



Black-footed Ferret SAFE Program Action Plan 2019-2021

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with the Black-footed Ferret SSP[®] and United States Fish and Wildlife Service



Figure 1. Black-footed ferret (*Mustela nigripes*) in the wild. Photo by U.S. Fish and Wildlife Service.

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SAFE Species Program Goal

The goal of the Black-footed Ferret SAFE program is to recover the black-footed ferret (BFF) such that it no longer meets the Endangered Species Act's definition of endangered but is downlisted to threatened. To be able to downlist the BFF, the BFF SAFE program will support recovery of the BFF as outlined in the United States Fish and Wildlife Service (USFWS) Black-footed Ferret Recovery Plan through targeted conservation, public awareness, communication and funding actions. Specifically, the program objectives are to:

- 1) Support the BFF SSP's breeding program using science-based management to increase the number of BFFs available for the reintroduction program by increasing the whelping rate of all SSP females to 60% by 2021;
- 2) Work with the Conservation Education Committee (CEC) and Public Relations (PR) and Marketing Committee to develop a strategic plan for these two areas
- 3) Increase annual AZA funding support for BFF recovery efforts, including funding for both the field and managed care activities.

The SAFE Program Leader and major Program Partners, as members of the black-footed ferret SSP, currently work very closely with USFWS, the agency that implements the recovery plan and oversees ferret recovery. The SSP is part of the Managed Care Subcommittee within the Black-footed Ferret Recovery Implementation Team (BFFRIT) and is in close communication with USFWS at all times.

Program Operational Structure

Black-footed Ferret SAFE Program				
	Program Operational Structure			
	Role	Representative	Institution	Contact Info
Officers	Program Leader	Guy Graves	Louisville Zoo	guy.graves@louisvilleky.gov
	Vice Program Leader	Rachel Santymire	Lincoln Park Zoo	rsantymire@lpzoo.org
Steering Committee		Jeff Baughman Robyn Bortner TBD Vicki Lake Gerri Mintha Education Advisor	Cheyenne Mountain Zoo USFWS National Black-footed Ferret Conservation Center (NBFFCC) Phoenix Zoo Smithsonian Conservation Biology Institute (SCBI) Toronto Zoo TBD	jbaughman@cmzoo.org robyn_bortner@fws.gov ehastings@phoenixzoo.org lakev@si.edu gmintha@torontozoo.ca TBD
BFF SAFE Program Partners		TBD	US Fish & Wildlife Service TBD	
Zoo Display Partners			Abilene Zoo Amarillo Zoo Dakota Zoo Elmwood Park Zoo El Paso Zoo Hutchinson Zoo Lee Richardson Zoo Navajo Nation Zoo Northeastern Wisconsin Zoo Roosevelt Park Zoo Saskatoon Forestry Farm Park and Zoo Topeka Zoological Park	bill.gersonde@abilenetx.com rhonda.votino@amarillo.gov director@dakotazoo.org mhaynes@elmwoodparkzoo.org kisedajj@elpasotexas.gov kileyb@hutchgov.com kristi.newland@gardencityks.us dmikesic@navajozoo.org Murach_CD@co.brown.wi.us bclarkrpz@srt.com Garth.Graham@Saskatoon.ca ddinwiddle@topeka.org

			Zoo America	KAGovern@hersheypa.com
Museum or Nature Center Partners			Fort Collins Museum of Discovery Milford Nature Center Prairie Park Nature Center Rocky Mountain Arsenal Wildlife Refuge	See appendix for non-AZA contacts
Field Partners			Association of Zoos and Aquariums, APHIS/Wildlife Services, USDA, Arizona Game and Fish Department, Audubon of Kansas, Bureau of Indian Affairs, USDI, Bureau of Land Management, USDI, Canada, Parks Canada Grasslands National Park, Cheyenne River Sioux Tribe, City of Fort Collins, Natural Areas Department, Colorado Cattlemen’s Association, Colorado Parks and Wildlife, Defenders of Wildlife, US Fish and Wildlife Service, USDI, US Forest Service, USDA, Fort Carson, US Army, US Geological Survey, Biological Resources Division, USDI (Fort Collins, CO and Madison, WI), Gros Venture and Assiniboine Tribe (Ft. Belknap, MT), Kansas Department of Wildlife, Parks and Tourism, Lower Brule Sioux Tribe (South Dakota), Mexico; Universidad Nacional Autonoma de MX, Ecologia y Conservacion de Fauna Silvestre Instituto de Ecologia, UNAM, Montana Department of Fish, Wildlife and Parks, Natural Resources and Conservation Service, USDA, National Fish and Wildlife Foundation, National Park Service, USDI, National Wildlife Federation, Navajo Nation (Arizona, New Mexico), Nebraska Game and Parks Commission, New Mexico Game and Fish Department, North Dakota Game and Fish Department, Northern Cheyenne Tribe (Montana), Oklahoma Department of Wildlife Conservation, Prairie Wildlife Research, Rosebud Sioux Tribe (South Dakota), South Dakota Game, Fish and Parks Department, Texas Parks and Wildlife Department, The Nature Conservancy (Kansas and South Dakota), Turner Endangered Species Fund, Utah Division of Wildlife Resource, World Wildlife Fund, Wyoming Game and Fish Department.	
Advisors	Veterinary Education	Della Garelle Kimberly Fraser Colleen Lynch	US Fish & Wildlife Service US Fish & Wildlife Service AZA Population Management Center	della_garelle@fws.gov kimberly_fraser@fws.gov clynch@riverbanks.org

	Population Biologist Studbook keeper	Paul Marinari	Smithsonian Conservation Biology Institute	marinarip@si.edu
FCC Liaison		Lisa Faust	Lincoln Park Zoo	lfaust@lpzoo.org
Optional:	Secretary Treasurer			

Conservation Target

Populations of black-footed ferrets (*Mustela nigripes*) and its habitat throughout the Great Plains of North America

Kingdom: Animalia; Phylum: Chordata; Class: Mammalia; Order: Carnivora; Family: Mustelidae

Status of Taxon within the AZA Community

The BFF is one of the most endangered mammals in North America. It serves as a good population management model for other zoo-housed endangered carnivore species because it is an r-selected species and, therefore, we can observe the effects of management changes on population fitness in a short period of time. In order to save the species, all known remaining BFFs were removed from prairie dog colonies outside of Meeteetse, Wyoming to begin an *ex situ* breeding program. Initially, not much was known about the reproductive biology of the BFF. While earlier attempts to breed members of the Mellette County South Dakota population in captivity were successful in the 1970s, none of the resulting offspring survived. Biologists with the Wyoming Game and Fish Department and the U.S. Fish and Wildlife Service convened domestic ferret breeders and reproductive experts from the Association of Zoos and Aquariums to share information that led to improved reproduction.

Today there are six facilities that make up the managed BFF Species Survival Plan[®] (SSP). These include the USFWS's National Black-footed Ferret Conservation Center (NBFFCC; Colorado), National Zoo's Smithsonian Conservation Biology Institute (Virginia), Louisville Zoological Garden (Kentucky), Toronto Zoo (Ontario, Canada), Cheyenne Mountain Zoo (Colorado) and Phoenix Zoo (Arizona; Figure 2). The Henry Doorly Zoo (Omaha, Nebraska) participated in the SSP[®] until the late 1990s. These institutions collectively manage a core breeding population of 280 to 300 black-footed ferrets. The SSP's primary goal is to produce as many BFF kits as possible in order to sustain future *ex situ* breeding and to supply BFFs for ongoing reintroduction efforts. Additionally, between 2011 and 2015, 22 AZA-accredited facilities contributed approximately \$5.8 million to 32 field conservation projects benefitting BFFs. These projects primarily focus on reintroduction, monitoring of reintroduced BFFs, and ecological studies focused on strengthening long-term sustainability of the population, such as those investigating the species' relationship with its prey, the black-tailed prairie dog (AZA-Accredited Facilities, 2016).



Figure 2. Black-footed ferret SSP facilities that are involved in the *ex situ* breeding program.

Black-footed Ferret Population AZA Species Survival Plan® Yellow Program

The BFF has been held *ex situ* since 1985 with breeding beginning in 1986. Population growth due to *ex situ* management has been variable (average $\lambda = 1.8$) as production rates have been determined by changing field program needs, including maintaining the *ex situ* population and supplying as many as 250 animals per annum for release efforts. The current breeding population size is 307 distributed among six facilities (5 AZA and 1 USFWS). The population is managed to a target size of 350. This target is intended to support the breeding population, animals for release, and the display and education population. Based on the TAG's space survey (2009) this includes approximately 65 non-breeding animals, 100 breeding animals in AZA institutions, and up to 200 breeding animals at the USFWS facility.

AZA Conservation Activities

AZA facilities have supported BFF recovery through programs that raise BFF conservation awareness; fund fieldwork and disease management; conduct and support research; and increase collaboration between zoos, government agencies, and other stakeholders. Current AZA activities and programs are listed below:

Funding

- Quarters for Conservation (2008-present)
 - Cheyenne Mountain Zoo
 - <http://www.cmzoo.org/index.php/conservation-matters/quarters-for-conservation/>
- BFF Tattoo Sales

Research

- SSP Biobanks and Monitoring Phenotypic Traits Related to Fitness

- Lincoln Park Zoo and USFWS
- BFF Mate Choice
 - Lincoln Park Zoo and USFWS
- Distinguishing between pseudopregnancy and pregnancy
 - Lincoln Park Zoo and National Black-footed Ferret Conservation Center
- BFF Genomics which is investigating genes related to fertility and the epigenetics
 - Smithsonian National Zoological Park and Lincoln Park Zoo
- Plague Mitigation using vaccination (of prairie dogs and BFFs) and/or insecticide
 - Smithsonian National Zoological Park, Phoenix Zoo and various other partners have contributed funding to support this research
- Biomedical Survey which compares the health and fertility of BFFs wild and under human care.
 - Lincoln Park Zoo, USFWS and Smithsonian National Zoological Park

Collaboration

- Work with Release/Reintroduction Sites
 - Phoenix Zoo with Aubrey Valley and Espee Ranch
 - Kansas zoos with Haverfield site
 - Lincoln Park Zoo with Northern Cheyenne Reservation
 - Smithsonian National Zoological Park with Meeteetse, Wyoming
- Small Carnivore TAG
- Reintroduction Scientific Advisory Group
- Reproduction and Endocrinology Scientific Advisory Group

AZA Public Engagement Activities

Current zoos with a live BFF display

Abilene Zoo, Amarillo Zoo, Cheyenne Mountain Zoo, Dakota Zoo, Elmwood Park Zoo, El Paso Zoo, Hutchinson Zoo, Lee Richardson Zoo, National Zoological Park, Navajo Nation Zoo, Northeastern Wisconsin Zoo, Phoenix Zoo (BFF webcam only), Roosevelt Park Zoo, Saskatoon Forestry Farm Park & Zoo, Topeka Zoological, Park Red River Zoo and Zoo America (Figure 3). Display facilities are important in providing education opportunities to explain the BFF decline and its critical role as an ambassador species to help reestablish healthy prairie ecosystems to the Great Plains of North America.

Public engagement activities

Zoos have used several approaches to engaging the public and making them aware of the black-footed ferret. Zoos have talk with visitors about BFFs on Endangered species day and the day of BFF rediscovery (Sept. 26th). Activities have included coloring sheets, making BFF masks, prairie jenga and crawling into large tubes like BFFs. Some zoos have permits to take the BFF to the classroom (or just at the zoo) in a mobile display and have develop curriculum about wildlife conservation using the BFF as a model. Other zoos have given scientific lectures to donors and visitors. Zoos also have had scientists and animal care staff talk to zoo camp youth about the BFF and its story. Additionally, zoos do both press releases and social media posts about BFFs. The USFWS maintains blackfootedferret.org and a Facebook page about FCC.

For education material, there are several videos made by the USFWS and Wyoming Game and Fish that can be found on YouTube. Clemson University created a video entitled “Great Plains 2-Ghosts of the Plains” Expeditions with Patrick McMillan. Another video filmed in Canada entitled, “Return of the

Prairie Bandit” was created by Kenton Vaughan. In addition to videos, several books have been written about the BFF story, including Phantom of the Prairie by J. London from Sierra Club, Wild and Free: the Story of a Black-footed Ferret by Jo-Ellen Bosson from The Smithsonian Wild Heritage Collection, Prairie Night by B. Miller, R. Reading and S. Forrest and Zoo Scientists to the Rescue by P. Newman.

Public/stakeholder engagement activities

The USFWS mostly takes the lead talking with stakeholders, including ranchers and US Park and Forest Service officials, about managing and conserving BFFs. Although at Wind Cave National Park, there were opportunities for the public to go on a hike at night and spotlight for BFFs. Some zoos are partnering with field sites. For example, Lincoln Park Zoo has partnered with the Northern Cheyenne Tribe (17th BFF reintroduction site). They received AZA CEF funding to developing a teacher (and community) workshop providing materials and activities to conduct a curriculum on the prairie ecosystem. The grant also provided professional development for the Tribe’s BFF biologists along with equipment for BFF monitoring. The zoos in Kansas assist with BFF monitoring at the Haverfield Ranch in Logan, Kansas.

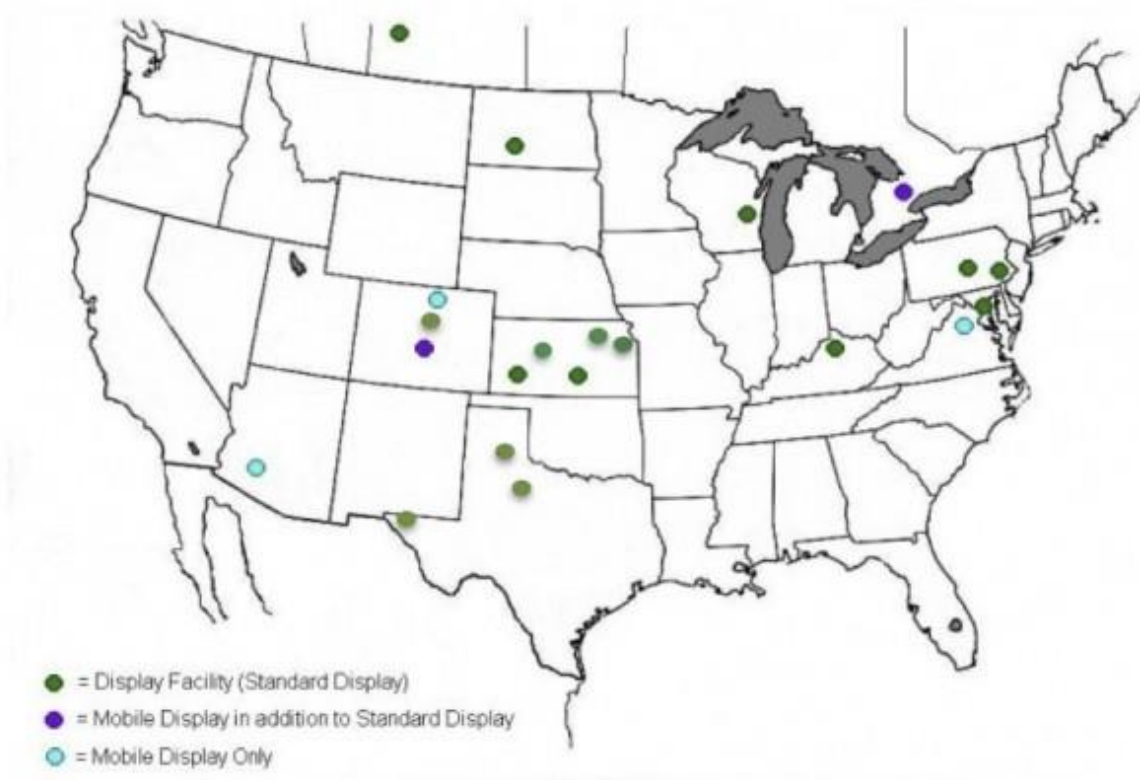


Figure 3. AZA facilities that are involved display black-footed ferrets.

Conservation Status of Taxa

Black footed ferret *Mustela nigripes*

- United States Conservation Status (<http://www.fws.gov/>)
 - Endangered and Experimental Population, non-essential
- IUCN Conservation Status
 - Endangered (assessed 2015 by Belant et al.)

Species Status

The status of the species, detailed in the USFWS 2013 BFF Recovery Plan, is as follows:

The black-footed ferret was listed as endangered in 1967 (32 FR 4001, March 11, 1967) and again in 1970 (35 FR 8491, June 2, 1970) under early endangered species legislation and was “grandfathered” into the ESA in 1973. Black-footed ferrets are exempt from the requirement to designate critical habitat because they were listed prior to the 1978 amendments requiring critical habitat. ...

We assigned the black-footed ferret a recovery priority number of 2C ... indicating that the ferret faces a high degree of threat with potential economic conflicts. The ferret depends wholly on prairie dogs, which are viewed as agricultural pests by some (USFWS, 2008). The high degree of threat is largely due to inadequate management and conservation of prairie dogs (see the section “Threats and Reasons for Listing”). The ranking also reflects the ferret’s taxonomic status as a full species. Priority 2C also reflects the high potential for recovery despite the above management challenges. (p. 13)

As of Fall 2018, there are 447 BFFs at 30 reintroduction sites (8 states, 3 countries), with 18 sites active, 9 sites inactive, and 3 in unknown status (Figure 4). BFF reintroduction began in 1991 with the release of one group into the Shirley Basin, Wyoming. Since 1987, over 9,300 kits have been produced through *ex situ* breeding and since 1991, over 4,300 BFFs have been released at 30 sites. When possible, populations are sampled and counted at least once a year as part of a management and recovery protocol. At the spring count of 2008 there were approximately 500 breeding adults in the wild, fewer than 250 of which had been born in the wild. The estimated number of breeding adults rose to 448 in 2009, but had declined to 274 in 2012, and was similar in 2015, at 295. The overall approximate population decline from 2008 to 2015 was about 40%. Of these, 206 mature individuals occur in self-sustaining free-living populations. These minimum population estimates occur in the spring. Maximum population estimates occur in the fall and include young of the year.



Figure 4. The 30 black-footed ferret reintroduction sites.

Recovery Plan

The black-footed ferret recovery plan was last revised by USFWS in 2013. A 5-year review is due to be conducted in 2018 (USFWS, 2013). It can be downloaded here:

https://ecos.fws.gov/docs/recovery_plan/20131108%20BFF%202nd%20Rev.%20Final%20Recovery%20Plan.pdf

The criteria for recovery, downlisting, and delisting a species are outlined in the 2013 BFF Recovery Plan and stated below:

Recovery Criteria:

This recovery plan revision provides reasonable biological and logistically achievable criteria that may be used to realize downlisting (endangered to threatened status) and delisting objectives.

In particular, we can achieve recovery of the black-footed ferret through more proactive management, especially plague management, of existing prairie dog habitat.

Downlisting Criteria:

Downlisting criteria have been expanded from criteria provided in the 1988 Recovery Plan (U.S. Fish and Wildlife Service 1988).

- Conserve and manage an *ex situ* breeding population of black-footed ferrets with a minimum of 280 adults (105 males, 175 females) distributed among at least three facilities.
- Establish free-ranging black-footed ferrets totaling at least 1,500 breeding adults, in 10 or more populations, in at least 6 of 12 States within the historical range of the species, with no fewer than 30 breeding adults in any population, and at least 3 populations within colonies of Gunnison's and white-tailed prairie dogs.
- Maintain these population objectives for at least three years prior to downlisting.
- Maintain approximately 247,000 acres (ac) (100,000 hectares (ha)) of prairie dog occupied habitat at reintroduction sites (specific actions are described in Part II of this plan) by planning and implementing actions to manage plague and conserve prairie dog populations.

Delisting Criteria:

Delisting criteria are new since the 1988 revision of the recovery plan. Delisting may occur when the following recovery criteria are met.

- Conserve and manage an *ex situ* breeding population of black-footed ferrets with a minimum of 280 adults (105 males, 175 females) distributed among at least three facilities.
- Establish free-ranging black-footed ferrets totaling at least 3,000 breeding adults, in 30 or more populations, with at least one population in each of at least 9 of 12 States within the historical range of the species, with no fewer than 30 breeding adults in any population, and at least 10 populations with 100 or more breeding adults, and at least 5 populations within colonies of Gunnison's and white-tailed prairie dogs.
- Maintain these population objectives for at least three years prior to delisting.
- Maintain a total of approximately 494,000 ac (200,000 ha) of prairie dog occupied habitat at reintroduction sites by planning and implementing actions to manage plague and conserve prairie dog populations (specific actions are described in Part II of this plan).
- Complete and implement a post-delisting monitoring and management plan, in cooperation with the States and Tribes, to ensure recovery goals are maintained.

Threats to BFF

The BFF (*Mustela nigripes*) is an endangered species whose survival is due in part to the efforts of both USFWS and AZA. It is the only ferret species endemic to North America and evolved to be a specialist carnivore that feeds on mostly prairie dogs (*Cynomys* spp), which are found throughout the Great Plains from Canada down into Mexico. After the United States' westward expansion, the prairie habitat became degraded and fragmented mostly due to the conversion into agricultural fields, livestock pastures and cities, and a federal government-sponsored poisoning campaign to eliminate the prairie dogs, which were viewed as competitors for the land. Unfortunately, this caused a near extinction of the BFF. However, in 1981 a small population of BFFs was discovered near Meeteetse, Wyoming (Miller *et al.*, 1996). In 1985, disease including canine distemper virus (CDV) and sylvatic plague (*Yersinia pestis*), which is an introduced disease that is spread by flea vector, aerosol or ingestion of contaminated food, was detected in the local prairie dog population (Carr, 1986). The last remaining 24 black-footed ferrets were removed from the wild (Carr, 1986; Miller *et al.*, 1996) to start an *ex situ* breeding program; however, six died immediately from CDV. With the remaining 18, the *ex situ* breeding program was initiated. In 1988, the USFWS developed a revised Black-Footed Ferret Recovery Plan which emphasized preservation of the species through natural breeding, a multi-institutional propagation program, and development of assisted reproductive techniques such as artificial insemination (AI; USFWS, 1988).

Disease is still an issue for BFFs under human care and wild black-footed ferret populations. Specifically, CDV has long been known to cause morbidity and mortality in this species, and contributed to the decline of the original Meeteetse population. Plague has been spreading eastward; however, the U.S. Geological Survey's National Wildlife Health Center (Madison, WI) in collaboration with United States Army Medical Research Institute for Infectious Diseases developed a vaccine that can be used in BFFs and an oral bait vaccine for prairie dogs (Rocke *et al.*, 2004).

Loss of fecundity is one of the issues impeding the BFF SSP's breeding program (Howard *et al.*, 2004). There has been a decrease in the *ex situ* population's fecundity, indicated by a decrease in whelping rates (from 70 to 35%) in females and normal sperm (from 50 to 16%) in males (Wolf *et al.*, 2000; Santymire *et al.*, 2006, 2007). The causes of these physiological changes are unknown; both nutritional and genetic hypotheses are under examination. However, due to its limited gene pool (n=7 founders), issues with inbreeding depression are inevitable (Reading *et al.*, 1996). Because nutrition can be a limiting factor for reproductive success in wild and domesticated mammals, it is important to investigate its attribution to declining fitness in the BFF *ex situ* population. Vitamin E is an antioxidant, which can promote sperm viability by preventing oxidative stress. Thus, antioxidants can improve sperm motility and concentration (Brezczynska-Slebodzinska, 1995; Suleiman *et al.*, 1996; Comhaire *et al.*, 2000). However, too much vitamin A can also adversely affect reproduction resulting in low conception rates, stillbirths and abnormal sperm. Vitamin A can also block the absorption of vitamin E and selenium (Combs, 1976; Vahl and Vant Klosser, 1987; Mazzaro *et al.*, 1995; Surai *et al.*, 1998). Records reveal that a decrease in normal sperm (%) in *ex situ* black-footed ferrets occurred following the conversion of diet in 2001, from a manually-prepared rabbit meat-based diet to the commercial horsemeat-based diet, Toronto Small Carnivore, Milliken Meats, Canada (Santymire *et al.*, 2015).

The prairie ecosystem remains diminished and fragmented. With the loss of prairie dog populations and good quality habitat, BFF recovery remains challenging. Human-wildlife conflict centered on the prairie dog limits the habitat for the BFF. The distances among the BFF reintroduction sites (Figure 3) makes natural immigration and emigration impossible; however, the incentive program

that pays private ranchers a dollar amount per acre of prairie dog towns, may open up corridors among these sites.

Objective Overview in Relation to Recovery Plan

Conservation Objectives

Objective	Recovery Plan Relevance
Increase the number of ferrets available for the reintroduction program by increasing the whelping success rate of all SSP females to 60% by 2021.	"1.5 of 2013 Recovery Plan (Implement breeding strategies to maintain genetic diversity in the captive population while providing suitable genetic and demographic stock for reintroduction programs)"

Public/Stakeholder Engagement and Communication/Public Awareness Objective

Objective	Recovery Plan Relevance
Work with the Conservation Education Committee (CEC) and Public Relations (PR) and Marketing Committee to develop a strategic plan for these two areas	"6.3 of 2013 Recovery Plan (Support site-specific ferret reintroduction efforts and develop an outreach plan to stakeholders that support ferret recovery)"

Funding Objective

Funding Objective:	Recovery Plan Relevance
Increase annual AZA funding support for BFF recovery efforts, including funding for both the field and managed care activities.	"6.4 of 2013 Recovery Plan (Consider funding needs for national and international ferret recovery)"

3-Year Work Plan

Conservation Objective: Increase the number of ferrets available for the reintroduction program by increasing the whelping success rate of all SSP females to 60% by 2021.

Rationale: The SSP program has two overarching goals: 1. Maintain the genetic health of the ex situ population; and 2. Provide individuals for release into the wild. Therefore, we need to increase the number of BFFs produced to achieve these goals. By ensuring that the SSP BFFs are reproducing at a rate that allows a surplus of individuals for release, we can support recovery efforts in the wild and increase the demand for more suitable habitat to be developed and maintained.

Action	Metrics	Timeframe	AZA Partners	Other Partners	Budget
1.1 Determine the effects of the Toronto small carnivore diet on semen quality and whelping rates.	<p>1) Diet study is implemented in 50% of the NBFCC and LZG population and samples are taken and evaluated</p> <p>2) Offspring traits (semen quality and breeding success) are evaluated after being born on the diet and surviving to the breeding season</p> <p>3) Traits are compared between wild and <i>ex situ</i> BFFs</p>	<p>Yr 1: Diet study is initiated at FCC and LZG; Samples are taken</p> <p>Yr 2: Offspring and parents are sampled in the spring; Potentially bring in wild males into the NBFCC outdoor pens</p> <p>Yr 3: Continue to sample offspring born on the different diet treatments. Potentially sample wild males that have been brought into the pens at NBFCC</p>	<ul style="list-style-type: none"> • Jeff Baughman, Cheyenne Mountain Zoo • TBD, Phoenix Zoo • Guy Graves, Louisville Zoo • Vicki Lake, SCBI • Rachel Santymire, Lincoln Park Zoo • Gerri Mintha, Toronto Zoo 	<ul style="list-style-type: none"> • Robyn Bortner, Della Garelle and Pete Gober, NBFCC • Travis Livieri, Prairie Wildlife Research • Rocky Mountain Arsenal 	<p>\$10,000/yr (travel for sampling, shipping samples, hormonal analysis (\$5/sample), vitamin E& A analysis (\$20/sample), oxidative stress quantification, epigenetics analysis, student stipend and microbial analysis</p>
1.2 Standardize the reproductive assessment tools	1. Zoos are trained to use new staining	Yr 1: Zoos have implemented the new protocol	<ul style="list-style-type: none"> • Jeff Baughman, 	<ul style="list-style-type: none"> • Robyn Bortner, Della Garelle 	<p>\$2,000/year (for stain, hormones,</p>

for ferrets across all SSP facilities	<p>protocols for vaginal cytology.</p> <ol style="list-style-type: none"> All six SSP facilities are using the same protocols. The number of females that require exogenous hormones to ovulate is reduced. Whelping rates increase across the SSP. 	<p>Yr 2: Zoos send slides to be evaluated by experts</p> <p>Yr 3: Everyone is successful using the same protocol</p>	<p>Cheyenne Mountain Zoo</p> <ul style="list-style-type: none"> TBD, Phoenix Zoo Guy Graves, Louisville Zoo Vicki Lake, SCBI Rachel Santymire, Lincoln Park Zoo Gerri Mintha, Toronto Zoo 	<p>and Pete Gober, NBFCC</p>	<p>shipping of sample slides)</p>
1.3 Develop methods to determine the rate of pseudo pregnancy vs pregnancy	<ol style="list-style-type: none"> Fecal samples are collected from females given exogenous luteinizing hormone and not paired with a male. Hormone results are obtained from new assays. 	<p>Yr 1: Samples are collected from a minimum of two females per year that are not paired and LH was used to cause ovulation</p> <p>Yr 2: Samples are evaluated from Yr 1 and more samples are collected.</p> <p>Yr 3: same as above</p>	<ul style="list-style-type: none"> Jeff Baughman, Cheyenne Mountain Zoo TBD, Phoenix Zoo Guy Graves, Louisville Zoo Vicki Lake, SCBI Rachel Santymire, Lincoln Park Zoo Gerri Mintha, Toronto Zoo 	<ul style="list-style-type: none"> Robyn Bortner, Della Garelle and Pete Gober, NBFCC 	<p>\$2,000/yr (shipping samples, commercial kits)</p>
1.4 Determine the effects of mate	<ol style="list-style-type: none"> Mate choice trials are conducted 	<p>Yr 1: Mate choice trials are conducted</p>	<ul style="list-style-type: none"> Guy Graves, Louisville Zoo 	<ul style="list-style-type: none"> Robyn Bortner, 	<p>\$20,000/yr</p>

<p>choice on whelping success</p>	<p>and behavior is evaluated 2. Fecal hormones are evaluated 3. Gut microbes are evaluated 4. MHC relatedness is evaluated</p>	<p>and samples are collected and evaluated Yr 2: Mate choice trials are conducted and samples are collected and evaluated Yr 3: All data are analyzed and a publication will be written</p>	<ul style="list-style-type: none"> • Vicki Lake, SCBI • Rachel Santymire, Lincoln Park Zoo 	<p>Della Garelle and Pete Gober, NBFCC</p>	<p>(CGF covers Yr1): (travel, student stipend, microbial analysis, hormonal analysis, MHC gene analysis, fedexing, equipment)</p>
<p>1.5 Develop new environmental enrichment to reduce stressors that may contribute to fetal absorption, abortion, or cannibalism</p>	<p>1. Various enrichment items will be evaluated based on behavior 2. Hair will be collected and analyzed for stress</p>	<p>Yr 1: Hair will be collected from <i>ex situ</i> and wild BFFs Yr 2: Hair will be collected from <i>ex situ</i> and wild BFFs Yr 3: Data will be analyzed and written up for publication</p>	<ul style="list-style-type: none"> • Jeff Baughman, Cheyenne Mountain Zoo • TBD, Phoenix Zoo • Guy Graves, Louisville Zoo • Vicki Lake, SCBI • Rachel Santymire, Lincoln Park Zoo • Gerri Mintha, Toronto Zoo 	<ul style="list-style-type: none"> • Robyn Bortner, Della Garelle and Pete Gober, NBFCC • Travis Livieri, Prairie Wildlife Research 	<p>\$3,000 per year (supplies, enrichment items, hormonal analysis)</p>

Public/Stakeholder Engagement and Communication/Public Awareness Objective

Public/Stakeholder Engagement and Communication/Public Awareness Objective 1: Work with the Conservation Education Committee (CEC) and Public Relations (PR) and Marketing Committee to develop a strategic plan for these two areas (Public/Stakeholder Engagement, Communications/Public Awareness).

Rationale: Currently, there are many outreach tools that have been developed by zoos and federal agencies. However, the BFF SSP has not had an AZA conservation education advisor in several years. The USFWS has been making great efforts to increase public awareness, but the BFF SAFE program would like to “regroup” with high-level advising of a professional educator to determine how Zoos and USFWS can identify appropriate strategic objectives, audiences, and actions in these two areas.

Action	Metrics	Timeframe	AZA Partners	Other Partners	Budget
1.1 Work with CEC and PR/Marketing Committees to identify a planning liaison	<ol style="list-style-type: none"> Liaison is assigned Planning helps identify Objectives, Audiences, and Actions needed to meet those Objectives Conservation Action Plan Addendum is created with updated Objectives for Public/Stakeholder Engagement and Communications/Public Awareness 	<p>Yr 1: CEC and PR/Marketing liaisons work with BFF SAFE steering committee and program partners to develop strategic plans</p> <p>Yr 2: Plans are approved and CAP addendum is finalized</p> <p>Yr 3: Liaisons work with Education Advisor to help guide actions from the strategic plan.</p>	<ul style="list-style-type: none"> Jeff Baughman, Cheyenne Mountain Zoo TBD, Phoenix Zoo Guy Graves, Louisville Zoo Vicki Lake, SCBI Rachel Santymire, Lincoln Park Zoo Gerri Mintha, Toronto Zoo Abilene Zoo Amarillo Zoo Dakota Zoo Elmwood Park Zoo El Paso Zoo Hutchinson Zoo Lee Richardson Zoo Navajo Nation Zoo Northeastern Wisconsin Zoo 	<ul style="list-style-type: none"> Kimberly Fraser, Robyn Bortner and Pete Gober USFWS Sierra Fraser 	\$1,000/yr (communications, shipping material, printing or creating outreach material)

			<ul style="list-style-type: none"> • Red River Zoo • Roosevelt Park Zoo • Saskatoon Forestry Farm Park and Zoo • Topeka Zoological Park • Zoo America 		
1.2 Identify a permanent Education Advisor and form an advisory committee to implement Plan	<ol style="list-style-type: none"> 1. Education advisor is identified and a sub-committee is formed 2. Strategy plan's objectives, Audiences, and Actions are prioritized and implementation is initiated 	<p>Yr 2: Education advisor is identified and a sub-committee is formed</p> <p>Yr 3: Advisor and committee sets priorities and works on plan's objectives</p>	<ul style="list-style-type: none"> • Jeff Baughman, Cheyenne Mountain Zoo • TBD, Phoenix Zoo • Guy Graves, Louisville Zoo • Vicki Lake, SCBI • Rachel Santymire, Lincoln Park Zoo • Gerri Mintha, Toronto Zoo • Abilene Zoo • Amarillo Zoo • Dakota Zoo • Elmwood Park Zoo • El Paso Zoo • Hutchinson Zoo • Lee Richardson Zoo • Navajo Nation Zoo • Northeastern Wisconsin Zoo 	<ul style="list-style-type: none"> • Kimberly Fraser, Robyn Bortner and Pete Gober USFWS • Sierra Fraser 	\$1,000/yr (communications, shipping material, printing or creating outreach material)

			<ul style="list-style-type: none"> • Red River Zoo • Roosevelt Park Zoo • Saskatoon Forestry Farm Park and Zoo • Topeka Zoological Park • 		
1.3 Inventory existing resources and evaluate	<p>1. Resources are gathered and placed in a central resource location</p> <p>2. Resources are evaluated based on the strategic goals set in the plan, which are based on recovery actions and SSP needs</p>	<p>Yr 2: All materials are collected and reviewed</p> <p>Yr 3: Public awareness needs are assessed and developed</p>	<ul style="list-style-type: none"> • Jeff Baughman, Cheyenne Mountain Zoo • TBD, Phoenix Zoo • Guy Graves, Louisville Zoo • Vicki Lake, SCBI • Rachel Santymire, Lincoln Park Zoo • Gerri Mintha, Toronto Zoo • Abilene Zoo • Amarillo Zoo • Dakota Zoo • Elmwood Park Zoo • El Paso Zoo • Hutchinson Zoo • Lee Richardson Zoo • Navajo Nation Zoo • Northeastern Wisconsin Zoo • Red River Zoo • Roosevelt Park Zoo 	<ul style="list-style-type: none"> • Kimberly Fraser, Robyn Bortner and Pete Gober USFWS • Sierra Fraser 	\$1,000/yr (communications, shipping material, printing or creating outreach material)

			<ul style="list-style-type: none"> • Saskatoon Forestry Farm Park and Zoo • Topeka Zoological Park 		
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Funding Objective

Funding Objective: Increase annual AZA funding support for BFF recovery efforts, including funding for both the field and managed care activities.
Rationale: Funding is needed to accomplish our conservation, public/stakeholder engagement and communication and public awareness goals.

Action	Metrics	Timeframe	AZA Partners	Other Partners	Budget
1.1 Have a BFF SAFE roundtable discussion and/or session to bring on more SAFE partners	1. More AZA facilities become BFF SAFE Partners	Yr 1-Yr 3: Have a BFF SAFE roundtable discussion at the AZA conferences to improve communications, help identify funding needs and actions and assign tasks to participants.	<ul style="list-style-type: none"> • Jeff Baughman, Cheyenne Mountain Zoo • TBD, Phoenix Zoo • Guy Graves, Louisville Zoo • Vicki Lake, SCBI • Rachel Santymire, Lincoln Park Zoo • Gerri Mintha, Toronto Zoo • Abilene Zoo • Amarillo Zoo • Dakota Zoo • Elmwood Park Zoo • El Paso Zoo • Hutchinson Zoo • Lee Richardson Zoo • Navajo Nation Zoo 	<ul style="list-style-type: none"> • Pete Gober USFWS 	\$5,000/yr (Travel to the conferences)

			<ul style="list-style-type: none"> • Northeastern Wisconsin Zoo • Red River Zoo • Roosevelt Park Zoo • Saskatoon Forestry Farm Park and Zoo • Topeka Zoological Park 		
1.2 Pursue competitive SAFE grants from AZA on an annual basis to gain funding support for specific initiatives for BFF recovery	<p>1. Funding priorities are developed for both <i>ex situ</i> and wild BFF recovery initiatives</p> <p>2. Annual report on Conservation and Science (ARCS) of AZA contributions reflects an increase in the funding to BFF conservation</p>	<p>Yr 1: SAFE steering committee works with FWS to determine funding priorities</p> <p>Yr 1-3: Write proposals to various funding sources</p> <p>Yr 1-3: Track ARCS report</p>	<ul style="list-style-type: none"> • Cheyenne Mountain Zoo • Phoenix Zoo • Louisville Zoo • SCBI • Lincoln Park Zoo • Toronto Zoo • Abilene Zoo • Amarillo Zoo • Dakota Zoo • Elmwood Park Zoo • El Paso Zoo • Hutchinson Zoo • Lee Richardson Zoo • Navajo Nation Zoo • Northeastern Wisconsin Zoo • Roosevelt Park Zoo • Saskatoon Forestry Farm Park and Zoo • Topeka Zoological Park • Zoo America 	<ul style="list-style-type: none"> • USFWS 	\$1,000/yr (communications, shipping material, printing or creating outreach material)

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