STATE OF NEVADA

DEPARTMENT OF WILDLIFE

Game Division

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#9

MEMORANDUM

April 22, 2016

To: Nevada Board of Wildlife Commissioners, County Advisory Boards to Manage Wildlife, and Interested Publics

From: Brian Wakeling, Administrator, Game Division BFW

Title: **Presentation of Fiscal Year 2017 Draft Predation Management Plan (Final Draft) – For Possible Action**

Description: The Commission will review with the Department the third and final draft of the Fiscal Year 2017 Predator Management Plan. The Commission may take action to modify or endorse the plan.

Presenter: Wildlife Staff Specialist Pat Jackson and Game Division Administrator Brian F. Wakeling

Agenda No: 9

Summary:

The Department will review and discuss with the Commission the third and final draft of the Fiscal Year 2017 Predator Management Plan. To date, the Commission has had the opportunity to discuss the direction of the plan at the January and March meetings. Additionally, the Wildlife Damage Management Committee (WDMC) and the Predatory Animal and Rodent Committee (PARC) have commented on the projects and design. The Plan has also been reviewed by USDA Wildlife Services as a cooperating agency, and many members of the public have also provided comment at Commission, WDMC, or PARC meetings.

In response to comments provided by the WDMC, NDOW has amended the plan in several areas. Specifically, understanding raven effects on desert tortoise biology has been added to Project 41. NDOW has clarified goals, identified indices to be used to initiate predator control, and set bighorn sheep population goals for two lethal projects. NDOW has included a summary of revenues and expenditures to the predator plan. Finally, Project 22-16 has been removed from the predator plan.

PARC also provided comments that NDOW addressed, and several were redundant with those identified by WDMC. NDOW has included a summary of revenues and expenditures within the predator plan. More detailed goals with clear response variables have been identified for several projects. NDOW has three levels of monitoring approaches. Those monitoring approaches have been classified for each project. NDOW has specified indices that will be used to initiate predator control, and NDOW has identified bighorn sheep population goals for two lethal projects. NDOW believes Project 32 does meet the requirements set forth in AB 78 (Sec. 4, 1c). NDOW believes projects 37 and 38 meet the requirements, which have been clarified in the current revision of Commission Policy 23.

Recommendation:

The Department recommends that the Commission **VOTE TO ENDORSE THE FINAL DRAFT VERSION OF THE FISCAL YEAR 2017 PREDATOR MANAGEMENT PLAN.**

Draft 3

Nevada Department of Wildlife
Predator Management Plan
Fiscal Year 2017

1 July 2016 to 30 June 2017

STATE OF NEVADA

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Nevada Department of Wildlife

Tony Wasley, Director

Jack Robb, Deputy Director
Liz O'Brien, Deputy Director
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Introduction

The goal of the Nevada Department of Wildlife's (NDOW's) Predator Management Program is to conduct projects consistent with the terrestrial portion of NDOW'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." Provisions outlined in NRS 502.253 authorize the collection of a $3 fee for each big game tag application, deposition of the revenue from such a fee collection into the Wildlife Fund Account, and use by NDOW to 1) develop and implement an annual program for the management and control of predatory wildlife, 2) conduct wildlife management activities relating to the protection of nonpredatory game animals and sensitive wildlife species, and 3) conduct research necessary to determine successful techniques for managing and controlling predatory wildlife. This statute also allows for: the expenditure of 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 Nevada Board of Wildlife Commissioners; and provide that unspent monies remain in the Wildlife Fund Account and do not revert to State General Funds at the end of any fiscal year.

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, although not all of these aspects are currently eligible for funding through predator fee dollars. NDOW intends to use predator management on a case-by-case basis, with clear goals, and based on an objective scientific analysis of available data. To be effective, predator management should be applied with proper intensity and at a focused scale. Equally important, when possible projects should be monitored to determine whether desired results are achieved. This approach is supported by the scientific literature on predation management. 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.

NDOW is a state agency that must balance the biological needs of wildlife, statutory mandates, and social desires of the public. In the 2015 legislative session, Assembly Bill 78 was adopted which in part amended NRS 502.253 (4) (b) to read: [The Department] "Shall not adopt any program for the management and control of predatory wildlife developed pursuant to this section that provides for the expenditure of less than 80 percent of the amount of money collected pursuant to subsection 1 in the most recent fiscal year for which the Department has complete information for the purposes of lethal management and control of predatory wildlife." NDOW intends to comply with statute and apply the tools of scientific predation management in biologically sound, socially responsible means.

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Budget Summary

Fiscal year 2015 predator fee revenues totaled $574,312; consequently this plan must budget $459,449.60 on lethal removal to meet the requirements set forth by assembly bill 78. Proposed predator projects for fiscal year 2017 include $697,000 for lethal work, these funds include fiscal year 2015 revenues and previous fiscal years surpluses. Over $500,000 in predator fee revenues are left over from previous fiscal years; it is the Department's goal to reduce this surplus.

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TYPES OF PROJECTS

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.

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. Identifying and monitoring a response variable is not a primary objective for implementation.
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 USDA Wildlife Services, private contractors, and other wildlife professionals to conduct lethal or non-lethal management of predators and will put forethought into project design. Response variables will be identified and data will be collected to determine project effectiveness. 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.

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LEVELS OF MONITORING

Below are the three levels of monitoring outlined in the predator management plan. The level of monitoring for each project is identified within the project description.

1. **Standard Monitoring**: The primary objective of standard monitoring is to use existing survey protocols to evaluate the response of game species or sensitive wildlife to lethal or non-lethal management of predators. NDOW conducts annual and biannual surveys to evaluate trend and composition of game species or sensitive wildlife and to inform the season and quota-setting process. Composition surveys will yield response variables such as recruitment of juveniles into the adult population and will be compared to published benchmarks of productivity in the management area of interest, to neighboring areas not receiving predator management, or in the same area before treatment began. Standard monitoring represents no change to existing monitoring efforts. Expected outcomes include an indication of project effectiveness and agency reports.
2. **Intermediate Monitoring**: The primary objective of intermediate monitoring is to apply a specific monitoring plan designed to evaluate the response of game species or sensitive wildlife to lethal or non-lethal management of predators. NDOW may collaborate with other wildlife professionals to identify reference and treatment areas or evaluate productivity of game species or sensitive wildlife before, during, and after implementation to determine effectiveness of predator management. Composition surveys may be modified to thoroughly evaluate productivity in the reference and treatment areas and to better accommodate annual variation in survey conditions. Expected outcomes will include an indication of project effectiveness, agency reports, and possible peer-reviewed publications.
3. **Rigorous Monitoring**: The primary objective of rigorous monitoring is to evaluate several response variables known to affect productivity of game species or sensitive wildlife and to determine the relative influence of those variables when measuring the response to lethal or non-lethal management of predators. NDOW may collaborate with other wildlife professionals to identify the requirements of rigorous monitoring and to further evaluate factors influencing productivity of game species or sensitive wildlife such as survival of juveniles, body condition of adults, or habitat productivity. Rigorous monitoring efforts will help to disentangle biotic and abiotic conditions that may influence productivity of game species or sensitive wildlife from the effects of lethal or non-lethal management of predators. Expected outcomes will include agency reports, peer-reviewed publications, and information on how to better manage Nevada's wildlife.

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FY 2017 PROJECTS RECOMMENDED FOR CONTINUATION

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

Justification

This project proposes to lethally remove Common Ravens from known Greater Sage-grouse leks and nesting habitats because raven predation on sage-grouse nests and broods can limit population growth. Ravens will be removed around known sage-grouse leks because most nest sites are located within 4 km of a lek. Ravens will be removed in areas of known greater abundance to benefit sensitive populations of sage-grouse.

Project Manager

Pat Jackson, Nevada Department of Wildlife

Project Type

Implementation

Monitoring Level

Standard

Response Variable

Raven point counts will be conducted before, during, and after removal to detect changes in raven densities.

Project Goals

1. Reduce raven populations in areas high abundance that overlap sensitive sage-grouse populations identified by NDOW and USDA Wildlife Services wildlife biologists.
2. Increase populations of sage-grouse in specific areas where deemed feasible.

Potentially Affected Species

Common raven, Greater Sage-grouse

Span More Than One Fiscal Year

Yes

Limiting Factor Statement

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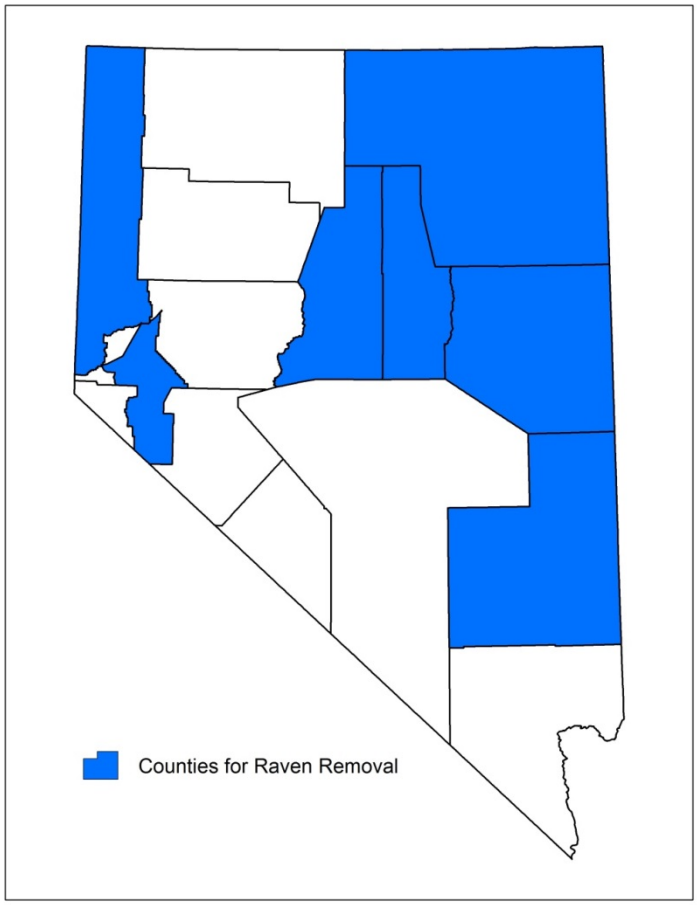
Though predation is a naturally occurring phenomenon for sage-grouse, their populations can be suppressed by abiotic factors such as dry climate and loss of quality habitat. Increases in predator numbers can also cause decreases in sage-grouse populations; common raven abundance has increased throughout their native ranges, with increases as much as 1,500% in some areas (Boarman 1993, Coates et al. 2007, 2014, Sauer et al. 2011). Under these circumstances, raven predation can have a negative influence of sage-grouse nesting success, recruitment, and population trend (Coates and Delehanty 2010).

Project Area

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



Habitat Conditions

Areas of common raven removal will be within or in close proximity to sage-grouse leks, nesting habitat, and brood-rearing habitat. Persistent drought throughout Nevada has reduced herbaceous cover, along with nesting and brood rearing habitat; these effects are exacerbated by wildfire and the invasion of cheatgrass. Transmission lines, substations, and nearby agriculture production often attract ravens which may threaten nearby sage-grouse populations.

Comments from FY 2015 Predator Report

None

Methods

Lethal Removal

Chicken eggs treated with 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 common ravens found will be collected and disposed of properly as per avicide protocol. Common raven take will be estimated at 1 raven per 11 eggs gone (Coates et al. 2007). DRC-1339 is effective only on corvids and most mammals and other birds are not susceptible to the specific effects from this agent.

Monitoring

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

Anticipated Result

1. The removal of common ravens is intended to result in long-term protection for sage-grouse populations through increases in nest success, brood survival, and recruitment.

Recommendations

Fund Project 21. Evaluate efficacy of Project 21 annually.

Budget

$3 Predator Fee	**Pittman-Robertson**	**Total**
$78,000	N/A	$78,000

Project 21-02: Common Raven Removal to Enhance Greater Sage-Grouse Nest Success

Justification

Ravens are a leading nest and brood predator for sage-grouse and reducing raven abundance can influence sage-grouse nest success and brood survival (Coates and

Delehanty 2010). This project will lethally remove ravens in habitats surrounding known sage-grouse leks and nesting habitats to enhance nesting success and brood survival.

Project Manager

Pat Jackson, Nevada Department of Wildlife

Project Type

Implementation and Experimental Management

Monitoring Level

Intermediate

Response Variable

The response variables that will be used to detect treatment effects for the lethal removal of ravens will be nest success and brood survival of sage-grouse within treated areas before and after treatment, which will be monitored through routine sage-grouse monitoring of leks and broods that will not be funded through the Predator Fee.

Project Goals

1. Increase populations of sage-grouse through improved nest success and brood survival in treated areas.

Potentially Affected Species

Common raven, Greater Sage-grouse

Span More Than One Fiscal Year

Yes, depending on outcomes associated with sage-grouse response. The scope and location of this project may be modified in future years.

Limiting Factor Statement

Though predation is a naturally occurring phenomenon for 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 sage-grouse populations; raven abundance has increased 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). Under these circumstances, raven predation can have a negative influence of sage-grouse nesting success, recruitment, and population trend (Coates and Delehanty 2010).

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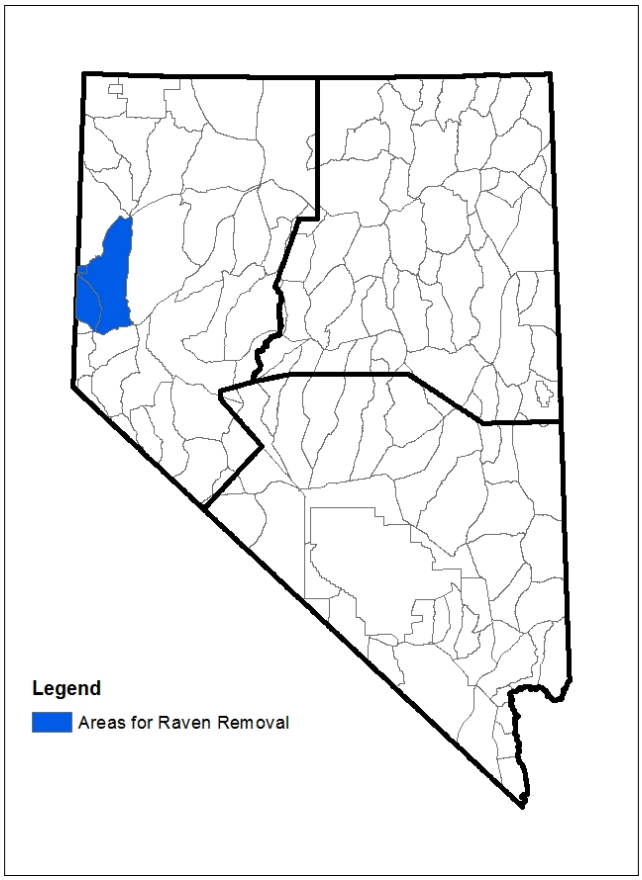
Project Area

Unit 02



Habitat Conditions

Areas of common raven removal will be within or in close proximity to sage-grouse leks, nesting habitat, and brood-rearing habitat. Persistent drought throughout Nevada has reduced herbaceous cover, along with nesting and brood rearing habitat; these impacts are exacerbated through wildfire and the invasion of cheatgrass. Transmission lines, substations, and nearby agriculture often attract ravens which may threaten sage-grouse populations nearby.

Comments from FY 2015 Predator Report

None

Methods

Lethal Removal

Chicken eggs treated with the avicide DRC-1339 will be deployed to remove ravens in areas surrounding known leks and brood-rearing habitats for sage-grouse (Coates et al. 2007). DRC-1339 is effective only on corvids and most mammals and other birds are not susceptible to the specific effects from this agent. Additionally, 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 raven carcasses will be collected and disposed of properly as per avicide management protocol. Raven take will be estimated at 1 raven for every 11 eggs that are consumed, destroyed, or eliminated in the field in accordance with methods documented by Coates et al. (2007).

Anticipated Result

1. The removal of common ravens is intended to result in long-term protection for sage-grouse populations through increases in nest success, brood survival, and recruitment.

Recommendations

Fund project 21-02 through FY 2018.

Budget

$3 Predator Fee	**Pittman-Robertson**	**Total**
$25,000	N/A	$25,000

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

Justification

California bighorn sheep populations have been reintroduced in northwestern Nevada, but mountain lion predation can be a significant source of mortality that may threaten the population's viability. Area 01 is in close proximity to the Sheldon National Wildlife Refuge, California, and Oregon; all three may act as a source for mountain lions. Mountain lions will be removed proactively by USDA Wildlife Services until the local bighorn sheep population reaches the population objective.

Project Manager

Chris Hampson, Nevada Department of Wildlife

Project Type

Implementation

Monitoring Level

Standard

Response Variable

The response variable will be the number of radio marked bighorn sheep killed by mountain lions.

Project Goal

1. Remove mountain lions to proactively protect reintroduced California bighorn sheep.

Potentially Affected Species

California bighorn sheep, mountain lion, mule deer

Span More Than One Fiscal Year

Yes

Limiting Factor Statement

Mountain lions are known predators of bighorn sheep (Rominger et al. 2004). Though predation is a naturally occurring phenomenon for bighorn sheep and other big game, their populations can be lowed or suppressed by abiotic factors such as dry climate and loss of quality

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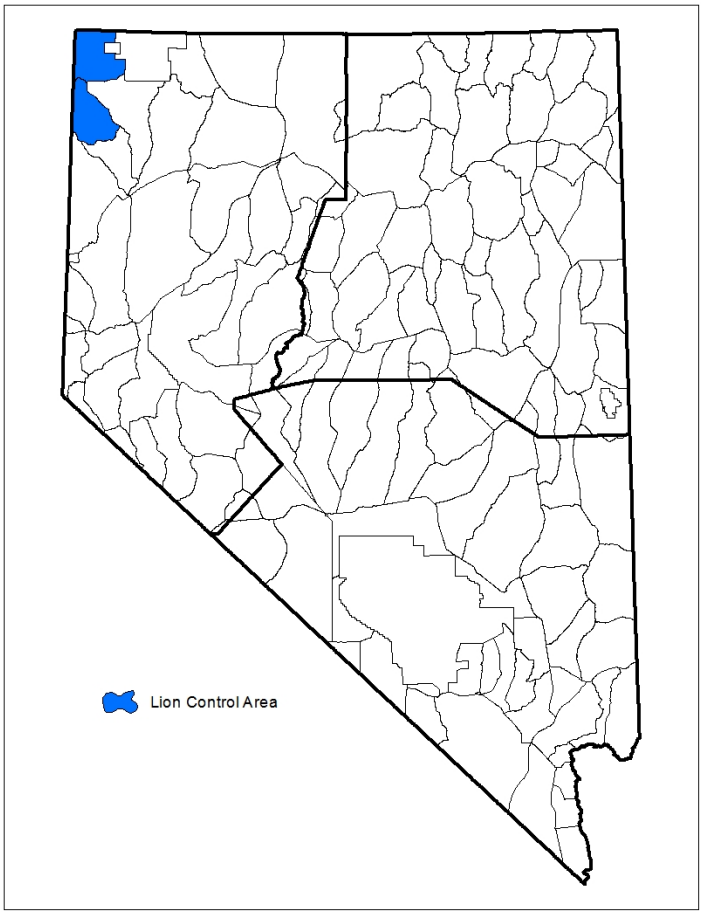
habitat. Mitigating abiotic factors by removing predators is imperative for some bighorn sheep populations to stabilize (Rominger 2007).

Project Area

Washoe County in Units 011 and 013.



Habitat Conditions

Persistent drought combined with fires and human disturbances throughout Nevada have reduced herbaceous cover, lambing, and browsing habitat. These effects may also be suppressing bighorn populations below carrying capacity or preventing them from reaching self-sustaining levels. Currently, several collaborations between the Bureau of Land Management and NDOW to remove pinyon-juniper are scheduled. These removals are intended to improve bighorn sheep habitat, improve access to water sources, and to remove habitat that is ideal for mountain lions to focus on bighorn sheep.

Methods

NDOW biologists, USDA Wildlife Services, and private contractors will collaborate to identify current and future California bighorn sheep locations and determine the best methods to

reduce California bighorn sheep mortality. Traps, snares, baits, call boxes, and hounds will be used to proactively capture mountain lions as they immigrate into the defined sensitive areas.

Population Estimate

The population estimate for California Bighorn sheep is 35-40 individuals for area 011 and 35-40 individuals in area 013.

Anticipated Result

1. Decrease predation from mountain lions for all age classes of reintroduced California bighorn sheep, resulting in an established, viable population. The frequency of mortality on radiomarked bighorn sheep will be the response variable monitored to determine the efficacy of this project.

Recommendations

Fund project 22-01. Monitor population. Cease proactive removal efforts after the local bighorn sheep population reaches 60 in each area (011 and 013; table 1).

Table 1. Population numbers to be used to redirect focus of project.

Action	Bighorn Sheep Population
Monitor bighorn population, conduct removal on case by case basis	> 80
Remove lions that consume bighorn sheep*	60 - 80
Remove all lions in area	< 60

*Indicates need for monitoring local mountain lion population.

Budget

$3 Predator Fee	Pittman-Robertson	Total
$90,000	N/A	$90,000

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Project 22-074: Monitor Rocky Mountain Bighorn Sheep for Mountain Lion Predation

Justification

Rocky Mountain bighorn sheep populations have been established in portions of Nevada, but mountain lion predation can be a significant source for mortality that may threaten the population's viability. No collared bighorn sheep have been killed by mountain lions in over a year, it is the area biologists belief lion predation is not a current threat to the local bighorn sheep population.

Project Manager

Kari Huebner and Scott Roberts, Nevada Department of Wildlife

Project Type

Implementation

Monitoring Level

Intermediate

Response Variable

The response variable will be the number of radio marked bighorn sheep killed by mountain lions.

Project Goal

1. Monitor the local Rocky Mountain bighorn sheep population. Bighorn sheep populations will be monitored on a continual basis and predator control will be implemented as deemed necessary at the discretion of the Area Biologist.

Potentially Affected Species

Rocky Mountain bighorn sheep, mountain lion

Span More Than One Fiscal Year

Yes

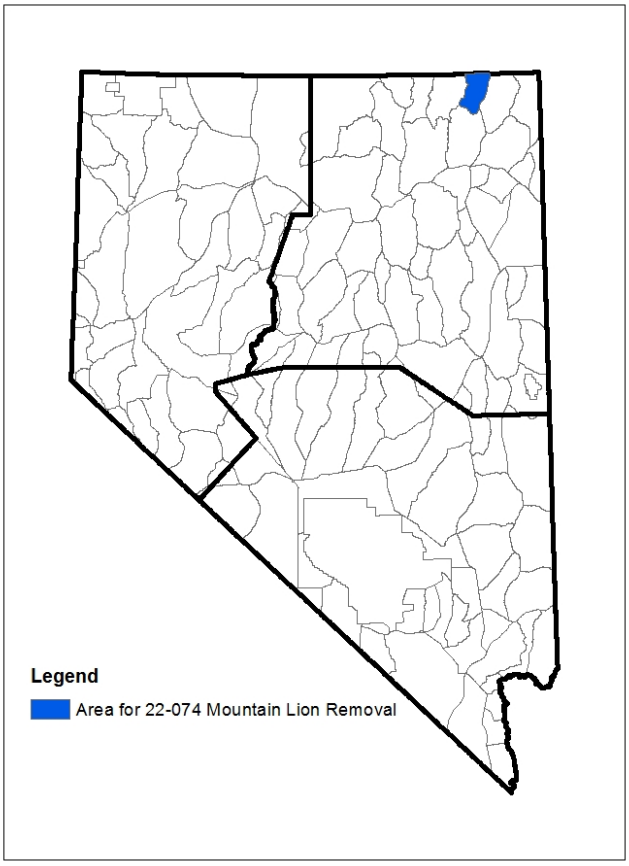
Limiting Factor Statement

Mountain lions are known predators of bighorn sheep (Rominger et al. 2004). Though predation is a naturally occurring phenomenon for bighorn sheep and other big game, their

populations can be lowed or suppressed by abiotic factors such as dry climate and loss of quality habitat. Mitigating abiotic factors by removing predators is imperative for some bighorn sheep populations to stabilize (Rominger 2007).

Project Area

Unit 074



Habitat Conditions

Persistent drought combined with fires and human disturbances throughout Nevada have reduced herbaceous cover, lambing, and browsing habitat. These effects may also be suppressing bighorn populations below carrying capacity or preventing them from reaching self-sustaining levels.

Comments from FY 2015 Predator Report

None

Methods

NDOW biologists will identify current and future Rocky Mountain bighorn sheep locations and determine the best methods to monitor this population. Additional GPS collars will be purchased and deployed to monitor the bighorn sheep population. If mountain lion predation is identified as an issue, then traps, snares, baits, call boxes, and hounds will be used to lethally remove mountain lions from the area.

Population Estimate

The population estimate for Rocky Mountain Bighorn sheep is approximately 15 individuals in area 074.

Anticipated Results

1. Monitor the population of Rocky Mountain bighorn sheep.
2. If mountain lion predation is identified as an issue, conduct lethal removal.

Recommendations

Fund project 22-074. Monitor population. Begin mountain lion removal efforts if lion predation is detected (table 2). Evaluate efficacy of project 22-074 annually.

Table 2. Population numbers to be used to redirect focus of project.

Action	Bighorn Sheep Population
Monitor bighorn population, conduct removal on case by case basis	> 15
Remove lions that consume bighorn sheep*	10 - 15
Remove all lions in area	< 10

*Indicates need for monitoring local mountain lion population.

Budget

$3 Predator Fee	Pittman-Robertson	Total
$90,000	N/A	$90,000

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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 mountain 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

Monitoring Level

Rigorous

Response Variable

No response variable will be collected, this is an experimentation project.

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).

Potentially Affected Species

Mule deer, mountain lion, black bear

Span More Than One Fiscal Year

Yes

Limiting Factor Statement

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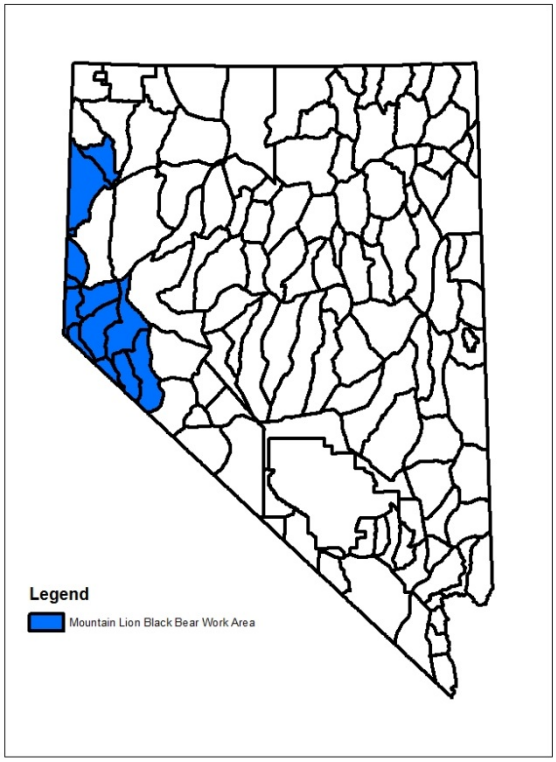
Black bears have recently expanded their distribution in western Nevada to include historical bear habitat in desert mountain ranges east of the Sierra Nevada and Carson Front (Beckmann and Berger 2003, Lackey et al. 2013). Additionally, recent findings have shown 50% of mountain lion killed deer are scavenged by black bears during summer months (Andreasen 2014, unpublished data). The current recolonization of historical 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) that bears and lions do not use as primary habitat.

Comments from FY 2015 Predator Report

None

Methods

A minimum of 18 black bears and 18 mountain lions, 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. To further maximize probability of recording predator-predator 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. Sixty mule deer will be fitted 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, this will be funded from a source other than predator fee funds.

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.

Recommendations

Fund Project 32 through FY 2020. (see appendix).

Budget

$3 Predator Fee	**Pittman-Robertson**	**Total**
$40,000	$120,000	$160,000

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Project 37: Big Game Protection-Mountain Lions

Justification

Predation issues frequently arise in a very short timeframe. These issues often occur within a fiscal year. By the time a project can be drafted, approved, and implemented, it may be too late to prevent or mitigate the predation issue. 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

Monitoring Level

Standard to Intermediate

Response Variable

Response variables may include reduction of prey taken by mountain lions, removal of a mountain lion that was documented consuming the concerned big game species, or a reduction in mountain lion sign. Because of the quick nature of the project, there may be times when no response variable will be measured.

Project Goal

Remove specific, problematic mountain lions to benefit game species.

Potentially Affected Species

Mountain lion, mule deer, bighorn sheep, antelope

Span More Than One Fiscal Year

Yes

Limiting Factor Statement

Mountain lions are known predators of bighorn sheep and other big game species (Rominger et al. 2004). Though predation is a naturally occurring phenomenon for bighorn sheep and other big game, their populations can be lowered or suppressed by abiotic factors such as dry

climate and loss of quality habitat. Mitigating abiotic factors by removing predators is imperative for some bighorn sheep populations to stabilize (Rominger 2007).

Project Area

Statewide

Habitat Conditions

Persistent drought combined with fires and human disturbances throughout Nevada have reduced herbaceous cover, lambing, and browsing habitat. These effects may have reduced mule deer and other big game populations below carrying capacity. These effects may also be suppressing mule deer or big game populations below carrying capacity (Ballard et al. 2001).

Comments from FY 2015 Predator Report

N/A

Methods

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. Removal efforts will be implemented when indices levels are reached, these include low annual adult survival rates, poor fall young:female ratios, spring young:female ratios, and low adult female annual survival rates (table 3). Depending on the indices identified, standard to intermediate levels of monitoring will be implemented to determine the need for or effect of predator removal. These additional monitoring efforts may be conducted by NDOW employees, USDA Wildlife Services, or private contractors.

Table 3. Indices used to initiate predator removal.

Species	Annual Adult Survival Rates	Fall Young: Female Ratios	Spring Young: Female Ratios	Adult Female Annual Survival Rates
California Bighorn Sheep	< 90%	< 40:100	--	--
Rocky Mountain Bighorn Sheep	< 90%	< 40:100	--	--
Desert Bighorn Sheep	< 90%	< 30:100	--	--
Mule Deer	--	--	< 35:100	< 80%
Pronghorn	< 90%	< 40:100	--	--

Anticipated Results

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.

Recommendations

Evaluate efficacy of Project 37 annually.

Budget

$3 Predator Fee	**Pittman-Robertson**	**Total**
$125,000	N/A	$125,000

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Project 38: Big Game Protection-Coyotes

Justification

Predation issues frequently arise in a very short timeframe. These occurrences often occur within a fiscal year, therefore by the time a project can be drafted, approved, and implemented, to prevent or mitigate the predation issue, it may be too late. 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

Monitoring Level

Standard to Intermediate

Response Variable

Response variables may include reduction of prey taken by coyotes, removal of a coyote that was documented consuming the concerned big game species, or a reduction in coyote sign. Because of the quick nature of the project, there may be times when no response variable will be measured.

Project Goal

Conduct focused coyote removal to protect game species.

Potentially Affected Species

Coyote, mule deer, 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

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loss of quality habitat Predation from coyotes may further suppress these populations (Ballard et al. 2001).

Project Area

Statewide

Habitat Conditions

Persistent drought combined with fires and human disturbances throughout Nevada have reduced herbaceous cover, fawning, lambing, and browsing habitat. These effects may have reduced mule deer and other big game populations below carrying capacity. These effects may also be suppressing mule deer or big game populations below carrying capacity (Ballard et al. 2001).

Comments from FY 2015 Predator Report

N/A

Methods

USDA 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 indices levels are reached, these include low annual adult survival rates, poor fall young:female ratios, poor spring young:female ratios, and low adult female annual survival rates (table 3). Depending on the indices identified, standard to intermediate levels of monitoring will be implemented to determine the need for or effect of predator removal. These additional monitoring efforts may be conducted by NDOW employees, USDA Wildlife Services, or private contractors.

Anticipated Results

1. Removal of coyotes in winter range and fawning and lambing 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.

Recommendations

Fund Project 38. Evaluate efficacy of Project 38 annually.

Budget

$3 Predator Fee	**Pittman-Robertson**	**Total**
$125,000	N/A	$125,000

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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

Monitoring Level

Standard

Response Variable

The response variable will be the fawn to doe ratios in the Diamond Mountains. This ratio will be observed throughout the life of the project.

Project Goal

To increase mule deer and sage-grouse populations by removing coyotes.

Potentially Affected 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, these populations can be continued to be suppressed by predation from coyotes (Ballard et al. 2001).

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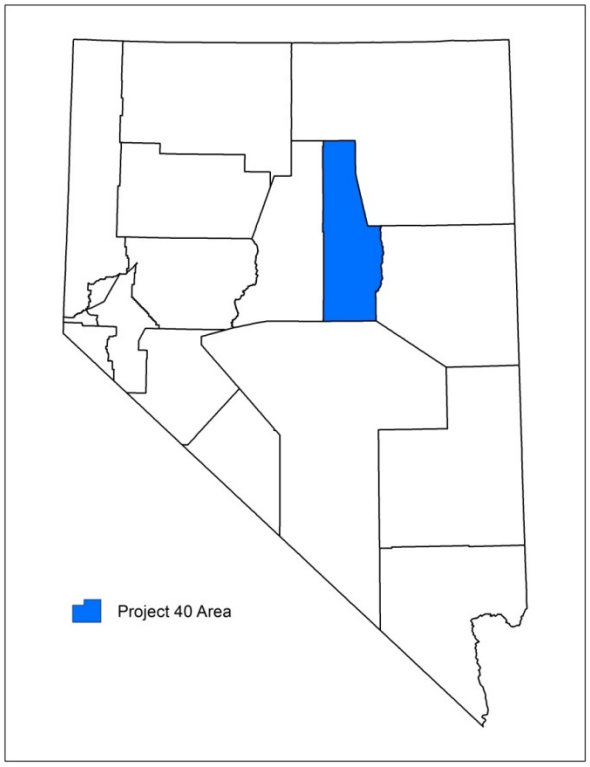
Project Area

Diamond Mountains in Eureka County



Habitat Conditions

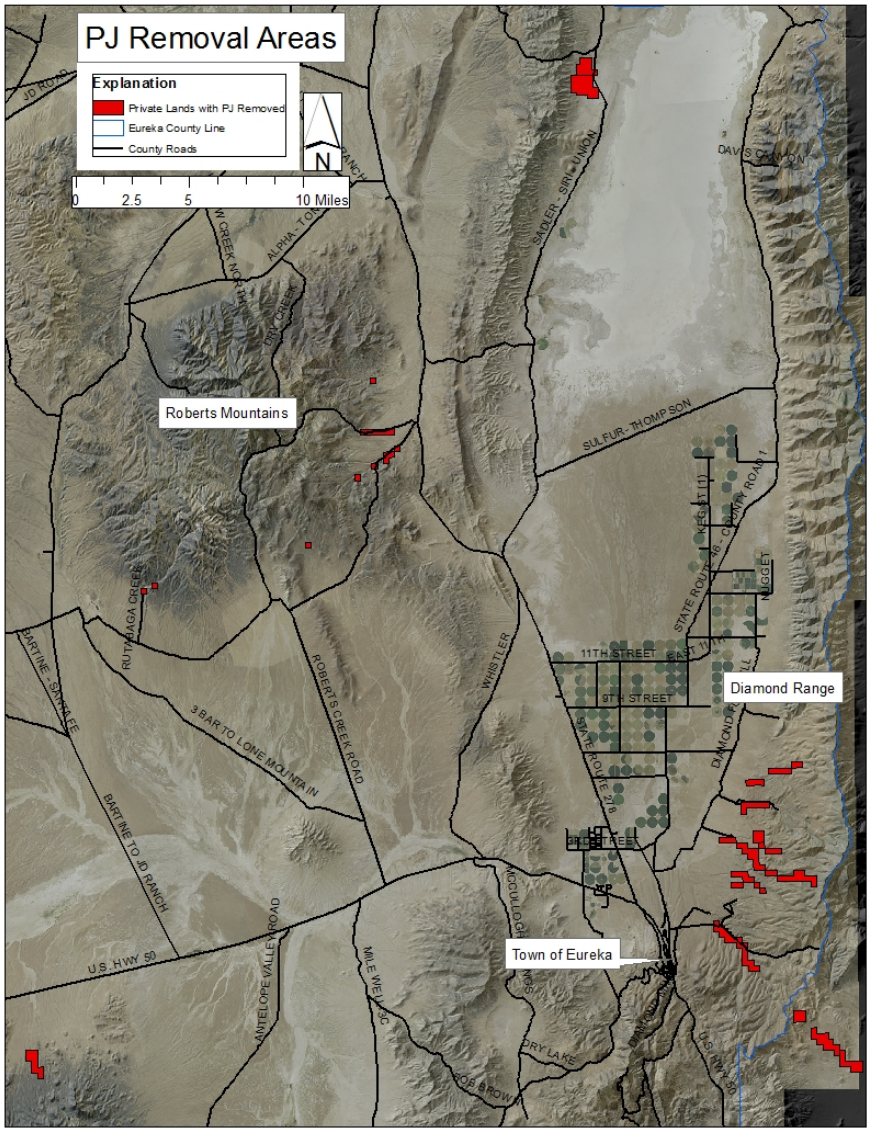
Persistent drought combined with fires and human disturbances throughout Nevada have reduced herbaceous cover, fawning, and browsing habitat. These effects may have reduced mule deer below carrying capacity. These effects may also be suppressing mule deer below carrying capacity (Ballard et al. 2001).

Comments from FY 2015 Predator Report

N/A

Information from Eureka County

Pinyon juniper removal occurred in 2013, 2014, and 2015 with more to be completed in 2016 within the Diamond Mountains.



Methods

USDA Wildlife Services and private contractors working under direction of NDOW and Eureka 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.

Anticipated Result

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.

Recommendations

Fund Project 40. Evaluate efficacy of Project 40 annually.

Budget

$3 Predator Fee	**Pittman-Robertson**	**Total**
$100,000	N/A	$100,000

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FY 2017 NEWLY PROPOSED PROJECTS

Project 41: Increasing Understanding of Common Raven Densities and Space Use in Nevada

Justification

Common ravens are the primary predator of sage-grouse nests and chicks (Coates and Delehanty 2010). Their populations have increased dramatically in Nevada, primarily due to human subsidies (Boarman 1993, Sauer et al. 2011). Understanding common raven density, distribution, and subsidy use will allow for intelligent management decisions to be made to reduce or alter raven densities in Nevada. These efforts are intended to benefit Greater sage-grouse, though desert tortoise may also benefit from this project.

Project Manager

Pat Jackson, Nevada Department of Wildlife

Project Type

Experimentation

Monitoring Level

Rigorous

Response Variable

No response variable will be collected, this is an experimentation project.

Project Goals

1. Increase understanding of common raven density, distribution, and subsidy use to maximize common raven management effectiveness.
2. Develop a protocol to estimate common raven populations in sage-grouse habitat, and monitor these populations.
3. Increase the understanding of how human subsidies affect common raven movements and space use, particularly near sage-grouse leks and nesting areas.
4. Develop a resource selection function model to identify landscape features that influence raven abundance and that may be used in conjunction with sage-grouse priority habitat maps to locate sites where lethal treatments of ravens may be applied with the greatest efficacy and efficiency.

Potentially Affected Species

Greater Sage-grouse, common raven, desert tortoise

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Span More Than One Fiscal Year
Yes

Limiting Factor Statement

Though predation is a naturally occurring phenomenon for sage-grouse, their populations can be suppressed by abiotic factors such as dry climate and loss of quality habitat. Increases in predator numbers can also cause decreases in sage-grouse populations; common raven abundance has increased 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). Under these circumstances, raven predation can have a negative influence of sage-grouse nesting success, recruitment, and population trend (Coates and Delehanty 2010). Raven predation has also been documented to negatively impact desert tortoise populations (Boarman 2003, Kristan III and Boarman 2003)

Project Area

Statewide

Habitat Conditions

Persistent drought throughout Nevada has reduced herbaceous cover, along with nesting and brood rearing habitat; these impacts are exacerbated through wildfire and the invasion of cheatgrass. Transmission lines, substations, and nearby agriculture production also threaten sage-grouse habitat.

Comments from FY 2015 Predator Report

N/A

Methods

Population monitoring and space use

Point counts for common ravens will be conducted from March through July of each year, which corresponds with 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). A combination of ARGOS and GSM backpack transmitters will be deployed to monitor common raven space use.

Development of Resource Selection Function (RSF)

An RSF will be developed using data on landscape features collected in habitats with varying observed abundance indices for ravens. The abundance indices collected will include

raven point count and sage-grouse point counts. The landscape features that will be entered into the model will include 1 meter resolution digital elevation models and fire regime. The RSF for ravens will be overlaid on polygons that feature sage-grouse priority habitats.

Identifying habitats likely to support high numbers of ravens where sage-grouse conservation is of highest priority will provide future locations where raven removal may be warranted, land use activities may be modified, or more intensive sage-grouse monitoring may be focused.

Utility line surveys

Various utility lines will be identified in and near sage-grouse habitat from February until June of each year, which corresponds with common raven nesting and brood rearing. Surveys will be conducted from OHV vehicles, variables including utility pole type, cross arm type, utility pole height, insulator position, perch deterrent effectiveness, and proximity to sage-grouse habitat will be recorded.

Anticipated Results

1. Develop a protocol to estimate common raven populations in Greater Sage-grouse habitat, and monitor these populations.
2. Increase the understanding of common raven density and distribution in the state of Nevada, and how human subsidies increase common raven density and distribution.

Recommendations

Fund Project 41. Evaluate efficacy of Project 41 annually.

Budget

$3 Predator Fee	**Pittman-Robertson**	**Total**
$100,000	$300,000	$400,000

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Project 42: Assessing Mountain Lion Harvest in Nevada

Justification

Nevada Department of Wildlife has a yearlong mountain lion hunting season limited by harvest quotas, although mountain lion are also lethally removal for livestock depredation and to limit predation on specific wildlife populations. Statewide annual adult female harvest is ≤25%, which indicates that statewide harvests are unlikely to be reducing statewide mountain lion population abundance (Anderson Jr and Lindzey 2005). Nevertheless, regional area harvests may be greater and can be more difficult to assess the effects due to small sample sizes. Conversely, current NDOW mountain lion removal projects may not be sufficiently intensive to reduce local mountain lion populations to attain reduced predation on prey populations. Improved understanding of mountain lion population dynamics in Nevada would allow for better informed management.

Project Manager

Pat Jackson, Nevada Department of Wildlife

Project Type

Experimentation

Monitoring Level

Rigorous

Project Goals

1. Develop a population model that incorporates NDOW mountain lion harvest data to predict the number of mountain lions that must be removed to reach desired goals in mountain lion removal projects.
2. Identify limitations and gaps in the existing demographic data for mountain lions that precludes a more complete understanding of mountain lion population dynamics and limits NDOW's management ability.

Potentially Impacted Species

Mountain lion, mule deer, bighorn sheep, elk

Span More Than One Fiscal Year

Yes

Project Area

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Statewide

Habitat Conditions

This work would not be conducted in the field, but would rely on statewide harvest data collected over time to include periods of normal and less-than-normal precipitation. Due to the span of the state data collection, habitat during the period of inference would also span a wide variety of conditions and vegetative communities.

Comments from FY 2016 Predator Report

NA

Methods

A private contractor will use existing mountain lion harvest data collected by NDOW biologists to develop a harvest model. The modeling approach will involve Integrated Population Modeling (IPM) which brings together different sources of data to model wildlife population dynamics (Abadi et al. 2010, Fieberg et al. 2010). With IPM, generally a joint analysis is conducted in which population abundance is estimated from survey or other count data, and demographic parameters are estimated from data from marked individuals (Chandler and Clark 2014). Age-at-harvest data can be used in combination with other data, such as telemetry, mark-recapture, food availability, and home range size to allow for improved modeling of abundance and population dynamics relative to using harvest data alone (Fieberg et al. 2010). We propose to assemble and integrate all available data relevant to mountain lion demography in Nevada to 1) improve the ability of NDOW to estimate mountain lion population dynamics and 2) identify limitations and gaps in the current data which could be addressed in the future. In addition to age-at-harvest information, these relevant data may include GPS and VHF telemetry data, capture-recapture data, mountain lion prey availability estimates, genetic data, and harvest effort data. Depending on available data, we will build a count-based or structured demographic model (Morris and Doak 2002) for mountain lions in Nevada. The model (s) will provide estimates of population growth, age and sex structure, and population abundance relative to different levels of harvest. Additionally, we will critically evaluate the model, as well as uncertainty in model outputs, to identify key gaps in existing data that limit the realism and utility of the model as a management tool. Based on this evaluation, we will make recommendations on the most cost-effective ways to address these data gaps and limitations to allow the model to be improved in the future.

Anticipated Results

1. Estimate statewide population dynamics, age structure, and sex structure of mountain lions in the state of Nevada with existing NDOW data.
2. Recommend additional data that could be collected to improve the model and reduce uncertainty in model results in the future.

Recommendations

Fund Project 42 through FY 2018.

Budget

$3 Predator Fee	**Pittman-Robertson**	**Total**
$2,500	$7,500	$10,000

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Project 43: Mesopredator removal to protect waterfowl, turkeys, and pheasants on Wildlife Management Areas

Justification

Mesopredators including coyotes, striped skunks, and raccoons often consume waterfowl, pheasant, and turkey eggs. Consuming these eggs may limit fowl species population growth, and could be causing a declines on Overton and Mason Valley Wildlife Management Areas.

Project Manager

Isaac Metcalf and Bennie Vann, Nevada Department of Wildlife

Project Type

Implementation

Monitoring Level

Standard

Response Variable

The response variable for waterfowl, turkeys, and pheasants will be the number of females with clutches, and the number of young per clutch.

Project Goal

1. To increase clutch size and survival of waterfowl, turkeys, and pheasants on Overton and Mason Valley WMAs.

Potentially Impacted Species

Assorted waterfowl, turkey, pheasant, coyote, striped skunk, raccoon

Span More Than One Fiscal Year

Yes

Limiting Factor Statement

Though predation is a naturally occurring phenomenon for waterfowl, turkeys, and pheasants, their populations can be lowed or suppressed by abiotic factors such as dry climate and loss of quality habitat.

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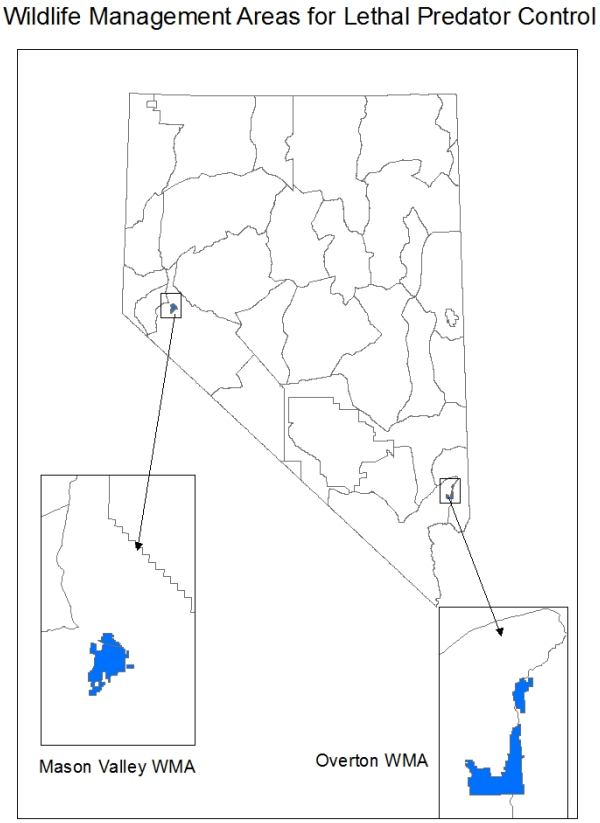
Project Area

Overton and Mason Valley Wildlife Management Areas



Habitat Conditions

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

Comments from FY 2015 Predator Report

N/A

Methods

USDA Wildlife Services and private contractors working under direction of NDOW, will use foothold traps, snares, calling and gunning from the ground to remove coyotes, striped skunks, and raccoons during waterfowl, turkey, and pheasant nesting seasons.

Anticipated Results

1. Increase the number of female turkeys, waterfowl, and pheasants that successful raise clutches.
2. Increase the number female turkeys, waterfowl, and pheasants that have clutches throughout the nesting season.

Recommendations

Fund Project 43. Evaluate efficacy of Project 43 annually.

Budget

$3 Predator Fee	**Pittman-Robertson**	**Total**
$50,000	N/A	$50,000

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PROJECTS RECOMMENDED FOR DISCONTINUATION

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.

Reason for Discontinuation

Project 22 was an umbrella project and created reporting confusion.

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.

Potentially Affected 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 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

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Persistent drought combined with fires and human disturbances throughout Nevada have reduced herbaceous cover, fawning, and browsing habitat. These effects may have reduced mule deer and other big game populations below carrying capacity. These effects may also be suppressing mule deer or big game populations below carrying capacity (Ballard et al. 2001).

Comments from FY 2015 Predator Report

None

Methods

NDOW funds USDA 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.

Anticipated Results

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

Recommendations

Because of reporting confusion, discontinue project 22. Change all sub projects to normal projects.

Project 22-16 Monitoring of Predator and Prey Populations Prior to a Lethal Treatment of Predators

Reason for Discontinuation

Project 22-16 was universally unpopular with county advisory board members, the Wildlife Damage Management Committee, and the Nevada Wildlife Commission.

Justification

Data on coyote abundance was collected during project 25, an additional amount of data on alternate prey populations has occurred since the inception of 22-16. Camera traps are currently being deployed to determine the occupancy of coyotes and mountain lions within the Monitor Mountain. In future years an intense, large scale removal effort will be conducted.

Project Manager

Pat Jackson, Nevada Department of Wildlife

Project Type

Experimental Management and Implementation (Future Years)

Response Variable

Data collected prior to lethal removal efforts will be used as the response variables. These will include but are not limited to occupancy of coyotes and mountain lions within the Monitor Mountains.

Project Goals

1. Determine the number of breeding pairs of coyotes in the Monitor Mountains.
2. Determine the occupancy of coyotes and other predators in the Monitor Mountains.
3. Determine the density, abundance, and/or occupancy of prey species in the Monitor mountains including lagomorphs, sage-grouse, and mule deer.

Potentially Affected Species

Coyote, mountain lion, 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, these populations can be continued to be suppressed by predation from coyotes and mountain lions (Ballard et al. 2001).

Project Area

Monitor Mountains in Unit 162

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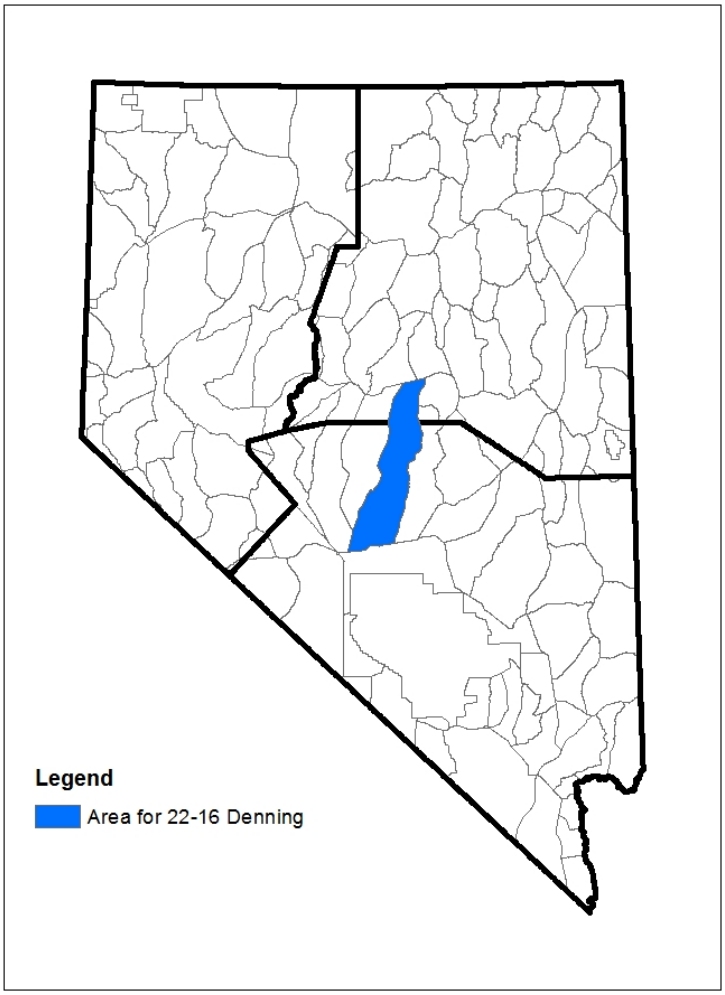


Habitat Conditions

Persistent drought combined with fires and human disturbances throughout Nevada have reduced herbaceous cover, fawning, and browsing habitat. These effects may have reduced mule deer below carrying capacity. These effects may also be suppressing mule deer below carrying capacity (Ballard et al. 2001).

Comments from FY 2015 Predator Report

To experiment with the best way to discover coyote den locations two methods were tested; forward looking infrared (FLIR) and ground searches with a contractor to locate dens. FLIR systems have been used to find a wide array of wildlife species. FLIR searches have also been able to find other species den entrances. Unfortunately, Owyhee Air was not able to find any coyote dens during this search. Until further advances are made elsewhere using FLIR

searches to find coyote dens, NDOW will not use this technique. A private contractor was able to locate one active den during a week of ground searches.

Methods

Lagomorph densities will be estimated driving road transects, using spotlights to detect individuals (Smith and Nydegger 1985, Ralls and Eberhardt 1997). Sage-grouse will be monitored through lek counts and wing counts. Mesopredators and mountain lion occupancy will be estimated using camera traps placed in a grid system (Mann et al. 2014). Breeding pairs of coyotes will be determined with a combination of ground searches and camera trapping

Anticipated Result

1. Determine the occupancy of predator and prey populations in the Monitor Mountains.

Recommendations

Discontinue project 22-16.

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

Reason for Discontinuation

Project 35 has been completed.

Justification

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

Project Manager

Russell Woolstenhulme, Nevada Department of Wildlife

Project Goals

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

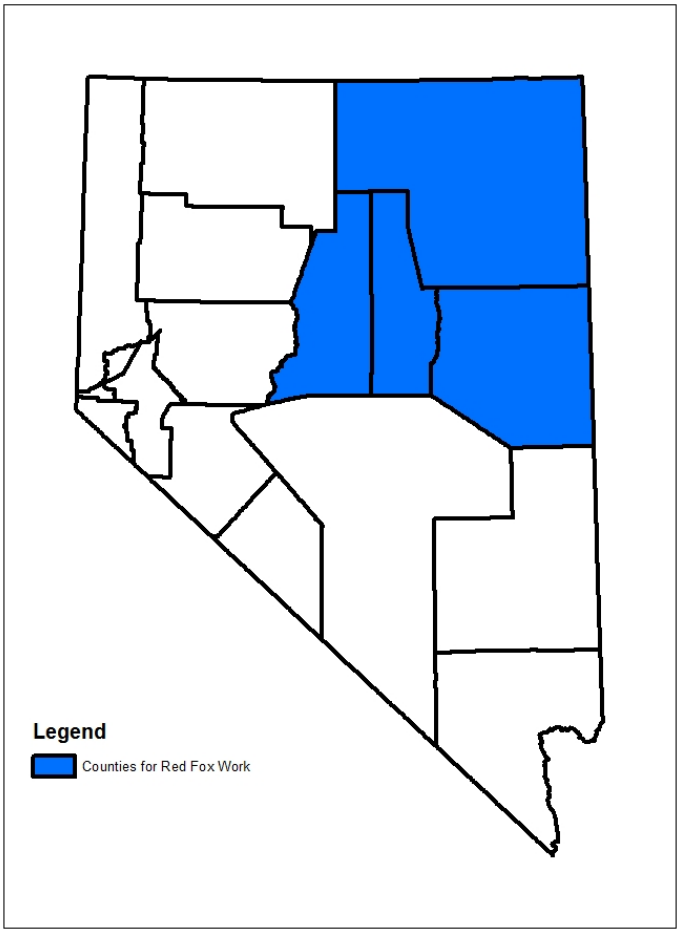
Potentially Affected Species

European red fox, Sierra Nevada red fox, Greater Sage-grouse

Span More Than One Fiscal Year
No

Project Area

Elko, White Pine, Lander, and Eureka counties



Recommendations

Terminate Project 35 as of 30, June 2016.

Project 39: Predator Education

Reason for Discontinuation

Project 39 was canceled due to AB 78. Spending $3 predator fee funds on predator education is no longer an allowable expenditure.

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 common raven densities through removal of human subsidies.

Project Manager

Pat Jackson, Nevada Department of Wildlife

Project Goals

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

Potentially Affected Species

Common raven, Greater Sage-grouse

Project Area

Statewide

Recommendations

Terminate Project 39 as of 30 June 2016.

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Overall FY 2017 Budget

Project	Predator Fee	PR Funds	Total
Department of Agriculture Administrative Support Transfer[a]	$14,000	N/A	$14,000
Project 21: Greater Sage-Grouse Protection (Common Raven Removal)	$78,000	N/A	$78,000
Project 21-02: Common Raven Removal to Enhance Greater Sage-Grouse Nest	$25,000	N/A	$25,000
Project 22-01: Mountain Lion Monitoring and Removal to Protect California Bighorn Sheep	$90,000	N/A	$90,000
Project 22-074: Mountain Lion Removal for the Protection of Rocky Mountain Bighorn Sheep	$90,000	N/A	$90,000
Project 32: Mountain Lion, Black Bear, and Mule Deer Interactions	$40,000	$120,000	$160,000
Project 37: Big Game Protection-Mountain Lions	$125,000	N/A	$125,000
Project 38: Big Game Protection-Coyotes	$125,000	N/A	$125,000
Project 40: Coyote Removal to Complement Multi-faceted Management in Eureka County	$100,000	N/A	$100,000
Project 41: Increasing Understanding of Common Raven Densities and Space Use in Nevada	$100,000	$300,000	$400,000
Project 42: Assessing Mountain Lion Harvest in Nevada	$2,500	$7,500	$10,000
Project 43: Mesopredator Removal to Protect Waterfowl, Turkeys, and Pheasants on Wildlife Management Areas	$50,000	N/A	$50,000
Total[b]	**$839,500**	**$427,500**	**$1,267,000**

[a] This 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).
[b] The projects that contain lethal removal as a primary aspect, making them ineligible for Federal Aid funding.

Expected Revenues and Beginning Balance of Predator Fee

	FY 2014 Audited	FY 2015 Actual	FY 2016 Estimated	FY 2017 Projected
Beginning balance	$377, 674	$380,038	$544,631	$562,943
Revenues	$570,368	$574,312	$574,312	$574,312
Plan Budget	$526,360	$338,000	$556,000	$839,500
Expenditures	$568,004	$409,719	--	--
Ending balance	$380,038	$544,631	$562,943	$297,500

[a]All actual and audited amounts are from the State Accounting System. Estimated revenues are projections based on recent receipts and budget expenditures are derived from the Predator Management Plan

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Appendix

http://www.ndow.org/Public_Meetings/Commission/Agenda/

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