

Nevada Department of Wildlife
Predation Management Status Report
Fiscal Year 2023



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Executive 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 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, non-lethal 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.

In FY 2023, 12 projects were included in the planned activities, with each project having committed funding. Included in NDOW's ongoing work is Greater sage-grouse protection (Project 21), bighorn sheep protection (Project 22-01, Project 22-074, Project 37 and Project 44), pronghorn protection (Project 38), mule deer protection (Project 40) and waterfowl, turkey, and pheasant protection (Project 43). The appendix of this document can be found at <https://www.ndow.org/blog/predator-management-plan/>

Fiscal year 2021 predator fee revenues totaled \$858,601. The Department needed to allocate about \$686,881 on lethal removal to meet the requirements set forth by Assembly Bill 78. Proposed predator projects for fiscal year 2023 included \$759,000 for lethal work, \$771,058 was spent on lethal removal in fiscal year 2023.

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

Common raven (thereafter raven) control efforts to conserve Greater sage-grouse commenced in March and extended throughout May 2023. The objective of this project is to increase Greater sage-grouse nest success and recruitment. USDA Wildlife Services (WS) performed raven control work through the placement of corvicide (DCR-1339) injected chicken eggs within occupied Greater sage-grouse habitats. The main treatment areas consisted of eastern and northeastern Nevada in situations where concentrations of ravens have been noted and where habitat has been compromised, potentially by wildfire or anthropogenic subsidies (e.g. landfills and transfer stations).

Through the efforts of USDA WS personnel, an estimated 4,871 ravens were removed during spring 2023 for project 21. 2,500 is the current number that NDOW can remove under the current USFWS depredation permit (#MB37116A-0).

Department Comments on Project

Raven management, including lethal removal, is imperative to maintain and improve Greater sage-grouse and the ecosystems they depend on. NDOW recommends continuing Project 21 while common ravens are believed to be a limiting factor for Greater sage-grouse.

\$3 Planned Expenditures	P-R Planned Expenditures	Lethal Expenditures	NDOW Non-Lethal Expenditures	NDOW Salary, Travel, and Office	Total
\$175,000	N/A	\$150,465	\$0	\$14,692	\$165,157

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

Efforts to establish a viable California bighorn sheep population along the Massacre and Coleman Rims continue. A recent augmentation on the southern portion of the Massacre Rim has helped to increase numbers in the area.

Between July 1, 2022 and June 30, 2023, 1 mountain lion was removed by USDA WS in Unit 013 and 12 mountain lions in Unit 014. Mountain lion removal efforts were made by a private contractor in Unit 012, 1 mountain lion was removed. The private contractor submitted the Annual Predator Management Project Reporting Form (Appendix).

Bighorn Sheep Herd Health (Biologist III Jon Ewanyk)

Despite the augmentation efforts in 2019, coupled with the ongoing predator removal, the California bighorn sheep population continues to decline in Unit Grouping 011, 013. The current population estimate for the 011,013 herd is down to 60 sheep remaining between the Coleman Rim, Massacre Rim, and Hays Canyon. This unit grouping was last surveyed in August of 2022 and 37 sheep were observed. The lamb recruitment improved from the previous year's survey and yielded a ratio of 48 lambs per 100 ewes. After briefly reopening the hunting season in 011, 013 for two years, it was determined that the number of mature rams was too low, and the hunting season was closed again by 2023. Both predation and habitat conditions have kept this herd below objective, however the precipitation levels received this year should help to improve the habitat conditions. Continued lion removal under Project 22-01 should also help to reduce the number of adult mortalities in the 011, 013 sheep herd.

Department Comments on Project

NDOW supports continuing Project 22-01 until the local bighorn sheep populations reach viability as defined in the annual Predator Plan.

\$3 Planned Expenditures	P-R Planned Expenditures	Lethal Expenditures	NDOW Non-Lethal Expenditures	NDOW Salary, Travel, and Office	Total
\$100,000	N/A	\$35,836	\$0	\$14,692	\$50,528

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

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 typical 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 bighorn sheep herd; however, the population rebound has not completely occurred.

The Contact Area is a major deer winter range. It is possible that mountain lions following the deer herd from summer range in the Jarbidge Mountains to winter range switch their diet to bighorn sheep when deer return to their summer range. Some mountain lions may be staying in the area on a yearlong basis with their primary food source being Rocky Mountain bighorn sheep.

No mountain lion removal efforts were conducted during FY 2023.

Bighorn Sheep Herd Health (Staff Specialist Mike Cox)

As of November 2023, there are currently 4 active bighorn collars (3 ewes and 1 rams). The collar activity is used to determine if there are any mountain lion related predation events. There were 4 new collars deployed in January and February 2022 collars in the Badlands herd on 3 ewes and 1 ram. Unfortunately, 1 ewe died of capture-related injury the same day of the capture. One ewe and 1 ram are still alive in 2023 and 1 ewe died of unknown causes. All 8 collars deployed in 2020 and 2021 are no longer functioning with 4 of the collars dropping off live ewes as scheduled; 2 ewes were euthanized for being positive for Mycoplasma ovipneumoniae, and 2 ewes died of unknown causes. In February and March 2023, 2 additional ewes were collared, and both are still alive. Lamb recruitment through late summer over the last decade has been adequate to allow for herd growth. But herd growth has not occurred indicating loss of lambs in the fall and winter months. Recruitment in 2022 and 2023 dropped below 30 lambs:100 ewes. The population is approximately 25 bighorn sheep.

Department Comments on Project

NDOW supports continuing Project 22-074 until the local bighorn sheep reaches population viability as defined in the annual Predator Plan.

\$3 Planned Expenditures	P-R Planned Expenditures	Lethal Expenditures	NDOW Non-Lethal Expenditures	NDOW Salary, Travel, and Office	Total
\$20,000	N/A	\$11,579	\$0	\$14,692	\$26,271

Project 37: Big Game Protection-Mountain Lions

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.

USDA WS removed 1 mountain lion in 021, 1 in 022 and 1 in 213. A private contractor lethally removed 6 mountain lions in the Snowstorm Mountains. The Annual Predator Management Project Reporting Form for Project 37 may be found in the appendix of this document.

Department Comments on Project

NDOW supports continuing Project 37 until local bighorn sheep and other big game populations become viable as defined in the annual Predator Report. NDOW supports the ability to remove mountain lions quickly.

\$3 Planned Expenditures	P-R Planned Expenditures	Lethal Expenditures	NDOW Non-Lethal Expenditures	NDOW Salary, Travel, and Office	Total
\$100,000	N/A	\$160,735	\$0	\$14,692	\$175,427

Project 38: Big Game Protection-Coyotes

Coyotes face an increase in caloric need when raising pups, both through an increase in parent energetic output and feeding growing pups (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.

Upon approval of Project 38, game biologists with pronghorn management responsibilities were asked whether their pronghorn herds may be underperforming due to coyote predation. Areas where predation by coyotes could be a factor limiting pronghorn populations received removal efforts from USDA WS. Wildlife Serviced performed coyote removal efforts in 011, 015, 021, 022, 031, 065, 102, 103, 108, 115, 131, 143, 144, 155, 161, 162, 221, 222, 231 and 232. 212 coyotes and 5 dens were removed.

Department Comments on Project

NDOW supports continuing Project 38 pending available funding.

\$3 Planned Expenditures	P-R Planned Expenditures	Lethal Expenditures	NDOW Non-Lethal Expenditures	NDOW Salary, Travel, and Office	Total
\$100,000	N/A	\$150,757	\$0	\$14,692	\$165,449

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

Mule deer populations in Diamond Mountains in Eureka County are believed to be underperforming due to competition with feral equids, pinyon-juniper expansion, and predation. To alleviate pressure on resources, 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 directed the removal of pinyon and juniper trees on private range lands in the Diamonds and Roberts Mountains in 2008, 2009, and 2011. USDA WS removed coyotes in the area in 2011 and 2012. A private contractor removed coyotes in 2014. On-going removal of coyotes may assist mule deer population recovery.

From July 2022 until June 2023 USDA WS conducted aerial gunning and trapping of coyotes in Area 14, removing 238 coyotes and 1 coyote den. The 3-year average spring adult to fawn ration for area 14 is 28.

Department Comments on Project

NDOW supports continuing Project 40 until mule deer populations reach levels defined in the annual Predator Plan.

\$3 Planned Expenditures	P-R Planned Expenditures	Lethal Expenditures	NDOW Non-Lethal Expenditures	NDOW Salary, Travel, and Office	Total
\$100,000	N/A	\$134,269	\$0	\$14,692	\$148,961

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

The common raven (*Corvus corax*) has been identified as the most common nest predator of Greater sage-grouse (*Centrocercus urophasianus*) (Coates et al. 2008, Lockyer et al. 2013). Although the raven is a natural predator of Greater sage-grouse nests (Schroeder and Baydack 2001), human subsidies, including food sources (e.g., roadkill (Kristan III et al. 2004, Coates et al. 2014a, b), landfills (William III and Boarman 2007, Peebles 2015) and artificial nesting structures (e.g., power and utility lines (Knight et al. 1995, Coates et al. 2014a, b, Howe et al. 2014), dramatically increased raven abundance as much as 1600% in some areas (Boarman 1993, Sauer et al. 2017). Increased raven abundance coupled with Greater sage-grouse habitat loss (Schroeder et al. 2004) and degradation (e.g., invasive species invasion (Commons et al. 1999, Baruch-Mordo et al. 2013, Coates et al. 2016), wildfire (Crawford et al. 2004, Lockyer et al. 2015) resulted in reduced or decreased Greater sage-grouse population growth in portions of its range (Klebenow 2001, Stiver 2011).

Raven Transmitters

Between July 2022 and June 2023, we retrieved 5 transmitters. We started the fiscal year tracking 20 radio-tagged ravens, by the end of the season 12 transmitters were still on air.

USGS Projects

The USGS engaged in 8 common raven related projects during fiscal year 2023. Project titles are as follows:

USGS raven related projects during fiscal year 2023.

1. Raven influences on sage-grouse population growth using hierarchical distance sampling of raven surveys and sage-grouse lek count data
2. Raven monitoring at Virginia Mountains (no \$3 predator fee funds spent)
3. Raven monitoring across Nevada
4. Raven disease exposure in the Great Basin
5. Effectiveness of egg-oiling raven nests using drone technology and sage-grouse nesting responses
6. Comprehensive literature review of raven space use, demography, and impacts to sensitive prey species
7. Updating the scientific management of ravens tool (SMaRT) with best current science, including statewide raven impact surfaces and areas with high subsidy potential
8. Joint modeling of USGS RRHLs with BBS and eBird to generate annual raven density surfaces and estimate spatial variation in trends over time

Department Comments on Project

Common raven predation may be the greatest limiting factor in Greater sage-grouse nest success, NDOW supports continuing Project 41.

\$3 Planned Expenditures	P-R Planned Expenditures	Lethal Expenditures	NDOW Non-Lethal Expenditures	NDOW Salary, Travel, and Office	Total
\$87,500	\$262,500	\$0	\$256,644	\$14,692	\$271,336

Project 42: Assessing Mountain Lion Harvest in Nevada

Nevada Department of Wildlife has a yearlong mountain lion hunting season limited by harvest quotas, although mountain lions are also lethally removed for livestock depredation and to limit predation on specific wildlife populations. Statewide annual adult female harvest is $\leq 35\%$, which indicates that statewide harvests are unlikely to be reducing statewide mountain lion population abundance (Anderson 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.

Department Comments on Project

Findings indicate Nevada has a stable mountain lion population.

\$3 Planned Expenditures	P-R Planned Expenditures	Lethal Expenditures	NDOW Non-Lethal Expenditures	NDOW Salary, Travel, and Office	Total
\$5,000	\$15,000	\$0	\$14,850	\$14,692	\$29,542

Project 43: Mesopredator Removal to Protect Waterfowl, Turkeys, and Pheasants on Wildlife Management Areas

USDA WS conducted mesopredator removal for the benefit of primarily waterfowl and turkeys in Mason Valley and Overton Wildlife Management Areas in FY 2023.

Species	Number Removed
Badger	2
Beaver	2
Bobcat	2
Coyote	43
Feral Cat	4
Raccoon	26
Skunk	12

Department Comments on Project

NDOW recommends continuing project 43 pending funding availability.

\$3 Planned Expenditures	P-R Planned Expenditures	Lethal Expenditures	NDOW Non-Lethal Expenditures	NDOW Salary, Travel, and Office	Total
\$50,000	\$N/A	\$22,282	\$0	\$14,692	\$36,974

Project 44: Lethal Removal and Monitoring of Mountain Lions in Area 24

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).

Attempts have been made to establish a desert bighorn sheep population in Area 24. Reintroduction attempts have provided mixed results, it has long been thought lion predation may be a contributing factor. Project 44 has evolved to be a reactive removal project. Mountain lions within the Delamars are captured, receive GPS collars, and kill sites are visited to determine diet. If a lion consumes a bighorn sheep it is lethally removed. The Annual Predator Management Project Reporting Form may be found at the appendix of this document.

From July 1, 2022 to June 30, 2023 2 mountain lions were collared. 243 kill site investigations were conducted.

Bighorn Sheep Herd Health (Biologist Matthew Shanks)

The Delamar Mountain bighorn sheep herd continues to show low lamb recruitment. Population continues to decrease. Some bighorn sheep herds in adjacent mountain ranges have had stable populations in this same timeframe. The cause of population decline within the Delamar Mountain range is not fully understood, although several known factors affect the herd. Mountain lion predation has been documented within the Delamar Mountains and likely has a limiting effect on the small population. Disease-related mortalities from *Mycoplasma ovipneumoniae* have also been documented in this herd in 2015. In addition, bighorn sheep may be dispersing to adjacent mountain ranges.

Drought and habitat loss are compounding factors that may make bighorn sheep within the Delamar Mountains more susceptible to population decline. Drought conditions have deteriorated habitat quality over the last several years. According to the U.S. drought monitor, most of the area was in exceptional or extreme drought between September 2020 and December 2022. However, moisture patterns have improved. Precipitation received during the summer and fall of 2022 and the winter of 2022-2023 has been well above average. In 2022, Community Environmental Monitoring Program weather stations in Pioche and Alamo registered 88% and 79% of average precipitation, respectively. Habitat conditions in the area continue to be affected by pinyon and juniper encroachment and feral horse use. In 2020 multiple wildfires burned large areas of preferred bighorn sheep habitat in the area. Severe drought conditions, limited water distribution, and removal of preferred habitat have put the Delamar Mountain bighorn sheep herd at higher risk of population collapse. Ongoing predator control efforts and maintenance of water development projects are very important for the future of this bighorn sheep population.

The last aerial survey in the Delamar Mountains was conducted in September of 2022. This survey resulted in the observation of 102 bighorn sheep classified as 18 rams, 67 ewes, and 17 lambs. This survey effort was extensive and provided vital knowledge of the population growth

rate. This is how the lamb ratio of this survey compares to previous years (26 lambs:100 ewes in 2017, 8 lambs:100 ewes in 2019, 45 lambs:100 ewes in 2020, and 25 lambs: 100 ewes in 2022), however the population is not in a “recovery” pattern currently. Hunter harvest success has remained high in the unit with the success being (100% in 2022, 60% in 2021, and 100% in 2020). Severe drought conditions in 2022 may have led to lower lamb ratios. However, in 2023 surveys in adjacent units have amounted to higher lamb ratios in the low 30’s. This is due to the increase of valuable forage and water on the landscape due to the winter of 2022. I suspect that the lamb ratios in 2023 in unit 241 also increased.

Department Comments on Project

NDOW supports continuing Project 44 until the local bighorn sheep populations reach viability as defined in the annual Predator Plan. NDOW also supports reactive removal of offending mountain lions while learning more about local mountain lion diet. NDOW supports seeking outside collaboration and funding sources.

\$3 Planned Expenditures	P-R Planned Expenditures	Lethal Expenditures	NDOW Non-Lethal Expenditures	NDOW Salary, Travel, and Office	Total
\$100,000	N/A	\$91,135	\$0	\$14,692	\$105,827

Project 45: Passive Survey Estimate of Black Bears in Nevada

Black bears are expanding numerically and geographically, and in so doing they are recolonizing historic ranges in Nevada. It is imperative the Department be able to estimate Nevada’s black bear population and monitor growth and change. Being able to do so passively will ensure the Department can reach these objectives safely and cost efficiently.

In a collaboration with Oxford and University of Montana, hair snare stations and trail cameras will be deployed on a grid to determine black bear density. Existing black bear GPS data will be incorporated into models. These data will ultimately result in a population estimate.

Department Comments on Project

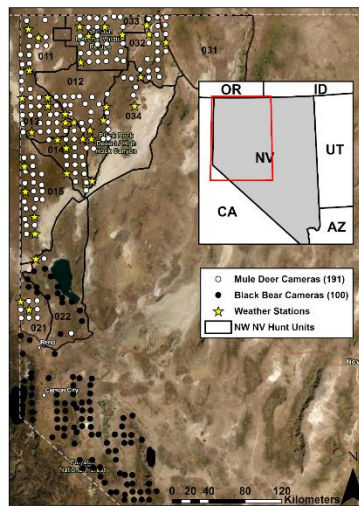
NDOW recommends continuing Project 45 as a monitoring project.

\$3 Planned Expenditures	P-R Planned Expenditures	Lethal Expenditures	NDOW Non-Lethal Expenditures	NDOW Salary, Travel, and Office	Total
\$5,000	\$15,000	\$0	\$20,000	\$14,692	\$34,692

Project 46: Investigating Potential Limiting Factors Impacting Mule Deer in Northwest Nevada

Recent decades have seen Northwest Nevada’s mule deer herds decline, resulting in fewer tags issued and low-quality hunt experiences. Several factors may be contributing, including predation, drought, wildland fire, invasive plant species, and competition from feral horses. A combination of these factors are likely at play, it is the Department’s desire to better understand the situation.

Project 45 and project 46 have the same collaborators, hence the same expert. As you can see in the map, the grid of cameras across northwest Nevada are now one continuous grid.



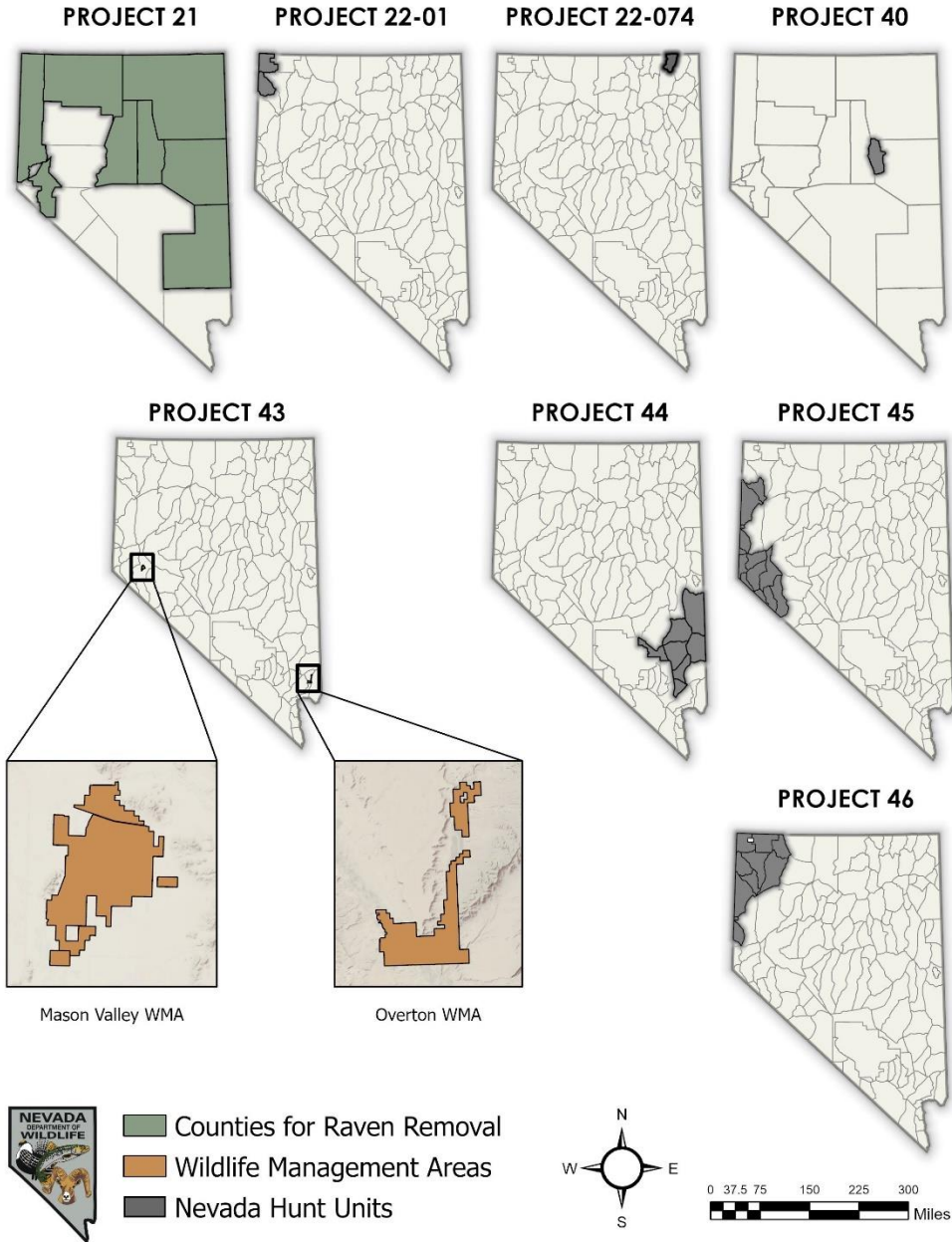
During fiscal year 2023, 3 manuscripts were published and 2 were submitted, all affiliated with this project. 275 trail cameras were maintained throughout the year, resulting in 1.26 million photographs collected. 35 weather stations were maintained, all were checked twice.

Department Comments on Project

Project 46 has the potential to greatly increase the understanding of flora and fauna communities in northwest Nevada.

\$3 Planned Expenditures	P-R Planned Expenditures	Lethal Expenditures	NDOW Non-Lethal Expenditures	NDOW Salary, Travel, and Office	Total
\$40,000	\$120,000	\$0	\$159,999	\$14,692	\$174,691

Maps of Projects



Overall Budget and Expenditures for FY 2023

Project	\$3 Planned Expenditures	P-R Planned Expenditures	Wildlife Services Expenditures	NDOW Non-Lethal Expenditures	NDOW Salary, Travel, and Office^b	Total
Department of Ag Transfer ^a	\$14,000	N/A	\$14,000	\$0	\$14,692	\$28,692
Project 21	\$175,000	N/A	\$150,465	\$0	\$14,692	\$165,157
Project 22-01	\$100,000	N/A	\$35,836	\$0	\$14,692	\$50,528
Project 22-074	\$20,000	N/A	\$11,579	\$0	\$14,692	\$26,271
Project 37	\$100,000	N/A	\$160,735	\$0	\$14,692	\$175,427
Project 38	\$100,000	N/A	\$150,757	\$0	\$14,692	\$165,449
Project 40	\$150,000	N/A	\$134,269	\$0	\$14,692	\$148,961
Project 41	\$300,000	\$0	\$0	\$256,644	\$14,692	\$271,336
Project 42	\$5,000	\$15,000	\$0	\$14,850	\$14,692	\$29,542
Project 43	\$50,000	N/A	\$22,282	\$0	\$14,692	\$36,974
Project 44	\$100,000	N/A	\$91,135	\$0	\$14,692	\$105,827
Project 45	\$5,000	\$15,000	\$0	\$20,000	\$14,692	\$34,692
Project 46	\$40,000	\$120,000	\$0	\$159,999	\$14,692	\$174,691
Total^c	\$1,159,000	\$150,000	\$771,058	\$451,493	\$190,996	\$1,413,547

^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 WS (e.g., mountain lion removal to benefit wildlife).

^bIncorporates both \$3 predator fee and P-R expenditures

^c Fiscal year 2021 predator fee revenues totaled \$858,601. The Department needed to allocate about \$686,881 on lethal removal to meet the requirements set forth by Assembly Bill 78. Proposed predator projects for fiscal year 2023 included \$759,000 for lethal work, \$771,058 was spent on lethal removal in fiscal year 2023.

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Appendix

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