costs	$ 216,400.00	