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Nevada Department of Wildlife

Predator Management Plan

Fiscal Year 2016

1 July 2015 to 30 June 2016



Photo Courtesy of A. Stinson

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Summary

The goal of the Nevada Department of Wildlife's (NDOW's) Predator Management Program is to conduct projects consistent with the terrestrial portion of the Department's Mission "to preserve, protect, manage and restore wildlife and its habitat for the aesthetic, scientific, educational, recreational and economic benefits to citizens of Nevada and the United States." In addition, provisions outlined in NRS 502.253 authorize the collection of a \$3 fee for each big game tag application, depositing the revenue from such a fee collection into the Wildlife Fund Account and used by the Department to 1) manage and control predatory wildlife, 2) pay for management activities relating to the protection of non-predatory game animals and sensitive wildlife species and related wildlife habitat, 3) conduct research, as needed, to determine successful techniques for managing and controlling predatory wildlife, including studies necessary to ensure effective programs for the management and control of predatory wildlife, and 4) fund education of the general public concerning the management and control of predatory wildlife. Expending a portion of the money collected to enable the State Department of Agriculture and other contractors and grantees to develop and carry out programs designed as described above; developing and conducting predator management activities under the guidance of the Wildlife Commission; and a provision that the \$3 fee monies remain in the Wildlife Fund Account and do not revert to State General Funds at the end of any fiscal year, are additional provisions of the Statute.

NDOW maintains a philosophy that predator management is a tool to be applied deliberately and strategically. Predator management may include lethal removal of predators or corvids, nonlethal management of predator or corvid populations, habitat management to promote more robust prey populations which are better able to sustain predation, monitoring and modeling select predator populations, managing for healthy predator populations, and public education. Predator management should be applied on a case-by-case basis, with clear goals, and based on an objective scientific analysis of available data. It should be applied with proper intensity and at a focused scale. Equally important, projects should be monitored to determine whether desired results are achieved.

NDOW is committed to using all available tools and the most up-to-date science, including strategic use of predator management, to preserve our wildlife heritage for the long term.

Budget Summary

Current proposed predator projects for fiscal year 2015 include \$372,000 for lethal work and \$84,000 for non-lethal work. This accounts for 81.4% of proposed \$3 predator fee expenditures being used for lethal control.

Table of Contents

TYPES OF PROJECTS	5
FY 2016 PROJECTS RECOMMENDED FOR CONTINUATION.....	6
Project 21: Greater Sage-Grouse Protection (Raven Removal).....	6
Subproject 21-02: Raven Removal and Greater Sage-Grouse Nest Success.....	9
Project 22: Mule Deer-Game Enhancement	12
Subproject 22-16 Coyote Den Density Effects on Mule Deer Fawns and Other Wildlife Species	17
Subproject 22-074: Mountain Lion Removal and Diet Analysis for the Protection of Rocky Mountain Bighorn Sheep	20
Project 32: Mountain Lion, Black Bear, and Mule Deer Interactions	24
Project 35: Using Genetic Testing to Identify Origin of Red Fox	27
FY 2016 NEWLY PROPOSED PROJECTS	30
Project 37: Big Game Protection-Mountain Lions	30
Project 38: Big Game Protection-Coyotes	32
Project 39: Predator Education	34
Project 40: Coyote Removal to Complement Multi-faceted Management in Eureka County .	37
PROJECTS RECOMMENDED FOR DISCONTINUATION	40
Subproject 22-205/207: Gabbs Valley Range Desert Bighorn Release Protection	40
Project 25: Coyote Diet and Habitat Selection	41
Project 29: Roadway Carrion Management to Enhance Greater Sage-Grouse Populations	43
Project 30: Landfill Waste Stream Management to Enhance Greater Sage-Grouse	44
Project 33: Bi-State Sage-Grouse Nesting Habitat Restoration.....	45
Overall Budget	46
Literature Cited	47
Appendix.....	49

Below are the three categories of projects in the predator management plan. Some projects have aspects of multiple types within a single activity or action. The project types are listed throughout this document.

TYPES OF PROJECTS

1. **Implementation:** The primary objective is to implement management of predators through lethal or non-lethal means. NDOW will collaborate with USDA Wildlife Services and private contractors to conduct lethal and non-lethal management of predators. NDOW and collaborators will collect all possible data to make inference on outcome and effectiveness of project, although this is not the primary objective.
2. **Experimental Management:** The primary objectives are management of predators through lethal or non-lethal means and to learn the effects of a novel management technique. NDOW will collaborate with Wildlife Services, private contractors, and other wildlife professionals to conduct lethal or non-lethal management of predators and will put forethought into project design. Expected outcomes will include project effectiveness, agency reports, and possible peer-reviewed publications.
3. **Experimentation:** The primary objective is for increasing knowledge of predators in Nevada. NDOW may collaborate with other wildlife professionals to study and learn about predators of Nevada. Expected outcomes will include agency reports, peer-reviewed publications, and information on how to better manage Nevada's predators.

FY 2016 PROJECTS RECOMMENDED FOR CONTINUATION

Project 21: Greater Sage-Grouse Protection (Raven Removal)

Justification

This project proposes to lethally remove ravens from known Greater Sage-Grouse leks and nesting habitats. It also proposes to monitor raven densities with the intentions of improving future raven removal efforts.

Project Manager

Pat Jackson, Nevada Department of Wildlife

Project Type

Implementation and Experimental Management

Project Goals

1. Improve understanding of raven density effects on Great Sage-Grouse populations through impacts on nest success, brood survival, and recruitment.
2. Identify local areas for project implementation through collaboration with NDOW and Wildlife Services wildlife biologists.
3. Increase populations of Greater Sage-Grouse in localized areas and where deemed feasible.

Anticipated Results

1. The removal of ravens is intended to result in long-term protection for Greater Sage-Grouse populations through increases in nest success, brood survival, and recruitment.
2. Monitoring of raven densities will provide managers with information about effective locations for raven removal locations, potentially using a resource selection function model designed to display areas of high raven density that overlap with important sage-grouse use areas.

Potentially Impacted Species

Common Raven, Greater Sage-Grouse

Span More Than One Fiscal Year

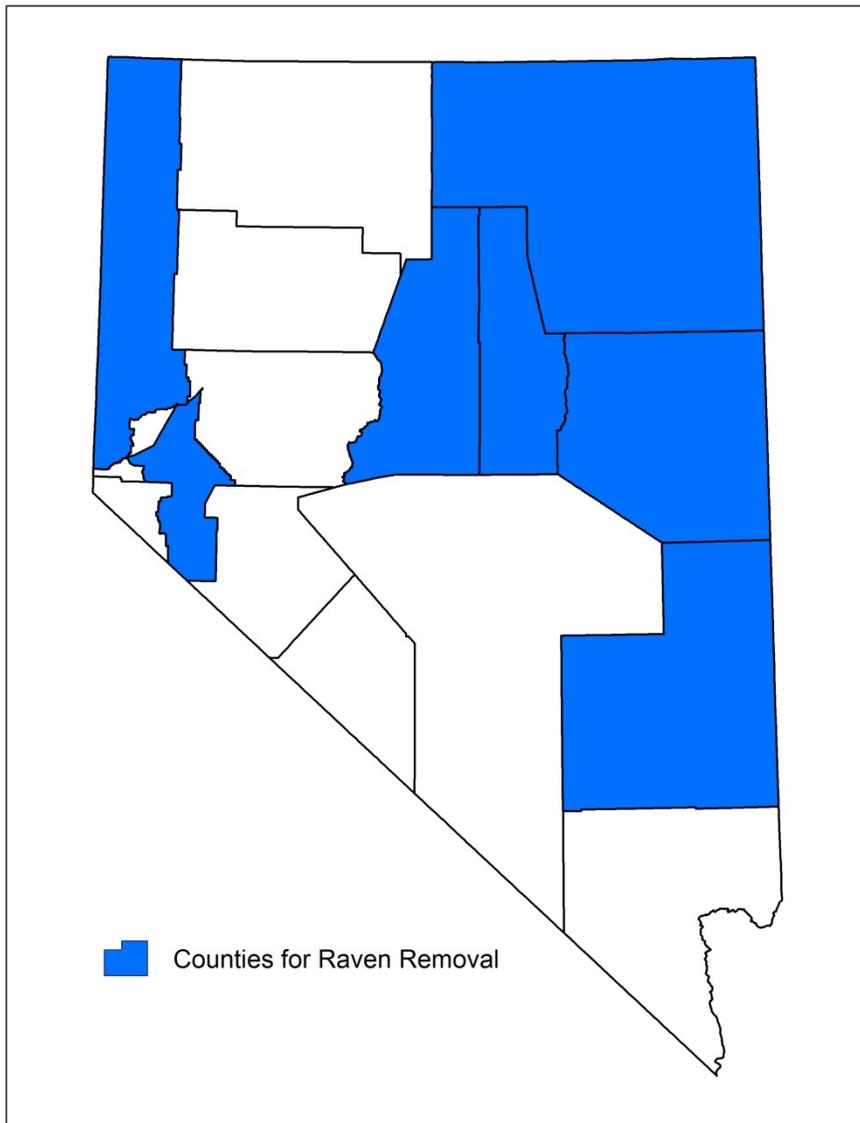
Yes

Limiting Factor Statement

Though predation is a naturally occurring phenomenon for Greater Sage-Grouse, their populations can be lower or suppressed by abiotic factors such as dry climate and loss of quality habitat. Increases in predator numbers can also cause decreases in Greater Sage-Grouse populations; raven abundance has tripled throughout their native ranges, with increases as much as 1,500% in some areas (Boarman 1993, Coates et al. 2007, 2014, Sauer et al. 2011).

Project Area

Elko, Eureka, Humboldt, Lander, Lincoln, Lyon, Washoe, and White Pine counties



Habitat Conditions

Areas of raven removal will be within or in close proximity to Greater Sage-Grouse leks, nesting habitat, and brood-rearing habitat. Persistent drought throughout Nevada has reduced herbaceous cover on nesting and brood-rearing habitat.

Comments from FY 2014 Predator Report

None

Methods

Following the Objective 1.1, 1.2, and 1.3 from the 2014 Nevada Greater Sage-Grouse Conservation Plan (<http://sagebrushco.nv.gov/>), a standard protocol will be set for raven removal efforts (See appendix).

Lethal Removal

Chicken eggs treated with the avicide (DRC-1339) will be deployed to remove ravens (Coates et al. 2007). To reduce non-target species exposure, no eggs will be left in the environment for over 96 hours. No leftover eggs will be used on subsequent treatments. All remaining eggs and any dead ravens found will be collected and disposed of properly as per avicide management protocol. Raven take will be estimated at 1 raven per 11 eggs gone (Coates et al. 2007).

Monitoring

Point counts for ravens will be conducted from March through July of each year, which corresponds with Greater Sage-Grouse nesting and brood-rearing season. Surveys will be similar to Ralph et al. (1995): lasting 10 minutes; conducted between sunrise and 1400; conducted under favorable weather conditions; and stratified randomly across study areas (Luginbuhl et al. 2001, Coates et al. 2014).

Recommendations

Fund Project 21. Evaluate efficacy of Project 21 annually.

Budget

<u>\$3 Predator Fee</u>	<u>Pittman-Robertson</u>	<u>Total</u>
\$78,000	N/A	\$78,000

Subproject 21-02: Raven Removal and Greater Sage-Grouse Nest Success

Justification

This project proposes to lethally remove ravens from known Greater Sage-Grouse leks and nesting habitats and monitor raven abundance that may be used to target further removal efforts.

Project Manager

Pat Jackson, Nevada Department of Wildlife

Project Type

Implementation and Experimental Management

Project Goals

1. Understand where raven densities may be negatively affecting Great Sage-Grouse populations.
2. Determine what method of raven management is appropriate.
3. Increase populations of Greater Sage-Grouse.
4. Implementation will occur near leks for this sensitive species to reduce raven take of nearby nests with eggs.

Anticipated Results

1. The removal of ravens and predators is intended to result in long-term protection for Greater Sage-Grouse populations.
2. Monitoring of raven densities will provide managers with needed raven management locations, potentially through a resource selection function model of raven distribution and abundance.

Potentially Impacted Species

Common raven, Greater Sage-Grouse

Span More Than One Fiscal Year

No

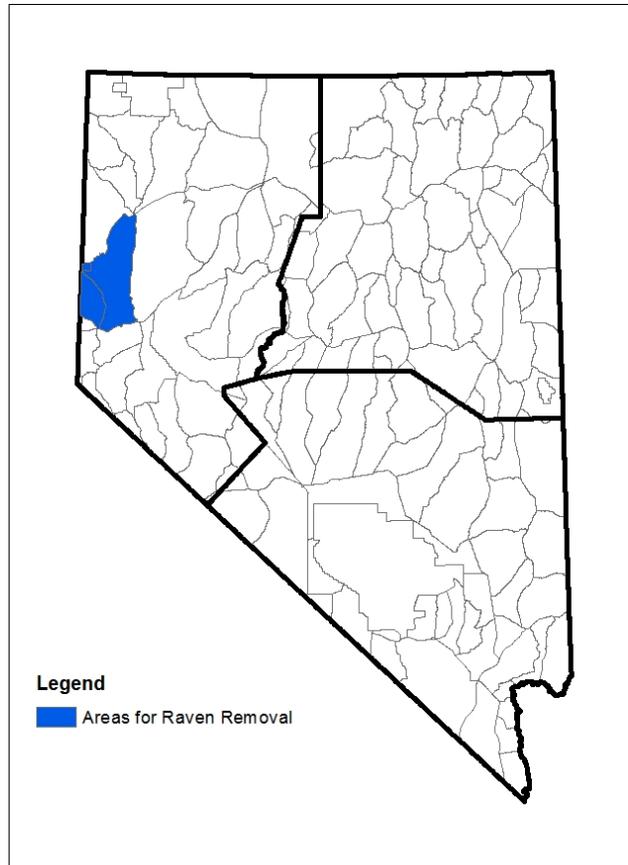
Limiting Factor Statement

Though predation is a naturally occurring phenomenon for Greater Sage-Grouse, their populations can be lower or suppressed by abiotic factors such as dry climate and loss of quality habitat. Increases in predator numbers can also cause decreases in Greater Sage-Grouse

populations; raven abundance has tripled throughout their native ranges, with increases as much as 1,500% in some areas (Boarman 1993, Coates et al. 2007, 2014, Sauer et al. 2011).

Project Area

Unit 02 the in Diamond Mountains



Introduction

Although predation is a naturally occurring phenomenon for Greater Sage-Grouse, their populations can be lower or suppressed by abiotic factors such as dry climate and loss of quality habitat. Increases in predator numbers can also cause decreases in Greater Sage-Grouse populations; raven abundance has tripled throughout their native home ranges, with increases as much as 1,500% in some areas (Boarman 1993, Coates et al. 2007, 2014, Sauer et al. 2011).

Methods

Lethal Removal

Chicken eggs treated with the avicide (DRC-1339) will be deployed to remove ravens (Coates et al. 2007). To reduce non-target species exposure, no eggs will be left in the environment for over 168 hours. No leftover eggs will be used on subsequent treatments. All remaining eggs and any dead ravens found were collected and disposed of properly as per avicide management protocol. Raven take will be estimated at 1 raven per 11 eggs gone (Coates et al. 2007).

Great Sage-Grouse Monitoring

Leks are counted a minimum of four times from March to May each year. Counts are conducted from 30 minutes before sunrise to 1.5 hours after sunrise. Greater Sage-Grouse are marked with ATS VHF transmitters, and throughout the nesting and brood-rearing periods are located at least twice per week. Greater Sage-Grouse nests are monitored a minimum of three times per week and classified as successful, depredated, partially depredated, or abandoned. Since 2009, 39 nests have received camouflaged micro-cameras with time-lapsed video recorders to determine the outcome or to identify nest predators.

Development of Resource Selection Function (RSF)

Development of RSF analyses for raven habitat in Nevada will provide NDOW with information to more effectively understand raven population patterns across the state and to effectively implement management actions to reduce raven predation pressures on greater sage-grouse. The RSF mapping process is a data-driven approach that uses raven survey data and multiple environmental factors, including spatial land cover types at multiple spatial scales, edge (interface between two land cover types) indices, energy infrastructure, and other anthropogenic subsidies to determine the landscape parameters for which ravens select. The USGS has recently carried out this habitat mapping approach for ravens within the Idaho National Laboratory in southeastern Idaho (Coates et al. 2014).

Recommendations

Fund subproject 21-02 through FY 2016.

Budget

<u>\$3 Predator Fee</u>	<u>Pittman-Robertson</u>	<u>Total</u>
\$50,000	N/A	\$50,000

Project 22: Mule Deer-Game Enhancement

This is an overarching project description with four subprojects to implement or experiment with aspects of predation management to increase predator management efficacy.

Project Manager

Pat Jackson, Nevada Department of Wildlife

Project Type

Implementation and Experimental Management

Project Goal

Enhance mule deer and other game populations where they may be at risk, experiencing chronic low recruitment, or catastrophic decline.

Anticipated Results

1. The removal of predators is intended to result in enhancement of mule deer and other big game herds.
2. Further data collection and analysis will determine the effectiveness of this project and direct wildlife management policy in the future.

Potentially Impacted Species

Coyote, Mountain Lion, Mule Deer, Bighorn Sheep, Antelope, Greater Sage-Grouse

Span More Than One Fiscal Year

Yes

Limiting Factor Statement

Though predation is a naturally occurring phenomenon for mule deer and other big game, their populations can be lowered or suppressed by abiotic factors such as dry climate and loss of quality habitat. Under these conditions, predation may be a regulating factor.

Project Area

Statewide, where determined appropriate

Habitat Conditions

Persistent drought throughout Nevada has reduced herbaceous cover, fawning, and browsing habitat.

Comments from FY 2014 Predator Report

None

Introduction

In 2009, Project 22 was initiated statewide to provide flexibility and opportunity to respond quickly to conditions on the ground that biologists believe could be adversely affecting population trajectory of specific mule deer herds and other big game populations.

Methods

NDOW funds Wildlife Services and private contractors to remove predators given the constraints of weather, time, and available funding using aerial gunning, hounds, calling, call boxes, shooting, foot-hold traps, and snares to accomplish the treatment. Selective and timely management work focused on critical seasonal big game ranges. The timing of management work will be in accordance with individual project criteria, but occur primarily on critical winter ranges and summer fawning areas or in release-augmentation areas.

Recommendations

Project 22 should be phased out after completion of sub projects.

Subproject 22-01: Mountain Lion Removal to Protect California Bighorn Sheep

Justification

Lethal removal of mountain lions will allow newly reintroduced bighorn sheep populations to reach sustainable levels.

Project Manager

Pat Jackson, Nevada Department of Wildlife

Project Type

Implementation

Project Goals

1. Remove mountain lions to proactively protect newly reintroduced California bighorn sheep.
2. Determine mountain lion age structures and sex ratios.

Anticipated Results

Decrease predation from mountain lions for all age classes of newly reintroduced California bighorn sheep, resulting in an established, viable population.

Potentially Impacted Species

California Bighorn Sheep, Mountain Lion, Mule Deer

Span More Than One Fiscal Year

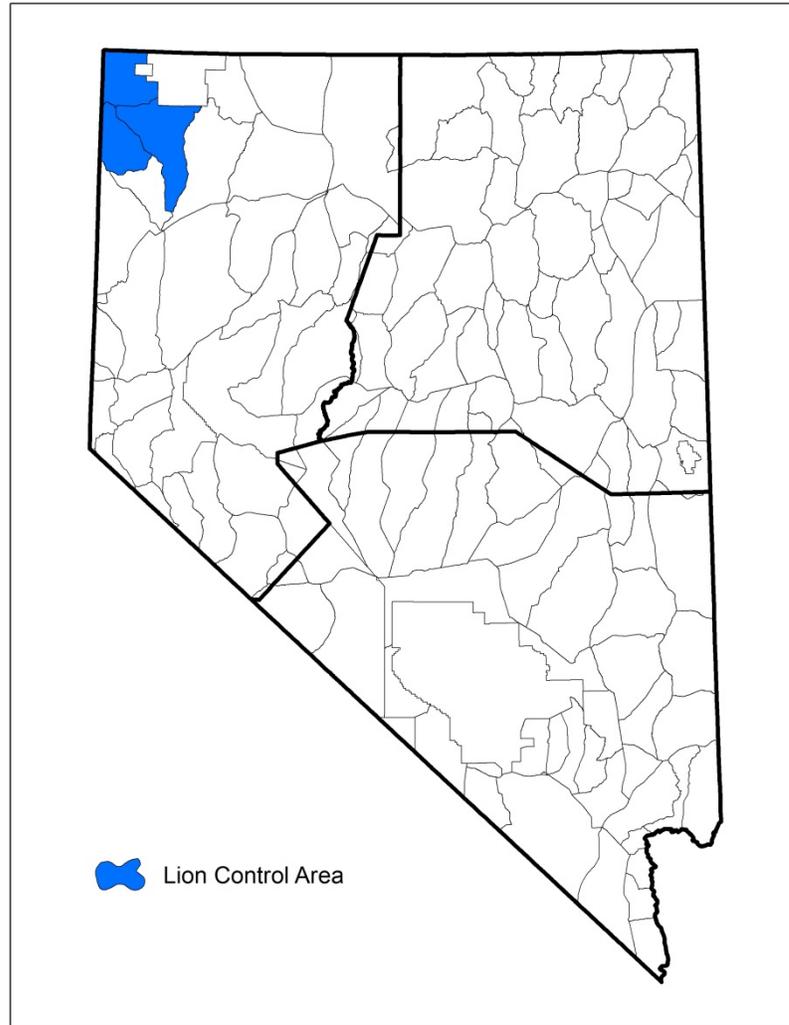
Yes

Limiting Factor Statement

Though predation is a naturally occurring phenomenon for mule deer and other big game, their populations can be lowed or suppressed by abiotic factors such as dry climate and loss of quality habitat.

Project Area

Washoe County in Units 011, 012 and 013.



Introduction

Attempts have been made to establish a California bighorn sheep population in Area 01. Significant levels of mountain lion-induced mortality have been observed. California bighorn sheep populations may require a reduction in mountain lion densities to reach population viability.

Methods

NDOW biologists and Wildlife Services will collaborate to identify current and future California bighorn sheep locations and determine the best methods to reduce California bighorn sheep mortality. Mountain lion traps, snares, baits, and call boxes will be set to proactively capture mountain lions as they immigrate into the defined sensitive areas.

Recommendations

Fund subproject 22-01. Evaluate efficacy of subproject 22-01 annually.

Budget

<u>\$3 Predator Fee</u>	<u>Pittman-Robertson</u>	<u>Total</u>
\$45,000	N/A	\$45,000

Subproject 22-16 Coyote Den Density Effects on Mule Deer Fawns and Other Wildlife Species

Formerly: Diamond Roberts Mule Deer Fawns

Justification

Understanding coyote den densities will allow for testing the efficiency of locating and removing coyotes from dens in future years. Lethal removal is intended in future fiscal years, but understanding baseline densities and the ability to detect dens are essential to effective future implementation.

Project Manager

Pat Jackson, Nevada Department of Wildlife

Project Type

Experimental Management and Implementation (Future Years)

Project Goals

1. Determine the number of active coyote dens in the Monitor Mountains and the diet of pups at discovered dens.
2. Determine the density, abundance, and/or occupancy of prey species in the Monitor including lagomorphs, Greater Sage-Grouse, and mule deer.

Anticipated Results

1. Understand how the increased caloric requirements to support coyote pups influences mule deer fawns and other wildlife species.
2. Determine the number of coyote dens across the landscape, the number of coyote dens in sensitive mule deer fawning habitat, and calculate the effort for effective management.
3. Determine efficacy of removing specific pairs of coyotes to benefit recruitment of mule deer and benefit other wildlife species.

Potentially Impacted Species

Coyote, Mule Deer

Span More Than One Fiscal Year

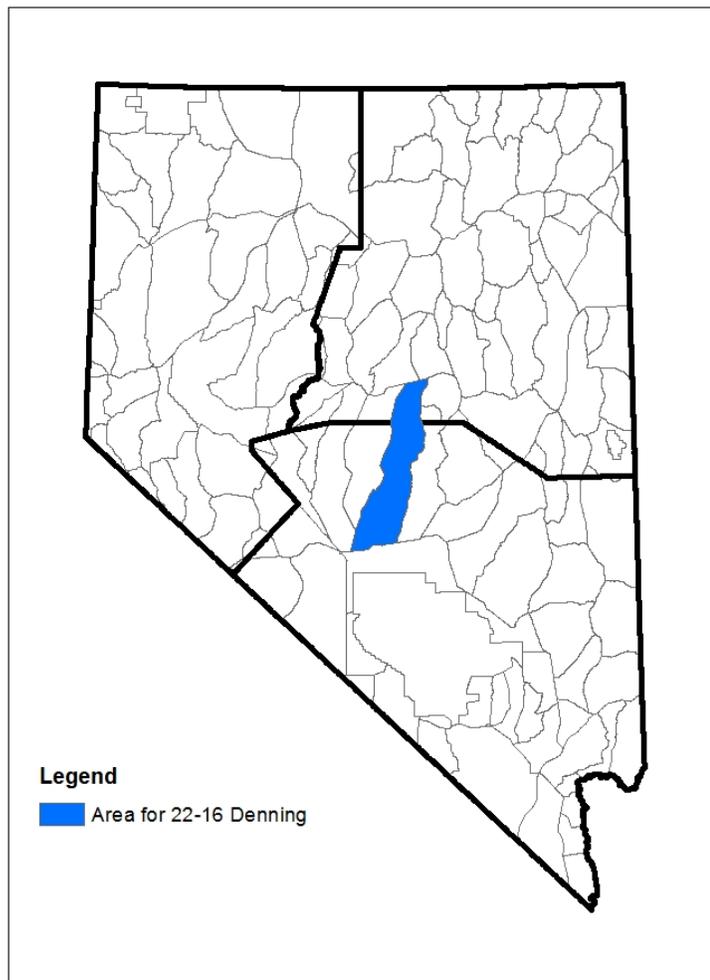
Yes

Limiting Factor Statement

Though predation is a naturally occurring phenomenon for mule deer and other big game, their populations can be lowed or suppressed by abiotic factors such as dry climate and loss of quality habitat. Under these conditions, predation may become a regulating factor.

Project Area

Monitor Mountains in Unit 162



Habitat Conditions

Persistent drought throughout Nevada has reduced herbaceous cover, fawning, and browsing habitat.

Comments from FY 2014 Predator Report

Due to questions about the original study design and data collection protocols for this project and changes in personnel within key positions at NDOW, this project should be redesigned with strong collaboration between NDOW field biologists, regional supervisors, wildlife staff biologists, and personnel conducting the carnivore work. Previous portions of this project intended to address sage grouse populations should be separated and specifically designed for that species.

Although scheduled to end in June 2015, NDOW will make recommendations regarding plans to amend work plans and continue predation management in accordance with this project within the FY2016 plan.

Introduction

Coyotes face an increase in caloric need when raising pups, both through an increase in parent energetic output and feeding growing pups. Parent coyotes have been found to be exclusively responsible for sheep predation. Removing coyote pups from dens or preventing parents from breeding has been demonstrated to reduce predation on domestic livestock (Till and Knowlton 1983, Sacks et al. 1999, Seidler et al. 2014). Parent coyotes and their pups may consume a drastically different diet than their non-parent counterparts at the same time of year. This difference in diet likely requires larger prey, including mule deer fawns. Coyote removal may increase mule deer fawn and other wildlife species reproductive output.

Methods

Coyote dens will be found using a combination of a private contractor who specializes in coyote denning and Owyhee Air using an infrared camera. Lagomorph densities will be estimated driving road transects, using spotlights to detect individuals (Smith and Nydegger 1985, Ralls and Eberhardt 1997). Greater Sage grouse will be monitored through lek counts and wing counts. Mesocarnivores and mountain lion occupancy will be estimated using camera traps placed in a grid system (Mann et al. 2014).

Recommendations

Fund Subproject 22-16 through FY 2020. Evaluate efficacy of Subproject 22-16 annually.

Budget

<u>\$3 Predator Fee</u>	<u>Pittman-Robertson</u>	<u>Total</u>
\$40,000	\$120,000	\$160,000

Subproject 22-074: Mountain Lion Removal and Diet Analysis for the Protection of Rocky Mountain Bighorn Sheep

Formerly: Protection of Rocky Mountain Bighorn Sheep in Badlands, Unit 074

Justification

Lethal removal of mountain lions will allow reintroduced Rocky Mountain bighorn sheep populations to reach sustainable levels.

Project Manager

Pat Jackson, Nevada Department of Wildlife

Project Type

Implementation and Experimental Management

Project Goals

1. Remove mountain lions within close proximity of Rocky Mountain bighorn sheep to allow for population growth. This removal will be implemented only in association with herds that are being affected negatively by mountain lion predation as determined by the best available biological evidence.
2. Establish stable isotope signatures for prey species in Unit 074, and compare these signatures to removed mountain lion signatures to determine mountain lion diet.

Anticipated Results

1. Decrease predation from mountain lions for all age classes of Rocky Mountain bighorn sheep.
2. Data collected through the removal of mountain lions will increase understanding of population dynamics and age structure, and will help to determine the level of exploitation in the population.
3. Stable isotopes collected from mountain lions and prey species will provide insight of mountain lion diet on a weekly, monthly, and lifetime span for Unit 074 and potentially statewide.

Potentially Impacted Species

Rocky Mountain Bighorn Sheep, Mountain Lion, Mule Deer

Span More Than One Fiscal Year

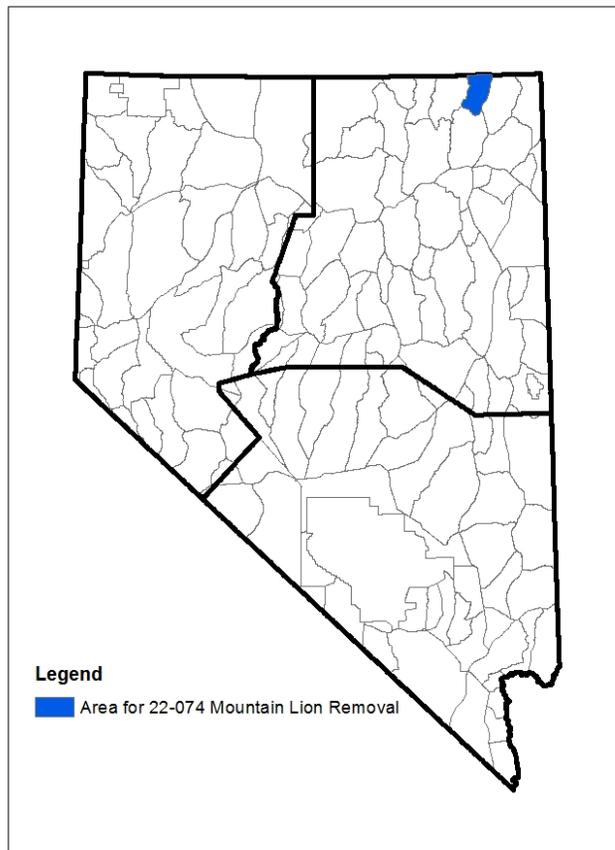
Yes

Limiting Factor Statement

Though predation is a naturally occurring phenomenon for mule deer and other big game, their populations can be lowed or suppressed by abiotic factors such as dry climate and loss of quality habitat.

Project Area

Elko County within Unit 074



Habitat Conditions

Persistent drought throughout Nevada has reduced herbaceous cover, lambing, and browsing habitat.

Comments from FY 2014 Predator Report

None

Introduction

The Unit 074 Rocky Mountain bighorn sheep herd experienced a die-off in 1999. Two years following the die-off the lamb recruitment was low, remaining consistent with bighorn sheep die-offs. Since then the average lamb recruitment has been 48 lambs:100 ewes. This level of recruitment should have resulted in an increasing sheep herd; however sheep numbers have remained stagnant.

The Contact area is a major deer winter range. It is possible that mountain lions following the deer herd to winter range from the nearby Jarbridge mountains are remaining after the deer have left in the spring and switching their diet to bighorn. Some mountain lions may be staying in the area on a year-round basis with their primary food source being Rocky Mountain bighorn sheep.

Methods

Minimum convex polygons (MCP) will be drawn around GPS data from collared sheep. These MCPs will be used to define the area for mountain lion removal (Fig 1). Removals will be conducted in winter months to take advantage of snow conditions. Removals will be conducted with mountain lion hounds; fresh samples of blood and tissue are imperative for stable isotope examples. Samples for stable isotope analysis will be collected from prey including Rocky Mountain bighorn sheep, mule deer, elk, jackrabbits, bobcats, and coyotes through helicopter captures, collected specimens, hunters, trappers, and road kill.

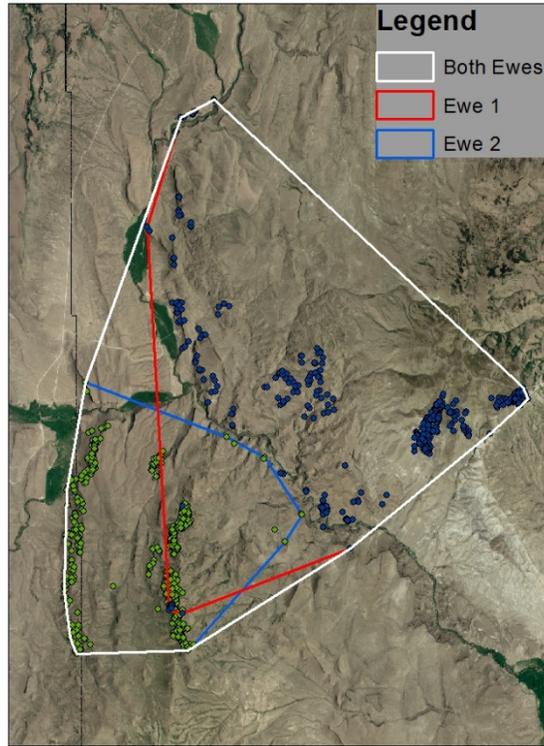


Figure 1. Minimum convex polygons and GPS points from two ewes collared for subproject 22-074.

Recommendations

Fund subproject 22-074. Evaluate efficacy of subproject 22-074 annually.

Budget

<u>\$3 Predator Fee</u>	<u>Pittman-Robertson</u>	<u>Total</u>
\$45,000	N/A	\$45,000

Project 32: Mountain Lion, Black Bear, and Mule Deer Interactions

Justification

Black bears are expanding numerically and geographically, and in so doing they are recolonizing historic ranges in Nevada. It is imperative to understand to what extent this increasing distribution is affected by their interactions with lions. Black bear interactions with mountain lions at kill sites could potentially have effects on mule deer populations, and possible implications on livestock husbandry practices.

Project Manager

Jon Beckmann, Wildlife Conservation Society

Project Type

Experimentation

Project Goals

1. Increase understanding of apex predator resource partitioning, competition, and commensalism in desert ranges where black bears have established territories recently that overlap those of mountain lions.
2. Determine if mountain lion predation rates on mule deer increase in areas occupied by black bears.
3. Determine if mountain lion conflicts with humans increase where black bears are present (i.e., prey switching to less energetically expensive prey such as domestic livestock).

Anticipated Results

1. Improved understanding of mountain lion and bear dietary preference, dietary overlap and prey switching capabilities will provide insight for better big game population management.
2. Targeted predator population management could improve attendant big game population management which has implications for big game tag allocation.
3. Mountain lion subsidies may increase black bear recolonization eastward into Nevada, which could have direct implications on future management decisions.
4. Use field-based, scientific data to understand, predict, and potentially mitigate, changes in human-lion conflict where bears are re-establishing historic ranges.

Potentially Impacted Species

Mule deer, mountain lion, black bear

Span More Than One Fiscal Year

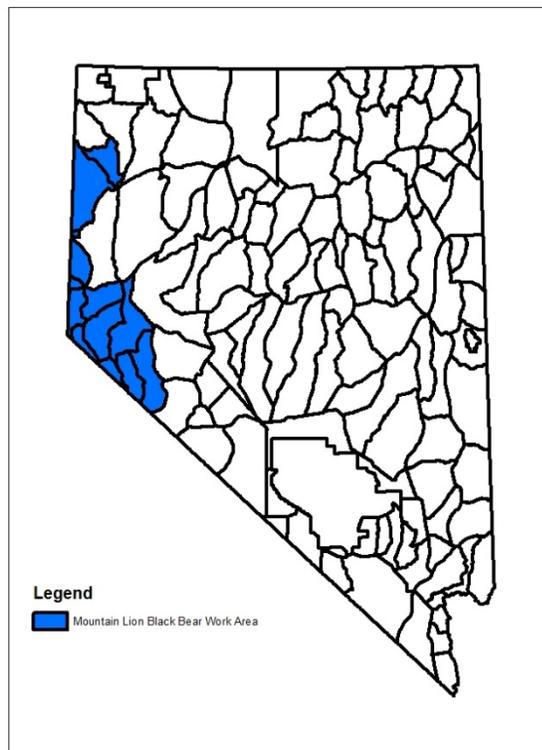
Yes

Limiting Factor Statement

Black bears have expanded their distribution in western Nevada recently to include historical bear habitat in desert mountain ranges east of the Sierra Nevada and Carson Front (Beckmann and Berger 2003, Lackey et al. 2013). Additionally, recent findings have shown during summer months 50% of mountain lion killed deer are scavenged by black bears (Andreasen 2014, unpublished data). The current recolonization of historic bear habitat provides a unique opportunity to determine if these interactions between black bears and mountain lions are subsidizing the bear population increase.

Project Area

Units 014, 015, 021, 192, 194, 195, 196, 201, 202, 203, 204, 291



Habitat Conditions

The study area consists of mountain ranges and associated basins that are characterized by steep topography with high granite peaks and deep canyons. Mountain ranges are separated by desert basins that range from 15–64 km across (Grayson 1993). These basins are often large expanses of unsuitable habitat (e.g., large areas of sagebrush [*Artemisia* spp.]) that bears and lions do not use as primary habitat.

Comments from FY 2014 Predator Report

None

Methods

A minimum of 18 black bears, 18 mountain lions, and 60 mule deer will be captured and fitted with Vectronic brand GPS PLUS collars with proximity sensors to assess behavioral responses of each species upon close interaction. We will attempt to maintain sample sizes of six bears and six mountain lions collared in each of our three study areas for five years. Mule deer will be fit with Vectronic brand GPS PLUS Vertex Survey collars to monitor daily survival of individuals and to estimate annual adult doe survival in each study area. To further maximize probability of recording carnivore-carnivore interactions, we will monitor kill sites of collared mountain lions with real-time trail cameras and target black bears scavenging from lion kills for collaring with GPS proximity collars.

Recommendations

Fund Project 32 through FY 2020. Evaluate efficacy of Project 32 annually (see appendix).

Budget

<u>\$3 Predator Fee</u>	<u>Pittman-Robertson</u>	<u>Total</u>
\$40,000	\$120,000	\$160,000

Project 35: Using Genetic Testing to Identify Origin of Red Fox

Justification

Exotic red fox populations may be increasing in Nevada, which can negatively affect Greater Sage-Grouse populations. Understanding this increase to properly manage and potentially reclassify red fox populations is imperative; red fox may disproportionately affect the Bi-State population of Greater Sage-Grouse.

Project Manager

Russell Woolstenhulme, Nevada Department of Wildlife

Project Type

Experimentation

Project Goals

1. Determine if European red fox are spreading and hybridizing with native Sierra Nevada red fox.
2. Determine potential zones of occupation for any delineated populations.
3. Potentially make recommendations to reclassify red fox in the state of Nevada to unprotected.

Anticipated Results

1. Determine if European red fox are spreading and hybridizing with native Sierra Nevada red fox.
2. Potentially make recommendations to reclassify red fox in the state of Nevada to unprotected.

Potentially Impacted Species

European Red Fox, Sierra Nevada Red Fox, Greater Sage-Grouse

Span More Than One Fiscal Year

No

Limiting Factor Statement

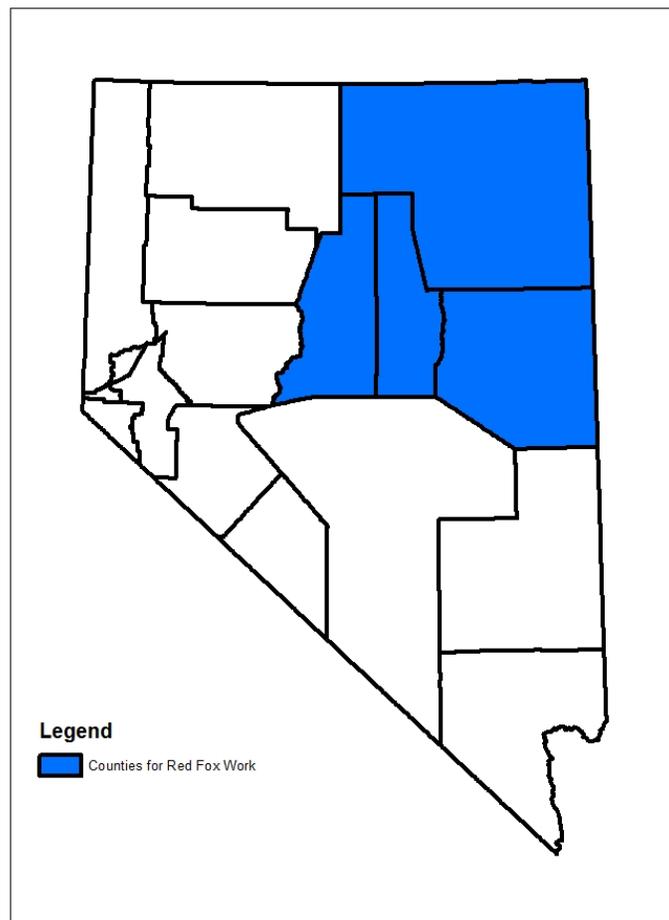
The red fox can be a significant predator of ground-nesting birds and is known to affect several endangered ground-nesting bird species, including Greater Sage-Grouse in the western United States (Connelly et al. 2000, Slater 2003) As of 1996, red fox numbers appeared to be expanding in northeast Nevada and were presumed to be non-native in origin (Kamler and Ballard 2002). Recent trapping activity in this part of the state suggests that expansion has

increased rapidly in the past 2 years and preliminary data from some locations support the suggestion that these may be of a non-native origin (R. Stoeberl, personal communication).

Red foxes occurred historically at low abundance among “sky island” mountain ranges of the Great Basin (Perrine et al. 2007). However, red foxes have increased significantly in abundance and range, and currently occur in many areas of Nevada that overlap sage-grouse lek and nesting habitat where they were not formerly known to occur. Thus, it is likely that this efficient avian predator could pose a significant threat to Greater Sage-Grouse in Nevada. The genetic origin of these foxes is currently unknown.

Project Area

Elko, White Pine, Lander, and Eureka counties



Habitat Conditions

Persistent drought throughout Nevada has reduced herbaceous cover on Greater Sage-Grouse nesting and broad-rearing habitat.

Comments from FY 2014 Predator Report

None

Methods

A UC Davis genetics lab will genotype fox samples with 33 high-resolution nuclear loci to compare with historical and modern reference samples previously published (Aubry et al. 2009, Sacks et al. 2011). These samples will be provided from private trappers and a graduate student conducting surveys during summer months. Analyze genotypes will be analyzed to determine native vs. non-native ancestry, genetic affinities of native and non-native samples to assess hybridization, and genetic affinities of non-native northeast Nevada genotypes. To determine source of origin, samples will be compared with those from populations in western Utah and southern Idaho.

Recommendations

Fund Project 35 through FY 2016. See appendix.

Budget

<u>\$3 Predator Fee</u>	<u>Pittman-Robertson</u>	<u>Total</u>
\$2,500	\$7,500	\$10,000

FY 2016 NEWLY PROPOSED PROJECTS

Project 37: Big Game Protection-Mountain Lions

Justification

Removing mountain lions that prey on sensitive game populations quickly is a required tool to manage big game populations statewide.

Project Manager

Pat Jackson, Nevada Department of Wildlife

Project Type

Implementation

Project Goal

Remove specific, problematic mountain lions to benefit game species.

Anticipated Result

1. Lethal removal of individual, problematic mountain lions will provide a precise tool, protecting reintroduced and sensitive big game populations.
2. Implementation will occur in association with game populations that are sensitive (e.g., small in size, limited in distribution, in decline) and may benefit from rapid intervention from specific predation scenarios.

Potentially Impacted Species

Mountain Lion, Mule Deer, Bighorn Sheep, Antelope

Span More Than One Fiscal Year

Yes

Limiting Factor Statement

Though predation is a naturally occurring phenomenon for mule deer and other big game, their populations can be lowed or suppressed by abiotic factors such as dry climate and loss of quality habitat. Predation may become a regulating influence under these conditions.

Project Area

Statewide

Habitat Conditions

Persistent drought throughout Nevada has reduced herbaceous cover, fawning, and browsing habitat.

Comments from FY 2014 Predator Report

N/A

Introduction

In some circumstances, culling of top predators is beneficial for protection of newly translocated big-game populations, small and isolated big-game populations, or big-game populations held below carrying capacity by predation (Hayes et al. 2003, Rominger et al. 2004, McKinney et al. 2006). The geographic range of mountain lions is larger than any big-game mammal in North and South America (Logan and Sweanor 2000), and specific areas may benefit from removal efforts that may target more than a single mountain lion.

Methods

Working with Wildlife Services, private houndsmen, and private trappers, NDOW will specify locations of mountain lions that may be influencing local declines of sensitive game populations. Locations will be determined with GPS collar points, trail cameras, and discovered mountain lion kill sites. Work will be implemented when population trends are detected, fawn to doe ratios fall below 20:100, problematic mountain lions are detected on trail cameras (i.e. at water sources) or area biologists have other biological evidence demonstrating mountain lion removal is necessary.

Recommendations

Evaluate efficacy of Project 37 annually.

Budget

<u>\$3 Predator Fee</u>	<u>Pittman-Robertson</u>	<u>Total</u>
\$90,000	N/A	\$90,000

Project 38: Big Game Protection-Coyotes

Justification

Removing problematic coyotes quickly is a required tool to manage big game populations statewide.

Project Manager

Pat Jackson, Nevada Department of Wildlife

Project Type

Implementation

Project Goal

Conduct focused coyote removal to protect game species.

Anticipated Result

1. Removal of coyotes in winter range and fawning areas in certain situations will provide a valuable tool for managers.
2. Implementation will occur during times and locations where sensitive game species are adversely affected (e.g., local decline, reduced recruitment) based on the best available biological information.

Potentially Impacted Species

Coyote, Mule Deer, Antelope

Span More Than One Fiscal Year

Yes

Limiting Factor Statement

Though predation is a naturally occurring phenomenon for mule deer and other big game, their populations can be lowed or suppressed by abiotic factors such as dry climate and loss of quality habitat. Predation may become a regulating factor under these circumstances.

Project Area

Statewide

Habitat Conditions

Persistent drought throughout Nevada has reduced herbaceous cover, fawning, and browsing habitat.

Comments from FY 2014 Predator Report

N/A

Introduction

Coyotes face an increase in caloric need when raising pups, both through an increase in parent energetic output and feeding growing pups. Parent coyotes have been found to be exclusively responsible for sheep predation, removing coyote pups from dens or preventing parents from breeding has been demonstrated to reduce predation on domestic livestock (Till and Knowlton 1983, Sacks et al. 1999, Seidler et al. 2014). Parent coyotes and their pups may consume a drastically different diet than their non-parent counterparts at the same time of year; this difference in diet likely requires larger prey, including mule deer fawns. Removing coyotes may increase mule deer fawn and other wildlife species reproductive output.

Methods

Wildlife Services and private contractors working under direction of NDOW, will use foothold traps, snares, fixed-wing aircraft and helicopters for aerial gunning, calling and gunning from the ground to remove coyotes in sensitive areas during certain times of the year. Work will be implemented when population trends are detected, fawn to doe ratios fall below 20:100, or area biologists have other biological evidence demonstrating coyote removal is necessary.

Recommendations

Fund Project 38. Evaluate efficacy of Project 38 annually.

Budget

<u>\$3 Predator Fee</u>	<u>Pittman-Robertson</u>	<u>Total</u>
\$90,000	N/A	\$90,000

Project 39: Predator Education

Justification

Educating the public about predator habits will reduce human-wildlife interactions, and participation with waste management. Public support and participation will benefit future predator management activities, and potentially reduce raven densities through removal of human subsidies.

Project Manager

Pat Jackson, Nevada Department of Wildlife

Project Type

Implementation

Project Goals

1. To educate the public about predator issues, biology, and management.
2. To decrease predator populations through public participation.

Anticipated Results

1. Increasing public support of predator management will benefit all stakeholders statewide.
2. The public may assist with non-lethal techniques by removing human subsidies. Removing human subsidies can reduce urban black bear complaints and raven densities.

Potentially Impacted Species

Raven, Greater Sage-Grouse

Span More Than One Fiscal Year

Yes

Limiting Factor Statement

Though predation is a naturally occurring phenomenon for Greater Sage-Grouse, their populations can be lower or suppressed by abiotic factors such as dry climate and loss of quality habitat. Increases in predator numbers can also cause decreases in Greater Sage-Grouse populations; raven abundance has tripled throughout their native ranges, with increases as much as 1,500% in some areas (Boarman 1993, Coates et al. 2007, 2014, Sauer et al. 2011).

Project Area

Statewide

Habitat Conditions

Areas of raven removal will be within or in close proximity to Greater Sage-Grouse leks, nesting habitat, and brood-rearing habitat. Persistent drought throughout Nevada has reduced herbaceous cover on nesting and brood-rearing habitat.

Comments from FY 2014 Predator Report

N/A

Introduction

Human-wildlife (primarily black bears and coyotes) interactions continue to increase as human development and wildlife habitat overlap, green spaces in urban landscapes increase, predator populations increase, and other related approaches (Luniak 2004). Reducing human subsidies can help to reduce human-wildlife interactions.

Though predation is a naturally occurring phenomenon for Greater Sage-Grouse, their populations can be lower or suppressed by abiotic factors such as dry climate and loss of quality habitat. Increases in predator numbers can also cause decreases in Greater Sage-Grouse populations; raven abundance has tripled throughout their native ranges, with increases as much as 1,500% in some areas (Boarman 1993, Coates et al. 2007, 2014, Sauer et al. 2011). Lethal removal is an important management tool, but longer term management strategies will need to include removing human subsidies including trash and livestock carcasses.

Methods

Working with counties throughout Nevada, NDOW hopes to create an educational campaign to reduce human created carrion on the landscape to reduce raven densities, primarily in close proximities to Greater Sage-Grouse leks.

Recommendations

Fund Project 39. Evaluate efficacy of Project 39 annually

Budget

<u>\$3 Predator Fee</u>	<u>Pittman-Robertson</u>	<u>Total</u>
\$1,500	\$4,500	\$6,000

Project 40: Coyote Removal to Complement Multi-faceted Management in Eureka County

Justification

Continuing predator removal will complement previous coyote removal, feral horse removal, and habitat restoration to benefit mule deer populations.

Project Manager

Pat Jackson, Nevada Department of Wildlife

Project Type

Implementation

Project Goal

To increase mule deer and Greater Sage-Grouse populations by removing coyotes.

Anticipated Results

1. Coyote removal will complement feral horse removal already conducted by the BLM, habitat improvement conducted by Eureka County, private coyote removal funded by Eureka County, and Wildlife Service coyote removal funded through Wildlife Heritage funds in 2011 and 2012.

Potentially Impacted Species

Coyote, Greater Sage-Grouse, Mule Deer

Span More Than One Fiscal Year

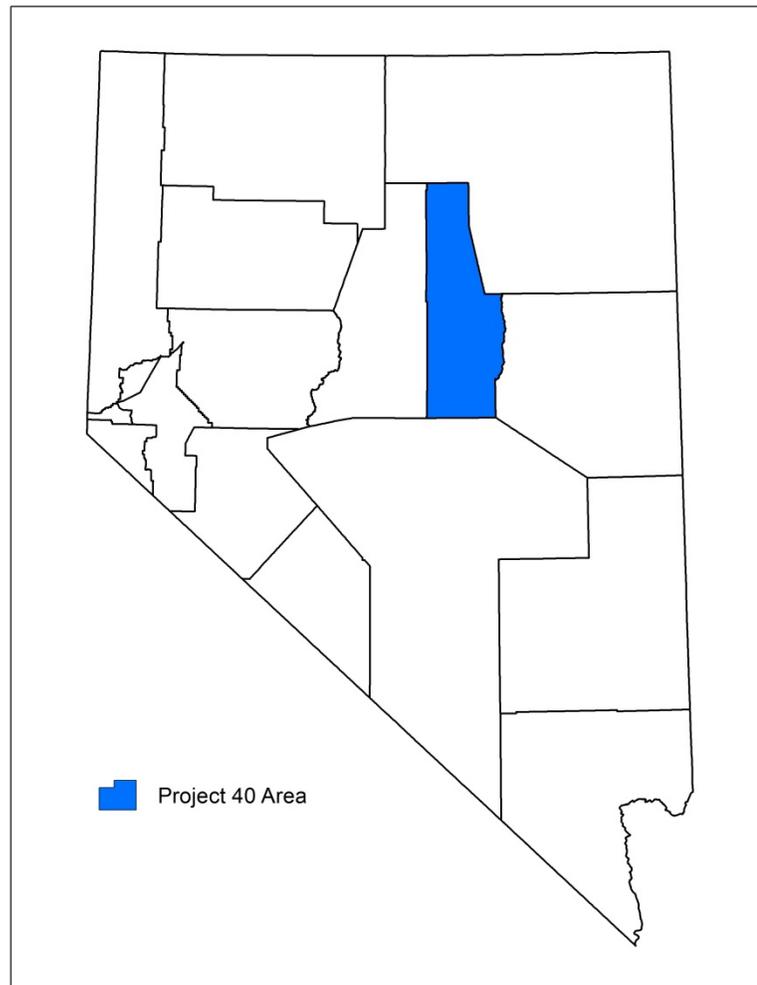
Yes

Limiting Factor Statement

Though predation is a naturally occurring phenomenon for mule deer and other big game, their populations can be lowed or suppressed by abiotic factors such as dry climate and loss of quality habitat.

Project Area

Diamond Mountains in Eureka County



Habitat Conditions

Persistent drought throughout Nevada has reduced herbaceous cover, fawning, and browsing habitat.

Comments from FY 2014 Predator Report

N/A

Introduction

The BLM conducted a feral horse round-up in the Diamond Mountains in January 2013, removing 792 horses. Eureka County and the Eureka County Advisory Board to Manage Wildlife had crews with chain saws cut pinyon and juniper trees on private range lands in the Diamonds and Roberts Mountains in 2008, 2009, and 2011. Wildlife Services removed coyotes

in the area in 2011 and 2012. A private contractor has removed coyotes in 2014. Continuing to remove coyotes may assist mule deer population recovery.

Methods

Wildlife Services and private contractors working under direction of NDOW and Washoe County, will use foothold traps, snares, fixed-wing aircraft and helicopters for aerial gunning, and calling and gunning from the ground to remove coyotes in sensitive areas during certain times of the year.

Recommendations

Fund Project 40. Evaluate efficacy of Project 40 annually

Budget

<u>\$3 Predator Fee</u>	<u>Pittman-Robertson</u>	<u>Total</u>
\$60,000	N/A	\$60,000

PROJECTS RECOMMENDED FOR DISCONTINUATION

Subproject 22-205/207: Gabbs Valley Range Desert Bighorn Release Protection

Goal

Decrease mortality due to predation to all age classes of bighorn sheep which will allow the population to reach a threshold where predation no longer limits the population.

Project Area

Units 205 and 207

Implication for Management

Remove lions that are in close proximity to recently released bighorn populations.

Conclusion

Desert bighorn sheep population levels do not warrant mountain lion removals. Removal efforts can be reinstated through proposed project 37.

Recommendation

Terminate sub project 22-205/207 as of 30 June 2015.

Project 25: Coyote Diet and Habitat Selection

Formerly: Coyote Ecology Analysis

Goals

1. How does availability of lagomorphs and small mammals influence coyote abundance, diet, and home range size?
2. What is the microhabitat use of coyotes in central Nevada and how do coyotes differ amongst individuals, across seasons, and throughout different habitats?

Project Area

Toquima and Monitor Mountains in Units 161 and 162

Implication for Management

1. Improved success of game population management is a potential result of an improved understanding of coyote dietary preference, coyote productivity and prey switching capabilities.
2. Improved understanding of coyote population dynamics and resource partitioning could improve our ability to manage wildlife habitats for optimum wildlife productivity statewide.

Introduction

Lethal management of coyotes in Nevada and throughout the West for livestock protection and to enhance populations of game species such as mule deer remains controversial (Knowlton et al. 1999, Martínez-Espiñeira 2006). To better address stakeholder concerns and develop strategic approaches to balancing the need for coyote management with sustaining desired wildlife populations it is important to have a better understanding of coyote responses to resources availability prior implementing management programs (Jackson 2014).

Methods

Iridium GPS locations for each coyote have been compiled, and 30 random locations collected between denning and pup rearing season (April 16 to August 15; Gese 2005) will be selected for microhabitat space use analysis. Twenty variables will be measured at each location (Mosby et al. 2012). LANDFIRE will be used to classify habitat types in a 1 km circle surrounding each den (Rollins et al. 2006, Squires et al. 2008, Rollins 2009). Vegetation will be reclassified with the LANDFIRE vegetation map into seven habitat (forest, grassland, road, sagebrush, mesic shrub-meadow, riparian and mesic-meadow) as described by (Gese et al. 1996a, b). Thirteen variables will be collected at each den site and den area.

Recommendations

Terminate project 25 as of 9 August 2015.

Project 29: Roadway Carrion Management to Enhance Greater Sage-Grouse Populations

Goals

1. Reduce manmade food resource subsidy availability to common ravens along roads in northern Nevada and along common raven migration corridors in southern Nevada.
2. Evaluate effects of resource subsidy availability on Greater Sage-Grouse recruitment and common raven abundance, home range size and clutch size.

Project Area

Greater Sage-Grouse range in northern Nevada and Common Raven migration corridors in central and southern Nevada.

Implication for Management

1. In areas where manmade resource subsidies for resident common raven populations are found to be a dietary factor, Greater Sage-Grouse nest success and brood survival may be optimized by strategic removal of these subsidies.
2. In areas where seasonal common raven migration corridors are found to link manmade resource subsidies to high priority resident Greater Sage-Grouse populations, Greater Sage-Grouse nest success and brood survival may be optimized in priority Greater Sage-Grouse habitats by strategic removal of these raven migration corridor food subsidies. Depending on the extent of raven migration, some of these food subsidies could be found tens or even hundreds of miles away from priority Greater Sage-Grouse habitat.

Conclusion

After one year of field work it has been determined removing road carrion is not cost effective.

Recommendation

Terminate project 29 as of 30 June 2015.

Project 30: Landfill Waste Stream Management to Enhance Greater Sage-Grouse

Goal

Reduce manmade resource subsidy availability to Common Ravens at public landfills and public dead animal pits across Nevada.

Project Area

Statewide with special focus on Greater Sage-Grouse nesting habitat.

Implication for Management

1. In areas where manmade resource subsidies for resident common raven populations are found to be a dietary factor, Greater Sage-Grouse nest success and brood survival may be optimized by strategic removal of these subsidies.
2. In areas where seasonal common raven migration corridors are found to link manmade resource subsidies to high priority resident Greater Sage-Grouse populations, Greater Sage-Grouse nest success and brood survival may be optimized in priority Greater Sage-Grouse habitats by strategic removal of these raven migration corridor food subsidies. Depending on the extent of raven migration, some of these food subsidies could be found tens or even hundreds of miles away from priority Greater Sage-Grouse habitat.

Conclusion

The majority of public landfills are permitted to remove ravens and conduct their own raven management.

Recommendation

Terminate project 30 as of 30 June 2015.

Project 33: Bi-State Sage-Grouse Nesting Habitat Restoration

Goal

Increase carrying capacity and reduce predation via restoration of several hundred acres of high priority Bi-State Sage-Grouse nesting habitat to good or excellent condition.

Project Area

Sweetwater, Pine Grove and Wassuk Ranges of Lyon, Douglas and Mineral counties.

Implication for Management

Bi-State Sage-Grouse populations would benefit from a greater abundance and higher quality of unfragmented sagebrush steppe habitat in the Pine Grove, Sweetwater and Wassuk ranges of Western Nevada.

Conclusion

Previous and currently allocated funds have yet to be spent on this project. Other federal aid dollars exist to fund this project need be.

Recommendation

Terminate project 33 as of 30 June 2015

Overall FY 2016 Budget

Project	\$3 Predator Fee	PR Funds	Total
Department of Agriculture Administrative Support Transfer ^a	\$14,000	N/A	\$14,000
Project 21: Greater Sage-Grouse Protection (Raven Removal)	\$78,000	N/A	\$78,000
Subproject 21-02: Raven Removal and Greater Sage-Grouse Nest Success	\$50,000	N/A	\$50,000
Subproject 22-01: Mountain Lion Removal to Protect California Bighorn Sheep	\$45,000	N/A	\$45,000
Subproject 22-14 Coyote Den Density Effects on Mule Deer Fawns and Other Wildlife Species	\$40,000	\$120,000	\$160,000
Subproject 22-074: Mountain Lion Removal and Diet Analysis for the Protection of Rocky Mountain Bighorn Sheep	\$45,000	N/A	\$45,000
Project 32: Mountain Lion, Black Bear, and Mule Deer Interactions	\$40,000	\$120,000	\$160,000
Project 35: Using Genetic Testing to Identify Origin of Red Fox	\$2,500	\$7,500	\$10,000
Project 37: Big Game Protection-Mountain Lions	\$90,000	N/A	\$90,000
Project 38: Big Game Protection-Coyotes	\$90,000	N/A	\$90,000
Project 39: Predator Education	\$1,500	\$4,500	\$6,000
Project 40: Coyote Removal to Complement Multi-faceted Management in Eureka County	\$60,000	N/A	\$60,000
Total^b	\$556,000	\$252,000	\$808,000

^aThis transfer of \$3 predator fees for administrative support to the Department of Agriculture partially funds state personnel that conduct work for the benefit of wildlife at the direction of USDA Wildlife Services (e.g., mountain lion removal to benefit wildlife).

^bThe projects that contain limited lethal removal as a primary aspect, making them ineligible for Federal Aid funding, is 85% of predator fee budget.

Expected Revenues and Beginning Balance

	FY 2014 Actual	FY 2015 Estimated	FY 2016 Projected
Beginning balance	\$377,674	\$437,529	\$420,808
Revenues	\$570,368	\$502,879	\$570,368
Authorized budget	\$526,360	\$519,599	\$556,000
Expenditures	\$509,156	--	--
Ending balance	\$437,529	\$420,808	\$435,176

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Appendix

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