

**Evaluation of Priorities and Costs in Species Recovery Plans:
Sonoran Pronghorn (*Antilocarpa americana sonorensis*), Louisiana
Black Bear (*Ursus americanus luteolus*) and Sierra Nevada Bighorn
Sheep (*Ovis canadensis sierra*)**

by

Matthew G. Ritter

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This Thesis for the Master of Environmental Studies Degree

by

Matthew G. Ritter

has been approved for

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by

Ralph Murphy, Ph.D.
Member of the Faculty

Date

ABSTRACT

Evaluation of Priorities and Costs in Species Recovery Plans:
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(*Ursus americanus luteolus*) and Sierra Nevada Bighorn Sheep (*Ovis canadensis
sierra*)

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Recovery Plans are crucial in preventing a species from extinction. Without such plans several species would go extinct because of resource limitation. The research examined how Species Recovery Plans were funded and implemented by government stakeholders, and how the spending compared to the goals laid out in the Recovery Plans for the Sonoran Pronghorn, Louisiana Black Bear, and Sierra Nevada Bighorn Sheep. This answered how stakeholder expenditures affect the implementation of tasks outlined in the Recovery Plan and compare the results with the species status. The research determined the effectiveness of Species Recovery Plans and if tasks were being funded appropriately. The methodological approaches for the thesis consisted of a literature review, and budget analysis. One species was over budget, one was on budget, and the other was under budget. Overall, funds were contributed accordingly because Sonoran Pronghorn, Louisiana Black Bear, and Sierra Nevada Bighorn Sheep populations all remained stable from 2007 to 2010. Expenditures were properly directed to the tasks of most concern producing stable populations in 2012.

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1. Introduction

The Endangered Species Act declares "...the United States has pledged itself as a sovereign state in the international community to conserve to the extent practicable the various species of fish or wildlife and plants facing extinction." To date the Endangered Species Act is the most important legal document providing protection for twelve hundred species threatened with extinction (USFWS, 2010). The goal of the Act is to recover a species until the risk of extinction no longer persists. For the protection of Endangered Species, Section Four was amended in 1988 to require developing recovery plans for each listed species unless a plan would not help in recovering the species (Crouse, 2002). Species Recovery Plans present an outline protecting a species from extinction developed through a combination of policy, economics, and science.

Recovery Plans provide a roadmap for U.S. Fish and Wildlife Service (USFWS) biologists to recover a species. Each plan incorporates a species' description and current population, containing the most up-to-date information on the species. The recovery objective also needs to be identified, indicating when the goal is met. One example is setting a target population number (Simon, 1995). An implementation schedule outlining priority tasks and expenditure estimates must be included in the Recovery Plan and last, relevant external views of the plan need to be identified in an appendix (Restani, 2002).

Plans go through intense draft processes before finalization and it is up to USFWS Regional Directors to determine the suitability of a Species Plan after a recovery team forms and develops the Plan. Recovery Teams include a diverse background of people from tribal members to home building associations (Crouse, 2002). The team includes

representatives from several backgrounds to produce an objective plan while taking into consideration stakeholders' needs. The process of developing and writing a plan is circumstantial to a species and too complex to completely grasp (Baker, 1999). After the drafting process the plan is independently peer reviewed and published for public input. Once all reviews are analyzed the plan can be finalized (Baker, 1999).

The two agencies responsible for developing and administering Recovery Plans are USFWS and National Marine Fisheries Service (NMFS). Recovery Plans identify actions that might be taken by a variety of agencies and private entities to promote the conservation of a listed species (Crouse, 1999). Recovery teams prioritize actions to guide scarce resource expenditures to the most important priorities. The Plans, also, assist biologist in determining effects projects have on the endangered species and identify ways to avoid them (under section 7 of the Endangered Species Act). No plan is perfect, limitations exist, yet 99% of species listed have been saved from extinction (USFWS, 2011).

Additionally, the complexity of ecological systems makes it difficult for biologist to completely understand therefore, Recovery Plans are based on the most current available data, yet gaps exists. Researcher Deborah Crouse explains this time lapse may "...allow further deterioration in the species status' and, in some cases, an irreversible loss of populations or habitat" (Crouse, 720). Data can be difficult to obtain therefore the recovery process is further delayed (Crouse, 2002).

Unfortunately, Plans are required by law to be developed, yet no law exists enforcing them. State and other federal agencies escape enforcing any plan, leaving the

burden to U.S. Fish and Wildlife Service and National Marine Fisheries Service, plus affected stakeholders (Crouse, 2002).

Additionally, USFWS prioritizes species threatened with extinction through a ranking system. The model ranks a species with number one being of the most concern and 18 being least. The number relates to the degree of threat, recovery potential, and taxonomy (Simon, 1995). For example the Sonoran Pronghorn and Sierra Nevada Bighorn Sheep have a ranking of 3C, while the Louisiana Black Bear has a ranking of 9C. The “C” represents a subspecies and explains the Bear is of less concern than the Pronghorn and Bighorn according to USFWS. The ranking system provides USFWS with a list of species most threatened with extinction.

In 1995, USFWS spent \$348 million on endangered species recovery; today that number is \$1.62 billion (Baker, 2010). USFWS’s expenditures increased over 400 percent in 15 years yet listed species have only increased from 1,179 in 1998, to 1200 in 2010 and much of the funding goes towards few select charismatic species (Brown, 1998). A small number of species have been listed in the last decade, but the cost of recovery increased at alarming rates explaining the variations in expenditures. Although USFWS may spend more on particular species fortunately, most endangered species populations are recovering or stable in the United States (Brown, 1998).

In conclusion, Recovery Plans are crucial in preventing a species from extinction. Without such plans several species would go extinct because of resource limitation. Policy, economics, and science provide significant detail in developing a Species Recovery Plan. The partnership between each assists in maintaining the existence of

many species. Since 1969, 99% of endangered species in the United States have overcome extinction through the efforts of USFWS and other government stakeholders.

2. Methods

The thesis looked into how Species Recovery Plans were funded and implemented by government stakeholders, and how the spending compared to the goals laid out in the Recovery Plan for the Sonoran Pronghorn, Louisiana Black Bear, and Sierra Nevada Bighorn Sheep. This was to answer how stakeholder expenditures affect the implementation of tasks outlined in the Recovery Plan and compare the results with the species status. This is to determine the effectiveness Species Recovery Plans and if tasks are being funded appropriately. Specific methods like spreadsheets and pie charts determined and evaluated where funds were implemented for each of the species between 2007 and 2010.

The methodological approaches for the thesis consisted of a literature review, and budget analysis. The literature review provided information concerning the species biology, demographics, threats, endangerment, and other valuable population information. Additionally, peer-reviewed articles produced the foundation for estimating recovery costs for each species and identified background information for a budget analyses on these endangered species plans and the goals for delisting them.

The thesis was a budgetary analysis of three Species Recovery Plans analyzed between 2007 and 2010. Four years was enough time to understand trends and differences between each Plan to determine the successes of the species recovery and how it compares to the goals of the Recovery Plan. To better understand the goals of the

Recovery Plan and stakeholders involved Excel was used to produce graphs, charts, and spreadsheet of the raw data.

Among several other chapters in a Species Recovery Plan are the cost and implementation schedules. USFWS went to great lengths to develop tasks, list costs, determine responsible agencies, and estimate task completion dates for each species. The cost and implementation schedules were taken from each Plan and categories were created illustrating priority recovery efforts in a spreadsheet.

Moreover, tasks were defined as projects regarding the species' recovery. The tasks were entered into a spreadsheet and defined under the task description. Tasks were then assigned to each category with their appropriate cost estimates and responsible stakeholders. Accountable parties were defined in the Recovery Plan as government and non-government entities, but the thesis only analyzed government stakeholders.

The implementation schedule was determined through published USFWS documents. For every endangered species the agency set up an execution report. The reports were updated regularly and illustrated past, present, and future tasks, the status of different projects, estimated task costs to date, and agency comments. The implementation report was filtered for only ongoing and current projects between 2007 and 2010 to obtain a clear understanding of what exactly was going on with the recovery for a given year.

Out of all the tasks developed in the Species Recovery Plan only ongoing and/or current tasks between 2007 and 2010 were analyzed for the study. The tasks were then placed under the appropriate categories and estimated expenditure totals were calculated.

Totals amounted to the entire number of expenditures per priority. Cost estimates were developed from the Plans, government publications, and other peer reviewed articles.

Furthermore, expenditures were determined through plan updates and critical habitat publications. After careful review of all publications related to costs, estimates were calculated. Cost estimates were determined from the most recent publications and peer review articles.

Overall, spreadsheets illustrated species recovery priorities, tasks, task descriptions, responsible stakeholders, and estimated costs. This information demonstrated which priority received the most funding and it was assumed the priority receiving the most funding was the highest priority set forth in the Plan by the Recovery Team.

To compare this information to actual spending U.S. Fish and Wildlife Service produced expenditure reports each year illustrating costs for listed species, federal Department spending, State expenses, and individual agency contributions. The document provided exact annual funding contributions from various agencies on a specific species and the total costs of that species' recovery annually. Agencies that provided funding between 2007 and 2010 were analyzed individually to better understand their role in the species recovery.

Stakeholders were arranged under each Federal Department in a spreadsheet with the appropriate year and financial contributions. Pie charts illustrated percentages for stakeholder financial contributions from the spreadsheets. Agencies contributing less than 1% of funds were not analyzed in the study because their contribution did not have an impact on the overall implementation of task processes.

Once stakeholders were acknowledged they were researched individually to answer why they were contributing that specific year. Peer reviewed articles and government publications answered questions regarding agency funding and activities for that year. The analysis gave background about the agency, land they manage in the vicinity of the endangered species, any activities they have going on around the species, and their recovery efforts for the species to examine the reason why they were involved in the Recovery.

Current recovery projects, expenditures for each priority, and population estimates were all examined and compared to the goals outlined in the Recovery Plan for delisting the species. The results showed how effective recovery spending was by comparing priority costs with Recovery Plan goals and the species' current population trends. Additionally, it answered how stakeholder contributions and actions influenced a species' recovery goals.

Recovery Plan expenditures were reviewed to understand government stakeholder spending and their impacts on the endangered species recovery efforts. Public government documents were examined to determine the agency's activity in the locality of the endangered species. After comparing results from recovery goals, stakeholder spending, and species population estimates the plan was determined either effective or not and explained the impacts government stakeholders had on funding and implementing a Species Recovery Plan.

3. Case Study

More than eighty mammal species were listed under the Endangered Species Act as threatened or endangered, but the analysis focused on only three of these species. Of the three species analyzed two were listed as endangered, Sonoran Pronghorn and Sierra Nevada Bighorn Sheep, and the Louisiana Black Bear was listed as threatened. Each of the mammals was a subspecies.

Several factors influenced the endangered species over the course of the analysis. The main cause for the Sonoran Pronghorn and Louisiana Black Bear's demise was fragmentation of habitat from conversion of land to agriculture, livestock grazing, development, and encroachment consequently leading to populations of less than 400 individuals. The Sierra Nevada Bighorn Sheep was listed due to disease and parasites transmitted from domestic sheep which caused the population to also decline to less than 400 individuals.

Overall, a variety of stakeholders implemented and funded each subspecies recovery. The agencies involved took responsibility in different tasks defined in the Species Recovery Plan and contributed funds to specific tasks they were responsible for. During the course of the analysis each of the subspecies populations either stabilized or increased implying that Recovery Plans were developed and executed appropriately.

3.1 Sonoran Pronghorn

3.1.1 Background

The Sonoran Pronghorn belongs to a family of North American mammals that have all succumbed to extinction, except the Pronghorn. Endemic to the western portion of North America the subspecies prefers vegetation consisting of creosote and white bursage (USFWS and DOD, 2005). The highly adaptive Sonoran Pronghorn resides in various ranges of climatic conditions throughout its distribution.

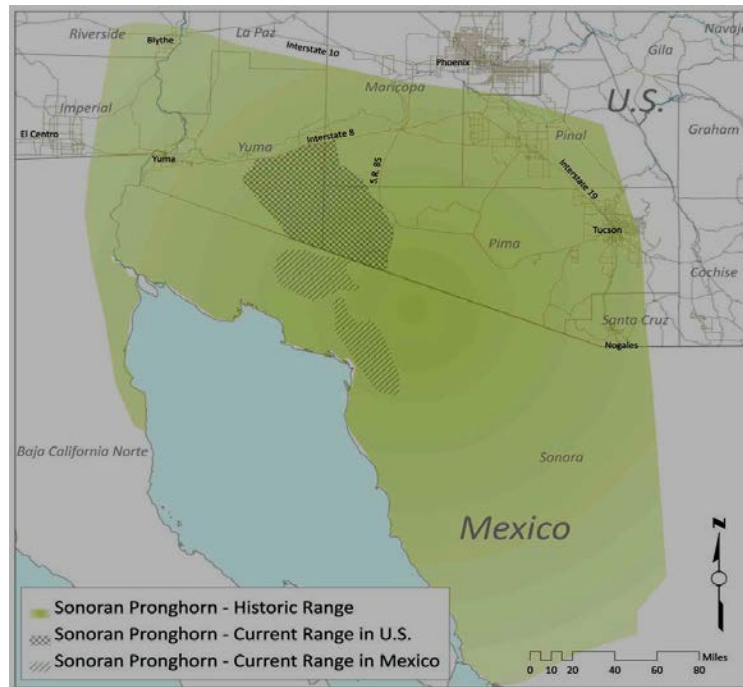


Fig. 1 Current and historic range of the Sonoran Pronghorn. The area in green represents the historic range of the species. The crosshatched section in Arizona depicts the current U.S. population, while the lighter cross hatched section illustrates the current range of the species in Mexico (USFWS, 2003).

Historically the species ranged from Nogales, Mexico to Yuma, Arizona, not in extensive numbers, maybe a few thousand. Explorers observed several populations in the open valleys of Southern Arizona and Northern Mexico. Unfortunately, at the present time, Sonoran Pronghorn have been eradicated from almost their entire historic range. In

fact, the Pronghorn exists on less than eight percent of its previous distribution, roughly 2,750 square miles (USFWS, 2010).

The subspecies requires a vast area of desert scrub vegetation ecosystem to meet annual survival and reproductive needs (USFWS, 2003). Biologists believe 200 square miles of land can support up to 100 female Pronghorn. Luckily, enough space exists for the Pronghorn, but the ecosystem no longer sustains the animal because of habitat degradation from development and other negative factors.

Two other populations of Sonoran Pronghorn reside in Northern Mexico. One population exists in the Pinacate Region of northwestern Sonora, and the other remains on the Gulf of California west and south of Caborca, Sonora (USFWS, 2003).

Unfortunately, a washed out International Boundary fence, highways, and roads separate the U.S. subpopulation from the two other populations. The human barriers resulted in the inability for the subpopulations to interact with each other leading to less genetic variation in the overall population.

The species range, in Arizona, almost completely encompasses federal lands (USFWS, 2003). The largest portion of the range lies in Cabeza Prieta National Wildlife Refuge (CPNWR), 41.6%. Second the Barry M. Goldwater Range contains 30% of the species' range. Roughly 12% of the population's distribution resides in Organ Pipe Cactus National Monument and the remaining ranges are managed by the Bureau of Land Management, 4.4%, private landowners, 1.5%, and State Trust Lands, 1.2% (USFWS, 2010).

Reasons for Listing

More than any other anthropological activity livestock grazing affects Pronghorn the most. When listing the species, habitat alteration (caused in part by grazing) was one of the most significant factors in the species decline (USFWS, 2003). To offset the difficulty USFWS determined that sensitive habitats needed: protection from excessive grazing, land for conservation purposes, and grazing practices requiring changes to allow for natural fire regimes (USFWS, 2011)

Invasion of invasive shrubs, anthropological barriers, and human caused fire regimes all disrupt the natural processes of the remaining ecosystem. After careful review of threats to the species the Recovery Team came to a conclusion (USFWS, 2003). To eliminate the obstacle controlled burns and natural fire regimes were the best defense. Controlled burning keeps invasive species at bay and reduces fuel loads (USFWS, 2003). USFWS and partners contribute to the activity to keep the ecosystem as “natural” as possible.

Furthermore, conversion of lands to agriculture, unsustainable livestock management practices, and rural and urban development posed threats to the existence of the Sonoran Pronghorn (USFWS, 2011). To avoid the complete loss of the species USFWS mitigated habitat loss, protected vulnerable habitat from excessive grazing, implemented management guidelines to reduce loss, and acquired land for conservation easements to protect vital development sites. Although, the threat was not of great concern it has become an increasing problem (USFWS, 2011).

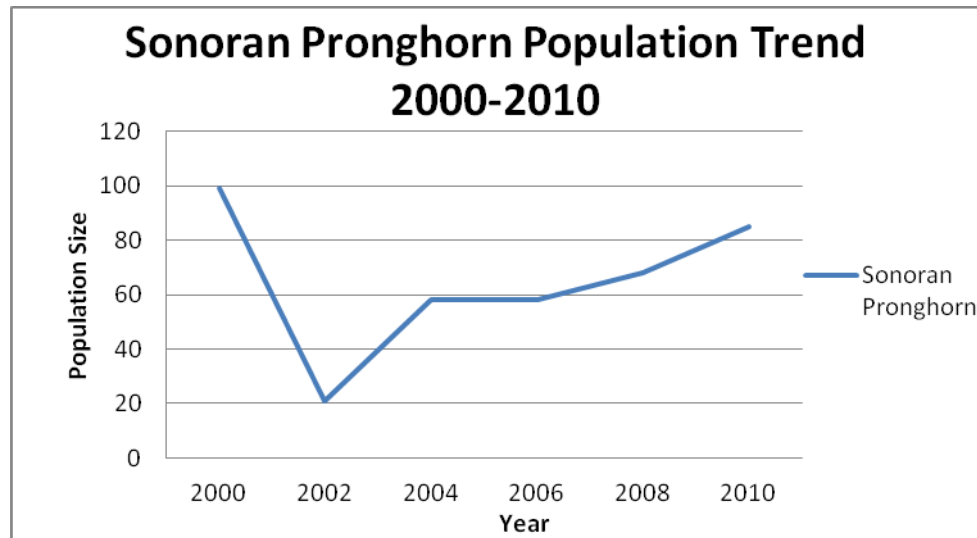
Predation by large mammals and predatory birds presents another obstacle Sonoran Pronghorn are confronted with. High predator numbers can significantly affect

the Pronghorn population. For most species predation is usually considered insignificant for listing unless the population is small and vulnerable like the Sonoran Pronghorn (USFWS, 2003).

In addition to habitat destruction and predation the Pronghorn recently dealt with incredible variations in weather patterns. Seasonal changes varied significantly in the last few decades. Winters have been mild, while summers continued to bake the desert in drought. Research shows the recent weather activities may have caused drastic changes in the population size of the Pronghorn reducing numbers by nearly 80% (USFWS, 2003).

U.S. Fish and Wildlife Service initiated tactics to protect the species from increasingly unstable weather patterns. Drought played a large role in the species loss so biologists thought functioning riparian habitat was the best way to buffer drought and would sufficiently recover the Pronghorn. This was one of the highest priorities on USFWS agenda because of the 2001-2002 drought that almost wiped out the species entirely (USFWS, 2011).

Last, illegal activities impacted the Pronghorn population at alarming rates. Along the border, poaching, human hurdles, and construction negatively influence the population. To offset harmful activity USFWS increased enforcement along the border to implement illegal harvesting of the species and survey the range regularly (USFWS, 2003).



Graph 1. Sonoran Pronghorn population trend from 2000 to 2010. Blue line represents the Sonoran Pronghorn, the x-axis is the years, and y-axis is the population. The decline in population in 2002 was due to severe drought (USFWS, 2011).

Population Dynamics

The population remained around 100 individuals since the mid 1960s, by the 1990s it was closer to 200 but slowly dwindled. In 2000, the population lingered just below 140 individuals. The winter of 2000-2001 brought heavier rains than usual making for an ideal fawning season (USFWS and DOD, 2005). Unfortunately, the period of revival for the Pronghorn was followed by the worst drought in decades in 2002 (USFWS, 2003).

2002 brought drastic changes to the species population dynamics and the population declined over 70% to less than 25 individuals. The subspecies neared extinction in 2002 thus biologists believed the solution for recovering the population was to develop a captive breeding program and facility (Cohn, 2007).

Successful recovery efforts began to pay off in 2004 the Pronghorn population more than doubled to around 70 individuals. In 2010, the population stabilized due to the recovery efforts of various Federal and State agencies and remained around 100 individuals (USFWS, 2010).

Species Recovery Plan and Goals

On November 26, 2003 the Species Recovery Plan for the Sonoran Pronghorn's final draft was completed. The subspecies was given a priority rank of 3C by USFWS meaning the degree of threat to the species was large, but the potential for recovering the species was also high. The population suffered a large population decline in 2002 and struggled to sustain their only U.S. population in southwestern Arizona (USFWS, 2003). Several Federal and State agencies played a crucial role in the recovery of the Pronghorn, and provided financial assistance to the survival of the critically endangered species.

Numerous factors influence the subspecies adversely, human barriers, variations in climate, and habitat loss impacted the population most significantly; as a result USFWS biologists managed the population through unique conservation strategies like captive breeding. The captive breeding facility provides shelter to individual Sonoran Pronghorn to develop and maintain a second population (USFWS, 2003).

Conclusion

To delist the species the Plan outlines two goals. In the short term, the population must be estimated at 300 individuals and a second separate population must be established. USFWS determined the best recovery action for the Pronghorn was establishing a second population with a captive breeding and release facility (USFWS, 2003).

3.1.2 Analysis

For the analysis of the Sonoran Pronghorn priorities were outlined in the Plan in order of importance. For example relocation was the priority of most importance and research was the least according to the Recovery Team. Tasks were defined as projects concerning the species' recovery under one of the five categories set forth by USFWS. A spreadsheet displayed each project and was defined under the task description.

3.1.2.1 Priorities, Tasks, and Spending

| Sonoran Pronghorn | | | | |
|--------------------------|-------------|---|---------------------------------|-----------------------|
| Priority | Task | Task Description | Stakeholder | Cost Estimates |
| Relocation | 1.11 | Viable population estimates | ADGF | \$10,000.00 |
| | 2.21 | Evaluate reintroduction sites and techniques | ADGF, FWS | \$70,000.00 |
| | 2.23 | Public input into reintroduction | ADGF, FWS | \$10,000.00 |
| | 2.25 | Legal aspects of reintroduction | ADGF, BLM, FWS | \$100,000.00 |
| | 2.32 | Review captive techniques | ADGF, FWS | \$100,000.00 |
| | 2.33 | Transplant holding requirements | ADGF, FWS | \$100,000.00 |
| | 2.34 | Transplant protocol | ADGF, FWS | \$100,000.00 |
| Total: | 7 | | | \$490,000.00 |
| Habitat | 1.1 | Fawn recruitment | USAF, USFWS, USMC | \$30,000.00 |
| | 1.2 | Habitat enhancement | USAF, USFWS, USMC | \$150,000.00 |
| | 1.3 | Water investigation | USAF, USFWS, USMC | \$50,000.00 |
| | 1.52 | Investigate preferred habitat | ADGF, BLM, FWS | \$50,000.00 |
| Total: | 4 | | | \$280,000.00 |
| Disturbance | 1.103 | Notify refuge of fatalities | USAF, USMC, NPS, BLM, ADGF, FWS | |
| | 1.73 | Long-term investigation of military effects on behavior | ADGF, USAF, USMC | \$100,000.00 |
| Total: | 2 | | | \$100,000.00 |
| Monitoring | 3.1 | Aerial surveys in U.S. and Mexico | ADGF, NPS, USAF, FWS, USMC | \$10,000.00 |
| | 3.4 | Continue telemetry tracking and assessment of radio marking goals, including Mexico | ADGF | \$50,000.00 |
| Total: | 2 | | | \$60,000.00 |
| Research | 1.9 | Effects of disease and parasites; | ADGF, USAF, FWS | \$20,000.00 |
| | 1.101 | Update veterinarian contact | FWS, ADGF | \$10,000.00 |
| | 1.102 | Materials for medical situations and specimen salvage | FWS, ADGF | included in 1.101 |
| Total: | 3 | | | \$30,000.00 |
| Total: | 18 | | | \$960,000.00 |

Table 1. Chart defines priorities determined by the Sonoran Pronghorn Species Recovery Team. Five columns depict the priority, task number, task description, stakeholders, and estimated costs. Expenditure and task totals are illustrated in yellow (USFWS, 2003).

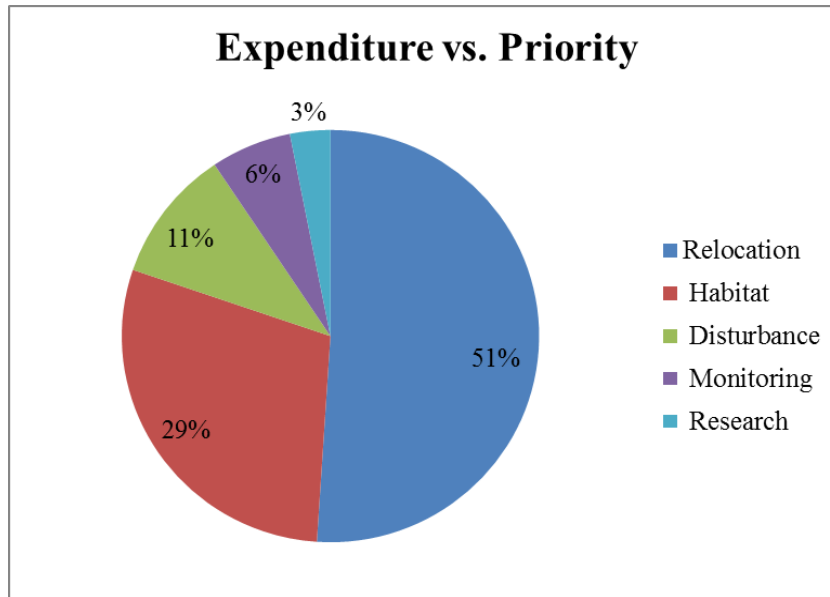


Chart 1. 2 Pie chart of priority expenditures in percentages. The chart key represents the various priority laid out in the Species Recovery Plan and illustrates priority percentages (USFWS, 2003).

Relocation

Relocation, the most important priority for Pronghorn recovery consisted of 51% of the annual recovery budget (USFWS, 2003). A second population must be formed to delist the species therefore; this was the main focus for recovering the Pronghorn. Some tasks are explained in further detail because the chart does not provide enough explanation.

Studies performed by agency researchers helped understand captive breeding techniques associated with the species (USFWS, 2003). They also managed transplant holding requirements and the funds for the requirements went towards meeting Federal regulations for transporting an Endangered Species. Other expenditures included transplant protocol for the project and public input for reintroduction (USFWS, 2003).

Roughly half a million dollars was estimated for the category, \$490,000.00.

Expenditures varied from 2007 to 2010 because of U.S. Customs and Border Patrol (this

will be explained in the stakeholder analysis). Government agencies accountable for this category involved Arizona Game and Fish Department, U.S. Fish and Wildlife Service, and Bureau of Land Management (USFWS, 2003).

Habitat

Priority two for the Sonoran Pronghorn recovery is habitat. The category accounted for 29% of the recovery budget and the annual estimated costs for habitat was \$280,000.00 from 2007 to 2010 (USFWS, 2007).

Tasks found in this category pertain to conserving the ecosystem. Fawn recruitment refers to a fawn surviving longer than six months. Habitat enhancement is a process where generators pump water from underground wells to fill tanks to sustain life. Another type of habitat enhancement places tanks in areas where runoff from rains can fill them in an attempt to produce watering holes (Cohn, 2007). These small areas replenish and sustain several species through severe drought.

Research shows enhancement plots; vital to the desert ecosystem frequented most by Pronghorn contain more biodiversity. Seeds lying dormant for years begin to germinate from Pronghorn activity and moisture (Cohn, 2007). The species' activity circulates the soil replenishing vital nutrients needed for plants to grow. Forage enhancement plots develop, manage, preserve, supervise, and, adapt irrigated forage plots as a way to sustain natural forage growth for Sonoran Pronghorn and other desert species when drought ensues (Cohn, 2007).

The increase in spending for the category in 2008 and 2010 came from a large capital contribution from Customs and Border Patrol to fund tasks for several years. The U.S. Air Force, U.S. Fish and Wildlife Service, U.S. Marine Corps, Arizona Department

of Game and Fish, and Bureau of Land Management all contributed time and energy to the tasks and funding under habitat (USFWS, 2003).

Disturbance Reduction

Distribution reduction refers to reducing anthropologic barriers on the Sonoran Pronghorn. One responsibility, stated in the Plan, was to notify authorities immediately after discovering an injured or deceased Pronghorn (USFWS, 2003). Each agency responsible for the subspecies recovery provided this service.

The Goldwater Range, in southeastern Arizona, stretches across extensive regions of undeveloped wilderness several species residing in the area only come into contact with military personnel, as their only human interaction. The military investigated long term effects of their actions on Sonoran Pronghorn through various research studies including: analyzing the effects of aircraft noise on Sonoran Pronghorn; influences of night operations on the subspecies; and impacts of military doings on the Pronghorn.

Determining cost prompted difficulty because of 1.103 (notify refuge of fatalities). The task is nearly impossible to determine because each stakeholder has a different means of reporting the fatality. Costs are different for each individual case stated. Each agency spent various amounts on the task under the priority depending on land where the subspecies' ranged. The U.S. Air Force, U.S. Marine Corps, National Park Service, Bureau of Land Management, Arizona Game and Fish Department, and U.S. Fish and Wildlife Service all took part in specific tasks under disturbance reduction (USFWS, 2003).

Monitoring

Monitoring received roughly 6% of the annual expenditures. Aerial and telemetry surveys made up the majority of the spending. The U.S. Air Force (AF) surveyed Arizona and Mexico regularly to evaluate population dynamics. The study gathered information for fawn recruitment measures and population information (USFWS, 2003).

Monitoring costs were estimated to be around \$60,000.00. Agencies implementing this category included Arizona Game and Fish Department, National Park Service, U.S. Air Force, U.S. Fish and Wildlife Service, and U.S. Marine Corps (USFWS, 2003).

Research

Research accounted for 3% of the recovery budget. Studies on disease and parasite and their effects on the population were funded at the estimated cost of \$30,000.00. Responsible parties contributing to the category were Arizona Game and Fish Department, U.S. Air Force, and U.S. Fish and Wildlife Service (USFWS, 2003).

Conclusion

USFWS and partners produced and implemented the Sonoran Pronghorn Recovery Plan based on five distinct categories. The categories that received most of the funding was relocating individuals, and establishing a second population while research received the least amount of funding. Overall, the priorities helped shape and determine what is most important for saving the species.

3.1.2.2 Government Stakeholders

The distribution of the subspecies is immense and lies on lands managed by several government agencies. Stakeholders overseeing land occupied by the Pronghorn

population took part in the implementation and recovery goals of the Recovery Plan. Money was also provided for recovery by agencies that were negatively impacting the subspecies. Overall, stakeholders contributed to the Pronghorn recovery because the subspecies occurs on land managed or developed by them.

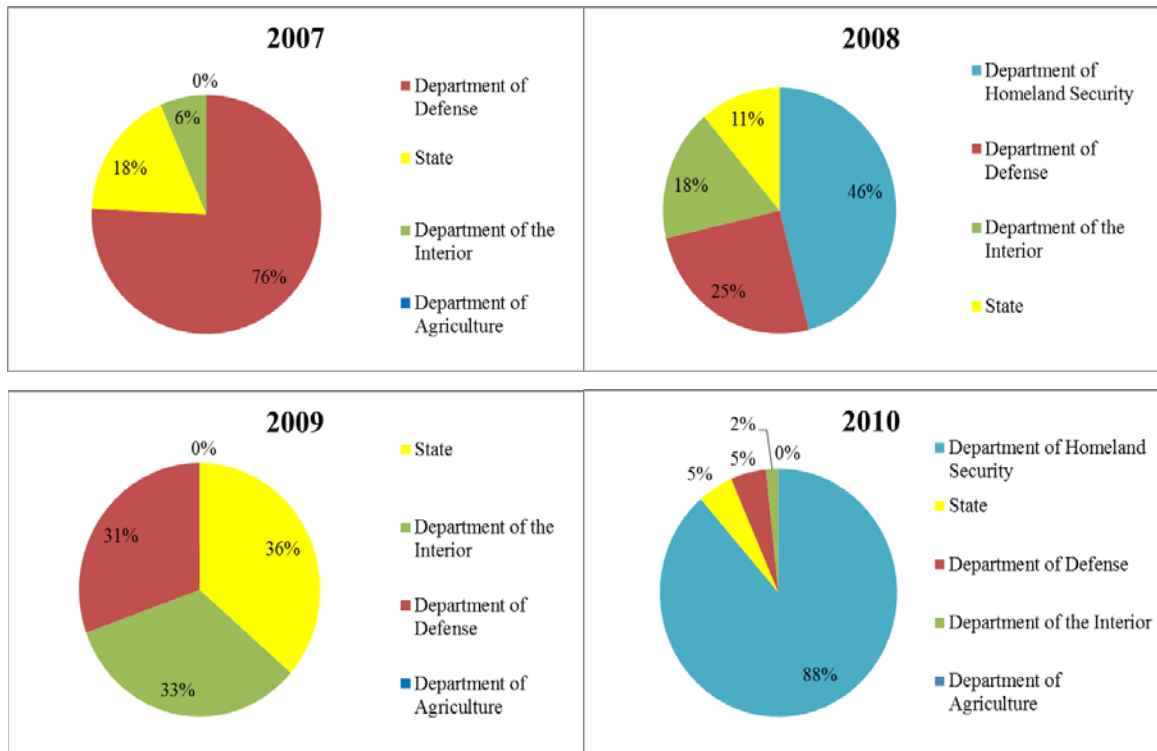


Chart 2. Pie chart represents Federal and State Government stakeholders and their contribution from 2007 through 2010 in percentages. Key represents government stakeholders from the largest contributor to the smallest for that year (USFWS, 2007-2011).

Department of Homeland Security

| Department of Homeland Security | Year | 2007 | 2008 | 2009 | 2010 |
|---------------------------------|-------------------------------|------|--------------|-----------|--------------|
| | Customs and Border Protection | | | 1,015,000 | |
| Total: | | 0.00 | 1,015,000.00 | 0.00 | 5,142,700.00 |
| % of Total: | | 0% | 46% | 0% | 88% |

Table 3. Total spending from U.S. Customs and Border Protection under the Department of Homeland Security from 2007 to 2010 on Sonoran Pronghorn recovery columns represent the Dept. and year while the rows illustrate total spending for that year and the percent against the total spending (USFWS, 2007-2011).

Customs and Border Protection

Although the Department of Homeland Security did not manage lands where Sonoran Pronghorn resided their activities effected the Pronghorn population. The activities of the stakeholder negatively impacted the subspecies because of their border activities specifically building a fence and radio tower.

The flow of illegal immigrants and drug smugglers rose in recent years concerning involved Pronghorn recovery stakeholders. Not only did the Pronghorn deal with illegal activities from undocumented people but the actions of the US Border Patrol responding to those events (Cohn, 2007). This further disturbed the already nervous, fragile population and separated them from vital food and water sources.

The agency did not fund recovery in 2007, but they initiated several projects. One project, a Biological Assessment, looked into field activity effects Border Patrol in Yuma may have on Sonoran Pronghorn (USFWS, 2009). The Tucson Sector of the Border Patrol required personnel to make an effort not to harm the subspecies while apprehending undocumented people.

Additionally, the Border Patrol knew of the negative impacts their actions had on Pronghorn habitat due to vehicle and helicopter traffic looking for drug activity (USFWS, 2008). The impacts were unknown at the time but the influences may be detrimental to the Pronghorn population, therefore the agency paid a substantial amount for the recovery.

Customs and Border Patrol contributed funds in 2008 and 2010. In the beginning of 2008 the agency completed “Final Environmental Assessment for the Proposed Installation of 5.2 Miles of Primary Fence near Lukeville, Arizona - U.S. Border Patrol,

Tucson Sector, November 2007” (USFWS, 2007). The project stretched across Organ Pipe Cactus National Monument, home of the endangered Sonoran Pronghorn.

Unfortunately, the fence drastically altered the species habitat because it cut through five miles of pristine Pronghorn habitat in Organ Pipe Cactus National Monument (USFWS, 2008).

A Biological Opinion addressing all Border Patrol activities from 2000 continued annual revisions through the analysis. A Biological Opinion refers to a “document stating the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) opinion as to whether a Federal action is likely to jeopardize the continued existence of a threatened or endangered species or result in the destruction or adverse modification of critical habitat” (ExpertGlossary, 2012). The Opinion addressed ways the Border Patrol could assist with conservation measures to reduce adverse effects that happened over the decade (USFWS, 2008).

In 2008, the Border Patrol spent \$1,015,000.00, 46% of the annual expenditures for Pronghorn conservation. That year the Department installed a permanent vehicle barrier along the western border of Organ Pipe Cactus National Monument (USFWS, 2006). The Biological Opinion stated the actions and effects the project could have on Pronghorn.

Customs and Border Patrol explained measures it would take to reduce negative activity on the range of the endangered species. For example, “...clean construction equipment prior to entering OPCNM to minimize the spread and establishment of non-native and invasive species...” to protect the endangered mammal (USFWS, 2009). The agency took responsibility for their harmful impacts on the Pronghorn.

Moreover, the Opinion rendered the agency to fund USFWS for 10 years of water for the Sonoran Pronghorn at an expense of \$25,000.00 annually. The agency hoped by doing that it may counter potential hazards that occurred. To offset negative Pronghorn impacts the stakeholder provided roughly \$382,000.00 to restore 84 acres of the species range. The money was given to the Department of Interior to devise a plan on managing fence activities. It was their responsibility to distribute the funds accordingly.

In 2009, the Border Patrol pledged that they would provide annual financial assistance to Organ Pipe Cactus National Monument, Cabrieza Prieta National Wildlife Refuge, Barry M Goldwater Range, and the Bureau of Land Management because of their irresponsible activities. The money went directly towards investigating the effects illegal immigrants and smugglers have on Pronghorn and their habitat. Additionally, the agency hoped to aid these agencies in habitat restoration and develop recovery actions for the Pronghorn.

Activities continued in 2010 and the Border Patrol paid for 88% of the total recovery of the Sonoran Pronghorn, over five million dollars. This year the agency contributed to the majority of recovery due to their negative ongoing actions, vehicle traffic, development, and various others (USFWS, 2010). Similarly to 2008 Customs and Border Patrol supplied funds to the same recovery projects and goals.

A Biological Opinion to construct and maintain 5.2 miles of fence in the Organ Pipe Cactus National Monument was developed. The Opinion described side effects of the fence on the Pronghorn population and illustrated conservation measures to minimize adverse effects on the population like cleaning their equipment prior to construction projects around the subspecies (USFWS, 2008).

Additionally, the Department of Homeland Security proposed a plan to implement the *SBI*net Ajo-1 Tower Project in the Ajo Station's Area of Responsibility (AOR) of USBP-Tucson Sector, Arizona which would affect the Pronghorn negatively. The project resided in Organ Pipe Cactus National Monument and the disturbance negatively affected the surrounding ecosystem, as a result, the agency initiated plans for conservation measures (USFWS, 2011).

The *SBI*net Ajo-1 Tower Project is a tower with a comprehensive system of sensor and communication technology. The tower enables Department of Homeland Security to track illegal activities more easily and should minimize traffic in Pronghorn habitat helping the subspecies long term (USBP, 2009).

Department of Interior requested Border Patrol to fund most of the recovery because of how detrimental the projects were to remaining Sonoran Pronghorn population. Estimates for costs to counter the damage came in a variety of forms. One example was that before initial construction could begin Border Patrol would provide the Department of the Interior with \$200,000.00 (USBP, 2009). The project determined illegal vehicle routes in Pronghorn habitat, as well as, map Pronghorn occurrences in the area of development. The idea was to close roads frequented most by the subspecies permanently (USFWS, 2011).

Additionally, the project provided Department of the Interior with \$1,750,000.00 in funding to close and restore unauthorized vehicle routes. The action continued for two years and DOI focused their efforts on roads that harmed Sonoran Pronghorn the most (USBP, 2011). Each agency took responsible for choosing where restoration projects would occur on the land they managed.

During the 2010 fawning season Border Patrol conducted weekly aerial surveys through Arizona Department of Game and Fish, at a cost of \$14,000.00 with additional money funded the project for five more years (USFWS, 2011). In total, the agency gave \$346,000.00 to the Department of the Interior for purchasing radio collars, costs associated with the collaring, and 100 tracking flights to conduct surveys (USBP, 2010).

Water tanks were also supplied for \$60,000.00, \$20,000.00 to provide transportation of Pronghorn, and Border Patrol took responsibility for developing a forage enhancement plot at \$215,000.00. The agency expended \$23,000.00 at Organ Pipe Cactus National Monument to operate five emergency food and water plots for Pronghorn over six months (USBP, 2009).

The other project that received large amounts of funding from Border Patrol was to establish a second population. The agency dedicated \$470,000.00 to the task. Expenditures were associated with transportation of Pronghorn, fencing and pen materials, and other expenses the recovery team encountered (USFWS, 2011).

The recovery plan for the Sonoran Pronghorn does not mention contributions from U.S. Customs and Border Protection. Their activities taking place from 2007 to 2010 impacted Pronghorn habitat, subsequently Customs and Border Patrol contributed capital to several ongoing recovery activities.

Department of Defense

| Department of Defense | Year | 2007 | 2008 | 2009 | 2010 |
|-----------------------|--------------|------------|------------|------------|------------|
| | Air Force | 913,907 | 486,500 | 254,576 | 210,000 |
| | Marine Corps | 50,000 | 75,000 | 72,000 | 70,000 |
| | Total: | 963,907.00 | 561,500.00 | 326,576.00 | 280,000.00 |
| | % of Total: | 76% | 25% | 30% | 5% |

Table 2. Agency expenditure from 2007 to 2010 for U.S. Air Force, and Marine Corps. The table illustrates the years and contributions for the recovery and the percentage of funds compared to the total spending for that year (USFWS, 2007-2011).

U.S. Air Force

Forty percent of the Sonoran Pronghorn's distribution occupies the Barry M. Goldwater Range. The U.S. Air Force managed the eastern half of the range where most of the Pronghorn's distribution occurs. The agency paid a large portion for the recovery of the species and managed various projects outlined in the Plan.

The Department of Defense had concerns with its effects that hinder Pronghorn recovery from military activities like live ordnance, chaff, and flares that were repeatedly dropped on Pronghorn habitat by military aircraft. Barry M. Goldwater Range contains three areas where Pronghorn occur. Military bombing targets on the range include: North Tactical Range, South Tactical Range, and Range 1. Over the course of this analysis researchers conducted studies to measure stresses on the Pronghorn induced because of military missions. Military activities continue to kill Sonoran Pronghorn residing on the Range one to two individuals a year, close to 1% of the population (Krausman, 2007).

The Air Force investigated the "...military use of the airspace above and the ground space on BMGR-East and CPNWR..." near Luke Air Force Base (USAF, 6-6). The project, Luke Air Force Base use of Ground-Surface and Airspace for Military Training on the BMGR, damaged the surrounding environment. The ongoing process resulted in the Air Force working off of old Biological Opinions to document their impacts (USFWS, 2010). Overall, the project's potential effects were not substantial enough to harm Sonoran Pronghorn based on the agency's data.

The Air Force analyzed and included the most up-to-date information into an Opinion for BMGR Integrated Natural Resources Management Plan. In short, the Military Lands Withdrawal Act requires Secretaries from the Air Force, Navy, and

Interior to prepare a management plan for the Barry M. Goldwater Range for the purpose of "...proper management and protection of the natural and cultural resources..." found on the range (USFWS, 2010). The plan required an investigation of Sonoran Pronghorn and its habitat.

Western Army National Guard Aviation Training Site Expansion Project (WAATS) was the last ongoing project by the Air Force. The Project is an educational facility for military personnel helicopter training (USFWS, 2010). In 2007, WAATS expanded on critical Pronghorn habitat. The agency wrote a Biological Opinion to determine any detrimental effects on Pronghorns, costing upwards of six figures.

U.S. Air Force activities continued for the years analyzed. In 2007, the Air Force spent \$913,907.00 nearly 72% of the entire budget. USAF contributed to each of the projects mentioned in the Priorities, Tasks, and Spending section of the thesis. Expenditures dropped, in 2008, significantly to \$486,500.00, roughly 22% of the total because Western Army National Guard Aviation Training Site concluded. 2009 spending was \$254,576.00, 24% because Opinions were not completed and expenditures in 2010 total 3.6%, \$210,000.00, of the Pronghorn recovery budget (USFWS, 2011).

Marine Corps

The Marine Corps operated the western portion of BMGR. Sonoran Pronghorn occur mostly in the eastern portion of the range; therefore the Marine Corps' responsibility was minimal for the recovery. The agency assisted with several ongoing projects defined in the Sonoran Pronghorn Recovery Plan for example habitat enhancement, aerial surveys, and water investigation.

The Marine Corps improved a Biological Opinion for Marine Corps Air Station-Yuma in the Arizona Portion of the Yuma training complex. The Biological Opinion addressed actions the military took in the Eastern portion of the range (USFWS, 2010). Over flights, ground-based activities, delivery targets, and other detrimental actions all had the potential to harm the species therefore; the agency utilized funds for the Opinion. The Opinion required Marine Corps to fund a scientific investigation where the project occurred.

In 2007, the agency expended \$50,000.00 on the recovery of the Sonoran Pronghorn. In total this was roughly 3.9% of the annual budget. Activities included all projects mentioned in the analysis. Spending in 2008 rose to \$75,000.00, still 3.9% of the annual expenditures. Funding for 2009 was 6.7% of the total budget, \$72,000.00 and \$70,000.00 was dedicated to Sonoran Pronghorn recovery in 2010 from the Marine Corps (USFWS, 2009).

State

| State | Year | 2007 | 2008 | 2009 | 2010 |
|------------|------------|------------|------------|------------|---------|
| | Arizona | 225,000 | 247,300 | 389,500 | 282,000 |
| Total: | 225,000.00 | 247,300.00 | 389,500.00 | 282,000.00 | |
| % of Total | 18% | 11% | 36% | 5% | |

Table 5. The State of Arizona’s total expenditure for the Sonoran Pronghorn recovery from 2007 to 2010 representing the years analyzed, the agency, and the agency’s contribution for the overall recovery (USFWS, 2007-2011).

Arizona Department of Game and Fish

The State of Arizona funded several aspects of the recovery through the Arizona Department of Game and Fish. State lands account for 1.2% of the Pronghorn’s range. Arizona protected the species with specific tasks outlined in the recovery (USFWS, 2003).

In 2000, Congress created State Wildlife Grants "...to assist states with their voluntary and proactive efforts to protect... wildlife species around the U.S. from becoming endangered..." (AZGF, 2010). These funds conserve wildlife from further population degradation and State funds for Pronghorn conservation come from the grants (AZDFG, 2010).

In Arizona, funds from SWG were matched with State Heritage Funds and made monitoring and managing populations easier because it eased some of the financial stresses of the recovery. The Sonoran Pronghorn received its funding from both programs which benefited the species greatly (Voyles, 2010).

In 2007, the State funded 18% of the recovery efforts, \$225,000.00. Expenditures were directed to the appropriate actions (USFWS, 2007). The following year Arizona funded almost the same amount, \$247,000.00. The percentage fell to 11% even though more was spent (USFWS, 2008). This was because recovery expenditures nearly doubled in 2008. Arizona spent \$389,500.00 for the recovery efforts in 2009, 36% of the entire budget. The most likely cause was because USFWS, Air Force, and State were the main contributors that year dividing most of the recovery by three. 2010 expenses were less than the year before at \$282,000.00, 5% (USFWS, 2010). Expenses fell because of the large funds given by U.S. Border Patrol.

Department of Interior

| Department of the Interior | Year | 2007 | 2008 | 2009 | 2010 |
|----------------------------|---------------------------|------------------|-------------------|-------------------|------------------|
| | Bureau of Land Management | 21,000 | 50,000 | 50,000 | |
| | National Park Service | 62,000 | 70,000 | 35,000 | 42,000 |
| | USFWS | | 265,000 | 270,000 | 49,193 |
| | U.S. Geological Survey | | | | 7,328 |
| | Total: | 83,000.00 | 385,000.00 | 355,000.00 | 98,521.00 |
| | % of Total | 7% | 17% | 33% | 2% |

Table 4. The Department of Interior expenses produced by Bureau of Land Management, National Park Service, USFWS, and U.S. Geological Survey between 2007 and 2010. Each agency represents a total amount of spending and the percentage the department spent on recovery (USFWS, 2007-2011).

Bureau of Land Management

The Sonoran Pronghorn’s range falls on four percent of BLM land, therefore BLM attributed small portions of their annual budget to the conservation of the endangered species. One ongoing project BLM had on Pronghorn habitat was an off-road vehicle use area. The agency followed up on past Biological Opinion adding new information as it became available (USFWS, 2007). BLM managed the land and regularly updated the Resource Management Plan.

Cattle grazing allotments run by BLM lie on Pronghorn territory, as well. The Five Livestock Grazing Allotments Projects outside of Ajo, Arizona continued in 2007 (USFWS, 2007). One was on the Coyote Flats in the range of the endangered subspecies. The BLM’s Biological Opinion states, “...no Sonoran Pronghorn have been observed in or near the Coyote Flat since the 2002 Biological Opinion was issued” (USFWS, 5). The final decision USFWS gave allowed grazing to continue.

In 2007, Bureau of Land Management spent \$21,000.00 on Sonoran Pronghorn recovery, 1.6%. BLM developed another Opinion addressing “...a proposed one time deviation from the aforementioned conservation measures in order to allow a special

event (Unity Run) to occur on BLM lands” (USFWS, 3). In order to protect the species BLM sent staff to drive the Unity Run route the day before the event to conduct a slow speed survey (USFWS, 2007).

Furthermore, the agency promised to heavily monitor the area after the event on March 15, 16, 2007. The Biological Opinion described other actions BLM took to protect the Pronghorn while roads were reopened. Again USFWS allowed the event to take place with limited concern (USFWS, 2007).

Similarly to 2007, 2008 did not change. Expenditures on Sonoran Pronghorn recovery in 2008 were \$50,000.00 (USFWS, 2008). The same projects took place during that year with no special requests.

In 2008, BLM contributed 2.3% to the annual expenditure for Sonoran Pronghorn recovery. 2009 BLM operations continued the same as the two previous years. Spending remained at \$50,000.00 but increased to 4.6% of the entire budget. BLM contributed nothing to Sonoran Pronghorn recovery for 2010 (USFWS, 2010). There are several reasons for the lack of funds, including other agencies contributions, or other extrinsic factors.

National Park Service

The National Park Service (NPS) operates Organ Pipe Cactus National Monument (OPCNM), 12% of the Sonoran Pronghorn’s habitat. The National Park Service was responsible for providing a portion of funds to Pronghorn recovery.

In 2007, NPS spent nearly \$62,000.00 accounting for almost five percent of the annual Sonoran Pronghorn recovery budget (USFWS, 2007). Monument staff actively worked with the Department of Homeland Security and other law agencies to minimize

the impact of their actions on Sonoran Pronghorn. The work included reporting the U.S. Border Patrol of Pronghorn locations (USFWS, 2010).

Additionally, the National Park Service conducted aerial surveys in Arizona and Mexico. This was part of an ongoing project since before 2004 and NPS monument staff assisted with the biennial range wide surveys of Sonoran Pronghorn in the U.S. and Mexico via helicopter (USNPS, 2010).

The National Park Service assisted USFWS and Arizona Department of Game and Fish (ADGF) with Sonoran Pronghorn operations and continued development on Sonoran Pronghorn Semi-Captive Breeding Facility (USNPS, 2010). The project resulted in NPS funding \$50,000.00 in 2007, 4.9%. The Captive Breeding program cost \$400,000.00 annually split between responsible agencies (Cohn, 2007).

In 2007 NPS took more measures to protect the Pronghorn and enforced that the Organ Pipe Cactus National Monument maintained a Pronghorn monitoring program, with monitoring starting no later than March 1. In 2008, the agency funded aerial surveys in Arizona and Mexico (USNPS, 2010). NPS expenditures rose to \$70,000.00, 3.1% of the total. NPS spending dropped by half in 2009 to \$35,000.00, or 3.2% and rose in 2010 to \$42,000.00 or 0.72% of the total budget (USFWS, 2011). The fluctuations in costs could be contributed to several factors like agency funds, other contributions from stakeholders, less projects, and other issues.

U.S. Fish and Wildlife Service

U.S. Fish and Wildlife Service (USFWS, USFWS) functions under Department of Interior and managed the Cabeza Prieta National Wildlife Refuge (CPNWR). The refuge

contains over 40% of the Sonoran Pronghorn's habitat; therefore USFWS contributed funds to recovery projects for the Pronghorn.

USFWS did not fund Sonoran Pronghorn recovery in 2007 because it was not in charge of funding projects but managing them. In 2008, USFWS funded 1.2% of the total Pronghorn recovery, \$265,000.00 (USFWS, 2008). The spending was dedicated to all of the projects listed in the analysis.

\$270,000 was spent on the same projects, 25% of the entire budget in 2009 (USFWS, 2009). 2010 changed drastically expenditures dropped to \$49,193.00 or less than 1% of total funding because the large contribution of funds from U.S. Customs and Border Patrol Projects USFWS participated in continued, but with much less economic contributions (USFWS, 2010).

U.S. Geological Survey

Unlike most other federal agencies U.S. Geological Survey (USGS) did not take part in the development of the Recovery Plan. In 2010, USGS spent \$7,328.00 conducting research on the subspecies. The project analyzed and determined genetic variability between captive and wild populations. The expected spending for the study cost over \$30,000.00, but in actuality 24% of the funds came from USGS (Villarreal, 2011).

3.1.3 Conclusion

Government stakeholders involved in Sonoran Pronghorn recovery planning determined expenditure distribution for species recovery success. The U.S. Fish and Wildlife Service determined where most funds went, but each stakeholder took part in

implementing certain tasks. Priority/Category expenditure allocation was determined by stakeholders involved in the creation and execution of the subspecies' recovery plan.

Overall the focus of the Sonoran Pronghorn Recovery Plan was to establish a second population. The cost-effectiveness analysis illustrated of current projects, 2007 to 2010, 51% of costs went towards relocation. The Plan was implemented according to the available resources from different stakeholders. Current conservation projects implemented between 2007 and 2010 showed success in the recovery efforts.

Spending appeared skewed in 2008 and 2010, because of large payments provided by Customs and Border Patrol. The agency provided large financial contributions to the recovery efforts for current and future years. When funds were not influenced by the agency's large contributions actual spending resembled the estimated expenditures closely, roughly one million dollars annually for Sonoran Pronghorn conservation. 2007 and 2009, years not influenced by the Customs and Border Patrol, reflected the Plan's estimated spending close to the actual.

Furthermore, the subspecies was ranked high on USFWS' endangered species priority list. Since the Pronghorn was vulnerable perhaps funds were allocated correctly because of its priority ranking. Also, there were at least six major contributing stakeholders between the years analyzed.

Stakeholders that managed land in the distribution of the population took part in the implementation and recovery goals of the Recovery Plan. Destructive projects developed by government stakeholders led to them contributing money to the recovery efforts. In all, agencies managing land or constructing negative projects in the vicinity of the endangered subspecies provided funds for the recovery.

In order to maintain the current population of Sonoran Pronghorn five categories were determined: habitat, relocation, monitoring, research, and disturbance reduction. The largest concern for the species was acquiring a second population. The analysis found the majority of expenditures went towards this category from 2007 to 2010, roughly 51% of funding. The data looks askew because of upfront payment in 2008 and 2010 from Customs and Border Protection. With the prioritization of needs the Plan was successfully implemented and spending closely resembled recovery plan estimates.

3.2 Louisiana Black Bear

3.2.1 Background

The Louisiana Black Bear (*Ursus americanus luteolus*) is a subspecies of the American Black Bear. Their historic range stretched across East Texas, Louisiana, and Mississippi. Unfortunately the Bear has been eradicated to small pockets primarily in Louisiana. The Tensas and Atchafalaya River Basins contain the majority of the Bear population roughly 75 individuals (USFWS, 2009).

These opportunistic mammals feed on a variety of seeds, fruits, and berries but most commonly found in Bear's diets are invertebrates consisting of worms, caterpillars, and other insects. Additionally, the species can live up to 25 years in the wild depending on food supply and physiological status (USFWS, 2009).



Fig. 2 Map of Louisiana illustrating Louisiana Black Bear's range in Louisiana and the border of Mississippi. Areas of purple, blue, and brown represent the current Bear population, green depicts where officials are trying to establish another population, and yellow signifies corridors connecting the habitats (Corns, 2002).

The subspecies prefers basic needs food, water, shelter, and various denning sites in a relatively large, unbroken piece of forest. Territories for the Bears range between 17 and 62 square miles. Their territory is determined by the season, sex, environmental conditions, and the density of the overall Bear population (USFWS, 1995).

Louisiana Black Bear reside most commonly in the bottomland hardwood forests of Louisiana but prefer other habitats like salt and freshwater marshes, canals, bayous, and agricultural fields. The Bear occurs on the coastal plains of Louisiana, but most likely the highest densities lived in the hardwood forest of Louisiana (Black Bear Conservation Coalition, 2010).

The most vital part of Bear habitat is remoteness but for over a century humans have fragmented Bear habitat with roads, clear cuts, and other barriers making remoteness extremely difficult for the subspecies to obtain (USFWS, 2009). As an added site specification Louisiana Black Bear need to be able to easily escape their encroached fragmented ranges.

Reason for Listing

At one time numerous Black Bears ranged throughout the entire state of Louisiana numbering in the thousands. Today there are between 300 and 400 individuals remaining. Habitat fragmentation led to the listing of the Louisiana Black Bear in 1992. Overutilization of the forest drastically reduced the quantity and quality of Bear habitat because of development (USFWS, 1995). Consequently, the subspecies occurs on less than 80% of its historical range.

Habitat degradation's occurs because of agricultural practices like clearing and grazing. Patchy habitat due to intense farming practices have fragmented the ecosystem

and now limit the subspecies' population from growing. Immigration and emigration increasingly has slowed because of fences, roads, canals, and other human barriers (USFWS, 1995). Overall, the destruction of Bear habitat increases the mortality rate as Bears are forced to go longer distances to forage, cross roads, and range on non-protected sites throughout their range (USFWS, 2009).

Additionally, the Bear declined because of human caused mortalities like illegal poaching. As the human population grows and expands into critical Bear habitat conflicts rise. Vehicle accidents, poaching, and problem bear reduction activities all contributed to the loss of the subspecies over the past few decades (USFWS, 2009). As development made the species more accustomed to human food interactions between people and Louisiana Black Bears increased drastically. The Bears associate large densities of humans as a source to obtain food, creating nuisance Bears. Problem Bears are relocated and in some cases the only alternative is captivity or euthanization (USFWS, 2009).

Increased human-bear conflicts led to poaching because Bear tolerance decreases with every new incident. The negative activities contributed largest to the Bear's demise. As Louisiana Black Bear ranges become further fragmented human-bear conflict increases and Bears rarely win (USFWS, 2009).

Species Recovery Plan and Goals

The Louisiana Black Bear was listed as threatened on January 7, 1992 and a recovery plan was finalized on September 27, 1995. The U.S. Fish and Wildlife Service designated the priority for the subspecies a 9C. Meaning the degree of threat was moderate, but the potential to recover the population was high.

The main goals of the recovery intended to increase habitat restoration projects, obtain data to sustain all subpopulation, and connect each population through corridors throughout their habitat (USFWS, 2009). Another primary goal of the Plan was education. The recovery plan acknowledged that increasing public knowledge and support leads to increased Bear populations because people become familiar with Bear biology and behavior. Ultimately, the goal was to recover the species from threatened to no longer needing Endangered Species Act protection (USFWS, 1995).

Conclusion

In order to delist the subspecies three criteria were required. First, two viable subpopulations must be established in the Tensas and Atchafalaya River Basins. Additionally, corridors must be developed for immigration and emigration to occur between subpopulations and last, each population's habitat and corridors must be conserved and protected from further fragmentation of the ecosystem (USFWS, 1995).

3.2.2 Analysis

The Louisiana Black Bear priorities were outlined in its Recovery Plan in order of importance. Research was the priority of most importance and protection was the least according to the Recovery Team. Tasks were defined as projects regarding the species' recovery under one of four categories set forth by USFWS. A spreadsheet displayed each project and was defined under the task description.

3.2.2.1 Priorities, Tasks, and Spending

| Louisiana Black Bear | | | | |
|-----------------------------|-------------|--|-----------------------------------|---------------------|
| Priority | Task | Task Description | Stakeholder | Estimates |
| Research | 4.1 | Develop population monitoring techniques or indices. | LDWF, FWS, USGS, USACE | \$200,000.00 |
| | 4.2 | Conduct population viability analysis. | LDWF, FWS, USGS | \$87,600.00 |
| | 4.3 | Define viable subpopulation goals. | LDWF, FWS, USGS | part of 4.10 |
| | 4.4 | Evaluate population indices and goals. | LDWF, FWS, USGS, NDWFP | \$35,000.00 |
| | 4.5 | Develop corridor guidelines. | LDWF, FWS | part of 4.10, 4.20 |
| | 4.6 | Study Bear biology and limiting factors. | LDWF, FWS, USGS, MDWFP | part of 4.10, 4.20 |
| Total: | 6 | | | \$322,600.00 |
| Habitat | 1.1 | Identify key recovery blocks and key corridors. | FWS, TPW, NRC | \$65,000.00 |
| | 1.2 | Develop landowner protection of Bear habitat. | LDWF, FWS | part of 1.10 |
| | 1.3 | Enhance, restore, and manage Bear habitat. | NRC, FWS, TPW, LDWF, USACE, MDWFP | part of 1.10 |
| | 1.4 | Develop, implement, and evaluate habitat restoration plan | LDWF, NRC, FWS, MDWFP, TPW | \$28,000.00 |
| | 1.5 | Protect habitat to support long-term survival of Bear populations. | LDWF, FWS, USACE, MDWFP, NRC | \$140,000.00 |
| Total: | 5 | | | \$233,000.00 |
| Education | 2.1 | Disseminate Bear status, recovery, and management information. | LDWF, NRC, FWS, USACE, MDWFP, TPW | \$39,000.00 |
| | 2.2 | Reduce illegal killing through education. | TPW, LDWF, FWS, MDWFP, LE, WS | \$59,000.00 |
| | 2.3 | Reduce human-bear conflict through education. | LDWF, FWS, WS, MWFP, LE, TPW | \$132,000.00 |
| | 2.4 | Identify Bear management incentives for private landowners and distribute. | LDWF, NRC, FWS, MDWFP, TPW | part of 2.1 |
| Total: | 4 | | | \$230,000.00 |
| Protection | 3.1 | Enforce legal protection of Bears. | LDWF, FWS, WS, MDWFP, LE | \$50,000.00 |
| | 3.2 | Coordinate record keeping of Bear deaths. | TPW, LDWF, FWS, WS, MDWFP, LE | used existing funds |
| | 3.3 | Develop and implement road management guidelines. | LDWF, FWS, USGS | \$7,039.00 |
| Total: | 3 | | | \$57,039.00 |
| Total | 18 | | | \$842,639.00 |

Table 6. Ongoing and current Priorities outlining tasks, task descriptions, responsible stakeholders, and estimated costs for the Louisiana Black Bear Recovery Plan. Totals of expenditures and tasks are represented in yellow (USFWS, 1995).

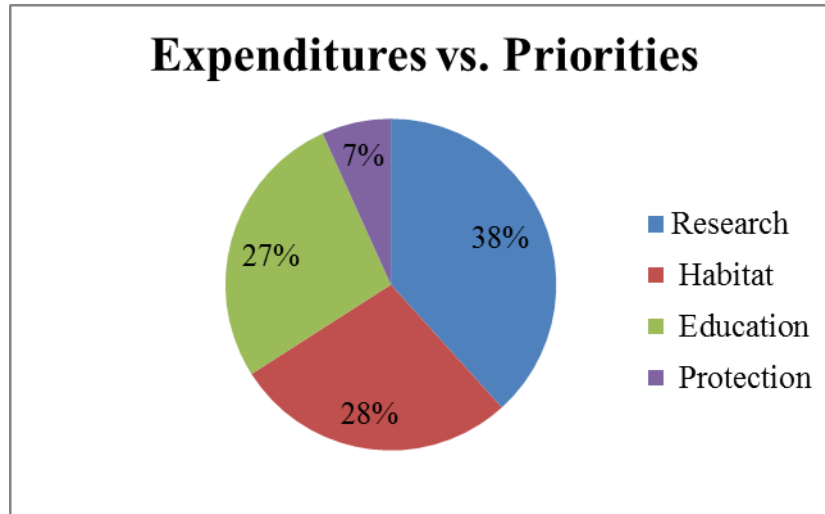


Chart. 3 Pie Chart explaining expenditures per Priority in percentages. The key represents the various priorities from most concern to least concern (USFWS, 2007).

Research

Research accounted for the majority of the annual Species Recovery Plan with spending at 38%. Research was conducted on different aspects of the Louisiana Black Bear population. Population viability research, corridors in Bear habitat, and the biology of the subspecies all required research to ensure a successful recovery (USFWS, 1995).

The main concern for this category was establishing population monitoring techniques, determining population goals for the species, and studying its habitat and biology. Little was known about Bear subpopulations; therefore studies examined Bear corridors and implemented them into habitat management (USFWS, 1995).

Government stakeholders associated with the recovery goal included Louisiana Department of Wildlife and Fisheries, U.S. Fish and Wildlife Service, U.S. Geological Survey, U.S. Army Corps of Engineers, and Mississippi Department of Wildlife, Fish, and Parks.

Habitat

Habitat was the second category in the recovery plan for the Louisiana Black Bear. Five tasks were assigned to this priority costing nearly 28% of the annual budget, \$233,000 (USFWS, 1995). Severely modified Bear habitat reduced suitable habitat by 80% in the 1980s. Fragmentation occurred through much of the environment causing a reduction in habitat quality and quantity leading to a declining Bear population (USFWS, 1995). One goal of the Species Recovery Plan was to establish a metapopulation of two or more viable subpopulation.

Corridors connect Bears among their fragmented ecosystems to insure long-term habitat protection. The corridors allow Bears from different regions to interact with each other varying the gene pool safely and without the problem of humans and human barriers. A varied gene pool increases the health of the species because inbreeding becomes rarer. Consequently, Bears reside on public and private lands and the Recovery Team believed building strong, positive relationships with private landowners was vital to the recovery efforts.

Agencies responsible for implementing and funding habitat included the U.S. Fish and Wildlife Service, Texas Parks and Wildlife, Natural Resources Conservation Service, Louisiana Department of Wildlife and Fisheries, U.S. Army Corps of Engineers, Mississippi Department of Wildlife, Fisheries, and Parks (USFWS, 1995).

Education

Education, the third category of the Recovery Plan costs 27% of the recovery to develop and implement information and education programs for private landowners and the public (USFWS, 1995). Habitat loss and human induced mortality were the leading

causes of Black Bear deaths during the analysis. With an understanding of recovery actions and management practices the public supports and actively participates in Bear recovery with the help of various stakeholders (USFWS, 1995).

Environmental education for hunters about consequences they may face if they were to kill a Bear was vital for Bear conservation according to USFWS (USFWS, 1995). The education program also reduced human-bear conflicts because of a contingency plan for responding to problem Bears. Funding for education went primarily towards public outreach and awareness about Louisiana Black Bears (USFWS, 1995).

Stakeholders responsible for executing the category consisted of Louisiana Department of Wildlife and Fisheries, Natural Resources Conservation Service, U.S. Army Corps of Engineers, Mississippi Department of Wildlife, Fish, and Parks, Texas Parks and Wildlife, U.S. Department of Agriculture, and U.S. Fish and Wildlife Service (USFWS, 1995).

Protection

Protection refers to defending and managing the remaining Louisiana Black Bear population. The category defined how Bear habitat was managed as well as meeting population goals. Road kill and poaching keep population goals from being reached because the lack of enforcement. Three tasks designated under this priority cost 7% of the annual recovery budget (USFWS, 1995).

Under the tasks, road management, guidelines referred to following certain factors like the distribution and density of roads, road use, design, and management as a guideline. The remaining tasks were associated with developing, monitoring, and reviewing a management plan for each subpopulation. The Louisiana Department of

Wildlife and Fisheries, U.S. Fish and Wildlife Services, U.S. Department of Agriculture, Mississippi Department of Wildlife, Fish and Parks, and Texas Parks and Wildlife all took responsibility for funding and implementing the category (USFWS, 1995).

Conclusion

The U.S. Fish and Wildlife Service and other government stakeholders developed and implemented the Louisiana Black Bear Recovery Plan based on four different priorities. The category that received most attention was research while protection obtained the least amount of funding. Overall, the organization of priorities determined the most threatening activities to the population.

3.2.2.2 Government Stakeholders

Eight government agencies coordinated together to execute and fund the Louisiana Black Bear recovery. The Bear ranges across various lands managed by different agencies in the area. The parties decided habitat reduction led to the demise of the Louisiana Black Bear and is the largest threat to their existence. Over one third of the expenses went towards research. Overall, the stakeholders implemented and provided capital in cooperation with each other overseen by USFWS.

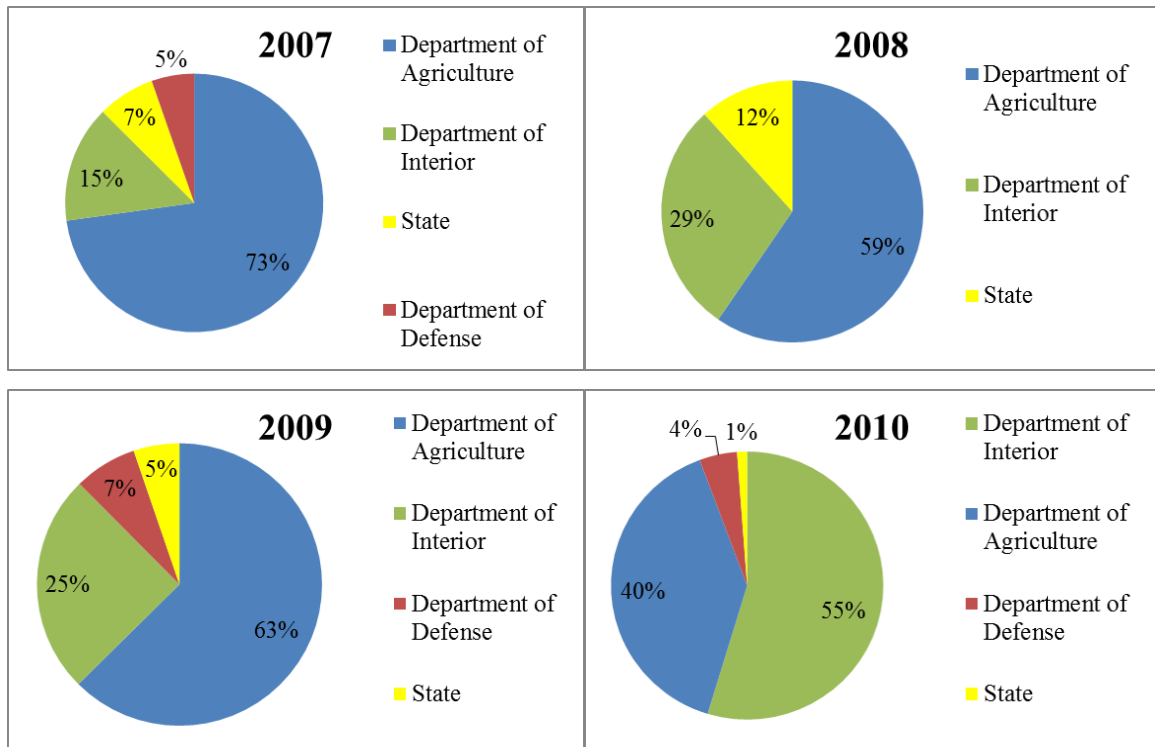


Chart 4. Years 2007-2010 illustrating government stakeholders expenditure participation for Louisiana Black Bear recovery. Each key represents the various agencies from the largest contributor to the smallest (USFWS, 2007-2011).

Department of Agriculture

| Department of Agriculture | Year | 2007 | 2008 | 2009 | 2010 |
|--|--|--------------|--------------|------------|--------|
| | Animal and Plant Health Inspection Service | 14,945 | | | 43,000 |
| Forest Service | 422,000 | 265,000 | 345,000 | 135,000 | |
| Natural Resources Conservation Service | 844,200 | 807,657 | 898,900 | 600,750 | |
| Total: | 1,281,145.00 | 1,072,657.00 | 1,286,900.00 | 755,364.00 | |
| % of Total: | 72.67% | 58.75% | 61.96% | 39.44% | |

Table 7. Agency expenses for Louisiana Black Bear recovery under the Department of Agriculture. The table illustrates the years analyzed in columns and the rows signify the agencies: Animal and Plant Health Inspection Service, Forest Service, and Natural Resources Conservation Services. Totals are depicted in yellow while blue shows the percentage of the total spending for that year (USFWS, 2007).

Animal and Plant Health Inspection Service

Animal and Plant Health Inspection Service (APHIS) participated in the development of the Louisiana Black Bear Recovery Plan. Under the Department of Agriculture lies APHIS which provides Wildlife Services (APHIS, 2006). Wildlife

Service's protect threatened and endangered species by responding immediately to problems a species causes. The main objective for the agency focused on enforcing protection and developing community outreach programs in Louisiana (APHIS, 2006).

The agency responded to Bear complaints and for their efforts the public began to have a better understanding of the subspecies (APHIS, 2006). Other aspects of protection came from data collection addressing issues related to the Bear (USFWS, 2010).

The agency provided funds for the years analyzed except 2008 the reason can be attributed to the large financial investment from Natural Resource Conservation Service. Spending by the agency was less than 2% for each year, but Animal and Plant Health Inspection Service has been recognized for its work in Louisiana Black Bear conservation (Black Bear Conservation Coalition, 2010).

U.S. Forest Service

The U.S. Forest Service (USFS) did not participate in developing the Louisiana Black Bear Recovery Plan, but contributed funds. The subspecies occurs across four states in various National Forests managed by USFS. The agency contributed large amounts of money for this reason.

Kisatchie the only National Forest in Louisiana holds some of the last remaining Bear populations. Mississippi contains a small population of the subspecies which occur in DeSoto National Forest. Lastly, Ouachita National Forest in Oklahoma and Arkansas maintain Bear habitat and people recently saw the subspecies in the forests (TPWD, 2005).

Small pockets of USFS land dot Black Bear habitat throughout their range therefore the agency took responsibility for protecting it. Overall, USFS contributed

around 20% of the spending from 2007 to 2009 and then only 7% in 2010 (USFWS, 2010). That year the majority of the recovery was funded by the U.S. Geological Survey and Natural Resource Conservation Service, therefore the agency contributed far less. The stakeholder primarily focused their efforts on enhancing Bear habitat in National Forests.

Natural Resources Conservation Service

The U.S. Department of Agriculture manages Natural Resources Conservation Service (NRCS) a major contributor in Bear recovery. The agency helped in the development and execution of the Plan and focused much of their attention on habitat restoration and protection for the remaining Louisiana Black Bear.

Natural Resources Conservation Service contributed to the recovery of the subspecies through their Wetlands Reserve Program and Conservation Reserve Program (USFWS, 2009). In short, the programs are voluntary programs that offer incentives to private landowners for preserving and restoring wetlands across the U.S. (King, 2006). From 1993 to 2008 over 180,000 acres were restored to forestland through the program in Louisiana for Bear habitat by Wetlands Reserve Program as a result the agency conserved more than 138,000 acres of Bear habitat in Mississippi (Davidson, 2009).

Conservation Reserve Program restored over 200,000 acres in Louisiana and roughly 328,000 acres in Mississippi from 1993 to 2008 (USFWS, 2009). The program was intended to transform farmland into lands for conservation. When landowners enroll it is their responsibility to make an attempt to restore habitat, and take measures to reduce flooding for compensation (USFWS, 2010). Since the subspecies' listing in 1992 over 831,000 acres of prime Bear habitat have enrolled in both programs in Louisiana and

Mississippi. Most recently, between 2008 and 2011 over 500 more acres were restored and 1550 acres were improved in East Texas (Industrial Economics, Inc, 2009).

Natural Resources Conservation Services funded over 43% of the recovery efforts from 2007 to 2009. In 2010, the agency contributed 31% of the expenditures (USFWS, 2010). In 2010, USGS paid almost half of the recovery costs, as a result other agencies gave less. Overall, the agency dedicated most funds towards habitat restoration the number one priority in the Recovery Plan. The Bear population increased since listed in the early 1990s; therefore NRCS successfully utilized funds for recovering the subspecies (Davidson, 2010).

Department of Interior

| Department of Interior | Year | 2007 | 2008 | 2009 | 2010 |
|------------------------|-----------------------|------------|------------|------------|------------|
| | National Park Service | 3,075 | 4,800 | 3,200 | |
| | USFWS | 255,000 | 459,700 | 425,000 | 186,836 |
| | US Geological Survey | | 52,997 | 87,954 | 855,527 |
| | Total: | 258,075.00 | 517,497.00 | 516,154.00 | 186,836.00 |
| | % of Total | 14.64% | 28.34% | 24.85% | 9.75% |

Table 9. Agencies under the Department of Interior, National Park Service, USFWS, and U.S. Geological Survey, expenditures for Louisiana Black Bear recovery. Totals represented in yellow and blue signifies the percent of the total spending for the year (USFWS, 2007-2010).

Fish and Wildlife Service

U.S. Fish and Wildlife Service (USFWS, USFWS) undertook many responsibilities in the Louisiana Black Bear Recovery Plan, and funded various tasks on a state level. USFWS worked primarily with Louisiana Department of Wildlife and Fisheries to implement tasks in the Plan. Several National Wildlife Refuges exist throughout the Bear's range, so the agency oversaw conservation activities in those areas (Industrial Economics, Inc, 2009).

The Tensas River National Wildlife Refuge and Atchafalaya National Wildlife Refuge are two refuges USFWS focused much of their attention on. Both have relatively

large (compared to other regions) Black Bear populations with about 75 individuals. USFWS worked on population viability studies in both areas subpopulations in 2007. Population estimates were completed in 2010 suggesting the Bear population increased by roughly 50% (USFWS, 2011)

Habitat degradation contributed most to eliminating the subspecies, therefore USFWS implemented Partners for Wildlife (West, 2005). Partners for Wildlife is an incentive program through USFWS providing financial assistance to private landowners. The program enhanced habitat on private lands and restored more than 10,000 acres of prime Black Bear habitat since its beginnings (West, 2005).

In addition to funding and implementing reforestation projects USFWS contributed capital to various research studies for the Louisiana Department of Wildlife and Fisheries and Black Bear Conservation Committee. Different universities received funds from the stakeholder for research and most recently, USFWS worked with USDA Wildlife Service's providing resources for Bear conflict management programs for community members (Industrial Economics, 2009).

USFWS coordinated with other stakeholders to develop a web-based Bear data management system. The system tracked Bear sighting and mortalities throughout the state and responsible agencies entered historical and current data into the system as completion neared for the data management system (USFWS, 2011).

Overall, the stakeholder took responsibility for financing and applying tasks in priorities, habitat and research. USFWS funded around 20% of the recovery from 2007 to 2009, but then only 7% in 2010 (USFWS, 2010). Again, U.S. Geological Survey contributed a large percentage of capital to the recovery so USFWS provided less money.

USFWS led in managing the Louisiana Black Bear Recovery and the subspecies' population increased. Due to the subspecies federal status USFWS made decisions within the scope of the Recovery Plan.

U.S. Geological Survey

The U.S. Geological Survey (USGS) took part developing and executing several tasks outlined in the Plan and provided various resources. For example, the agency contributed to the web-based management system and population viability studies from 2008 to 2010. The agency provided research for various demographic studies to evaluate population trends. The surveys and study provided important information on Bear population dynamics and potential habitat.

In 2009, the agency completed a study entitled “The Effects of Hurricanes Katrina and Rita on Habitat of the Louisiana Black Bear” to model vital coastal habitat. The research addressed the impacts both hurricanes had on Bear habitat and identified potential Bear habitat along the Louisiana coast. The data determined potential corridors coastal Bears could use to interact with other populations in the Atchafalaya River basin (Davidson, 2010).

The following year USGS collared Bears in Louisiana as a way to collect data using GPS tracking devices. Scientists from the agency collaborated with USFWS to address priority research needs (Black Bear Conservation Coalition, 2010). The agency focused their efforts on obtaining research and contributed large amounts of time and financial incentives to researching the subspecies.

USGS took part in creating the Plan and designated funds each year analyzed except in 2007 (USFWS, 2007). No studies were ongoing during that year and the large

funds from the Forest Service countered nonexistent funds from USGS. In 2008 and 2009 recovery funding fell below 5% and spiked to 45% in 2010, \$855,527.00 (USFWS, 2010). The stakeholder contributed a substantial amount of capital to research studies on the endangered subspecies paying for most of that recovery priority. The agency focused much of its attention on researching potential and current habitat to minimize Bear loss and maximize habitat in the region.

States: Louisiana, Mississippi, and Texas

| State | Year | 2007 | 2008 | 2009 | 2010 |
|-------|----------------|------------|------------|------------|-----------|
| | LA, MS, and TX | 126,622.00 | 210,650.00 | 107,118.00 | 22,700.00 |
| | % of Total | 7.18% | 11.54% | 5.16% | 1.19% |

Table 10. Fund contributions from Louisiana, Mississippi, and Texas for Louisiana Black Bear Recovery. State totals were combined and cannot be represented independently. Yellow illustrates the totals and blue represents the percent for the total spending (USFWS, 2007-2010)

Louisiana Department of Wildlife and Fisheries

The remaining Black Bear populations reside mostly in Louisiana; therefore Louisiana Department of Wildlife and Fisheries (LDWF) led several recovery tasks. The agency conducted research, provided protection, and restored Bear habitat and worked on various conservation projects regarding Louisiana Black Bear while funding operations according to the Plan.

The agency developed several studies addressing delisting criteria for Louisiana Black Bear between the years examined. The study analyzed Bear DNA to better understand Bear population dynamics. The DNA determined gene flow, taxonomy, and populations sizes of the subspecies and researchers could identify individual Bears with the research (Black Bear Conservation Coalition, 2010).

Additionally, population viability analyses in 2007 determined Bear populations in the Tensas River basin and Upper and Lower Atchafalaya basins increased. In 2010,

the agency collared Bears with GPS collars in Louisiana for studies. The agency focused largely on research and habitat restoration (USFWS, 2011).

Louisiana Department of Wildlife and Fisheries participated in the recovery through education and public outreach. In 2009 LDWF increased public understanding of the Bear through outreach workshops and public meetings. To reduce human-bear conflicts the agency created a phone number and pamphlets for residents to report nuisance Bears (USFWS, 2010).

The agency also helped private landowner with Bear management techniques and dispersed information on managing incentives. LDWF implemented nuisance Bear reduction strategies through community development projects. The agency took responsibility for relocating problem Bears when detected (TPWD, 2005).

The agency successfully turned a nuisance species into a conservation achievement because of its projects. The agency contributed with other states less than 7% in 2007 and 2008 (USFWS, 2008). In 2009, contributions lessen to 1%, and jumped the highest in 2010 to 12%. State spending fluctuated depending on Bear actions in Louisiana. Larger nuisance Bear populations increase the budget because of relocation costs them changing percentages annually. LDWF contributed time to various tasks and took responsibility overseeing tasks outlined in the Species Recovery Plan.

Mississippi Department of Wildlife, Fish, and Parks

The Louisiana Black Bear population expanded and increased in Mississippi leaving the Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) in charge of managing the population in the state. The stakeholder took part in the creation and implementation of the Plan and contributed to the education and research categories.

The agency focused most of its attention on education. For example, Bear biologists gave over 40 presentations about the subspecies in the Mississippi region. A large part of the conservation project consisted of public outreach (USFWS, 2011). MDWFP hosted workshops, public speakers, and festivals to educate citizens about Bear conservation to improve community-Bear relationships (USFWS, 2011).

Moreover, media offered information to the public through magazine and newspaper articles and the agency put together a webpage for Bear conservation (Black Bear Conservation Coalition, 2010). The site contained ecological and Bear management articles, recent stories, video posts, and photos for people to familiarize themselves with the endangered subspecies.

The other category the MDWFP invested in was research. Agency researchers monitored 19 radio collared Bears throughout the state, and captured and collared new Bears. Part of the research was conducting den checks. Den checks help biologist estimate the breeding female populations to better understand the Bear. The agency conducted the studies through 2009 to document birthrates of radio collared females (Black Bear Conservation Coalition, 2010).

Mississippi Department of Wildlife, Fish, and Parks investigated movements and habitat use of Louisiana Black Bear via GPS collaring in Mississippi. The study examined human barriers that interfered with Bear movement and habitat degradation from development (USFWS, 2011). The data provided biologists with new evidence that the population increased in Mississippi.

Mississippi was one of only two states that provided state-funded compensation programs. The program was run by the agency and was where contributions from the

state came from. MDWFP focused on public outreach and research and the Louisiana population increased in the state since 2007 (USFWS, 2011).

Texas Parks and Wildlife Department

Texas Parks and Wildlife Department (TPWD) supervised Louisiana Black Bears in East Texas. The subspecies prefer habitat eastern Texas provides with oaks and other mass producing trees. The agency produced the Plan and supported it through habitat management, education, and research.

Texas was the other state that provided financial incentives to private landowners willing to convert or preserve forest back to their natural state or as close as possible. In 2010, the agency and its partners created Land Conservation Priority Maps for East Texas and developed a Hardwood Habitat Cooperative. The activity offered landowners funds to restore or improve areas of hardwood on their lands. These efforts of habitat restoration contributed to enhancing over 1,550 acres in East Texas (USFWS, 2011).

Louisiana Black Bear population research continued with TPWD support and since 1977, the department conducted Louisiana Black Bear surveys and sightings in eastern Texas. For example, the department directed field research to locate suitable Bear habitat in Texas in an attempt to determine if Texas could sustain a Bear population (TPWD, 2005).

Similarly to other stakeholders the agency provided workshops and other community outreach projects to educate residents about the subspecies. Texas Parks and Wildlife analyzed conflict management protocols and executed them where needed (TPWD, 2005).

Overall, the agency contributed to the success of the subspecies throughout the years analyzed. The stakeholder attributed most of their attention to habitat and research categories. Programs provided incentives for habitat preservation and biologists obtained research for Louisiana Black Bear population trends in Texas (USFWS, 1995). Overall, the stakeholder managed Louisiana Black Bears in Texas and influenced the subspecies success from 2007 to 2010.

Department of Defense

| Department of Defense | Year | 2007 | 2008 | 2009 | 2010 |
|-----------------------|-------------------------|-----------|-----------|------------|-----------|
| | Army Corps of Engineers | 94,140.00 | 12,900.00 | 147,400.00 | 85,475.00 |
| % of Total: | 5.34% | 0.71% | 7.10% | 4.46% | |

Table 8. Department of Defense Army Corps of Engineers expenditures for 2007-2010 yellow shows the total funds contributed and blue illustrates the percent of total spending (USFWS, 2007-2010).

Army Corps of Engineers

The Department of Defense oversees the Army Corps of Engineers (ACE) which funded and assisted in developing the Recovery Plan for the subspecies. The stakeholder managed lands where Louisiana Black Bear roam. In Louisiana, ACE manages the Atchafalaya Basin a large expanse of contiguous forest.

In the Atchafalaya Reserve ACE manages the Atchafalaya Spillway Water Diversion Project. The spillway is a major flood control area developed to divert the Mississippi river north of New Orleans. The spillway created the Atchafalaya Basin containing the endangered Bear. The project created a diverse and productive ecosystem for many species to thrive since it began (USFWS, 2006).

Moreover, the agency managed the Yazoo Backwater Reformulation Project on the lower end of the Mississippi. In summary, water has been trapped by a levee creating

back water thus the Army Corps of Engineers created a pumping plant to reduce backwater in the Yazoo Backwater Area (USFWS, 2006).

Fortunately, most Bears occur on large areas of publicly owned land around the Yazoo project, but private lands could potentially lose critical Bear habitat due to mismanagement of the watershed. Residential lands could become submerged without the pump destroying prime habitat for the subspecies (USFWS, 2006).

Habitat loss was the largest threat to the species and Army Corps of Engineer may have contributed to the destruction from the pump activities. USFWS concluded the relatively small project would probably not adversely affect the Bears but could potentially. ACE countered the threat by providing financial assistance and energy to the recovery and since 2001 the agency reforested over 2,000 acres on Corps lands (TXPWD, 2005).

To avoid any committed harm to the subspecies the Army Corps of Engineers planned to help reforest past and potential future wetland loses. The agency provided conservation easements to eager landowner and reforested qualified lands (USFWS, 2006). Additionally, the stakeholder contributed funds for radio collar tracking devices for the Black Bear. MDWFP received the funds and attached the collars to Bears in the Delta National Forest and Yazoo National Wildlife Refuge (USFWS, 2006).

Overall, the agency participated in a few projects in the recovery mostly dealing with habitat conservation and public awareness. Army Corps of Engineers did not fund much of the recovery budget because they managed a small portion of land and interfered little with the subspecies' reduction.

3.2.3 Conclusion

Government stakeholders that contributed to the Louisiana Black Bear recovery plan determined fund allocation in the Plan, but USFWS had the overall say. Each stakeholder played an important role in creating and executing the Recovery Plan for the subspecies. Stakeholders determined the best way to increase the Bear population was through research, education, habitat, and protection.

Stakeholders determined habitat reduction impacted the Louisiana Black Bear most therefore focused on placing the majority of the funds towards research. More than a third of the budget went towards that category. Stakeholders funded research projects studying Bear populations, and other ways to counter the effects of human encroachment.

The budget analysis determined a successful utilization of funds. The main goal of the recovery plan was to increase Black Bear populations, develop corridors, and protect vital habitat. The population improved to roughly 350 individuals because of projects defined in the Plan and each task placed the subspecies closer to the goals outlined in the Plan for delisting.

Actual costs almost doubled what was estimated in the Plan from 2007 to 2010. Costs were difficult to determine and estimates could have been less than anticipated. One of the reasons costs were double comes from Natural Resource Conservation Service. Their program converting and protecting wetland had overwhelming success from landowner enrollment.

Land owners enrolled throughout the years studied thousands of acres. Expenditures for every year except 2010 were over 40% for the stakeholder because of the public's overwhelming enrollment. Expenditures for the Wetlands Reserve Program

were not included in the Recovery Plan and could explain some of the discrepancy between actual and estimated spending.

More than eight stakeholders were involved in implementing and funding the Recovery Plan. That many stakeholders could explain why funding may have increased during the analysis. Furthermore, the subspecies is one of the more charismatic endangered species in the U.S. which may have something to do with expenditure inconsistencies.

Overall, the subspecies plan led to an improving Louisiana Black Bear population. A budgetary analysis revealed successful fund allocation according to the plan. The supervising stakeholder was USFWS. Although, USFWS gave the Bear a priority rating of a 9C, threatened but improving, it still received more funding than the plan specified. Expenditure discrepancies could come in various forms like unaccounted projects in the Species Recovery Plan increasing costs.

3.3 Sierra Nevada Bighorn Sheep

3.3.1 Background

Bighorn sheep in the western United States arrived over 600,000 years ago from Siberia. The ungulates route crossed over the Bering land bridge and over thousands of years subpopulations evolved. Bighorn sheep occupy a range from southern Canada to Mexico (USFWS, 2007). One subspecies, the Sierra Nevada Bighorn Sheep, came under recent threat due to disease from domestic livestock.

The subspecies lives exclusively in the Sierra Nevada Mountain Range of California. Portions of their range extend from Yosemite National Park in the north to Sequoia National Park in the south. Fortunately, the species ranges almost entirely on federally managed lands (USFWS, 2007).



Figure 3. Map illustrating Sierra Nevada Bighorn Sheep range in the Sierra Nevada Mountain Range stretching through California and Nevada. The key depicts the current annual ranges of five herd units (USFWS, 2012).

The species survives due to its agility among the cliffs and efficient eyesight since elevations within the range vary from 4,700 feet to over 13,000 feet (USFWS, 2007). The Sheep prefer habitat encompassed with rocky slopes, and open woodlands. Within the Sheep's range occur wide distributions of vegetation. The lowest elevations hide the sagebrush-bitterbrush-bunchgrass scrub, as the elevation increases the vegetation becomes pinyon-juniper woodland and mountain mahogany scrub. At mid-elevation subalpine forests, woodlands, and meadows begin to appear and last, in the highest places of their range lie vast alpine meadows and other alpine habitats (USFWS, 2007).

Historically herds existed throughout the Sierra Nevada Mountain Range from the Sonora Pass to Olancho Peak. Researchers never determined how large the population ever exceeded, but believed it contained more than 1,000 individuals (USFWS, 2007). Today's population looks drastically different. The species occurs in only two areas of its former range in small, fragmented populations. Habitat occupied by the Sheep was managed by the U.S. Forest Service, National Park Service, and Bureau of Land Management between 2007 and 2010 (USFWS, 2007).

Population Dynamics

The Sierra Nevada Bighorn Sheep population never appeared in extensive numbers, but could be found in few herds a few thousand individuals. In the late 1970s the population lingered around 250 individuals and by 1985 the population grew to 300. The Bighorn seemed stable due to recovery efforts, and a reintroduction program, but in 1995 the population declined to around 100 individuals because of an unseasonably cold winter (USFWS, 2007).

The winter of 1995 brought difficulty because it was unusually cold, and the subspecies headed to higher ground. Higher grounds meant colder weather and many could not survive the temperatures. Numbers have increased since the decline in 1995, and the population rose to over 122 in 1999 (USFWS, 2007). Designated recovery actions helped the population slowly recovery to around 400 individuals by 2011 (CDFG, 2011).

Reasons for Listing

Disease played the largest role in the decline of the subspecies. Domestic Sheep carry virulent diseases which transfer to Bighorn Sheep populations in the Sierra Nevada. The most significant threat to the species was pneumonia, caused by *Pasteurella*, or in combination of other pathogens. Disease within the domestic and wild Sheep population were nearly impossible for researchers to collect and examine because infected animals show little signs of sickness until they die (USFWS, 2007).

Beginning in the 1870s diseases carried by domestic Sheep played a large role in the demise of the subspecies. Management techniques were implemented by the Recovery Team and now domestic grazing only occurs adjacent to the Sierra Nevada Bighorn Sheep. The major risk of transfer occurs when a domestic Sheep strays into Bighorn habitat or vice versa (USFWS, 2007).

Since the late 1970s mountain lion have accounted for some of the Sheep's decline bringing concern to wildlife biologists. Winter ranges of the subspecies leaves them most vulnerable from attacks by puma therefore; mountain lion with a taste for Bighorn are removed and relocated to protect the Sheep (USFWS, 2007). Since the

population was so low each individual loss is immense to the overall population even though few have been taken by puma.

Species Recovery Plan and Priorities

On April 20, 1999 the species was listed as Endangered under the Endangered Species Act. The Species Recovery Plan followed and was finished on September 24, 2007. USFWS ranked the subspecies a 3C on their recovery priority rank system (USFWS, 2007). This means there is a high degree of threat, but the potential to recover is also high. Various agencies took part in implementing and funding the recovery plan and stakeholders played a crucial role in the survival of the species because of their financial aid and efforts (USFWS, 2007).

The main goals of the subspecies' recovery were to manage the species to a self-sustaining population size and increase their geographic range. The plan called for maintaining long-term viability through different programs and techniques that will ensure the delisting of the species. The main priority focus for the recovery plan was increasing the population to a healthy size (USFWS, 2007).

Conclusion

In conclusion, to delist the species requires a minimum of 350 adult females and herds need to be monitored with at least three censuses. Twelve herds must be formed and land management and techniques must provide long term protection to the species. The first priority for the recovery was to translocate "Bighorn Sheep into unoccupied herd units that are needed for recovery, or to aid in the recovery of occupied herds (USFWS, 47)." USFWS believed this will vary the gene pool and increase the breeding population.

3.3.2 Analysis

Sierra Nevada Bighorn Sheep priorities were illustrated in its Recovery Plan in order of importance. Increasing the population was the priority of most importance and research was the least according to the Recovery Team. Tasks were defined as projects regarding the species' recovery under one of five categories set forth by USFWS. A spreadsheet displayed each project and was defined under the task description.

3.3.2.1 Priorities, Tasks, and Spending

| Sierra Nevada Bighorn Sheep | | | | |
|------------------------------------|-------------|--|--------------------|----------------------|
| Priority | Task | Task Description | Stakeholder | Cost Estimate |
| Population Increase | 2.1 | Prepare and implement a management plan to temporarily protect Sierra Nevada Bighorn Sheep herds from predation losses, where needed, until viable herd sizes are reached. | CDFG | \$350,000.00 |
| | 2.2.1 | Reduce potential predator influences on winter habitat selection where appropriate | CDFG | \$40,000.00 |
| | 2.3.1 | Prevent contact between Bighorn Sheep and domestic Sheep or goats | FS, FWS, BLM, CDFG | \$7,500.00 |
| | 2.2.3 | Enhance Bighorn Sheep winter range habitat to increase visibility where appropriate | FS, NPS, CDFG | \$30,000.00 |
| | 2.3.2 | Develop an action plan in the event that a pneumonia outbreak occurs | CDFG | \$10,000.00 |
| | 2.4 | Manage human use locally where it is found to cause Bighorn Sheep to avoid important habitat and, thereby, compromises survivorship or reproductive success | FS, NPS, FWS, CDFG | \$1,000.00 |
| | 3.1 | Develop and implement a strategy for translocations | FS, NPS, FWS, CDFG | \$30,000.00 |
| | 3.2.1 | Manage wild herds as sources of stock | CDFG | part of other |
| Total: | 8 | | | \$468,500.00 |
| Monitoring | 5.2 | Monitor key predators in the vicinity of winter ranges | CDFG | \$10,000.00 |
| | 5.1 | Develop and implement a monitoring plan for population abundance and distribution of Bighorn Sheep herds in the Sierra Nevada | CDFG | \$200,000.00 |
| | 5.4 | Monitor exposure to disease organisms of concern | CDFG | \$3,750.00 |
| | 5.3 | Monitor vegetation structure and composition changes likely to affect Bighorn Sheep population parameters. | FS, NPS, CDFG | \$10,000.00 |
| Total: | 5 | | | \$223,750.00 |
| Habitat | 1.2 | Maintain and/or enhance integrity of Bighorn Sheep habitat | NPS, FS, FWS, CDFG | \$149,000.00 |

| | | | | |
|----------------------|-----------|--|-------------------------|---------------------|
| Total: | 1 | | | \$149,000.00 |
| Recovery Team | 8 | Establish an implementation advisory team for coordination and communication | CDFG, FWS, FS, BLM, NPS | \$1,000.00 |
| Total: | 1 | | | \$1,000.00 |
| Research | 6.2 | Develop a population viability analysis (PVA) for the Sierra Nevada Bighorn Sheep | CDFG | \$50,000.00 |
| | 6.3 | Further investigate habitat use patterns of Bighorn Sheep herds | CDFG | \$10,000.00 |
| | 6.4 | Investigate and analyze human use patterns relative to habitat use patterns of Bighorn Sheep | FS, NPS, CDFG | \$5,000.00 |
| | 6.6 | Investigate future reintroduction sites relative to potential predator and domestic Sheep problems and other potential conflicts | FS, NPS, CDFG | \$10,000.00 |
| | 6.8 | Attempt to develop long term data that will help elucidate predator-prey dynamics of this ecosystem as they affect Bighorn Sheep | FS, NPS, CDFG | \$80,000.00 |
| Total: | 5 | | | \$155,000.00 |
| Total: | 19 | | | \$997,250.00 |

Table 11. Sierra Nevada Bighorn Sheep Priority categories including tasks, task descriptions, responsible stakeholders, and estimated costs (USFWS, 2007-2011).

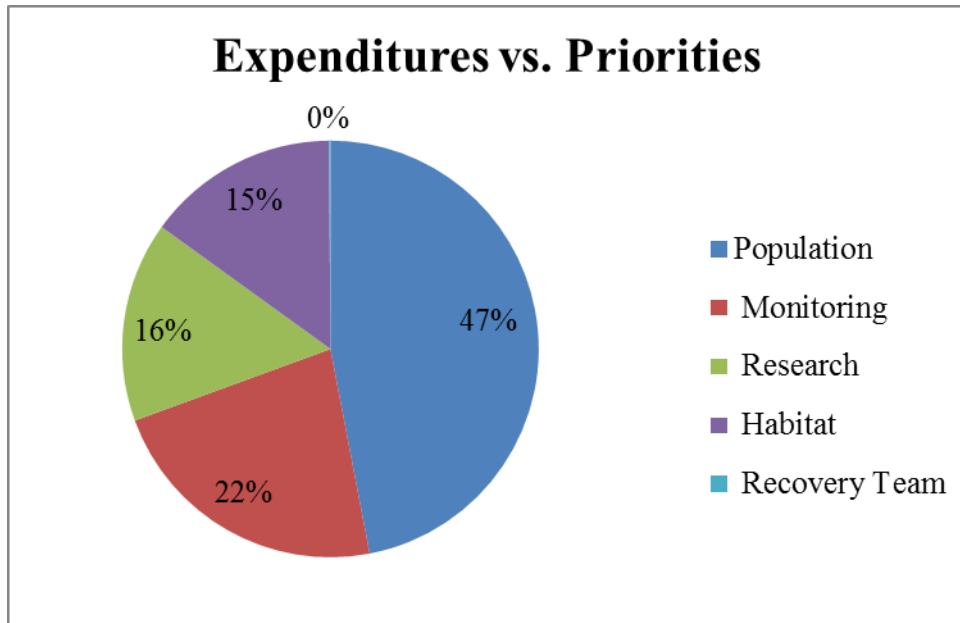


Chart 5. Pie chart illustrating expenditures per priority by percentage. The key depicts the five priorities outlined in the Species Recovery Plan in order of importance (USFWS, 2007).

Population Increase

Population increase, category one, regards measures taken to enhance the survivorship of the Sierra Nevada Bighorn Sheep. Eight tasks reside under the category and the total estimated costs were approximately \$468,500.00 (USFWS, 2007). Until herd sizes stabilize a management plan was created to protect the sheep from predation and disease.

The sheep population can catch diseases from domestic sheep which can dramatically alter the population. Pneumonia outbreaks are potentially most harmful; therefore an action plan was developed with an emphasis on increasing the population through various conservation tasks. Disease was the number one cause for the species demise (USFWS, 2007).

Human barriers, like fences, keep Sheep from roaming vital habitat within their range. Therefore, important areas for the bighorn that received large amounts of human activity were located and closed. Additionally, the population became fragmented and as a result USFWS developed strategies for relocating the subspecies to produce additional herds. Translocating refers to taking a bighorn sheep from one area and moving it to another place in an attempt to establish another herd (USFWS, 2007).

Moreover, project costs for tasks can never be certain, and expenditures differ drastically. The species implementation was frequently updated and provided ongoing and current projects for each year of the study. 47% of the costs on current projects attributed to increasing the population (USFWS, 2007).

Funding and responsibilities for costs under this category came from Federal and State Government Agencies. Accountable stakeholders included: California Department

of Fish and Game, U.S. Fish and Wildlife Service, Bureau of Land Management, National Park Service, and Forest Service. Each party either contributed funds under the category, provided other means of support, or both (USFWS, 2007).

In conclusion, expenditures for increasing the Sierra Nevada Bighorn Sheep population used nearly half of the annual recovery budget yet, the percentage of funding stayed the same each year. Researchers believed increasing the population was the most efficient way to bring the Sierra Nevada Bighorn Sheep back from the brink of extinction. The recovery team dedicated time and costs to monitoring predator populations, researching disease, and relocating individuals.

Monitoring

The second category, monitoring, made up 22% of the annual recovery budget. There were five tasks dedicated to sheep monitoring costing over \$223,750.00 (USFWS, 2007). Population status and trends, sheep habitat, and threats to the subspecies made up projects outlined under the monitoring priority.

Stakeholders watched predators, like puma, ranging in the locality of the subspecies because of the potential threat they have on the sheep. The predator contributing the most to the decline of the species is the mountain lion. Predation is not usually a contributing factor when listing a species, but since the bighorn population was small each loss dramatically effects the remaining population (USFWS, 2007).

In recent years vegetation succession penetrated bighorn habitat, because natural fire regimes no longer exist. Fires burn off any invasive species in the ecosystem that outcompete endemic species, unfortunately this no longer occurs regularly because of the weather variations and human interferences. Agencies conducted studies monitoring the

makeup and structure of the vegetation where likely effects of succession appeared to increase vegetation to better understand Sheep habitat (USFWS, 2007).

Monitoring consisted of 22% of the expected spending outlined in the SRP, \$223,750.00. Agencies contributing to the category included: California Department of Fish and Game, Forest Service, and National Park Service. CDFG maintained the most responsibility in regards to monitoring (USFWS, 2007).

Research

The final portion of the recovery plan covered current and relevant research. Little was known about Bighorn Sheep habitat; therefore the ecosystem required further investigation. Biologist worked in the field surveying suitable habitat for the subspecies and other studies focused on future relocation sites with regards to predators and domestic livestock (USFWS, 2007).

Overall, research comprised 16% of the recovery costing \$155,000.00. There were five tasks under the priority. Little was known about this subspecies; therefore most research projects focused on the species range and population. Government stakeholders backing the priority consisted of California Department of Fish and Game, Forest Service, and National Park Service. The agency's individual tasks were outlined in the SRP (USFWS, 2007).

Habitat

Habitat the fourth category focused on for the recovery of the bighorn. Fifteen percent of the annual budget went towards this priority. The operation cost roughly \$149,000.00 and the only task designated under the category was preserving or enriching Bighorn Sheep habitat.

USFWS felt that in order to increase the population the subspecies habitat needed protection. Responsible parties for implementing and contributing capital involved the National Park Service, Forest Service, U.S. Fish and Wildlife Service, and California Department of Fish and Game. Each stakeholder took responsibility for providing USFWSs outlined in the SRP (USFWS, 2007).

Recovery Team

The Recovery Team assumes less than 1% of the annual recovery budget and received \$1,000.00 for one task at hand, coordinating a cooperative advisory team to oversee the Bighorn projects. Stakeholders range from Federal and State agencies to private organizations and require effective team work to implement a successful plan. This category was far less than 1% of the annual budget; therefore the report did not analyze it (USFWS, 2007).

Conclusion

USFWS and other agencies assisted in the creation and execution of the Sierra Nevada Bighorn Sheep Recovery Plan based on five distinct priorities. Diseased, predation, and changing weather patterns have all lead to the demise of the subspecies. The category that received most attention was to increase the population while the least amount of funds went towards the Recovery Team. Overall, the organization of priorities resulted in explaining the highest degree of threat to the subspecies.

3.3.2.2 Government Stakeholders

The highest degree of threat for the Sierra Nevada Bighorn Sheep came primarily from disease. The subspecies ranges across land primarily managed by USFWS and other government agencies. Consequently, three to four main government agencies paid

expenses during the years analyzed leading to decreased spending planned in the Recovery Plan.

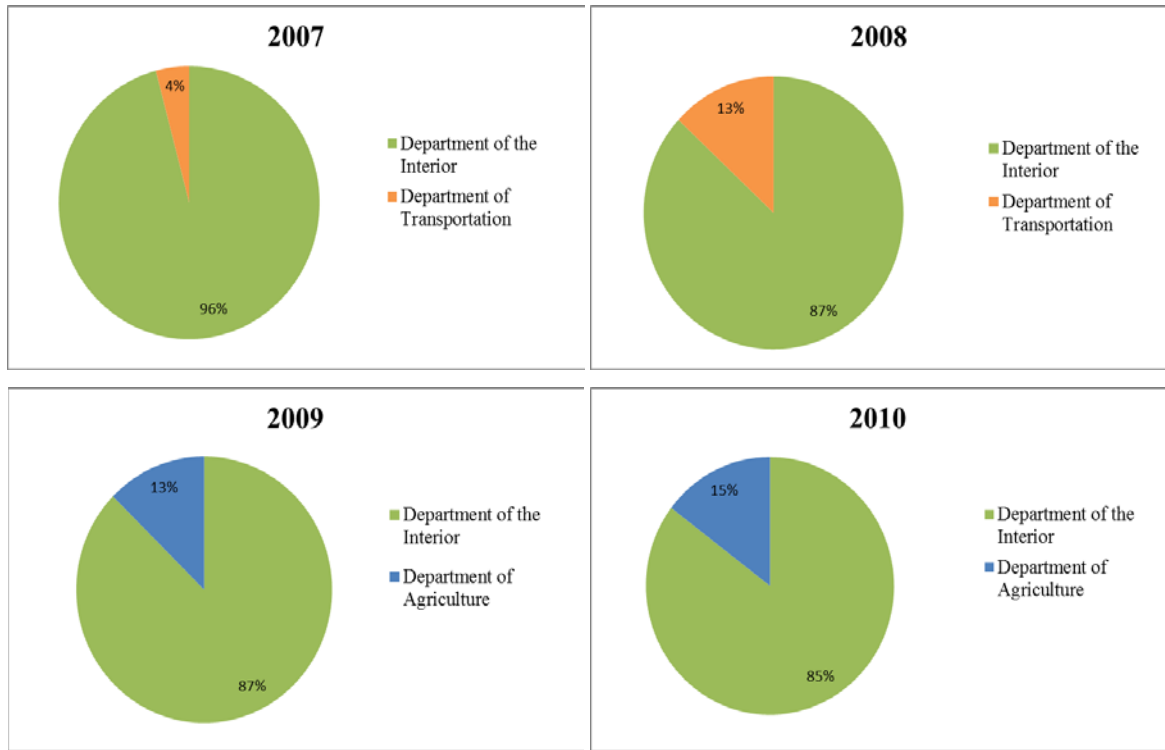


Chart 6. Four pie charts signifying stakeholder contributions for Sierra Nevada Bighorn Sheep recovery spending percentages, 2007-2010. Each chart is a year analyzed and the key illustrates the contributing stakeholders in order of most concern (USFWS, 2007-2010).

Department of Interior

| Department of the Interior | Year | 2007 | 2008 | 2009 | 2010 |
|----------------------------|------------------------|------------|------------|------------|------------|
| | BLM | 4,500 | 25,000 | | 34,500 |
| | National Park Service | 2,500 | 3,700 | 5,800 | 165,600 |
| | USFWS | 550,976 | 247,798 | 188,979 | 82,379 |
| | U.S. Geological Survey | | 42,350 | | 90,000 |
| | Total: | 557,976.00 | 318,848.00 | 194,779.00 | 372,479.00 |
| | % of Total | 96% | 87% | 87% | 85% |

Table 14. Department of Interior's agencies, BLM, National Park Service, USFWS, and the U.S. Geological Survey, spending on Sierra Nevada Bighorn Sheep recovery from 2007-2010. Yellow illustrates the totals and blue shows the percentage of total spending for the year represented by column (USFWS, 2007-2011).

Bureau of Land Management

Domestic sheep grazing allotments BLM manages were found in a few places on the subspecies' range. BLM managed lands on the bighorn sheep's range and supervised one project in the Plan, 2.3.1 (Prevent contact between bighorn sheep and domestic sheep or goats), for each year of the study.

The main focus of the agency was to prevent domestic sheep from coming into contact with Bighorn Sheep. Each allotment the agency managed increased the chances of disease spreading to the subspecies (BLM, 2011). The potentially negative impacts made the stakeholder a contributor to the species recovery each year except 2009 because funds were directed from other stakeholders.

Bureau of Land Management contributed to funding every year of the study except 2009 because USFWS funded almost the entire recovery leaving other agencies to pay far less. The agency funded less than 8% of the species recovery, but this was because it managed little land where the subspecies occurred (USFWS, 2010).

National Park Service

The National Park Service (the Park Service, NPS) managed habitat for the Sierra Nevada Bighorn Sheep because the subspecies ranged in various areas of National Park lands. Kings Canyon National Park, Sequoia National Park, and Yosemite National Park all harbor herds of the endangered subspecies therefore, USFWS sent biologists from all three national parks to take part in the preparation of the recovery plan.

The Park Service led projects 2.2.3 (Enhance bighorn sheep winter range habitat to increase visibility where appropriate), and 2.4 (Manage human use locally where it is found to cause bighorn sheep to avoid important habitat and, thereby, compromises

survivorship or reproductive success) for category 1, population increase. NPS also was responsible for 5.3 (Monitor vegetation structure and composition changes likely to affect bighorn sheep population parameters) under priority two and 1.2 (Maintain and/or enhance integrity of bighorn sheep habitat) for habitat (USFWS, 2007). The stakeholder's main focus was to provide land for the sheep to roam and reestablish a population in the Great Western Divide part of Sequoia National Park.

Sheep occur on various areas of the Park Service managed land thus, the agency contributed to the annual recovery. In October 2010 NPS prepared a study on Sierra Nevada Bighorn Sheep in Sequoia and Kings Canyon National Park. The project undertaken by the stakeholder included: capturing and radio collaring sheep, as well as attaching GPS devices on the subspecies found in Sequoia National Park. The actions promoted the well-being of the population and the Park Service used the data to create a model for managing the subspecies and understand migration patterns.

In conclusion, the Park Service contributed less than 3% of the funds from 2007 to 2009 and nearly 38% in 2010 (SKCNP, 2011). The reason for the increase was because of studies produced in 2010. The subspecies ranged on various patches of National Park Service lands, so the agency contributed time and expenditures to the species recovery. The stakeholder focused primarily on the first three priorities, and the population of Sierra Nevada Bighorn Sheep increased.

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service took part in funding and implementing several projects, but did not lead any projects for the SRP. The agency undertook the most tasks,

updated current research, and devised new ways of managing the subspecies' population (USFWS, 2007).

The percentage of funds USFWS placed into the recovery varied throughout the years examined. USFWS contributed 95% of the funds for 2007 (USFWS, 2007). The following year the percentage dropped to 68%, increased to 85% in 2009, and ended at 19% in 2010. USFWS funded the majority of the projects until 2010 (USFWS, 2010). This year the National Park Service contributed what FWS could not.

U.S. Geological Survey

The U.S. Geological Survey (USGS) did not participate in the creation of the Bighorn Recovery Plan. The agency produced studies regarding the population which was attributed to spending in 2008 and 2010. USGS contributed 11% of total recovery in 2008, and 20% in 2010 because of research studies conducted with the subspecies (USFWS, 2010). Each study required different amounts of funding.

Department of Agriculture

| Department of Agriculture | Year | 2007 | 2008 | 2009 | 2010 |
|---------------------------|--|----------------|----------------|------------------|------------------|
| | Animal and Plant Health Inspection Service | | | 200 | |
| | Forest Service | | | 28,000 | 64,000 |
| | Natural Resources Conservation Service | 140 | | | |
| | Total: | 140.00 | 0.00 | 28,200.00 | 64,000.00 |
| | % of Total: | 0.0241% | 0.0000% | 12% | 14% |

Table 12. The Department of Agriculture's expenditures for Sierra Nevada Bighorn Sheep recovery between 2007 and 2010. Agencies contributing funds are Animal and Plant Health Inspection Service, Forest Service, and Natural Resources Conservation Service represented by rows. Columns illustrate each year and the total spending in yellow and blue represents the percentage of total spending (USFWS, 2007-2010).

U.S. Forest Service

Sierra Nevada Bighorn Sheep occur on various areas managed by the U.S. Forest Service (USFS). Today's population mainly inhabits Inyo National Forest, yet some individuals occur in the Sierra and Sequoia National Forests. From the time the subspecies was listed in 1999 USFS worked with USFWS on various actions outlined in the Recovery Plan (USFWS, 2007).

The Forest Service led population increase projects 2.3.1 (Prevent contact between bighorn sheep and domestic sheep and goats), 2.2.3 (Enhance bighorn sheep winter range habitat to increase visibility where appropriate), and 2.4 (Manage human use locally where it is found to cause bighorn sheep to avoid important habitat and, thereby, compromises survivorship and/or reproductive success). The agency also led task 5.3 under Monitoring, and 1.2 (Maintain and/or enhance integrity of Bighorn Sheep habitat) for the Sheep's habitat. The main goals of the agency was to restore the subspecies population to their historic range, increase the population to allow for down listing or delisting to occur, and provide community support through education and awareness regarding sheep (USFWS, 2007).

The stakeholder participated in the species recovery because of grazing permits they managed for domestic sheep in close proximity to the wild population. USFS used helicopters, which disrupt the subspecies, to conduct forest surveys for land mapping (USFWS, 2011).

Additionally, prescribed and fire suppression activities and permits for public use of the forest all negatively impacted the remaining Sierra Nevada Bighorn Sheep during the years analyzed. The Forest Service acknowledged their impacts on the subspecies and

contributed funds. The agency monitored domestic grazing allotments throughout the range of the subspecies because the threat of disease increased near these allotments and could wipe out an entire herd of Bighorn from disease (USFWS, 2011).

Although, USFS did not contribute funds in years 2007-2008 the agency led certain projects and participated in others they were responsible for outlined in the Recovery Plan. In 2009, the agency funded recovery efforts because of an Environmental Impact Statement (EIS) regarding Motorized Travel Management (USDA, 2009).

The agency created an EIS to reexamine an old rule and improve vehicle use in Inyo National Forest for multiple management and recreational reasons (Upchurch, 2009). USFWS determined little concern with disturbing the Sierra Nevada Bighorn Sheep, but because of the risk USFS contributed to the recovery in 2009 and the project continued through 2010.

Overall, most of the Forest Service's spending went towards enhancing Bighorn Sheep habitat. Sierra Nevada Bighorn Sheep occur in three National Forest managed by USFS, therefore the stakeholder took responsible for executing several tasks under the various categories (USFWS, 2007). The agency activity in 2009 and 2010 negatively impacted the subspecies because of grazing allotments, but the agency took precautions not to cause harm and provided funds.

Department of Transportation

| Department of Transportation | Year | 2007 | 2008 | 2009 | 2010 |
|------------------------------|---------------------------------|-----------|-----------|------|------|
| | Federal Aviation Administration | 24,000 | 48,000 | | |
| | Total: | 24,000.00 | 48,000.00 | 0% | 0.00 |
| | % of Total: | 4% | 13% | 0% | 0% |

Table 13. Department of Transportation’s Federal Aviation Administration expenditures for Sierra Nevada Bighorn Sheep recovery from 2007 to 2010. Yellow depicts total expenditures for the year and blue shows the percentage of total spending (USFWS, 2007-2010).

Federal Aviation Administration

The Federal Aviation Administration (FAA) did not take part in creating or implementing the SRP, yet the agency contributed to the expenditures in 2007 and 2008. The FAA managed the western portion of the R2508 Complex which overlaps the Sierra Nevada Range. The portion of the Complex affecting the sheep is Edwards Air Force Base (Brown, 2009).

The base contains ecosystems vital to the Bighorn’s recovery meadows, marshes, and water sources, crucial habitat designated for the survival of the subspecies. Threatened and endangered species resided in the Complex, but the Sierra Nevada Bighorn Sheep was not a species of much concern because it is rarely seen near the Complex (Brown, 2009).

Occasionally, sheep can be spotted in the valleys of the Complex and for that reason the agency expended funds to the recovery. The stakeholder impacted the species negatively because of various military activities. Actions included ground operations, flight activity, and weapons missions all potentially harming the endangered subspecies (Brown, 2009).

The stakeholder took responsibility for contributing four percent in 2007 and thirteen percent of funds in 2008. The reason the agency paid for the recovery was

because of their activities in the vicinity of the Sierra Nevada Bighorn Sheep. Federal Aviation Administration did not pay in 2009 or 2010 because USFWS felt the subspecies was affected little by the agency's activities.

State

California Department of Fish and Game

The State did not contribute funds to recovery efforts for the years studied, yet the agency led several parts of the recovery. The stakeholder took responsibility for implementing task 2.1 (Prepare and implement a management plan to temporarily protect Sierra Nevada Bighorn Sheep herds from predation losses, where needed, until viable herd sizes are reached.), 2.2.1 (Reduce potential predator influences on), 3.2.1 (Manage wild herds as sources of stock), and 2.3.2 (Develop an action plan in the event that a pneumonia outbreak occurs) under category one (USFWS, 2007). Tasks, under monitoring, led by the agency were 5.2 (Monitor key predators in the vicinity of winter ranges), 5.1 (Develop and implement a monitoring plan for population abundance and distribution of Bighorn Sheep herds in the Sierra Nevada), and 5.4 (Monitor exposure to disease organisms of concern) (USFWS, 2007).

The state agency headed the Recovery Team project and lastly, under the research priority the stakeholder managed tasks 6.2 (Develop a population viability analysis (PVA) for the Sierra Nevada Bighorn Sheep), 6.3 (Further investigate habitat use patterns of bighorn sheep herds), 6.4 (Investigate and analyze human use patterns relative to habitat use patterns of Bighorn Sheep), 6.6 (Investigate future reintroduction sites relative to potential predator and domestic sheep problems and other potential conflicts),

and 6.8 (Attempt to develop long term data that will help elucidate predator-prey dynamics of this ecosystem as they affect Bighorn Sheep) (USFWS, 2007).

California Department of Fish and Game (CDFG) managed the recovery as a whole. With its role the agency worked with other federal, state, and private stakeholders to continue sustainable conservation practices and aid in the recovery of species threatened with extinction on their lands. CDFG focused primarily on supporting the region for the long-term viability of Sierra Nevada Bighorn Sheep population (CDFG, 2011).

3.3.3 Conclusion

Government stakeholders involved in Sierra Nevada Bighorn Sheep Recovery Plan determined fund allocation for species recovery success. Priority expenditure distribution was determined by stakeholders in the subspecies recovery plan and USFWS determined where funds were distributed. Agencies involved with recovery projects saw their funds implemented to the correct tasks in the Recovery Plan. Representatives from almost every agency participated in developing the SRP and determined the priority that would be focused on most was increasing the population.

The recovery team defined priorities as: population increase, monitoring, habitat, recovery team, and research. Tasks and cost estimates were examined for each priority to determine the significance each had against others. Increasing the population was the main focus of the recovery goals and USFWS and partners focused much of their attention on this priority.

As of 2011, the Sierra Nevada Bighorn Sheep had a high degree of threat primarily from disease. Fortunately, USFWS set a high potential for recovering the

subspecies. Although, the sheep has one of the highest priorities set forth by USFWS it was underfunded by comparing actual to estimated spending. Only three to four main stakeholders contributed to the expenditures during the years analyzed and three of the four years were primarily funded by USFWS.

The toll of having to pay for almost all of the recovery expenses showed in the Sierra Nevada Bighorn Sheep analysis. Stakeholders participated little in the recovery spending leaving USFWS to make up the majority of the costs. Since the costs were primarily funded by one stakeholder it is no surprise the subspecies plan was underfunded by almost a third.

Estimated costs doubled actual costs for the years analyzed. Planned spending was roughly one million dollars, but actual spending was around \$350,000 during the years analyzed. Costs were difficult to determine for the Recovery Team, therefore some estimates may have been far less than expected. Unfortunately, the plan may be underfunded due to more charismatic species receiving funds, like the Louisiana Black Bear.

Overall, the Recovery Plan's main focus was to increase the population, and that is where the majority of the funding went, 47%. The budget analysis determined the Species Recovery Plan was utilized correctly from 2007 to 2010. The population increased to around 300 individuals in 2011 from less than 100 in 2000 and remained stable (USFWS, 2011).

4. Discussion

Though the U.S. Fish and Wildlife Service's ranking system is beneficial in determining a species status it did not have any effect on spending in the analysis. The Louisiana Black Bear was much less based on the ranking system, than the Bighorn Sheep, but received far more funding. Sheep expenditures were less than half anticipated costs, while the Black Bear's expenditures nearly doubled its estimates in the years examined.

Furthermore, the analysis illustrated that the number of stakeholders could have an impact on expenditures outlined in the Species Recovery Plans. The Sonoran Pronghorn and Louisiana Black Bear had at least six stakeholders contributing funds leading both subspecies to be on or over budget. Unfortunately, one stakeholder contributed the majority of the funds for the Bighorn Sheep, which could explain expenditure estimates being far less than anticipated.

The Pronghorn and Bear had more stakeholders implementing their plans because several agencies managed the land in which both subspecies occur. The Sheep occurs primarily on U.S. Fish and Wildlife Service land, therefore not as many stakeholders took part in implementing and funding the Plan. The few agencies managing lands in the subspecies' distribution provided financial and management incentives to the recovery of the species but mainly coming from USFWS.

Stakeholders contributed according to their influence on the species. For example, agencies supervising land in the endangered species habitat that had projects going on contributed to the species recovery. Some of these projects could negatively impact the

subspecies; therefore responsible agencies took accountability for executing and funding recovery efforts for all three subspecies.

Not all government stakeholders involved in the Species Recovery Plans managed land in the endangered species' range, but still contributed to the recovery. Some stakeholders conducted research, built infrastructure, and converted habitat into development and assisted with recovery. The stakeholders were held accountable for their detrimental activities and took part in executing and/or funding the recovery plan.

Overall, the analysis provided vital information to determine how stakeholders coordinated in executing and funding Species Recovery Plans. Additionally, the thesis determined where funds were placed and how that compared to the recovery tasks outlined in the Species Recovery Plan. The three subspecies analyzed had very different outcomes.

5. Conclusion

Overall, funds were contributed accordingly because Sonoran Pronghorn, Louisiana Black Bear, and Sierra Nevada Bighorn Sheep populations all remained stable from 2007 to 2010. Expenditures were properly directed to the tasks of most concern producing stable populations. Stakeholders contributed properly and executed projects productively.

The main goal of the Sonoran Pronghorn's Recovery Plan was to relocate individuals from one population to establish a second population in another part of Arizona. Fifty one percent of the funding went directly towards these efforts and the species had over six stakeholders contributing resources which led to an increasing population in 2012.

The Louisiana Black Bear population fluctuated for many years, but increased in 2012. Stakeholders' contributed the most time, energy and capital into researching and protecting bear habitat. Like the Sonoran Pronghorn more than six stakeholders contributed to Bear Recovery and expenditures were double what estimates presented. One example is Natural Resource Conservation Service converted much more land into suitable habitat than anticipated, increasing recovery costs.

Last, disease threatened the Sierra Nevada Bighorn Sheep almost wiping out the entire population in 1995 because of abnormally cold weather. The Recovery Team's largest concern was increasing the population through various conservation activities. Unfortunately, the species' funding fell shorter than anticipated primarily because the species only had a couple of stakeholders contributing to its recovery throughout the

study. Also, it occurs on land managed almost entirely by the U.S. Fish and Wildlife Service.

The methods for the study determined how Species Recovery Plans were implemented and financed through government stakeholders and compared them to the goals illustrated in the Recovery Plans of the Sonoran Pronghorn, Louisiana Black Bear, and Sierra Nevada Bighorn Sheep. This methodology worked well to narrow the focus of each government participant in the Recovery Plans by utilizing graphs and charts. Overall, the methods were successful for completing this work.

The budgetary analysis illustrated trends in each of the subspecies' Recovery Plan spending and determined if the money was effectively spent on increasing all of the subspecies populations. Results from the recovery goals, stakeholder spending, and species population estimates determined the effectiveness of each plan and gave an understanding of the impacts government agencies have on these subspecies.

To begin the process spreadsheets were organized with ongoing tasks containing costs for project costs and individual stakeholders. The spreadsheets organized the priorities set forth in the Recovery Plan from the most significant to the least significant with cost estimates attached. This helped obtain a view of individual project costs, overall recovery spending and the government stakeholders associated with those challenges. Additionally, spreadsheets were created for each individual department. This was to illustrate the costs given to the recovery projects and show how much individual agencies contributed to financially. Spreadsheets were a great way to illustrate the various projects in each recovery plan and the different stakeholders impacts attributed to the goals of the Plan.

The spreadsheets provided evidence of the various tasks while pie charts illustrated which projects received the most funds, as well as, which government stakeholder contributed the most money. One pie chart was created for each case to show the goals of the Recovery Plan and how they were funded with percentages. Other pie charts were organized by agency attributions to each Plan through each year analyzed. Separate pie charts were created representing the various years for each individual case study, 2007-2010.

One strength from the methodology used was the organization of the research. Each Recovery Plan had raw data showing the costs and projects currently being funded. Taking that data and organizing the information into spreadsheets showed the overall recovery status for that specific year. The pie charts determined the percentages with illustrations to see which agency was implementing the most funds, as well as, which priority was given the most attention for the years analyzed.

Methodological weaknesses for the project were few, but difficult to overcome. Species Recovery Plans do not have all the details, especially regarding costs. Cost estimates had to be pulled from other peer reviewed documents or public documents from the various states. This may have skewed the data somewhat. Some projects were impossible to determine costs associated with them, therefore they were left blank.

Moreover, project end dates could not always be determined through USFWS spreadsheets therefore, calls had to be made. USFWS officials did not even know if some projects had been completed or not so that became an estimate.

The most difficult information to gather was individual spending from each agency to specific projects. Raw data only gave total spending from the stakeholder for a

given year but nothing specific. The amount of funding for each project from each agency was determined by various factors. Project costs were estimated with raw data provided by USFWS. The spending was then calculated by comparing responsible agencies to their projects, how much activity they had on the land, and how much land they owned. This demonstrated government stakeholders that funded and implemented the various projects.

Additionally, the budget analysis determined costs for recovering a species per each individual project associated with the plan. The analysis illustrated how the budget was determined and the objectives set forth to achieve the goals planned for the recovery. The budget analysis was able to illustrate how costs were saving these three species. Recovery Plans had estimated costs and the different goals for a species recovery. Once a species' goals were compared to the various projects being funded a conclusion could be drawn. Funding coincided with the goals of the Plan leading to a successful Recovery Plan for each subspecies.

There were several layers to the research for this thesis. Not only were the species researched, but individual stakeholders, Recovery Plan goals, projects, and costs. Each added another piece to the puzzle to determine if the Plans were successful.

Overall, projects that were funded for each subspecies increased their populations making the Plans successful. The Sonoran Pronghorn population lingers around 120, while the Louisiana Black Bear and Sierra Nevada Bighorn Sheep populations hover around 400 in 2012. These numbers are larger than they were ten years ago illustrating that Recovery Teams managed and utilized funds accordingly for the survival of each subspecies analyzed.

One species was over budget, one was on budget, and the other was under budget. The reasons for the discrepancies between their estimated and actual spending can be attributed to various intrinsic and extrinsic factors. Each plan implemented funds accordingly and each population either stabilized or improved between 2007 and 2010. The analysis illustrated stakeholders allocated resources appropriately and recovery efforts were successful because of stable populations in 2012.

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