Grant Opportunity – Determining the effects of mineral development on Greater Sage-grouse in northeastern Nevada

The Nevada Department of Wildlife (NDOW) has received Federal Grant funding (75%) and Nevada Upland Game Stamp funding (25%) to research the effects of mineral development on Greater sage-grouse. This would initiate an approximate 5-7 year study to determine the effects on sage-grouse demographics such as annual survival, nest survival and chick survival as well as overall effects to total population size. The total amount of funding available for this project in State Fiscal Year 2023 is $190,000.

Proposals are due no later than Wednesday, July 6, 2022. Grant proposals and any questions should be submitted to the Nevada Department of Wildlife Upland Game Staff Specialist, Shawn Espinosa at sespinosa@ndow.org.

Grant Application Instructions

Please find a Scope of Work below detailing the deliverables to determine the effects of large scale mineral development including exploration, infrastructure development and placement, actual mining activities, road traffic and noise associated with mining operations on local sage-grouse populations.

The proposal must include:

- Demonstrate qualifications to conduct tasks identified within the scope of work;
- Identification of the project manager and any supporting staff along with a brief description of their qualifications;
- A proposed cost estimate with detail to include: salary, travel, material costs and other anticipated expenses;
- A schedule of activities;
- Submission of the draft report in digital form

Grant Eligibility (must meet all of the following criteria)

- Must be a Government Agency, Academic Institution (University) or scientific non-profit institution with offices located in either Nevada or California;
- Specific experience working with Greater Sage-grouse in Nevada and measuring demographic parameters and habitat selection of sage-grouse;
- Must also have prior experience assessing the effects of predator control (specifically ravens) efforts on sage-grouse populations.

Scope of Work

The following methods have been applied to reach similar objectives for multiple other sage-grouse research and monitoring projects across Nevada and the Bi-State region since 2003.

Objective 1: Sage-Grouse Capture and Radio-GPS Telemetry

- Capture and mark sage-grouse using spotlighting techniques (Wakkinen et al. 1992, Giesen et al. 1982) during the fall and spring of each year.
- Captured birds will be aged, weighed, sexed, banded, measured including total tarsus, culmen, wing chord and primary 1,9,10, and fitted with either a necklace-mounted very

high frequency (VHF) radio transmitter with an activity sensor (Sveum et al. 1998), or a rump-mounted GPS transmitter (the decision to fit either a GPS or VHF transmitter will be made randomly for each bird).

- Data from the GPS transmitters will be downloaded from the ARGOS website and post-processed using various computer software and quality control measures. However, GPS technology is costly, and use of additional VHF transmitters will allow us to increase our sample size for demographic analyses.
- All birds will be released at the point of capture and the location marked using a Global Positioning System (GPS).
- Radio-marked birds will be followed using standard tracking protocols every two to three days.
    - All bird locations will be recorded in Universal Transversal Mercator (UTM) units.
- A Microsoft Access database of all morphological, telemetry, GPS, and vegetation information collected within the study area will be maintained.
- Data will be collected in the field using personal digital assistants (PDA's).

<u>Objective 2: Vital rates and population trajectories</u>

Nest, Brood and Adult Survival:

- Monitoring will begin in March and continue through August (Schroeder 1997).
- Determine locations of female sage-grouse within approximately 30 m every two days throughout the nesting season using a portable receiver and hand-held antenna (Schroeder 1997). Care will be taken to not disturb the females.
- Transmitters will be equipped with an activity sensor and we will assume females are nesting when movements become localized (Connelly et al. 1993) and/or activity sensors indicate long periods of inactivity.
    - By locating the female and her nest site, data can be collected on timing of incubation, nest failure, and nest success.
- Map nest locations using a GIS.
- When monitoring indicates that a female has terminated the nesting effort, determine nest fateby examining the chorioallantoic membrane, allantoic sac, and broken eggshells (Connelly et al. 1993).
    - A membrane that is detached from the eggshell will be classified as a successful hatch (Klebenow 1969, Gregg et al. 1994).
- Clutch size will be determined when possible by counting eggshells following a successful hatch or the destruction of the nest within five days of the females' departure from the nest site (Schroeder 1997).
- Calculate nest success as the percent of all nests that hatched $\geq$1 egg (Schroeder 1997).
- Locate radio-marked females with broods on 10-day intervals until 50 days post-hatch to evaluate brood success.
- Document mortality events and record the potential cause of mortality.
    - Transmitters are equipped with mortality signals, so fixed wing aircraft will be used when personnel are not in the field to remotely monitor monthly mortality.
    - We will use these data to calculate seasonal and annual survival rates.
- Use Program MARK and R-Mark to construct nest survival models to estimate daily and annual nest, brood, and adult survival. Explore the use of shared-frailty models that facilitate data integration from multiple studies and improved the precision of survival estimated (Halstead et al. 2012)

Lek Counts

- Lek counts will be conducted following the detailed protocol in Connelly et al. (2003).
    - Surveys will be conducted at each lek 3 times per season from 15 March – 15 May each year.
    - Surveys will be conducted from a vehicle or a sufficient distance from the lek to avoid disturbance. Binoculars or spotting scopes will be used to conduct counts approximately a half hour before to 1.5 hours after sunrise.
    - New leks discovered will be monitored similarly and reported to NDOW.
- Population trajectories from lek count data will be integrated into a state-space Bayesian model and eventually combined with vital rates (i.e., survival and recruitment) with an Integrated Population Modelling approach (Coates et al. 2014).

<u>Objective 3: Spatial use and habitat associations</u>.

Home range estimation:

- Annual and seasonal home ranges will be determined from radio-marked sage-grouse using fixed kernel probabilistic density estimators in Geospatial Modelling Environment (Beyer 2012). Locations with temporally independent (e.g., > 12 hrs apart.) seasons will be broken into nesting (~ March-June), brood-rearing (~June-Aug), and fall-winter (Sept-Feb).

Movement path estimation:

- Brownian bridge models will be used to model autocorrelated movement paths for GPS-marked sage-grouse (Horne 2007). These models will allow more detailed evaluation of sage-grouse spatial use relative to encounter frequency with landscape treats (e.g., pinyon-juniper).

Macro-habitat sampling:

- Generalized land-cover representing the dominant vegetation type within 30 x 30 m pixels will be classified into binary rasters using Landsat based mapping products Nevada (i.e. SynthMap). High-resolution (2-m) layers of sagebrush and herbaceous understory recently developed by USGS (C. Homer) will also be utilized.
- Proportions of each land-cover type in each 30 x 30 m pixel that sage-grouse might perceive across the landscape will be measured in a GIS at three spatial scales.
- Circular moving windows with radii of 167.9m (9 ha), 439.5 m (61 ha), or 1451.7 m (661 ha) will be used to represent previously measured minimum, mean, and maximum daily distance traveled for sage-grouse, respectively, to calculate the proportion of a particular habitat within a respective spatial scale.
- Distances to landscape features and topographic indices that may further explain variation in sage-grouse habitat use will also be calculated.
    - Distance to water features derived from the National Hydrography Database will include perennial streams, intermittent streams, all streams, springs, and open waterbodies.
    - Elevation, slope, and surface roughness (i.e., variance in elevation change) associated with used and available points were determined from the National Elevation Dataset

Micro-habitat sampling:

- Conduct intensive micro-habitat surveys for all nests and brood locations. In addition, conduct habitat surveys at dependent random (based off the used location) and independent random (randomly generated within the study area boundaries) locations.
- Determine micro-habitat selection by comparing habitat use to availability, with emphasis on nest sites and brood rearing sites.
- Measure species composition and vegetation characteristics at use sites to determine habitat use as described below.
- Estimate habitat availability by measuring the same variables at randomly sampled sites stratified within similar habitats (Drut et al. 1994).
- Measure shrub canopy cover using three 20-m transects (Canfield 1941, Drut et al. 1994) and understory and grasses using five uniformly spaced rectangular plots of 20 by 50-cm along each transect (Daubenmire 1959).
- Record canopy cover, shrub height, percentage cover for perennial/annual grasses and forbs, maximum perennial grass/forb height, grass droop height, residual grass height (Wakkinen 1990, Gregg et al. 1994).
- Measure vertical vegetation cover at the nest site using a Robel pole and two additional readings along each 20-m transect (Robel et al. 1970, Sveum et al. 1998).
    - Nest shrub species, maximum height and width, percent dead/bare, and distance to different covertype/water source will also be recorded.

Monitoring avian predators:

- Conduct point surveys for ravens and raptors throughout study sites from 15 May – 01 August each year.
    - Use binoculars to count the numbers of avian predators, flying or perched, at each point.
    - Use rangefinders and compasses to calculate a projected UTM coordinate of each avian predator.
- Quantify nesting and perching activities of ravens and raptors at surveys along transmission lines and other associated infrastructure.
- Record subsidies including livestock, feral horses, irrigation, fences, and other similar structures.
    - These results will provide valuable information in effective strategies to reduce secondary predator effects (indirect).

<u>Objective 4. Habitat selection and demographic models</u>

- Develop resource selection functions (RSF) for sage-grouse nesting, brood rearing, and winter seasons and annual use using logistic regression analyses within a generalized linear mixed model (GLMM) framework by contrasting use and availability data (Manly et al. 2002).
    - Use a multi-part variable selection procedure that relies on bias-corrected Akaike's information criterion (AICc) (Burnham and Anderson 2002) that ultimately identifies the most parsimonious RSF model for each site (Coates et al. in press).
    - Within a raster GIS, model-averaged parameter estimates are then applied to each pixel across the study area extent to create a baseline resource selection map for sage-grouse.
- Compare habitat selection parameter coefficients among control and disturbed sites.

- Fit covariates to survival models to describe environmental factors most responsible for variation in daily and annual nest, brood, and adult survival.
    - Each of these analyses will include covariates of distance to infrastructure, micro- and macro-scale habitat covariates, raven abundance, and individual covariates (e.g., grouse age).
    - Use a multi-part variable selection procedure that relies on bias-corrected AICc that ultimately identifies the most parsimonious model for each survival period and evaluate differences between control and disturbed sites.

1. Location and Description:
   a) The Cortez Range study area is located in northern Eureka County between State Highway 278 and 306. The range is a southwest to northeast trending mountain range typical of other mountain ranges in this portion of the Great Basin. The range is composed of private and public lands managed by the Bureau of Land Management. Uses include historic and current mining, livestock grazing and hunting. The range has experienced several wildfires over the past 30 year period. The Horse Creek area of this mountain range is proposed for significant mineral development over the next decade. Several sage-grouse leks are in close proximity to this development.
   b) The Pinion Range study site is situated in southwestern Elko County south of Elko, NV. This range is a north/south trending mountain range dominated by big sagebrush, mountain shrub, pinyon and juniper and some aspen communities. The area is composed of a mix of private and public lands managed by the Bureau of Land Management. The head of Cissillini Canyon, a drainage to Dixie Creek, just south of Ravens Nest and Bunker Hill is proposed for significant mineral development.

2. Contractor furnished property and services:
   The contractor shall furnish all labor, equipment, and supplies necessary to perform all work as set forth in the specification.

3. Government furnished property and services:
   No government furnished property is being provided by NDOW.

4. Selection Process:
   The winning proposal will be selected through the NDOW scoring process, outlined in the NDOW Subgrant Manual at https://www.ndow.org/wp-content/uploads/2021/12/NDOW-GRANTS-MANUAL-4.17.17.pdf.

5. Contract Monitor
   A. Contract Monitor: Shawn Espinosa
      Nevada Department of Wildlife
      6980 Sierra Center Parkway
      Reno, NV 89521
      Phone: (775) 688-1523
      E-mail: sespinosa@ndow.org

6. Reporting

   The successful subgrantee shall be required to provide NDOW with an annual progress report due by December 31st of each year of the project and monthly progress updated from March through July to provide updates and accomplishments during the field season.

Reporting deadlines and content shall be consistent with normal Federal Grant reporting requirements and will be detailed in the subgrant award.

7. Invoicing

   A. All invoices shall be sent to the contract monitor listed above.
   B. If the full complement of objective is not met, and the vendor deems continued efforts are no longer feasible or worthwhile for the term of the contract then an invoice should be submitted for the work completed up to that point for which NDOW has not already been invoiced.