Turner Endangered Species Fund

&

Turner Biodiversity Division

Annual Report
2012

Mike Phillips, Carter Kruse, Dustin Long, Val Asher, Chris Wiese, Mackenzie Mizener,

Hanne Small, and Magnus McCaffery

Turner Endangered Species Fund/Turner Biodiversity Division

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All photos not otherwise marked are TESF/TBD photos.

Cover photo: *Desert bighorn sheep taken with a remote camera in the Fra Cristobal Mountains of the Armendaris Ranch, NM.*

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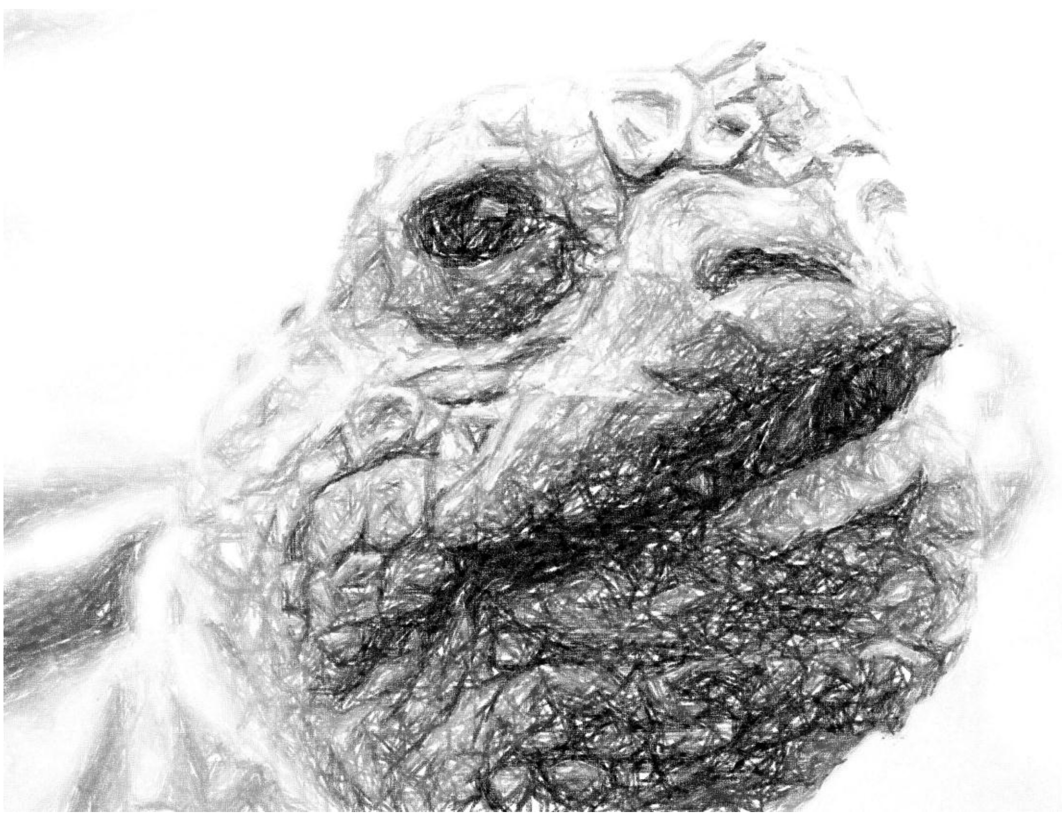


A juvenile bolson tortoise

TURNER ENDANGERED SPECIES FUND/TURNER BIODIVERSITY DIVISION TEAM

Beau Turner

Beau is **Chairman of the Board of Trustees for the TESF**, and is **Director of Natural Resources and Biodiversity for Turner Enterprises, Inc.** Beau coordinates and oversees wildlife-related projects for the approximately 2 million acre operation. He serves as a Trustee for the Turner Foundation, Inc., and serves on the boards of the Jane Smith Turner Foundation and the Captain Planet Foundation. His greatest passion is getting young people outdoors and excited about nature and the environment. To achieve this, he founded the Beau Turner Youth Conservation Center in Florida.

Mike Phillips, M.Sc.

Executive Director, TESF; Coordinator, TBD ~ *mike.phillips@retranches.com*

Mike has served as TESF Executive Director and TBD Coordinator since the efforts were launched by Ted Turner in 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.

Carter Kruse, Ph.D.

Senior Aquatics Biologist, TBD ~ *carter.kruse@retranches.com*

Carter has worked for the Turner organization since 2000. He has a B.Sc. in Wildlife and Fisheries Sciences from South Dakota State University, and a M.Sc. and Ph.D. in Zoology from the University of Wyoming. Carter manages a variety of projects from water rights to native species conservation. A current program of interest is water management and conservation on working ranches under a changing climate. Carter lives near Bozeman with his wife and five kids.

Dave Hunter, D.V.M.

Wildlife Veterinarian, TESF, TEI ~ *dave.hunter@retranches.com*

Dave has served as the veterinarian for TEI and TESF since October 1998. He graduated with a Doctor of Veterinary Medicine from Washington State University in 1976. He is an Adjunct Professor at Texas A&M University, and an 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, and on the Board of Directors of the International Wildlife Health Institute. Dave currently works on health issues at the interface of ecosystems, wildlife, livestock and humans.

Dustin Long, M.Sc.

Senior Biologist, TESF ~ *dustin.long@retranches.com*

Dustin began working for TESF in 1998 and is focused on recovering black-footed ferrets, their prey base, and habitats to Turner properties. He has a M.Sc. in Life Science from New Mexico Highlands University, and is affiliated with several professional organizations. He also proudly serves on the Maxwell Schools Board of Education. He lives on Vermejo Park Ranch, NM but also works extensively at the Bad River Ranches, SD and the Z-Bar Ranch, KS.

Magnus McCaffery, Ph.D.

Senior Biologist, TESF ~ *magnus.mccaffery@retranches.com*

Magnus is the lead biologist on TESF's Chiricahua leopard frog project, and is working with the bolson tortoise recovery team to develop a robust strategy for reintroducing the bolson tortoise to New Mexico. Magnus is a native of Scotland, where he graduated with a BSc in Marine Biology and an MSc in Wildlife Biology. A passion for ecology and wild places brought him to Montana, where he gained a PhD in Wildlife and Fisheries Biology from the University of Montana.

Val Asher, B.S.

Field Biologist, TESF ~ *val.asher@retranches.com*

Val has served as wolf biologist for TESF since May 2000. Working closely with state and federal agencies, she was a wolf specialist in Montana from 2000-2009. In 2010, she began investigating how wolves affect ranched bison and wild elk populations on the Flying D Ranch. Val has chased wolves in Minnesota, Montana, Idaho, Arizona and New Mexico and was part of the capture team in Canada during the Yellowstone/Central Idaho wolf reintroduction. She is happiest when "out and about".

Hanne Small, B.S.

Biologist, TESF ~ *hanne.small@retranches.com*

Hanne has worked with the Turner Endangered Species Fund since April 2011. She is currently working on the Chiricahua leopard frog project at the Ladder Ranch in New Mexico. She earned her B.S. in Wildlife Science with a minor in Forestry from Virginia Tech. Before TESF, she worked with numerous species including swift fox, prairie dogs, pika, bats, treefrogs, aquatic invertebrates and wild mustang horses with U.S. Fish and Wildlife Service. Hanne is interested in conservation of wildlife, specifically bats and amphibians. In the future, she would like to pursue a degree in veterinary medicine.

Chris Wiese, Ph.D.

Biologist, TESF ~ *chris.wiese@retranches.com*

Chris oversees the bolson tortoise and Mexican gray wolf projects on the Ladder and Armendaris Ranches in New Mexico. Prior to joining TESF in 2012, Chris was a cell biologist. She received her PhD in Cell Biology from the Johns Hopkins Medical School in 1996. In 2007, Chris decided to trade in lab coat and pipettors for snake chaps and sunscreen. Since then, she has focused her research efforts on the reproductive biology of desert living tortoises, including the bolson tortoise.

Mackenzie Mizener, B.S.

Part-time Biological Technician, TESF

Mackenzie works on the aplomado falcon project, where she conducts hacking, supplemental feeding, and surveys. She majored in Animals Science with a minor in Veterinary Technology at Sul Ross State University, TX. She aims to gain hands-on experience with animals and veterinary medicine in a clinical atmosphere, as well as furthering her wildlife field skills.

Barb Killoren, B.S.

Office Administrator, TESF ~ *barbara.killoren@retranches.com*

Barb began her career with TESF in 2001. As office administrator Barb manages the day to day operations and provides comprehensive support to the Executive Director, project managers and field personnel. She takes pride in providing a warm, supportive work environment to for all TESF members. Barb has a Bachelor of Science from the University of Wisconsin, Eau Claire. She enjoys camping, hiking and the Montana outdoors, and is proud to be a dedicated, valued member of the TESF team.

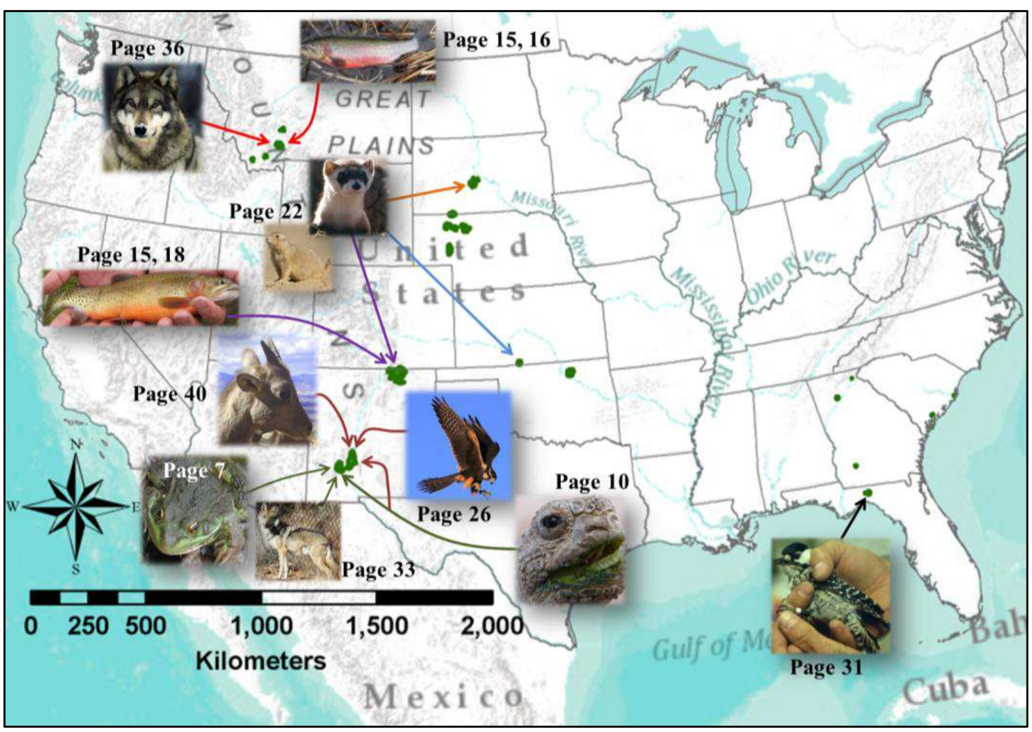
BACKGROUND

Every year tens of thousands of species and attendant ecological actions, fine-tuned by time and place, disappear at the hand of man. These losses strip away the redundancy and certainty of nature and diminish the lives of millions of people. If these trends continue, the world will become a dismal place indeed, with silent springs and hot summers and little left to excite the senses except the weeds. Without doubt, the extinction crisis looms as one of humanity's most pressing problems.

In response to the crisis, Mr. Ted Turner and his family launched the Turner Endangered Species Fund (TESF) and the Turner Biodiversity Division (TBD) in June 1997. These private entities are dedicated to conserving biodiversity by ensuring the persistence of wildlife species and their habitats. Our activities are guided by the principles of conservation biology, and we endeavor to contribute to the distribution of reliable scientific and policy information.

We invite collaboration, and work closely with state and federal agencies, universities, and private organizations. We operate on the belief that wrapping many minds around a problem builds a certain route to success. Whether we seek to manage an extant population or restore an extirpated one, our goal is population persistence with little or no human intervention. We believe that intact native species assemblages are indicative of a healthy landscape, and a high degree of ecosystem integrity.

The Turner Endangered Species Fund and Turner Biodiversity Division have achieved much, and are widely recognized as an effective force in conservation…..but more can be done! This work is challenging because private stewardship of biodiversity is an evolving yet essential approach to conservation. The problems involved are complex, and effective solutions require broad-based sociopolitical, biological, geographical, and fiscal considerations. Many of our projects will be controversial, slow to succeed, and fraught with uncertainty, and some may fail. Difficulties will arise, not because we were ill prepared or that we did not work hard, but rather that restoration of intricate ecosystems is a complex task, and an imprecise process about which scientists as yet know little. However, this will not diminish our resolve. We believe that real solutions to the extinction crisis will come through genius and determination, but will also require mankind's recognition of what is at stake.



Map of Turner properties (green polygons) in the United States, with reference to the TESF and TBD imperiled and native species projects highlighted in this report.

IMPERILED SPECIES CONSERVATION PROJECTS

~ CHIRICAHUA LEOPARD FROG ~

Lithobates chiricahuensis
– ESA listing: THREATENED

STATUS: *Ongoing*

Principal biologists:
- *Magnus McCaffery*
- *Hanne Small*

Background

The Chiricahua leopard frog (CLF), has been lost from significant portions of its historical range in New Mexico and Arizona, and was listed as threatened under the Endangered Species Act (ESA) in 2002.

Numerous factors are implicated in the range-wide decline of this species, including: disease, nonnative species invasions, habitat degradation, and an increase in the severity and duration of drought conditions. Perhaps in response to reduced natural habitat availability and drying conditions, CLF naturally colonize stock tank structures. These serve as artificial CLF habitats in an increasingly arid landscape, and natural CLF colonization events have prompted conservation actions that utilize stock tanks to create captive CLF refugia populations. This involves removing frogs from the wild whose populations are deemed at risk of extirpation and placing them into escape-proof steel livestock tanks.

We have worked in partnership with the U.S. Fish and Wildlife Service (USFWS), and the New

Map 1: The Ladder Ranch is a CLF Management Area within the Mimbres-Alamosa Recovery Unit. In 2012, the Ladder's ranarium facility bred captive CLFs from seven off-ranch populations, spanning 3 Recovery Units.

Mexico Department of Game and Fish (NMDGF) to conserve the CLF on the Ladder Ranch since 2001. The conservation value of this 62,950 hectare property, located in Sierra County, New Mexico (***Map 1***) cannot be overstated. As *home to the last, large CLF population in New Mexico*, the Ladder Ranch plays a crucial role in the survival of this species as well as their range-wide recovery. The ranch is one of four CLF Management Areas within the Mimbres-Alamosa

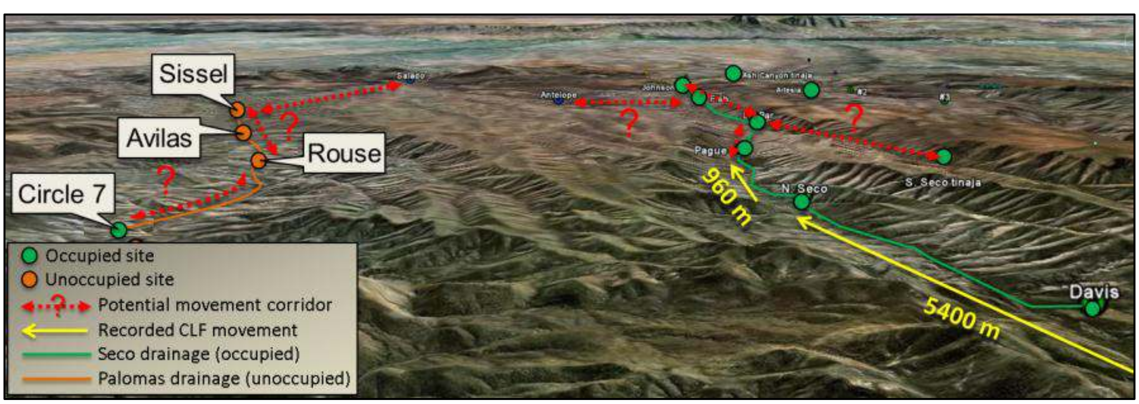


Figure 1: Expanding CLF occupancy into new wetlands to bolster the strong Seco Creek (green) population. With habitat modification and CLF translocations in Las Palomas Creek (orange), we aim to establish a robust, connected, and self-sustaining population on the Ladder Ranch.

CLF Recovery Unit (***Map 1***). The Ranch also lies at the ecotone of two Ecoregions: the *Arizona-New Mexico Mountains Ecoregion*, and the *Chihuahuan Desert Ecoregion*, and as such comprises diverse habitats that support high levels of biodiversity. From a broader conservation perspective, the Chihuahuan Desert Ecoregion is a *WWF Global 200 Priority Ecoregion*, conservation of which will help maintain a broad diversity of Earth's ecosystems, and the Ladder Ranch itself is recognized as a *Key Conservation Area* by The Nature Conservancy.

Our overarching goal is to work with the USFWS to achieve range-wide CLF recovery that results in the delisting of the species from the ESA. To this end, our CLF conservation strategy on the Ladder Ranch incorporates three core objectives:

(A) To maintain and expand wild CLF populations on the Ladder Ranch.
(B) To maintain captive refugia and captive breeding facilities for on- and off-ranch frogs.
(C) To increase our CLF conservation capacity: securing grants, implementing research, developing effective conservation methods.

Progress in 2012

We made notable progress in 2012 with our three core objectives. To ensure the persistence of the Ladder Ranch's wild CLF population, we closely monitored all occupied sites on the ranch, and data suggests that the Ladder population remains robust. However, this population is largely confined to a single drainage (Seco Creek). We aim to improve the likelihood of CLF persistence on the Ladder by expanding CLF distribution into unoccupied wetland habitats through the creation of a network of natural and artificial wetlands (***Figure 1***). In 2012, we began wetland habitat improvements (e.g. ***Figure 2***) in several drainages to expand and secure the Ladder's CLF population. Importantly, our federal *Threatened Species Recovery* permit was amended in 2012, giving us the tools to effectively monitor planned CLF expansions into new wetland sites.

We also increased our capacity to contribute to range-wide CLF recovery through improvements to captive CLF infrastructure. We made three steel stock tanks 'escape-proof', and in collaboration with the USFWS, stocked them with CLFs from populations deemed to be at risk of extirpation (***Table 1***; ***Figure 3***). This creates captive "assurance" colonies for these populations, thus preserving as much genetic diversity as possible for the species, and perhaps saving unique locally adapted genotypes that could prove critical in long-term survival of the species.

Figure 2: CLF habitat improvement at a stock water site on the Ladder Ranch. Solar pumping of groundwater fills a CLF-accessible tank and earthen pond. Partial fencing of pond reduces ungulate trampling of frog habitat.

Table 1: Escape-proof refugia tanks on the Ladder Ranch in 2012, holding CLFs from off-ranch source populations.

Steel tank	Tadpoles	Adult-form	Source population
Feedlot	586	2	Beaver Creek
Seco	900	23	Kerr Spring/Creek
Wildhorse	502	204	Cuchillo/Seco
South	82	19	Cuchillo

Figure 3: Metamorphs produced from reproduction between Seco and Cuchillo individuals. Offspring were transferred to Wildhorse refugia tank on the Ladder Ranch to create an assurance colony for CLFs with Cuchillo genes.

2012 was also the inaugural year for full-scale operation of the Ladder Ranch captive-breeding ranarium (***Figure 4***). Under our amended federal permit, we began encouraging captive breeding of adult CLFs from seven off-ranch populations, spanning three CLF Recovery Units (***Table 2***; ***Map 1***). Egg masses produced in the adult ranarium cages were transferred to an adjacent tadpole rearing facility. This tadpole facility was completed in spring 2012 and comprises nine tanks which can hold approximately 1,000 tadpoles each. During its first year of operation, the facility produced 22 viable egg masses (***Table 2***), and the tadpoles from these masses were either released into the wild (***Map 1***), or into captive refugia holding tanks (***Table 1***).

Table 2: The number, source, and reproduction of adult CLFs in the Ladder ranarium during 2012.

Cube #	Source*	Adult ♂	Adult ♀	# egg masses
1	Blue Cr.	4	1	5
2	Alamosa W.S.	3	3	0
3	Beaver Cr.	3	4	17
4	Kerr Can.; N.F. Negrito	6 1 unknown sex	0	0
7	Bolton Spr.; Moreno Spr.	0 6	1 0	0
8	Bolton Spr.; Moreno Spr.	1 0	0 1	0

**** SOURCE POPULATIONS (see Map 1):***
Blue Creek (RU 7); Alamosa Warm Springs (RU 8); Beaver Creek (RU 6); Kerr Canyon (RU 6); North Fork Negrito (RU 6); Moreno Springs (RU 8); Bolton Springs (RU 8).

Figure 4: Captive breeding ranarium and tadpole-rearing facility at Ladder HQ.

2012 CLF planning meeting at the Ladder Ranch

TESF and the Ladder Ranch hosted the *2012 Stakeholder Conservation and Coordination Meeting*, which brought together representatives from federal and state agencies, as well as from zoos, academia, and non-profit organizations (***Figure 5***). During this 3-day meeting, members of the CLF recovery team discussed progress made in 2011, and formulated recovery strategies for 2012.

In attendance:

1. **Michelle Christman (USFWS, NM)**
2. **Jeff Servoss (USFWS, AZ)**
3. **Magnus McCaffery (TESF)**
4. **Carter Kruse (TBD)**
5. **Hanne Small (TESF)**
6. **Rebecca McCaffery (Contract biologist)**
7. **Bruce Christman (Contract biologist)**
8. **Art Telles (USFS)**
9. **Jerry Monzingo**
10. **Justin Schofer (USFS)**
11. **Rene Guaderrama (USFS)**
12. **Jack Barnitz (BLM)**
13. **Charlie Painter (NMDGF)**
14. **Mike Sredl (AGFD)**
15. **Diane Barber (Ft. Worth Zoo, TX)**
16. **Kristine Schad (Lincoln Park Zoo, IL)**
17. **Randy Jennings (WNMU)**
18. **Martha Cooper (TNC)**
19. **Robert Martin (TNC)**

Figure 5: The Ladder Ranch proved to be an ideal venue for the 2012 meeting of the CLF recovery team (Photo Credit: J. Servoss).

Panoramic view of the Ladder Ranch farm and headquarters (Credit: M. McCaffery).

~ BOLSON TORTOISE ~

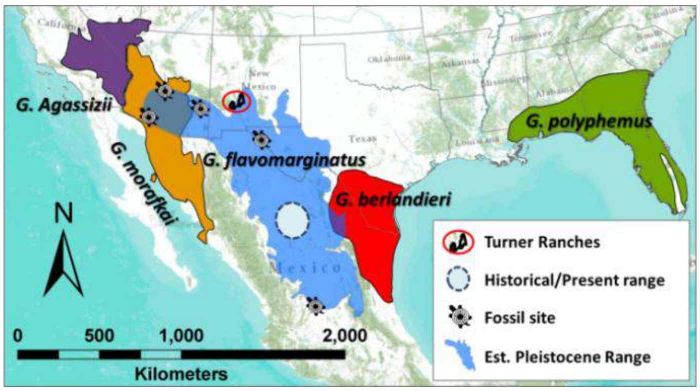
***Gopherus flavomarginatus* –**
– ESA listing: ENDANGERED

STATUS: *Ongoing*

Principal biologists:
- *Chris Wiese*
- *Magnus McCaffery*

Background

The bolson tortoise was first described to science in 1959, and is the largest of the five North American tortoise species. During historical times, the species was endemic to the Mapimían subprovince of the Chihuahuan Desert. However, fossil evidence suggests that its distribution during the late Pleistocene epoch (~ 12,000 years B.P.) was far more extensive, likely ranging throughout the Chihuahuan Desert ecoregion and west into present-day Arizona (***Map 2***). Since then, the species has experienced a 90% decline in range, linked, at least in part, to pre-Columbian human depredation and land use pressures. We currently have only a limited understanding of the ecology of the relict wild bolson tortoise population in Mexico, although it is thought that both range and numbers continue to diminish due to anthropogenic development and consumption. These stressors led to the listing of the bolson tortoise as endangered under the Endangered Species Act in 1979.



Map 2: Current ranges for the five North American tortoise species, and estimated Pleistocene range of the bolson tortoise based on fossil evidence.

TESF's bolson tortoise project is the culmination of over 40 years of work by a group of dedicated individuals to preserve the species from extinction. The precursor to our recovery program was a single bolson tortoise, named Gertie (see ***Figure 6***), collected in 1971 from the wild in Mexico and transferred to the Appleton-Whittell Research Ranch (AWRR) in Arizona by Dr. David Morafka. In 1976, Dr. John Hendrickson of the University of Arizona supplemented Gertie with an additional 15 tortoises brought from captive facilities in Mexico. Reproduction over the next 30 years led to a captive population of 37 tortoises.

In 2006, TESF translocated these 37 tortoises (30 adults and 7 hatchlings) from the Appleton Ranch to 3 locations in New Mexico. Twenty-six adults (which tested negative for *Mycoplasma*) were housed in two large outdoor enclosures on the Armendaris Ranch. The remaining four adults, which tested positive for *Mycoplasma,* were placed at the Living Desert Zoo and Gardens State Park (LDZG) near Carlsbad. The seven hatchlings were placed in a large indoor enclosure at the Ladder Ranch.

Our overarching goal is to restore one bolson tortoise population to the Armendaris Ranch and one population to the Ladder Ranch, and that these populations are able to persist with minimal management. We also aim to support efforts to conserve the species in Mexico. To achieve our first goal, we have devised captive breeding and management techniques to:

Figure 6: The Turner family with the bolson tortoise, Gertie. Gertie was an adult when she was collected from the wild in Mexico in 1971, and is probably now over 60-years old. She weighs around 25 lbs. and lays 10-15 eggs/year. The captive recovery population now includes ~ 30 of Gertie's offspring – some of which will be of releasable size in summer 2013.

(1) Produce large numbers of hatchlings.
(2) Rear juvenile tortoises until they have reached releasable size.

As our captive population grows, we are applying quantitative population techniques to inform us of how best to release captive animals whose shells have attained sufficient hardness to resist some predation events (estimated shell length of 100 – 110 mm).

Progress in 2012

Captive population growth

Since 2006, our captive population has grown by over 700%, with at least 298 tortoises in the recovery population at the end of 2012 (***Figure 7***). The Ladder and Armendaris Ranches currently house around 259 individuals whilst LDZG holds 39 tortoises.

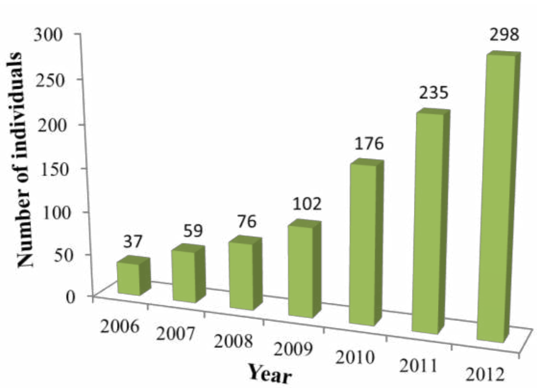


Figure 7: Growth of the captive bolson tortoise population.

2012 Hatchling production

In 2012 we achieved a record level of recruitment into our program, with a total of 87 hatchlings entering the captive population (63 produced on the Armendaris Ranch, and 24 produced by the 4 adults at LDZG; ***Figure 8***). On the Armendaris, this was the result of intensively monitoring egg development using radiography and ultrasound (***Figure 9***), collecting eggs using induced oviposition, and placing eggs in incubators. Given that bolson tortoises exhibit temperature dependent sex determination, and the critical temperatures that produce male and female offspring is currently unknown, we carefully controlled incubation temperatures to fill this gap in our understanding of bolson ecology.

Enhancing juvenile forage

Through regular health assessments of our captive population, we found that a number of juvenile tortoises exhibited evidence of poor nutrition (e.g. osteopenia, sunken scutes, soft

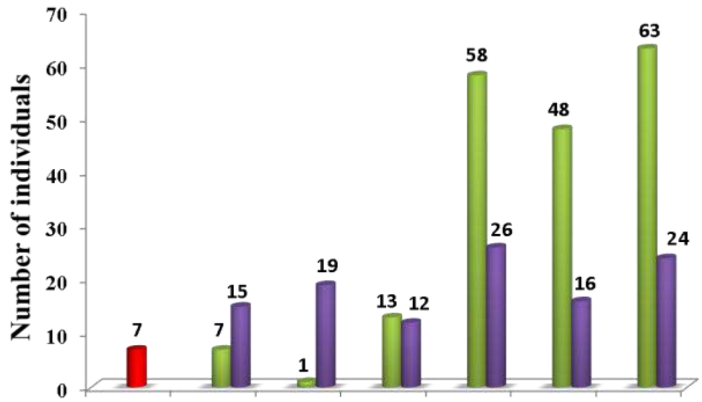


Figure 8: Hatchlings produced at AWRR (red bar), LDZG (purple bars) and the Armendaris Ranch (green bars) from 2006 – 2012.

shells), particularly in the Armendaris juvenile pen. We therefore made efforts to improve the quality and quantity of forage for captive juveniles. The plant cover in the Armendaris juvenile pen consists predominantly of Galleta grass (*Hilaria jamesii*) (***Figure 10***), and is likely a useful forage species for adult bolson tortoises. However, the height and toughness of this grass seems to preclude consumption by juveniles, who instead forage mainly on forb species – preferring tender new shoots and leaves.

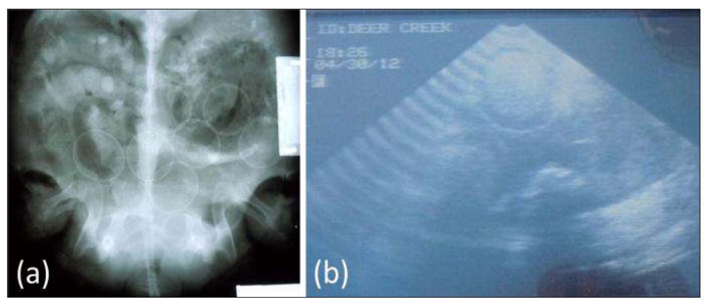


Figure 9: (a) X-ray image showing 7 eggs. (b) Ultrasound image showing 2 eggs.

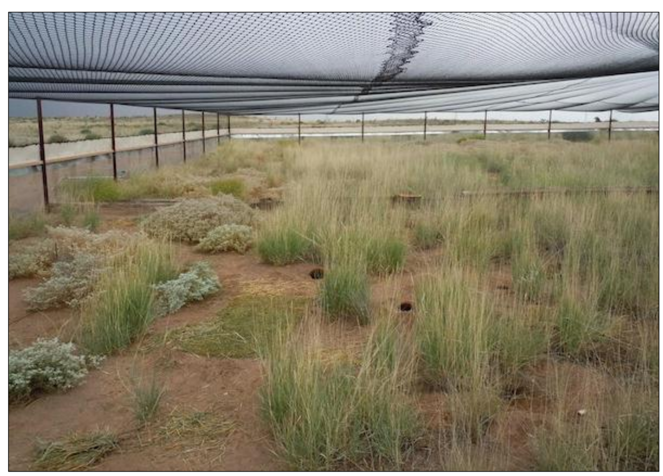


Figure 10: Vegetation cover in the Armendaris juvenile pen.

To enhance forage availability in 2012, we ensured that the juvenile tortoises could access all parts of the juvenile pens, and planted small sections of Bermuda grass turf and herbaceous species. We also provided mixed grass and alfalfa hay. The tortoises were observed to graze and browse on all of this supplementary vegetation, and were particularly selective of various types of purslane plants (*Portulaca* spp.) (***Figure 11***).

Figure 11: The addition of purslane plants to the Armendaris Truett pen provided quality forage for juvenile tortoises.

Overall, our efforts to manage forage availability for captive juveniles provided the animals with sufficient nutrition to attain, on average, a 5% increase in body length at the Ladder headstart pen, and a 10% increase in the Armendaris pen, during 2012.

Pseudo-release of juveniles in 2012

As the number of bolson tortoises in our captive population grows, we move steadily towards the next step in the recovery program – releasing bolson tortoises to the wild. To ensure that we have as much information as possible for designing a successful release strategy, we implemented a pseudo-release of bolson tortoise juveniles in September 2012.

Figure 12: Transmitter placement on a juvenile tortoise used in a 2012 pseudo-release.

This involved fitting 10 juveniles (minimum shell length = 110 mm) with radiotransmitters (***Figure 12***) and translocating them from their predator-proof juvenile pens to the large 20 acre Cedar Tank adult holding pen. This adult pen is not predator-proof. At the time of translocation, each individual was placed at the entrance of a pre-constructed artificial burrow. Through regular monitoring, we found that by late October, each tortoise had settled into a burrow, and that none of the artificial burrows that we provided were used, with the tortoises preferring to modify rodent burrows or construct new burrows. As of early November, all 10 tortoises were still alive, and appeared to have settled into their overwintering burrows. However, at least three of the tortoises (08-CB19, 09-CB37, and 10-CB49) were easily visible in shallow burrows and thus may not be protected from the coldest winter temperatures. We did not intervene by forcing them into deeper burrows, and it will be interesting to see how many of these juveniles emerge in spring 2013.

Unexpected discoveries in 2012

Figure 13: A previously unknown juvenile bolson tortoise photographed by a trail camera in the Cedar Tank adult pen.

Using remote cameras deployed in the Cedar Tank adult pen, we found evidence of three previously unknown bolson tortoise juveniles in August and September of 2012 that had hatched naturally in the Cedar Tank pen (e.g. ***Figure 13***). Together with several other examples of naturally hatched individuals in 2009 (see 2009 Press Release: ***page 13)***, these newly detected juvenile tortoises confirm that successful nesting, egg development, and emergence can occur with no management intervention on this landscape.

Once reintroductions begin, bolson tortoises will share habitat with bison on the Armendaris and Ladder Ranches.

PRESS RELEASE – First Bolson Tortoises Born in New Mexico in Over 7,500 Years
Turner Endangered Species Reports Important Success for Long-term Restoration Effort

FOR IMMEDIATE RELEASE
Contact: Mike Phillips, 406-556-8500
mike.phillips@retranches.com
September 23, 2009


Bolson tortoise hatching out in an incubator on the Armendaris Ranch

BOZEMAN, Mont., -- Today the Turner Endangered Species Fund (TESF) reports that for the first time in approximately 10,000 years, three new bolson tortoises hatched out of their eggshells and scurried for cover in their new Chihuahuan desert home. Earlier in the summer their mother had carefully buried the eggs on Ted Turner's Armendaris Ranch in south-central New Mexico.

The hatchlings were found by Rosalinda Palomo Ramos, a New Mexico State University graduate student, who is studying the diet of the tortoises. The three wild hatchlings have now joined seven other 2009 hatchlings, which had emerged from eggs that were collected on the ranch and were then placed in incubators. Next year, the hatchlings will join their one-to-three year old siblings, which now live in a predator-proof "headstart" pen on the Ladder Ranch, another Turner ranch located west of the Armendaris. The vision is for the hatchlings is that they be re-released in the wild once they reach a size where they are less vulnerable to predation by ravens, coyotes, and other predators.

Bolson tortoises were long considered extinct until a remnant population was discovered in 1959 in northern Mexico in an area known as Bolsón de Mapimí. In the 1970's a group of tortoises was brought to the Appleton Research Ranch in southeastern Arizona, and in 2006, all 26 of these tortoises were moved to the Armendaris Ranch.

TESF oversees the bolson tortoise recovery program. This project is particularly exciting, given that very little is known about the ecology, life history, or husbandry of bolson tortoises. This lack of knowledge is not surprising since the species has been extinct from the U.S. for thousands of years. The Fund has assembled a group of renowned tortoise experts to guide the conservation effort. The Fund also works closely with the Living Desert Zoo in Carlsbad, NM, which houses four of the original Appleton tortoises and is also raising hatchlings from incubated eggs.

The bolson tortoise (*Gopherus flavomarginatus*) is one of four species [now five species with the 2011 splitting of the desert tortoise into two distinct species] of land tortoises native to North America. It is also the largest, weighing up to 13 kilograms (29 pounds) or more. Its lifespan is similar to a human's, living 70 years or more and reaching sexual maturity as a teenager. Paleontologists believe the species ranged from Arizona eastward to west Texas during the late Pleistocene, about 10,000 years ago.

From a conservation standpoint, having all your tortoise "eggs in one basket" is risky. Hence, establishing a new population, in addition to the original Mexican population, is a significant contribution to science, society, and nature. TESF programs, such as the bolson tortoise restoration effort on Turner's ranches, play an important role in this regard.

The Turner Endangered Species Fund is a non-profit operational charity dedicated to preserving nature by ensuring the persistence of imperiled species and their habitats with an emphasis on private land. The Fund was formed by Ted Turner and his family in June 1997.

The Armendaris and Ladder ranches collectively they comprise over 500,000 acres of the most stunning Chihuahua grassland, desert scrub, riverine mixed forest, and sky island habitat still remaining in the southwestern United States. The ranches are located in southern New Mexico and are currently the only restoration sites in the United States for the Bolson tortoise.

Developing a release strategy

Given the current growth rate of our captive population (see ***Figure 7***), we anticipate having sufficient numbers of releasable individuals to begin releasing tortoises to the wild by 2015. In 2012, we developed female-based age-structured population-projection models to inform the release phase of our bolson tortoise conservation program. These models use available data to predict how captive and wild populations will grow or decline under different management options. Population models are a powerful tool for managing wildlife populations, and can be used to:

- Rank relative threats to a population
- Evaluate effects of management actions
- Determine the demographic/ecological variables that have greatest influence on extinction risk
- Identify information gaps and research priorities

Using this technique, we began to evaluate the relative effects of different release strategies on captive and wild population growth rates (***Figure 14***). Initial results suggest that annual supplementation of a wild population from captive stocks will be required for several decades. In addition, to achieve rapid wild population growth whilst maintaining a productive captive population that is held small enough so as not to overburden our captive holding facilities (i.e. < 500 individuals), a staggered release strategy that utilizes multiple age-classes (≥ 6 years old) is currently our best model for meeting these criteria.

We will continue to refine this approach and use it to inform the establishment of a viable wild population as efficiently as possible.

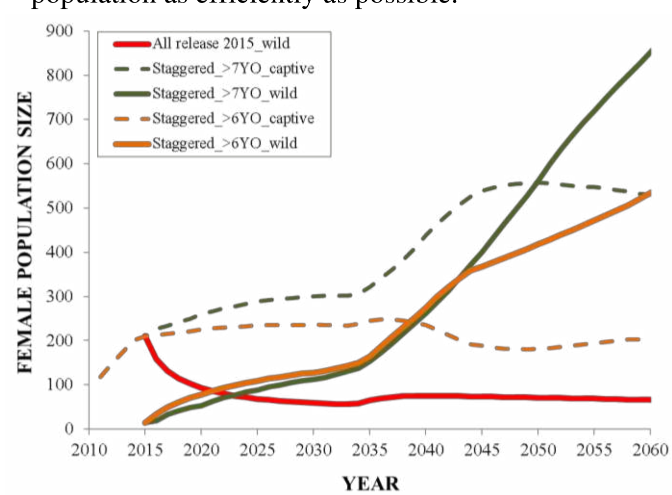


Figure 14: Captive (dashed) and wild (solid) female population trajectories under different release scenarios. RED = release of all captive individuals in 2015; GREEN = staggered release of multiple age-classes (≥ 7 years old); ORANGE = staggered release of multiple age-classes (≥ 6 years old).

A juvenile (possibly 07-CB19) that was translocated to the Cedar Tank adult pen as part of the 2012 pseudo-release study, is caught by remote camera paying Gertie a visit. This image shows the size difference between a 5-year old juvenile and an adult that is over 60-years old.

Large areas of Chihuahuan Desert habitat on the Armendaris and Ladder Ranches have the requisite soil types and vegetation to meet the ecological requirements of the bolson tortoise. This area, adjacent to the Cedar Tank adult pen on the Armendaris, may be useful when we begin to establish wild populations in the coming years.

~ CUTTHROAT TROUT ~

Westslope cutthroat trout (*Oncorhynchus clarkii lewisi*) – ESA listing: NOT LISTED
Rio Grande cutthroat trout (*Oncorhynchus clarkii virginalis*) – ESA listing: CANDIDATE


Figure 15: WCT from Cherry Creek.

STATUS: *Ongoing*

Principal biologist:
- *Carter Kruse*

Background

The cutthroat trout is native to the Rocky Mountains, and coastal areas of the western U.S., and comprises 14 subspecies. The seven major inland subspecies (based on distribution) historically occupied the majority of cold water environments from Canada to southern New Mexico. However, all subspecies have suffered significant range reductions through competition and introgression with nonnative salmonids, but also by anthropogenic habitat degradation and overexploitation. Lahontan (*O. c. henshawi*) and greenback (*O. c. stomias*) cutthroat trout are listed as threatened under the U.S. Endangered Species Act (ESA) and the other inland subspecies have either been petitioned for listing under the ESA or are considered species of concern by state and federal agencies.

Turner western ranches are located within the range of the northern- and southernmost inland subspecies. Westslope cutthroat trout (WCT) (***Figure 15***) were historically the most widespread subspecies – occupying an estimated 90,800 km of streams and rivers of Montana, Wyoming and Idaho. The overall range of genetically pure WCT has been reduced by around 76%, while focusing on only the range of the subspecies on the east side of the Continental Divide reveals an alarming range contraction of over 95%. The subspecies was petitioned for listing under the ESA in 1997, but was deemed not warranted in 2003.

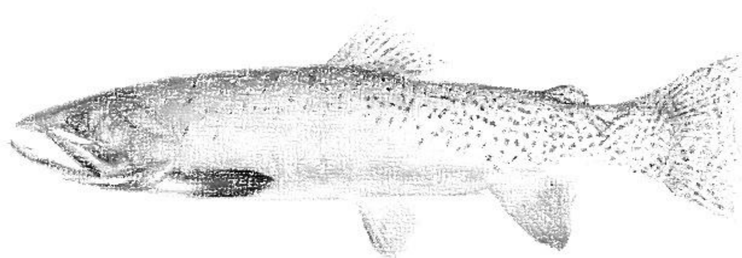
Similarly, Rio Grande cutthroat trout (RGCT) were historically found in about 10,700 km of habitat in the upper Rio Grande River basin of Colorado and New Mexico, although the current distribution of genetically pure populations have been reduced by 92%. This subspecies was petitioned for listing in 1998 and was added to the candidate list (listing is warranted but precluded) in 2008.

Both WCT and RGCT have been conferred with special status by state and federal land management agencies in the states in which they are found, in recognition of their conservation plight (e.g., WCT are designated as a species of concern by Montana Fish Wildlife and Parks (MTFWP), and a sensitive species by the U.S. Forest Service (USFS) and Bureau of Land Management (BLM) in Montana.

The Turner organization plays an important role in cutthroat conservation. The Flying D, Snowcrest, Vermejo, and Ladder ranches all contain large, connected sections of high quality cold water stream habitat within the historical range of WCT and RGCT. Cutthroat trout conservation is consistent with the mission of Turner Enterprises and fits within the land management framework on the ranches. Most importantly, the Turner family has been supportive of cutthroat restoration, embracing the risks inherent with large-scale native trout restoration. Subsequently, the Turner Biodiversity Program (TBD) developed a Cutthroat Trout Initiative with a goal of catalyzing cutthroat restoration or conservation activities on 400 km of stream. **This is by far the most comprehensive and ambitious effort on behalf of native cutthroat trout ever undertaken by a private organization**. Efforts to restore or conserve cutthroat trout are underway in eight streams on four ranches (***Table 3***).

Table 3: Cutthroat trout projects on Turner Ranches.

Stream	Ranch	Species	Project length (km)	Status
Cherry Cr.	Flying D	WCT	100	Completed in 2012
Spanish Cr.	Flying D	WCT	30	Early planning
Green Hollow Cr.	Flying D	WCT	4	Underway
Bear Trap Cr.	Flying D	WCT	8	Being considered
Greenhorn Cr.	Snowcrest	WCT	32	Final planning
Costilla Cr.	Vermejo	RGCT	190	Underway
Las Animas Cr.	Ladder	RGCT	48	Advanced planning
Vermejo River	Vermejo	RGCT	32	Underway



Overall cutthroat conservation goals

All our cutthroat trout restoration projects have similar goals:

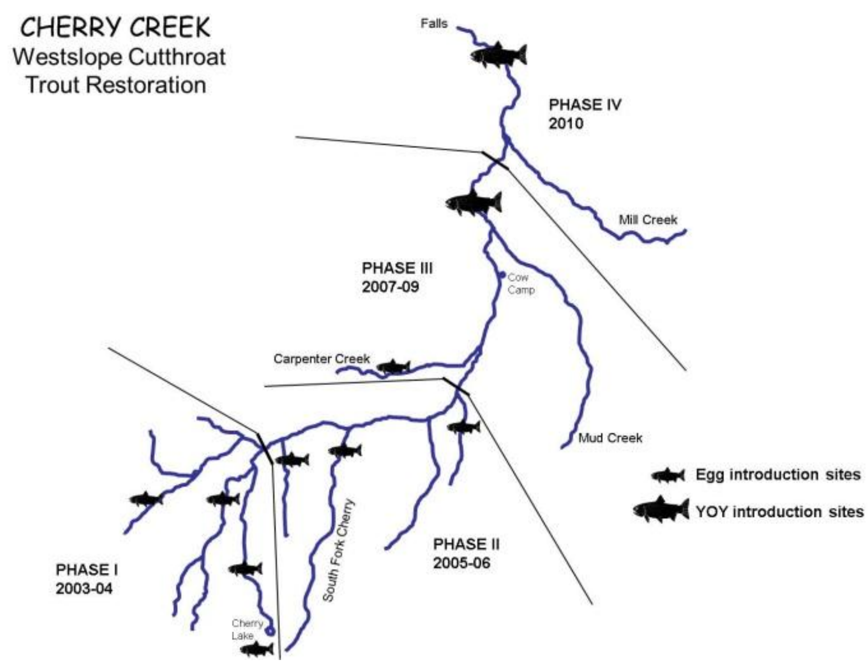
Box 1: Overarching goals of Turner Biodiversity's Cutthroat Trout Initiative

1) Develop *project working groups* that collaboratively define leadership roles and are responsible for all aspects of the projects.
2) Select re-introduction sites that encompass large geographic areas with high quality and diverse habitats. This allows the recovery of robust populations with diverse life-history strategies that can resist threats such as climate change, catastrophic events, and invasive species.
3) Eliminate nonnative competitors at the re-introduction site through physical and/or chemical renovation, and prevent their recolonization.
4) Establish self-sustaining populations, large enough to withstand environmental and demographic stochasticity, and likely to persist over the long-term (> 100 years) with no human intervention.
5) Establish a monitoring strategy that evaluates key project aspects and allows adaptive management to improve and guide future efforts.
6) Provide the public with opportunity to learn about and experience restored cutthroat trout populations.

The following two case studies outline our implementation of these goals. These two efforts represent TBD's flagship cutthroat recovery projects, and are the two largest cutthroat trout restoration efforts ever undertaken in the U.S.

CASE STUDY 1 – Cherry Creek WCT Project, Madison River Drainage, MT.

Encompassing approximately 100 km of stream habitat and 8 acres of lake habitat, this was one of the largest piscicide renovation projects ever undertaken for cutthroat trout conservation. The majority of the project took place on private land and was a collaborative effort among the land owner – Turner Enterprises, Inc. – and public resource management agencies – MTFWP and the USFS.



Map 3: The Cherry Creek project area

Nonnative fish removal

Due to the large spatial scale involved, nonnative fish were removed from the treatment area in four phases, with each phase treated on at least two separate occasions (***Map 3***). The piscicide (antimycin) was applied at a rate of 10 parts per billion (ppb) to remove rainbow (*O. mykiss*), brook (*Salvelinus fontinalis*), and Yellowstone cutthroat (*O. c. bouvieri*) trout from phases 1 and 2. Rotenone (50 ppb) was used to eliminate the nonnative trout in phases 3 and 4. While phases were isolated from recolonization during project implementation by a combination of natural and artificial fish movement barriers, the overall project area is protected from reinvasion by an 8 m waterfall at the downstream end of phase 4 (***Map 3***; ***Figure 16***). Piscicide applications were completed in 2010.

Native introductions

WCT introductions into the phase 1 area were initiated in 2006 using remote stream-side egg incubators. Introductions were completed in 2012 with the stocking of young-of-year fish into phase 4. During this time, approximately 37,000 eyed eggs and 8,500 young-of-year fish from multiple wild populations and a hatchery conservation broodstock were introduced. All temporary fish barriers were removed in 2011 to reconnect the phases. Post-treatment monitoring documented WCT throughout the project area in 2012 and at least two years of natural reproduction, while finding no remaining nonnative salmonids. We expect that natural reproduction from these introduced fish will continue to fill the project area until the system's carrying capacity is reached.

Conservation value

The Cherry Creek project is a significant conservation achievement for WCT on the east side of the continental divide. This project increases the length of stream occupied by WCT in the Madison River basin from 7 km to over 100 km (or from 0.3% of historical occupancy to almost 5%). Perhaps more importantly, the success of the Cherry Creek project has catalyzed several other cutthroat trout reintroduction projects in southwestern MT. It is important to note that due to the large barrier falls (***Figure 16***), the Cherry Creek project area was historically fishless. Thus, this project actually represents a novel introduction of WCT to a previously inaccessible area within the subspecies' historical range. By providing full- and part-time biological staff, purchasing equipment and chemicals, and cost-sharing agency expenses, Turner Enterprises, Inc. carried over 75% of the project cost.

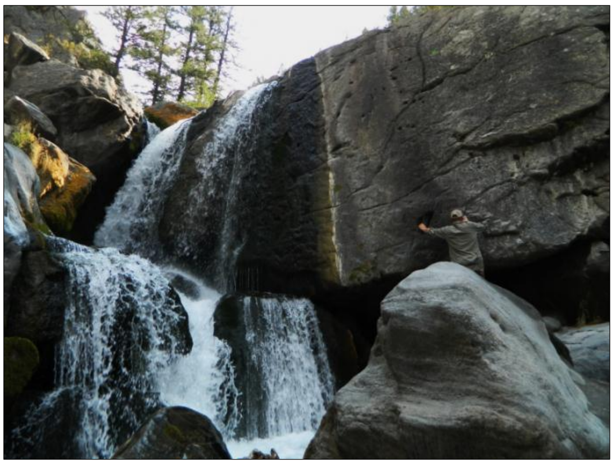


Figure 16: The 8 m falls, downstream of phase 4 on Cherry Creek, creates an effective fish barrier.

Awards

The Cherry Creek project is recognized as a model example of a collaborative conservation effort, receiving a *Collaborative Group Award* from the MT Chapter of the American Fisheries Society (AFS) in 2007, a *Collaborative Aquatic Stewardship Award* from the USFS in 2010, and a *Conservation Achievement Award* from the Western Division of AFS in 2011. This and other cutthroat trout projects were a major reason that Turner Enterprises, Inc./Turner Endangered Species Fund received the *President's Fishery Conservation Award* from the National AFS in 2012.

Education & research

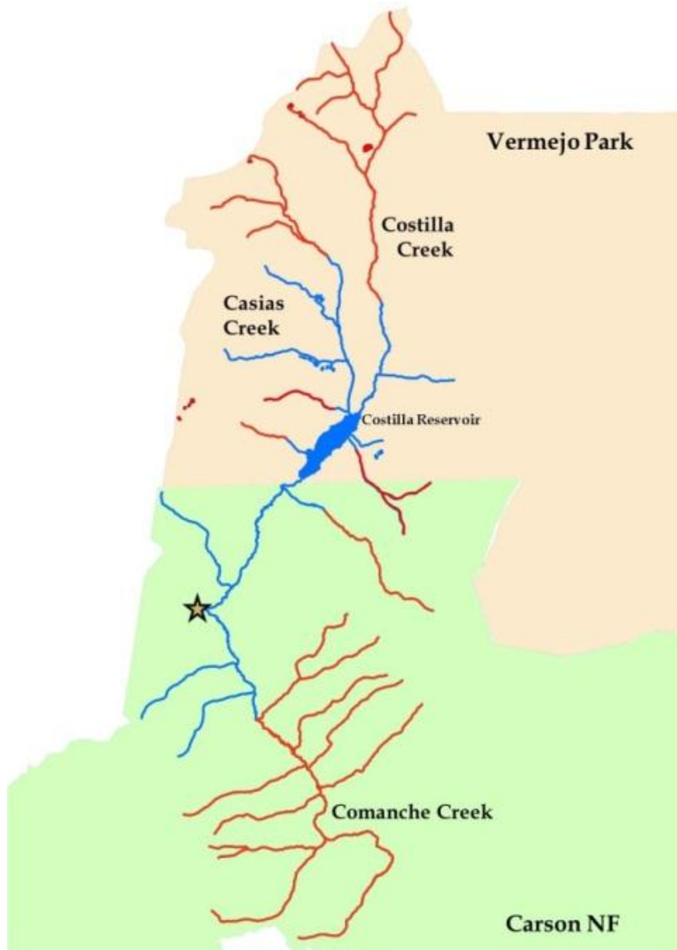
The project has also proved to be fertile ground for education and research. Five graduate students used different aspects of the project to receive doctoral and master's degrees. Numerous undergraduate and high school students worked on the project as volunteer or paid technicians. Throughout the project, researchers and managers collaborated on project implementation and evaluation, allowing for adaptive improvements and greater efficiency as the project unfolded. The scope of this project yielded innovative research on genetically moderated survival, growth and dispersal of repatriated cutthroat trout stocks, the impacts of piscicides on non-target organisms; habitat moderated movement of fish in renovated habitats, and the genetic fitness of multiple source stocks. This research and resulting publications in peer reviewed scientific journals will be invaluable to guide and improve future aquatic conservation efforts.

Detoxifying rotenone using potassium permanganate (red color) during fish removal treatment of Cherry Creek (phase III).

CASE STUDY 2 – Costilla Creek RGCT Project, Rio Grande River Drainage, NM and CO.

As the **most ambitious watershed renovation project <u>ever</u> initiated on behalf of cutthroat trout**, the Costilla Creek project encompasses approximately 190 km of stream habitat (55% on Vermejo Park Ranch) and 20 lakes (***Map 4***).

This is a collaborative effort among TBD, Vermejo Park Ranch (VPR), NM Department of Game and Fish (NMDGF), CO Parks and Wildlife (COPW), USFS, and Trout Unlimited (TU), and was originally designed in 1998 to recover native RGCT to 22 km of stream and four lakes, protected by an artificial fish migration barrier.



Map 4: The Rio Costilla project area. Red lines = stream segments that have been renovated and re-stocked with RGCT. Yellow star = location of the final artificial fish movement barrier.

Project implementation

Antimycin was applied in 2002 to remove nonnative brook, rainbow, and brown (*Salmo trutta*) trout from historical RGCT habitat in the headwaters of Costilla Creek. RGCT were then re-introduced by stocking 9,500 young-of-year fish from hatchery broodstock into renovated stream habitat for three consecutive years (2002-2004). By 2005, the post-treatment RGCT population comprised similar sized fish, at densities comparable to the pre-treatment, nonnative trout population (***Figure 17***).

Unfortunately during a 2004 lake restocking action, rainbow trout were inadvertently introduced back into the project area. Administrative and regulatory resistance prevented immediate localized nonnative removal with piscicide, and by 2007 hybrid rainbow-RGCT trout were prevalent in the system. In 2008 a large portion of the project area was successfully re-treated with rotenone (50 ppb) to remove these hybrids. This time, mixed-aged individuals from the NMDGF hatchery broodstock were introduced (1,900 in 2008 and 10,200 in 2009). The population recovered by 2010, with no evidence of hybrids or other nonnatives remaining.

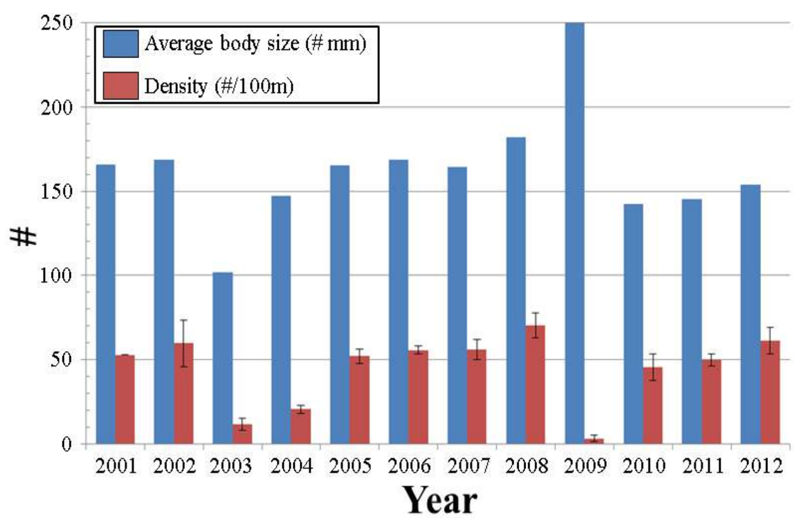


Figure 17: The density of trout (#/100 m; red bars), and their average length (mm; blue bars) in upper Costilla Creek before and after renovation. Piscicide treatment and re-stocking of RGCT occurred after the 2002 sample and after the 2008 sample (after removal of hybrids).

Project expansion

A 2007 environmental assessment proposed expanding the project area to its current size of 190 km of lotic habitat and 20 lakes. Watershed renovation is currently ongoing in phases, but the project is complicated due to its size, regulatory requirements, the need for at least seven artificial and temporary fish movement barriers (e.g., ***Figure 18***), a 15,700 acre-feet reservoir, and public resistance. To date, nearly 100 km of stream (40% on private land) and 9 lakes have been chemically renovated and restocked with RGCT.

Figure 18: Temporary fish movement barrier on Allen Creek in the Rio Costilla watershed to prevent nonnative fish migration back into a renovated section of the stream.

Conservation value

Assuming this project meets its scheduled completion date of 2020, it will represent a 20% increase in the amount of stream occupied by RGCT within their historical range. However, this effort would not have been initiated without Turner support (50% cost share), and is the flagship restoration effort on behalf of RGCT for the NMDGF. Planning and implementation of the Costilla Project is largely responsible for the development of consistent NM state guidelines regarding the use of piscicides, and for re-development of NMDGF's native cutthroat trout hatchery broodstock; both important steps for range-wide restoration and conservation of the species

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2012 summary of all TBD cutthroat projects

Actions initiated or completed by TBD and our partners to accomplish the goals of the Cutthroat Trout Initiative (see ***Box 1***) in 2012 are described below (see ***Table 3***):

Cherry Creek, MT (***Case Study 1***) – In 2012, approximately 4,000 young-of-year WCT (e.g. ***Figure 19***) were stocked into Phase 4 of the project area, and constituted the final scheduled introduction to the system. We expect that natural reproduction will fill the project area to capacity over the next 2-3 years. We continued monitoring in 2012, documenting that WCT can now be found throughout the project area, with at least two years of natural reproduction documented. No nonnative trout were detected after hundreds of man-hours of electrofishing in 2012. Over 2,800 WCT were individually marked with passive integrated transponder (PIT) tags, and TBD in partnership with the Wildlife Conservation Society (WCS) are using these fish to better understand survival, movement, growth, and genetic fitness of the introduced population (***Figure 20***).

Figure 19: Young-of-year WCT stocked into Cherry Creek.

Figure 20: TBD staff use mobile antennae to search for PIT tagged WCT in Cherry Creek.

NF Spanish Creek, MT – In 2012, TBD continued to gather pre-treatment information necessary for planning this project. A fish barrier site was located and a barrier feasibility study completed. A second population monitoring section was established in the upper watershed and the project area was reconnoitered to better define a potential treatment schedule. An environmental analysis was initiated to evaluate the introduction of WCT into upper Placer Creek, a fishless tributary to NF Spanish Creek. We continue to lean heavily on our project partners to move this project forward.

<u>Green Hollow Creek, MT</u> – Since 2003, TBD has used electrofishing to reduce brook trout numbers in upper Green Hollow Creek, and thereby mitigate disease and competitive pressure on the Green Hollow II arctic grayling (*Thymallus arcticus*) conservation broodstock. In 2010 the focus of the removal program shifted from reduction to elimination in anticipation of reintroducing WCT to the creek. Over 3,500 brook trout were removed by electrofishing in 2012, and we anticipate total removal of brook trout within one to two years. In conjunction with this project, we are collaborating on an innovative effort that is exploring the utility of using carbon dioxide as a nonnative fish removal tool.

<u>Bear Trap Creek, MT –</u> Due to its remoteness and lack of an obvious barrier site, this project is the least likely of the Cutthroat Trout Initiative to be implemented. However, in 2012 TBD began the necessary steps to assess project feasibility. Multiple population monitoring sections were established and sampled, a few fish that visually looked like cutthroat trout were sampled for genetic purity, and the watershed was reconnoitered to assess the potential scale of the project.

<u>Greenhorn Creek, MT</u> – This project entered final planning stages in 2012 in anticipation of a piscicide treatment in 2013. A permanent fish barrier (***Figure 21***), completed in October, will prevent nonnative re-invasion of the project area. The entire project area was assessed for a final time in order to identify all fish-holding water and develop a treatment plan. Fish population monitoring was conducted at seven, 100 m sites in the north and south forks to establish a pre-treatment population baseline. Potential donor streams (to provide WCT for introduction to Greenhorn Creek) were sampled and are being genetically tested. Final environmental analyses and permitting for the piscicide application are progressing.

Figure 21: Permanent fish movement barrier on Greenhorn Creek.

<u>Costilla Creek, CO/NM</u> (***Case Study 2***) **–** In 2012, we installed two temporary fish barriers in Dominquez and Allen creeks, and renovated habitat above the barriers in anticipation of restocking RGCT. Around 4,500 young-of-year and age-1 RGCT were stocked into upper Casias Creek where nonnative removals were completed in 2011. To support recreational angling at VPR, several hundred RGCT were stocked into Lake #1 in July 2012. Glacier Lake and Lake #1 were also stocked with young-of-year RGCT in September 2012. Electrofishing was conducted in Casias and Costilla creeks to monitor the recovery of previously introduced RGCT. The data (***Figure 17***) shows the RGCT population in upper Costilla Creek is similar in size structure and density to the pre-treatment, nonnative fish community.

<u>Las Animas Creek, NM</u> – The Las Animas Creek Native Fishes Project was initiated in 1998 to restore the fish community of RGCT, Rio Grande sucker (*Catastomus plebeius;* a state species of concern), and Rio Grande chub (*Gila pandora*) to the upper 30 miles of Animas Creek. This fish community, once common in NM and southern CO, can no longer be found due to habitat loss and the introduction of exotic competitors. Animas is the southernmost historical distribution of RGCT and Rio Grande sucker, and this project presents an opportunity to restore a fish community that is functionally extinct across its range.

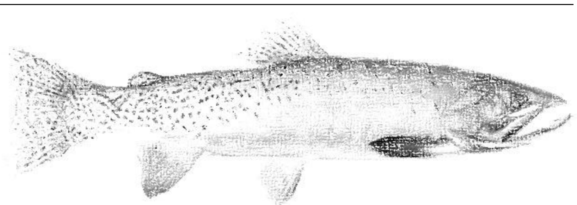
Half of the project area is located on the Ladder Ranch, with the remainder on the Gila National Forest. The project was initially opposed by a third party that owned ~one mile of Animas Creek between the Ladder and the national forest boundary. To move the project along, the Ladder purchased the intervening land in 2002. Despite this, the project stalled in 2003 due to other priorities among partners, political resistance, and the presence of the threatened CLF. In 2011 the NM Game Commission approved project implementation, but a severe 2012 fire season on the Gila National Forest took priority and the USFS was unable to commit resources to the project. Nevertheless, we continued pre-treatment monitoring in 2012, including fish distributions, abundance, and genetic analysis of Rio Grande sucker populations. TBD is now considering a shift from chemical to mechanical removal methods, which could allow the project to proceed while the permitting process for chemical renovation runs its course.

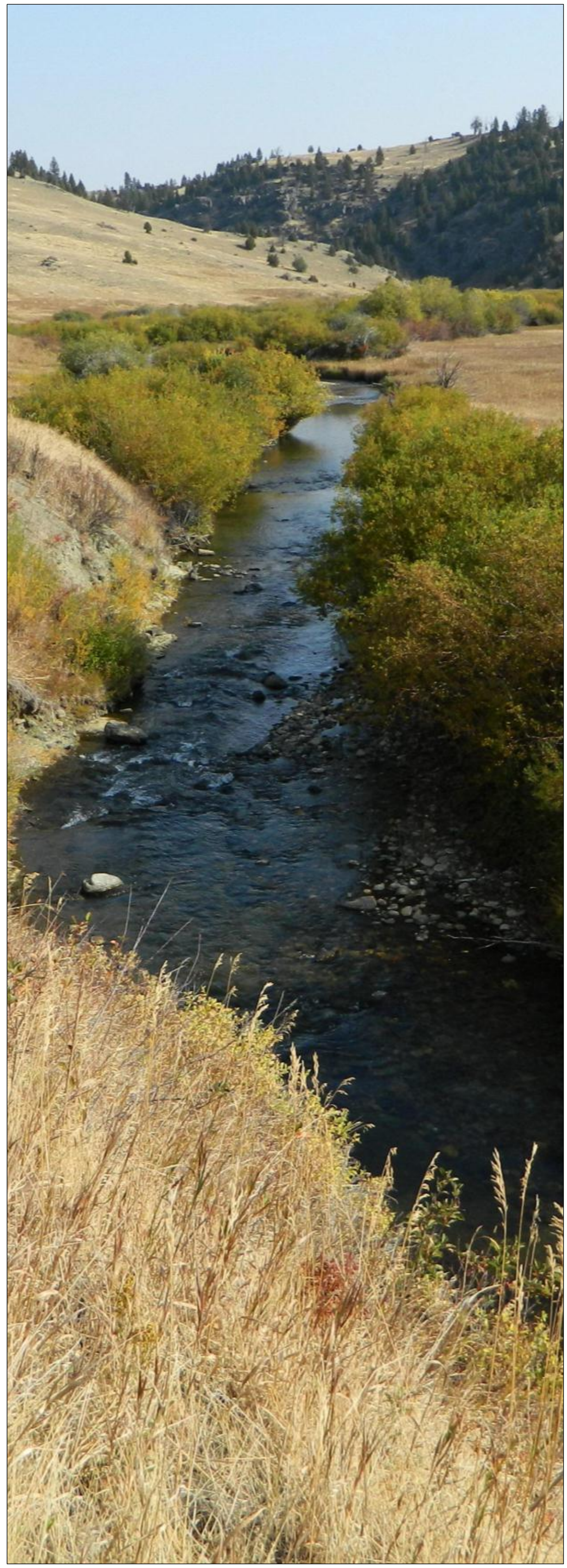
<u>Vermejo River, NM</u> – This is the only project in the Cutthroat Trout Initiative where cutthroat trout (RGCT) actually remain within their historical range on Turner ranches, albeit in sympatry with nonnative brook trout. This population is threatened by encroachment of rainbow trout hybrids and competition with brook trout. In 2010, TBD initiated a project to improve the status of this extant RGCT population. Our three major goals were to: **(1)** reduce or eliminate rainbow trout hybrids in the upper Vermejo River watershed to maintain or reduce the current level of introgression, **(2)** reduce brook trout numbers in the upper Vermejo River watershed to maintain and perhaps enhance RGCT populations, and **(3)** determine source rainbow trout populations in the drainage. In order to accomplish these goals, TBD removed nonnative fishes from over 30 km of stream, using electrofishing from 2010-12. Over 10,000 adult brook trout have been removed, including 3,528 in 2012. More importantly, while 17 rainbow-cutthroat trout hybrids were removed from the population in 2010, only two were detected in 2011, and none in 2012. Overall RGCT numbers remained relatively stable through the three years of monitoring (***Table 4***).

An important development in 2012 was the identification of a neighboring ranch's private fishing ponds as the likely source of rainbow trout invasion into the Vermejo River RGCT population. A fish screen was installed to prevent additional escapement from the ponds and TBD is working with the landowner to switch their fish stocking program to sterile rainbow trout.

Table 4: Summary of fish captured in the Vermejo River

	2010	2011	2012
Total stream length sampled (km)	23.8	31.2	32.2
# brook trout	2583	5401	3528
# RGCT x Rainbow trout hybrids	17	2	0
# RGCT	2411	4012	3624
Brook trout density (per km)	109	173	110
RGCT density (per km)	101	129	113





Phase IV of the Cherry Creek WCT restoration project.

~ BLACK-FOOTED FERRET ~

***Mustela nigripes* –**
– ESA listing: ENDANGERED

STATUS: *Ongoing*

Principal biologist:
- *Dustin Long*

Background

The historical range of the black-footed ferret 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 burrows for shelter, the historical range of black-footed ferrets coincided with distributions of the black-tailed prairie dog (BTPD; *C. ludovicianus*), Gunnison's prairie dog (GPD; *C. gunnisoni*) and white-tailed prairie dog (*C. leucurus*). The major threat to black-footed ferrets has been loss of prairie dog colonies due to grassland conversion, rodenticide use, and disease. As prairie dogs were lost from the landscape, ferret populations declined to a point where the species was considered extinct.

Early restoration efforts followed the 1964 discovery of a small relict ferret population in Mellette County, SD. However, captive breeding of animals from this population failed, and the last record of ferrets at the Mellette site was in 1974.

In 1981 another population was discovered in Meeteetse, WY. Eighteen ferrets were removed from this population in 1986, and were used as founder for the federal captive breeding program.

Extant populations, both captive and reintroduced, all descend from these 18 founding animals. Although the black-footed ferret remains one of the most endangered mammals in North America, the species now exists in the wild at 16 reintroduction sites across North America.

Key recovery criteria stated in the 1988 black-footed ferret Recovery Plan is to establish a population of 1,500 free-ranging adult black-footed ferrets, comprising 10 or more populations, with no fewer than 30 breeding adults in any population. As of 2010, it is believed that the free-ranging adult standard (i.e., 1,500 individuals) is approximately 47% achieved and the establishment of 10 populations with no fewer than 30 breeding adults is 40% achieved.

Our goal is to make a substantive contribution to the numerical and ecological aspects of black-footed ferret recovery. We aim to restore up to four populations (> 30 family groups) that count towards species recovery. The potential exists to restore two such populations at Vermejo Park Ranch (VPR), and one each at Bad River Ranches (BRR) in South Dakota, and the Z-Bar Ranch in Kansas.

One population at VPR will be situated in short-grass prairie occupied by black-tailed prairie dogs. The second VPR population will be reintroduced to high elevation grasslands occupied by Gunnison's prairie dogs. The population at BRR will be situated in northern mixed-grass prairie occupied by black-tailed prairie dogs, while the ferret population at the Z-Bar Ranch will be restored to southern mixed-grass prairie occupied by black-tailed prairie dogs.

In conjunction with a ferret release strategy, we are engaged in restoration of ferret habitat through strategic expansion and management of prairie dog colonies on Turner properties.

Since 2008, TESF has conducted permanent releases of 240 black-footed ferrets to VPR (***Table 5***). In addition, we have implemented temporary ferret releases at both VPR and BRR as part of a ferret pre-conditioning effort. We currently have two ferret populations on Turner properties, both of which are located at VPR (***Map 5***). This project achieved a major milestone in 2009 when we recorded wild ferret reproduction at VPR (see 2009 Press Release: ***page 25***).

Table 5: Release of black-footed ferrets on Turner property.

Year	Ranch	#	Release type	Release site – prey colony
2005	VPR	15	T	BTPD
2006	VPR	16	T	BTPD
2007	VPR	44	T	BTPD
2008	VPR	54	P	BTPD
2009	VPR	89	P	BTPD
	BRR	13	T	BTPD
2010	VPR	33	P	BTPD
	BRR	14	T	BTPD
2011	VPR	20	P	BTPD
	BRR	10	T	BTPD
2012	VPR	20	P	GPD
		24	P	BTPD

KEY:
T = Temporary release; P = Permanent release

2012 activities

Vermejo Park Ranch, New Mexico

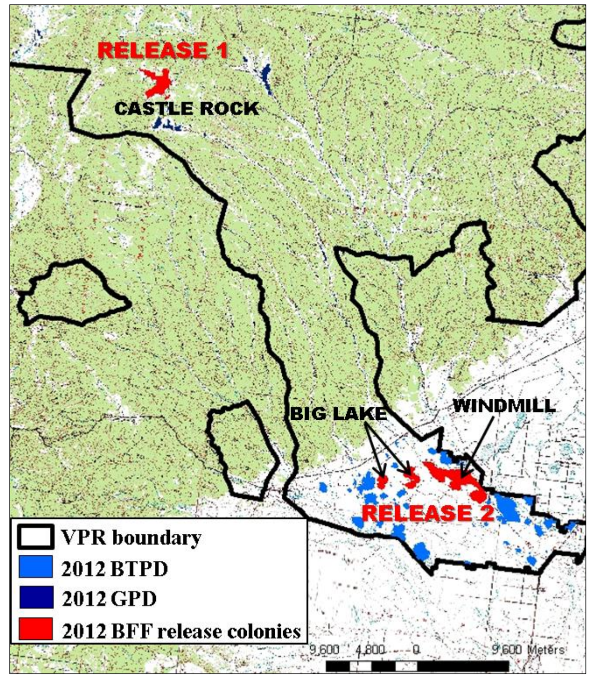
VPR: Black-footed ferret actions

In 2012, TESF conducted two black-footed ferret releases:

1. We released **20 ferrets** in September 2012 onto a **Gunnison's prairie dog colony** in the **Castle Rock area of VPR** (*Map 5*; *Table 5*). This release represents the first ferret reintroduction onto a Gunnison's prairie dog colony in New Mexico, as well as the first time ferrets have been released into the Castle Rock area by TESF.
2. We released **24 ferrets** in November 2012 onto a **black-tailed prairie dog colony** at the **southern end of the ranch** (*Map 5*; *Table 5*).

To facilitate **Release 1,** TESF completed the administrative framework necessary to release ferrets on Gunnison's prairie dogs at the Castle Rock site. During 2012, all federal and state permitting requirements were met, as well as the submission of a successful ferret allocation proposal to the USFWS. During 3-weeks of post-release monitoring at the Castle Rock site (Release 1), we detected 11 out of the 20 ferrets released. Although we do not have an estimate of detection probability, we suspect that more ferrets were present.

In February 2012, prior to implementation of ferret releases at the Windmill and Big Lake black-tailed prairie dog complexes (**Release 2**), we conducted a 10-day ferret survey to quantify survival from 2011 releases. This indicated that a minimum of 5 adult males were present at this site. No females or unidentified (wild-born) ferrets were observed. The apparent loss of all females and kits in 2011, many of whom were wild-born, was likely a result of record drought conditions from late 2010 through 2011. A review of past drought events (2005-2012) and ferret survival during those years strongly suggests drought has a profoundly negative impact on ferret survival. A follow-up survey at Windmill and Big Lake prairie dog complexes, immediately prior to the November 2012 ferret release resulted in no ferret detections.



Map 5: 2012 black-footed ferret release sites on VPR in relation to black-tailed prairie dog (BTPD) and Gunnison's prairie dog (GPD) colonies.

VPR: Prairie dog actions & management

Mapping work (***Figure 22***) conducted during 2012 revealed that the 44 black-tailed prairie dog colonies on VPR grew by almost 9%, to cover a total area of 9,758 acres. Density estimates from three of these colonies (Windmill, 00-10, Big Lake) yielded an estimate of 19 prairie dogs/ha. Juveniles represented 37% of the population. This contrasts with 2011 density estimates, where few prairie dog pups survived the summer, likely due to a severe and prolonged drought. It appears that most pups survived the 2012 summer.

Figure 22: Mapping BTPD colony. (Credit: J. Chipault).

All GPD colonies in the Costilla Basin, half of the Castle Rock Colony complex, and two colonies (08-1 and 09-2) in the Van Bremmer Canyon were prophylactically dusted with Deltamethrin in early spring to reduce plague risk.

VPR's 24 GPD colonies grew 55% in 2012 to cover 2,301 acres. Density estimates on select portions of the Castle Rock colony indicated 182 prairie dogs/ha.

Other prairie dog management activities conducted during 2012 include:

- Capture and translocation of 1,223 GPDs from the Propane Colony and their release into the Costilla Basin.
- Testing the effectiveness of raptor perches, tree carcass barriers, and recreational shooting to control black-tailed prairie dog colony expansion.
- In 2012 TESF personnel shot ~ 2,600 prairie dogs on VPR. Of those, ~ 450 were shot on ferret release colonies. Shooting does not occur during parturition and whelping (April-May). The use of non-toxic (non-lead) ammunition is required for all prairie dog shooters.
- To discourage shooting on closed colonies and of non-target species, we prepared an informational flyer in 2012 to accompany the shooting map provided to prairie dog shooters.

VPR: Education and research

The black-footed ferret and prairie dog efforts at VPR have made major contributions to ecological research. In 2012, **David Eads** (*Colorado State University*) completed his Ph.D. field work, and **William Briggs** (*Northern Arizona University*) completed his M.Sc. thesis. We assisted **Gabriela Castellanos-Morales** (*National University of Mexico*) with range-wide mapping of black-tailed prairie dog genetic variation for her Ph.D. research. Ph.D. candidate, **Chuck Hayes** (*University of New Mexico*) completed his final season of data collection, and **Dean Biggins** (*USGS*) completed a small rodent plague study in the Costilla Basin.

Bad River Ranches, South Dakota

BRR: Black-footed ferret actions

TESF did not engage in any ferret related work at BRR in 2012 due to a dispute with the Iversen Ranch regarding an unsubstantiated claim of prairie dog encroachment from the BRR Ash Creek Recovery Area (ACRA) onto their property. With the resolution of this dispute in late 2012, we aim to pursue a ferret release on BRR in 2013.

BRR: Prairie dog actions & management

Prairie dog mapping work at BRR during 2012 indicated that there are a total of 38 black-tailed prairie dog colonies covering 2,689 acres. Colonies in the ACRA grew by 9% since 2011, and now cover 1,644 acres.

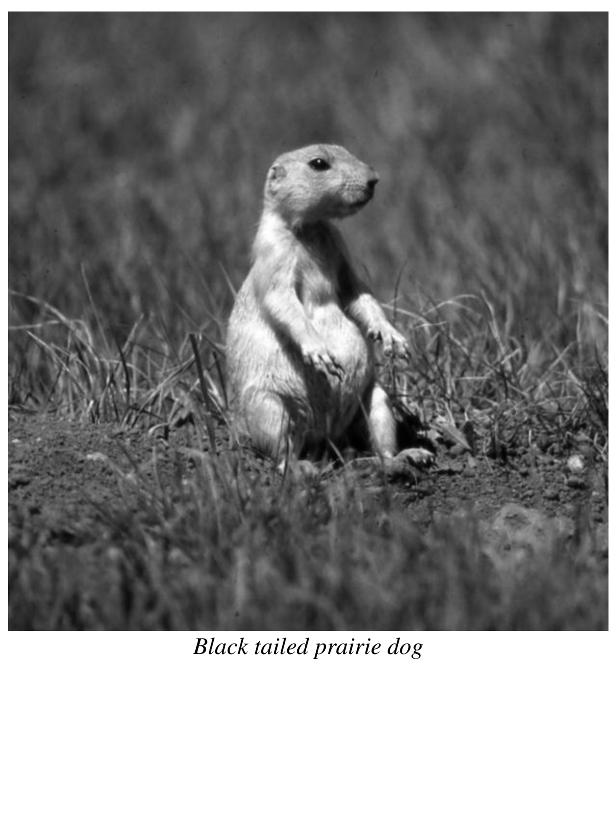
In 2011 we were actively managing 40 BTPD colonies, covering an area of 1,747 acres. These "management" colonies were found to have declined by 40% in 2012, whereby we now have 26 management colonies, covering 1,045 acres. The cause of this overall decline in BRR's prairie dog population is currently unknown. Disease sampling returned negative results for both plague and tularemia.

Z-Bar Ranch, Kansas

Z-Bar personnel implemented management actions to prevent tall vegetation encroachment of BTPD colonies in 2012. This is a continual threat to prairie dog restoration in this high-rainfall area. The Z-Bar currently has 14 BTPD colonies, covering an area of 592 acres. This represents only a 0.5% areal increase from the total 2011 acreage. This lack of significant growth was likely due to the 115 mm of rain in February which resulted in an early flush of vegetation, compounded by a delayed mowing effort.

Ladder Ranch, New Mexico

There are two small BTPD colonies on the Ladder Ranch. One comprises 10 – 15 individuals, and covers under an acre. The second comprises 5 – 10 individuals. Ranch manager, Steve Dobrott, observed a sudden population decline in 2011 and responded by dusting both colonies with Deltamethrin. The cause of the population decline may have been attributable to plague or drought, likely the latter.



Black tailed prairie dog

PRESS RELEASE – First Black-footed Ferret Born in New Mexico in 75 years

Turner Endangered Species Reports Important Success for Long-term Restoration Effort

FOR IMMEDIATE RELEASE

Contact: Mike Phillips, 406-556-8500
mike.phillips@retranches.com

September 17, 2009

The first black-footed ferret to be born in the wild in New Mexico in over 75 years was confirmed for the first time during spotlight surveys at the Vermejo Park Ranch on September 16, 2009. Ferrets are intensely curious (a useful trait for a predator) and somewhat tolerant of humans in part because they are nocturnal and have relatively few encounters.

BOZEMAN, Mont., -- Today the Turner Endangered Species Fund reported that the first black-footed ferret to be born in the wild in over 75 years had been discovered at Vermejo Park Ranch in north-central New Mexico. Since 1998, the Fund has participated in the federal program to recover the ferret which is one of the rarest animals in the world. First with captive breeding and more recently with reintroductions to the wild grasslands at Vermejo, the Fund has made substantive contributions to the recovery program.

Reintroductions conducted between 2005 and 2007 at Vermejo involved 75 ferrets. Eventually 40 of these animals were recaptured and, as planned, translocated to other restoration sites in the western United States for permanent release. The remaining 35 ferrets were never retrieved and probably died after living for some time in the wild at the ranch. Ferrets are notoriously short-lived, with an average life span of only a few years.

In 2008 the Fund released 54 ferrets that were allowed to remain free-ranging at Vermejo. The wild-born animal discovered last night was an offspring from two of these animals. Currently about 10 ferrets are free-ranging at Vermejo. Additional reintroductions involving up to 60 ferrets will be carried out this fall. Reintroductions will continue until establishment of a viable population of about 30 family groups, or about 120 ferrets.

The black-footed ferret is one of the rarest mammals in the world and is protected under the federal Endangered Species Act. Since 1981 the U.S. Fish and Wildlife Service has worked with multiple partners, like the Turner Endangered Species Fund, to recover the species. There are currently 18 black-footed ferret reintroduction sites located in eight states with one site in Mexico. Black-footed ferrets have been reintroduced in Wyoming, South Dakota, Montana, Arizona, Colorado, Utah, Kansas, and New Mexico. Today, from the 18 individual ferrets taken from the wild between 1985-1987 to begin the captive breeding program, approximately 800 to 1,000 individuals now live in the wild.

The Turner Endangered Species Fund is a non-profit operational charity dedicated to preserving nature by ensuring the persistence of imperiled species and their habitats with an emphasis on private land. The Fund was formed by Ted Turner in June 1997.

Vermejo Park Ranch contains about 60,000 acres of shortgrass prairie on which the Fund conducts the ferret restoration project. The ranch is located in north-central New Mexico and is owned by Ted Turner. Vermejo Park is one of the few ferret reintroduction sites to be located on private land.

PRAIRIE DOG FIELD NOTES – Dustin Long

While at Bad River Ranches, I took a drive up to the Ash Creek Recovery Area (ACRA). I drove the east and west benches, observing only one prairie dog – despite the warmth of the day, and little wind. During my drive, I occasionally stopped and glassed the colonies, listening for alarm calls. The one prairie dog I did observe was toward the north end of the west bench. I did not hear any alarm calls on any of the colonies. I also walked a ¼ mile loop through the center of the large colony on the west bench. I did not observe any carcasses or anything unusual. The burrows appeared to have been recently active, although there was no evidence that any activity had occurred in the days immediately preceding my visit.

I did observe 12 raptors. This suggests to me that prairie dogs have been active in the area recently.......however, it could also be that they were scavenging prairie dog carcasses. I did not observe any raptors with a prairie dog.

Last month, I observed a few prairie dogs, but heard many while walking along the vegetation barrier which was not dusted last year. In my opinion we could be witnessing one of two events: plague or torpor.

Based on what I've read, heard, and observed, this is the wrong time of year for plague and I would expect there to be evidence in the form of a carcass .... or at least part of a carcass. We also had the colonies dusted for plague in spring 2012. Of course none of these observations or activities guarantees the absence of plague. On the other hand, torpor is normally a response to adverse environmental conditions......quite often food shortages. Vegetation on the colonies appears sufficient and so lack of forage does not explain why the prairie dogs may be in a state of torpor. Note: I have also noticed black-tailed prairie dogs on Vermejo Park Ranch inexplicably disappear for a few weeks during winter when weather conditions and forage both seemed suitable for above-ground activity.

With the help of Tom LeFaive's, BRR's manager, I will keep a close eye on the ACRA colonies for signs of activity. If activity does not increase in the coming months I will head up to BRR in early spring 2013 to collect carcass/flea samples.

~ APLOMADO FALCON ~

Falco femoralis septentrionalis
– ESA listing: ENDANGERED

STATUS: *Ongoing*

Principal biologists:
- *Mike Phillips*
- *Tom Waddell*
- *Mackenzie Mizener*

Background

The aplomado falcon's range once extended from the southwestern U.S. to Argentina. This included southeastern Arizona, southern New Mexico, and parts of Texas.

Population declines began in 1890, and by 1950 the bird was largely extirpated from the U.S. Implicated in this decline are: habitat loss, pesticides, human exploitation, and disease.

With listing under the ESA in 1986, The Peregrine Fund (TPF), the Mexican government, and the USFWS launched a cooperative recovery program to establish 60 breeding pairs in the U.S.

Aplomado falcon restoration on the Armendaris is led by TPF, with collaboration from the USFWS, NMDGF, White Sands Missile Range (WSMR), the ranch, and TESF. From 2006 to 2012, 112 captive-bred aplomado falcons have been released on the Armendaris (***Figure 23***).

Figure 23: Aplomado falcons have been released on the Armendaris Ranch since 2006. This involves placing falcons into a hack box atop a tower structure from which they are released after several days.

2012: Aplomado falcons on the Armendaris

During 2012, TESF participated in the release and management of 10 juvenile falcons on the Armendaris Ranch (***Table 6***).

Table 6: 2012 Aplomado falcons released on the Armendaris.

$^{\Psi}$Color band/ID	Sex	Hack box *Date; **age**$^{\Phi}$	Release †Date; **age**$^{\Phi}$	Last seen $^{\Omega}$Date; **age**$^{\Phi}$
Red 16	M	25 June; **34**	1 July; **40**	30 Sept.; **131**
Green 14	M	25 June; **34**	1 July; **40**	6 Nov.; **168**
Red 49	M	25 June; **32**	1 July; **38**	1 July; **38**
Green 35	M	25 June; **33**	1 July; **39**	1 July; **39**
Green P3	F	10 July; **34**	17 July.; **41**	19 Sept.; **105**
Red 37	M	10 July; **34**	17 July.; **41**	18 July; **42**
Red M3	F	10 July; **34**	17 July.; **41**	25 Oct.; **141**
Green N3	F	10 July; **33**	17 July.; **40**	Late Dec.
Green 05	M	10 July; **33**	17 July.; **40**	20 Sept.; **105**
Red N4	F	10 July; **33**	17 July.; **40**	8 Nov.; **154**

KEY:
Ψ = Located on right leg
**** = Date of entry to hack box***
Φ = Age of individual in days
† = Date released from hack box.
Ω = Date/age at last detection

Observations & management: 2012 update

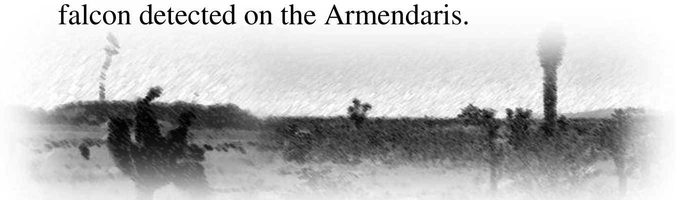
Monitoring

Falcons were monitored throughout the year on and around the Armendaris. This involved unscheduled driving surveys. No breeding pairs or nesting behavior was documented in 2012.

Supplemental Feeding Program

Following TPF's successful hacking of juvenile falcons in 2006 on the Armendaris, Tom Waddell continued supplemental feeding through spring 2007. By late December 2006, only two falcons returned to feed each day. This pair established a nest nearby, fledging two young in 2007. This was the first documented case of 9-month old falcons nesting and rearing young.

In an attempt to encourage falcon residency on the Armendaris, we implemented supplementary feeding of released falcons in October 2012. By December, only two birds were detected on the Armendaris (IDs: *Green N3* and *GBB4*). *GBB4*, released at WSMR was regularly observed at the feeding station through December 7th. This bird was detected once more on December 21st. *Green N3* (***Table 6***; ***Figure 24)*** visited the feeding station every day of December (except December 1st-5th, and 7th), and by the end of the month was the only falcon detected on the Armendaris.



Aplomado falcons have been released into the Chihuahuan Desert grasslands of the Armendaris since 2006.

Figure 24: Green N3 was the only falcon detected on the Armendaris at the end of December 2012.

Artificial nest platforms

During 2012 we observed falcons at artificial nest platforms on the Armendaris. They did not use the structures for nesting purposes but rather for shade.

Hunting behavior

Observation of hunting events was obscured by uneven terrain, accessibility, and vegetation structure. Consequently, we only observed hunting behavior in the vicinity of the hack site and along roads in the area. The first documented pursuit occurred on 22nd July at approximately 0750 h, where a group of 4 – 5 falcons were seen chasing a small passerine. This pursuit failed. The first successful hunt was observed on 23rd August. Four of the released aplomado falcons were observed chasing a bat. Either Green 05 or Green N3 caught the bat in-flight at dusk. The falcon then consumed the bat on a nearby yucca.

The majority of observed hunting attempts involved several falcons chasing a single prey individual. During group hunts, falcons would take turns diving at the prey, while other falcons would fly ahead in an attempt to prevent prey escape.

Roosting Behavior

In the first weeks following release, we observed that falcons tended to roost close to the hack tower at the release site, often in yuccas.

Over time, the falcons began roosting at greater distances from release sites. The animals released earlier in July (***Table 6***) were generally the first to disperse, followed by animals that were released later in July.

Telemetry study

Despite 5 years of annual releases on the Armendaris, no aplomado falcons have persisted on the ranch. To determine the fate of animals released on the Armendaris, three of the released females in 2012 were fitted with GPS backpack transmitters by TPF so that movement patterns and survival could be determined (***Figure 25***).

Figure 25: Aplomado falcon on the Armendaris fitted with GPS transmitters to provide movement and survival data. (Credit: J. Blue)

CAN APLOMADO FALCON RECOVERY SUCCEED IN THE UNITED STATES?

The northern aplomado falcon recovery plan, written in 1990, tentatively states that downlisting from endangered to threatened can occur once a minimum self-sustaining population of 60 breeding pairs has been established in the United States. It was estimated that implementation of this plan could lead to downlisting within 2 – 4 decades. However, it was deemed inappropriate at that time to designate delisting criteria until further research had identified the quantity of suitable habitat and other unknown factors. It should be recognized that only delisting would qualify as successful recovery, and the criteria for which would by definition be more stringent than downlisting.

Since 2006, 112 falcons have been released on the Armendaris, with only one recently released bird observed at supplemental feeding stations at the end of 2012. At a broader scale, of the 942 falcons released during the period 2002 – 2011 in west Texas and New Mexico, no pairs were evident in 2012.

During an aplomado falcon recovery meeting in Albuquerque, NM on October 30th 2012, attended by Turner representatives Mike Phillips, Tom Waddell, Chris Wiese, and Mackenzie Mizener (as well as representatives from the USFWS, White Sands Missile Range, BLM, NMDFG, and TPF), Bill Heinrich and Paul Juergens (TPF) presented their arguments for discontinuing falcon releases in New Mexico and west Texas. However, the majority of those present at the meeting leaned towards releasing birds again in 2013 and outfitting as many of them as possible with GPS transmitters to provide insight into the cause of their disappearance (i.e. dispersal or death).

The following email exchange (**emails 1 – 3, below**) in the days following this meeting discusses ideas of how best to proceed with northern aplomado falcon recovery. The exchange raises questions about whether recovery (as defined by the federal recovery plan) can be achieved, and gives insight into the internal struggles inherent to such efforts that attempt to arrest the extinction of species whose historical ranges are now unsuitable for supporting the species.

1.

From: Mike Phillips (TESF-Bozeman)
Sent: *Thursday, November 01, 2012*
To: *Patricia Zenone; Grainger Hunt*
Subject: *Aplomado Falcons*

Thanks again, Pat, for organizing and hosting the falcon recovery meeting on October 30, 2012. It was time well spent.

On the way home as I considered our discussion I grew increasingly comfortable with the notion of continuing the work in New Mexico, with a continued focus on telemetric monitoring and a renewed focus on surveys. This increasing comfort was based on my realization of the magnitude of any decision to terminate work in New Mexico (and west Texas). Since restoration potential seems lacking in Arizona, termination of the work everywhere except coastal Texas would probably be tantamount to accepting that the aplomado falcon cannot be recovered.

Put in that context, I think all would agree that terminating work in New Mexico and west Texas would constitute a major decision that should not be reached until all reasonable effort had been exhausted to succeed or, conversely, assemble data that unequivocally illustrated failure.

Mike Phillips

~ RESPONSE FROM GRAINGER HUNT (TPF) ~

2.

***From:* Grainger Hunt**
Sent: *Thursday, November 01, 2012 10:34 AM*
To: *Benjamin Tuggle*
Cc: *Mike Phillips (TESF-Bozeman)*
Subject: *Aplomado Falcons*

Dear Dr. Tuggle *[USFWS Southwest Regional Director; Editor's note]*

Before reading the rest of this letter, please consider the following two facts:

- **During 1993-2004, TPF released 839 aplomado falcons on the Texas coastal plain. The first productive pair appeared in 1995, and there were at least 37 pairs by 2002.**
- **During 2002-2011, TPF released 942 falcons in West Texas and New Mexico. There are no pairs in evidence today.**

I am writing to follow up on a conversation that you and Peter Jenny had a week or so ago regarding further releases of aplomado falcons in New Mexico and West Texas. The futility of such a venture is obvious to all of us at The Peregrine Fund on the basis of several decades of direct experience with this species, including eleven years of releases in West Texas and seven in New Mexico. It is not just that aplomado falcons cannot develop a breeding population in this region. Further releases there would be knowingly cruel and beyond the moral standards of our organization and yours. These facts have taken a long time to emerge, and neither your group nor ours can be faulted for having tried our best to achieve success. But there is no longer any reasonable alternative to the conclusion that almost all the released falcons are dead. The rare reports of falcon sightings here and there are insignificant in the context of a potential breeding population.

There is simply too much adversity, a root source of which is the sustained lack of precipitation that now characterizes the region. Birds that survive predation have insufficient food during dry periods. We base this on our field observations, and on the work of Alberto Macias-Duarte and his coworkers in Chihuahua. The strong relationship of prey bird density to precipitation within Chihuahuan Desert grasslands is very well documented. Even if the region were to receive large amounts of rainfall in the next few years, any resulting population would be lost during the next drought. And drought is not the only problem. Fewer migrant prey birds winter in Chihuahuan Desert grasslands than formerly because of widespread conversion within the northern prairie states and provinces to croplands during the past century.

Note that aplomados failed to expand from Chihuahua into the U.S. even during the comparatively moist 1970s and 1980s, nor can the Chihuahuan birds be expected to do so in the future. That population has dwindled from 35 known pairs in the 1990s to six known pairs today, the result of drought and agricultural expansion. There are no pairs currently known in New Mexico despite the release of 305 aplomados during 2006-2011. Neither of the two pairs that appeared on the Armendaris Ranch persisted for more than one year despite the artificial provisioning of one pair, and the proximity of both to prey-feeding stations. The very rare occurrences of wild pairs elsewhere in New Mexico have never persisted beyond a year or so. Likewise, no known pairs presently derive from the 637 falcons we released in western Texas during 2002-2011where habitat conditions were ostensibly better than those in New Mexico. Eight-to-ten pairs briefly appeared, but all summarily vanished with the reappearance of drought. These dismal results have convinced us that aplomado falcons cannot form viable breeding populations in West Texas or New Mexico. If they could, there would be some indication. This outcome is not unreasonable, given the fact that the borderlands of the United States lie at the extreme edge of climatic tolerance for this species, and the climate is not expected to improve.

Mike Philips of the Turner Foundation yesterday declared that giving up in New Mexico and West Texas "…is tantamount to accepting that the aplomado falcon cannot be recovered." Please consider that we have established two subpopulations of breeding aplomados on the Texas coast, and we know what is required for their expansion in that region to 50 or more secure pairs. The solution is habitat restoration and management, one of the core responsibilities of the U.S. Fish and Wildlife Service. We have a fairly firm idea of the kind of habitat that is needed and its scale in relation to aplomado falcon recovery, but we must neglect these issues in proportion to efforts required of us in the Chihuahuan Desert. Meanwhile, the subpopulation that centers upon the Brownsville plain is currently in serious need of protection and a better understanding of its ecology, particularly with respect to great horned owl occurrence and ranging in relation to landscape features and existing falcon pairs.

Dr. Tuttle, please support our decision to discontinue aplomado falcon releases in the Chihuahuan Desert, and let us turn our full attention to the Texas coast where success in restoration can be reasonably anticipated. We and the birds need your help on this.

Respectfully,

Grainger Hunt, Ph.D.
Senior Scientist, The Peregrine Fund

~ RESPONSE FROM MIKE PHILLIPS ~

3.

From: Mike Phillips (TESF-Bozeman)
Sent: *Thursday, November 01, 2012 12:21 PM*
To: *Grainger Hunt; Benjamin Tuggle*
Subject: *RE: Aplomado Falcons*

Thanks, Grainger, for your note that further clarifies the P Fund's stance. As I stated more than once during the recent meeting, the data assembled and conclusions presented in your recent manuscript are compelling. I am particularly compelled by the likely notable increase in aridity throughout the southwest to hinder falcon recovery. The increase is expected to be so profound that colleagues that serve with me on the science subgroup of the Mexican wolf recovery team are considering how to account for it in the recovery plan we are developing for that species. I mention this to highlight the simple fact that if the likely increase in aridity can have a material impact on an ecological generalist like the Mexican wolf then it is easy to imagine even more profound consequences for a species with slightly more narrow ecological capabilities.

However, based on what I recall was said by Bill and Paul during the meeting about the capacity of coastal Texas to support birds and the criteria presented in the aplomado falcon recovery plan, downlisting seems to be the only objective that could be achieved with a singular focus there. That is what precipitated my statement that "... termination of the work everywhere except coastal Texas would probably be tantamount to accepting that the aplomado falcon cannot be recovered."

The restoration of two subpopulations in coastal Texas is a tremendous success. I am hopeful that you are correct that continued work can be accomplished that will allow "... their expansion in that region to 50 or more secure pairs." If that expansion can grow to 60 pairs then downlisting would be indicated per the aplomado falcon recovery plan. While downlisting would be a major milestone it falls short of delisting (i.e., recovery). I recognize that the recovery plan does not present delisting criteria but it is reasonable to expect that they would be substantially more demanding than downlisting criteria.

It is for these reasons that I concluded that "... termination of the work everywhere except coastal Texas would probably be tantamount to accepting that the aplomado falcon cannot be recovered."

I recognize that this conclusion could be premature if restoration potential exists in Arizona. But, based on statements made during the recent meeting and the text of the final rule for the nonessential/experimental population designation (page 42301, middle column) such potential does not seem to exist.

For the reasons above I believe that terminating work in New Mexico and west Texas would constitute a major decision by the Service that should not be reached until all reasonable effort had been exhausted to succeed or, conversely, assemble data that unequivocally illustrated failure. In my opinion most participants at the recent meeting seemed to agree that neither of these requisites had been reached.

Mike Phillips

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*[**Editor's note:** TESF officially supports a continuation of aplomado falcon releases in 2013 and 2014].*

~ RED-COCKADED WOODPECKER ~

Picoides borealis
– ESA listing: ENDANGERED

STATUS: *Ongoing*

Principal biologists:
- *Mike Phillips*
- *Greg Hagen*

Background

In March 1998, TESF and the USFWS introduced red-cockaded woodpeckers (RCW) to the Avalon Plantation in Florida. This was the first time a private landowner, state, or federal agency had reintroduced a population of red-cockaded woodpeckers where there was no extant resident population. 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 ultimately become a source of RCWs for reintroductions to other sites within the species' historical range.

RCWs are a cooperatively breeding species, living in family groups consisting of a breeding pair, which may also include one or two male helpers (females can also become helpers, but do so at a lower rate than males). The ecological basis of this cooperative breeding life history strategy is linked to high variation in habitat quality. The critical resource for RCWs is the availability of tree cavities, which the birds excavate in live pine trees, often taking several years to accomplish. A group of cavity trees occupied by a potential breeding group (an adult female and an adult male, with or without helpers) is termed a cluster, and this is the metric of population size for RCWs

We envision that our goal of contributing to range-wide RCW recovery through translocation of birds from Avalon to new recovery sites could begin once the Avalon population reaches 20 – 25 family groups. However, while the population at Avalon grew steadily during the first nine years of the project, there are signs that population growth has slowed in recent years.

2012 objectives & strategies

1. Increase the RCW population through additional provision of recruitment clusters and supplemental cavities.
2. Establish recruitment clusters in suitable habitat by installing a minimum of 4 artificial cavities in each recruitment cluster.
3. Provide supplemental cavities in clusters that fail to meet the minimum guidelines of 4 suitable cavities per active group.
4. Identify and protect active cavity trees from inadvertent damage (incidental damage from timber harvests, soil compaction due to chronic protection measures to reduce fuel at the base and near the cavity tree, and scorching from prescribed fires).
5. Conduct annual monitoring of all active and inactive clusters, as well as any newly established recruitment cluster.

2012 management actions

Methods used to achieve our goals fall into two major categories: (1) artificial cavity construction (*recruitment clusters* and *supplemental cavities*) and (2) cavity tree and habitat management.

Artificial cavity construction

We established three *recruitment clusters* in previously abandoned clusters in October – November 2012. Each of these *recruitment clusters* contained a minimum of four artificial cavities (***Figure 26***), and were situated in suitable RCW habitat (sparse understory < 1 m, adequate forage, and proximity to active clusters; e.g. ***Figure 27***). *Recruitment clusters* are generally located within 0.4 – 1 km of an active cluster, and has a minimum of 4 suitable cavities.

No *supplemental cavities* were required in 2012 since all clusters met the minimum criteria of at least 4 suitable cavities per cluster.

Figure 26: Artificial cavity insert

Figure 27: The open, longleaf pine habitat of the Avalon Plantation provides high quality RCW habitat.

Cavity tree and habitat management

All cavity trees (active and inactive) were mowed in February – March 2012, in advance of the burning season. A Timber Ax attached to a New Holland TV145 tractor was used for all mowing (***Figure 28***). This combination worked perfectly – minimal soil disturbance and zero soil compaction. Fine fuels (pine needles, grass, etc.) that remained after mowing, allowed the prescribed fire to harmlessly burn under the cavity trees. This approach to fuel management causes the fire to maintain a consistent burn throughout the area, while ensuring the protection of cavity trees. No cavity tree mortality or scorch was experienced throughout the entire burning season. In addition, all cavity trees were marked and vehicle operators reminded of their locations.

Figure 28: New Holland TV145 with attached Timber Ax allows efficient mowing while minimizing soil disturbance and compaction.

Cluster surveys

We conducted a comprehensive assessment of RCW cluster status from December 2011 to January 2012. We determined that the population currently consists of 13 active (in use) clusters, 2 inactive (previously used) clusters, and 7 abandoned clusters (***Figure 29***). An active cluster is defined as having at least one cavity tree showing signs of fresh resin during the survey period. An inactive cluster is defined as not currently supporting any RCWs and shows no evidence of RCW activity. An abandoned cluster is defined as showing no evidence of RCW activity for three or more years.

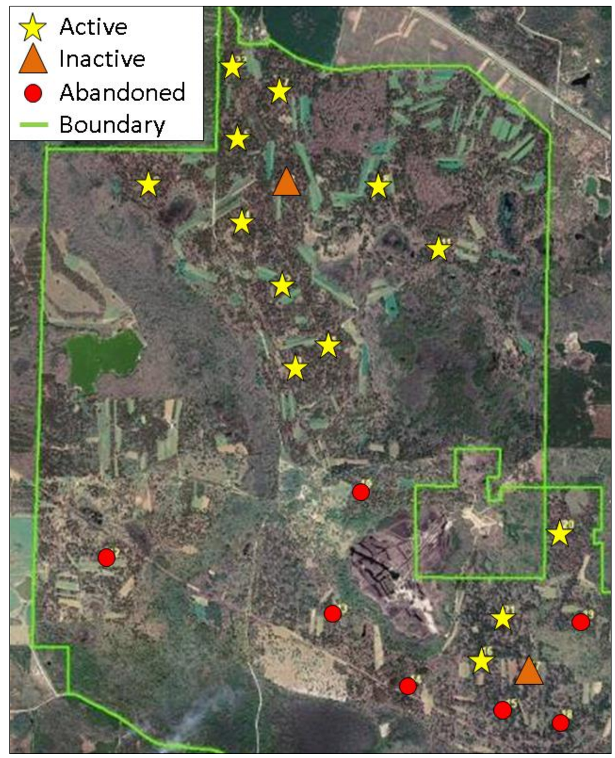


Figure 29: Status of RCW clusters at Avalon in 2012.

~ MEXICAN GRAY WOLF ~

Canis lupus baileyi
– ESA listing: ENDANGERED

STATUS: *Ongoing*

Principal biologists:
- *Chris Wiese*
- *Mike Phillips*

Background

The Ladder Ranch has been involved in Mexican Gray Wolf recovery since 1997, with construction of the *Ladder Ranch Wolf Management Facility (LRWMF)*. This pre-release facility is managed by TESF and the USFWS. TESF is the only private group ever permitted to assist with fieldwork in captivity and the wild to advance wolf recovery. Since this facility began operation in 1998, it has held over 90 wolves.

As a member of the Mexican Wolf Species Survival Plan (SSP), we follow SSP management guidelines that are administered in both the U.S. and Mexico. The mission of the SSP is *to reestablish the Mexican wolf in the wild through captive breeding, public education, and research*.

Currently, around 60 Mexican wolves live in the wild in New Mexico and Arizona, while nearly 300 animals comprise the captive population. Thus, the captive population is a key component to Mexican wolf recovery, as it is the major source of wolves to reestablish the species in the wild. As a pre-release facility, the LRWMF promotes wolf recovery by providing pre-release care and acclimatization of animals eligible for release to the wild.

The SSP uses several criteria to determine the eligibility of a wolf for release. These include: genetic makeup in relation to both captive and wild populations (i.e., "surplus" to the captive community and underrepresented in the wild), reproductive performance, behavior, and physical suitability.

The LRWMF also plays a support role in the USFWS's implementation of wolf reintroductions to the wild. For example, LRWMF assists with specific management needs associated with the *Mexican Wolf Blue Range Reintroduction Project*, such as providing pen space for wolves that require temporary or permanent removal from the wild.

The success of the Mexican Gray Wolf Recovery Program depends on the captive propagation of wolves that are genetically and physically suitable for release in the wild. However, it is also critically important that release candidates exhibit natural behaviors, including avoidance and fear of humans. We therefore take steps to avoid socializing or habituating the wolves housed at the LRWMF so they will not be attracted to human activity once released into the wild. This includes keeping the period of captivity as short as possible, and minimizing contact with humans or human activities (i.e., we feed only once or twice a week, and we spend as little time as possible in the wolf pens). We also reinforce the wolves' natural avoidance behavior to humans by providing as much privacy and as little disturbance as possible.

Wolves held at LRWMF in 2012

During 2012, five wolves were held at the LRWMF. Three of these individuals are eligible for release to the wild (***Table 7***).

Table 7: Wolves held at the LRWMP in 2012.

ID #	Sex	Birth date	Entry date	Pen #	Release eligible?	Exit date
M919	M	Apr. '04	9/28/05	5	No	8/7/12Ψ
M921	M	5/13/05	9/28/05	5	Yes	8/7/12Ψ
M1043	M	Spr. '06	8/18/07	1	No	5/18/12*
M1049	M	5/7/07	2/2/11	4	Yes	6/19/12*
M1177	M	4/28/09	3/29/11	2, 3	Yes	5/18/12*

KEY:
Ψ =Transferred to Living Desert Zoo & Gardens, Carlsbad, NM
****=Transferred to Sevilleta Wolf Management Facility in NM***

Food & feeding

Mexican gray wolves held at the LRWMF are fed a combination of foods recommended by the SSP. These are: Mazuri® Exotic Canine Diet, Central Nebraska classic canine diet (AKA carnivore logs), and meat scraps and bones of native prey species. Mazuri® Exotic Canine Diet is a meat-based kibble diet that meets the nutritional requirements of all wolf life stages. Carnivore logs are composed predominantly of horse meat and meat byproducts that are frozen into 5 pound logs. These are protein-rich and also suitable for all life stages. Native prey animals include mule deer, white-tailed deer, elk, and bison (when available), and are used as supplemental wolf feed. Native prey supplemental food is mainly provided as meat scraps and/or bones salvaged from hunts on the Armendaris and Ladder Ranches.

Current feeding protocols at the LRWMF are based on the recommendations of the 2009 Mexican Wolf husbandry manual, and consist of: 15 – 20 lbs. (3 – 4 logs) of canine logs and 10 – 15 lbs. of kibble per wolf per week.

Close cooperation between TESF and the USFWS has led to successful operation of the LRWMF since 1998. This is the only private facility to serve as a pre-release setting for the preparation of Mexican wolves for life in the wild. From left to right: Sherry Barrett (USFWS Mexican Wolf Recovery Coordinator), Benjamin Tuggle (USFWS Southwest Regional Director), Dan Ashe (USFWS Director), Barbara Ashe, Mike Phillips (TESF Executive Director), Beau Turner, Ted Turner, and Mike Finley (President of the Turner Foundation).

Observations in 2012

We observed LRWMF animals on a regular basis to ensure their health and well-being. Informal observations took place during scheduled feedings, where we endeavored to obtain a visual of each animal in the facility.

Formal observations were made at least once a month from one of two observation areas: (1) from the road above the wolf pens and (2) from a blind that is positioned near the facility (***Figure 30***). The advantage of the blind is that it is situated close to the pens, and usually provides a good view of the wolves. The disadvantage of using this location is that the road leading to the blind requires driving past the pens, thereby causing disturbance to the wolves. Conversely, the more distant roadside observation site permits taking up position unseen, but gaining a good view of all of the wolves can be challenging.

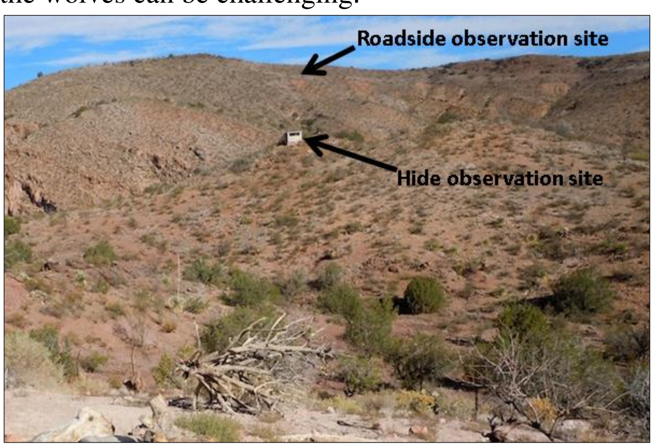
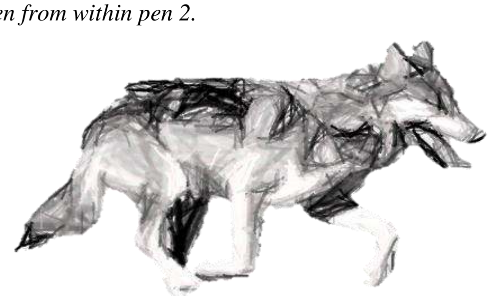


Figure 30: Observation sites relative to wolf pen 2. The photo was taken from within pen 2.



Health assessments & medical care

All five wolves were captured at LRWMF in February 2012, and received vaccinations and a thorough health assessment. All animals were found to be in good condition with no medical issues detected.

In addition to this routine health check, semen was collected from three of the males (M1177, M919, and M921) for sperm banking, as these animals are deemed genetically valuable to the recovery program. Unfortunately, the collected semen was not successfully banked, possibly due to poor quality semen in the case of M1177, or rendered non-viable due to urine contamination in the case of M919 and M921. Another attempt at banking semen from these animals will be made in early 2013.

Additionally, each wolf was examined and received de-worming (ivermectin) or ectoparasite control (revolution) agents prior to transference to other facilities between May and August, 2012.

Captures & transfers

In 2012, it was necessary to transfer all wolves from the LRWMF to other holding facilities (***Table 7***) to allow renovations and erosion control work to take place. Therefore, no animals were transferred *into* the LRWMF in 2012.

Three wolves were moved to the Sevilleta Wildlife Refuge near Albuquerque, NM in May and June. The two remaining wolves were captured for relocation to LDZG during the Turner Foundation's 2012 Summer Educational Board Retreat in August. Volunteers assisting with this wolf capture included the Director of the USFWS, Dan Ashe, and USFWS Southwest Regional Director, Dr. Benjamin Tuggle (***Figure 31***).

Figure 31: Capture of a Mexican wolf for at the LRWMF in August 2012. Volunteer help included Dr. Benjamin Tuggle (USFWS Southwest Regional Directory; at left) and USFWS Director, Dan Ashe (red shirt).

2012 LRWMF maintenance

Due to the age of the facility and exposure to a harsh environment, we made frequent minor repairs to the enclosures and to the water system throughout 2012. Additionally, in collaboration with the USFWS, we initiated major repair work and erosion control measures to ensure the continued functionality of the facility. To accomplish this work, we drew on the help of over 40 volunteers from a broad geographic area and diverse backgrounds including: the local high school in Truth or Consequences, New Mexico State University, the University of New Mexico, the Wilderness Alliance, and SEEDs. Volunteers (see ***Figure 32***) from the desert tortoise ecological community also helped out, coming from as afield as California, Arizona, Alaska and Washington.

The following repair work was initiated in mid-October 2012.

- Erosion control work involving construction of rock or log retaining walls and water diversions (***Figure 33***).
- Repairs to ATV trails leading to the pens.
- Installation of plumbing to supply wolves with drinking water.
- Raising the height of the fences in all pens.

All repair work in pens 1 and 2 was completed by the end of December 2012. However, renovations of pens 3, 4, and 5 will continue into January 2013.

Recovery management & planning

Mike Phillips contributed to the development of the Mexican wolf recovery plan by serving as a member of the Science Planning Subgroup of the Mexican wolf Recovery Team. In addition, Val Asher recently accepted an invitation from the USFWS to serve as a technical advisor to their Wolf-Livestock Interdiction Program.

Figure 32: Some members of the volunteer workforce break for lunch after a morning spent repairing the wolf pens.

Figure 33: An example of erosion control measures: rock walls, reinforced with logs.

~ ROCKY MOUNTAIN GRAY WOLF ~

Canis lupus
– ESA listing: DELISTED

STATUS: *Ongoing*

Principal biologists:
- *Mike Phillips*
- *Val Asher*

Background

Gray wolves of the Beartrap Pack first established residency on the Flying D Ranch in 2002. At its peak in 2011, this pack comprised 24 wolves making it one of the largest packs in the northern Rocky Mountains.

Gray wolves are now widely distributed in the northern Rocky Mountains, including the Greater Yellowstone ecosystem. Recovery goals to delist gray wolves were met in 2002. Montana and Idaho have been managing wolves in their states with federal funding and under federal guidelines since 2005. Wolves were delisted from the ESA in April of 2011. In Montana, wolves were reclassified statewide as a "*species in need of management*." This designation allows for flexibility in managing wolves and addressing wolf-livestock conflicts.

In 2009, Montana Fish, Wildlife and Parks (MTFWP) implemented a wolf harvest with a quota of 75 wolves, which was met. Due to litigation, the wolf harvest was postponed in 2010. In 2011 the state set a quota of 220, with 166 wolves harvested by the end of the season. The quota of 220 remained the same for 2012. As of January 7th 2013, 140 wolves had been harvested during the 2012 hunting season *(see http://fwp.mt.gov/hunting/planahunt/huntingGuides/wolf/).*

In 2000, TESF hired a biologist to assist the USFWS, and later MTFWP, with wolf recovery in southwest Montana. TESF is the only private organization ever permitted to assist the USFWS with wolf recovery and it was a notable achievement for us to be involved for over nine years with the daily implementation of wolf recovery and management. In 2010, our efforts shifted to the Flying D Ranch, with a focus on understanding how wolves affect ranched bison and wild elk populations on a working landscape.

Population trends of the Beartrap pack

Prior to 2001, single wolves had been known to travel through the Flying D, but it was not until 2002 that the Beartrap Pack established a territory that included the ranch. The pack was reduced to about 3 wolves in 2004 after a control action took place near Ennis Lake in response to livestock

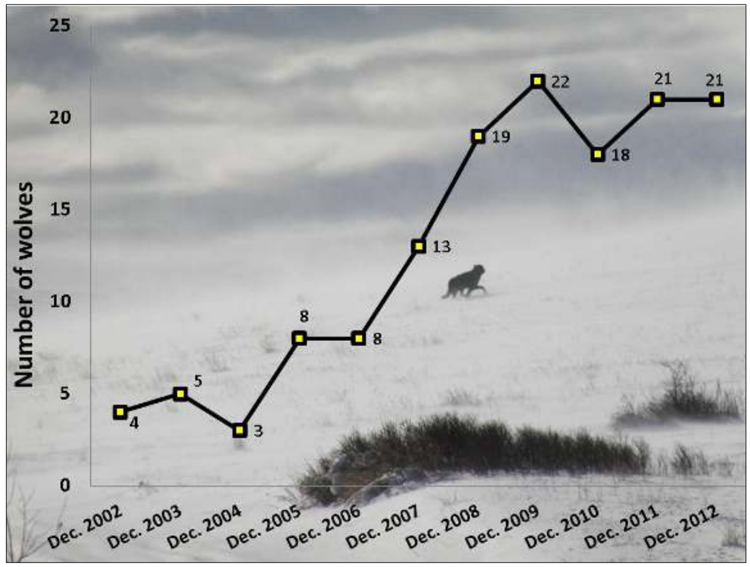


Figure 34: Annual counts of the Beartrap pack.

depredations. Since then, the pack has increased in size and included over 13 wolves for the last six years (***Figure 34***).

The alpha female denned on the Gallatin National Forest Service until 2005, and then began denning on the Flying D from 2006 onwards. In 2010, six pups were whelped at the Deep Creek den, and in 2011, the behavior of several known pack members in two different areas of the ranch indicated the possibility of two dens. In 2011, 11 pups were documented, nine black and two gray. Denning was again recorded on the ranch in 2012, where we documented 5 pups in one litter and 3 in another.

Wolf/Prey interactions on the Flying D

A total of 652 carcasses were investigated on the Flying D from 2010 – 2012. Known causes of death included bloat, fence mishaps, culling by ranch staff, hunter or rut wounded animals and predation. Methods of detecting carcasses included taking cues from scavengers (ravens, eagles and magpies), glassing for wolves, backtracking to kills when snow was present, as well as using olfactory senses to find carcasses.

Cause of death was determined by skinning out the carcass to examine for haemorrhaging under the skin, bite marks and feeding pattern.

Sign at the carcass in the form of tracks and scat were also noted. Categories used to define predator killed prey were "confirmed", "suspected" and "unknown". Due to a small sample size, suspected/confirmed kills were combined to look at prey composition.

A total of 195 predator kills were documented during this 3-year period (2010 – 2012), with 147 attributed to wolves. The remainder comprised 26 coyote kills, 4 mountain lion kills, 2 bobcat kills, 4 bear kills, and 12 due to unknown predators. A breakdown of the number of confirmed and suspected wolf kills during this time period reveals that wolves were likely responsible for killing 93 elk, 43 bison, 8 white-tailed deer (WTD), and 3 coyotes (***Figure 35***).

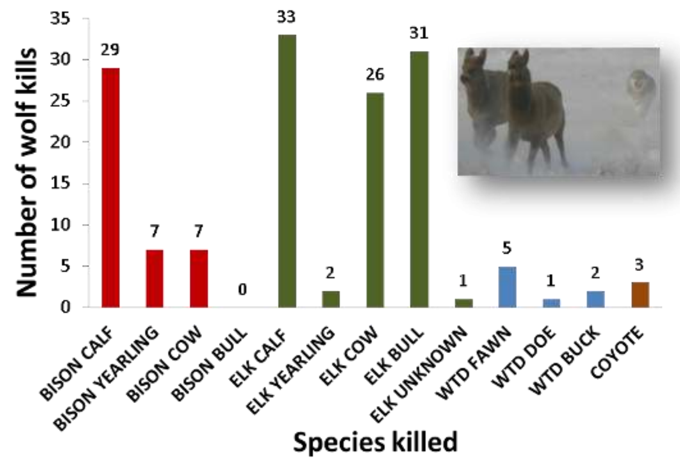


Figure 35: Confirmed/suspected wolf kills by species and life stage.

For bison, calves (68%) were most vulnerable to wolves compared with bulls (0%), yearlings (16%) and cows (16%). Considering elk, wolves killed bulls (35%), cows (30%), and calves (36%) in similar numbers. Deer fawns (62%) were more vulnerable than adult deer (38%).

Bison are the dominant prey species on the Flying D landscape, estimated at 3300 – 5400 individuals over the last four years. Elk estimates have ranged from 1675 – 1878 individuals since wolves established themselves in the Flying D system, although lower elk estimates were documented prior to wolves colonizing the ranch. Elk numbers on the ranch have remained relatively stable over the last few years, but it should be noted that at the time of the 2012 counts, approximately 300 elk that are typically resident on the Flying D were located on a neighboring property (***Figure 36***). With a bison population almost twice as large as that of elk, we can assume that encounter rates between bison and wolves are higher than encounter rates between elk and wolves. Elk also have the ability to leave the ranch if pressure from predators is strong. However, with the data collected to date, wolves appear to be more successful at killing elk, or are actively selecting elk to prey upon (***Figure 37***).

Wolf/elk relations on the Flying D

Research suggests that wolves can influence the size of elk herds and their use of habitats, leading MTFWP to consider wolf activity as a major factor affecting elk populations and hunter success. A study conducted in the Gallatin Canyon reported smaller elk group sizes and presence closer to vegetative cover when wolves were present compared with when wolves were absent. Other studies have concluded no effect of wolf presence on herd size. On the Flying D, we see both large and small herds, but preliminary data analysis suggests that these differences in group size tend to correlate with seasonal changes.

A study conducted on the Flying D from 2003 through 2005 revealed that as wolves settled onto the ranch, elk increased their use of the more complex habitats (juniper canyons and steep slopes) that are typically preferred by mule deer. 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, whereas wolves appeared to select for elk that were in poor body condition. This is perhaps due to differences in hunting strategies between the two predators. A mountain lion is an ambush predator whose success depends 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.

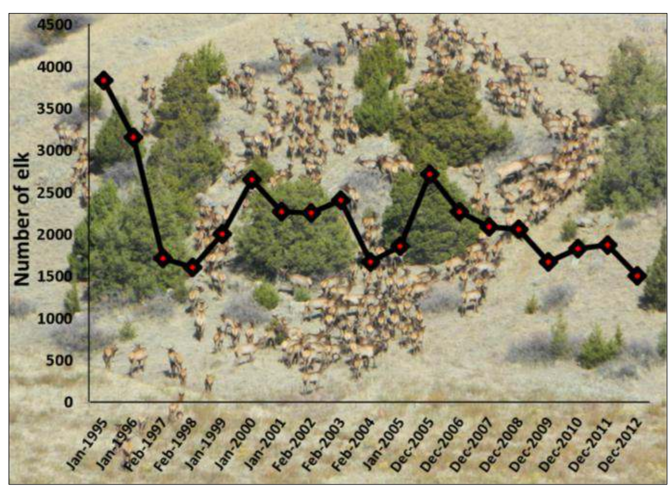


Figure 36: Elk abundance estimates on the Flying D, provided by the Flying D ranch and Montana Hunting Corporation.

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. We have documented such movements 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.

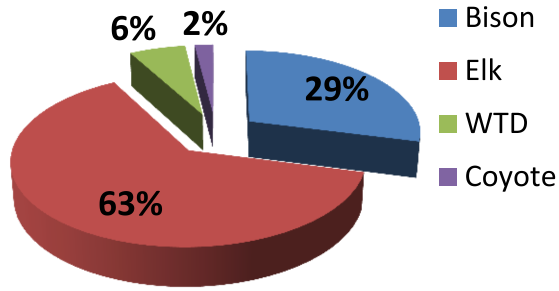


Figure 37: Percentage of wolf kills by prey species.

Wolf/bison relations on the Flying D

Given their large size, herd behavior, and willingness to confront predators, healthy adult bison are relatively immune to wolf predation. Bison calves are less vulnerable to predators than elk calves due to adult group defense. The testing of bison by wolves has been observed numerous times on the ranch. When wolves are present, cow bison tend to stand still with a head/tail up posture, or initiate a group defense strategy with calves in the middle and cows facing outward. We have also seen cows with no calves charge wolves while cows with calves used the distraction to move from the area. Bison are usually aware of when wolves are in their vicinity, often observing the wolf as it passes through the herd, without exhibiting fight or flight behavior (***Figure 38***). Body language of each species likely plays a central role in the outcome of encounters. Bull bison have been observed in a head/tail up posture in response to wolf presence, but most often continue to graze with wolves several meters from them. The most notable reaction of a bull bison to wolf presence, that we have observed, occurred when bulls are resting. In this circumstance, wolf presence (estimated to be within <10 m) causes the bull get to its feet. Studies have shown that wolf predation of adult bison typically occurs when extenuating factors (e.g., injury, depleted energy reserves due a hard/long winter, old age, etc.) have predisposed the bison to predation.

Figure 38: Wolf/bison encounters are common on the Flying D, although they do not always lead to a predation event.

Efforts to monitor the bison herd increased in 2011 and 2012, whereby we have 1 to 3 individuals riding pastures an average of 6 days/week. Detection of smaller predated ungulates (e.g. young-of-year animals) is challenging since consumption of these carcasses can be up to 100%. Thus, our estimates of wolf-killed deer fawns and elk calves are probably biased low. Since newborn bison calves are small and bison cows tend to leave the herd to calve, we do not currently have enough evidence to give us a clear picture of the effects of predation on newborn bison calves.

Despite the super-abundance of bison on the Flying D Ranch, elk remain the most common prey for members of the Beartrap wolf pack.

Frequently asked questions from ranch staff and guests at the Flying D

QUESTION 1: *How much have wolves cost the ranch?*

ANSWER: There is a Montana based program that addresses the economic impacts of verified wolf caused livestock losses called the Montana Livestock Loss Reduction and Mitigation Board (MLLB). Using the formula for the MLLB compensation program, the ranch could be compensated for each bison killed by a wolf at full fall market value for that year. Since we do not sell our calves, but wait until they are at least yearlings, average yearling weights can be used to assign a monetary value to each animal. Over the last three years, direct losses from wolves cost the Flying D approximately $40,784. Over the same period, losses attributed to other predators (mostly coyotes) cost the ranch around $12,376 (see ***Table 8***). **NOTE: these calculated costs are likely underestimates of the actual costs, since not all wolf-killed bison carcasses are found. This therefore represents the monetary value of verifiable wolf depredations that the Flying D could claim under the MLLB program**. (MLLB website: *http://liv.mt.gov/LLB/default.mcpx*).

Table 8: Minimum estimated costs of bison depredation on the Flying D Ranch, using the best available survey data.

YEAR	Age/Sex	Mean weight of bison (lbs.)	Market value (per pound)	# bison killed by wolves	# bison killed by other predators	Cost due to wolves	Cost due to other predators
2010	Yearling ♀	600	$1.10	6	4	$3,960	$2,640
	Yearling ♂	665	$1.30	7	4	$6,052	$3,458
	Adult ♀	1010	$0.75	3	0	$2,272	$0
2010 TOTAL				**16**	**8**	**$12,284**	**$6,098**
2011	Yearling ♀	600	$1.40	8	2	$6,720	$1,680
	Yearling ♂	665	$1.75	9	2	$10,474	$2,328
	Adult ♀	1010	$1.05	3	0	$3,030	$0
2011 TOTAL				**20**	**4**	**$20,224**	**$4,008**
2012	Yearling ♀	575	$1.50	3	1	$2,588	$862
	Yearling ♂	640	$2.20	3	1	$4,224	$1,408
	Adult ♀	1010	$1.45	1	0	$1,464	$0
2012 TOTAL				**7**	**2**	**$8,276**	**$2,270**
TOTAL COST (2010 – 2012)				**43**	**14**	**$40,784**	**$12,376**

QUESTION 2: *How many wolves can the ranch sustain?*

ANSWER: In areas removed from human pressures, wolf numbers in an area are driven by food availability, intraspecific interactions between packs, and within-pack social dynamics. We have documented up to 24 wolves in the Beartrap pack, with double litters occurring in 2011. However, it appears that in 2012 the Beartrap pack has split into two groups, probably due to pack social dynamics, with the larger group consisting of 15 individuals (14 blacks and 1 gray, of which 5 pups), and the smaller group comprising 6 individuals (an old gray male and female with four black wolves, of which three are pups). If this split persists, wolves will most likely disperse into less safe areas, and in turn will be at risk from lethal control actions resulting from livestock depredations and legal harvest. Therefore, it may be that 24 wolves represent the approximate carrying capacity of the Flying D Ranch.

QUESTION 3: *Can the Beartrap pack sustain a wolf harvest?*

ANSWER: Yes. Data suggests that a healthy wolf population can sustain losses of 15 – 20% without impacting annual survival rates and long-term persistence. This is considered compensatory mortality, where harvest deaths are substituting for deaths that would otherwise have occurred naturally. It should be recognized that the loss of breeders would have more severe effects on population viability than the loss of animals of lesser importance in the social structure of the pack. Given the protection afforded by having a home range on the Flying D, and provided that harvest quotas are not set too liberally, the Beartrap pack is not likely to be adversely affected by a wolf harvest.

~ DESERT BIGHORN SHEEP ~

Ovis canadensis mexicana
– NM listing: DELISTED

STATUS: *Completed successfully*

Principal biologist:
- *Mike Phillips*

TESF's involvement in this restoration project ended on June 30th, 2011 with the establishment of a population of over 250 sheep in the Fra Cristobal and the Caballo Mountains. This is the largest desert bighorn sheep population in NM and the largest population on private land in the country.

The restoration project began in 1995, with the release of 37 of the endangered sheep into the Fra Cristobal Mountains (***Figure 39***). Another 7 sheep were released in 1997.

Throughout the project, we monitored both sheep and mountain lions. Controlling mountain lions to minimize predation on sheep was our principal management activity. To ensure success, we not only had "boots on the ground" on an almost daily basis, we also used remote, motion-sensitive cameras and telemetric equipment to improve our ability to detect the presence of mountain lions (***Figure 40***), and the threat they posed to sheep. Strategic field support was also provided by ranch personnel and NMDGF.

Due to the herd's large size NMDGF translocated 16 ewes from the Fra Cristobal Mountains (***Figure 41***) to suitable habitat elsewhere in New Mexico to further secure the species' future. This represented the first time that desert sheep have been restored to private property and managed so successfully to serve as a "donor population" for range-wide recovery efforts.

Management of sheep (and mountain lions) is now coordinated by the Armendaris Ranch operating under an agreement with NMDGF. In 2012, five mountain lions were lethally removed from the system. Trophy ram hunts were implemented in 2012. **Six desert bighorn rams were harvested, with the Armendaris Ranch generating $165,000 in permit sales and $11,000 in guiding fees.** $55,000 of the income from sheep hunts was donated to Beau Turner's Youth Conservation Center in Florida.

Figure 39: Desert bighorn sheep released in the Fra Cristobal Mountains on the Armendaris Ranch.

Figure 40: Mountain lions were monitored using remote cameras, and lethal removal was used in certain cases to reduce predation pressure on the recovering desert bighorn sheep population.

Figure 41: Ewes were translocated from the robust Fra Cristobal population to bolster desert bighorn sheep recovery elsewhere in New Mexico.

~ WESTERN LANDOWNERS ALLIANCE (WLA) ~

[left to right] Mike Phillips, Paul Vahldiek, Michael Soulé, and Cristina Eisenberg during a meeting at the High Lonesome Ranch (Debeque, CO). The purpose of the meeting was to consider the role of private land in efforts to conserve biological diversity.

Despite our successes, the need for private land to serve as beachheads of security for imperiled species has grown more acute since TESF was founded in 1997. It is extremely unlikely that most federally listed species in the U.S will recover without the cooperation of non-federal landowners. This is because more than 60% of the U.S. is privately owned (***Figure 42***), and at least 80% of endangered or threatened species occur either partially or solely on private lands, with only about 12% of listed species found almost exclusively on public lands. Therefore, willing private landowners are essential to successful biodiversity conservation in this country, and cannot be ignored when setting conservation goals.

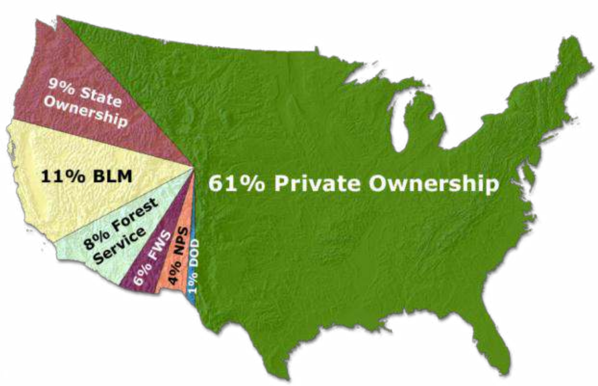


Figure 42: Land ownership in the lower 48 states of the U.S.

Many private landowners are, however, wary of the possible consequences of attracting or maintaining imperiled species on their properties. It is possible that their apprehension could be assuaged if presented with tangible examples that illustrate the capacity of private land to support imperiled species, even in the presence of active and successful land management programs. The types of examples needed are the same as the projects we have been advancing for 15 years.

It is now incumbent on us to consider new collaborations that can increase the number of private landowners motivated by an approach to land management that includes a focus on imperiled species. To that end we have worked with a few other landowners and leading conservation scientists to consider the value of the WLA. Such an alliance would be a coalition of landowners committed to managing their lands in an economically and ecologically sustainable manner that conserves common and imperiled species, landscape connectivity, and ecological processes across the North American west (e.g. ***Figure 43***).

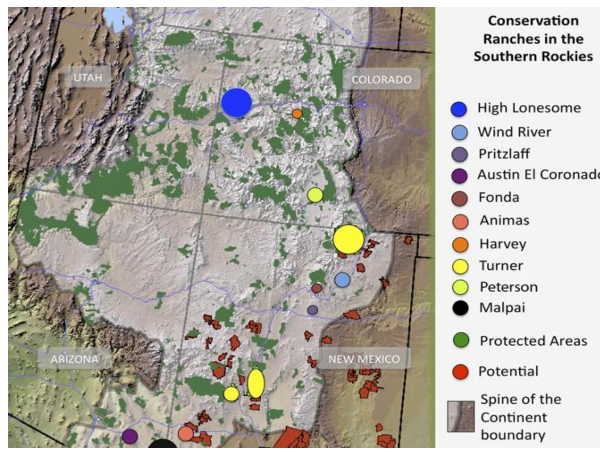


Figure 43: Alliance of privately owned conservation ranches in the southern Rocky Mountains. These properties are being managed in an economically and ecologically sustainable manner, and are endeavoring to conserve common and imperiled species, landscape connectivity and ecological processes.

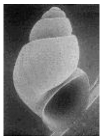
This alliance represents a way of drawing attention to, and spreading far and wide, the Turner approach to land ownership. Only by growing the ranks of the engaged can we hope to arrest the extinction crisis. Team Turner is ideally suited to play an active role.

> "Team Turner represents the flagship in the private lands conservation movement. The confidence, ethic, and strength they bring to their work encourage all who wish for a prosperous, just, and peaceful future."
>
> Dr. Michael Soulé,
> Founder of the Society for Conservation Biology

DEVELOPING PROJECTS

~ CHUPADERA SPRINGSNAIL ~

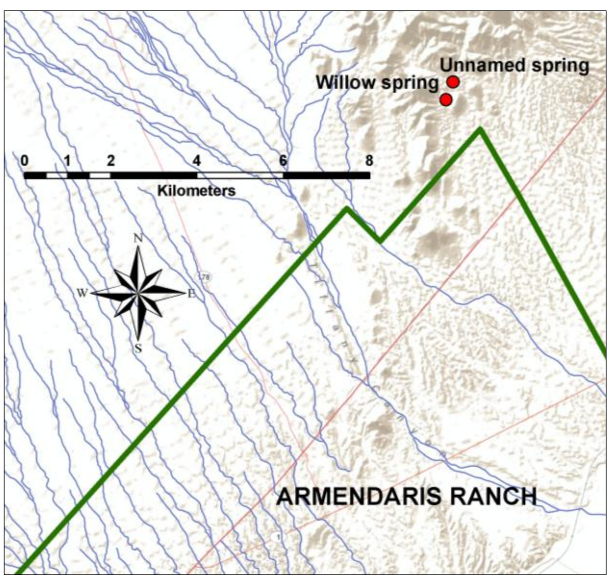
Pyrgulopsis chupaderae
ESA listing: ENDANGERED



STATUS: *Under development*

Principal biologist:
- *Magnus McCaffery*

The Chupadera springsnail is a tiny (1.6 to 3 mm tall) freshwater snail (***Figure 44***) that is found only in 2 small springs in New Mexico (Willow Spring and an unnamed spring; ***Map 6***). These small springs are located about a kilometer north of the Armendaris Ranch, on private land at the south end of the Chupadera Mountains in Socorro County, NM. Due to the landowner on which the sites are located denying access for springsnail surveys, monitoring has not occurred since 1999. This is a highly imperiled species with numerous threats to its habitat. The USFWS designated the snail as a candidate for protection under the ESA in 1984, and listed it as endangered in 2011. Critical habitat was designated at Willow Spring and the nearby unnamed spring in 2012 (***Map 6***).



Map 6: Critical habitat (red points) for the Chupadera springsnail in relation to the Armendaris Ranch (green line).

Acting with the authority of the Board of Trustees, during the Turner Foundation Educational Retreat in New Mexico, we (Tom Waddell, Mike Phillips, Dave Hunter, and Magnus McCaffery) undertook a field reconnaissance for this highly endemic and critically imperiled species in November 2012.

Figure 44: Chupadera springsnails on index finger.

We detected the snail at Willow Spring (***Figure 45***), but not at the nearby unnamed spring. Willow Spring consists of a trickling run of warm water, macrophytic vegetation, with cobble embedded in the substrate. Inspection of the underside of the cobble revealed Chupadera springsnails. In contrast, the water at unnamed spring was cold, and choked with grasses and sediment, with no cobble.

Figure 45: Willow Spring is designated critical habitat for Chupadera springsnail.

We believe that TESF is ideally suited to work at the interface between the local land manager (and the development group for which he works), and the USFWS to facilitate the conservation of the Chupadera springsnail.

Since the reconnaissance, Tom Waddell has reached out to the local manager and found him amenable to accepting our help to minimize the burden that he and his superiors feel from presence of the snail and hence the ESA. We are proceeding slowly and respectfully to generate sufficient trust for developing a useful collaborative relationship that would allow us to implement a long-term monitoring plan to instruct future management. The USFWS is keenly supportive of our effort to broker a future for the Chupadera springsnail.

SPECIAL PROJECTS

~ ROCKET 21 ~

TESF and Rocket21™ (an online social network where kids explore amazing possibilities for their lives and futures) joined forces in 2012 to run a video competition themed ***HOWL-o-ween: Dream Big in the Wild***. This was designed to increase kids' awareness of wildlife conservation, as well as introduce them to wildlife science careers.

Middle and high school student members of Rocket21 were invited to share videos featuring their most inspired, passionate, creative, and individual brand of wolf howl to compete for one of two family trips to Montana. Winning howlers will participate in a wolf conservation and recovery activity dubbed a "howling party", along with biologists and researchers at Ted Turner's Flying D Ranch in Montana. Winners will also tour Yellowstone National Park.

In a separate category, teachers also had the opportunity to enter their classes to compete for one of two school-based "Classroom Howling Parties." Winning classrooms will receive a visit from a team of wildlife experts from TESF.

Individual competition winners

Under-13 age category: Joshua Kilgore.
~ Joshua will take his two 10 year old brothers and one of his parents on his trip to Montana. ~

Over-13 age category: Zane Carey.
~ Zane will travel to Montana with his dad. ~

Class competition winners

~ Kathleen Talbot's 5th grade class at Portola Elementary, San Bruno, CA.

~ Michele Burke's engineering class at Woodland Park High School, Woodland Park, CO.

AWARDS & HONORS

~ USFWS CHAMPION AWARD ~

Ted Turner was awarded the USFWS's **2011 Recovery Champion** award at the Ladder Ranch in New Mexico (***Figure 46***).

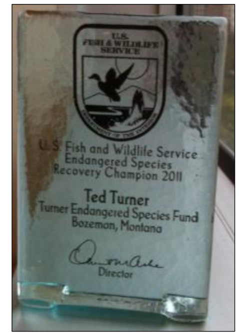
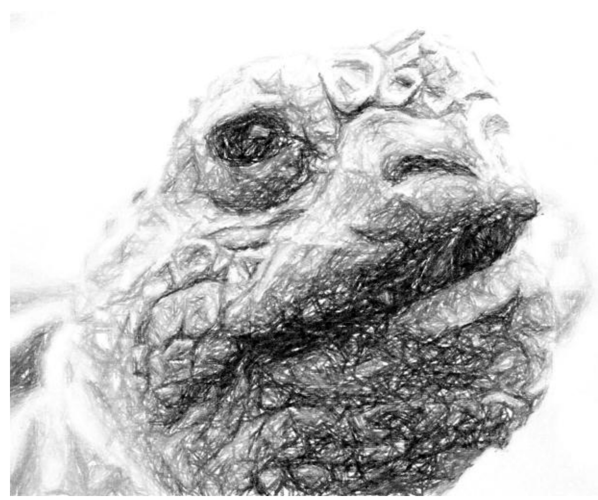


Figure 46: USFWS Director, Dan Ashe, presents Ted with the 2011 Recovery Champion Award at the Ladder Ranch in August 2012.

~ ROLEX AWARD FOR ENTERPRISE ~

Mike Phillips was shortlisted as a finalist for the prestigious **Rolex Awards for Enterprise** for TESF's pioneering work to reintroduce bolson tortoises to New Mexico.



~ AFS PRESIDENT'S FISHERY CONSERVATION AWARD ~

TBD/TESF was awarded the **2012 President's Fishery Conservation Award** from the American Fisheries Society. This was in recognition of outstanding work on behalf of aquatic conservation in Montana and New Mexico. It also recognized our efforts to initiate habitat protection and improvements in cooperation with state and federal agencies.

PUBLICATIONS IN 2012

Andrews, T.M., B.B. Shepard, A.R. Litt, **C.G. Kruse**, A.V. Zale, and S.T. Kalinowski. In review. Juvenile dispersal among different populations of cutthroat trout introduced as embryos to vacant habitat. North American Journal of Fisheries Management.

Andrews, T.M., B.B. Shepard, A.R. Litt, **C.G. Kruse**, M.L. Nelson, P. Clancey, A.V. Zale, M. L. Taper, and S.T. Kalinowski. In review. Performance of juvenile cutthroat trout from five populations translocated as embryos into a fishless common habitat in Montana. Transactions of the American Fisheries Society.

Billman, H.G., **C. G. Kruse**, S.St-Hilaire, T. M. Koel, J. L. Arnold, and C.R. Peterson. 2012. Effects of rotenone on Columbia spotted frogs *Rana luteiventris* during field applications in lentic habitats of southwestern Montana, USA. North American Journal of Fisheries Management 34:781-789.

Chipault, J.G., Biggins, D.E., Detling, J.K., **Long, D.H**., and R.M. Reich. 2012. Fine-scale habitat use of reintroduced black-footed ferrets on prairie dog colonies in New Mexico. Western North American Naturalist 72(2), pp. 216–227.

Derr, J. N., P. W. Hedrick, N. D. Halbert, L. Plough, L. K. Dobson, J. King, C. Duncan, **D. L. Hunter**, N. D. Cohen, D. Hedgecock. 2012. Phenotypic effects of cattle mitochondrial DNA in American bison. Conservation Biology 26(6):1130-1136.

Eads, D., **Long, D**., and D. Biggins. In Review. Estimating prairie dog densities for conservation of black-footed ferrets. Submitted to Wildlife Society Bulletin.

Kruse, C. G., P. Clancey, S. Barndt, K. Patten, and B. Shepard. Submitted. Setting the stage for conservation success: large-scale watershed renovation and re-introduction of cutthroat trout in the Rocky Mountain region of the United States. P. Soorae, editor. Global reintroduction perspectives: 2013. More case studies from around the globe. Gland, Switzerland: IUCN/SSC Reintroduction Specialist Group and Abu Dhabi, UAE: Environment Agency-Abu Dhabi.

Long, D. H. Submitted. Restoration of black-tailed prairie dogs to Vermejo Park Ranch, MN USA. P. Soorae, editor. Global reintroduction perspectives: 2013. More case studies from around the globe. Gland, Switzerland: IUCN/SSC Reintroduction Specialist Group and Abu Dhabi, UAE: Environment Agency-Abu Dhabi.

Phillips, M. K. Submitted. Establishment of a desert bighorn sheep population to the Fra Cristobal Mountains, New Mexico, USA. P. Soorae, editor. Global reintroduction perspectives: 2013. More case studies from around the globe. Gland, Switzerland: IUCN/SSC Reintroduction Specialist Group and Abu Dhabi, UAE: Environment Agency-Abu Dhabi.

Wilkinson, T. 2012. A big win for the westslope. Montana Outdoors. July-August issue, pages 16-21. Montana Fish Wildlife and Parks, Helena.

CONFERENCE PRESENTATIONS/POSTERS IN 2012

Goguen, C., and **D. Long**. Effects of prairie dog colonies on wildlife of shortgrass prairie habitats in northeastern New Mexico. Poster session presented at: 4th International EcoSummit: Ecological Sustainability. Columbus, Ohio. September/October 2012. Poster presentation.

Kruse, C. G., P. Clancey, K. Patten, and B. Shepard. 2012. Collaborative efforts on behalf of interior cutthroat trout (*Oncorhynchus clarki*): a private initiative to catalyze native trout restoration in 250 miles of habitat. 2012 Annual Meeting of the Montana Chapter of Society of Conservation Biology. Bozeman, MT. October 2012. Oral presentation.

Kruse, C. G, M. Kossler, and **D. Long**. 2012. Investing in the conservation and recovery of New Mexico's native cutthroat trout: how the American Reinvestment and Recovery Act influenced native species conservation in northern New Mexico. 142nd Annual Meeting of the American Fisheries Society. St. Paul, Minnesota. August 2012. Oral presentation.

Long, D. 2012. History of coyote management in the West and recommendations for managing coyote populations on Vermejo Park Ranch, NM. TEI Wildlife Board. May 2012. Oral presentation.

McCaffery, M., and **M. Phillips**. Using population ecology to plan the restoration of bolson tortoises (*Gopherus flavomarginatus*) to their Pleistocene range in the US. 5th Annual Research Symposium for Conservation Biology. Montana Chapter Society for Conservation Biology. Bozeman, MT. October 2012. Oral presentation.

McCaffery, M. Endangered species: private conservation. 2012 Foundation for Research on Economics & the Environment – Conference Series for Religious Leaders. Gallatin Gateway, MT. August 2012. Oral presentation.

McCaffery, M., and **M.K. Phillips**. Using population ecology to plan the restoration of bolson tortoises (Gopherus flavomarginatus) to their Pleistocene range in the US. 2012 Society for Conservation Biology's North American Congress for Conservation Biology. Oakland CA. July 2012. Oral presentation.

McCaffery, M., and **M.K. Phillips**. Using population ecology to plan the restoration of bolson tortoises (*Gopherus flavomarginatus*) to their Pleistocene range in the US. 37th Annual Meeting and Symposium of the Desert Tortoise Council. Las Vegas, NV. February 2012. Oral presentation.

Phillips, M.K. The ultimate trump card: politics or science. Montana State University Ecology Department Seminar Series. Bozeman, MT. October 2012. Oral presentation.

Phillips, M.K. The world's most significant effort to conserve imperiled species on private land. 2012 Society for Conservation Biology's North American Congress for Conservation Biology, Oakland CA. July 2012. Oral presentation.

Phillips, M.K. The ultimate trump card: science or politics. 2012 Society for Conservation Biology's North American Congress for Conservation Biology, Oakland CA. July 2012. Oral presentation.

Phillips, M.K. The ultimate trump card: politics or science. 2012 Annual Meeting of the Montana Chapter of the American Fisheries Society. Helena, MT. May 2012. Oral presentation.

Phillips, M.K. MSU Ecology Seminar Series. Bozeman, MT. February 2012. Oral presentation.

Phillips, M.K. Restore To What: Where Do the Mexican Wolf and Bolson Tortoise Belong? Montana State University Ecology Department Seminar Series. Bozeman, MT. February 2012. Oral presentation.

Wiese, C., S. Hillard, and **M.K. Phillips**. The bolson tortoise (Gopherus flavomarginatus) breeding program on the Turner Ranches in New Mexico. 10th Annual Symposium on Conservation and Biology of Tortoise and Freshwater Turtles, Tucson, AZ. July 2012. Oral presentation.

Wiese, C. The Bolson Tortoise Breeding Program on the Turner Ranches in New Mexico. 37th Annual Meeting and Symposium of the Desert Tortoise Council. Las Vegas, NV. February 2012. Oral presentation.

Wiese, C. The Bolson Tortoise Breeding Program on the Turner Ranches in New Mexico. 10th Annual Meeting of the Turtle Survival Alliance. Tucson, AZ. August 2012. Oral presentation.

APPOINTMENTS

Kruse, C. G. Affiliate Faculty, Montana State University, Department of Ecology
Kruse, C. G. Affiliate Faculty, New Mexico State University, Department of Fish, Wildlife and Conservation Ecology
Kruse, C. G. Affiliate Faculty, Idaho State University, Department of Biological Sciences
Kruse, C. G. New Mexico Rio Grande Cutthroat Trout Working Group
Kruse, C. G. Montana Westslope Cutthroat Trout Technical Committee
Kruse, C. G. New Mexico Chiricahua Leopard Frog Stakeholder and Working Group
Long, D. Black-Footed Ferret Recovery and Implementation Team; Executive and Conservation Subcommittee
McCaffery, M. Affiliate Faculty, Montana State University, Department of Ecology
Phillips, M. USFWS Mexican Wolf Recovery Team
Phillips, M. IUCN/SSC Wolf Specialist Group
Phillips, M. IUCN/SSC Reintroduction Specialist Group
Phillips, M. IUCN/SSC Bison Specialist Group
Phillips, M. IUCN/SSC Board of Directors, International Wolf Center
Phillips, M. State Senator, Montana

A remote camera captured this sequence of a great horned owl (Bubo virginianus) in the Fra Cristobal Mountains of the Armendaris.

ACRONYMS & ABBREVIATIONS USED IN REPORT

AFS = American Fisheries Society
AGFD = Arizona Game & Fish Department
BLM = Bureau of Land Management
BRR = Bad River Ranches
BTPD = Black-tailed prairie dog (*Cynomys ludovicianus*)
CLF = Chiricahua leopard frog (*Lithobates chiricahuensis*)
COPW = Colorado Parks & Wildlife
ESA = Endangered Species Act
GPD = Gunnison's prairie dog (*Cynomys gunnisoni*)
LDZG = Living Desert Zoo & Gardens State Park in Carlsbad, NM
LRWMF = Ladder Ranch Wolf Management Facility
MT = Montana
MTFWP = Montana Fish Wildlife & Parks
NF = North Fork
NM = New Mexico
NMDGF = New Mexico Department of Game & Fish
PIT = Passive Integrated Transponder
PPB = Parts per billion
RCW = Red-cockaded woodpecker (*Picoides borealis*)
RGCT = Rio Grande cutthroat trout
SD = South Dakota
SSP = Species Survival Plan
SWMF = Sevilleta Wolf Management Facility
TBD = Turner Biodiversity Division
TEI = Turner Enterprises, Inc.
TESF = Turner Endangered Species Fund
TNC = The Nature Conservancy
TPF = The Peregrine Fund
TU = Trout Unlimited
USFWS = U.S. Fish & Wildlife Service
VPR = Vermejo Park Ranch
WCS = Wildlife Conservation Society
WCT = Westslope cutthroat trout
WNMU = Western New Mexico University
WSMR = White Sands Missile Range

A juvenile swift fox at Bad River Ranches. (Original Photo Credit: G. Joutras).