

Oregon Cougar Management Plan

Evaluation of cougar removal on human safety concerns, livestock damage complaints, and elk cow: calf ratios in Oregon

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ABSTRACT

The Oregon Department of Fish and Wildlife (ODFW) developed the 2006 Oregon Cougar Management Plan (CMP) to guide cougar management in Oregon. The CMP addresses human safety (including pets), livestock depredation, and conflict with other big game species using proactive, adaptive management strategies. To assess effects of administrative cougar removal, three target areas were chosen to evaluate effects of cougar removal on major categories of conflict: human safety concerns in Jackson County (SW Oregon), livestock depredation in the Beulah Wildlife Management Unit (WMU; SE Oregon), and elk predation in the Heppner WMU (NE Oregon). Administrative cougar removals were designed to supplement removals related to hunter-harvest and complaints. From January 2007 to April 2009, 101 cougars were administratively removed from the three areas at a total cost of \$310,501, of which \$201,522 were expenses for new ODFW seasonal employees, supplies and services, and contracts with USDA Wildlife Services. No state general funds, tax dollars or federal funds were used for implementing cougar removal in target areas. All funds used for target area implementation were ODFW license fee dollars. ODFW employees took 60 percent of all cougars administratively removed and 66% of the cougars were removed using dogs trained to pursue cougars. Cougar removal in the Jackson County Target Area did not fully address human safety-related conflict. Cougar removal in the Beulah Target Areas reduced cougar–livestock conflicts. Cougar removal in the Heppner Target Area positively affected elk populations. ODFW will continue to monitor Cougar Target Areas to determine the effectiveness of administratively removing cougars, and whether observed treatment effects on livestock depredation and elk calf recruitment will provide long-term benefits in the Beulah and Heppner Target Areas, respectively.

INTRODUCTION

Cougar (*Puma concolor*) populations across North America have fluctuated dramatically during historic times. From the early period of European settlement through the mid-1960s, cougars were nearly extirpated primarily by state, provincial, or federal agricultural agencies. During the mid-1960s, varying but generally short periods of complete cougar protection were implemented and cougar management was transferred to respective state or provincial wildlife management agencies. With subsequent application of science-based wildlife management practices, most agency managers believe cougar populations are more robust now than at any time in recent history (Beausoleil and Martorello 2005).

The successful recovery of cougar populations in western North America presents significant challenges for management agencies. Highly valued as a hunted game species, cougars also have the potential to come into conflict with humans. Cougars can cause direct conflict through depredation on livestock and pets. Although rare, cougars have attacked humans (Beier 1991), and cougar predation can impact wildlife populations. People interested in cougars and cougar management tend to have strong and often conflicting opinions, values, desires, and objectives relative to cougars. The spectrum of values and desires ranges from complete protection or preservation of cougars via hunting prohibitions or highly restrictive regulations to aggressive cougar management for reducing conflict and improving other big game populations. Consequently, cougar management is often controversial, and opposing public desires can lead to highly emotional and politically charged decision processes. Within this dynamic arena, agencies and associated decision makers must evaluate relevant biological information, assess the foregoing influences, and pursue management approaches appropriate for their specific situation (Shroufe 2006).

Throughout western North America, hunting and hunters played a major role in the history of cougar management. Initially, unregulated hunting, extensive use of poisons, bounties, and a general “kill-on-sight” philosophy resulted in near extirpation of many cougar populations. However, in many states it also was hunters that secured protection for cougars and transferred cougar management to state wildlife management agencies. Today, hunting is a primary cougar management tool and hunters carry the majority of the financial burden for cougar management via the purchase of hunting licenses and tags. However, cougar mortality due solely to harvest by licensed hunters does not appear to have kept pace with modeled population growth and has not been sufficient to reduce conflict between cougars and people, livestock, or other wildlife populations.

In Oregon, cougar management is guided by Oregon’s Wildlife Policy (ORS 496.012) which directs the Oregon Fish and Wildlife Commission to maintain all species of wildlife at optimum levels, to provide optimum recreational benefits, and to regulate wildlife populations in a manner compatible with the primary uses of the land. Legal status, management, and population levels of cougars in Oregon have undergone significant changes since the mid-1800s. Cougars may have been extirpated by 1970 had they not been placed under management of the Oregon Department of Fish and Wildlife (ODFW) as a game mammal in 1967. Since 1967, cougar management has varied from closed seasons (no public hunting), to controlled hunting with dogs allowed in selected areas during specific times, to a harvest quota system with unlimited tag availability for year-round hunting with the use of dogs prohibited. A 1994 ballot measure (Measure 18) eliminated the public use of dogs for cougar hunting. In 1995, ODFW established six cougar management zones to administer hunting seasons (Figure 1). Cougars are currently managed under the 2006 Cougar Management Plan (CMP) adopted by the Commission.

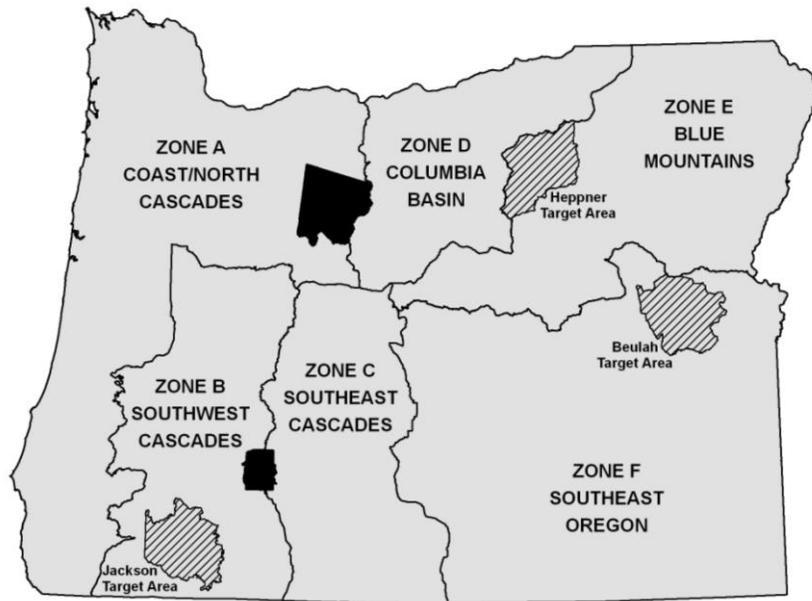


Figure 1. Cougar Management zones and location of cougar target areas in Oregon.

Oregon is not immune to the challenge of factoring human dimensions and values into management strategies. From 1990 to 2003, Oregon’s human population grew 24.4 percent (U.S. Census Bureau 2005). Statewide cougar populations also increased during that period from about 2,600 to about 5,100 (Keister and Van Dyke 2002, Oregon Department of Fish and Wildlife unpublished data). Increased human development and increasing cougar populations have led to higher than desired conflict levels in rural, suburban, and urban settings. Average annual number of cougars killed due to livestock depredation and human safety concerns for the period 1995–2003 was 117 (Table 1). This is a five-fold increase compared to 23 cougars killed per year due to livestock depredation and human safety concerns during 1987–1994.

ODFW has statutory responsibility to address cougar-human conflicts. Although there has not been a documented fatal human attack by a cougar in Oregon, there are numerous examples of situations where cougars and humans have come into very close contact and cougar behaviors suggest there is a valid safety concern. Some Oregon residents have expressed concerns about potential cougar attacks. Human safety concerns include situations where cougars appear accustomed to human activity and development, and are often seen during daylight hours in close proximity to houses and people. Oregon Revised Statutes (ORS 498.166) allow any person to take a cougar that is posing a threat to human safety, without first obtaining a permit from ODFW. Pet losses due to cougars in populated areas are considered a human safety concern because of the close association between pets and humans. Cougars killed for human safety concerns must be reported to ODFW immediately. Cougars killed in response to human safety concerns are the second highest cause of non-hunting mortality for Oregon cougars (Table 1). Statewide, human safety concerns reported to ODFW increased to a high of 651 in 1999 and although declining since 1999, continue to be a concern (Table 1).

Table 1. Trend in reported conflict and associated cougar mortality in Oregon, 1994-2008.

Year	Reported Conflicts				Non-hunting cougar mortality			
	Livestock Depredation	Human Safety	Other	Total	Livestock Depredation	Human Safety	Other ^a	Total
1994	223	331	0	554	29	11	20	60
1995	285	446	11	742	41	22	12	75
1996	309	531	0	840	64	34	25	123
1997	316	482	0	798	82	20	18	120
1998	372	582	0	954	93	20	17	130
1999	421	651	0	1072	91	39	25	155
2000	369	517	56	942	120	27	17	164
2001	330	471	28	829	97	27	21	145
2002	336	409	20	765	111	25	35	171
2003	320	369	8	697	111	28	25	164
2004	149	371	27	547	95	28	35	158
2005	185	376	92	653	125	28	30	183
2006	175	226	67	468	106	26	32	164
2007	177	211	57	445	115	21	41	177
2008	157	277	57	491	108	23	52	183

^a Includes all other causes of mortality such as cougar-vehicle collisions, unknown causes, etc.

Ranching and farming are important components of Oregon’s economy and addressing cougar livestock conflicts is an essential part of cougar management. As the cougar population increased and the human population expanded into rural and suburban areas, potential for cougar-livestock conflicts increased. Cougars rarely cause damage to land or crops; most damage occurs when cougars take or attempt to take livestock. Oregon Revised Statutes (ORS 498.012) allow landowners (or lawful occupants) to take any cougar that is causing damage, is a public nuisance, or poses a public health risk on property they own or lawfully occupy, without first obtaining a permit from ODFW. Landowners may kill the cougar(s) causing the damage using dogs and/or with the aid of bait (ORS 498.164(4)). All cougars killed for livestock depredation must be reported to ODFW immediately.

The majority of livestock depredation complaints resulting in cougar control actions are verified because the carcass or kill site is used for trapping or as the starting site for pursuit with hounds. Cougar complaints involving livestock are generally addressed by USDA Wildlife Services in counties that participate in the program or by landowners or their agents in non-participating counties. The leading cause of non-hunting mortality for cougars in Oregon is removal of cougars in areas experiencing livestock depredation, which peaked at 125 cougars killed in 2005 (Table 1). Cougar-livestock conflicts reported to ODFW increased to a high of 421 in 1999 and continue to be a concern (Table 1).

In accordance with Oregon’s Wildlife Policy (ORS 496.012), management objectives for elk include specific population sex and age ratios. In northeast Oregon, elk (*Cervus elaphus*) calf: cow ratios have declined since the early 1990s in eight Wildlife Management Units (WMUs). Elk populations declined (Oregon Department of Fish and Wildlife 2003b) even as numbers of elk hunters and harvest have been reduced in an effort to maintain elk populations at established Management Objectives (MO). In the Wenaha and Sled Springs WMUs calf survival was as low as 25% and cougars were responsible for 69 percent of the radio-collared elk calf mortalities, while pregnancy rates of adult cows were high (Rearden 2005). Thus there is increasing evidence

that cougar predation may limit some ungulate populations in some situations (Edelmann 2003, Harrison 1989, Hayes et al. 2000, Mathews and Coggins 1997, Myers et al. 1998, Rearden 2005, Wehausen 1996).

ACTIONS TAKEN

ODFW developed and the Oregon Fish and Wildlife Commission adopted in October 2006 the 2006 Oregon Cougar Management Plan (CMP) to guide management of cougar in Oregon during 2006–2011 (Oregon Department of Fish and Wildlife 2006). The purpose of the CMP is to maintain cougar population levels while managing cougar conflicts with humans, livestock, and other big game mammal populations. Five objectives were adopted that address the broad range of public concerns regarding cougars in Oregon. Objective 1 established as ODFW policy the maintenance of a statewide population of cougars that is self-sustaining and assures the widespread existence of cougars in Oregon. Objective 2 established maximum threshold levels for non-hunting cougar mortality associated with human safety, pet safety, and livestock depredation. Objectives 3 and 4 established maximum threshold levels for reported conflicts associated with human safety concerns, and livestock depredation, respectively. The focus of the CMP objectives is to reduce conflicts with cougar while maintaining a healthy statewide cougar population. Objective 5 established criteria whereby action may be taken to improve populations of other big game mammals. Specific criteria for other big game mammal populations (specifically, ungulates such as deer and elk) are based on minimum recruitment levels needed for population maintenance.

Since its development, the CMP has garnered a great deal of interest and scrutiny. A number of local interest groups criticized the CMP and associated objectives whereas other groups supported the CMP and desired broader implementation. As a result of the dramatically different opinions and desires, the Oregon Legislative Assembly also began actively monitoring cougar management and implementation of the CMP. ODFW frequently provides updates on management activities and progress directly to the Oregon Legislature.

The CMP was similar in design and scope to several other species-specific management plans developed by ODFW. However, a new component of the CMP was to utilize proactive, adaptive strategies to manage cougar in Oregon. One adaptive management strategy developed was to administratively remove cougars in areas where reliance on licensed cougar hunters proved ineffective at addressing chronic conflicts related to human safety, livestock depredation, or population dynamics of ungulates. In November 2006, ODFW selected three target areas to evaluate the efficacy of administratively removing cougars due to human safety concerns, livestock depredation, and elk population recruitment impacts from November 2006 to April 2009 (Figure 1). The Jackson County Target Area was selected due to a large number of complaints related to human safety. The Beulah Target Area was selected due to a high number of cougar-livestock conflicts. The Heppner Target Area was selected due to elk cow: calf ratios much lower than desired and believed to be the result of cougar predation.

Utilizing published research, data collected during routine cougar management activities, estimates of cougar density based on zone-specific cougar population models, and habitat characteristics of each area (Keister and Van Dyke 2002, Oregon Department of Fish and Wildlife unpublished data), an annual cougar removal objective was established for each target area (Table 2). The annual removal objective was determined based on the number of additional mortalities needed in the area to cause a decline in cougar density based on the zone-specific population model (Keister and Van Dyke 2002). Administrative cougar removals occurred primarily during November–April each year unless otherwise noted and all cougars were lethally

removed. Data or samples collected from all known cougar mortalities in the target area included date, method of take, location (UTM), gender, reproductive status if female, lactation status, and a tooth for age analysis. Animals were classified into three age classes by gender: juvenile (< 1 yr old), sub-adult (1-2 yr old), and adult (\geq 3 yr old). Age class was based primarily on cementum analysis (Trainer and Matson 1989) and secondarily using gum line recession (Laundre et al. 2000). Ages of cougars removed were compared between sources of mortality and gender in the areas using Analysis of Variance (Proc GLM, SAS Institute Inc. 1985). Administratively removed animals were made available to educational institutions when possible.

Table 2. Location, purpose, size, annual objective, and activity dates for three cougar removal areas in Oregon, 2006-2009.

Target Area Name	General Location	Management Zone	Purpose	Area (mi ²)	2007 Cougar Density ^a	Cougar Removal Objective	Timing of Activity
Jackson County	SW Oregon	B	Reduce human safety/pet concerns	1,123	12.3	24/year	Year-round
Heppner	NE Oregon	E	Improve ungulate recruitment	1,189	10.6	30/year	Year-round
Beulah Unit	SE Oregon	F	Reduce livestock depredation	1,175	3.2	12/year	Year-round

^a Number of cougars per 100 square miles.

All known cougar mortalities and all reported cougar conflicts within each target area and for the encompassing management zone were monitored. Criteria to measure success of reducing conflict associated with human safety concerns or livestock depredation were primarily a reduction in cougar mortality resulting from those types of conflicts and secondarily, a reduction in the number of reported complaints received. Criteria to measure elk recruitment were based on spring calf:cow ratios estimated during annual trend counts and population modeling used to determine attainment of established population objectives. Additionally, each target area was paired with a control area where no administrative removals occurred. Control areas were selected based on having similar cougar densities, human demographics, livestock grazing practices, and or ungulate populations. This allowed for an additional comparison of the results from the target areas after removal of cougars.

Cougar populations were monitored primarily using sex-age data collected during mandatory check-in within the target area, within the entire management zone, and cougar population modeling for the management zone. There are limited data on proactively removing cougars to accomplish specific management goals. Nevada (Ashman et al. 1983) uses a harvest rate of 30 percent for management of cougar populations. Alberta regulates cougar harvest to be <10 percent of the population (Pall 1984, as reported in Lindzey et al. 1992). Harvest records for both Nevada and Alberta indicated that cougar populations were not declining. However, accurately assessing cougar population size and subsequent harvest rates relative to population size is not logistically feasible at large spatial scales. Anderson and Lindzey (2005) manipulated a cougar population in Wyoming and found cougar harvest composition can be used to adaptively monitor cougar populations where sex and age data are collected from harvested cougars. By monitoring the proportion of adult females in the total known mortality, cougar population trends can be inferred: when the proportion of adult females in the total mortality exceeds 25 percent for a given area, the cougar population is likely declining (Anderson and Lindzey 2005). Based on this evidence and the knowledge that Oregon cougar harvest was < 14 percent of the

modeled population estimates for any zone-year combination, we assumed that increased, proactive removal in target areas would not significantly reduce the cougar population in any given zone. When the proportion of adult females in the total mortality exceeds 45 percent, the resultant decline in a local cougar population is likely precipitous (Anderson and Lindzey 2005). Consistent with the CMP, our objective was to increase the 3-yr average percent adult females in the total mortality in each target area to 40–45%, while maintaining a 3-yr average percent adult females in the total take for the zone at no more than 25–35%.

JACKSON COUNTY TARGET AREA

Study Area

The Jackson County Target Area was selected specifically to evaluate the efficacy and feasibility of increasing cougar mortality near human habitation to reduce cougar-human conflicts to acceptable levels. Jackson County was selected due to the relatively high number of non-hunting cougar mortalities and reported conflicts related to human safety concerns, the proximity of cougars (and cougar habitat) to an urban environment (Medford-Central Point, OR), and the rural nature of surrounding areas. The 1,123-mile² area is in the south central part of Cougar Management Zone B: Southwest Cascades located in Jackson County, southwest Oregon (Figure 2). The Jackson County Target Area encompassed portions of three WMUs: Rogue, Applegate, and Evans Creek.

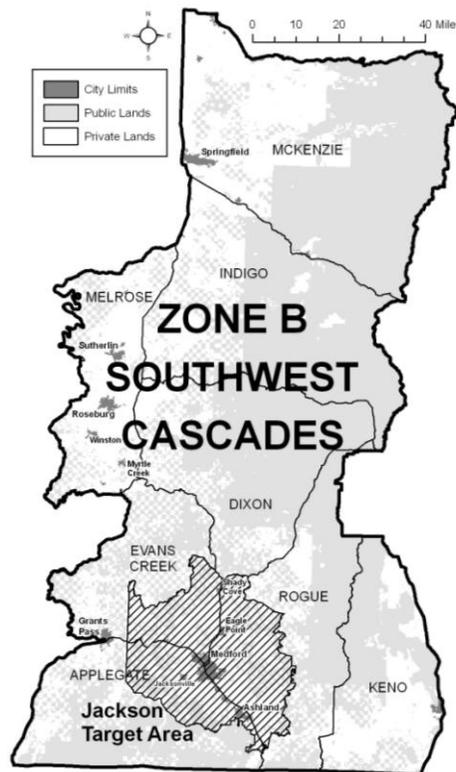


Figure 2. Location and land ownership of Jackson County Cougar Target Area.

Non-hunting cougar mortality in Zone B associated with either livestock depredation or human safety concerns ranged from 12 cougars in 1994 to 43 cougars in 2003, averaging 32 cougars killed annually since 1994. As stated in the CMP, ODFW desires to have non-hunting mortality associated with livestock and human safety concerns at or below 11 cougars killed in Zone B. Reported cougar conflicts in Zone B peaked in 1999 at 379 complaints and have averaged 245 complaints per year since 1994. The desired level for reported conflicts related to human safety concerns in Zone B is 84.

ODFW began Jackson County Target Area management activities in December 2006 using foot-hold traps and snares to administratively remove cougars. In November 2007, USDA Wildlife Services was contracted to use trained pursuit dogs in addition to traps and snares, and in 2009, ODFW assisted USDA Wildlife Services with administrative removal actions. As a control comparison, data from Jackson County Target Area were compared to equivalent data from Josephine County, which has a similar cougar population, habitat conditions, and human populations.

Results

Between December 2006 and April 2009, 12 male and 12 female cougars were administratively removed (six, seven, and 11 during winters 2006-07, 2007-08, and 2008-09 respectively). The spatial distribution of the removals within the target area was not uniform, as most cougars were removed from larger land-ownership parcels located near the outer edges of the target area (Figure 3). ODFW removed six cougars during the first winter of activity (2006–2007), Wildlife Services removed 16 cougars in winters of 2007–2008 and 2008–2009; and ODFW removed an additional two cougars during winter 2009. Twelve cougars were removed using traps or snares and 12 cougars were removed using trained dogs. Twenty cougars were removed from private lands and four were removed from public land. Average ages of all known cougar mortality in the target area were not statistically different either between sexes ($P=0.16$) or between sources of mortality ($P=0.93$) (Table 3).

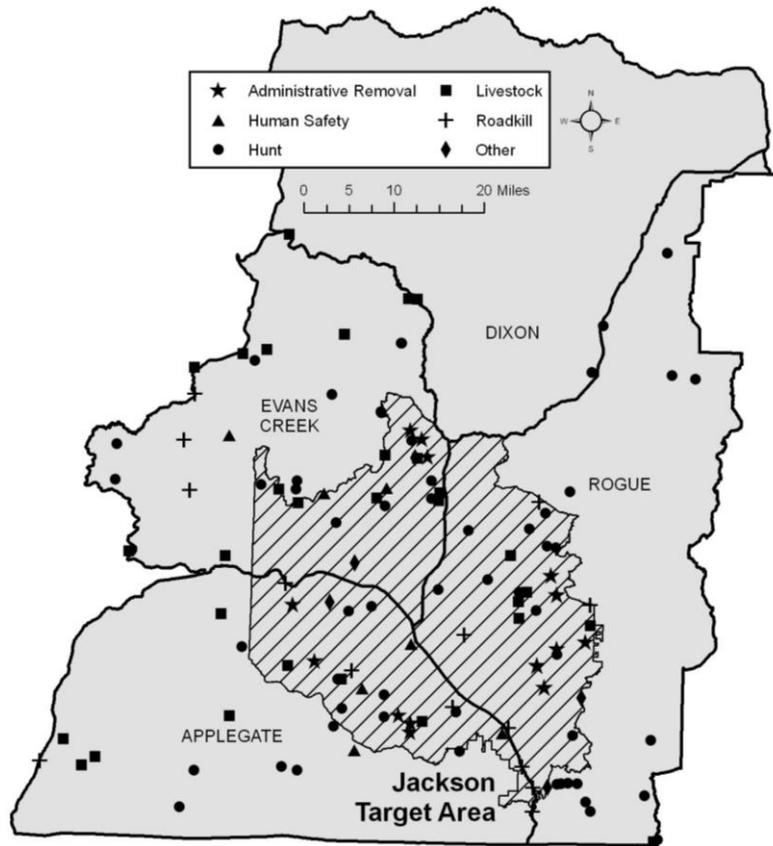


Figure 3. Distribution of known cougar mortalities in the Jackson County Cougar Target Area and vicinity, southwestern Oregon, 2006–2009.

Table 3. Age class and average age by gender for all known cougar mortalities in the Jackson County Target Area vicinity, Oregon, 2006–2009. *Age class based on gum recession for 27 animals pending confirmation with cementum analysis.*

Mortality Source	Female				Male			
	Juvenile	Sub-Adult	Adult	Ave. Age	Juvenile	Sub-Adult	Adult	Ave. Age
Administrative Removal	5	3	4	3.08	3	4	5	2.42
Hunting	0	6	5	2.82	1	4	5	3.13
Human-Pet Safety	1	1	0	0.50	0	3	0	1.03
Livestock Depredation	0	3	4	4.81	0	5	4	2.60
Other	1	0	1	2.67	0	5	0	1.75
Total	7	13	14	3.30	4	21	14	2.26

Non-hunting cougar mortality associated with livestock depredation and human safety concerns within the target area prior to implementing administrative cougar removal was seven cougars in 2003, 10 in 2004, and seven in 2005, respectively. In the Josephine County control area, non-hunting mortality was zero cougars in 2003, four cougars in 2004, and zero in 2005, respectively. During and after administrative removal, non-hunting cougar mortality (not including administrative removals) in the target area was six cougars in 2006, six in 2007 and eight in 2008, respectively. Corresponding non-hunting mortality in the Josephine County control area was zero in 2006, zero in 2007 and two in 2008, respectively. An additional 21 cougars were killed in the target area by hunters (Table 3). During years that include the administrative removal period, there were 48, 40, and 70 combined human safety, pets/livestock/other conflicts

reported within the target area, respectively, and 12, 23, and 34 conflicts reported in the Josephine County control area in 2006, 2007 and 2008, respectively.

At the zone level, combined non-hunting cougar mortality associated with livestock and human safety concerns (32, 36, and 38 cougars for 2006, 2007, and 2008, respectively) remained higher than the annual objective of 11 established in the Cougar Management Plan. The number of reported cougar conflicts in Zone B related to human or pet safety initially decreased from 127 in 2005, to 58 in 2006, but subsequently increased to 113 in 2008. Number of reported conflicts remains higher than the annual objective of 84 established in the Cougar Management Plan. The 3-yr average percent of adult females in the total mortality within the target area was 21% (23, 18, and 21 percent for winters 2006–2007, 2007–2008, and 2008–2009, respectively). For Zone B the 3-yr average percent of adult females in the total mortality was 17% (18, 16, and 17 percent for 2006, 2007, and 2008 respectively). Population modeling indicated cougar population for Zone B initially decreased from 1,529 in 2006 to 1,478 in 2007 but remained essentially stable at 1,476 in 2008. The total mortality quota for Zone B (165) was not met during the administrative removal period.

Discussion

Compared to the time period 2003–2005, the number of cougars killed in the Jackson County Target Area because of livestock or human safety concerns declined by only four cougars during the three years of target area implementation. Reported conflicts for human safety concerns were highly variable across the three years. Non-hunting mortality was less in the Josephine County control area but a similar trend was observed for reported conflicts.

ODFW was not able to achieve its annual cougar removal objective for the Jackson County Target Area. Only 25 percent (6 of 24 cougars) of the desired cougar removal objective was achieved in 2006–2007 and 29 percent (7 of 24) of the desired cougar removal objective was achieved in 2007–08. The number of administrative cougar removals increased in 2008–2009 but still only 46 percent (11 of 24) of the desired objective were removed. According to county tax records, 57.6 percent of all parcels identified within the target area boundary (excluding areas within incorporated city limits) were less than five acres in size with 93 percent of all ownerships less than 50 acres in size. Additionally, privately owned properties with potentially differing land management priorities (e.g. livestock production, commercial timber, rural housing development) were interspersed among parcels of public property in a checkerboard fashion. The matrix of small private ownerships within the target area prevented adequate access for effective cougar removal. Contacting landowners to obtain permission to access these small private ownerships proved very difficult, making it nearly impossible to use pursuit with trained dogs to address human safety concerns. Additionally, because of potential capture of pets or disturbance by humans, foot hold traps and snares were rarely used. Thus removal activity in the Jackson County Target Area did not appear to decrease conflict related to human safety concerns in Cougar Zone B, likely due to the difficulties attaining cougar removal objectives. For Zone B, both the modeled cougar population estimate (1,476–1,529) and the low proportion of adult females in the total mortality for Zone B (16–18 percent) suggest the cougar population was not over-exploited.

BEULAH TARGET AREA

Study Area

The Beulah Target Area was selected to evaluate the efficacy and feasibility of increasing cougar mortality near areas of livestock production to reduce livestock depredation by cougars. The Beulah Target Area has a history of cougar-livestock conflict. Non-hunting cougar mortality associated with either livestock depredation or human safety concerns increased from one removed in 1995 to 21 in 2003, and has averaged 11 through 2009. As stated in the CMP, the desired objective is for non-hunting mortality associated with livestock and human safety concerns not to exceed 11 cougars killed in Zone F annually. Reported cougar conflicts in Zone F increased from 14 in 1994 to 41 in 1999, and has averaged 24 complaints per year. The desired level for reported conflicts related to livestock depredation in Zone F is 27 annually.

This 1,175-mile² target area is located in Cougar Management Zone F: Southeast Oregon, in the Beulah WMU in Malheur County (Figure 4). The target area is a mix of public and privately held rangelands (57 percent public) interspersed with small parcels of irrigated hay fields. Cattle, sheep and horses are the primary livestock species and grazing occurs on both public and private land. Grazing rotations follow an elevation gradient with livestock concentrated at lower elevations during winter. Vegetation in the Beulah Target Area consists of open conifer forest on the western edge transitioning to sagebrush steppe in the east.

Beulah Target Area provides quality year-round habitat for mule deer, elk and pronghorn antelope (*Antilocapra americana*). In addition, the target area includes most of the primary winter range for deer, elk, and pronghorn antelope that summer at higher elevations in the Beulah WMU and surrounding WMUs. The combination of a large ungulate prey base in proximity to livestock production areas likely contributes to the relatively high number of cougar-livestock conflicts.

The Malheur River WMU was selected as a comparison area for analysis. The Malheur River WMU is located immediately west of Beulah WMU, and is similar in size, terrain, and habitat composition. Livestock grazing practices and land ownership also are similar. The Malheur River WMU is 69 percent publicly owned. No administrative cougar removal occurred in the Malheur River WMU during 2006–2009 but cougar hunting was allowed and response to individual cougar related conflicts did occur.

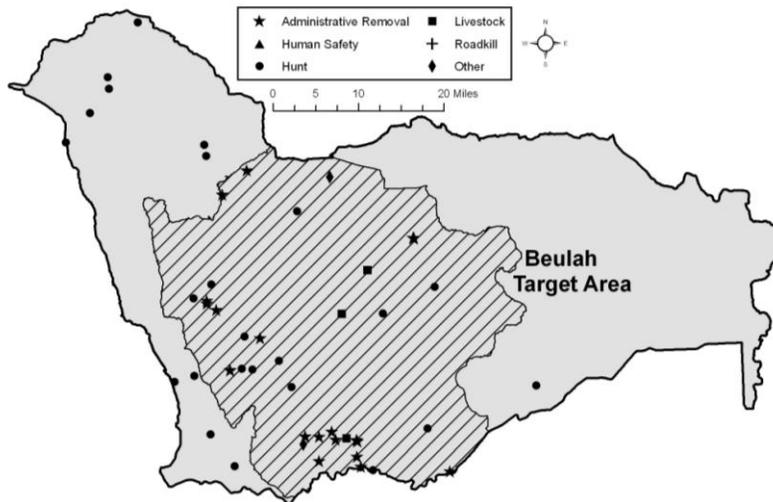


Figure 5. Distribution of known cougar mortalities in the Beulah Unit Cougar Target Area, Oregon, 2006–2009.

Table 4. Age class and average age by gender for all known cougar mortalities in the Beulah Target Area, Oregon, 2006–2009. Age class based on gum recession for 19 animals pending confirmation with *cementum analysis*.

Mortality Source	Female				Male			
	Juvenile	Sub-Adult	Adult	Ave. Age	Juvenile	Sub-Adult	Adult	Ave. Age
Administrative Removal	0	4	5	3.89	0	3	12	4.20
Hunting	0	2	3	3.20	1	2	3	2.91
Human-Pet Safety	0	0	0		0	0	0	
Livestock Depredation	1	2	1	3.25	2	0	0	0.00
Other	0	0	0		0	1	1	2.50
Total	1	8	9	3.56	3	6	16	3.44

During 2006 and 2007, non-hunting cougar mortality associated with livestock depredation and human safety concerns (12, 12, and nine for 2006, 2007, and 2008, respectively) remained higher than the annual objective of 11 established in the CMP for Zone F in two of three years. Since 2005 livestock related cougar complaints have declined from 18 in 2005 to six in 2008, which met the conflict threshold of 27 or less established in the CMP. The average percent of adult females in the total mortality for Beulah Target Area after two years was 24% (32 and 16 percent for winters 2007–2008 and 2008–2009, respectively). Similarly, percent of adult females in the total mortality for Zone F after two years was 29% (32 and 25 percent for 2007 and 2008, respectively). The modeled cougar population trend for the zone remained relatively stable during the administrative cougar removal period (852 and 868 for 2007 and 2008, respectively).

Discussion

Documented trends in cougar–livestock conflict in Beulah WMU provided evidence that increasing cougar mortality near livestock concentrations may reduce cougar–livestock conflicts. Prior to administratively removing cougars, 13 (0.36/mo) non-hunting mortalities occurred in Beulah WMU. During target area implementation, only five (0.18/mo) non-hunting cougar mortalities occurred. Reported cougar–livestock conflicts showed a similar pattern: 16 reported prior to cougar removal whereas only three were reported during target area implementation. These trends were not apparent in the Malheur River WMU. After cougar removal, both

parameters were less than conflict threshold values established in the CMP. Thus, administrative cougar removal activity in the Beulah Target Area appeared to reduce cougar-livestock conflict in Zone F: SE Oregon. For Zone F, the modeled cougar population estimate (852 and 868 for 2007 and 2008, respectively), and the proportion of adult females in the total mortality within the target area (16–32 percent) and for Zone F (18–32 percent) suggest the total mortality may have been sufficient to cause a decline in the cougar population during winter 2007, but not a precipitous decline.

HEPPNER TARGET AREA

Study Area

The Heppner Target Area was selected because of the large decrease in elk calf:cow ratios believed to be from cougar predation. Since 2000, elk calf: cow ratios declined in the Heppner Target Area from long-term averages of 35-40 calves per 100 cows to < 20 calves per 100 cows (Table 5). Calf ratios have been below 23 calves per 100 cows for three years (2004–2006), and elk populations have been below population objectives since 2003 (three years), thus meeting the criteria for a target area as established in the CMP. Observed bull ratios in the Heppner Target Area have been below management objective for seven of the eight years (Table 5). Non-hunting mortality associated with livestock depredation and human safety concerns continues to be much higher than 13 as established in the CMP for Zone E.

Table 5. Trends in bull elk ratio and calf elk ratio in the Heppner Target Area and Ukiah WMU, Oregon, 2000–2009.

Year	Heppner Target Area						Ukiah WMU					
	Bulls: 100			Calves: 100			Bulls: 100			Calves: 100		
	LCL ^b	Cows	UCL ^b	LCL	Cows	UCL	LCL	Cows	UCL	LCL	Cows	UCL
2000	9.8	9.9	10.0	34.1	36.5	38.9	8.8	10	11.2	26.4	28.0	29.6
2001	8.9	9.0	9.1	32.6	35.2	37.8	8.0	9	10.0	23.7	25.0	26.4
2002	7.2	7.4	7.5	28.1	30.4	32.7	7.9	9	10.1	31.4	33.0	34.6
2003 ^a		8			27		5.0	6	7.0	22.4	24.0	25.6
2004	5.4	5.5	5.6	16.3	18.0	19.6	7.8	9	10.2	22.3	24.0	25.7
2005	5.6	5.7	5.8	18.8	21.2	23.6	3.2	4	4.8	17.5	19.0	20.5
2006	9.8	10.0	10.1	15.5	17.1	18.7	7.9	9	10.1	17.6	19.0	20.4
2007	5.1	5.2	5.3	13.6	15.1	16.7	9.0	10	11.0	11.2	13.0	14.1
2008	7.0	7.1	7.1	28.3	29.9	31.4	8.3	9	9.7	15.1	16.0	16.9
2009	8.7	8.8	8.9	27.9	29.4	30.9	9.3	10	10.7	10.3	11.0	11.7

^a No count data available. Estimates based on modeling.

^b LCL and UCL are lower and upper 95% confidence limits, respectively.

The 1,189-mile² Heppner Target Area encompasses 80 percent of the Heppner WMU and includes portions of Morrow, Grant, Umatilla and Wheeler counties in north central Oregon (Figure 6). The target area includes the entire Heppner WMU except for the Ritter Area south and east of the North Fork of the John Day River.



Figure 6. Location and land ownership of Heppner Unit Cougar Target Area.

Removal activities began in the Heppner Target Area in January 2007. The initial annual removal objective of 30 cougars was established based on extrapolation of modeled cougar density estimates for the cougar management zone to the target area. Removal objectives were re-evaluated annually. During the first two years of implementation (July 2006–June 2007 and July 2007–June 2008) attempts were made to remove 30 cougars per year from the target area, primarily during winter months. Based on the number of cougars removed during the first two winters, and in response to the improved elk calf:cow ratios, the removal objective was reduced to 20 during the third year of implementation (July 2008- March 2009) as part of the adaptive management component of target area implementation.

Elk populations were surveyed in the Heppner Target Area after each treatment year (winter) to monitor population response to cougar removals. Surveys were conducted using routine and customary helicopter surveys during March or April. Elk data from the Heppner Target Area were compared to the neighboring Ukiah WMU which has experienced a similar decline in elk population and elk calf ratios (Table 5).

Results

During 2006–2009, 53 cougars (26 male, 27 female) were removed (20, 22, and 11 for winter 2006-07, 2007-08, and 2008-09, respectively), all by ODFW personnel. Between 55 and 73 percent of the annual objective was removed. Most cougars (48) were removed using trained dogs but five were captured using traps or snares. Thirty-two cougars were removed from public land and 21 were removed from private lands. During the implementation period, hunters killed an additional 28 cougars, one cougar was taken for livestock depredation, and one was killed illegally in the Heppner Target Area (Table 6). No cougars were killed as a result of human safety concerns during the same period in the Heppner Target Area. Distribution of cougar removals within the target area was not uniform (Figure 7) but instead was concentrated on elk winter ranges. Average ages of all known cougar mortality in the target area were not statistically different either between sexes ($P=0.21$) or among sources of mortality ($P=0.95$) (Table 6).

Table 6. Age class and average age by gender for all known cougar mortalities in the Heppner Target Area, Oregon, 2006–2009. *Age class based on gum recession for 13 animals pending confirmation with cementum analysis.*

Mortality Source	Female				Male			
	Juvenile	Sub-Adult	Adult	Ave. Age	Juvenile	Sub-Adult	Adult	Ave. Age
Administrative Removal	5	10	12	3.69	7	5	14	3.60
Hunting	1	10	7	3.38	0	4	6	2.98
Human-Pet Safety	0	0	0		0	0	0	
Livestock Depredation	0	1	0	2.00	0	0	0	
Other (Illegal Kill)	0	0	1	4.00	0	0	0	
Total	6	21	20	3.54	7	9	20	3.42

Elk populations in the Heppner Target Area did not respond immediately. However, in 2008 calf ratios increased 76 percent from 17:100 cows in 2006 (95% CI = 15–19:100 cows) to 29:100 cows in 2009 (95% CI = 28–31:100 cows) (Table 5). Bull ratios remain below established management objective for the Heppner Target Area after three years of cougar removals. Observed calf ratios in the Ukiah WMU (control site) did not have the increase during 2008 as observed in the Heppner Target Area. Ukiah WMU calf ratios were 13 calves: 100 cows, 16 calves: 100 cows, and 11 calves: 100 cows for 2007, 2008, and 2009, respectively (Table 5).

The 3-yr average percent of adult female cougar in the total mortality for Heppner Target Area was 22% (26, 23, and 17 percent for winters 2006–2007, 2007–2008, and 2008–2009, respectively). In Zone E: Blue Mountains, the 3-yr average percent adult females in the total mortality was 20% (18, 23, and 20 percent for 2006, 2007, and 2008 respectively). Modeled cougar population trend for Zone E suggests only a slight decline during the administrative cougar removal period (1,618, 1,587, and 1,572 for 2006, 2007, and 2008, respectively).

Discussion

The objective for Heppner Target Area was to increase the elk calf ratio to 31–35 calves: 100 cows. Administrative cougar removal appears to have had the desired effect on the elk calf ratio. Above-average snowfall occurred during winters 2007–2008 and 2008–2009. For winter 2008–2009, cumulative snowfall at the Heppner recording station was at least 3 times that of normal (Figure 8). Radio telemetry data from ODFW studies suggest that during winters with above-average snowfall, elk from neighboring units (Ukiah, Starkey, Desolation and Northside) migrate into Heppner Target Area to escape the snow cover (Wilt 1986). In 2008 and 2009 observed Heppner Target Area total elk counts were much higher than normal years and likely included over 1,000 elk from neighboring WMUs. Considering observed 2009 calf ratio estimates for the Ukiah, Desolation, Northside, and Ritter portion of the Heppner WMUs (not part of the target area) of 11, 16, 22, and 12 respectively, it is likely the influx of elk from these WMUs lowered observed calf ratio estimates for resident elk in the Heppner Target Area.

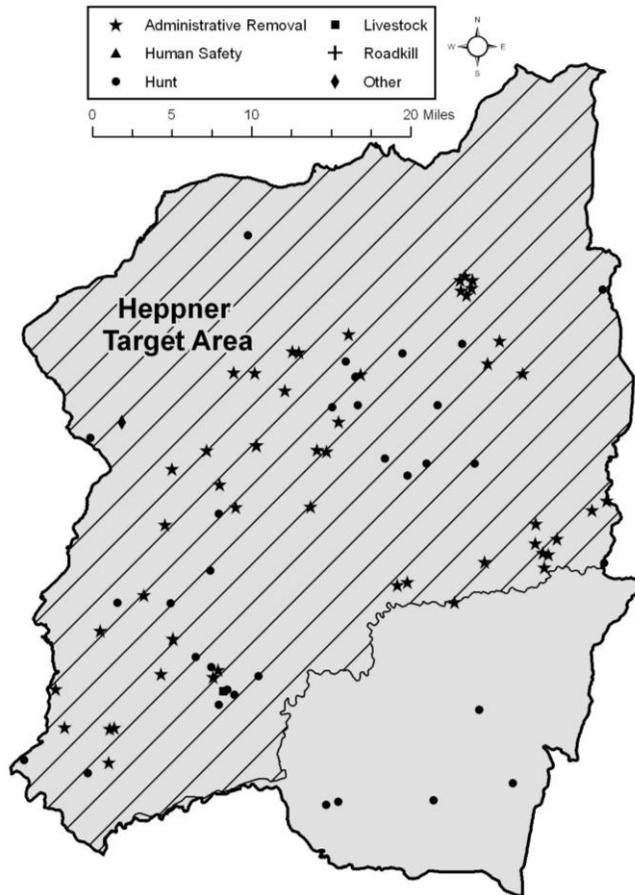


Figure 7. Distribution of known cougar mortalities in the Heppner Unit Cougar Target Area, Oregon, 2006–2009.

Heppner WMU is one of the most popular units for hunting elk in Oregon (Johnson and Moore 1992). In 1995 when the Heppner WMU elk population was at or near management objective, there were 7,198 reported elk hunters in Heppner WMU (3,295 controlled elk hunters and 3,903 general season hunters; ODFW unpublished data). During the 2008 elk seasons, there were 5,693 reported elk hunters (1,425 controlled elk hunters and 4,268 general season elk hunters; ODFW unpublished data). This is a difference of 1,505 hunters between elk populations at MO or below MO. Assuming that the observed 30 calves per 100 cows are recruited into the Heppner Target Area elk population, and assuming that there are approximately 2,246 cow elk in the Heppner Target Area, approximately 600 elk have been added to the population. Of these about half will be bulls available for harvest in subsequent years. If improved calf ratios and resulting elk population trends continue, it is possible that elk hunting opportunities will subsequently increase to levels observed when elk populations were at or near MO in the Heppner WMU.

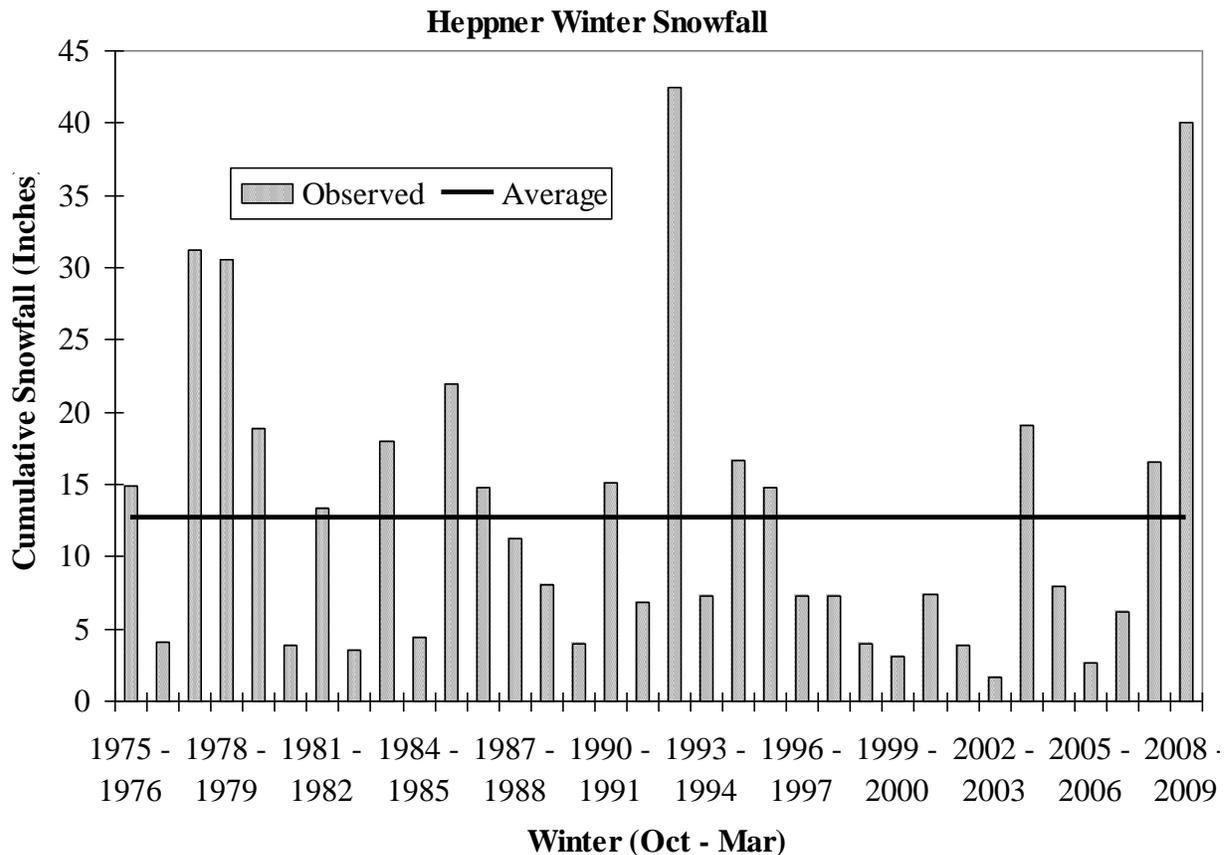


Figure 8. Annual winter snowfall at the Heppner, Oregon recording station, 1975–2009.

The cougar population within Heppner Target Area likely decreased as a result of administrative removals. The number of days of effort per cougar removed increased from 4.3 days/cougar in 2006–2007 to 8.3 days/cougar during 2008–2009. The average age of female cougars taken in the Heppner Target Area also appears to have declined from 4.7 during the first year to 2.9 (note that cougars killed during 2008–2009 are still pending age confirmation with cementum analysis). While the overall cougar population likely declined in Heppner Target Area, the presence of cougar sign (i.e. tracks observed of adult and young of the year) found during removal activities throughout the year suggests a healthy, viable population of cougars persists in the target area. Additionally, licensed hunters continue to encounter cougars while hunting other big game species. Conversely, the cougar population within Cougar Management Zone E appears unaffected. The proportion of adult females in the total mortality both within the target area (17–26 percent) and throughout Zone E (18–23 percent) were well below the 40 to 45 percent that would be indicative of a heavy exploitation rate (Anderson and Lindzey 2005).

COST

Through April 2009, 101 cougars were removed from the three target Areas. ODFW employees took 60 percent of all cougars killed through administrative actions in the target areas and 2/3 of the cougars were taken using trained dogs. Total cost of implementing target area cougar removal for three years was \$310,501 (Table 7). During the first year, ODFW personnel salary accounted for 78 percent of target area implementation costs. As target area activities progressed and staff became more efficient, salary costs declined. Existing employee salaries are shown as part of implementation costs. Although existing employee salaries are real costs because employees working on target area activities are not addressing other district biologist duties, they

do not represent additional expenditures to ODFW. Therefore, the real, additional cost to ODFW for implementing target area cougar removal was \$201,522. No state general funds (tax dollars) or federal funds were used for implementing cougar removal in target areas. All funds used for target area implementation were ODFW license fee dollars.

Table 7. Cost of implementing and conducting cougar removals in 3 cougar target areas in Oregon, winters 2006–2007, 2007–2008, and 2008–2009.

Target Area	Expenditure	06-07	07-08	08-09	Total
All	Existing Costs ^a	\$65,074	\$34,064	\$9,841	\$108,979
	Additional Costs ^b	\$48,091	\$81,763	\$71,668	\$201,522
	Total ^c	\$113,165	\$115,827	\$81,509	\$310,501
Jackson County	Existing Employee Salaries	\$16,918	\$0	\$0	\$16,918
	New Employee Salaries	\$0	\$0	\$0	\$0
	Supplies & Services ^d	\$4,181	\$40,000	\$30,000	\$74,181
	Jackson Cnty. Sub-Total	\$21,099	\$40,000	\$30,000	\$91,099
East Beulah	Existing Employee Salaries	\$4,656	\$0	\$0	\$4,656
	New Employee Salaries	\$7,200	\$0	\$0	\$7,200
	Supplies & Services ^d	\$8,010	\$18,251	\$21,915	\$48,176
	E. Beulah Sub-Total	\$19,866	\$18,251	\$21,915	\$60,032
Heppner WMU	Existing Employee Salaries	\$43,500	\$34,064	\$9,841	\$87,405
	New Employee Salaries	\$15,500	\$18,250	\$16,858	\$50,608
	Supplies & Services	\$13,200	\$5,262	\$2,895	\$21,357
	Heppner Sub-Total	\$72,200	\$57,576	\$29,594	\$159,370
All	Existing Employee Salaries	\$65,074	\$34,064	\$9,841	\$108,979
	New Employee Salaries	\$22,700	\$18,250	\$16,858	\$57,808
	Supplies & Services	\$25,391	\$63,513	\$54,810	\$143,714
	Total ^c	\$113,165	\$115,827	\$81,509	\$310,501

^a Includes existing employee salaries for all Target Areas combined.

^b Includes new employee salaries and supplies & services for all Target Areas combined.

^c Total Expenditure for all three target Areas.

^d Contract with USDA Wildlife Services during 2007-2009.

CONCLUSIONS

The odds of a human being attacked or injured by a cougar are extremely low: More people are injured or killed annually by rattlesnakes, bees, and dogs than by cougars (Beier 1991). However, this does not diminish the fact that when a person is injured or killed by a cougar, the incident is a very serious situation requiring an immediate and intensive response by the wildlife management agencies. Circumstances leading to legitimate human safety concerns can be broken down into three categories: (1) situations where cougars appear to be accustomed to human activity and development, (2) cougars are seen frequently during daylight hours in close proximity to houses and people, and (3) pets are lost due to cougars in populated areas. It is

reasonable to take actions preventing or minimizing the potential for these situations to escalate into incidents resulting in the injury or death of a human in Oregon due to cougars. The efforts of ODFW to reduce human safety concerns due to cougars were not successful largely because of land ownership patterns in the Jackson County Target Area and the inability to remove the target number of animals annually. The methods ODFW used to attempt administrative removal of cougars in the urban-rural interface to reduce cougar-human conflict will likely not work in other areas with similar land-ownership patterns without an extensive outreach program to landowners to provide permission to access their properties. The same challenges encountered by ODFW are likely to be encountered by licensed cougar hunters in these areas. Thus, public hunting may have little effect for decreasing levels of conflict in situations where cougars and cougar habitat are in close proximity to an urban environment.

Based on the 2005 two-year average value for beef cows and the market year average calf price (USDA National Agricultural Statistics Service 2006), cattle producers in Oregon lost an estimated \$721,750 in potential revenue due to feline depredation (including cougars and bobcats). The efforts of ODFW to administratively remove cougars from an area with high levels of livestock depredation reduced livestock related conflict in the area during the removal period, supporting the hypothesis that increased cougar mortality near areas of livestock concentrations can reduce cougar-livestock conflicts. Cattle production is a significant factor for Malheur County (US Department of Agriculture 2007). Aggressive, focused cougar removal may be a viable option for reducing livestock depredation and subsequently benefiting the livestock producer in Malheur County by reducing economic loss and potentially minimizing livestock protection costs.

Hunting provides an important source of income for many rural economies such as found in the Heppner WMU (Dean Runyan Associates 2009). Hunting in the Heppner WMU contributed an estimated \$1,720,000 to portions of Grant, Wheeler, Morrow, and Umatilla Counties during 2008 from hunters throughout the state of Oregon. Further, residents that hunted within 50 miles of the Heppner WMU spent an estimated \$184,444. Based on data collected on hunters traveling to the Starkey WMU (ODFW unpublished data) inflated to 2008 values, elk hunters spend an estimated \$430.95 per trip to hunt elk in northeastern Oregon. Given that there are approximately 1,505 fewer elk hunters in the Heppner WMU compared to when elk populations were at or near MO, this represents a loss of \$647,150 of income to local rural counties. Administrative cougar removal in an area of high predation rates on ungulates resulted in increased survival of calf elk as measured by end-of-winter calf to cow ratios during the removal period. Improvements in elk populations and subsequent increases in elk hunting opportunity in Heppner WMU will benefit economies that rely on this resource.

Cougars are still present in these target areas, but there is no verifiable information on what percentage of the cougar population in each target area was removed. For example, if it is assumed that cougar density was 15 adult and sub-adult cougars per 100 mi² in the Heppner Target Area, there would have been 178 cougars in the target area. If none of the subadult and adult cougars killed by administrative removal or hunters (n = 70, Table 6) immigrated into the Heppner Target Area, the cougar population was reduced by 41 percent. However, it is highly likely that some of the cougars killed immigrated into the target area during this work and the percentage reduction in the cougar population was likely less. Based on the fecundity of cougars, the calf to cow ratio for elk will likely begin to decline in 2010 as the cougar population increases with all other factors held constant. Cougar populations in the Beulah Target Area are likely to respond in a similar manner and livestock depredation may potentially increase again in the future.

We found varying efficacy when using administrative removal of cougars as authorized in the CMP for the three specific types of cougar-human conflicts. Continued monitoring of cougar-

livestock conflicts and measuring calf to cow ratios will be required to determine duration of the effects observed during this administrative removal.

RECOMMENDATIONS

Four of six cougar management zones are above the desired maximum threshold criteria for non-hunting cougar mortality (Table 8) indicating that conflict with cougars continues to be higher than desired as specified in the CMP. Therefore, ODFW proposes continued implementation of target areas consistent with the CMP. For Beulah Target Area, one more year of cougar removal is required to more adequately evaluate the data (Figure 9). ODFW also proposes implementation of four new target areas as described below. Two new target areas will be for elk, and two for mule deer.

Ukiah Target Area

The Ukiah Target Area was selected to improve the elk population because the ratio of calves:100 cows has been below 23:100 since 2005 (5 years) and the elk population has been below management objective since 2004 (6 years). Additionally, data from Ukiah WMU were used as comparison for evaluating the Heppner Target Area. Combining analysis of three years data from Ukiah with that already collected from Heppner will strengthen analyses for this region of northeastern Oregon.

The 883-mile² Ukiah WMU is in Cougar Management Zone E: Blue Mountains and includes land primarily in Umatilla County. Target area activities will occur primarily on elk winter ranges within the forested portions of the unit. Cougar removal methods and elk population monitoring will be consistent with those implemented for the Heppner Target Area. Personnel hired to implement the Heppner Target Area will be maintained to implement the Ukiah Target Area. Using estimated cougar density for the zone and habitat characteristics of each area, the initial cougar removal objective will be 35/year. As part of the adaptive management component of target area implementation, the removal objective will be evaluated annually based on the number of cougars removed by hunters, the responses of elk calf: cow ratios, and for other conflicts. Elk population data will be compared back to information collected in Heppner through continued monitoring in that target area to evaluate success of cougar removal actions in the Ukiah.

Wenaha Target Area

The Wenaha WMU Target Area also was selected for elk population improvement because the ratio of calves: 100 cows has been below 23:100 for three years and the elk population has been well below management objective nine of ten years (Table 9). The 420-mile² Wenaha WMU Target Area is also in Cougar Management Zone E: Blue Mountains and includes portions of Union and Wallowa counties. Cougars will be removed year round with most activity during winter using hounds and snares on elk winter ranges. Elk surveys will be conducted using routine

Table 8. Observed and desired values for non-hunting cougar mortality, number of reported human safety conflicts, and number of reported livestock conflicts due to cougars in Oregon 2004-2009.

Zone	Year	Cougar Mortality		Human Safety / Pets		Livestock Depredation	
		Observed	Objective	Complaints	Objective	Complaints	Objective
A	2004	39	15	159	191	47	102
	2005	35	15	135	191	73	102
	2006	26	15	91	191	56	102
	2007	37	15	64	191	69	102
	2008	35	15	90	191	57	102
B	2004	38	11	122	84	59	69
	2005	38	11	129	84	48	69
	2006	32	11	60	84	63	69
	2007	36	11	78	84	67	69
	2008	36	11	114	84	64	69
C	2004	10	5	20	28	12	24
	2005	4	5	19	28	9	24
	2006	10	5	14	28	8	24
	2007	4	5	16	28	8	24
	2008	4	5	21	28	15	24
D	2004	5	5	19	20	4	12
	2005	26	5	24	20	16	12
	2006	27	5	18	20	13	12
	2007	24	5	7	20	12	12
	2008	16	5	4	20	14	12
E	2004	19	13	46	22	12	25
	2005	33	13	64	22	23	25
	2006	25	13	37	22	22	25
	2007	23	13	31	22	12	25
	2008	31	13	47	22	16	25
F	2004	12	11	8	54	16	27
	2005	17	11	9	54	18	27
	2006	12	11	9	54	13	27
	2007	12	11	14	54	3	27
	2008	9	11	7	54	2	27

helicopter surveys during March or April. Volunteer agents already in place will be used to implement cougar removals. Using estimated cougar density for the zone and habitat characteristics of the area, the initial cougar removal objective will be 20 cougars/year. As part of the adaptive management component of target area implementation, the removal objective will be evaluated annually based on the number of cougars removed and in response to elk calf: cow ratios. Elk population data will be compared to data collected in the Mt Emily WMU to evaluate success of cougar removal in the Wenaha WMU.

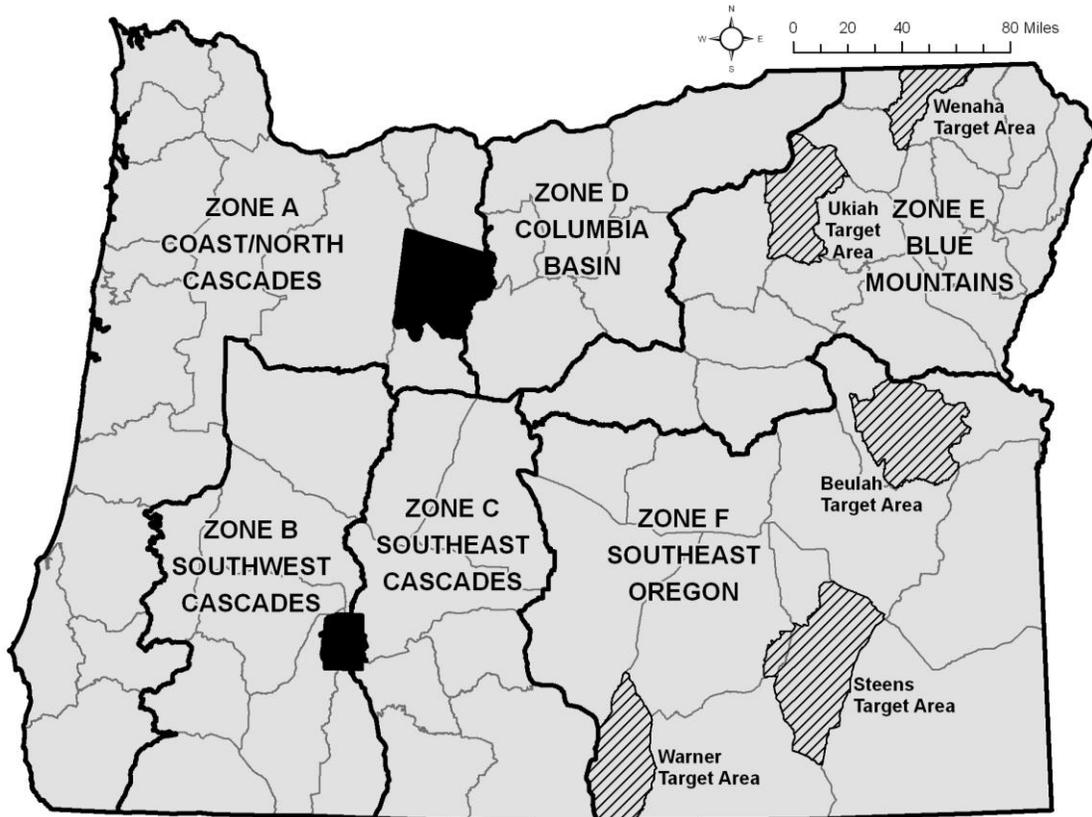


Figure 9. Cougar Management zones and location of new cougar target areas in Oregon.

Steens Mountain Target Area

Steens Mountain Target Area was selected to address declining mule deer populations. Steens Mountain WMU was selected for more intensive management as part of Oregon’s Mule Deer Initiative (MDI). Along with the need for some habitat improvements, cougar predation has been suggested as a probable cause of the deer population decline during development of a management plan for MDI. Consistent with the CMP, deer populations have been < 60 percent of population management objective for over three years (Table 10). Removal activities in the 1,572 mile² Steens Mountain Target Area will focus on mule deer winter ranges within Steens Mountain WMU and a small portion of the Juniper WMU in Cougar Management Zone F: Southeast Oregon in Harney County. Malheur National Wildlife Refuge is not included in the target area boundary.

Cougars will be removed using existing USDA-Wildlife Services personnel in Burns, OR. Using estimated cougar density for the zone and habitat characteristics of each area, the initial cougar removal objective will be 20 cougars/year. As part of the adaptive management component of target area implementation, the removal objective will be evaluated annually based on the number of cougars removed and observed responses in mule deer populations. Mule deer populations will be monitored using routine and customary helicopter and ground surveys during March or April. Additional effort also may be required to obtain more rigorous population estimates. Mule deer population data will be compared to data from Beatys Butte and Trout Creek Mtns to evaluate success of the actions. Resident bighorn sheep populations potentially benefiting from cougar removal will also be monitored for responses to administrative cougar removals.

Table 9. Trends in elk population and calf elk ratio in the Ukiah and Wenaha WMUs Oregon, 2000–2009.

Year	Ukiah WMU			Wenaha WMU		
	Population	MO	Calves: 100 Cows	Population	MO	Calves: 100 Cows
2000	5,500	5,000	28	1,100	4,250	12
2001	5,600	5,000	25	1,150	4,250	14
2002	5,100	5,000	33	1,400	4,250	15
2003	5,000	5,000	24	1,400	4,250	20
2004	4,800	5,000	24	1,450	4,250	16
2005	4,300	5,000	19	1,600	4,250	20
2006	4,100	5,000	19	1,600	4,250	30
2007	4,000	5,000	13	1,550	4,250	13
2008	4,000	5,000	16	1,500	4,250	16
2009	4,000	5,000	11	1,100	4,250	18

Table 10. Trends in mule deer population, deer fawn ratio, and buck ratio in the Steens Mountain and Warner WMUs Oregon, 2000–2009.

Year	Steens Mountain WMU				Warner WMU			
	Population	% of MO (11,000)	Bucks: 100 Does	Fawns: 100 Does	Population	% of MO (5,500)	Bucks: 100 Does	Fawns:10 0 Does
2000	5,150	47%	25	67	2,562	47%	21	49
2001	6,200	56%	31	44	no data		19	66
2002	5,900	54%	22	65	1,328	24%	22	41
2003	5,600	51%	24	55	2,136	39%	13	55
2004	5,500	50%	34	44	1,630	30%	15	56
2005	5,000	45%	51	55	2,270	41%	18	70
2006	4,000	36%	29	69	1,036	19%	24	48
2007	4,300	39%	47	59	2,958	54%	14	37
2008	3,850	35%	29	35	2,389	43%	15	50
2009	3,700	34%	28	68	no data			

Warner Target Area

Warner Target Area also was selected to address declining mule deer populations. Warner WMU was selected for more intensive management as part of Oregon’s Mule Deer Initiative (MDI). Along with the need for some habitat improvements, cougar predation has been suggested as a probable cause of the deer population decline during development of a management plan for MDI. Consistent with the CMP, deer populations have been <60% of population management objective for over three years (Table 10). The 960 mile² Warner Target Area focuses on mule deer winter ranges within the WMU in Cougar Management Zone F: Southeast Oregon in Lake County.

Cougars will be removed using volunteer agents in place for Lake County. Using estimated cougar density for the zone and habitat characteristics of each area, the initial cougar removal objective will be 14 cougars/year. As part of the adaptive management component of target area implementation, the removal objective will be evaluated annually based on the number of cougars removed and observed responses in mule deer populations. Mule deer populations will

be monitored using routine and customary helicopter and ground surveys during March or April. Additional effort also may be required to obtain more rigorous population estimates. Mule deer population data will be compared to data from the Beatys Butte and Interstate WMUs to evaluate success of the actions.

Use of Volunteer Agents

In 2007, the Oregon Legislative Assembly enacted HB 2971 which authorizes ODFW to appoint agents for assistance in their official duties pursuing black bear and/or cougar with dogs subject to the department's direction and control. In January 2008, the Commission adopted rules for implementing HB 2971 allowing ODFW to utilize volunteers to address conflict with cougars or bears using trained dogs. Individuals wishing to be an agent for ODFW must apply and complete a rigorous screening process demonstrating they possess the necessary skills and equipment, and do not have any criminal history. Further, agents completing the screening must undergo extensive training prior to conducting any activities. Once training is completed, agents can only work under a signed agreement with ODFW that details all activities and locations where actions can be taken. Because these agents are volunteers for ODFW but have a very specialized skill needed by the department, their use will result in a significant cost savings when these agents are used to implement target area removals.

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