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Wildlife Damage Management Protection Efforts for a Vulnerable Pronghorn Antelope Population in Northwestern Nevada: 2000 through 2004

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ABSTRACT: In January 2000, the Nevada Board of Wildlife Commissioners (Wildlife Commissioners) directed Nevada's state game management agency, the Nevada Department of Wildlife (NDOW), to secure wildlife damage management (WDM) assistance from the United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services Program (WS) for the purpose of protecting a struggling population of pronghorn antelope located in northern Washoe County, Nevada. NDOW had documented, over a several-year period, that this northern Nevada antelope population had consistently demonstrated unacceptably low fawn recruitment levels. While NDOW was unsure of the cause for this consistent poor production record, the Wildlife Commissioners suspected "excessive" fawn predation to be one of the primary causes for the unacceptable recruitment levels. WS was contracted by NDOW to initiate fawn protection efforts for this population with an emphasis on coyote predation management. In collaboration with WS, NDOW mapped out a designated protection area where WDM activities would be conducted, established that WDM activities would only be conducted during the vulnerable fawning period, and set a target recruitment level for the herd which, when reached, would conclude the WDM activities. Prior to the initiation of WDM actions, WS personnel conducted several predator surveys to establish the coyote incidence level within the designated protection area. These data were to serve as a baseline indicator to help gauge the effectiveness of ongoing coyote removal efforts. While WS removed any coyote encountered within the specified protection area during the critical fawning season, removal efforts were primarily directed at older, territorial coyotes. The doe-to-fawn ratio was determined by NDOW at the end of each season, and when the ratio reached NDOW's predetermined level of 32 fawns per 100 does, WDM activities were terminated. Additional benefits stemming from the antelope project included reduced predator pressure on other game species inhabiting the same area (such as mule deer), and collection of coyote blood samples for the monitoring of wildlife diseases such as plague.

KEY WORDS: *Antilocapra americana*, *Canis latrans*, Centers for Disease Control, coyote, Nevada Board of Wildlife Commissioners, Nevada Department of Wildlife, pronghorn antelope, Washoe County Vector Control, wildlife damage management, Wildlife Services

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INTRODUCTION

In December 1999, the Nevada Wildlife Services program (WS) was contacted by a group of concerned citizens who wanted to help protect Nevada's wild ungulate populations from predation caused by predatory wildlife. The main predator of concern was the coyote (*Canis latrans*). This group of concerned citizens, which included professional hunting guides, sportsmen, wildlife groups, politicians, lawyers, and various members of the general public who had concerns about what they saw as excessive predation on certain wildlife species, wanted WS to conduct a general campaign of predator control. In response to this request, WS informed the group that WS does not conduct predator control. Rather, WS conducts wildlife damage management (WDM) activities for the benefit of an identified resource such as juvenile mule deer (*Odocoileus hemionus*), pronghorn antelope (*Antilocapra americana*), or any other wildlife resources, and these WDM activities include actions to control predation, but WS does not involve itself with actions aimed at managing populations of predators across a broad landscape (Spencer 2004). WS recognizes that each depredation event and management situation

requires an assessment of the legal, social, economic, biological, ethical, and technical aspects (Knowlton *et al.* 1999) and any action must be based on protection of a specific vulnerable resource.

The group of concerned citizens went on to generate legislative action by Bill Draft Request 45-160, which resulted in Assembly Bill 291 (Nevada Legislature 2001). This act established the annual collection of a \$3.00 application fee for every game tag application, providing NDOW with a completely funded management tool directed toward ungulate protection from predation.

The first area where NDOW directed WS to conduct WDM activities for the protection of antelope fawns was game management unit (GMU) 011. NDOW decided that the only predator to be targeted for protection of the resource was the coyote. Coyotes are an extremely opportunistic predator that, despite various levels of control actions specifically targeting them, have expanded their range and population into areas that had no previous record of coyotes. In fact, evidence indicates that coyotes today are actually doing better in terms of population size and distribution than when North America was first settled by Europeans (Moore and Parker 1992).

GMU 011 is located in northwestern Washoe County, Nevada and consists of typical high desert habitat with limited water availability. This high desert area varies in elevation from 4,000 ft. in the valleys to 7,500 ft. at the highest points. The protection area is approximately 20 mi wide and 19 mi long, but only about 40% of the area contains high quality antelope fawning habitat.

BACKGROUND

In Nevada, WS is the federal side of the cooperative federal/state entity, the Nevada Animal Damage Control Program (NADCP). The NADCP is a collaborative entity comprised of federal, state, local municipalities, and private entities working together toward the mutual goal of protecting Nevada’s resources. The state side of the cooperative program is the Division of Resource Protection, within the Nevada Department of Agriculture. The NADCP is both managed and supervised by WS but works closely with its collaborators.

WS is authorized to protect wildlife and other resources from damage caused by wildlife when the WDM action is requested by the appropriate management authority (USDA 1995). WS activities are conducted in cooperation with other federal, state, and local agencies, as well as with private organizations and individuals. WS is authorized by Congress to provide direct assistance to resource owners who are experiencing loss or eminent loss in wildlife damage situations. Additionally, WS field activities are conducted in accordance with Annual Work Plans, permits, and authorizations received from cooperating federal and state regulatory agencies.

INITIATION OF WILDLIFE DAMAGE MANAGEMENT

WS recognizes that the management of most wild mammals, reptiles, and amphibians in the United States and Canada is the responsibility of the individual states and provinces. In general, the capture, possession, or killing of resident wildlife to achieve control of damage or nuisance situations is regulated by state or provincial laws (Dolbeer *et al.* 1994). Even when the WDM actions are requested by the state’s designated wildlife management agency, WS strongly recommends that prior to conducting any wildlife damage management actions, every detail of the requested action be put in writing to minimize the risk of misunderstanding or confusion (Spencer 2002) and to more clearly delineate the scope of the project.

Also prior to conducting WDM activities in the antelope protection area, it was important to establish who has ownership or management authority of the land involved. WS determined that some of the area in question was managed by the Bureau of Land Management (BLM) and that a portion of the protection area was located within a designated Wilderness Study Area. WS required written permission from the BLM to conduct WDM activities on these lands. Some of the involved area was privately owned, and WS secured agreements with local livestock producers, who were more than willing to allow coyote removal on their private lands, because coyotes had an adverse effect on their livestock operations in this area.

The resource needing protection in GMU 011 was antelope fawns. Antelope fawn production in this northwestern Nevada game management unit had a history of being much lower than desired. NDOW reported the fawn production in GMU 011 to be one of the lowest in the state prior to 2000. Prior to WDM, the 5-year average was recorded by NDOW to be at 12 fawns per 100 does, which is well below the maintenance level needed to sustain this population of antelope.

Poor nutrition, predation, disease, and adverse weather during the fawning period have all been identified as potential factors influencing pronghorn fawn survival rate (Trainer *et al.* 1983). In mid-July 1995, the fawn-to-doe ratio was less than 1:100 in nearby Hart Mountain National Antelope Refuge (HMNAR). This ratio was the lowest recorded for that refuge in nearly 40 years of observation (U.S. Fish and Wildlife Service, unpubl. data). Contrary to the often held popular conception that coyotes prey only on the sick and weak, mortality of pronghorn fawns on the HMNAR during 1996 and 1997 was found to be primarily due to predation by coyotes, with coyotes killing fawns apparently regardless of fawn health (Dunbar *et al.* 1999).

Newborn antelope fawns typically have an average weight of 4.0 kg, making them highly vulnerable to predators, especially coyotes, in western desert communities. Trainer *et al.* (1983) concluded that predation was the leading cause of pronghorn antelope fawn loss, accounting for 91% of the mortalities that occurred during a 1981-82 study in southeastern Oregon.

Prior to conducting lethal removal of coyotes, WS conducted predator scent-post station surveys during the months of March through June. Scent-post stations were placed at ½-mile intervals for 25 miles for a total of 50 stations. Scent post stations were monitored for 3 nights each month for a total of 150 station-nights per month. Tracks were identified and recorded around each scent station. These surveys were conducted annually throughout the 5-year project. Over the 5-year period, the only other mammalian species that visited scent post stations was the bobcat. Bobcat visitation to scent stations was constantly low throughout the study period. Although the bobcat is a documented a major predator of antelope fawns (Beale and Smith 1973), WS did not target the bobcat for removal in the protection area, as it was not on the list of species NDOW requested WS to address.

The 5-year survey average of coyotes per month shown in Table 1 indicates that WS was successful at suppressing the local coyote population within the protected area during the 4-month period. Table 2 also shows that coyote activity within the fawning areas declined in May, the height of the antelope fawning period.

Table 1. Average monthly count of coyote presence (tracks) at 150 scent-post track stations established on GMU 011, 2000 through 2004.

| March | April | May | June |
|-------|-------|-----|------|
| 47 | 21 | 19 | 12 |

METHODOLOGIES

WS used voice howling surveys to determine that territorial coyotes inhabited much of the critical fawning areas. Territorial coyotes tend to be older coyotes, and older coyotes tend to be the more experienced hunters. Coyotes in Nevada have also been documented to be as old as 13 years (Bowers and Spencer 2006). Research indicates that coyote territories in an area are contiguous, with little overlap (Gese *et al.* 1996) and that coyotes do not tend to occur where they cannot be territorial year-round (Shivik *et al.* 1996). Furthermore, evidence suggests that alpha coyotes are the principle killers of wild ungulates (Gese and Grothe 1995, Gese 1999). Thus, we considered the coyotes representing the greatest threat to the antelope fawns to be the older-aged, territorial alpha coyotes inhabiting the area around known antelope fawning grounds.

Having access to a wide arsenal of WDM tools is the most effective way for a wildlife specialist to consistently remove offending coyotes from a protection area. WS employed several WDM methods and technologies to selectively remove offending coyotes. Aerial hunting is a highly selective and environmentally friendly method for removing offending coyotes. Environmental hazards associated with aerial shooting are minimal, as this method is highly selective for specific target animals (USDA 1994). In combination with an experienced ground crew, aerial hunting can be a very productive method for removing coyotes (Bowers and Spencer 2006). Aerial gunning during the coyote breeding season is selective for breeders, where ground crews elicit howling and direct the aircraft to responding coyotes; non-breeding coyotes generally do not howl during this season (Gese and Ruff 1998). The aerial hunting crew also proved valuable in locating coyote dens and reporting their location to ground personnel.

Soft-catch leghold traps (SCT) and trail snares (TS) were placed at locations where aerial hunting conditions were not favorable (e.g., brushy draws, heavy foliage, etc.). SCT were especially valuable in association with limited water sources. SCT were placed along corridors water sources, in close enough proximity to the water to capture coyotes, yet far enough away to neither scare antelope away from using water sources nor involve other non-target animals that were also attracted to the water source (Bowers and Spencer 2006). TS were the most valuable long-term tool and the preferred ground method of removal. Both SCT and TS were placed in remote or semi-remote locations to avoid involvement with people. An aircraft was sometimes used in conjunction with aerial hunting activities to check the remote set equipment from the air, in order to save valuable field time.

WS was able to use calling and shooting around the fawning grounds to specifically target coyotes preying on fawns by using fawn bleat sounds to coax in coyotes close enough for removal by shooting. The use of the electronic calling system was also implemented in the protection area, and it proved to be highly effective at locating and calling in coyotes (Miller *et al.* 2006). Some opportunistic shooting was employed when coyotes were spotted within the protection area.

Decoy dogs were used from March to July (and especially in the months of May and June) to trail coyotes lost by aircraft, decoy aggressive territorial coyotes, and to find coyote dens. WS noticed that around the middle of May, juvenile coyotes would start to respond to sirens and voice howling, thus giving up their secretive den locations. This made territorial coyote removal extremely effective with the use of decoy dogs. Denning was utilized most often when the aerial crew located coyote dens from the air, and ground personnel would treat active coyote dens with gas cartridges. Because M-44 devices are not labeled for wildlife protection, they were not used.

RESULTS

During the 5-year project, WS removed a total of 420 coyotes from the protection area by various methods (Table 2). The primary area(s) where coyotes were removed were the antelope fawning areas. WDM operations ceased in GMU 011 after 4 consecutive years of above-average antelope fawn production was recorded by NDOW; the ratio reached or exceeded NDOW's predetermined level of 32 fawns per 100 does.

Now that the antelope population in this unit has reached a sustainable level, we believe it can now withstand normal coyote predation rates without the predation having an adverse effect on the population. Wild populations can live with predation if the predation levels are not abnormally high or the wildlife population is abnormally low.

During the course of the project, WS personnel observed that the age and the aggressiveness of coyotes found within the protection area decreased. While at the beginning of the project the majority of the captured coyotes were obviously older and responded with aggression, those coyotes captured later in the project appeared to be younger and showed a considerable less aggressive behavior. It is speculated that the antelope protection actions favored a more transient non-territorial type of coyote. Coyote cementum aging was not conducted at this protection area, but in another portion of Nevada it was suspected that WDM activities do cause the age of coyotes to decrease as territorial coyotes are removed (Bowers and Spencer 2006).

Each fall, NDOW conducted aerial flight surveys within GMU 011 to determine the fawn-to-doe ratio and to collect other herd composition data. NDOW determined the fawn-to-doe ratio for each year, 2000 through 2004 (Figure 1). NDOW wanted to compare the fawn-to-doe ratio of GMU 011 to that of 3 of the surrounding GMUs to see if the increase in fawn-to-doe ratio was a result of the WDM activities conducted or some other reason.

Table 2. Total coyote take, by method, from GMU 011 during 2000-2004.

| Method of Take | Coyotes Removed |
|-------------------------|-----------------|
| Aircraft | 286 |
| Denning / decoy dogs | 29 |
| Calling / shooting | 23 |
| Trail snare | 47 |
| Soft-catch leghold trap | 35 |
| Total | 420 |

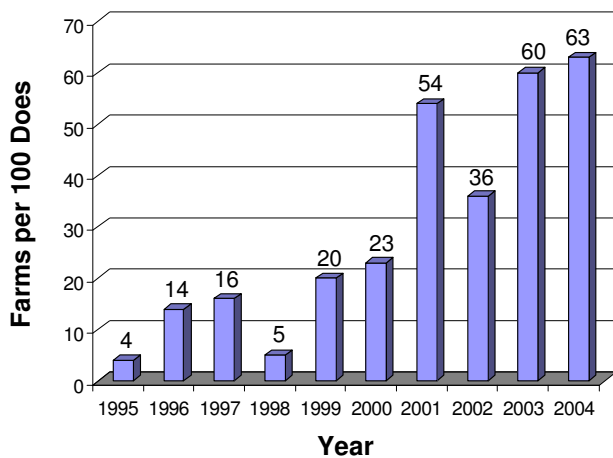


Figure 1. Fawns per 100 does in GMU 011, before WDM (1995-1999) and during WDM activities (2000-2004).

The fawn production of GMU 011, where WDM (treatment) occurred, was to be compared with the fawn production ratios for GMUs 013, 014, and 033 (Sheldon Antelope Refuge), all of which would be viewed as “control” areas, as these units did not receive the WDM treatment. All 3 “control” area units are adjacent to and similar to, in habitat and topographic features, GMU 011 (Woolstenhulme 2005).

However, while the 4 units have similar habitat and topography, there was the possibility that the units had experienced differences in precipitation, and a significant difference in precipitation could be responsible for differences in the fawn production. To eliminate the possibility that precipitation was an influencing variable, a 1-way analysis of variance (ANOVA) was conducted, comparing each of the areas, with precipitation as a covariate. Results indicated that precipitation did not differ between areas either before of during the project years 2000-2004 ($F = 0.37$, $Pr > F = 0.8248$) (Woolstenhulme 2005).

A mixed model ANOVA was used to analyze fawn production numbers comparing fawn production prior to and during the treatment period (2000-2004). The analysis indicates that control of coyotes increased the fawn-to-doe ratio on the WDM treated area ($F = 12.13$, $Pr > F = 0.001$). This analysis used precipitation as a covariate to help eliminate the possibility that annual precipitation could be responsible for any differences. The test ruled out precipitation as a significant factor (Woolstenhulme 2005).

The results of this project suggest that properly administered WDM activities can produce increased survival of vulnerable antelope fawns. WDM activities were validated as an effective tool for game managers to implement for improving the recruitment of antelope fawns into a struggling herd.

RESIDUAL BENEFITS OF WDM

WS observed throughout the 5-year protection period indications that other ungulate species may have also experienced a positive effect from WS’ coyote removal

project. Connolly (1978) reviewed 68 studies of predation on wild ungulate populations and concluded that in 31 cases, predation was a limiting factor, and clearly fawning antelope are not the only species effected by coyotes. During the first year of the WDM project, WS found several coyote den sites that had remains of antelope, mule deer, and bighorn sheep (*Ovis canadensis*) associated with them. While we continued to find coyote den sites throughout the study period that had remains of mule deer, the number of den sites with the remains and the amount of deer fawn remains at the sites diminished over the duration of the project. Hamlin *et al.* (1984) in a study of mule deer fawn mortality in Montana observed that a minimum of 90% of the summer mortality of fawns was a result of coyote predation. As mentioned earlier, older aged coyotes tend to be more experienced and bolder hunters, which more frequently choose larger prey species than the less aggressive younger coyotes. WS found that coyotes removed from this area during WDM activities later in the project appeared to be younger age-classed transient coyotes as compared to those coyotes taken the first year, which were older and more aggressive.

WS also observed coyotes on several occasions in and around sage grouse lek sites. While WS did not notice large amounts of sage grouse remains at coyote den sites, WS did observe occasions where coyotes caused disturbance to sage grouse by scaring birds off the leks and or off their nests.

There also appears to be a “residual effect” resulting from WDM activities pertaining to resident domestic livestock. Experienced livestock producers in the area reported to WS that livestock losses dropped dramatically during coyote removal efforts. In 2005 a year following WDM activities antelope fawns in GMU 011 were recorded by NDOW at 70 fawns per 100 does. It is likely that the residual effect of WDM project will continue to have an effect on this antelope population at least until the age structure of coyotes in GMU 011 rise to pre WDM levels. Hopefully, now that the antelope population has been allowed to establish at a healthy level, predation, even by more experienced and bolder coyotes, will not have the limiting effect it had earlier.

DISEASE SURVEILLANCE

An effort was made by WS employees to collect blood samples from each coyote removed from the project area. WS worked closely with Washoe County Vector Control and the Nevada Department of Agriculture’s Animal Testing Laboratory. WS used Nobuto filter strips for collection of the blood samples and Global Positioning System units to take latitude and longitude at each collection location. The Nobuto blood samples were tested by CDC for the presence of plague titers. Results of the disease testing showed that eleven percent (11%) of the sampled coyotes tested positive for the plague titers in the antelope protection area. This level of plague-positive coyotes is the normal occurrence level found across the state of Nevada during routine coyote plague sampling from 1997 to 2006 (Spencer, unpubl. data).

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