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More case studies from around the globe
Edited by Pritpal S. Soorae

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Black-footed ferret recovery in North America

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Introduction

Black-footed ferrets (*Mustela nigripes*) are mustelids and dependent on prairie dogs (*Cynomys* spp.) as prey and their burrows for shelter. Widespread poisoning of prairie dogs, conversion of rangeland to cropland and exotic disease (plague) severely reduced ferrets and their prey throughout the 20th century. By the 1980s ferrets were found in only one *in situ* population and the last 18 were captured for *ex situ* captive breeding. More than 7,000 ferrets have been produced in captivity since 1987 and 3,500 released into the wild since 1991 at 19 locations in the United States, Mexico and Canada. Four re-introduction sites are considered viable and self-sustaining with annual population counts ≥100 individuals. Captive breeding occurs at 6 zoos/breeding centers (5 in United States, 1 in Canada). Approximately 1,000 ferrets (adults and kits) survive in the wild range-wide and 240 breeding animals are maintained in captivity. The Black-Footed Ferret Recovery Implementation Team (BFFRIT), an advisory group to the US Fish & Wildlife Service, is a tri-national organization of agencies, organizations, zoos, tribes, universities and private landowners. In the United States, ferrets are federally listed as Endangered under the Endangered Species Act (ESA), IUCN Endangered D (2008) and CITES Appendix 1 (1975).

Goals

Goals and success indicators of the black-footed ferret recovery program from the 2007 Draft Revised Black-Footed Ferret Recovery Plan:

- Goal 1: Maintain a captive ferret population of optimal size and structure to support genetic management and re-introduction efforts.
- Goal 2: Reduce disease-related threats, particularly sylvatic plague, in wild populations of ferrets and associated species (i.e. prairie dogs).

Black-footed ferret in Conata Basin, South Dakota
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- Goal 3: Ensure sufficient prairie dog habitat to support a wide distribution of self-sustaining ferret populations.
- Goal 4: Establish free-ranging populations of ferrets to meet ESA down-listing and de-listing goals.
- Goal 5: Promote partner involvement and adaptive management through regular programmatic review and outreach.

Success Indicators

To down-list from Endangered to Threatened ESA status:

- Indicator 1: Maintain a minimum core captive breeding population of 240 adults (90 males:150 females).
- Indicator 2: Minimize fundamental threats and habitat conservation obstacles currently suppressing black-footed ferret population growth, such that a total national population of 1,500 free-ranging breeding adults, in 10 or more populations, with no fewer than 30 breeding adults in any population, is established.
- Indicator 3: Maintain population objectives for at least three years prior to down-listing.
- Indicator 4: Establish the widest possible distribution of reintroduced black-footed ferret populations across the species' historical range by allocating individual state recovery targets proportional to the distribution and abundance of historical habitats.

To de-list from Threatened ESA status:

- Indicator 5: Accomplish Indicators 3 and 4 and additionally minimize fundamental threats and habitat conservation obstacles currently suppressing black-footed ferret population growth such that a total national population of 3,000 free-ranging breeding adults, in 30 or more populations, with no fewer than 30 breeding adults in any population, and at least 10 populations with 100 or more breeding adults, is established.

Project Summary

Feasibility:

Planning and guidance: Black-footed ferrets were extinct in the wild by 1987 when the last 18 individuals were captured and placed into a captive breeding facility (see Lockhart *et al.*, 2006 for background on the history of recovery efforts). The recovery plan at the time, authored in 1978, provided basic guidance for captive breeding and subsequent re-introduction. A more detailed revised plan in 1988 ably guided recovery efforts and a new plan revision is expected in 2012. The first attempts at captive breeding ferrets in the 1970's did not produce viable offspring but set the stage for successful breeding efforts, allowing re-introductions to commence in 1991. Re-introduction techniques and sites needed to be identified, evaluated, and prioritized. Siberian polecats (*Mustela eversmanii*) acted as surrogates to advance proficiency in radio tagging and tracking of ferrets. A system for evaluating prairie dog complexes to support ferret re-introduction was developed using biological, quantitative factors such as prairie dog colony size and density as well as qualitative factors including disease, predators and political

aspects. Several workshops and symposia were held regarding captive breeding, small populations, prairie dog management, disease and habitat evaluation.

Annually, re-introduction sites can request captive ferrets for re-introduction. Ferrets are allocated using an objective ranking process (Jachowski & Lockhart, 2009). All ferret releases in the United States through 2004 were designated “non-essential experimental” under Section 10(j) of the ESA and subsequent releases are 5-year experimental populations under a 10(a)(1)(A) permit. Agricultural organizations typically wield political clout and generally oppose ferret re-introduction, primarily because of ESA fears and need for larger areas of prairie dogs (Miller *et al.*, 2007). Local attitudes typically range from vehemently opposed to apathetic. In some cases litigation is used to attempt blocking of re-introductions or rescind current efforts.

Implementation:
Captive breeding: Husbandry techniques were refined and the first successful captive breeding occurred in 1987. Disease management in captivity is paramount and strict protocols are adhered to. Genetic management is closely monitored and ferrets are bred using a mean-kinship strategy to maintain ≥80% genetic diversity and provide animals for re-introduction. Genetically ‘surplus’ animals are targeted for re-introduction candidates. Artificial insemination for genetically valuable, but behaviorally-challenged, breeders and sperm banking is used to produce genetically valuable animals, some from males deceased >10 years.

Pre-release conditioning: Captive-born ferrets targeted for re-introduction are placed in outdoor pens, simulating quasi-natural conditions with dirt burrows and live prey. Ferrets that receive pre-release conditioning in outdoor pens prior to release have demonstrated 10-fold higher survival rates in the wild than ferrets that receive no pre-release exposure (Biggins *et al.*, 1998). Pre-release conditioning is now standard for all re-introduction candidates.

Re-introduction: Ferrets are typically released in the fall during natural dispersal and kits (young of the year) are the primary candidates. One site in Arizona experimented with spring releases to coincide with Gunnison prairie dog (*Cynomys gunnisoni*) emergence from

Prairie dog colony (BFF habitat) in Conata Basin, South Dakota © Travis M. Livieri

hibernation. Translocation of wild ferrets from self-sustaining re-introduction sites began in 1999.

Research and operational conservation: Research during re-introduction occurs at most sites to refine re-introduction strategies, learn more about ferret ecology and ultimately to provide feedback and improve the overall recovery effort. Radio-telemetry, while difficult and expensive, was instrumental in early ferret research. One of the primary threats to ferret recovery is sylvatic plague, caused by the bacterium (*Yersinia pestis*), and fatal to both prairie dogs and ferrets. Dusting prairie dog burrows to kill fleas, a primary vector of plague, increases survival of both prairie dogs and ferrets (Matchett *et al.*, 2010). An effective plague vaccine is used in ferrets and expected in the next 5 years for prairie dogs. Continued research is needed in many areas including, but not limited to, plague ecology in prairie dogs, understanding ferret population ecology, and climate change effects on prairie dogs and ferrets.

Post-release monitoring:
Population estimation: Black-footed ferrets are primarily nocturnal, semi-fossorial and most efficiently located using spotlighting. In the initial stages of re-introduction, radio-telemetry was used extensively to document survival and movements relative to pre-release conditioning strategies. Spotlighting surveys, from a vehicle or on-foot, are typically conducted in the fall during dispersal. Passive integrated transponder (PIT) tags are implanted in all released ferrets and wild-born individuals are live-trapped and implanted with PIT tags. Population estimates at a re-introduction site are typically minimum-number-alive (MNA) estimates or, more recently, correlated density estimates (CDE). MNA is simply the number of cumulatively identified individuals and varies with sampling effort. CDE utilizes a more structured sampling approach that yields a population estimate with associated variance.

Current conservation status: As of 2010, there are ~1,000 black-footed ferrets surviving in the wild of which ~500 are breeding adults. Ferrets now occupy 8 of the 12 US states historically inhabited as well as Chihuahua, Mexico and Saskatchewan, Canada. Captive breeding populations remain stable at ~240 breeding individuals.

Major difficulties faced

- Socio-politics: Socio-political views of prairie dogs lead to suppression of prairie dog numbers down to levels that make them functionally extinct (Miller *et al.*, 2007). In many states throughout the range of prairie dogs they are considered a pest species and actively controlled through economically infeasible poisoning programs. New poisons are available and overall negative attitudes towards prairie dogs are slow to change. Rural governments and agricultural interests can have a disproportionately large voice in prairie dog management decisions, even on publicly-owned lands. Many areas that once were prime prairie dog habitat were converted from rangeland to cropland. Despite increasing recognition of prairie dogs as a keystone species and ecologically important (Miller *et al.*, 2007), they continue to be persecuted and

managed at levels generally lower than needed to support black-footed ferret populations.

BFF captured for vaccination against plague in Conata Basin, South Dakota © Travis M. Livieri

- Disease: Plague is exotic to North America and many animals have no natural resistance. Black-footed ferrets and prairie dogs are both extremely susceptible to plague and the disease greatly impacted the prairie dog ecosystem throughout the 20th century. In a matter of months, an epizootic of plague can remove all prairie dogs from thousands of hectares of ferret habitat. Mitigation tools such as dusting of prairie dog burrows and vaccines for ferrets are effective (Matchett *et al.*, 2010), but costly, and not feasible over the long-term. Vaccines for prairie dogs may soon be available but delivery may be problematic and costly. We still understand relatively little about plague ecology in the prairie dog ecosystem and the future of ferret recovery will always need to consider plague.
- Mechanisms to establish new recovery sites: Most of the large prairie dog complexes in North America are identified and contribute to black-footed ferret recovery. Recovery of the species is dependent upon creating new prairie dog complexes of adequate size to support ferret re-introduction. Currently there are few recovery sites in the southern and eastern portions of the ferret's historic range and future recovery sites in those areas are more likely to include private lands. In general, private landowners are wary of endangered species re-introduction and intolerant of large prairie dog complexes. Thus, incentives are needed to encourage active, positive management of prairie dogs for ferret re-introduction. BFFRIT is currently developing a national landowner incentive program that shows promise for developing prairie dog complexes for ferret re-introduction but implementation of the incentive program has yet to occur. Also, legal mechanisms to allow ferret re-introduction are lacking. The recovery program has used 10(j) non-essential, experimental or 10(a)(1)(A) experimental populations in the US with some degree of success. Unfortunately these mechanisms are generally slow and costly to implement. As a result, the opportunity to release ferrets in new areas is sometimes lost because the legal process is too onerous.
- Inter-organizational co-operation and conflict resolution: Earlier years of the recovery program were sometimes marred by conflict between partner agencies (Lockhart *et al.*, 2006). Since 1996, the US Fish & Wildlife Service

asserted a stronger leadership role in the recovery program which improved cooperation and conflict resolution, although gaps remain. Several key partners are not actively participating in the program and often political pressures can change the dynamic of a partner's role in the program. For example, the US Forest Service manages Conata Basin, South Dakota one of the most successful ferret recovery sites. Political pressures from 2004 - 2008 directed US Forest Service leadership to consider poisoning up to half of the prairie dog habitat. Fortunately, the poisoning did not occur, but the commitment of the US Forest Service to black-footed ferret recovery was compromised at the time.

Major lessons learned

- Commit to recovering wild populations before captive breeding and re-introduction are necessary: The opportunity to recover black-footed ferrets failed in the 1970's and nearly failed in the 1980's partly because of inadequate habitat conservation for ferrets. We are now challenged with an extensive captive breeding and re-introduction program, in addition to habitat conservation efforts. Lockhart *et al.* (2006; p.7), from the perspective of recovery coordinators, stated, "however difficult the challenges of recovering wild populations in native habitat may be, those challenges pale in comparison to the trauma, demands and resources required for last-ditch captive breeding and re-introduction efforts."
- Captive breeding of black-footed ferrets should have been initiated earlier: The recovery program failed to act on plans in advance and commit funding for personnel and facilities (Lockhart *et al.*, 2006) which partially was the reason captive breeding of the Meeteetse population was not started earlier than 1986. Had the captive breeding effort begun earlier there would likely be less concern about genetics today. Of the last 18 ferrets, 15 successfully bred in captivity although many were already closely related. It is estimated that of the 18 ferrets there were 7 unique founders.
- Patience and persistence: Two of the four highly successful recovery sites took nearly 10 years of efforts to become established. The first re-introduction site, in Shirley Basin, Wyoming was largely written off as unsuccessful by the mid-1990's. A small population of ferrets persisted there and, when conditions were optimal, the population grew exponentially in the 2000's.
- Pre-release conditioning: Captive-born ferrets are given the best chance to survive in the wild when exposed to pre-release conditioning (Biggins *et al.*, 1998). This is one of the most important biological lessons learned in the ferret recovery program and has contributed greatly to establishing populations.
- Cooperation and creative partnerships are essential: Captive breeding would not have succeeded without the cooperation of zoos and, consequently, captive breeding became a foundation of overall program success. Re-introduction requires cooperation and partnerships between many diverse groups, particularly among private landowners and agricultural organizations. Because the ferret recovery program has been moderately successful, it may be prudent to become even more proactive and creative in efforts to further establish wild ferret populations (Lockhart *et al.*, 2006).

Success of project

Highly Successful	**Successful**	Partially Successful	Failure
	√		

Reason(s) for success/failure:

- Persistence and patience in captive breeding: The first attempts at captive breeding in the 1970's did not produce viable offspring and the initial attempt in 1986 was unsuccessful. Capturing young animals, attention to detail in husbandry techniques, reproductive cycles and pairings resulted in the first viable captive-born kits in 1987. The captive breeding program has grown and developed since 1987 and provides high-quality animals for re-introduction throughout their range. Zoos that captive breed black-footed ferrets (National Zoological Park, Louisville Zoo, Toronto Zoo, The Phoenix Zoo, Cheyenne Mountain Zoo, and, at one time, the Henry Doorly Zoo and Turner Endangered Species Fund) have committed substantial resources, without compensation, to the captive breeding effort.
- High quality habitat and mitigation of disease at self-sustaining re-introduction sites: Re-introduction sites that are currently considered self-sustaining and viable have high quality habitat that is plague-free or the disease is actively mitigated. Dusting prairie dog burrows to kill fleas, a vector of plague, and vaccinating ferrets is effective in managing plague and increasing both prairie dog and ferret survival (Matchett *et al.*, 2010). The substantial commitment by site managers to mitigate plague is a significant reason for success, such as the ongoing dusting/vaccination efforts in Conata Basin/Badlands, South Dakota.
- Pre-release conditioning of captive animals: Releasing captive-born ferrets with outdoor pen exposure (Biggins *et al.*, 1998) allowed rapid and efficient population establishment at some recovery sites. Pre-release conditioning is now standard in the ferret recovery program and translocation of wild animals is an effective tool in establishing new populations.
- Continued research and monitoring: An adaptive approach to program management has allowed research to address issues facing the program and advance recovery. Several examples include pre-release conditioning improving survival (Biggins *et al.*, 1998) and establishment of populations, artificial insemination helped genetic management, and plague research has given us short-term tools to understand and mitigate the disease (Matchett *et al.*, 2010).
- Patience and persistence in re-introduction: Re-introduction of captive-born ferrets into the wild began in 1991 yet the first self-sustaining and viable populations were not observed until 1999. Program partners remained fiscally and politically committed to re-introduction, sometimes without evidence of immediate population establishment. Most sites monitor wild populations annually, allowing yearly assessment of program progress and wild population establishment.

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