TURNER ENDANGERED SPECIES FUND

2010 Annual Reports – Compendium

View of Seco Creek drainage on the Ladder Ranch, NM. Steel rim tanks and earthen livestock ponds in this valley are integral components of TESF's strategy to conserve federally threatened Chiricahua leopard frog populations.

Mike Phillips
Executive Director

Magnus McCaffery
Wildlife Biologist

TURNER ENDANGERED SPECIES FUND
1123 Research Drive
Bozeman, Montana 59718

TABLE OF CONTENTS

TESF PERSONNEL

Beau Turner

Beau Turner is involved in numerous charitable organizations related to environmental conservation and preservation around the world. He currently serves as Chairman of the Board of Trustees for the Turner Endangered Species Fund and is the Director of Natural Resources and Biodiversity for Turner Enterprises, Inc., the land-holding group for the Turner Family. In this capacity, Beau coordinates and oversees wildlife-related projects for the approximately 2 million acre operation.

Among Beau's challenges is the directive to balance a strong concern and ethic for environmental protection with several for-profit ventures, including the largest bison operation in the world. He serves as a Trustee for the Turner Foundation, Inc., a private family foundation that focuses on environmental and population-related causes, and serves on the boards of the Jane Smith Turner Foundation, the Captain Planet Foundation, the Wetlands America Trust and the Peregrine Fund. He is also a council member for the Jim Range Conservation Fund.

Beau works closely with groups such as the National Wild Turkey Federation, Boone and Crockett Club, Ducks Unlimited, Tall Timbers Research Station and Land Conservancy (an organization that promotes sound stewardship among land owners in the Red Hills region of Georgia and Florida). Beau's greatest passion is getting young people outdoors and excited about nature and the environment. To help achieve this goal, he founded the Beau Turner Youth Conservation Center (BTYCC) near his home in Florida in 2008. The BTYCC is a place where children are encouraged to be active outdoors. They learn about conservation, interact with nature, acquire fishing, archery, hunting and camping skills and study alternative energy sources (the BTYCC is the first youth center in Florida powered entirely by solar power). Currently, Beau is working on growing the youth center concept and developing the BTYCC into a model for similar centers nationwide.

Mike Phillips

Email: mike.phillips@retranches.com

Mike Phillips has served as the Executive Director of the Turner Endangered Species Fund since the nonprofit was launched by Ted Turner in 1997, where he oversees all activities of the Fund.

Mike has played a key role in wolf conservation and recovery. From 1986–1994, he was the Field Coordinator for the Red Wolf Recovery Program. He was also instrumental in the return of gray wolves to the Yellowstone Ecosystem, serving as Project Leader for the Yellowstone gray wolf restoration effort from 1994–1997.

Mike received his B.Sc. in Ecology, Ethology, and Evolution from the University of Illinois in 1980, and his M.Sc. in Wildlife Ecology from the University of Alaska in 1986. He has conducted wildlife research, with an emphasis on large carnivores, throughout the United States and Australia. Mike's career focuses on imperiled species recovery, integrating private land and conservation, ecological economics, and socio-political aspects of natural resource use.

In 2009, Mike was appointed to the Turner Energy and Ecosystem Committee. This focused on ensuring that the many private and public efforts of Ted Turner and his family are successful, while reducing greenhouse gas emissions by maximizing energy efficiency and minimizing waste.

In 2006 Mike entered the political arena through election to the Montana legislature as the representative for House District 66, Bozeman. Shortly thereafter, Mike founded the Montana Legislative Climate Change Caucus. In 2009, Mike was elected as the Chairman of the House Democratic Caucus. During this legislative session, Mike played a critical role in crafting and passing the nation's most comprehensive law for sequestering CO^2 in geological formations. Mike was re-elected in 2010 and will serve through 2012 as a member of the legislature's energy, tax, and fish and wildlife committees. In addition to representing Montana's 66^{th} House District, Mike served as a co-chair of Montana Democratic Legislative Campaign Committee during 2007 and 2008. In the fall of 2009 Mike was recruited by the White House to join a coalition of state legislative leaders to work with the Obama administration and Congress to pass clean energy jobs and climate change legislation.

Mike is an experienced writer and public speaker. He has authored or co-authored hundreds of reports and over 65 publications, including peer-reviewed articles, book chapters, conference proceedings, government reports, and popular articles**.** Mike has delivered over 200 public presentations to conservation organizations and professional conferences, including several invited plenary, keynote, and banquet presentations**.**

Mike lives in Bozeman with his wife (Linda, research scientist and Ph.D. student, Ecology Department, Montana State University), their four children (Grace – 20, Drake – 15, Samuel – 14, Annabelle 2 years), and their Jack Russell terrier (Scout).

Dave Hunter

Email: dave.hunter@retranches.com

Dr. Dave Hunter has served as the veterinarian for Turner Enterprises, Inc and Turner Endangered Species Fund since October 1998. Dave initiated his undergraduate work at New Mexico State University and received his B.Sc. in 1974 and Doctor of Veterinary Medicine degree from Washington State University in 1976. He then undertook an internship at the Animal Medical Center in New York. After leaving private practice in Seattle, WA, Dave was the Wildlife Veterinarian with the California Department of Fish and Game from 1986 to 1989. From 1989 to 1998, he continued his wildlife career as the Wildlife Veterinarian for Idaho working with the Idaho Departments of Fish and Game and Agriculture. He has conducted research on wildlife health issues on many avian and mammalian species. He is currently an Adjunct Professor at Texas A & M University, associate Professor of Research at Boise State University, University of Idaho, and Montana State University. He is a founding member of International Wildlife Veterinary Services, on the Board of Directors of International Wildlife Health Institute (IWHI), and a former president of the American Association of Wildlife Veterinarians. Dave has written several book chapters and authored many peer-reviewed publications. He lectures throughout the world on disease, immobilization, welfare and health concerns of wildlife. Currently he is involved in many health issues at the interface between ecosystems, wildlife, livestock and humans.

Magnus McCaffery

Email: magnus.mccaffery@retranches.com

Dr. Magnus McCaffery joined the Turner Endangered Species Fund as a wildlife biologist in December 2010. He has a B.Sc. in Marine Biology, a M.Sc. in Wildlife Biology and Conservation, and recently graduated from the University of Montana with a Ph.D. in Fish and Wildlife Biology. Magnus is involved in endangered species conservation throughout the United States, with current projects including the restoration of Bolson tortoises and Chiricahua leopard frogs to the New Mexico landscape. Additionally, Magnus will be involved in the management of red-cockaded woodpeckers, gopher tortoises, indigo black snakes, and initiating a monitoring

program for the endangered wood Stork at the Avalon Plantation in Florida. Magnus's goal is to use the best available science to conserve endangered species, mitigate the impacts of exotic species, and restore and maintain intact ecosystems.

Dustin Long

Email: dustin.long@retranches.com

Dustin Long began working for TESF as a field biologist in 1998 and was promoted to senior biologist in 2010. Dustin earned his M.Sc. in Life Science with an emphasis is Natural Resource Management in 1997 and his B.Sc. in Environmental Science in 1993 from New Mexico Highlands University.

Dustin serves as the project manager for the restoration of black-footed ferrets, black-tailed prairie dogs, Gunnison's prairie dogs, and other grassland species and their habitats. He has recently become involved in Rio Grande cutthroat trout restoration project at Vermejo Park Ranch, NM. Dustin is an active member within the community and is affiliated with several local, state, and national social and professional organizations and currently serves on the Maxwell Schools Board of Education. Dustin's professional interests include population ecology, grassland ecology, predator/prey interactions, conservation education and sustainable living. Dustin has authored and co-authored several book chapters and technical articles. Dustin lives on Vermejo Park Ranch but spends time at the Bad River Ranches, SD and the Z-Bar Ranch, KS.

Valpa Asher

Email: val.asher@retranches.com

Valpa Asher has served as wolf biologist for the Turner Endangered Species Fund since May of 2000. Working closely with the U.S. Fish and Wildlife Service and Montana Fish, Wildlife and Parks, she was a wolf specialist for southwest Montana from 2000-2009. It was a notable achievement for TESF, as a private organization, to assist state and federal agencies with on-the-ground wolf recovery efforts. In 2010, her focus shifted to the Flying D Ranch, which houses

one of the largest wolf packs outside of Yellowstone Park. Here she investigates how wolves affect ranched bison and native elk populations. In addition, Val was the field team leader for Arizona Game and Fish Department on the Mexican wolf recovery project from 1998 to 2000. From 1994 to 1997 she served as wolf field biologist for U.S. Fish and Wildlife Service in Idaho and was part of the team sent to Canada to retrieve wolves for the reintroduction to Yellowstone and Central Idaho. Val received her B.A. in Environmental Studies from Warren Wilson College in 1992. She has been involved in wolf, ungulate, sage grouse and peregrine falcon research throughout the U.S. Her professional interests include canid behavior, restoration ecology, and working with private landowners to promote wildlife conservation.

Lydia Moore

Email: lydia.moore@retranches.com

Lydia Moore joined Turner Endangered Species Fund part-time in November 2009 and became full-time May 2010. She is currently working on restoring bolson tortoises and aplomado falcons on the Armendaris Ranch in New Mexico. Lydia completed her B.A. at Oberlin College in Biology and Environmental Studies in 2008. After graduating college she worked for The Peregrine Fund releasing and monitoring aplomado falcons on the Armendaris ranch. In October 2008 Lydia moved to Seattle, WA to work for the National Wildlife Federation and was involved with helping assess climate change impacts on Washington's fish and wildlife. She is interested in restoring species to their native habitats as well as the development of sustainable land use practices.

Bill Mader

Email: bill.mader@retranches.com

Dr. Bill Mader joined the Turner Endangered Species Fund as a biologist in January of 2009. He earned a B.S. degree in Wildlife Biology from the University of Arizona before graduating with a Ph.D in zoology in 1981 from Brigham Young University. Bill leads the endangered species restoration projects on the Ladder Ranch, including Chiricauhua leopard frogs, Bolson tortoises and Mexican grey wolves and participates in projects on the Armendaris Ranch. Before his position with TESF, Bill was the administrator of the Red Cliffs Desert Reserve in southern

Utah, and worked for several major corporations. He did pioneering research on Harris' Hawks, and conducted the first population-ecology study of a raptor in South America. Bill has published in scientific journals, written chapters in two books and published a novel. He is a pilot biologist and former Alaskan smokejumper. He lives on the Ladder Ranch with his wife Penny and some dogs and cats.

Lily Sweikert

Email: lily.sweikert@retranches.com

Lily Sweikert has been working with the Turner Endangered Species Fund since 2008. She earned an undergraduate degree in Biology from Boston University in 2005. She spent a year living in New York City working as a Zoo Keeper Intern at the Central Park Zoo and as a Veterinary Assistant. She continued working as a Veterinary Assistant when she moved to Central Illinois in 2006. Lily decided to enter the world of Wildlife Biology by taking an internship with the Alaska Bird Observatory in Fairbanks, AK in 2007 and never looked back. After Alaska, Lily worked with the USFWS on the California Condor Conservation Project out of Ventura, CA. From there, after a brief stint in Wyoming, she joined TESF. In 2008, Lily coordinated the Aplomado Falcon Restoration Project and the Bolson Tortoise Captive Breeding Project on the Armendaris Ranch outside of Truth or Consequences, NM. In early 2009 Lily moved to Bad River Ranches, outside of Pierre, SD, to start the Black-footed Ferret Restoration Project. Lily hopes to pursue a graduate degree in the near future.

ADMINISTRATION

December 16th – January 19th, 2010

- We have had increasing interest from the BBC to film a documentary on our restoration projects.
- We scheduled a meeting in Washington D.C. for January 27th, 2010 with senior officials from the Department of Interior to discuss conservation of plains bison and the potential to list the species as threatened under the ESA.
- We Continued working on final report for 2009 and several other reports for TESF cooperators.

January 20th – March 10th, 2010

- We began considering ways to integrate endangered species conservation activities at the Beau Turner Youth Conservation Center (BTYCC).

March 11th – April 7th, 2010

- We began considering personnel actions needed due to Lisa Haynes' decision to leave TESF and Joe Truett's decision to retire.
- Hired Ms. Lydia Moore (effective early May) to fill gap created by Haynes' decision.

April 8th – May 13th, 2010

- Continued to develop a personnel plan to respond to Joe Truett's retirement.
- May 1st: Lydia Moore began full-time employment at the Armendaris as the replacement for Lisa Haynes who resigned (on April 30) to focus on wild cat conservation.
- To ensure continued efficient and effective operations, we instituted weekly or bi-weekly conference calls to review the status of each project.

May 14th – June 11th, 2010

- Completed employee evaluations for 2009.
- Developed position descriptions and wage adjustments for two promotions and one new hire.
- Assisted with modifications to state permits authorizing cougar study at the Ladder Ranch to avoid conflict with Mexican wolf recovery.
- Finalized a $35,000 contract with New Mexico Department of Game and Fish to offset the cost of the desert sheep project through June 2011.
- Processed a $1,000 donation to the bolson tortoise project from the El Paso Zoo.
- Completed an agreement with the U.S. Fish and Wildlife Service for $2,200 to develop a white paper concerning the details and effectiveness of restoring prairie dogs to promote recovery of the black-footed ferret.

June 12th – July 27th, 2010

- During the last week of June and first week of July, Mike Phillips met with the full Board and summarized TESF's growth since inception in 1997 and the status of current projects.
- Mike Phillips was invited to deliver plenary talk at the 2010 annual meeting of the Montana Chapter of the Society for Conservation Biology.
- TESF advertised an entry level biologist position for TESF/TBD, with the aim of filling the position by early September.
- On July 19th, six swift foxes were observed on Bad River Ranches, including four pups. This suggests an element of persistence of this reintroduced species in the absence of management since Kevin Honness' death in the spring of 2008.

- TESF received a $5,000 unsolicited donation from Lynnie Appleton for the bolson tortoise project.
- On July 26th we gave a tour for the Flying D to Diana Blank and Barry and Martha Berlin from the Kendeda Foundation.

July 28th – September 10th, 2010

- By early September we had reviewed over 100 applications for the new biologist job (to be stationed in Bozeman) and reduced the list to 10 finalists. We intend to make a selection by the end of September.
- Began working on 2011 and 2012 budgets.
- On July 31st Phillips and Asher participated in a tour of the Flying D for staff and supporters from American Wildlands.
- To assist with recovery of the endangered American burying beetle we initiated a collaborative effort with the Osage Nation (whose lands surround the Bluestem Ranch), the Nature Conservancy, and the U.S. Fish and Wildlife Service. The work will focus on the Bluestem Ranch and calls for completing baseline natural history surveys that aim to improve the security of the species at the ranch and on the nearby Nature Conservancy's Tallgrass Prairie Preserve.

September 10th – October 19th, 2010

- We hired Dr. Magnus McCaffery as the new biologist to be stationed in Bozeman. Magnus and his family will arrive in early December. He will work on a variety of projects and administrative tasks.

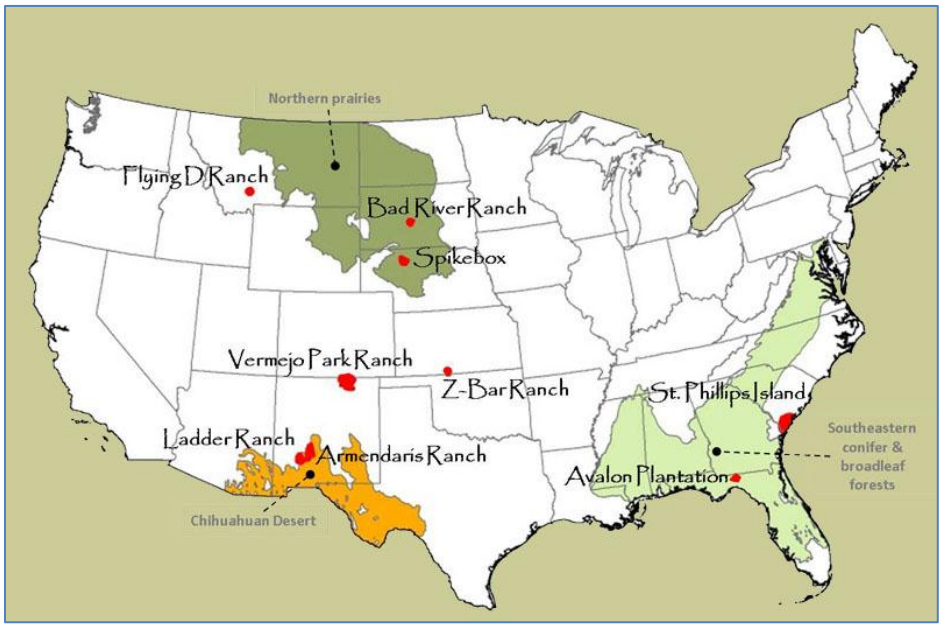
October 20th – November 16th, 2010

- TESF conducted a site visit to the Avalon Plantation to review the red-cockaded woodpecker project. We also began investigating the potential for TESF to become involve in recovery efforts for endangered wood storks. Iamonia Lake, the focus of TESF restoration work in 2001 and 2002 is potentially important foraging habitat for wood storks, and several birds were observed on November 2nd.

November 17th – December 31st, 2010

- Received approval for TESF's budget for 2011 (total was $775,935 and included a $509,250 grant from the Turner Foundation).
- Submitted a $100,000 funding proposal to the Rolex Corporation through the Rolex Awards for Enterprise (www.rolexawards.com). If awarded the money would be used to support the Bolson tortoise reintroduction project at the Armendaris Ranch.
- Submitted a $10,000 funding proposal to South Dakota Game, Fish, and Park for the black-footed ferret project at Bad River Ranches.
- Completed a property-wide survey at the Avalon Plantation that revealed 15 active clusters of red-cockaded woodpeckers, all located on Avalon Proper. This is the baseline population that we are presenting to the U.S. Fish and Wildlife Service for inclusion in a Safe Harbor Agreement.
- Phillips was honored to receive an invitation to serve on the Mexican Wolf Recovery Team. The team's first meeting is scheduled for February 2011.
- Secured access to a reliable source of non-lead bullets. Such ammunition ensures the suitability of shooting as a method for controlling prairie dogs at Bad River. Mark Kossler and John Hansen were critically important to this effort.

MAP OF R. E. TURNER PROPTERTIES



Map showing major TESF project locations in relation to WWF Global 200 Priority Ecoregions, conservation of which would help maintain important aspects of Earth's ecosystems

PROJECT LOCATIONS:

Avalon Plantation, FL:
Red-cockaded woodpecker

Flying D Ranch, MT:
Gray wolf

Bad River Ranch, SD:
Black-tailed prairie dog/black-footed ferret

Vermejo Park Ranch, NM:
Black-tailed prairie dog/black-footed ferret

Armendaris Ranch, NM:
Aplomado falcon
Bolson tortoise
Desert bighorn sheep

Ladder Ranch, NM:
Bolson tortoise
Chiricahua leopard frog

PROJECT 1: BOLSON TORTOISE CONSERVATION ON TURNER RANCHES

Project objective:
TESF aims to restore wild populations of the Bolson tortoise to portions of its Pleistocene range in the United States.

Short-term objective:
In the short-term, our goal is to breed adult Bolson tortoises and rear large numbers of juvenile tortoises in captivity. We aim to produce offspring with the highest possible genetic diversity, and to release these juvenile tortoises into the wild once they are large enough to withstand predators (shell length ≥110 mm).

Project Background:
The Bolson tortoise (*Gopherus flavomarginatus*) is the largest of the four North American tortoise species and was first described as a distinct species in 1959[1]. Evidence suggests that this species was distributed throughout the Chihuahuan Desert until the late Pleistocene[2]. Through anthropogenic factors and habitat loss, Bolson tortoises experienced severe population declines and range contraction, with relict populations today restricted to a small area (~10 km^2) in north central Mexico. Population surveys conducted in the 1980's estimated fewer than 8,000 extant individuals.

In 2006, a group of 30 captive Bolson tortoise adults, collected over several decades by a private individual, was transferred to the northernmost portion of the tortoise's prehistoric range. 26 of these adults were taken to the Armendaris Ranch, NM, and the remaining 4 were housed at the Living Desert Zoo in Carlsbad, NM. Under the auspices of the Turner Endangered Species Fund (TESF), a plan was developed to establish a breeding program and determine whether a self-sustaining population of Bolson tortoises could be successfully reintroduced to the New Mexico landscape in an effort to contribute to the conservation of this species.

Activities in 2010:

Overwintering

To evaluate whether juvenile tortoises are capable of surviving winter conditions in New Mexico, we overwintered (from 2009 to 2010) a subset of juvenile tortoises in an outdoor captive environment (Headstart Pen, Ladder Ranch (Figure 1.1)). This resulted in 100% survival. As a safeguard, another group of juveniles were overwintered indoors, in stock tanks with artificial burrows (Figure 1.2). All but one of these juveniles survived. A veterinary examination of all the tortoises in April 2010 determined that 3 tortoises had health issues that necessitated daily care and/or medication. These 3 tortoises were transferred (Apr. 28) to collaborators at the El Paso zoo and reside permanently there. They are now in comparatively good health and are now part of an educational display.

Bolson tortoise meeting at Ladder Ranch, NM

In April 2010 we held a Bolson tortoise recovery meeting at the Ladder Ranch, NM to determine strategies to achieve our goal of Bolson tortoise restoration on the Armendaris and/or Ladder ranches. In attendance were: TESF staff (Mike Phillips, Joe Truett, Bill Mader, Rosalinda Palomo Ramos, Mary Jean McCann, Lisa Haynes, Dave Hunter, Lydia Moore), Jim Juvik (University of Hawaii – Hilo), Jim Jarchow (Veterinarian, Tucson), Scott Hillard (University of California – Los Angelos), Chris Wiese (University of Wisconsin – Madison), John Kaseda (Zoo Animal Curator -El Paso Zoo), Ken Britt (Living Desert Zoo – Carlsbad New Mexico), and Holly Payne (Living Desert Zoo – General Curator).

Bolson tortoise captive breeding program

To get the breeding program up and running, we decided (during the Bolson Tortoise Recovery meeting held in April 2010) to continue to induce oviposition with oxytocin. The benefit of this method is that it eliminates the need for us to find nests, and transport eggs to incubators, two steps that can reduce egg viability. The challenges we discovered with the induced oviposition method is that there is individual and seasonal variation between peak eggshell thickness at time of oviposition. As a consequence, we may be misled by the radiography and either miss a clutch (because the tortoise nested in the enclosure before we induced her) or we may see egg breakage and/or egg mortality because the eggshells are too thin at the time of induction. Getting it 'just right' will take time and experimentation. We plan on continuing our studies of the relationship between eggshell thickness and egg survival in 2011. Ultimately, we aim to focus on improving conditions for natural nesting, as this will (1) minimize stress on the females, (2) decrease the need for project personnel, and (3) greatly reduce project costs. On the other hand, placing eggs in incubators (as we have done in 2010 and will do in 2011) gives us the opportunity to study the parameters of temperature-dependent sex determination in Bolson tortoises. This is important since we may have to manipulate sex ratios to achieve optimal rates of population growth to establish wild populations.

Growth of captive population

Since beginning the Bolson tortoise restoration effort in 2006, TESF and its collaborators have grown the original captive population of 30 adults (and 7 hatchlings in 2006) to 176 individuals in 2010 (Figure 1.3). This increase in the captive population corresponds to strong annual population growth rates, with captive breeding yielding a 55% increase in the 2010 captive population (Figure 1.4).

FIGURES

Figure 1.1: The headstart Pen at the Ladder Ranch

Figure 1.2: We installed 10 burrows in each of the three stock tanks in the Ladder's Anvil Room.

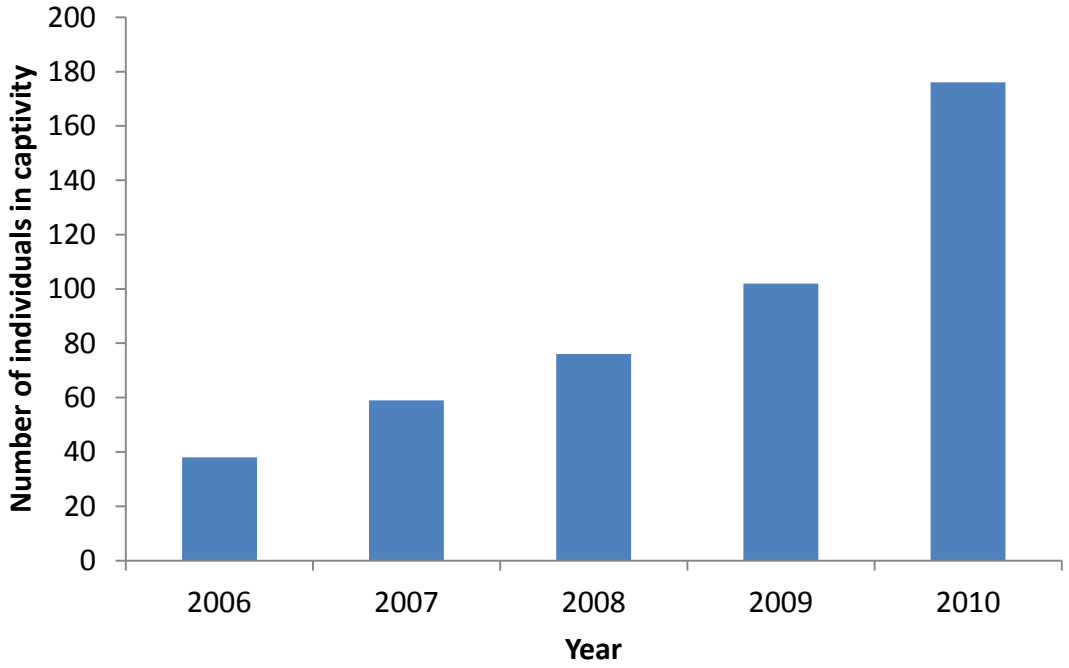


Figure 1.3: Number of captive Bolson tortoise individuals from the beginning of the project in 2006 through 2010

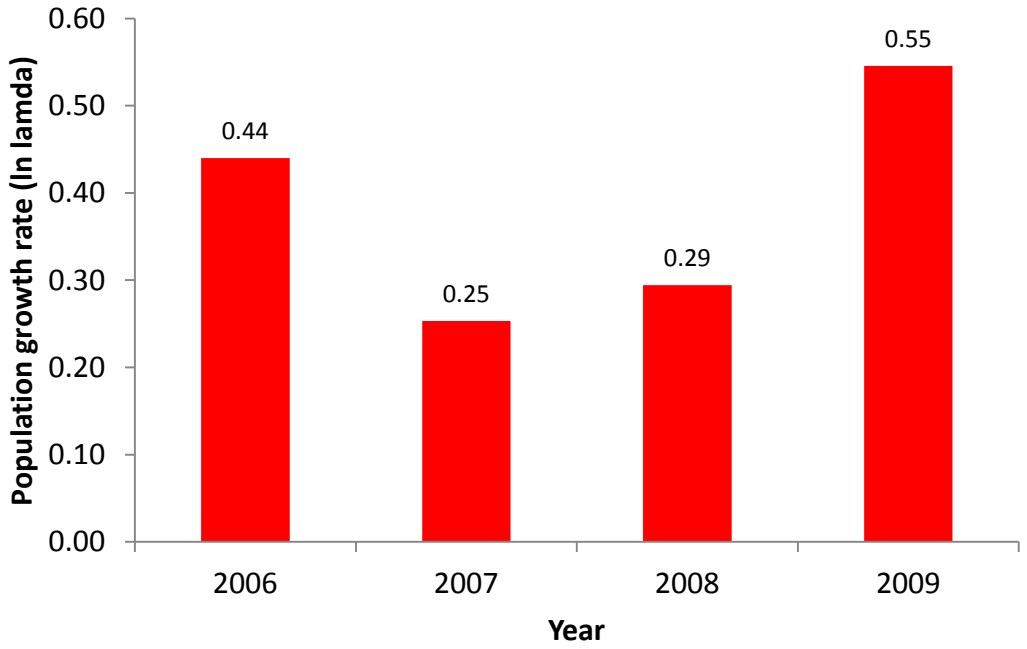


Figure 1.4: Annual population growth rate of captive bolson tortoise population. In the year 2009-2010, our captive Bolson tortoise population grew by 55%

Figure 1.5: Juvenile tortoises that are kept awake during the winter are allowed to soak three times per week. Hatchlings were weighed before and after each soaking to determine dehydration levels. Gaining around 15-20% of their body mass after being soaked meant they were dehydrated before soaking.

PROJECT 2: CHIRICAHUA LEOPARD FROG CONSERVATION

Background:
The Chiricahua leopard frog (*Lithobates chiricahuensis*) has disappeared from around 80% of its historical range in New Mexico and Arizona. Once common in the cienegas, ponds, lakes and rivers of the southwestern U.S., populations have been decimated by a number of stressors, including predation by invasive species, disease, as well as anthropogenic habitat degradation and destruction. The leopard frog is now often found in steel-rim and earthen tanks that are maintained by ranchers to water their cattle.

The Chiricahua leopard frog was listed as a threatened species in 2002, with a special rule allowing ranchers to continue regular maintenance of any livestock tanks that harbor frogs. The Turner Endangered Species Fund and the Ladder Ranch Biodiversity Division (Team Turner) have developed a project at the Ladder Ranch, NM to improve the conservation status of this threatened species. The ranch's Seco Creek drainage supports the largest Chiricahua leopard frog population in New Mexico. Team Turner has been conducting frog monitoring surveys, research (frog movement patterns), disease testing, and conservation activities (e.g., habitat improvement) since 2001.

TESF Goals:
- To maintain viable populations of Chiricahua leopard frogs on the Ladder Ranch, NM
- To establish a Chiricahua leopard frog breeding facility on the Ladder Ranch that can be used to repopulate reduced or extirpated wild populations across New Mexico.
- To increase our knowledge of Chiricahua leopard frog ecology, and establish methods that lead to successful conservation actions.

Activities in 2010:
Ranarium
We continued construction work on a CLF captive breeding facility (Ranarium) at ranch headquarters. The goal of the Ranarium is to rear individuals in captivity for release to habitats across New Mexico where populations have been severely reduced or extirpated. The Ranarium consists of 8 pens (AKA "cubes") that can hold adult frogs in a captive outdoor environment, and these will be used for captive breeding and as a refuge for rescued frogs.

In 2010, we placed five adult frogs in two of the pens (1 male and 2 females in one, and one male and one female in the other). The lone male and female that were placed in a pen were rescued from a population that inhabited Bolton Canyon in southwestern New Mexico. At the time of rescue the population was declining toward extinction due to habitat destruction caused by a flash flood.

Captive refugia

In addition to the Ranarium, Team Turner is experimenting with using existing steel-rimmed stock tanks and associated earthen ponds to achieve Chiricahua leopard frog conservation goals. We are evaluating the utility of these artificial water bodies to hold and successfully reproduce frogs. In 2010 we translocated 210 tadpoles and 40 juvenile/adult frogs from the Seco Creek drainage on the Ladder Ranch to five of these steel tanks. We also translocated approximately 900 tadpoles and 23 adult frogs from the Arizona Sonora Desert Museum to the Seco Well tank (this tank is isolated from streams or other water bodies to reduce the risk of escaping frogs intermixing genetically with Ladder Ranch populations).

Translocated frogs were monitored regularly throughout the summer and fall of 2010 to obtain minimum counts and to monitor habitat and water quality. Some tadpoles appear to have metamorphosed successfully in all five steel-rim tanks. Monitoring was reduced during winter months and will resume regularly in spring 2011.

Maintaining captive CLF under captive conditions in steel water storage tanks on the Ladder Ranch is a work-in-progress. There are many questions that remain unanswered, including:

- How many frogs can each steel storage tank support?
- Do steel tanks provide enough habitat complexity to fulfill all the life-history requirements of this species?
- Can CLF successfully overwinter in a steel storage tank?
- Can CLF successfully reproduce in the steel tanks?
- Should captive populations be augmented on a regular basis for genetic and demographic purposes?
- Are captive populations a long-term solution to conserve CLF on the Ladder Ranch and promote regional recovery?

Visual surveys confirmed the presence of Chiricahua leopard frogs in the wild in many areas of the Ladder Ranch, particularly in Seco Creek, where adult frogs, tadpoles, and egg masses were detected throughout the drainage.

PROJECT 3: POPULATION EXPANSION OF THE RED-COCKADED WOODPECKER ON THE AVALON PLANTATION

Project Background:
In March 1998, the Turner Endangered Species Fund (TESF) in cooperation with the U.S. Fish and Wildlife Service introduced endangered red-cockaded woodpeckers (*Picoides borealis*) to the Avalon Plantation in north Florida. This was the first time a private landowner, state, or federal agency reintroduced a population of red-cockaded woodpeckers (RCW) where no founder population existed. The primary objectives of the project were to establish a population of red-cockaded woodpeckers that would persist with minimal management and to develop techniques that could be used to promote recovery of the species elsewhere. A secondary objective was for the Avalon Plantation to become a donor for reintroductions once the Avalon population reached 20 – 25 breeding groups (clusters). By the end of 2010, the population consisted of 15 active clusters; 14 potential breeding pairs and 1 single bird group.

Avalon Plantation is located in Jefferson County, Florida approximately 35 km east of Tallahassee. It is the southern-most plantation in the Red Hills physiographic region of northern Florida and southern Georgia. In March 1988, Ted Turner donated a 3,450 ha conservation easement to The Nature Conservancy. This easement recognizes the natural, scenic, aesthetic, and special character of the plantation and serves to ensure the conservation and protection of the property as a relatively natural habitat of fish, wildlife, and plants. The easement, coupled with the tradition of exemplary land stewardship practiced by the landowner, provide an excellent opportunity to conserve and expand the red-cockaded woodpecker

Activities in 2010:
TESF is required by the U.S. Fish and Wildlife Service to address each of the following field activities on an annual basis:

1. Construct artificial recruitment clusters (minimum of 3/year) in key areas to help expand population growth.
2. Provide supplemental cavities in groups that fail to meet the minimum guidelines of 4 suitable cavities per active group.
3. Work actively to identify and protect active cavity trees from inadvertent damage (incidental damage from timber harvests and scorching from prescribed fires).
4. Under-plant longleaf pine seedlings in 3 active clusters or recruitment clusters each year.

Field Activity 1
Due to ongoing efforts to secure a RCW Safe Harbor Agreement for Avalon Plantation, as well as on other Tuner Properties; construction of artificial recruitment clusters was suspended until a resolution has been determined on the Safe Harbor Agreement. Nevertheless, sites have been selected for recruitment clusters once the issue is settled. In an effort to facilitate recruitment cluster selection and aspects of the Safe Harbor process, a complete inventory of current clusters was initiated in early September 2010.

Field Activity 2
During the 2010 RCW inventory, it was found that 5 groups had fallen below the minimum recommended number of 4 suitable cavities. One particular group required 2 supplemental cavities. As such, supplemental cavities were constructed in these groups (total = 6) to ensure 4 suitable cavities were available.

Field Activity 3
All cavity trees have been marked and identified throughout the property. Prior to any activity within or near cluster sites, vehicle operators are reminded of the location of cavity trees.

Prior to burning, the area around all active cavity trees is flat mowed. This approach to fuel management allows the fire to maintain a consistent burn throughout the area, while ensuring the protection of cavity trees. No cavity trees were destroyed or damaged during prescribed burning. *A total of approximately 7,500 acres were burned on Avalon Proper between March 6, 2010 and April 1, 2010.*

Field Activity 4
Avalon continues to under-plant longleaf pines across the whole of Avalon Proper, with the majority of clusters being under-planted.

PROJECT 4: PRAIRIE DOG AND BLACK-FOOTED FERRET RESTORATION AND MANAGEMENT ON TURNER RANCHES

Background:
The historical range of the black-footed ferret (*Mustela nigripes*) spanned much of western North America's intermountain and prairie grasslands extending from Canada to Mexico. Completely dependent on prairie dogs (*Cynomys* spp.) for food and on their borrows for shelter, the historical range of black-footed ferrets coincided closely with the distributions of the black-tailed prairie dog (*C. ludovicianus*), Gunnison's prairie dog (*C. gunnisoni*) and white-tailed prairie dog (*C. leucurus*). As a result of introduced disease and anthropogenic persecution of prairie dogs, ferret populations declined to a point where the species was considered functionally extinct.

Early efforts to restore the species followed the discovery of a small population in Mellette County, South Dakota in 1964. However, attempts at captive breeding with a few captured animals from this population failed, and the last wild ferret observed at the Mellette County site was in 1974. When the last captive animal died at Patuxent Wildlife Research Center in Laurel, Maryland in 1979, the ferret was again presumed extinct.

In 1981, a second population was discovered in Meeteetse, Wyoming. Following disease outbreaks at Meeteetse, 18 surviving wild black-footed ferrets were removed between 1985 and 1987 to initiate a captive breeding program. No wild populations of black-footed ferrets have been found since the capture of the last Meeteetse ferret, despite intensive range wide surveys. Extant populations, both captive and reintroduced, all descend from these 18 founding animals. Black-footed ferrets remain one of the most endangered mammals in North America. The species now exists in the wild at 17 reintroduction sites across 8 States, Canada, and Mexico.

One of the overarching goals from the 1988 Recovery Plan was to establish a population of 1,500 free-ranging adult black-footed ferrets in 10 or more populations with no fewer than 30 breeding adults in any population. As of early 2010, it is believed that the free-ranging adult standard (i.e., 1,500 individuals) is approximately 47 percent achieved and the establishment of 10 populations with no fewer than 30 breeding adults is 40 percent achieved.

Activities in 2010:

Summary

The Turner Endangered Species Fund (TESF) released 33 black-footed ferrets at Vermejo Park Ranch (VPR) and temporarily released 14 ferrets as part of a wild pre-conditioning experiment at Bad River Ranches (BRR). Eight of the 14 ferrets released at BRR in 2010 and 2 ferrets released in 2009 were recaptured and sent to VPR for permanent release. The VPR ferret release project documented poor adult summer survival and no kits were produced in 2010, the cause of which is currently under investigation. TESF personnel established 6 new Gunnison's prairie dog colonies on the shortgrass prairie of VPR, supplemented two Gunnison's colonies established in 2009 and introduced 180 Gunnison's into an unoccupied black-tailed prairie dog colony. All Gunnison's colonies were prophylactically dusted with a pulicide to prevent plague. One new black-tailed colony was established at BRR. Mapping at VPR indicated 44 black-tailed colonies, covering 8,243 acres, and 30 Gunnison' colonies covering 730 acres. Mapping at Bad River indicated 73 black-tailed prairie dog colonies covering 3,253 acres; colonies in the Ash Creek Recovery Area (ACRA) shrank by 6% to cover 1,467 acres. The Z-Bar Ranch has 15 black-tailed colonies covering 462 acres. Efforts to limit black-tailed colony growth at VPR included the installation of raptor perches, tree carcass barriers and shooting. Blowing dust remained a problem at VPR in 2010 which elicited a chiseling and reseeding effort and a deferred grazing schedule on the Phoneline colony. Managers at the Ladder, Armendaris and the Nebraska Ranches managed black-tailed prairie dogs on their respective properties independently. Several university funded prairie dog research projects are ongoing at VPR and BRR.

VERMEJO PARK RANCH, NM

We released and monitored ferrets on the shortgrass prairie, measured black-tailed prairie dog colony growth and population densities, measured Gunnison's prairie dog colony growth, established new Gunnison's prairie dog colonies on the shortgrass prairie, and tested the effectiveness of raptor perches, tree carcass barriers, and recreational shooting in curtailing black-tailed prairie dog colony expansion.

Black-footed Ferret

- On May 14 an article was published in the Raton Range titled: "*Ferrets force property owners to handle prairie dog control*". The article was prompted by the U.S. Department of Agriculture's (USDA) reluctance to poison prairie dogs in Colfax County because of our ongoing ferret release. We provided clarification to portions of the article and rebutted other portions in a letter to the editor in the Raton Range (Addendum 4.1). We provided a similar letter to the Colfax County Commission explaining our U.S. Fish and Wildlife Service (USFWS) release permit and why the article was inaccurate and misleading. Shortly after the article was published, the USFWS and USDA met and resolved the issue.
- Spring surveys (March-April) indicated a minimum of 12 ferrets living on VPR. The purpose this survey was not to identify each individual ferret living on VPR but rather to ensure that each black-tailed prairie dog colony suitable for ferret habitation (Windmill and Big Lake sub-complexes) had both male and female ferrets living on it. Additional data gathered during the fall ferret surveys suggests that the ferret population on VPR during the spring was likely well above 20 individuals.

- Fall surveys (Sept-Oct) indicated a VPR ferret population of 5 individuals (4 of 5 ferrets found in the fall surveys were not located in the spring surveys. We are uncertain what happened to most of the ferrets between spring and fall surveys. No kits were located in the 2010 fall surveys. All ferrets located in the fall surveys appeared to be physically healthy. We are currently in consultation with the USFWS and the Black-footed Ferret Recovery and Implementation Team Disease Subcommittee on ways to determine and mitigate the cause(s) of 2010's losses.

- Possible explanations for poor ferret survival between spring (March-April) and fall surveys (Sept-Oct) are:
    1. **Disease (plague, CDV, tularemia).** Ferrets are vaccinated for plague and CDV before release so neither disease is likely the cause. Additionally, we observed no evidence of plague or tularemia in any of our prairie dog population. It is possible, though very doubtful based on consultation with biologists and veterinarians, other diseases such as West Nile Virus or avian influenza may be the cause for high ferret mortality.
    2. **Predation.** Predation as an explanation for the ferret losses we observed during the 5-6 month period between spring and fall surveys seems unlikely. Published literature and our observations indicate losses attributed to predation (and other causes) are highest during the 2-month period post release. Ferrets that had survived from September 2009 – April 2010 were unlikely to all be predated upon during 5-6 month period between spring and fall surveys. In addition, predation does not explain why female ferrets we located in the fall failed to produce kits.
    3. **Poor habitat.** Prairie dog mapping and density surveys suggest ferrets should have done very well in 2010 (see black-tailed prairie dog section below).
    4. **Parasitization.** With the information available to use now the most likely explanations for our ferret losses in 2010 is myiasis by flesh flies (*Wohlfahrtia vigil*). Myiasis would explain the loss of ferrets during the summer and would also explain why female ferrets failed to produce litters.
- TESF released 33 ferrets in 2010 (1 adult male; 3 adult female; 13 juvenile males; 15 juvenile females). Ten of those ferrets were transferred to VPR from BRR (see BRR ferret section below). Ferrets were released on the Windmill and Big Lake sub-complexes.

Black-tailed Prairie Dog

- Vermejo's 44 black-tailed prairie dog colonies expanded by 4.6% in 2010 to total 8,243 acres. Coverage in 2009 was 7,877 acres.
- Density estimates collected on 3 colonies (Windmill, 00-10, Big Lake) indicate an average of 9 pd/acre. Juveniles represented 45% of the population.
- Significant portions of the Phoneline (1,268 acres), Maxwell (183 acres), Boxcar (96 acres), Mance (148 acres) and South #2 (406 acres) colonies are either uninhabited or are occupied at significantly reduced densities (total 2,101 acres).
- Four colonies not mapped in 2009 either because the colony appeared unoccupied or existed at very low densities added 119 acres to 2010's total (Bison Pens 33 acres; Cimarron 5 acres; Freeway 78 acres, East Ponil 3 acres).
- In 2010 we observed no evidence of plague in any of the black-tailed colonies.

- David Eads (PhD candidate) completed his first field season on Vermejo in 2010 and will finish his project in 2011 (see Addendum 4.2 for update). Chris Goguen (PhD) completed his 2 year research project in 2010 (see Addendum 4.3 for update).

Blowing dust

- Drought conditions in 2008 and early 2009 and strong spring winds in 2008, 2009 and 2010 resulted in large amounts of soil blowing from the Phoneline, Maxwell, and Boxcar colonies into the village of Maxwell during the spring of those years. Complaints from residents in and around Maxwell prompted TESF and TEI to respond in 2009-2010 which has included: reducing prairie dog densities through shooting, removing bison from the Phoneline pasture in 2010, chiseling in late 2009 and early 2010, and reseeding a portion of the Phoneline colony with forage kosha and native sunflower. Reseeding the Phoneline with forage kosha and native sunflower was not effective. Neither species germinated in any significant amount.
- Chiseling was effective in reducing the amount of windblown soil in late winter/spring 2010 and provided furrows for plant germination during the summer.
- Reducing prairie dog densities and deferred grazing in the Phoneline pasture has given vegetation time to grow and should drastically reduce the wind erosion on those colonies in the future.

Barriers

- In 2010 the Vermejo Forestry Department moved 60 pinyon/juniper tree carcasses to the East 64 colony and 04-8 colonies (30 each) as a project to evaluate the effectiveness of tree carcass barriers in limiting colony growth. Mapping of colonies before and after the barriers were installed suggests that barriers alone may slow, but do not retard, colony growth (East 64 colony). Barriers in conjunction with shooting appeared to not only limit, but retard, colony growth on colony 04-8.

Raptor Perches

- TESF and TEI installed 29 raptor perches as part of a comprehensive effort to limit prairie dog colony growth in specific areas. Raptors were routinely observed using the perches.

Shooting

- An estimated 5,500 black-tailed prairie dogs were shot in 2010. Colonies were not shot during parturition and whelping (April-May). Maintaining reliable records on all colonies open to shooting became erratic and cumbersome and so we no longer requested shooters keep kill data on certain colonies. Small portions of several colonies that do support ferrets are open to limited shooting by select personnel and we do keep detailed records on the location and number of prairie dogs shot in those areas.
- We estimate 11,000 black-tailed prairie dogs have been shot since 2009 and that over 15,000 rounds have been fired. Approximately 2/3 (7,260) of those prairie dogs have been shot with lead bullets. If half of the prairie dogs were shot with .17 (17grains) and half with .223 (55grains) that translates into approximately 261,360 grains or 37.3lbs of lead hitting flesh. We do not have a reliable estimate on what percentage of that lead remained in the carcass and was consumed by raptors.

- Non-toxic (green, non-lead) ammunition has recently become readily available (it was very difficult to procure earlier in the year) and has prompted TESF and TEI to require all prairie dog shooters us non-toxic ammunition beginning 1 January, 2011.

Gunnison's Prairie Dog

- Vermejo's 30 Gunnison's colonies (not including 2010's translocations) grew 53% to cover 730 acres. Gunnison's colonies occupied 477 acres in 2009.
- All Gunnison's colonies were prophylactically dusted with the pulicide Deltamethrin in late spring.
- 728 Gunnison' prairie dogs were captured and translocated in 2010. Six new colonies were established on the shortgrass prairie (10-1 through 10-6)), 2 of 2009's translocations (09-11 and 09-12) were supplemented with additional prairie dogs and we removed as many of the black-tailed prairie dogs from the West 64 colony as possible and released 180 Gunnison's into the colony. We will evaluate the response of Gunnison's being translocated into an "abandoned" black-tail colony.
- Good precipitation and insufficient grazing in the summer of 2010 resulted in several of 2009's translocations in the Van Bremmer canyon being choked out by vegetation. We mowed several of the colonies during the growing season but the effort and resources required were deemed unsustainable.
- Ranch Manager, Mark Kossler, expressed some concern with Gunnison's moving into residential areas and within the "compound" at Headquarters. Mark's concerns are related to human health and damage to infrastructure (foundations, water lines, etc). The prairie dogs are dispersing into these areas from the Propane and Horsepasture colonies.
- Chuck Hayes (PhD candidate) completed his first field season on Vermejo in 2010 and will finish his project in 2011 (see Addendum 4.4 for update).

BAD RIVER RANCHES, SD

We released, monitored, and recaptured ferrets in the ACRA for permanent release at VPR, measured black-tailed prairie dog colony growth and population densities, established 1 new prairie dog colony in the Rankin pasture and installed the infrastructure for an additional prairie dog translocation in the South Ash Creek pasture, and installed wind erosion samplers in the North Ash Creek pasture.

Black-footed Ferret

- On 23 September 2010 TESF and several USFWS personnel released 5 ferrets (2 juvenile females, 2 juvenile males, and 1 adult female) in the ACRA for wild pre-conditioning.
- On 5 October 2010 TESF, professional wildlife photographer Joe Riis, and USFWS personnel released an additional 9 ferrets (3 juvenile females, 3 juvenile males, and 3 adult females) in the ACRA for wild pre-conditioning.
- During the temporary release period, TESF spent 187 hours monitoring the locations of the ferrets. We recorded 147 ferret sightings, averaging 0.78 ferrets/hour. We also located two ferrets from the 2009 release. During the release we recorded the locations of badger dens on the release colony.
- The TESF began trapping the ferrets on 13 November 2010. We spent almost 53 hours trapping ferrets. We trapped the 2 adult males released in 2009 and 4 juvenile females, 2

juvenile males, and 2 adult females released in 2010. All trapped ferrets were transferred to VPR for permanent release.

Black-tailed Prairie Dog

- Mapping indicated BRR contained 73 colonies covering 3,253 acres (Table 11).
- The annual growth rate for colonies ranch-wide since 1999 averaged 25%.
- The estimated prairie dog density within colonies averaged 15-20 per acre.
- The ACRA (45% of the total ranch acreage, to be specifically managed for prairie dog and ferret restoration) contained 12 colonies covering 1,467 acres.
- The annual growth rate for colonies in the ACRA since 1999 averaged 28%.
- In 2010, the ACRA lost 6% of its prairie dog colony acreage due to a lack of grazing. The North Ash Creek pasture, the pasture that contains most of the ACRA prairie dog colonies, only received 15.5 days of grazing. In 2009, the prairie dog colonies in the ACRA grew 22% because bison grazed the North Ash Creek Pasture for 54.5 days. TESF expressed its concern to TEI regarding a lack of grazing in the ACRA in 2010 and the implication of insufficient grazing in the future.
- In 2011 TESF hopes for increased grazing but if that fails we will explore other options to reduce grass height and promote prairie dog colony expansion such as prescribed burning, haying, and mowing. The aerial imagery acquired at the time of the purchase of the ranch by R.E. Turner shows hay bales throughout much of the ACRA.
- Four Big Springs No. 8 wind erosion sample collectors were installed at 2 locations in the North Ash Creek pasture.
- Erica Mize (M.S candidate) completed her first season on BRR.

Z-BAR RANCH, KS

Manager Keith Yearout and his wife Eva managed existing black-tailed prairie dog colonies on the Z-Bar Ranch to prevent encroachment of tall vegetation, a continuing threat to prairie dog restoration in this high-rainfall area.

- The Z-Bar Ranch currently has 15 black-tailed prairie dog colonies covering 462 acres.
- In September 181 prairie dogs were captured in Hutchinson, KS and translocated to the Z-Bar.

LADDER RANCH, NM

Manager Steve Dobrott continued his effort to support the reintroduction of black-tailed prairie dogs to Arizona (black-tailed prairie dogs were extirpated in AZ in the 1960's). These capture and translocation efforts are significant because Ladder prairie dogs are being used to exclusively for the first translocations in Arizona.

- Currently there are 5 black-tailed prairie dog colonies occupying 75-100 acres in the Avant Pasture on the Ladder (East, South, Kate's, Gold Dust and Airport colonies). The Airport colony is beginning to merge with the Gold Dust colony.
- The Arizona Game and Fish Department trapped 120 prairie dogs from the Airport Colony this year and translocated them to southern Arizona. This is the second translocation from Ladder prairie dog stock that has contributed to the reestablishment of prairie dogs in Arizona.
- The USFWS trapped from the same colony two years ago for reintroductions at Bosque del Apache National Wildlife Refuge, NM.

ARMENDARIS RANCH, NM

Manager Tom Waddell provided the following update on black-tailed prairie dogs at the Armendaris Ranch.

- Currently there are 10 small colonies covering about 17 acres on the Armendaris. There are no ongoing studies.

NEBRASKA RANCHES

John Hansen provided the following black-tailed prairie dog information on the Turner Ranches in Nebraska.

- There are six small colonies covering 80-120 acres on the Blue Creek Ranch. There is the potential for many more acres on the southern end of ranch just out of the Sandhills soil type. Four of these colonies were established (or satellites of the original translocations) during John Hansen's tenure as manager. Two of the colonies were there when Turner purchased the ranch but they were each less than 10 acres in size.
- There is one small colony on the Fawn Lake Ranch in the south-southeast portion of ranch. Currently it is probably less than 30 acres with little opportunity to expand due to soil type.
- The Spike Box Ranch may have a few burrows in the extreme southwest portion of ranch next to the neighbors (dependant on the neighbors poisoning program).
- Occasionally there are a couple of burrows on the extreme northeast portion of the McGinley Ranch.

ADDENDA

ADDENDUM 4.1

Letters to the Editor [sent on June 7, 2010]

The Raton Range
P.O. Box 1068
Raton, NM 87740

Editor:

On May 14 an article was published in the Raton Range titled: "*Ferrets force property owners to handle prairie dog control*". We feel the article poorly represents the steps the Turner Endangered Species Fund and Vermejo Park Ranch took to eliminate the potential for our black-footed ferret research project to impact the lawful activities of landowners and public agencies.

Under the circumstances we expected the ferret project to operate, we insisted, and the U.S. Fish and Wildlife Service (USFWS) willingly agreed, on a provision in our permit that states that a private landowner or public agency has no responsibility if a ferret is accidentally killed or injured while controlling prairie dogs or due to any other lawful activity. In short, if you're not breaking the law and you accidentally kill a ferret you will not be held responsible for the animal's death. Consequently, the ferret project at Vermejo Park cannot be used as rationale to justify any decision that USDA Wildlife Services reaches concerning prairie dog control in Colfax County.

While it may appear to be merely a matter of semantics it is important to note the ferrets released at Vermejo Park are not classified as "experimental – nonessential" under section 10(j) of the Endangered Species Act as mentioned in the article, but rather are considered part of a research project under section 10(a)(1)(A) of the Act. Consequently, the petition that was mentioned in the article which was submitted by 3 environmental organizations to the USFWS to have 10(j) ferret releases reclassified as fully endangered has no bearing on the Vermejo Park ferret research project--and even if it did, the Service decided on May 17 to deny the Petition.

Lastly, and perhaps most importantly, we have received no reliable reports of ferrets leaving Vermejo Park from any State or Federal agency or private landowner. All concerned State and Federal public agencies and adjacent landowners are aware of the ferret project and have been asked to contact me if a ferret is spotted.

If you have any questions or would like to know more about the ferret research project on Vermejo Park or if you think you've spotted a ferret please call me at 575-375-2488.

Sincerely,

Dustin Long
Turner Endangered Species Fund
P.O. Box 131
Cimarron, NM 87714

ADDENDUM 4.2

Summary of Flea Ecology in prairie dog colonies: Implications for transmission and persistence of *Yersina Pestis*
For Vermejo Park Ranch, 2010

Dave Eads, *Colorado State University, The Graduate Degree Program in Ecology, Department of Biology,* Fort Collins, Colorado (David.Eads@colostate.edu)
Dean Biggins, *United States Geological Survey, Fort Collins Science Center*, Fort Collins, Colorado
Mike Antolin, *Colorado State University, The Graduate Degree Program in Ecology, Department of Biology,* Fort Collins, Colorado
Dustin Long, Turner Endangered Species Fund, Vermejo Park Ranch, New Mexico

- Nineteen trapping plots distributed throughout the western portion of the VPR.
- Plot-specific estimates of prairie dog density from trapping data (June-August), burrow transects (6 per plot), and visual counts (minimum of 9 per plot)
- Fleas (located in Fort Collins)
    - Total of 2,631 fleas
        - 1,448 fleas collected from prairie dog bodies
        - 1,183 fleas collected from prairie dog burrows
    - Numbers of fleas vary among trapping plots
        - Fleas were more abundant in certain plots
- Blood samples (nobuto strips – in Fort Collins)
    - Blood samples from all individually marked animals
        - Mainly prairie dogs
        - A few 13-lined ground squirrels
        - A few desert cottontails
- Carcasses (located in Fort Collins)
    - A few prairie dog carcasses
        - Flesh flies suspected cause of one mortality (larvae in prairie dog mouth)
        - A 13-lined ground squirrel carcass
- Soil samples
    - Real-time soils samples collected at 2-m depth near trapping and burrow-swabbing locations
        - 212 soil samples from differing plots

ADDENDUM 4.3

Summary of Research Conducted on Vermejo Park Ranch, Summer 2010

Christopher B. Goguen, Assistant Professor of Biology, Penn State University, 76 University Drive, Hazleton, PA 18202. Office phone: 570-450-3088. E-mail: cbg10@psu.edu

Effects of black-tailed prairie dogs on vertebrate diversity:

- Three times each over the summer, I conducted morning surveys for birds, mammals, and snakes on 600-m transects on 12 prairie dog colonies and 12 associated control transects on uncolonized prairie habitats.
- In June, I sampled habitat and vegetation associated with each colony and control transect.
- Overall, during surveys I detected 28 bird species (21 species on colonies, 25 on controls), 8 mammal species (8 on colonies, 4 on controls), and 2 snake species (2 on colonies, 0 on controls).

Characteristics of prairie dog colonies used by mountain plovers and burrowing owls:

- At least 3 times during the summer, we conducted complete searches of 44 different prairie dog colonies for presence and breeding evidence of mountain plovers and burrowing owls.
- During June, we also conducted extensive habitat sampling on all 44 colonies sampled.
- Overall, we detected mountain plovers on 14 colonies (strong breeding evidence on 11 colonies) and burrowing owls on 41 colonies (strong breeding evidence on 34 colonies).

Nest-site characteristics of Mountain Plovers:

- We located 13 plover nests among 7 different prairie dog colonies
- For each nest, we conducted extensive habitat sampling at the nest site and at a non-use site located 100 m away from the nest.

Breeding habitat and diet of barn owls nesting in the Vermejo bison pasture:

- We collected and dissected 357 pellets from 5 barn owl nests.
- In the pellets, I identified 545 individual prey items from 11 vertebrate taxa (9 genera of mammals, birds, and fish).

ADDENDUM 4.4

Summary of Gunnison's Prairie Dog Research Activities
For Vermejo Park Ranch, 2010
C. L. Hayes, New Mexico Department of Game and Fish and University of New Mexico

I conducted research regarding the effects of resource pulses on demography of a keystone herbivore, Gunnison's prairie dog (*Cynomys gunnisoni*) in 2010 at Vermejo Park Ranch, and at a comparison, low-elevation site for Gunnison's prairie dogs (Sevilleta National Wildlife Refuge). Some of the interim findings from 2010 listed below.

- I had 49 captures (representing 44 unique individuals and 5 recaptures) of Gunnison's prairie dogs during pre- and post-monsoon trapping periods. No trap mortalities occurred. Samples for carbon isotopes were taken from plasma, blood, fat, and hair obtained from captured animals. Samples have been prepared for analysis of carbon isotope ratios from these tissues at the University of New Mexico, to assess the utilization of cool-season and warm-season plant productivity by Gunnison's prairie dogs.
- Trap success (probability of capture per trap-day) was significantly different ($P < 0.05$) between Vermejo (0.10 ± 0.03) and Sevilleta (0.020 ± 0.003 SE), based on data pooled from pre- and post-monsoon periods.
- Lincoln-Peterson population density estimates (animals/hectare) generated from resight scans conducted at Vermejo (84.9 ± 15.3) and Sevilleta (11.0 ± 1.5) were significantly different ($P < 0.001$). Population density estimates calculated from the number of marked and unmarked animals observed on 2-day counts of unique individuals showed the same pattern between study areas, but were not significantly different (Vermejo = 72.8 + 18.2, Sevilleta = 27.0 + 11.5). Both approaches may have overestimated densities if there were violations of the assumption that no identifying marks are lost or overlooked during resight periods.
- The proportion of juveniles observed in the population during the June resight period was significantly different ($P < 0.05$) between Vermejo (0.55 ± 0.29) and Sevilleta (0.28 ± 0.54). This does not represent litter sizes, but the average number of juveniles observed during an individual scan of the colony.
- Mean weights of prairie dogs captured at Vermejo (789 ± 41g) did not differ significantly from prairie dogs captured at the low-elevation study site (Sevilleta = 862 ± 45g).
- Relative water content (g moisture/g green vegetation) from samples of standing vegetation changed significantly ($P < 0.05$) following the monsoon period at both Vermejo and Sevilleta. Relative water content was higher at Vermejo (0.45 pre- to 0.66 post-monsoon) than at Sevilleta (0.18 to 0.32).
- Thirty-seven species of birds were detected during avian point-count surveys at Vermejo. There were no significant differences in abundance or species richness of birds detected from on- and off-colony survey points.

In summary, Gunnison's prairie dog colonies monitored at Vermejo in 2010 were found at higher densities, contained more juveniles, and had more moist vegetation available to them compared to colonies near the southern end of the species range. These population-level differences were not associated with any observable differences in body size of individuals from colonies at the 2 study locations.

PROJECT 5: APLOMADO FALCON REINTRODUCTION AT THE ARMENDARIS RANCH

Goal: To assist in establishing a self-sustaining population of at least 60 breeding pairs in the United States in order to down-list the species to threatened.

A Background and History of the Aplomado Falcon Restoration Project on the Armendaris Ranch, New Mexico

Prepared by: Lily Sweikert

The aplomado falcon once inhabited a vast historical range, extending from the southwestern U.S. to Argentina. In the U.S., this included southeastern Arizona, southern New Mexico, and the Trans-Pecos and southern portions of Texas.

Populations of aplomado falcons began to decline in 1890, and by 1950 the bird was largely extirpated from its range north of the Mexican border (Hector, 1987). The reasons for this are unclear, but likely factors include habitat loss, pesticides, collection of voucher specimens, and disease.

In 1986, the falcon was listed as endangered under the Endangered Species Act (Fed. Register 51 (37), February 25, 1986, pp.6686-6690). In 1987, The Peregrine Fund (TPF), the Mexican government, and the United States Fish and Wildlife Service (USFWS) launched a cooperative program to restore the falcon to the U.S. and northern Mexico, with the primary goal of establishing a self-sustaining population of 60 breeding pairs in the U.S.

TPF, known for their expertise in restoring endangered birds, established a captive breeding program for the falcon. In 1987 and 1988, TPF researchers surveyed suitable habitat in Mexico (Sandfort, 1994). The researchers found 25 territories and located 15 active nests. Nestlings were taken during both years to establish the captive breeding program (Mutch, 2007).

The first reintroduction took place in Texas in 1993. Since 1985 there have been over 1500 releases resulting in 50 known breeding pairs. In 2006, there were 56 wild young fledged from 33 nests (TPF Operation Report). From 2006 to 2008, TPF, the USFWS, along with several private and public land owners including Turner Enterprises Inc. on the Armendaris Ranch, released 120 falcons in southern New Mexico under section 10(j) of the Endangered Species Act. Section 10(j) allows the USFWS to release a non-essential, experimental population into the species' historical range without restricting current or future land management activities.

After TPF finished hacking the releases in 2006 on the Armendaris Ranch, Tom Waddell, the Ranch Manager employed by Turner Enterprises Inc., continued to provide quail to the released individuals

throughout the fall and winter and into the spring. By late December only two falcons were showing up to feed every day. In early spring 2007, these falcons nested successfully in an abandoned raven's nest, fledging two chicks. This was the first record of falcons released the previous summer (less than 9 months old), nesting successfully.

Following this success, the TESF established an Aplomado Falcon Restoration Project on the Armendaris Ranch to assist the recovery effort's goal of down-listing the species from endangered to threatened.

Activities during the period of 2006-2010:

ARTIFICIAL NEST PLATFORMS

2007-2009

In July 2007 TESF received a Private Stewardship grant from the USFWS to improve habitat for aplomado falcons on the Armendaris. Artificial nest platforms were constructed for placement in areas lacking suitable natural nests. Similar platforms have been used successfully by falcons in Texas. Design work to ensure durability and mobility began in late winter 2007. Construction was completed by spring 2008. The nest box has a plywood top and bottom, with bars on the sides placed wide enough for aplomado falcons to enter but too narrow for larger birds. By early summer 2008 we had erected the platforms throughout the ranch. When necessary, we erected a security fence around the nest platform to protect the structure from rubbing by bison.

In 2009 TESF retrofitted all artificial nest platforms with nests made from decreasing sized wreaths, Spanish moss, cedar shavings and gravel. When these nests were placed into the nest boxes the space between the top of the nest and the ceiling was too small to allow a falcon to stand on the edge of the nest. Consequently TESF added pieces of 2″x 2" to two sides of the top of the nest box to raise the roof.

In May 2009, we observed a pair exhibiting nesting behavior near Deep Well. This pair of juvenile birds was seen attending the nest in one of the artificial nesting platforms placed there. However, no eggs were detected and the birds later abandoned the platform. None of the other nest platforms were used for aplomado falcon nesting during 2009.

2010

During 2010, no falcons were observed using the platforms for nesting. Individual falcons were frequently observed perching on the platforms, but were never in pairs.

During April 2010, four nest platforms that had previously been observed with a falcon on them in past years had a Bushnell 5 Mega-Pixel Trophy Cam trail camera set up on them. The cameras were placed on t-posts located about 20 ft south of each of these nest platforms so as not to disturb falcons if they were to nest on the platform. The purposes of the trail cameras were to document falcon presence on the platforms, determine nesting activity, detect the presence of predators such as great-horned owls, and detect avian competitors for the platforms. No falcons were observed nesting via the trail cameras, but kingbird nesting behavior was documented on one of the four platforms. We also documented a falcon and a raven perching on the same nest platform simultaneously suggesting that ravens may compete with falcons for the platforms.

The June monthly survey of the nest platforms showed that three nest platforms were being used by kingbirds and three were being used by ravens.

PEREGRINE FUND RELEASES

2006-2009

In 2006, the first year of releases in New Mexico, TPF released falcons from the South hack site on the Armendaris Ranch. In 2007-2008, TPF released falcons at South and North hack sites and on the White Sands Missile Range (WSMR), approximately 30 miles northeast of the Armendaris sites (Table 5.1). In 2009 TPF released falcons from the Thoroughbred hack site located about five miles southwest of the Armendaris Ranch headquarters.

2010

In 2010 TPF released falcons at the South Hack Site located in Cedar Lake pasture. The south hack site has two hack boxes set up approximately 50 yards apart. Two groups of falcons were released with 6 falcons per group on June 26 and 29 respectively. All 12 birds survived to day 21, which TPF determines a "successful" release. At the end of the hacking season on August 10, 8 of the falcons were regularly coming in to feed. Of the remaining four birds, one came in to feed once TESF took over supplemental feedings. It is not known what happened to the other three birds, which were last seen at the end of July. Female V/5 GR/BK sustained a wing injury on July 10th and remained close to the tower while recovering. By the 5th week of release, she was flying aptly and was roosting a considerable distance south of the hack site. Female S/3 RD/BK was observed with a wing injury on August 1st and was still showing signs of the injury at the closing of the site.

An unbanded adult falcon came in to feed on June 27th and continued showing up regularly for feedings after that date. Throughout the hack season the juvenile falcons attempted to prevent the adult from feeding on the towers through alarm-calling, harassing, and chasing the adult away from the site. However, the adult was usually successful in eating. During the hack season, the adult was never observed chasing or harassing the juveniles.

Bushnell 5 Mega-Pixel Trophy Cameras were set up on both of the hack towers; two were placed on the eastern tower as it had more falcon activity, and one camera was placed on the western tower. The purpose of the cameras was to detect the presence of predators such as great-horned owls, or food competitors such as ravens, swainson's hawks, and turkey vultures while the hack site attendants were not at the site during the middle of the day or at nighttime. The cameras picked up a vast amount of falcon activity, but no owls, ravens, swainson's, or turkey vultures during the hack season. The cameras supposedly had a "silent trigger" but there are a few pictures of falcons staring at the camera. The cameras did not appear to bother the falcons' feeding as they would feed on quail placed a few inches in front of the cameras.

In addition to the Armendaris release site, TPF released 22 falcons at the White Sands site, 16 at the Delk site, and 6 at the Cole site. A new site near Deming was established at the Beck ranch, where 11 falcons were released (Table 5.1).

PAIRING AND NESTING

2007-2009 Summary

In 2007, a pair of 2006 Armendaris-release falcons nested successfully, fledging two young. In 2008, the above-mentioned 2007 pair returned to the ranch in the spring, but their nest was blown down in a strong wind. They were seen nearby soon after, but they abandoned the territory and could not be located later in the spring or summer.

Another falcon pair from the 2007 release was identified near Lake Valley, New Mexico just south of the Ladder Ranch. A local rancher saw this pair and TESF biologist Kathryn Leifeste identified the birds on June 14, 2008. No nest was found in the area, and the falcons were not observed by TESF after this.

Two more pairs of aplomado falcons were identified on the Armendaris in late spring 2008, one pair established a territory near Deep Well, and the other pair was located near Cedar Tank. The Deep Well pair consisted of birds released in 2007; they established a territory around Deep Well, including the North hack site. The Cedar Tank pair consisted of a male released from the White Sands Missile Range hack site in 2007 (black/green H/Y) and an unbanded female, which is thought to be one of the wild-hatched chicks from the pair that nested on the Armendaris in 2007. None of the 2008 pairs successfully nested and raised young that we know of.

In 2009, only one serious nesting attempt was observed on the Armendaris. The unbanded female and a different male (black AW) established a nest on the power pole very close to the 2007 nest site. They attended the nest from March through June. No chicks were observed on the nest. Due to the length of time the adults stayed on the nest, we speculate that the eggs were infertile or inviable; regardless we never documented the presence of offspring.

2010

No nesting attempts were observed during 2010. The unbanded adult that regularly fed at the hack site arrived alone and did not appear to have a mate.

MONITORING

Aplomado falcons are monitored and tracked on the Armendaris via driving surveys along various routes throughout the ranch and surrounding areas. When sighted, falcons are observed for a short period of time to identify the individual and to determine health and behavior. Locations of sightings are recorded using Global Positioning Systems (GPS). Maps of falcon sightings are made with ArcMap. A falcon monitoring protocol was completed in December 2008, outlining survey methods, as well as other monitoring options.

SUPPLEMENTAL FEEDING PROGRAM

2006-Fall 2009

TPF normally feeds young aplomado falcons for forty days after they are released. After the 2006 release, ranch manager Tom Waddell continued to provide quail to the young birds until spring 2007. By that time only two falcons were returning to feed, and they nested in the area and successfully reared two young. This was the first documented case of yearling falcons nesting and successfully rearing young.

In fall 2007 TESF personnel resumed the supplementary feeding program following TPF protocols. Quail was provided until December when no falcons were returning to feed. One possible reason for this is that ravens began feeding on the quail provided to the falcons, often preventing falcons from eating at the towers, though many would still attempt to feed.

Following the 2008 summer releases, on September 12, 2008 we resumed the daily supplementary feeding program. Typically 3 to 7 falcons made use of supplemental food through the end of December. Due to low rainfall through spring 2009, we continued to provide food supplements every third day until May 27, 2009.

After the 2009 releases, TESF took over feeding on September 4th, 2009 and fed every other day. At this time 9 falcons were still regularly coming in to feed. By September 24, only four "regulars" were feeding, including an adult female (GR/BK 5/S) from the 2007 White Sands release. It appeared that the "regulars" were not voraciously hungry; most of the time they left significant quail parts uneaten.

On October 14, 2009 the supplemental feeding was discontinued due to the likelihood that a great-horned owl killed a juvenile falcon. On October 12, an owl flushed off the backside of the hack tower and was chased by three juvenile falcons. They returned about 15 minutes later to feed. Angel Montoya, TPF biologist, and TESF biologist Lisa Haynes investigated the area on October 14. They found a large bush with falcon feathers surrounding it and distinct evidence of predation. Although they thoroughly searched the immediate area for a falcon leg band, they did not find one. However, one male falcon (black/red 7/2) who was a "regular" at feedings, did not show up on October 12 suggesting that it was the falcon preyed upon by the owl.

2010

TESF took over supplemental feedings on August 12 following TPF 2010 hack season. The number of juveniles coming in to feed steadily decreased throughout the month of August. Eight juveniles were regularly feeding in the beginning of the month and this number decreased to about two regulars by the end. Throughout the month of August, the unbanded adult continued to feed and continued to be harassed and chased away by the juveniles. Female C/6 GR/BK was particularly aggressive towards the adult. Female S/3 RD/BK, who had a wing injury early on in August, appeared to have healed by August 22, on which date she was observed chasing female M/2 from the hack tower.

During the month of September, the only falcon that regularly showed up to the site was the unbanded adult. Juvenile male 7/8 BK/GR came in to feed on September 14 and 16. The adult was observed chasing 7/8 from the site on the 16th before he could feed. 7/8 did not show up at the site after that date. Male 9/3 BK/GR appeared at the site on September 24 and 28 and fed neither time, even though the adult was not present on either date. No other juveniles appeared at the site during the month of September.

The 2010 supplemental feeding program was discontinued on October 4 due to the lack of juveniles showing up at the site to feed. Because the supplemental feeding program was undertaken to increase the likelihood that juvenile falcons would survive to adulthood (and reach adulthood sooner), we determined that the 2010 feeding program was not effective to this goal while the sole falcon coming in to feed was an adult that was preventing juveniles from feeding.

Even during the month of August the juveniles appeared to be competent in catching their own food. Several falcons showed up at the site with full crops, apparently having caught their own food and showing no interest in the provided quail. The abundance of prey animals is likely due to the fact that precipitation was high during the winter of 2009-2010, resulting in ambient plant sustenance for insect and bird species on which the falcons prey. It is likely that the juveniles stopped appearing at the hack site because they were apt at catching their own prey, which was plentiful due to the winter rains. It is also likely that the unbanded adult, which was observed frequently on a nest platform about two miles west of the hack site by a trail camera and TESF personnel, designated the hack site as part of his or her territory and chased the juveniles away. It is possible that both of these factors influenced the departure of the juveniles from the hack site simultaneously.

NETWORKING AND SPRING SURVEYS 2008-2009

In January we began coordinating efforts to search for nesting territories. The aim of this coordinated effort is to establish a cost-effective system for monitoring for falcons throughout their range in New Mexico via a network of agency biologists (and interested private citizens). We hope that this Agency Networking Program draws attention to the regional presence and habitats of aplomado falcons and thereby promotes reliable identification and reporting of observations. Included in this effort was the development of a brochure and website (www.aplomadofalconrecovery.org) in late 2008.

Throughout February, March, and April 2009 we established and surveyed routes for nesting territories with the help of 3 contractors: Bob Barsch, David Griffin and Harley Shaw. Ground surveys were conducted on the Armendaris and in surrounding areas including White Sands Missile Range, Jornada Experimental Range, and areas near Cutter, Upham, and Rincon, south of the ranch. Several juvenile banded falcons were seen on the Armendaris, all of which, if bands were readable, were birds that had been attending supplemental feedings. One falcon was sighted just south of the ranch boundary southwest of Engle (too far away to read the bands). No other falcons were observed off the ranch during the formal surveys.

During late April and May we conducted three aerial surveys of power lines, tall trees, windmills and similar structures. We flew during three mornings for approximately 2 hrs per flight. The surveys extended north and south of the Armendaris and from the Ladder Ranch to Deming. During much of the survey we focused on high wooden power pole lines. Although we located many nests of other raptors, no aplomado falcon nests were observed other than the already recorded nest attended by the unbanded female and male black AW. When this nest was inspected from the air, the sitting falcon (possibly with eggs present) did not leave the nest in response to the plane. We did not detect any use of the artificial nest platforms during the surveys.

2010

Because the 2009 spring surveys were conducted in depth and found no new evidence of falcons present, we did not use extra field hands to conduct spring surveys in 2010. Spring surveys during 2010 focused on powerlines and searching for nests as well as falcons, but did not show evidence of nesting behavior. Because the personnel transition occurred during April and May, we were unfortunately unable to conduct an aerial survey of the ranch to check for nesting activity.

SUMMARY

Through collaboration with the Peregrine Fund, we aim to restore a viable population of aplomado falcons to the Armendaris Ranch, White Sand Missile Range, and environs in central New Mexico. We remain hopeful that long-term success is achievable through continued releases and strategic use of supplemental feeding.

Table 5.1: Aplomado falcon releases in New Mexico from 2006 through 2010.

Hack Site	2006	2007	2008	2009	2010	Cumulative Total
Armendaris (South)	11		31		12	54
Armendaris (North)		17	7			24
Armendaris (Thoroughbred)				14		14
White Sands MR		22	32	15	22	91
Deming - Delk				24	16	40
Deming - Cole				18	6	24
Deming - Beck					11	11
Overall Total	11	39	70	71	67	258

PROJECT 6: GRAY WOLVES ON THE FLYING D RANCH: ESTABLISHMENT AND IMPLICATIONS OF LONG-TERM RESIDENCY

Prepared by:
Val Asher, Biologist, Turner Biodiversity Divison, Flying D Ranch, 5048 Gateway South Road, Gallatin Gateway, Montana 59730
Mike Phillips, Executive Director, Turner Endangered Species Fund, 1123 Research Drive, Bozeman, Montana 59718

Overview

Gray wolves are now widely distributed in the northern Rocky Mountains, including the Greater Yellowstone Ecosystem. Recently the species was removed from the federal list of threatened and endangered wildlife.

Gray wolves of the Beartrap Pack first established residency on the Flying D Ranch in 2002. By December 2009 this pack included 19 to 22 wolves making it one of the largest packs in the northern Rocky Mountains. The pack was able to attain this large size due to the ranch's high degree of security and the area's robust prey base.

Population Dynamics of the Beartrap Pack

While single wolves traveled across the Flying D prior to 2001, the Beartrap Pack established a territory that included the ranch in 2002 (Table 6.1). The pack was reduced to about 3 wolves in 2004 after a control action took place near Ennis Lake in response to depredations on livestock. Since then the pack's size increased, numbering around 19 to 22 wolves by the end of 2009. While the alpha female probably denned on Forest Service land through 2005, evidence suggests that she denned on the ranch

from 2006 through 2008. We discovered the first confirmed den site on the Flying D in 2009. It seems fairly certain that she will den on the ranch in 2010.

The security of the ranch and the robust populations of prey explain the large size of the Beartrap Pack. Large packs were also documented in Yellowstone Park during the first decade of the restoration project. In more recent years, however, the size of Park packs has decreased due to intraspecific strife, disease (e.g., canine distemper, canine parvo virus), and a decline in prey abundance. Intraspecific strife is especially important in limiting pack size. Stress between pack members typically prompts individual wolves to disperse thus preventing packs from growing indefinitely. Legal and illegal killing are other factors that influence pack size. For these reasons, we predict that over an extended period the Beartrap Pack will average between 10 and 15 members.

Wolf – Prey Relations

Primary Effects of Wolf Predation

While countless studies have been conducted on predator-prey relations, the details of such relations remain poorly understood largely because they are notoriously site specific. Fortunately, reliable studies of wolf predation patterns in winter and summer have been conducted on Yellowstone Park's northern range, an area that is ecologically similar to the Flying D.

During the winter study in Yellowstone, wolves subsisted nearly exclusively on elk and exhibited a kill rate of about 1.9 kills/wolf/month (or about 22 kills/wolf/year) (Smith et al. 2004). During the summer study wolves scavenged more, subsisted on a more varied diet that includes about 20% deer, and exhibited a kill rate of about 1 kill/wolf/month (or about 12 kills/wolf/year) (Metz 2010).

Even though both studies noted considerable annual variation in wolf predation patterns (as have countless other studies – see Mech and Peterson 2003), it is possible to combine the two and estimate that the annual kill rate would be about 17 kills/wolf. Based on this, the Beartrap Pack of 20 wolves could be expected to make about 340 kills annually.

While it is difficult to predict annual kill rates, it is even more difficult to predict which prey wolves are likely to take and in what proportion. That said, Smith et al. (2004) reported the following percentages for winter kills: 43% calves, 20% cows, 21% bulls, and 9% unknown age and sex.

Comparing prey selection to prey availability, Smith et al. (2004) concluded that wolves selected for calves, against cows, and took bulls in proportion to their abundance in the population and most often in late winter. It is reasonable to expect that wolves on the Flying D will exhibit a similar pattern of selection.

While moose, bison, and mule deer were available to wolves on Yellowstone's northern range, elk was the most important prey. It is reasonable to expect that wolves on Flying D will continue focus on elk (Table 6.2).

Given the difficulties of determining kill rates and prey selection by wolves, it is more instructive to consider wolf use of prey from a strictly caloric or nutritional standpoint. After reviewing several studies that estimated food consumption by wolves (which ranged between 5 to 14 lbs/wolf/day), Peterson and Ciucci (2003) estimated the minimum daily energetic requirement (that would ensure survival and allow for reproduction) for an adult wild wolf to be 7 lbs/day (2,555 lbs/year). At this daily consumption rate the 20 wolves of the Beartrap Pack would consume 51,100 lbs of food per year. If the daily consumption rate was increased to 10 lbs per wolf (a good estimate of the midpoint of daily

consumption rates as reported by several studies), then the 20 wolves on the Beartrap pack would consume 73,000 lbs of food per year.

If we assume that an adult cow elk weighs 430 lbs (Arnaud 2004, Rob Arnaud personal communication) and that wolves can consume 75% of the animal (Peterson 1977), then each cow would provide about 325 lbs of sustenance. Thus, from a nutritional standpoint at daily consumption rates of 7 lbs or 10 lbs the Beartrap Pack of 20 wolves would consume the equivalent of 157 to 225 adult cow elk annually.

We can construct a crude predictive model concerning more specific patterns of predation on elk if we assume that:

- throughout a year the Beartrap wolves select prey in a manner similar to wolves in Yellowstone during winter (43% calves, 20% cows, 21% bulls, and 9% unknown age and sex; Smith et al. 2004).
- an average weight of 150 lbs for a calf, 430 lbs for a cow, 700 lbs for a bull, and 250 lbs for an elk of unknown age and sex.
- wolves derive sustenance from 75% of a prey animal.

Based on this crude model, if the daily consumption rate for each wolf was 7 lbs or 10 lbs, then the 20 wolves of the Beartrap Pack would, on an annual basis, consume:

- 196 to 280 calves,
- 31 to 45 cows,
- 20 to 30 bulls, and
- 24 to 35 elk of unknown age and sex.

As of January 2010, the elk herd on the Flying D was estimated to include 1088 adults and 672 calves (Rob Arnaud unpublished data). Based on the model above, on an annual basis the Beartrap Pack would consume at least 30% to 40% of the calves and 5% to 7% of the adults. Because of the uncertainty surrounding the type of elk selected by wolves and the importance of other prey species (especially during summer, Metz 2010), these results should be viewed as rough estimates that probably represent a near worst case representation of impacts of wolf predation on the Flying D elk herd.

Given the importance of ranching to the Flying D, a few words about wolf – bison interactions are in order. Although the vulnerability of bison to wolf predation is relatively slight, wolves have killed four bison calves (two red calves and two short yearlings, Table 6.2).

Bison calves are considerably less vulnerable to predators than elk calves due to adult group defense (Carbyn et al, 1993, Smith et al. 2000, Garrott et. al. 2008); Flying D bison have exhibited such behavior. However, when a cow/calf pair is isolated from a herd the vulnerability of the calf is increased.

Additionally, a calf is relatively vulnerable to predation after it establishes independence from the cow but before it gains experience as an independent member of the herd. This is the probable backdrop for the most recent kill of a calf (short yearling) by 13 members of the Beartrap pack on April 14, 2010. The kill site was a classic "environmental trap": very steep and narrow creek bordered by a dense growth of willows that limited the calf's defensive options and maximized the wolves' advantage. From a distance the calf appeared to be healthy otherwise. Asher will revisit the kill site after the wolves have left to inspect the carcass for abnormalities that might have predisposed the calf to predation (e.g., an arthritic hip or a deformed hoof) and to possibly collect a marrow sample from the femur to assess the calf's nutritional status.

Given their large size, herd behavior, and willingness to confront wolves, healthy adult bison are relatively immune from wolf predation. Indeed, studies have revealed that wolf use of adult bison typically occurs when extenuating factors (e.g., injury, depleted energy reserves due a hard/long winter, old age, etc.) have significantly predisposed the bison to predation (Carbyn et al. 1993, Smith et al. 2000, Smith and Ferguson 2005).

While it is reasonable to expect the wolves to kill (and scavenge) bison in the future (mostly calves), we predict that bison will remain a relatively unimportant prey item for the Beartrap Pack.

Secondary Effects of Wolf Predation

Research has shown that sometimes wolves influence the size of elk herds and their use of habitats. Biologists with Montana Fish, Wildlife, and Parks now consider wolf activity as one of the more important factors that affect elk population dynamics and hunter success. A study in the Gallatin Canyon reported that elk group sizes were smaller and elk were closer to (or in) vegetative cover when wolves were present in an area than when wolves were absent (Creel and Winnie 2005, Creel et al. 2005). Several other studies have also demonstrated that ungulates seek out predator-free refugia to avoid wolves (Mech 1977, Paquet 1993). Other studies in the region have, however, concluded that the risk of wolf predation did not affect the size of elk herds (Gude et al. 2006, Claire Gowan personal communication).

Although we continue to observe both large and small herds on the Flying D, increasingly elk seem to occur in smaller more widely distributed groups than before wolves were present.

A study conducted on the Flying D from 2003 through 2005 revealed that as wolves settled the ranch, elk increased their use of the more complex habitats (juniper canyons and steep slopes) typically preferred by mule deer (Atwood 2006, Atwood et al. 2006, Atwood et al. 2008). This led to an increase in cougar predation on elk and a decrease of cougar predation on mule deer. Interestingly, it appeared as though cougars killed elk irrespective of the elk's nutritional status. In contrast, wolves selected for elk in poor nutritional condition. This difference is probably related to specific hunting strategies. A cougar is an ambush predator whose success relies on the element of surprise. A wolf, by contrast, is a coursing predator whose success relies on locating a prey item that is predisposed to predation (Mech and Peterson 2003).

In addition to herd size and habitat use, wolves may cause elk to be more generally active. There is, for example, some evidence that elk will move from an area immediately following a predation event (Hamlin 2006). We have documented such movement on the Flying D where a herd under observation moved 2 miles from the site of a predation event that had occurred earlier in the day.

Much more fieldwork will be needed to determine if these preliminary patterns of secondary effects will apply over a long period of time. Additionally, more fieldwork will be required to determine if observed changes in elk group size and movement patterns are caused by wolves or some other factor. It has been observed, for example, that drought caused elk to modify movement patterns such that they abandoned the Flying D in favor of areas that provide more palatable forage (Arnaud 2004:20).

Conclusions

Multi-predator/multi-prey systems like that present on the Flying D Ranch are difficult to understand. The effects of wolf predation on any prey species can differ substantially over relatively small spatial and temporal scales, depending on a complex suite of interacting factors. We caution against generalizing the effects of wolf predation from any single study or simplistic predictive model. We

encourage continued collaborations to improve our understanding of wolf–ungulate interactions and enhance management and conservation activities.

To that end, Asher will continue to monitor wolf predation as a function of several variables (e.g., habitat, season, prey type, etc.). Additionally, Asher will continue to monitor wolf movements and high use areas (i.e., dens and rendezvous areas) in relation to elk and bison distribution. Management of bison in proximity to high use areas by wolves could be explored if the level of predation becomes problematic.

As *Team Turner* considers the nuances of wolf-prey relations, it is worthwhile to recall that countless studies (see Mech and Peterson 2003) have confirmed the veracity of two common sense conclusions:

- wolves prefer whatever individual or whatever species are vulnerable enough for them to kill with the least risk, and
- wolves aim to kill frequently enough to consume about 7 lbs. of food per day which represent sufficient sustenance for successful reproduction.

Countless studies have also confirmed that the ultimate limit on wolf density is imposed by food (Fuller et al. 2003:170). From such studies then it is entirely unremarkable that the Flying D's elk population (1,000 adults and 672 calves as of January 2010, Rob Arnaud, unpublished data) supports a wolf pack that is 20 members strong.

Wolf-Human Interactions

Direct Encounters

While debate continues about the threat that wolves pose to humans, it is important to note that about 19 million visitor-days have been recorded in Minnesota's Superior National Forest without any wolf attacks. Additionally, millions of visitor days are recorded without incident at National Parks and wilderness areas in Canada, Alaska, and the northern Rocky Mountains. In a comprehensive study, the Alaska Department of Fish and Game (2002) documented only 28 cases of humans being injured by wolf attacks since 1890, even though more than 60,000 wolves exist in Alaska and Canada. In North America from 1900 to 2000, no healthy wolf killed a human being (Alaska Department of Fish and Game 2002); however wolves killed a Canadian man in northern Saskatchewan in 2005 and a woman outside the village of Chignik Bay on the Alaska Peninsula in 2010. As tragic as these deaths are, it remains true the wolves present very little threat to human safety.

Humans have historically persecuted wolves throughout much of their range. Perhaps because of this, most wolves are typically shy and avoid humans; encounters between the two are rare. With the possible exception of the 1998 incident in Algonquin and the 2010 incident in Alaska, incidents seem to have been a result of mistaken identities, defensive reactions, habituation, or a person getting between wolves and a dog they were attacking.

While there is a greater chance of being killed by a lightning strike, bee sting, or a car collision with a deer than being injured by a wolf, like bears and cougars, wolves are instinctive predators that should be kept wild and respected.

We predict that wolves will become relatively tolerant of the sights and sounds of people on the Flying D as long as the level of harassment remains insignificant.

Options for Reducing the Potential for Conflicts Between Humans and Wolves

People living in areas inhabited by wolves should adhere to the following guidelines:

- Do not feed wolves or other wildlife (attracting any prey animal may attract wolves)
- Hang suet feeders at least 2 m (7 feet) above the ground surface or snow.

- Feed pets indoors and leave no food outdoors.
- Dispose of all food and garbage in cans with secure lids.
- Do not leave pets unattended outside (dogs and cats are easy targets for wolves).
- If pets must be unattended in a yard, keep them in a kennel with a secure top.
- Install motion sensor lights as they may help keep wolves away.

The following guidelines apply to camping in areas inhabited by wolves:

- Cook, wash dishes, and store food away from sleeping areas.
- Pack out or dispose of garbage and leftover food properly.
- Suspend food, toiletries, and garbage out of reach of any wildlife.
- Keep pets near you at all times.

Outdoor enthusiasts should adhere to the following guidelines when observing wolves:

- Do not feed wolves.
- Do not entice wolves to come closer.
- Do not approach wolves.
- Leave room for the wolf to escape.
- Do not allow a wolf to approach any closer than about 100 yards (harass the wolf away or leave the area)

If a wolf acts aggressively (e.g., growls, snarls or fearlessly approaches humans at a close distance) take the following actions:

- Raise your arms and wave them in the air to make yourself look larger
- Back away slowly; do not turn your back on the wolf.
- Make noise and throw objects at the wolf.
- If necessary bear spray can be used to control an encounter.
- Report any aggressive or unusually tolerant or persistent wolf to Danny Johnson and Val Asher.

Wolf Diseases of Importance to Human Health

Rabies

Rabies is an acute infectious disease of the central nervous system caused by a virus that generally persists in nature as a salivary gland infection in carnivores. The following information draws heavily on Sikes (1981).

The rabies virus is usually transmitted between animals and to man by biting. Rabies does represent a threat to human health; death almost invariably results 2 to 10 days after symptoms appear. Thousands of people in Asia and Africa die from rabies annually. In the U.S., since the widespread vaccination of domestic dogs and cats and the development of effective human vaccines and related treatments, the number of recorded deaths from rabies has dropped from 100 or more annually in the early twentieth century, to 1–2 per year, mostly caused by bat bites, which may go unnoticed by the victim and hence untreated.

Worldwide dogs are the most important vector for the disease, although all warm-blooded animals are susceptible, including wolves (although rabies has not been reported for wolves in the northern Rockies in the U.S.). Recently at the Ladder Ranch several dead grey foxes were found; the one carcass that was submitted for diagnostics was positive for rabies.

Symptoms of the disease in carnivores include aggressive behavior, uncoordinated movements, tremors, convulsions, paralysis, and death. Symptoms of the disease in humans include flu-like conditions for

normally two to twelve weeks followed by slight or partial paralysis, cerebral dysfunction, anxiety, insomnia, confusion, agitation, abnormal behavior, paranoia, terror, hallucinations, delirium, and eventually death.

How does one minimize the risk of contracting rabies?

- The best way to prevent contracting rabies is to avoid being bitten by a wild carnivore, especially one showing any of the clinical signs mentioned above.

Echinococcosis

Echinococcosis is a disease caused by a minute tapeworm *(Echinococcus granulosus)* which was recently documented in Montana (Foreyt et al. 2009). The following information relies heavily on Davidson and Nettles (1997) and a fact sheet produced by the state of Montana (Montana Fish, Wildlife, and Park 2010) and is presented in detail here due to recent concern (albeit misplaced) about the threat of echinococcosis to humans in Montana.

While some have claimed that the *Echinococcus granulosus* was introduced to Montana along with wolves as part of the restoration effort, this is extremely unlikely. All wolves translocated from Canada were given several administrations of dewormers that would have killed any tapeworms present (Johnson 2001).

The *Echinococcus* tapeworm resides in the intestine of its definitive host, including wolves, coyotes, and dogs, where it typically causes no adverse effects. Periodically, the adult tapeworm lays eggs that are excreted with the host's feces. The eggs are then consumed by an intermediate host, including rodents, and wild or domestic ungulates (or rarely a human). Once ingested, the eggs hatch in the digestive tract of the intermediate host. The eggs then enter the bloodstream and are carried primarily to the lung, liver, or brain where they develop into cysts (hydatid cysts) containing immature forms of the parasite. A few cysts may not cause adverse effects in the intermediate host, but many cysts can cause illness, and may be fatal. The parasite life cycle is completed when the intermediate host dies and a carnivore consumes the organs containing the cysts. Adult tapeworms then develop in the intestine of the primary host and begin laying eggs to repeat the life cycle.

While hydatid cysts can be debilitating, the tapeworm represents very little threat to human health. For example, the 15,000 to 16,000 annual visitors to Isle Royale National Park (a very small island -- 210 mi^2 or 134,000 acres) are only advised to not handle wolf scats and not drink naturally occurring water without first boiling it for 2 minutes or passing it though a filter (with pore size of 0.4 microns or less) to avoid ingesting the eggs of *Echinococcus granulosus* (and other harmful bacteria and miscroscopic organisms like *Giardia lamblia*). This is noteworthy since the island supports unusually high densities of moose, the most important host for the *Echinococcus* larvae in North America, and wolves. While it is quite common for Isle Royale moose to be infected with hydatid cysts, we know of no reported cases of echinococcosis (the disease) in visitors to Isle Royale.

In Yellowstone, another setting with unusually high densities of wolves on the northern range, the Park Services cautions visitors to not handle wolf or coyote scats to avoid ingestion of *Echinococcus* eggs.

Below are several relevant questions and answers related to echinococcosis from Montana Fish, Wildlife, and Parks (2010).

Can humans become infected with *Echinococcus*? Yes. There is some risk of humans becoming infected with *Echinococcus granulosus*. Echinococcosis in humans can lead to development of cysts in organs such as the lungs, liver or brain, just as it does with other intermediate hosts. Cysts may develop

over prolonged periods of time (10-15 years) before any clinical signs are evident. Treatment may involve surgical removal of cysts and treatment with anthelmintic medications (dewormer).

How could a human become infected? To become infected, a human must ingest parasite eggs, which are passed with the feces of an infected canine. Eggs could be ingested while consuming vegetation or drinking water that has been contaminated with infected feces. Humans may also become infected after handling contaminated canine scat or fur, and then transferring eggs to the mouth by touching the face or eating before adequate hand washing.

What happens when humans are infected with *Echinococcus*? Echinococcosis in humans can result in a variety of symptoms that depend on the site of the infection (e.g. liver, lungs, or brain). While the risk of human infection resulting from the wolf-ungulate cycle in Montana is theoretically possible, it is highly unlikely (Foreyt et al. 2009). When human infection does occur with the wild biotype that is present in Montana it is considered by some experts to be relatively benign (Rausch, 2003). Human cases caused by the domestic biotype of *E. granulosus* are also very uncommon, but do occur, especially in high-risk groups having close contact with sheepherding dogs in the southwestern United States (Arizona, California, New Mexico, Utah) (Foreyt et al., 2009). Utah has been reported to have the highest number of surgical human cases in the United States. From 1944-1994, 45 surgical cases were reported.

How do I minimize my risk of contracting ecinococcosis?

- Dog owners should not allow their dog to consume carcasses of wild or domestic ungulates. If your dog does have access to carcasses, talk to your veterinarian about an appropriate deworming strategy.
- Always wash your hands after handling a dog that has access to ungulate carcasses. When enjoying outdoor recreation, do not touch or disturb wolf, coyote, or fox scat.
- Hunters should wear gloves when field dressing a wolf, coyote, or fox carcass, and wash hands and forearms thoroughly, since they may have come into contact with contaminated feces or fur.

It is important to note that at both Isle Royale and Yellowstone National Parks, free-ranging, unsupervised dogs are not allowed. We understand that a similar policy is in effect at the Flying D. We recommend its continued application.

Conclusions

While the wolf populations in Idaho and northwestern Montana are well connected to one another, the population in the Greater Yellowstone Ecosystem remains relatively isolated. Given the need for populations to periodically exchange genetic material to ensure long-term health, the Flying D Ranch is a critically important "stepping stone" for promoting connectivity.

More generally, the Flying D is a remarkable and unique ranch due to the presence of a robust assemblage of large carnivores including grizzly bears, black bears, cougars, coyotes, and wolverines. The recent arrival of wolves adds immensely to this. It is safe to say that very few parcels of private land anywhere in the world are as "wild" as the Flying D.

From a conservation perspective, the wolves' arrival and likely long-term occupation of the Flying D Ranch is clear evidence that private land can contribute to the future well-being of even the most contentious species. This is not an inconsequential development for gray wolves in the northern Rocky Mountains and countless imperiled species elsewhere (Phillips 2001, Phillips and Smith 1998).

TABLES

Table 6.1: Number of wolves in the Beartrap Pack since establishing a territory on the Flying D Ranch in 2002.

DATE	12/31/02	12/31/03	12/31/04	12/31/05	12/31/06	12/31/07	12/31/08	12/31/09
NO. WOLVES	4	5	3	8	8	13	19	19-22

Table 6.2: Summary of wolf use of ungulates since intensive monitoring began in 2009.

Prey Type	# of confirmed wolf kills	# suspected wolf kills	Comments
elk calf	3	2	1 undetermined
elk cow	3	2	4 undetermined
elk bull	5		
white-tailed deer fawn	2	1	1 killed by bobcat, 1 undetermined
white-tailed deer doe	2		
white-tailed deer buck			1 killed by lion, 1 undetermined
mule deer fawn			
mule deer doe			
mule deer buck			
moose calf			
moose cow			1 undetermined
moose bull			
bison calf	4		two red calves and two short yearlings
bison cow			
bison bull			

ADDENDUM

MEMORANDUM

Date: July 30, 2010
To: TESF Board of Trustees
From: Mike
Subject: Predation

As we discussed at Vermejo, since the start of 2010 Team Turner has maintained an intensive wolf monitoring program on the Flying D that aims to generate reliable knowledge about wolf-prey interactions.
Recently an important trend has surfaced. Data we have collected reveals that at least 50% of the bull elk killed by wolves are somewhat predisposed to predation due to hoof deformities or abscess on a front hoof. Additionally, many of the bulls killed by wolves have bone marrow that is depleted of fat indicating malnutrition.

This trend is not surprising. Numerous other studies of wolves and prey have concluded that wolf hunting success is much improved when pursuing a prey item that is somehow predisposed to predation. The longest running such study spans 52 years (1958 thru present) and involves wolves and moose on Isle Royale National Park. There, researchers have related wolf hunting success to several factors that predispose moose to predation including nutritional status, arthritis, and periodontitis (gum disease that can lead to jaw necrosis). In severe cases of periodontitis researchers believe because the odor of the bacterial infection that causes the disease is so strong that wolves are likely able to determine (through smell) whether a moose has severe jaw necrosis before they attack it (Vucetich and Peterson 2010).

FIGURES

Figure 6.1: Two wolves from the Beartrap Pack, including the alpha female (animal at left) were photographed on the Flying D Ranch on the morning of April 14, 2010 shortly after the pack had killed a bison calf (a short yearling). Prior to the photograph being taken 13 wolves were observed at the kill site which was a classic "environmental trap": very steep and narrow creek bordered by a dense growth of willows that limited the calf's defensive options and maximized the wolves' advantage. From a distance the calf appeared to be healthy otherwise. Asher will revisit the kill site after the wolves have left to inspect the carcass for abnormalities that might have predisposed the calf to predation (e.g., an arthritic hip or a deformed hoof) and to possibly collect a marrow sample from the femur to assess the calf's nutritional status. Since intensive monitoring began in 2009, we have confirmed that the wolves have killed four bison calves (two red calves and two short yearlings). This photograph of the alpha female is instructive. When it was taken the wolves had consumed very little of the bison calf. Consequently, her robust shape and belly that almost drags the top of the snow is certainly due to a litter of pups. She will soon establish a den and whelp on the ranch. The Flying D is a truly remarkable and unique ranch given that it supports a robust assemblage of native large carnivores including gray wolves, grizzly bears, black bears, cougars, coyotes, and wolverines. Very few parcels of private land anywhere in the world are so "wild".

WOLF KILL FIGURES

When investigating kills, we document indexes of prey vulnerability (Figures 6.4 – 6.6). Body condition tends to decline as winter progresses. Marrow fat would be the last fat reserve to be used by the animal. The marrow of a healthy animal is solid, white and waxy. As body condition deteriorates, the marrow becomes red, solid, and slightly fatty to the touch. Marrow that is red to yellow and gelatinous indicates poor condition.

Figure 6.2: Bull elk killed by wolves in April. Bone marrow is yellow and gelatinous.

Figure 6.3: Bull elk killed by wolves in January. Bone marrow is white and waxy.

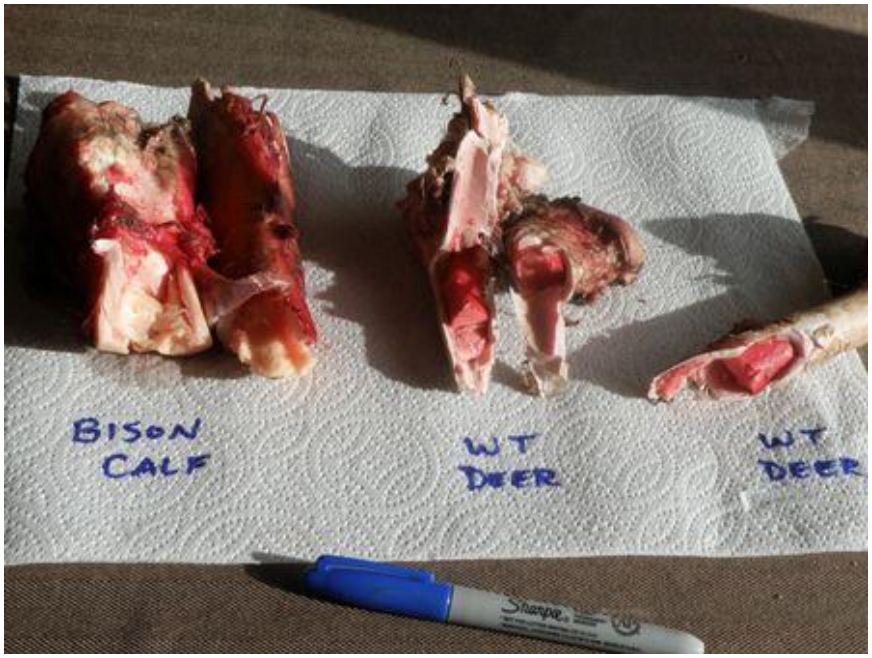


Figure 6.4: Comparison of body condition. Bison calf killed by wolves in January Marrow is white and waxy. Whitetail deer fawns killed in February, red and firm.

Figures 6.5: At least 50% of the bull elk killed by wolves are somewhat predisposed to predation due to hoof deformities or abscess on a front hoof.

Figure 6.6: Many bull elk that are killed by wolves on the Flying D have bone marrow that is depleted of fat, indicating malnutrition. Bone marrow with good fat stores is solid and white.

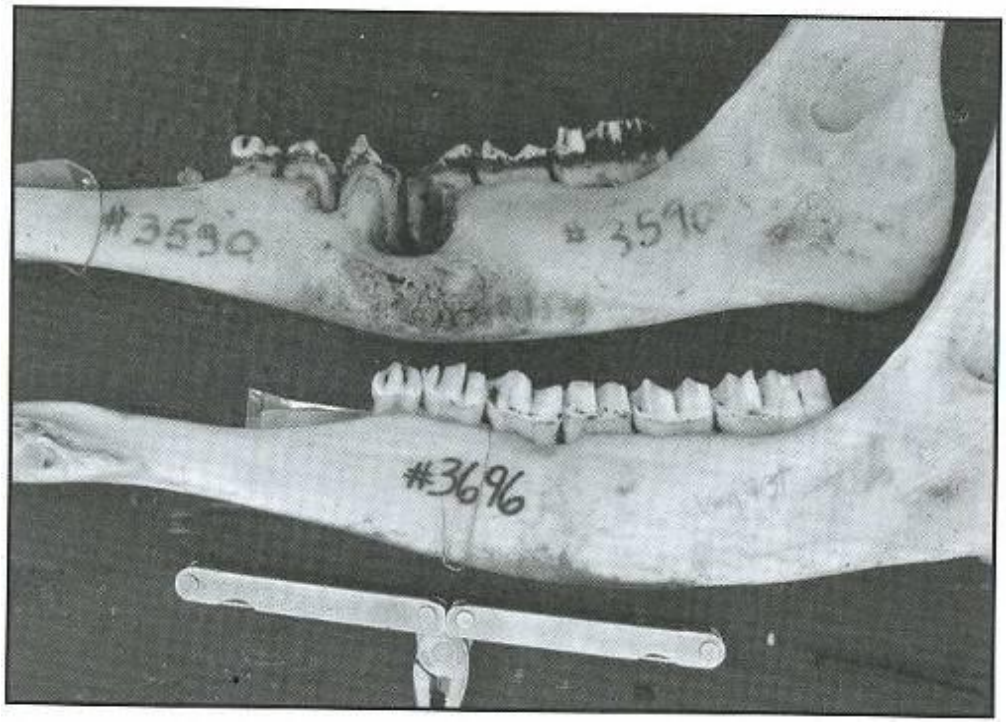


Figure 6.7: A normal moose jaw bone (below) and an example of a jaw bone with severe periodontitis (above). Among moose on Isle Royale that are older than 9 years of age, 70% die with at least slight jaw necrosis. Moose with jaw necrosis are vulnerable to malnourishment.

Literature Cited

Arnaud, R. 2004. Flying D Ranch: 2003 annual wildlife report. Arnaud Outfitting, Gallatin Gateway, MT.

Atwood, T. C. 2006. Coyotes, wolves, elk, and mule deer: predator-prey behavioral responses in southwest Montana. Dissertation, Utah State University, Logan.

Atwood, T. C., E. Gese, K. Kunkel 2006. Comparative patterns of predation by cougars and reconlonizing wolves in Montana's Madison Range. Journal of Wildlife Management 71: 1098-1106.

Atwood, Todd C., E. Gese, and K. Kunkel 2008. Spatial partitioning of predation risk in a multiple predator-multiple prey system. Journal of Wildlife Management 73:876-884.

Carbyn, L. N., S. M. Oosenbrug, and D. W. Anions. 1993. Wolves, bison, and the dynamics related to the Peace-Athabasca Delta in Canada's Wood Buffalo National Park. Canadian Circumpolar Institute, University of Alberta, Circumpolar Research Series 4:1-270.

Creel, S., and J.A.Winnie, Jr. 2005. Responses of elk herd size to fine-scale spatial and temporal variation in the risk of predation by wolves. Animal Behaviour 69:1181-1189.

Creel, S., J. A. Winnie, Jr., B. Maxwell, K. Hamlin, and N. Creel. 2005. Elk alter habitat selection as an antipredator response to wolves. Ecology 86:3387- 3397.

Davidson, W. R., and V. F. Nettles. 1997. Field manual of wildlife diseases in the southeastern United States. Southeastern Cooperative Wildlife Disease Study, College of Veterinary Medicine, University of Georgia, Athens.

Foreyt, W. J., M. l.Drew, M. Atkinson, D. McCauley. 2009. *Echinococcus granulosus* in gray wolves and ungulates in Idaho and Montana, USA. Journal of Wildlife Diseases 45:1208-1212.

Fuller, T. K., L. D. Mech, J. F. Cochrane. 2003. Wolf population dynamics. Pages 161 – 191 *in* L. D. Mech and L. Biotani, editors. Wolves: behavior, ecology, and conservation. University of Chicago Press, Chicago.

Garrott, R. A., P. J. White, M. Becker, C. Gower 2008. Apparent Competition and Regulation in a Wolf-Ungulate System: Interactions of Life History Characteristics, Climate, and Landscape Attributes. The Ecology of Large mammals in Central Yellowstone, 518-536.

Gude, J. A., B. Garrott, J.J. Borkowski, and F. King. 2006. Prey risk allocation in a grazing ecosystem. Ecological Applications 16: 285-298.

Hamlin, K. L. 2006. Monitoring and Assessment of Wolf-Ungulate Interactions and Population Trends within the Greater Yellowstone Area, Southwestern Montana, and Montana Statewide. Montana Fish, Wildlife and Parks unpublished report, Helena, Montana.

Johnson, M. R. 2001. Case 2: health aspects of gray wolf restoration. Pages 163-167 in D. S. Maehr, R. F. Noss, and J. L. Larkin, editors. Large Mammal Restoration. Island Press, Washington, D.C.

Mech, L. D. 1997. Productivity, mortality, and population trends of wolves in northeastern Minnesota. Journalof Mammalogy 58:559–74.

Mech. L. D., and R. O. Peterson. 2003. Wolf-prey relations. Pages 131 – 157 *in* L. D. Mech and L. Biotani, editors. Wolves: behavior, ecology, and conservation. University of Chicago Press, Chicago.

Metz, M. 2010. Summer prey selection and estimation of wolf kills rates in Yellowstone National Park. M.Sc. Thesis, Michigan Technological University, Houghton.

Montana Fish, Wildlife, and Park. 2010. Echinococcus fact sheet. Montana Fish, Wildlife, and Parks, Helena, Montana.

Paquet, P. C. 1993. Summary reference document—ecological studies of recolonizing wolves in the central Canadian Rocky Mountains. Unpublished report. John/Paul Associates for the Canadian Parks Service, Banff, AB.

Peterson, R. O. 1977. Wolf ecology and prey relationships on Isle Royale. U.S. National Park Service Scientific Monograph Series, No. 11, Washington, D.C.

Peterson, R. O., and P. Ciucci. 2003. The wolf as a carnivore. Pages 104 – 130 *in* L. D. Mech and L. Biotani, editors. Wolves: behavior, ecology, and conservation. University of Chicago Press, Chicago.

Phillips, M. K. 2001. A private effort to conserve biological diversity. Endangered Species Bulletin 26:26-29

Phillips, M. K., and D. W. Smith. 1998. Gray wolves and private landowners in the Greater Yellowstone Area. North American Wildlife and Natural Resources Conference 63:443-450.

Rausch, R. L. 2003. Cystic echinococcosis in the arctic and sub-arctic. Parasitology 127:73-85.

Sikes, R. K. 1981. Rabies. Pages 3 – 17 in J. W. Davis, L. H. Karstad, and D. O. Trainer, editors. Infectious diseases of wild mammals. Iowa State University Press, Ames.

Smith, D. W., L. D. Mech, M. Meagher, W. E. Clark, R. Jaffe, M. K. Phillips, and J. A. Mack. 2000. Wolf-bison interactions in Yellowstone National Park. Journal of Mammalogy 81:1128-1135.

Smith D. W., T. D. Drummer, K. M. Murphy, D. S. Guernsey, and S. B. Evans. 2004. Winter prey selection and estimation of wolf kills rates in Yellowstone National Park, 1995-2000. Journal of Wildlife Management 68:153-166.

Smith, D. W. and G. Ferguson. 2005. Decade of the wolf: returning the wild to Yellowstone. The Lyons Press, Guilford, Connecticut.

Vucetich, J. A., and R. O. Peterson. 2010. Ecological studies of wolves on Isle Royale: annual report 2009-10. Michigan Technological University, Houghton. 16 pp.

PROJECT 7: DESERT BIGHORN SHEEP AT THE ARMENDARIS RANCH

Ram at Eagle Rock water catchment, Fra Cristobal Mountains

2010 Report: *Submitted by Jeremy Plaguer*

Goal: To establish a viable, self-sustaining herd of desert bighorn sheep in the Fra Crisobal Mountains to contribute to desert bighorn sheep recovery in New Mexico.

Summary

Recent estimates indicate that 151 desert bighorn sheep currently occupy the Fra Cristobal Mountains (FCM). Most efforts this year were directed towards cougar removal. Two cougars were euthanized during this year. There have been a total of four sheep mortalities since February 4th 2010. There was one sheep survey conducted on June 4th 2010.

Introduction

Through the period TESF followed the management guidelines for cougars and bighorn sheep as specified in the Management Memorandum 2006-2011 (Addendum 7.1).

Sheep population status

Our minimum estimate for this population is 154 (Table 7.1), ten of which are radio collared. Two of the collars, however, do not emit a signal (ram 151.390) and ram (150.430). Ram 151.390 has not been observed or documented for over nine months. Ram (150.430) has not emitted a signal for almost four months.

Sheep Distribution and Movements

At the beginning of 2010, sheep were spread out across the mountain. However, larger groups of sheep were observed and classified. On February 11th another large group of 47 sheep was classified. Towards the end of February, I noticed that the rams had begun to leave the main groups and form smaller ram bands around the mountain. Similarly, the ewes had been mostly documented with lambs and yearlings.

The uncharacteristic rainfall during the winter of 2009 changed the sheep's movement as well. There were pools of water collected in various areas of the mountain north to south. Because of the regularity of precipitation since the end of 2009, sheep used water catchments less frequently.

Remote cameras, for example, failed to document sheep utilizing the Eagle Rock or Release Canyon catchments from January-March 2010.

Currently, sheep bands are dispersed from Summer Spring Canyon to Massacre Gap. These groups continue be located throughout this range. There is one collard ram (150.180) that has been detected by Chalk Gap the past month. The majority of collared and uncollared sheep are found between North Canyon and Deer Springs.

Sheep Monitoring Effort

Telemetric monitoring and direct observations of bighorn remain important and productive field activities. Additionally, remote cameras are still "capturing" sheep using water catchments and springs.

The presence of lions on the mountain during the year compromised my ability to monitor sheep. Although I was able to document and classify groups of sheep from the road, I only spent about 10-15% of my time hiking the mountain to register more proximate observations. I was able, however, to receive daily signals from the radio collared animals.

Sheep mortality

There were four mortalities documented this year. Out of the four mortalities, I only suspected two of them to be caused by cougars. The most recent sheep mortality was most likely cause by old age. The ewe (151.171) was documented to be 17-18 years old. This is the oldest desert bighorn sheep ewe to be documented in New Mexico.

Sheep Habitat in 2010:

In the months of April and May, precipitation was minimal. In June 1.2 inches was documented at the Top Catchment. July produced the highest amount of rain this year for a total of 2.5 inches at the top catchment. The mountain produced a great amount of forage during that time.
Since August, rainfall has decrease on the mountain. There has been less than .5 inches of rainfall for each month. November did not accumulate any rainfall on the mountain.

Monitoring Uncollared Cougars

Remote digital cameras continue to "capture" lions on the sheep management area. I located a female and possibly a young male's tracks at the top of the mountain in the months of January-February 2010. Fresh tracks were seen traveling from the water catchment to the old mine at the top of the mountain.
On September 6th 2010 I eventually caught the young male at the Top Catchment. On November 6th 2010 a remote camera documented a female in Summer Spring. I eventually caught this lion a few days later in Red Gap.

Cougar Mortalities

Two cougars were euthanized this report period.

Cougar Trapping Effort

Searches for tracks are carried out in vehicles and on foot 5 to 7 days each week. Track searches are concentrated in the areas where sheep are concentrated as well as in areas that have historically been frequented by cougars. There are currently 8 remote digital cameras distributed throughout the FCM and river corridor to monitor cougar activity in the area.
There was a total of 435 trap nights from January-February 2010. I had a maximum of 6 different sets of snares on the mountain each night. The closest I had come to catching a cougar was in mid January 2010. I placed the snares on safety for one day. When I returned to take the

safety off, I found that the trap was set off. The cougar had continuously moved around various traps.

Since April 2010 I began utilizing new techniques for capturing lions. I purchased two additional snares to have a total of 8 possible devices on the mountain. I also ordered two audio calls in attempt to lure lions into cubbies. None of these new efforts produced immediate results. In May we also tried using pack mules and dogs to capture the lion. There was a total of eight pack days utilizing a houndsman. Again, no results came of this method. Most of my efforts of capturing lions have recently been focused on the Top of the mountain. On September 6th 2010 I caught a young male on 300 yards west of the Top Catchment. Two months later I caught a female which may have been the mother of the male previously caught.

There have not been any snares deployed on the mountain since November 11th 2010. I will place snares on the mountain the next time I observe cougar presence on the mountain.

Table 7.1: Bighorn sheep observed or accounted for in the Fra Cristobal Mountains, June 4, 2010. (Table by Eric Rominger.

Year	Ewes	Y. Ewe	Lambs	CI	CII	CIII	CIV	Total
2010 (helicopter)	65	6	31	10	11	10	11	144
2010 missed for sure	3		1			6		10
Minimum count	68	6	32	10	11	16	11	154
2010 missed maybe	7			3				10

'Missed maybe' Is a group of 10 seen by W. Cleery. He thought the helicopter missed this group but we did see a group we classified as 5 ewes, 4 yearling males, and 3 lambs in this general area. I am disinclined to add these sheep.

Addendum 7.1

Fra Cristobal Desert Bighorn Sheep Management
Memorandum 2006-2011
New Mexico Department of Game and Fish
Turner Endangered Species Fund

BACKGROUND

In 1995, The New Mexico Department of Game and Fish (NMDGF) in cooperation with NM Ranch Properties, Inc. (NMRPI) transplanted 37 desert bighorn sheep (13 rams, 24 ewes) (*Ovis canadensis mexicana*) to the Fra Cristobal Mountains from the Red Rock captive facility. This herd was subsequently augmented in 1997 with 7 rams out of Red Rock (with the goal of reducing the number of rams in the captive facility). From 1995 to the present, NMDGF, NMRPI, and the Turner Endangered Species Fund (TESF) have jointly managed this desert bighorn sheep herd. A contractor was hired from the 1995 release until May 1996. From 1997 to 2002, two graduate students and several technicians were hired to study this herd, assessing habitat use and selection, and causes of lamb mortality (Bangs 2002, Bangs et al. 2005a, Bangs et al. 2005b, Parsons in prep.). In addition, Hornocker Wildlife Institute was contracted to monitor radio marked cougars as part of a study to examine desert bighorn sheep/cougar predator-prey relationships to further inform an adaptive desert bighorn sheep and cougar management plan (Wright et al. 2002). Since 2002, contract personnel have worked on desert bighorn sheep and cougars with funding provided by NMDGF, TESF, and the Foundation for North American Wild Sheep (TESF 2006).

By autumn 2002, the herd had increased to its highest level of approximately 75-80 individuals (NMDGF 2003). From 1995-2005, cougars were responsible for 83% (25 of 30 radiocollared adults) of the mortality on adult radiocollared desert bighorn sheep. From 1999-2002 an adaptive cougar and desert bighorn sheep management approach was followed whereby offending cougars were killed. In 2003, an experimental management plan to remove female cougars, and to radiocollar and monitor male cougars, was implemented (NMDGF files 2003). This action was to test the hypothesis that in the absence of female cougars, male cougars would not stay in desert bighorn sheep habitat and therefore would not kill desert bighorn sheep. Male cougars would be removed if they were documented to be a threat to desert bighorn sheep. The desert bighorn sheep population declined in 2003, and causes are attributed to a combination of cougar predation, diseases, and emigration to the adjacent Caballo Mountains.

An evaluation of habitat quality on the mountain was accomplished by Dunn (1994) and it was determined that approximately 65 square kilometers (km2) of high quality habitat exists. This puts the current density of desert bighorn sheep at approximately 1 desert bighorn sheep/km2. This estimate was compared to desert bighorn sheep densities in other mountain ranges in Arizona with extant desert bighorn sheep populations and determined to be one of the lowest densities known: 0.8 desert bighorn sheep/km2 in the Mojave Desert, 3.0-3.6 desert bighorn sheep/km2 in the San Andres Mountains, NM during the 1970s, and 19 desert bighorn sheep/km2 in the Red Rock captive facility during years when supplemental feed was not provided (NMDGF files 2006). Habitat quality on the mountain is likely high due to the low density of desert bighorn sheep in the Fra Cristobals. In addition, desert bighorn sheep group sizes, an indicator of habitat quality (Berger 1978), remains higher than or comparable to desert bighorn sheep in expanding populations in New Mexico (NMDGF files 2006).

In spring 2006, TESF/FNAWS/NMDGF began a comprehensive assessment of desert bighorn sheep and cougar data collected over the 10 years since the reintroduction began (TESF unpublished proposal to FNAWS). The goal of this assessment will be to inform cougar and desert bighorn sheep management over the short and long term. Desert bighorn sheep demographics and the primary factors affecting demographics will be analyzed over that period. The assessment is scheduled for completion in summer 2007. Development of this management plan is indicated by section B.3. from the original Memorandum of Understanding (signed July 1995) that authorized the desert bighorn sheep restoration project.

GOAL

To establish a viable, self-sustaining herd of desert bighorn sheep in the Fra Cristobal Mountains to contribute to desert bighorn sheep recovery in New Mexico.

Critical Elements

1) Management actions for this herd will strive to increase population numbers to the point it is large enough to serve as a source herd for transplants to other areas in New Mexico.
2) The population should contribute to advancing research when it is compatible with the goal statement.
3) The population should support a limited hunt at some time in the future. During the 5 year span of this Management Memorandum, the parties involved will work towards achieving this goal and critical elements. It is not intended that they will be achieved at the end of 5 years, only that progress and hence the Memorandum will be reevaluated at that time.

CONCURRENCE WITH OTHER PLANNING DOCUMENTS

This management goal and objectives are consistent with the original Memorandum of Understanding that authorized the desert bighorn sheep restoration project. They are also consistent with the *Strategic Plan New Mexico Department of Game and Fish FY 2006 through 2010* Objective 3. They are also consistent with many strategies in the *Plan for the Recovery of Desert Bighorn Sheep in New Mexico 2003-2013*, including Issue 2 Strategies 4 and 7.

MANAGEMENT STRATEGY

Desert bighorn sheep and cougars will be managed based on the size of the desert bighorn sheep herd. Therefore, 3 population sizes for female desert bighorn sheep greater than 1 year of age (i.e., ewes) that trigger differing levels of cougar control are harvest regulations.

The number of ewes in the population will be assessed each year in March and September (see *Evaluating the management plan*).

The **desert bighorn sheep management area** is delineated by the portion of the Fra Cristobal Mountains above 5,000 ft in elevation, all of which is owned by NMRPI.

For the purposes of capturing, radio-collaring, or killing cougars, the **cougar management area** is defined as all of the private Ranch property plus an area, referred to as "the corridor", between western boundary of the ranch private property and the eastern bank of the Rio Grande River. TESF will obtain permission from any other landowners/managing agencies involved before setting foot snares or box traps in the corridor.

TESF will be responsible for obtaining permission form landowners/Agencies in GMU 20 before setting foot snares or box traps or pursuing cougars with hounds on their property.

TESF will be responsible for obtaining and following all specifications of the Scientific and Educational Collection Permit.

NMDGF has no oversight or liability with immobilization or other drugs. TESF is responsible for compliance with all DEA rules.

In the following descriptions, if a radiocollared cougar targeted for control leaves the desert bighorn sheep management area before being killed, it can be pursued with hounds or foot snares may be set elsewhere on the Ranch or other lands within GMU 20 if the owner/managing Agency provide permission. If an uncollared cougar targeted for control leaves the desert bighorn sheep management area, it may be pursued with hounds or foot snares may be set only within the cougar management area.

< 30 ewes in desert bighorn sheep population
Any cougar that enters the desert bighorn sheep management area for any length of time will be killed.

31-75 ewes in desert bighorn sheep population
Any female cougar that enters the desert bighorn sheep management area will be killed.
Any male cougar that kills a desert bighorn sheep will be killed. Any radiocollared male cougar remaining in the desert bighorn sheep management area for greater than 96 hours
(4 days) will be considered a threat to desert bighorn sheep and will be killed, even if he leaves the management area before he is caught.

> 76 ewes in the desert bighorn sheep population
Only cougars (both male and female) that kill desert bighorn sheep will be killed.

SOURCE HERD REQUIREMENTS
A minimum of 100 desert bighorn sheep containing a minimum of 50 ewes must remain on the mountain post-transplant. This topic will be detailed further as we approach the herd size requirement.

Since we intend to use the Fra Cristobal desert bighorn sheep herd as a source of animals for restoration projects throughout New Mexico, we do not anticipate a cessation of cougar control.

MONITORING
TESF will hire necessary personnel to monitor and manage desert bighorn sheep and cougars throughout the year.

Field tasks are listed in order of importance below.

- snaring cougars and removing them or radio-collaring for monitoring.
- monitoring radio-collared cougars, with the goal of establishing a good sense of their movements and habits. This will undoubtedly require extensive and intensive effort. At this point it is not practical to establish a minimum level of VHF telemetric contact that the field team needs to accomplish this task. TESF will endeavor to download cougars GPS collars at least 5 times weekly.
- monitoring desert bighorn sheep with a goal of hearing the radioed animals at least 3 times weekly. Any desert bighorn sheep death will be carefully investigated to determine cause. As time allows, visual observations will be made on desert bighorn sheep to count the total population and estimate sex and age structure.

NMDGF will attempt to maintain active radio-collars on ~ 25% of the desert bighorn sheep. A disproportionate number of these collars will be placed on ewes. The next helicopter net gun capture will occur in autumn 2007, and it is likely that captures may occur every other year after that. However, if it proves practical to capture desert bighorn sheep with dart guns, captures may occur sooner and more frequently. NMDGF will conduct desert bighorn sheep population surveys in May and October each year. To limit potential disturbance from repeated helicopter surveys, ground surveys will be emphasized. NMDGF will, however, use helicopters if data collected during a ground census are deemed insufficient.

FEEDING

To provide the desert bighorn sheep herd with the best opportunity to increase in size, NMRPI may provide high protein horse feed (alfalfa pellets) may be provided during drought periods. Several feed sites will be established to prevent congregation in any given area. Habitat evaluation plots may be established to monitor the impacts of such a feeding program at key use areas

FUNDING

We anticipate that $35,000 to $45,000 will be required by the full-time biologist contracted for by TESF to accomplish most of the tasks above. Specifically, NMDGF will provide TESF with $25,000 for the period July 1, 2006 – June 30, 2007. Starting in July 2007, NMDGF will endeavor to provide TESF with $35,000 for each July to June fiscal cycle through 2011. This is contingent upon sufficient appropriations and authorization being made by the Legislature of New Mexico to fund this agreement.

In addition, NMDGF will provide personnel for desert bighorn sheep ground surveys, pay for any helicopter surveys deemed necessary including an emphasis on surveys in the adjacent Caballo Mountains to fully document the extent of emigration, and pay for desert bighorn sheep capture events including the helicopter, radiocollars and other equipment necessary for the trap. NMDGF will also provide 4 VHF radio-collars to be deployed on cougars.

TESF will contribute $10,000 for the period July 1, 2006 – June 30, 2007. Starting in July 2007, TESF will cover costs incurred by the field biologist when the $35,000 provided by NMDGF has been exhausted. TESF will provide housing and a vehicle for the field biologist. TESF will provide GPS collars for cougars.

Neither NMDGF, NMPRI, nor TESF shall have any financial obligation under this memorandum.

As practicable, the NMRPI will provide personnel for ground surveys.

NMDGF and TESF (and as practicable NMRPI) will provide biologists to assist with administrative and biological issues that may arise.

CONTRACT

A contract will be executed each year between TESF and NMDGF to implement the activities set forth above. The scope of work and compensation will be based on this Management Memorandum.

PERMIT

Authorization to snare mountain lions will be given through a scientific and education permit. The language will be based on this Management Agreement. At the end of each calendar year,

TESF will be responsible for submitting summary information to NMDGF. In addition, TESF will be responsible for renewing the permit when it expires.

EVALUATING THE MANAGEMENT MEMORANDUM

Every 6 months (March and September), involved parties will participate in a telephone conference to discuss effectiveness of the management plan as it has unfolded on the ground. During these meetings, the number of ewes on the mountain will be discussed, modifications may be made to the plan, and additional issues that arise may be resolved. The team will meet in summer 2007 after the comprehensive 10-year assessment of desert bighorn sheep project is completed to adjust this plan accordingly. At a minimum, the involved parties should meet in person at the end of the 5 year period (March 2011) to write a new management plan for the herd.

LITERATURE CITED

Bangs, Peter D. 2002. Habitat use by female desert bighorn sheep, Fra Cristobal Mountains, New Mexico. M.S Thesis. University of New Mexico. 75 pp.

Bangs, P. D., P. R. Krausman, K. E. Kunkel, and Z. D. Parson. 2005a. Habitat use by female desert sheep during lambing. European Journal of Wildlife Research 51:178-184.

Bangs, P. D., P. R. Krausman, K. E. Kunkel, and Z. D. Parson. 2005b. Habitat use by female mountain sheep in the Fra Cristobal Mountains, New Mexico. European Journal of Wildlife Research 51:77-83.

Berger, J. 1978. Group size, foraging and antipredator ploys: an analysis of bighorn sheep decisions. Behavioral Ecology and Sociobiology 4:91-99

Dunn, W. C. 1994. Evaluation of desert bighorn sheep habitat in New Mexico. A revision of the Final Report, New Mexico Department of Game and Fish, Federal Aid in Wildlife Restoration, Project W-127-R-7, Job No. 4. 43 pp.

NMDGF -- New Mexico Department of Game and Fish. 2005. Strategic Plan New Mexico Department of Game and Fish FY 2006 through FY 2010. 43 pp.

NMDGF—New Mexico Department of Game and Fish. 2003. Plan for the recovery of desert bighorn sheep in New Mexico 2003-2012. 58pp

Wright, A, M. Hornocker, and H. Quigley. 2002. Armendaris cougar project. Hornocker Wildlife Institute/WCS

PROJECT 8: THE MEXICAN WOLF AT THE LADDER RANCH

2010 Annual Report for the Ladder Ranch Mexican Wolf Captive Facility

General Management

2010 is the 13th year that the Turner Endangered Species Fund (TESF) and the U.S. Fish and Wildlife Service (USFWS) have collaborated to maintain Mexican wolves in captivity at the Ladder Ranch. We aim to promote wolf recovery primarily by using our facility to contribute to the pre-release care and acclimation of animals for eventual release to the wild.

We ended 2010 with 5 wolves at the Ladder Ranch (Table 8.1). We started with 10 wolves in 2010. Two animals were transferred by the USFWS to the Sevilleta National Wildlife Refuge on May 4, and 3 animals to Wildlife West in Edgewood, NM on November 17.

Wolves maintained at the Ladder Ranch during 2010 were valuable to the recovery program. Of the 5 remaining animals at the Ladder at the end of the year, 3 are eligible for release in the U.S. (921M, 1105F, and 1108F) and the other two (1043M and 919M) are suitable for release in Mexico. Of the two animals (886F and 1019M) which were transferred to Sevilleta one is suitable for release in the U.S and the other might be suitable for release in Mexico. Of the 3 transferred to Wildlife West, all are candidates for release in the U.S. (Table 8.1).

We observed all animals on a regular basis throughout the year to ensure their health and well-being. Every fifth day we fed wolves a diet of high-quality dry kibble (~ 6.5 lbs. of *Maxurio*) and "canine diet" (~15 lbs. of denatured horse meat from *Nebraska Brand*). We provided water ad libitum.

USFWS personnel checked and handled wolves several times throughout the year (Table 8.2). All animals were in excellent condition.

Throughout the year we made minor repairs to the wolf pens to ensure integrity and the water pumping system to ensure effective and reliable transport of water to the pens.

Outreach

With the assistance of USFWS, 12 volunteers assisted with the capture of wolves to either remove them from the Ladder Ranch facility or to conduct periodic health checks.

Future Plans

In 2011, we will continue to maintain the captive facility under the direction of the USFWS. In addition, we will promote the use of the Ladder Ranch by free-ranging wolves. To this end, we support field activities that would promote establishments of a new pack on the eastern slope of

the Black Range, immediately adjacent to the ranch's western boundary. This area supports good numbers of elk and deer.

We presented a similar expression of support for Mexican wolves inhabiting the Ladder Ranch in a letter to the U.S. Fish and Wildlife Service on March 1, 2005. We understand that the Ladder Ranch is one of the few tracts of private land in the Blue Range Wolf Recovery Area that is available for permanent occupation by free-ranging Mexican wolves.

TESF also accepted an invitation to serve on the Mexican wolf recovery team, charged with developing a recovery plan by spring 2012.

Table 8.1: Wolves maintained at the Ladder Ranch captive facility from January 1 through November 30, 2010. During the year 5 others were transferred from the Ladder Ranch to other facilities. No changes were planned in the roster of wolves at the ranch through December 31, 2010.

Wolf #	Gender	Comments
886	F	4/24/04 captive born at the Wild Canid Center (M520xF547) Release candidate - companion animal for M1019. Brought in to assist in managing M1019. ***Transferred with M1019 to Sevilleta facility on 5-4-10.***
919	M	May 2004 wildborn to Francisco Pack (M904xF511) Permanent removal. Service intends to transfer this animal to Mexico to participate in their reintroduction effort. Animal has extensive wild experience, and all captive experience has been in pre-release conditions.
921	M	5/13/05 wildborn to Francisco Pack (M904xF511) Remains eligible for release in the U.S.
1019	M	Spring 2005 wildborn genetics pending Permanent removal. Very difficult to manage in captivity. ***Transferred to Sevilleta facility on 5-4-10.***
1035	M	4/15/06 captive born SWMF (M730xF638) Remains eligible for release in the U.S. Genetically valuable to the wild population. ***Transferred to Wildlife West in Edgewood, NM on 11-17-10.***
1036	M	4/15/06 captive born SWMF (M730xF638) Remains eligible for release. Genetically valuable to the wild population. ***Transferred to Wildlife West in Edgewood, NM*** **on 11-17-10**
1037	M	Spring 2006 wildborn to Rim Pack (M992xF858) Remains eligible for release. ***Transferred to Wildlife West in Edgewood, NM on 11-17-10***
1043	M	Spring 2006 wildborn to Rim Pack (M992xF858) Permanent removal. Service intends to transfer this animal to Mexico to participate in their reintroduction effort. Animal has extensive wild experience, and all captive experience has been in pre-release conditions.
1105	F	Spring 2007 wildborn to Aspen Pack (M863xF667) Remains eligible for release in the U.S.. Genetically valuable to the wild population, has extensive wild experience.
1108	F	Spring 2007 wildborn to Aspen Pack (M863xF667) Remains eligible for release in the U.S. Genetically valuable to the wild population, has extensive wild experience.

Table 8.2: Staff from the U.S. Fish and Wildlife Service's Mexican wolf recovery team made several visits to the Ladder Ranch wolf facility during 2010.

Date of Visit	Purpose of Visit
1-2-10	Observe wolves
1-7-10	Observe wolves
2-13-10	Observe wolves
2-15-10	Capture/evauate wolf 886F
3-4-10	Capture/vaccinate 1105F, 1108F, 919M, and 921M
4-6-10	Feed wolves
5-4-10	Capture/move to different pen and Ladder 919 and 921; capture/transfer 1019M and 886F
5-13-10	Observe wolves
6-15-10	Observe wolves
9-7-10	Feed wolves
9-10-10	Feed wolves
10-20-10	Observe wolves
11-17-10	Capture/transfer 1035M, 1036M, and 1037M

SUMMARY ACTION PLAN FOR 2011

- Staff: 7 biologists, 4 seasonal technicians, 3 contractors
- Turner Foundation Grant: $509,250 (same grant amount as 2010)
- Turner Enterprises Support: $189,685 (for staff costs that TESF cannot pay for – worker's compensation insurance, health insurance, retirement, 2.45% of payroll taxes)
- Non-Turner Sources: $52,000 that requires a modest match of $9,500 (sources include federal and state governments)
- Fundraising: submit proposals to non-Turner sources for a minimum of $$25,000 to offset the cost of TESF field projects
- No. of Projects: 10 that aim to improve conditions for 10 imperiled species
- Area of Work: 6 Turner properties and hundreds of thousands of acres of adjacent public and private land.
- Focal Species: black-tailed prairie dog, Gunnison prairie dog, black-footed ferret, desert bighorn sheep, gray wolf, Mexican gray wolf, red-cockaded woodpecker, aplomado falcon, Chiricahua leopard frog, Bolson tortoise, American burying beetle. Secondary species include gopher tortoise, indigo black snake, and wood stork.
- Growth Strategy: Most projects for 2011 are multi-year efforts that began in 2006 or earlier. Consistent with our decision to carefully manage TESF's growth, new projects for 2011 are being carefully considered and will not be initiated if potential exists to negatively impact existing projects.