BLACK-FOOTED FERRET
DRAFT RECOVERY PLAN

Second Revision

February 2013

Recovery Plan for the Black-footed Ferret (*Mustela nigripes*)

Second Revision

Original Recovery Plan Approved in 1978

First Revision Approved 1988

Region 6
U.S. Fish and Wildlife Service
Denver, Colorado

Approved: _____
Deputy **Regional Director, Region 6, U.S. Fish and Wildlife Service**

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Concurred: _____
Acting **Regional Director, Region 2, U.S. Fish and Wildlife Service**

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EXECUTIVE SUMMARY

Current Species Status: The black-footed ferret (*Mustela nigripes*) was listed as endangered in 1967 pursuant to early endangered species legislation in the United States (U.S.) and was "grandfathered" into the Endangered Species Act of 1973 (ESA).

We estimate that the average minimum number of breeding adult ferrets in the wild is approximately 364 animals (Table 3), with a minimum of 270 of those animals at self-sustaining sites. Approximately 280 additional animals are managed in captive breeding facilities. At this time, the downlisting criteria may be 40 percent complete with regard to establishing 10 successful populations and approximately 18 percent complete with regard to the goal of 1,500 breeding adults at successful sites. Four reintroduction sites (Aubrey Valley, Arizona; Cheyenne River Reservation, South Dakota; Conata Basin, South Dakota; and Shirley Basin, Wyoming) are considered self-sustaining at present. The species remains vulnerable to several threats, including sylvatic plague and inadequate regulatory mechanisms.

Habitat Requirements and Limiting Factors: The black-footed ferret depends on prairie dogs for food and on their burrows for shelter. The historical range of the ferret coincided with the ranges of the black-tailed prairie dog (*C. ludovicianus*), Gunnison's prairie dog (*C. gunnisoni*), and white-tailed prairie dog (*C. leucurus*). The ferret's close association with prairie dogs was an important factor in the ferret's decline. From the late 1800s to approximately the 1960s, prairie dog occupied habitat and prairie dog numbers were dramatically reduced by the effects of both temporal and permanent habitat loss caused by conversion of native grasslands to cropland, poisoning, and disease. The ferret population declined precipitously as a result.

Recovery Strategy: In preparing this revised recovery plan, we solicited extensive partner review from the Black-footed Ferret Recovery Implementation Team (BFFRIT). The BFFRIT was established by the Service in 1996. One of its guiding principles has been its focus on involvement by many partners across the historical range of the ferret, including tribes, States, Federal land management agencies, non-governmental organizations, Canada, and Mexico. Recovery will be achieved by establishing a number of ferret populations where appropriate habitat exists and by ameliorating threats impacting the species so as to allow the ferret's persistence. Although ferret habitat has been dramatically reduced from historical times, a sufficient amount remains, if its quality and configuration is appropriately managed. This management, for the most part, is likely to be conducted by traditional State, tribal, and Federal fish and wildlife and land management agencies. Additionally, private parties, including landowners and conservation organizations, must continue to support ferret recovery. Many partners contributing to ferret recovery in many places will help minimize the risk of loss of wild populations.

Recovery Goal: The goal of this plan is to recover the black-footed ferret such that it no longer meets the ESA's definition of endangered or threatened and can be removed from the Federal List of Endangered and Threatened Wildlife (i.e., delisted).

Recovery Objectives: The recovery of black-footed ferrets will depend upon: (1) the continued efforts of captive breeding facilities to provide animals of suitable quality and quantity for release into the wild; (2) the conservation of prairie dog habitat adequate to sustain ferrets in several populations distributed throughout their historical range; and (3) the management of sylvatic plague to minimize impacts to ferrets at reintroduction sites.

Recovery Criteria: This recovery plan revision provides reasonable biological and logistically achievable criteria that may be used to realize downlisting and delisting objectives. In particular, we believe that we can achieve recovery of the ferret through more proactive management of existing prairie dog habitat.

Downlisting Criteria:

- Conserve and manage a captive breeding population of black-footed ferrets with a minimum of 280 adults (105 males, 175 females) distributed among multiple facilities (at least 3).
- 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 Recovery Plan. Delisting may occur when the following recovery criteria are met.

- Conserve and manage a captive breeding population of black-footed ferrets with a minimum of 280 adults (105 males, 175 females) distributed among multiple facilities (at least 3).
- 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 or white-tailed prairie dogs.
- Maintain these population objectives for at least three years prior to delisting.
- Maintain 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 plan, in cooperation with the States and tribes, to ensure recovery goals are maintained.

After Delisting:

- Conserve and manage a reduced captive breeding population of black-footed ferrets in order to maintain knowledge, incorporate developing technologies, and address potential population extirpations.

Actions Needed: We believe the single, most feasible action that would benefit black-footed ferret recovery is to improve prairie dog conservation. If efforts were undertaken to more proactively manage existing prairie dog habitat for ferret recovery, all other threats to the species would be substantially less difficult to address. Several States within the historical range of the species do not manage prairie dogs in a manner that supports ferret recovery. Some of these States have disease-free areas that would be especially valuable to ferret recovery. We recommend that the following actions be undertaken. These actions are not listed in order of priority, but all tasks and subtasks are prioritized in Table 7.

1. Conserve and manage a captive ferret population of reasonable size and structure to support genetic management and reintroduction efforts.
2. Identify prairie dog habitats with the highest potential for supporting future free-ranging populations of ferrets.
3. Establish free-ranging populations of ferrets to meet downlisting and delisting goals.
4. Ensure sufficient habitat to support a wide distribution of self-sustaining ferret populations.
5. Reduce disease-related threats in wild populations of ferrets and associated species.
6. Support partner involvement and conduct adaptive management through cooperative interchange.

Date of Recovery: We believe that downlisting of the black-footed ferret could be accomplished in approximately 10 years if conservation actions continue at existing reintroduction sites and if additional reintroduction sites are established. Downlisting and delisting could occur more quickly if additional partners became involved in recovery efforts.

Estimated Cost of Recovery Actions ($1,000s) (not adjusted for inflation): The following table summarizes the costs by decade of the various recovery actions that are described by individual task in Part II and prioritized in Part III of this revised recovery plan. Costs through 2020 address downlisting of the black-footed ferret. Subsequent costs address delisting the ferret.

Estimated Cost of Recovery Actions ($1,000's) (not adjusted for inflation)

Years	*Action 1*	*Action 2*	*Action 3*	*Action 4*	*Action 5*	*Action 6*	*Total*
2010-2020	7,000	90	9,950	23,000	8,110	6,990	55,140
2021-2030	5,000	60	10,960	22,000	4,940	5,040	48,000
2031-2040	5,000	60	10,960	22,000	4,940	5,040	48,000
Total	17,000	210	31,870	67,000	17,990	17,070	151,140

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ACRONYMS

APHIS:	Animal and Plant Health Inspection Service
AZA:	Association of Zoos and Aquariums
BFFRIT:	Black-footed Ferret Recovery Implementation Team
BLM:	U.S. Bureau of Land Management
CBSG:	Conservation Breeding Specialist Group (SSC/IUCN)
CS:	Conservation Subcommittee under BFFRIT
EPA:	U.S. Environmental Protection Agency
ES:	Executive Subcommittee under BFFRIT
ESA:	Endangered Species Act of 1973
IS:	Incentives Subcommittee under BFFRIT
IUCN:	International Union for the Conservation of Nature
NEPA:	National Environmental Policy Act
NPS:	U.S. National Park Service
OIS:	Outreach and Information Subcommittee under BFFRIT
PDMS:	Prairie Dog Management Subcommittee under BFFRIT
SCTAG:	Small Carnivore Taxon Advisory Group of the AZA
Service:	U.S. Fish and Wildlife Service
SPVS:	Sylvatic Plague Vaccine Subcommittee
SSC:	Species Survival Commission of the World Conservation Union
SSP®:	Species Survival Plan
USFS:	U.S. Forest Service
USFWS:	U.S. Fish and Wildlife Service
USGS:	U.S. Geological Survey

GLOSSARY

Beringia:	a land bridge that joined Alaska and Siberia during the Pleistocene ice ages
endemic:	native to a particular region
enzootic:	a disease outbreak causing a low level of mortality, persistent over a long time period
epizootic:	a disease outbreak causing a high level of mortality, persistent over a short time period
fossorial:	adapted to digging and life underground
heterozygosity:	having different forms of genes present for a particular trait
homozygosity:	having similar forms of genes present for a particular trait
mustelid:	of the weasel family in the order Carnivora (carnivorous mammals)

PART I. BACKGROUND

INTRODUCTION

The black-footed ferret recovery program is one of the oldest endangered species recovery programs in the U.S. (Biggins et al. 1997). The first recovery plan was published in 1978 (Linder et al. 1978), when no wild ferrets were thought to exist. A second recovery plan was completed in 1988 (U.S. Fish and Wildlife Service 1988) when captive breeding efforts had begun, but no reintroduction efforts had yet been initiated. The objective of the 1988 plan was to ensure the immediate survival of the ferret by: (1) increasing the captive population to 200 breeding adults by 1991, (2) establishing a pre-breeding population of 1,500 free-ranging adults in 10 or more populations with no fewer than 30 breeding adults in any population by 2010, and (3) encouraging the widest possible distribution of reintroduced populations for risk management purposes. These three objectives were further divided into numerous actions, tasks, and subtasks. Most of the original tasks associated with objective 1 have been achieved. Some related tasks are no longer relevant, such as searching for additional wild populations (Hanebury and Biggins 2006). Since 1988, ongoing efforts have highlighted the need for a new recovery plan that addresses additional considerations under objectives 2 and 3. Tasks associated with objectives 2 and 3 will require added emphasis as the recovery program matures. In particular, these new considerations include: (1) the availability of a sufficient quantity and quality of prairie dog habitat to support recovery of the species, (2) the impacts of disease, especially sylvatic plague, on reintroduced populations and their habitat, and (3) the adequacy of proactive management efforts and existing regulatory mechanisms in addressing the preceding two considerations. The tasks in this recovery plan have been discussed extensively between the Service and BFFRIT partners.

Part I of this recovery plan includes the evolving biological species status information pertinent to recovering the black-footed ferret. Part II outlines a general strategy for long-term recovery of the ferret in the wild, presents criteria for downlisting and delisting the species, and describes specific actions and recovery tasks. Part III provides a

schedule for implementing recovery tasks. The recovery plan will continue to be revised as needed to reflect changes in information, strategies, and actions.

This recovery plan relies extensively on several black-footed ferret status reviews (CBSG 1992, Hutchins et al. 1996, CBSG 2004, Garelle et al. 2006, U.S. Fish and Wildlife Service 2008), Service evaluations of tasks identified in the 1988 Black-footed Ferret Recovery Plan, and extensive review and input by parties associated with the BFFRIT. In particular, the "Annotated Recovery Plan Outline for the Black-footed Ferret" (Ray 2006) thoroughly examined all prior recovery tasks and existing literature. This outline contributed significantly to this recovery plan and is frequently referenced.

SPECIES STATUS

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. Critical habitat was not designated for the species; the species was listed prior to amendments that added critical habitat provisions. We assigned the ferret a recovery priority number of 2C on a scale of 1C-18, with 1C equaling the highest priority. This number indicates that the ferret faces a high degree of threat, with potential economic conflicts regarding the ferret's obligatory dependence on prairie dogs, which are viewed as pests by some parties (U.S. Fish and Wildlife Service 2008). The high degree of threat is largely due to inadequate management and conservation of prairie dogs, and is described in detail in the section "Threats and Reasons for Listing." The ranking also reflects the ferret's taxonomic status as a full species. Table 1 further describes recovery prioritization. Notably, this species continues to have a high potential for recovery despite the management challenges noted.

Table 1. Recovery priorities

Degree of Threat	Recovery Potential	Taxonomy	Priority	Conflict
High	**High**	Monotypic Genus	1	1C
		Species	**2**	**2C**
		Subspecies/DPS	3	3C
	Low	Monotypic Genus	4	4C
		Species	5	5C
		Subspecies/DPS	6	6C
Moderate	High	Monotypic Genus	7	7C
		Species	8	8C
		Subspecies/DPS	9	9C
	Low	Monotypic Genus	10	10C
		Species	11	11C
		Subspecies/DPS	12	12C
Low	High	Monotypic Genus	13	13C
		Species	14	14C
		Subspecies/DPS	15	15C
	Low	Monotypic Genus	16	16C
		Species	17	17C
		Subspecies/DPS	18	18C

The above ranking system for determining Recovery Priority Numbers was established in 1983 (48 FR 43098; September 21, 1983 as corrected in 48 FR 51985; November 15, 1983).

TAXONOMY

The black-footed ferret is in the Order Carnivora, Family Mustelidae, Genus *Mustela*, and Subgenus *Putorius*. No subspecies are recognized (Hillman and Clark 1980, Anderson et al. 1986). The species is one of five members of the genus *Mustela* in North America that also includes the ermine (*M. erminea*), long-tailed weasel (*M. frenata*), least weasel (*M. nivalis*), and American mink (*M. vison*) (Wilson and Ruff 1999). The black-footed ferret is the only ferret species native to the Americas. Other ferret species in the subgenus are the Siberian polecat (*M. eversmanni*) and the European ferret (*M. putorius*) (Hillman and Clark 1980, Anderson et al. 1986), which has been domesticated and is sold as a pet. The black-footed ferret is most closely related to the Siberian polecat (Hillman and Clark 1980, Anderson et al. 1986). The earliest fossil record of the black-footed ferret is from approximately 100,000 years ago (Anderson et al. 1986). The species was first formally described in 1851 by J.J. Audubon and J. Bachman (Anderson et al. 1986, Clark 1986).

SPECIES DESCRIPTION

The black-footed ferret is a medium-sized mustelid, typically weighing 1.4–2.5 pounds (645–1125 grams) and measuring 19–24 inches (479–600 millimeters) in total length. Upper body parts are yellowish buff, occasionally whitish; feet and tail tip are black; and a black "mask" occurs across the eyes (Hillman and Clark 1980, Anderson et al. 1986).

LIFE HISTORY

Four populations of the black-footed ferret have been studied intensively including: (1) Mellette County, South Dakota (1964–1974), (2) Park County, near Meeteetse, Wyoming (1981–1986), (3) a reintroduced population at UL Bend National Wildlife Refuge, Montana (1994 to present), and (4) a reintroduced population in Conata Basin, South Dakota (1996-present). Much of the information pertaining to the species' life history, survival, and behavior has been obtained from these four populations.

The ferret breeds at one year of age from mid-March through early April in the wild (Wilson and Ruff 1999). Gestation is about 42–45 days, and litter size averages approximately 3.5 individuals (Wilson and Ruff 1999). The ferret is solitary, except for breeding and the period when mother and young are together (Forrest et al. 1985). It is generally a nocturnal predator, appearing above ground at irregular intervals and for irregular durations (Clark et al. 1986). The ferret is an extreme specialist that depends on prairie dogs for food and shelter (Biggins 2006). Forrest et al. (1985) concluded that ferret densities at the last known wild population near Meeteetse, Wyoming, were linearly correlated with white-tailed prairie dog (*Cynomys leucurus*) colony size, with an average density of one adult ferret per 99–148 ac (40–60 ha) of occupied prairie dog habitat. Information on ferret life expectancy is sparse. However, mustelids typically have short mean life expectancies and 50 percent or greater juvenile mortality (Clark 1989). The mean life expectancy of free-ranging ferrets in the Meeteetse population was 0.9 years (Biggins et al. 2006).

HABITAT REQUIREMENTS

The black-footed ferret was historically found throughout the Great Plains, mountain basins, and semi-arid grasslands of North America wherever prairie dogs occurred (Hillman and Clark 1980, Figure 1). The species depends on prairie dogs (*Cynomys spp.*) for food and on prairie dog burrows for shelter (Biggins 2006). Field observations by Hillman (1968) indicate that ferrets feed entirely on prairie dogs. Diet samples support this, although other species of vertebrate prey have occasionally been reported (Oldemeyer et al. 1993, Miller et al. 1996).

DISTRIBUTION AND RANGE

The black-footed ferret is endemic to North America. The species entered North America from Siberia approximately 1–2 million years ago, spread across Beringia, and then advanced southward through ice-free corridors to the Great Plains by approximately 800,000 years ago (Wisely 2006). The species was probably common historically, contrary to early characterizations that addressed its natural history. However, its secretive habits (nocturnal and often underground) probably made it difficult to observe (Forrest et al. 1985, Anderson et al. 1986, Clark 1989).

The historical habitat of the black-footed ferret coincided with the ranges of the black-tailed prairie dog, Gunnison's prairie dog, and white-tailed prairie dog. These prairie dog species collectively occupied approximately 100 million ac (40.5 million ha) of intermountain and prairie grasslands extending from Canada into Mexico (Anderson et al. 1986, Biggins et al. 1997). The habitat occupied by prairie dogs existed within a range of an estimated 562 million ac (228 million ha) (Ernst 2008). There has been no documented occurrence of the ferret within the range of either the Utah prairie dog (*C. parvidens*) or the Mexican prairie dog (*C. mexicanus*), which have small, disjunct ranges (Lockhart et al. 2006). Ferrets from Arizona, Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah, Wyoming, Alberta, and Saskatchewan have been collected as museum specimens since the late 1800s (Anderson et al. 1986). Ferrets also likely occurred in Mexico in recent times, as

evidenced by: (1) the fairly contiguous historical distribution of prairie dogs between Arizona, New Mexico, and Mexico, (2) the similarity of biological communities in these areas, (3) the presence of a museum specimen from a site just north of the Mexico and U.S. border, and (4) fossil records further south in Mexico (Lockhart 2001).

Ernst (2008) utilized a geographic information system database to identify the likely distribution of prairie dog habitat where the black-footed ferret probably occurred historically in the United States. She concluded that 85 percent of all ferrets may have occurred in black-tailed prairie dog habitat, 8 percent in Gunnison's prairie dog habitat, and 7 percent in white-tailed prairie dog habitat. Although potential biases are possible in this characterization of the historical distribution of ferrets, most ferrets probably occurred in black-tailed prairie dog habitat based on the more expansive extent of their distribution and the higher quality ferret habitat they represent in terms of prairie dog densities. Figure 1 depicts both the historical and current distribution of the species. Current ferret populations are all the result of reintroduction efforts.

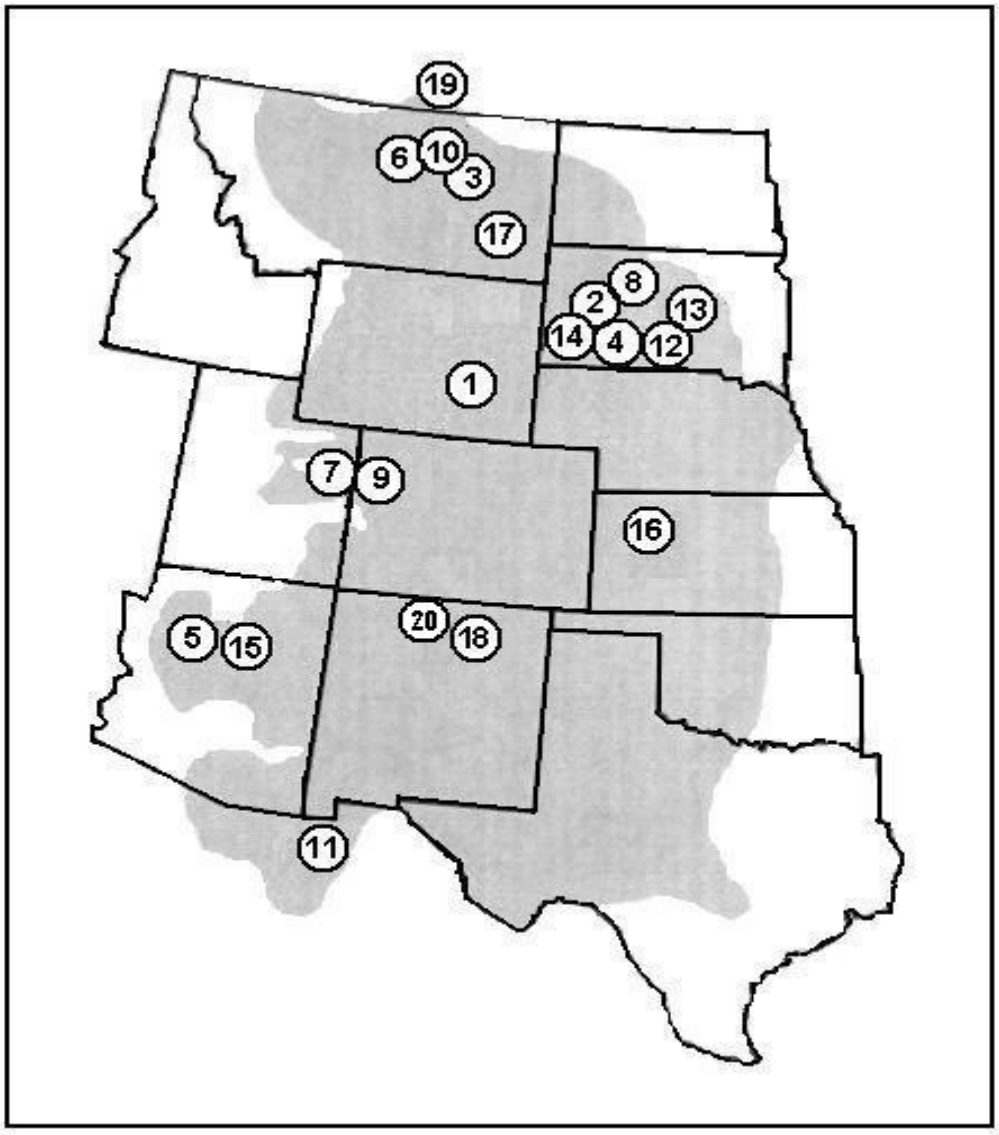

Figure 1. Probable historical range of the black-footed ferret (shaded) and current reintroduction sites. The locations of reintroduction sites are portrayed in their chronological order of implementation as follows: (1) Shirley Basin, WY (1991); (2) Badlands National Park, SD (1994); (3) UL Bend National Wildlife Refuge, MT (1994); (4) Conata Basin, SD (1996); (5) Aubrey Valley, AZ (1996); (6) Fort Belknap Indian Reservation, MT (1997); (7) Coyote Basin, UT (1999); (8) Cheyenne River Indian Reservation, SD (2000); (9) Wolf Creek, CO (2001); (10) BLM "40 Complex", MT (2001); (11) Janos, Chihuahua, Mexico (2001); (12) Rosebud Indian Reservation, SD (2004); (13) Lower Brule Indian Reservation, SD (2006); (14) Wind Cave National Park, SD (2007); (15) Espee Ranch, AZ (2007); (16) Logan County, KS (2007); (17) Northern Cheyenne Indian Reservation, MT (2008); (18) Vermejo Ranch (black-tailed prairie dog habitat), NM (2008); (19) Grasslands National Park, Saskatchewan, Canada (2009); and (20) Vermejo Ranch (Gunnison's prairie dog habitat), NM (2012).

POPULATION TRENDS

The black-footed ferret's close association with prairie dogs was an important factor in its decline. From the late 1800s to approximately 1960, both prairie dog occupied habitat and prairie dog numbers were reduced by the effects of: (1) habitat destruction from conversion of native prairie to cropland, (2) poisoning, and (3) disease. The ferret population declined precipitously as a result (Biggins 2006). These effects are described in more detail in the following section, "Threats and Reasons for Listing." The ferret was considered possibly extinct before a small population was located in Mellette County, South Dakota, in 1964 (Henderson et al. 1969). Breeding attempts with a few captured animals failed to produce surviving young. The last wild animals in the Mellette population were observed in the field in 1974 (Clark 1989). The last captive animal from the Mellette population died at Patuxent Wildlife Research Center in 1979 (U.S. Fish and Wildlife Service 1988) and again the ferret was presumed extinct. In 1981, a remnant population was discovered near Meeteetse, Wyoming (Clark et al. 1986, Lockhart et al. 2006). Disease outbreaks occurred at Meeteetse in the early 1980s. All surviving wild ferrets at Meeteetse were removed during 1985–1987. These ferrets were used to initiate a captive breeding program. Of the 18 remaining ferrets captured from Meeteetse, 7 produced a captive population lineage that is the foundation of present recovery efforts (Hutchins et al. 1996, Garrelle et al. 2006). Extant populations, both captive and reintroduced, descend from these "founder" animals.

No wild populations of black-footed ferrets have been found following the final capture of the last known Meeteetse ferret in 1987, despite extensive and intensive searches rangewide. It is very unlikely that any undiscovered wild populations remain (Hanebury and Biggins 2006, Lockhart et al. 2006).

There have been 20 specific black-footed ferret reintroduction projects, beginning in 1991 (Figure 1). These projects include: Shirley Basin, Wyoming, in 1991; Badlands National Park, South Dakota, in 1994; UL Bend National Wildlife Refuge, Montana, in 1994; Conata Basin, South Dakota, in 1996; Aubrey Valley, Arizona, in 1996; Fort Belknap Indian Reservation, Montana, in 1997; Coyote Basin, Utah, in 1999; Cheyenne

River Indian Reservation, South Dakota, in 2000; Wolf Creek, Colorado, in 2001; Bureau of Land Management 40 Complex, Montana, in 2001; Janos, Mexico, in 2001; Rosebud Indian Reservation, South Dakota, in 2004; Lower Brule Indian Reservation, South Dakota, in 2006; Wind Cave National Park, South Dakota, in 2007; Espee Ranch, Arizona, in 2007; Logan County, Kansas, in 2007; Northern Cheyenne Indian Reservation, Montana, in 2008; Vermejo Ranch (black-tailed prairie dog habitat), New Mexico, in 2008; Grasslands National Park, Saskatchewan, Canada, in 2009; and Vermejo Ranch (Gunnison's prairie dog habitat), New Mexico, in 2012.

Black-footed ferret reintroduction projects have experienced a range of success that we categorize in the following table. A site must meet the specified criteria in order to meet a particular classification. A site's classification may change over time. For example, both Badlands National Park, South Dakota, and Shirley Basin, Wyoming, were considered unsuccessful for several years, but are now considered as improving and successful, respectively.

Table 2. Black-footed ferret reintroduction efforts through 2012

Classification	Criteria	Site
Successful	• Self-sustaining • 30 or more breeding adults • Can support other sites with translocations • Multiple litters documented annually	• Aubrey Valley, AZ • Cheyenne River, SD • Conata Basin, SD • Shirley Basin, WY
Improving	• Increasing population • Litters documented annually	• Badlands NP, SD • Logan County, KS • Lower Brule, SD • Rosebud, SD • Wind Cave NP, SD
Marginal	• Performing minimally with no evidence of increasing populations • Few litters documented annually	• Coyote Basin, UT • Janos, Mexico • UL Bend NWR, MT • Wolf Creek, CO
Unsuccessful	• Populations declining or extirpated • No recent litters documented	• Espee Ranch, AZ • BLM 40 Complex, MT • Fort Belknap, MT

Recent	• Initiated within the past 5 years	• Grasslands NP, Canada • Northern Cheyenne, MT • Vermejo Ranch (btpd habitat), NM • Vermejo Ranch (gpd habitat), NM

Black-footed ferret populations are difficult to enumerate due to their remote locations, difficult accessibility, nocturnal habits, and logistical problems and costs associated with the requisite field work. Accordingly, ferret populations at some reintroduction sites are not regularly or even accurately assessed. We view ferret population estimates at most sites as only approximate minimum numbers because of the aforementioned issues and because additional variables such as weather, intensity of search effort, and length of search effort may provide different perspectives. One striking example of the difficulty of enumerating ferret populations is Shirley Basin, Wyoming, where approximately 200 individuals were estimated to occur in the fall of both 2008 and 2010 on only one-seventh of the prairie dog habitat—the amount of habitat surveyed. This ferret population may or may not be larger than estimated, but does indicate the general difficulties of estimating ferret populations in the wild.

We have derived our best estimate of adult ferrets extant in the wild at this time as an average of the collective observations in 2008 and 2011. We recognize that ferret populations at some sites likely declined between 2009 and 2012, but conversely, populations at other sites likely increased during this same period. The following table summarizes recent information regarding the cumulative number of black-footed ferrets released and minimum numbers documented at the reintroduction sites. Note that the rounding to derive estimates of breeding populations results in estimates that are not exactly 50 percent of the fall populations. The most significant change in population in recent years is the decline in ferret numbers at Conata Basin due to sylvatic plague (see discussion in section on “Disease or predation”).

Table 3. Numbers of black-footed ferrets in the wild, 1991 - 2012

Site (year initiated)	Prairie dog spp.	Ferrets released	Minimum fall population[1] 2008	Estimated breeding adults[2] 2009	Minimum fall population 2011	Estimated breeding adults 2012	Average estimate of breeding adults
Shirley Basin, WY (1991)	Wtpd	301	196	98	203 (in 2010)	102 (in 2011)	100
UL Bend NWR, MT (1994)	Btpd	208	13	7	20	10	9
Badlands NP, SD (1994)	Btpd	175	20	10	33	17	14
Aubrey Valley, AZ (1996)	Gpd	206	66	33	75	38	35
Conata Basin, SD (1996)	Btpd	150	292	146	72	36	91
Ft. Belknap, MT (1997)	Btpd	167	0	0	0	0	0
Coyote Basin, UT (1999)	Wtpd	249	25	13	3	1	7
Cheyenne River, SD (2000)	Btpd	219	150	75	25 (partial survey)	>13	44
BLM 40complex, MT (2001)	Btpd	95	3	3	No data	No data	2
Wolf Creek, CO (2001)	Wtpd	209	16	8	No data	No data	4
Janos, Mexico (2001)	Btpd	282	13	7	No data	No data	4
Rosebud, SD (2003)	Btpd	99	30	15	No data	No data	8
Lower Brule, SD (2006)	Btpd	87	26	13	12	6	10
Wind Cave NP, SD (2007)	Btpd	49	26	13	46	23	18
Espee Ranch, AZ (2007)	Gpd	44	Recent release	No data	No data	No data	No data
Logan County, KS (2007)	Btpd	36	15	7	38	19	13
N. Cheyenne, MT (2008)	Btpd	8	Recent release	No data	No data	No data	No data
Vermejo Ranch, NM (2008)	Btpd	77	Recent release	No data	5	3	2
Grasslands NP, Canada (2009)	Btpd	45	Recent release	No data	12	6	3
Vermejo Ranch, NM (2012)	GPD	20	Recent release	No data	No data	No data	No data
Total		**2726**	**891**	**448**	**544**	**274**	**364**

[1] Minimum fall population counts are derived from spotlight surveys and trapping efforts except in Shirley Basin, WY, where a model was used to estimate fall population.
[2] Breeding adult figures are estimated to be one-half minimum fall population counts from the previous yr.

THREATS AND REASONS FOR LISTING

Black-footed ferret populations declined for three principal reasons. First, a major conversion of native range to cropland, particularly in the eastern portion of the species' range, began in the late 1800s. Second, poisoning of prairie dogs as a means of reducing competition with domestic livestock for forage began in the early 1900s. Third, the exotic disease sylvatic plague first impacted prairie dogs in the 1930s (Eskey and Hass 1940). Each of these resulted in a substantial loss of prairie dogs, which in turn led to an even greater decline in ferret populations due to the species' dependency on large expanses of habitat occupied by prairie dogs (Lockhart et al. 2006). Additionally, even a temporal loss of prairie dog habitat can create a population bottleneck for ferrets, despite the subsequent recovery of the prairie dog population.

Section 4 of the ESA (16 U.S.C. 1533) and implementing regulations (50 CFR, part 424) set forth procedures for adding species to, removing species from, or reclassifying species on the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the ESA, a species may be determined to be endangered or threatened based on any of the following five factors: (A) the present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. We discuss each of these factors affecting the status of the black-footed ferret in more detail below.

Present or threatened destruction, modification or curtailment of habitat or range

The black-footed ferret's historical range (Figure 1) coincided with the ranges of the black-tailed, white-tailed, and Gunnison's prairie dogs. Historically, these prairie dog species occupied approximately 100 million ac (40.5 million ha) of intermountain and prairie grasslands rangewide (Anderson et al. 1986, Biggins et al. 1997). This occupied habitat existed within a range of approximately 562 million ac (228 million ha) (Ernst

2008) within the U.S. This is a minimum estimate of historical range because Ernst (2008) did not evaluate the ferret's range in Canada and Mexico. Occupied habitat likely shifted somewhat over time in response to drought, fire, and grazing by bison (*Bison bison*) and other animals, along with other factors.

In 1986, Anderson et al. (1986) estimated a 90 percent decrease in the amount of habitat occupied by all species of prairie dogs. Mac et al. (1998) estimated a 98 percent decline in numbers of prairie dogs throughout North America. Prairie dog occupied habitat reached a low point in the early 1960s when approximately 1.4 million ac (570,000 ha) were estimated to exist in the United States for black-tailed, white-tailed, and Gunnison's prairie dogs (Bureau of Sport Fisheries and Wildlife 1961). These low estimates likely continued for a decade thereafter, until Executive Order 11643 prohibited the use of certain toxicants that might cause secondary poisoning on Federal lands or through federally funded programs. The most recent Service estimates of prairie dog occupied habitat in the U.S. include 2,400,000 ac (972,000 ha) of black-tailed prairie dog occupied habitat (74 FR 63343; December 3, 2009), 841,000 ac (341,000 ha) of white-tailed prairie dog occupied habitat (69 FR 64889; November 9, 2004), and 340,000–500,000 ac (136,000–200,000 ha) of Gunnison's prairie dog occupied habitat (73 FR 6660; February 5, 2008) for a total of approximately 3,700,000 ac (1,500,000 ha) of occupied habitat. This is a decrease of approximately 96 percent from historically occupied habitat.

As prairie dog occupied habitat declined due to conversions from native prairie to cropland, poisoning, and disease during the late 19th century and the first half of the 20th century, black-footed ferret populations likewise declined (Fagerstone and Biggins 1986, Cully 1993, Biggins 2006, Lockhart et al. 2006). Prairie dog occupied habitat has increased approximately 250 percent since the 1961 estimate. However, by the 1960s, only two remnant ferret populations (in Mellette County, South Dakota, and Meeteetse, Wyoming) remained, and ferrets were unable to repopulate expanding prairie dog habitat.

Native Prairie Conversion: The conversion of native prairie to cropland is the primary, largely permanent, cause of habitat destruction within the historical range of the black-footed ferret. Approximately 112 million ac (45 million ha) of native prairie have been

converted to agricultural land within the ferret's historical range (Ernst et al. 2006). However, we estimate that approximately 400 million ac (163 million ha) of non-cultivated rangeland remain within the historical range of the ferret (U.S. Department of Agriculture 2005), and represent potential habitat for the prairie dog and ferret (Ernst et al. 2006). Rates of conversion from native prairie to cropland have slowed substantially in recent years, and we do not consider the present or threatened habitat loss due to cropland conversion as significant as historical levels of impact. Approximately 3.7 million ac (1.5 million ha) of prairie dog occupied habitat are currently available. It appears that sufficient potential habitat still occurs within the ferret's historical range to accommodate increases in occupied habitat when the 3.7 million ac (1.5 million ha) of currently occupied prairie dog habitat are contrasted with the 400 million ac (163 million ha) of current rangeland. Moreover, we project that less than 15 percent of currently occupied prairie dog habitat is necessary to recover the ferret, if this habitat is appropriately configured and managed (see Part II). We do not consider the present or threatened destruction of habitat or range due to conversion of native prairie to cropland a threat to ferret recovery at the present time. Cropland conversion no longer appreciably reduces survival or reproduction at the current level of cultivated land. In the absence of ESA protections, effects from cropland conversion at the current rate would not require regulation and would not be a threat.

Urbanization: Approximately 3.3 million ac (1.3 million ha) of historical black-footed ferret habitat have been lost to urbanization (Ernst 2008). However, it appears that sufficient potential habitat still occurs within the ferret's historical range to accommodate increases in occupied habitat when the 3.3 million ac (1.3 million ha) of urban lands are contrasted with the 400 million ac (163 million ha) of current rangeland. We describe the amount of prairie dog occupied habitat necessary to support a self-sustaining ferret population in more detail in Part II. We do not consider the present or threatened destruction of habitat or range due to urbanization a threat to ferret recovery at the present time. In the absence of ESA protections, effects from urbanization in their current state would not require regulation and would not be a threat.

Disease and Poisoning: We discuss the present or threatened modification of habitat or range due to sylvatic plague under factor C "Disease or predation" and the present or threatened curtailment of habitat or range due to poisoning of prairie dogs under factor E "Other natural manmade factors."

Overutilization for Commercial, Scientific, and Educational Purposes: All black-footed ferrets are located either in captive breeding facilities or at managed reintroduction sites. No black-footed ferrets are being utilized for commercial purposes. ESA permits may be provided for specific scientific or educational activities, but other uses are illegal and subject to law enforcement actions.

The captive black-footed ferret population is guided by the Association of Zoos and Aquariums (AZA) Black-footed Ferret Species Survival Plan (SSP®) to conserve a breeding population of a minimum of 240 ± 35 animals of optimum sex and age ratio to maximize productivity and genetic diversity (Hutchins et al. 1996). Captive ferrets in excess of SSP® needs are allocated each year for reintroduction or for scientific and educational purposes. Animals used for scientific or educational purposes are often older animals that are past prime breeding age, although some kits have also been allocated for research purposes. For example, some ferrets have been used for research and development of a plague vaccine (Rocke et al. 2006). Some individuals are also used as display animals for educational purposes at zoos.

Free-ranging black-footed ferrets occur only at managed reintroduction sites. Wild-born kits from successful reintroduction sites are sometimes trapped and released on other reintroduction sites (Lockhart 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, Larson 2008a). However, they remain part of the reintroduced population. Ferrets at some reintroduction sites are also trapped, given a plague vaccination, and promptly released. In very limited circumstances, studies that involve trapping and measuring various characteristics of ferrets in order to identify differences between captive and wild born ferrets have been authorized. No other collections of free-ranging ferrets for scientific or educational purposes are permitted.

We do not consider the overutilization for commercial, scientific, or educational purposes a threat to black-footed ferret recovery at the present time. It does not appreciably reduce survival or reproduction at present. In the absence of ESA protections, the SSP® would continue to appropriately allocate captive ferrets for purposes of captive breeding, reintroduction, scientific research, and education. State and Federal agencies do not allow take of free-ranging ferrets for purposes other than translocation or vaccination. In the absence of ESA protections, overutilization for commercial, scientific, or educational purposes would need to continue to be regulated.

Recreational Purposes: The interest in and the intensity of recreational prairie dog shooting has increased over the past decade at some black-footed ferret reintroduction sites. Depending on its intensity, shooting can impact local prairie dog populations, and the resulting loss in prey base likely affects black-footed ferret reintroduction sites (Pauli 2005, Reeve and Vosburgh 2006). Incidental take of ferrets by prairie dog shooters is also a potential, but as yet undocumented, source of ferret mortality. Recreational shooting of prairie dogs may contribute to the problem of lead accumulation in wildlife food chains that include prairie dogs (Pauli and Buskirk 2007). Killing large numbers of animals, not removing carcasses from the field, and using expanding bullets containing lead may present potentially dangerous amounts of lead to scavengers and predators of prairie dogs. However, no impacts from ingesting lead have been reported in ferrets.

Prairie dog shooting is presently managed at varying levels (seasonal to full closure) on all active black-footed ferret reintroduction areas by State wildlife agencies, Federal land management agencies, or tribes. Recreational shooting has not been intense enough to warrant suspension of recovery efforts at any site but was suspected of impacting ferrets at one site (Krueger 2008a). Recreational shooting of white-tailed prairie dogs at Wolf Creek, Colorado, appeared to restrict prairie dog densities and limit the carrying capacity or reproductive success for ferrets at this site (Krueger 2008b and Krueger 2008c). Recovery success at this site could likely be improved through the implementation of appropriate regulatory measures.

Prairie dog populations can recover from very low numbers following intensive shooting (Knowles 1988, Vosburgh 1996, Dullum et al. 2005, Pauli 2005, Cully and Johnson 2006). It appears that a typical scenario is either: (1) once populations have been reduced, shooters go elsewhere and populations recover; or (2) continued shooting maintains reduced population size at specific sites (Knowles 1988, Vosburgh 1996, Dullum et al. 2005, Pauli 2005, Cully and Johnson 2006). Some landowners maintain black-tailed prairie dog populations and derive income from charging people for recreational shooting. Monetary gain from shooting fees may motivate landowners to preserve prairie dog colonies for future shooting opportunities, which is preferable to eradicating them by poisoning (Vosburgh and Irby 1998, Reeve and Vosburgh 2006).

We do not consider overutilization of prairie dogs for recreational purposes a threat to black-footed ferret recovery at reintroduction sites at the present time, except in certain very limited circumstances. While recreational shooting of prairie dogs may occasionally limit the carrying capacity for ferrets, it does not appreciably reduce survival or reproduction at present. In the absence of ESA protections, recreational shooting would need to continue to be regulated at reintroduction sites by State and Federal agencies and tribes.

Disease or predation

Native canine distemper and nonnative sylvatic plague have seriously impacted both wild and captive populations of the black-footed ferret. Several other native diseases, including coccidiosis, cryptosporidiosis, and hemorrhagic syndrome also affect captive populations (Hutchins et al. 1996), but are not common in the wild.

Canine distemper: Canine distemper can significantly adversely impact the black-footed ferret. It was originally believed to have been the primary cause of the demise of the last wild population of ferrets at Meeteetse, Wyoming, in the mid-1980s (Clark 1989). At that time, it was believed that plague did not directly impact the species because many carnivore species, including other ferret species, were resistant (Cully 1993, Godbey et al.

2006). However, it is now believed that epidemics of both canine distemper and plague were likely responsible for the decline of the Meeteetse ferrets (Lockhart et al. 2006).

The canine distemper virus causes a systemic disease that is highly virulent to carnivore species, including the black-footed ferret. It is endemic in the United States and initially made reintroduction of ferrets more difficult (Wimsatt et al. 2006). Efforts in 1972 to breed ferrets from the Mellette County, South Dakota population were ultimately unsuccessful due to vaccine-induced canine distemper. Although safe in domestic ferrets, the vaccine induced fatal distemper in 4 of 6 vaccinated black-footed ferrets that were removed from the wild Mellette population for captive breeding purposes (Lockhart et al. 2006). Some ferrets in the Meeteetse population also succumbed to distemper in the mid-1980s (Clark 1989). More recently, an effective commercial distemper vaccine has become available and is widely employed in both captive and some wild ferret populations (Marinari and Kreeger 2006). Canine distemper vaccination can substantially reduce the threat of catastrophic population losses of ferrets. However, it is not practical to vaccinate all wild-born ferrets to protect them from periodic distemper events. Accordingly, wild populations may require monitoring and periodic augmentation.

We do not consider canine distemper a threat to black-footed ferret recovery at the present time. The distemper vaccine protects captive and newly released ferrets, and wild-born ferrets are monitored and managed to avoid long-term adverse impacts. Canine distemper does not appreciably reduce ferret survival or reproduction. In the absence of ESA protections, management for distemper would need to continue.

Sylvatic plague: Sylvatic plague infections are caused by the bacterium *Yersinia pestis*. Fleas acquire the bacterium from biting infected animals and can then transmit it to other animals in a similar manner. The disease can also be transmitted pneumonically (via the respiratory system) among infected animals or via the consumption of contaminated tissues (Godbey et al. 2006, Abbott and Rocke 2012). Recovery efforts for the black-footed ferret are hampered because both ferrets and prairie dogs are extremely susceptible to plague (Barnes 1993, Gage and Kosoy 2006). Plague can impact ferrets directly via

infection and subsequent mortality. It can also indirectly impact ferrets through the disease's effects on prairie dogs and the potential for dramatic declines in the ferret's primary prey base. The high densities and high rates of social contact of black-tailed and Gunnison's prairie dogs particularly enhance the spread of plague (Cully 1993).

The complex dynamics of sylvatic plague are not well understood. The potential significance of plague impacts on black-footed ferret populations underscores the value of establishing spatially separated reintroduction sites across the widest possible distribution of the species' historical range. Plague management tools and strategies are being developed (see following paragraphs and section on "Recovery Actions"). Releases in disease-free habitat should be prioritized whenever possible.

Sylvatic plague is a nonnative disease foreign to the evolutionary history of North American species. It did not exist on the North American continent prior to 1900, when it was inadvertently introduced into San Francisco (Gage and Kosoy 2006). It was first observed in prairie dogs in 1932 in Arizona (Cully 1993). Plague had been detected in prairie dogs in all States within the historical range of the black-footed ferret by 2005. The disease is currently present throughout the entire range of the white-tailed and Gunnison's prairie dogs and in at least the western two-thirds of the range of black-tailed prairie dogs (Barnes 1993, Lockhart et al. 2006). Figure 2 illustrates recent information regarding plague occurrence in the U.S. available from the U.S. Geological Survey (Abbott and Rocke 2012).

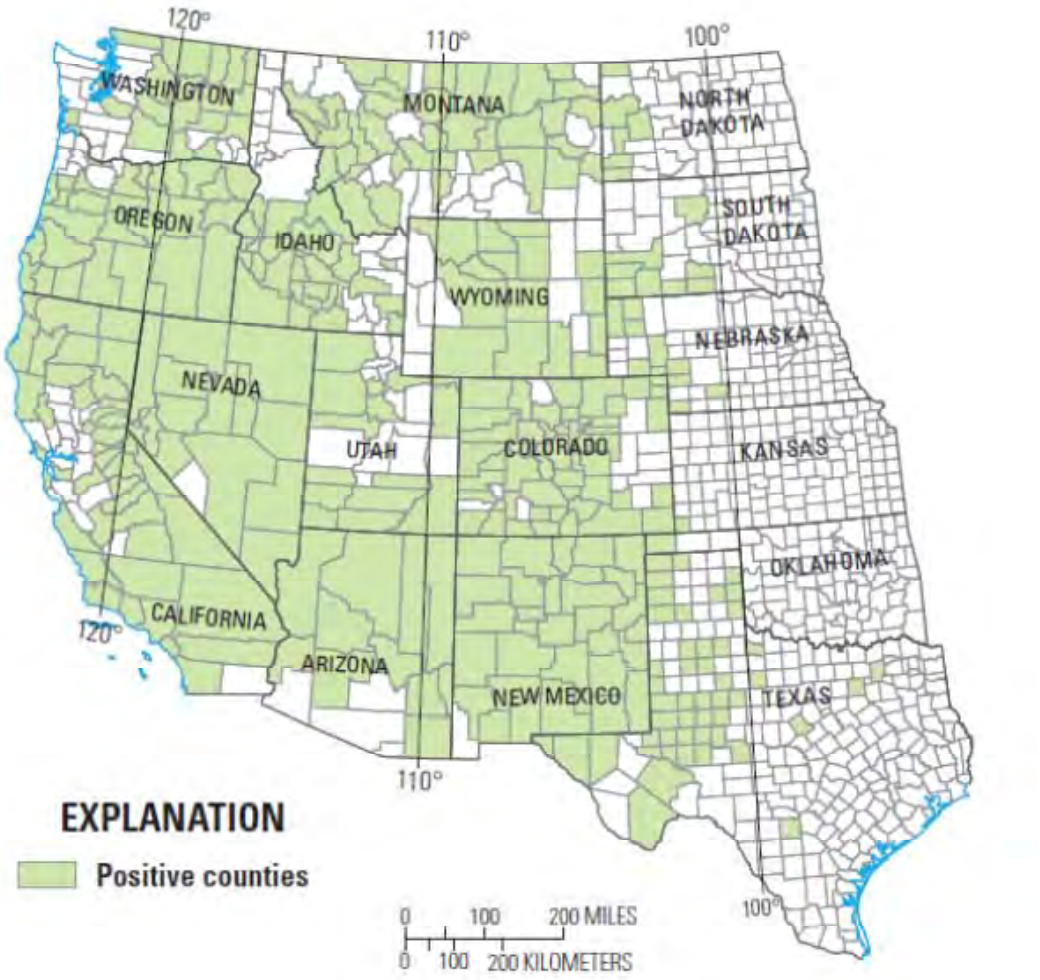

Figure 2. Western U.S. counties with plague-positive animal or flea samples (Abbott and Rocke 2012)

Plague in prairie dogs has been documented at or within 25 miles (40 kilometers) of all black-footed ferret reintroduction sites except for Rosebud Indian Reservation in South Dakota, Logan County in Kansas, and Janos in northern Chihuahua, Mexico (Lockhart 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007). Recent discussions with personnel at Rosebud Indian Reservation have indicated the possibility of plague at this site as well. However, it has not yet been confirmed in prairie dogs at this site.

Conata Basin, South Dakota, has been regarded as the most successful black-footed ferret reintroduction site. Until very recently, it supported the largest self-sustaining ferret population documented since the listing of the species in 1967, and perhaps for decades

before. Conata Basin has provided a surplus of kits for translocation to other reintroduction sites since 2000 (Lockhart 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, Larson 2008a). Plague was detected in prairie dogs approximately 25 miles (40 kilometers) south of Conata Basin in 2005. Approximately 3,500 pounds (1,600 kilograms) of the insecticide Deltamethrin (a powder formulation registered for flea control) were applied (dusted) on 7,000 ac (2,800 ha) of prairie dog burrows in known ferret habitat during the late summer and fall of 2005 in an effort to eliminate fleas. Despite continued dusting efforts, plague was identified at Conata Basin in May 2008.

Following detection of plague at Conata Basin, South Dakota, several Federal agencies undertook a dusting effort that targeted approximately 10,000 ac (4,000 ha) of prairie dog colonies on U.S. Forest Service (USFS) and National Park Service (NPS) lands (Griebel 2008a). Regardless, approximately 10,000 ac (4,000 ha) of untreated prairie dog colonies were impacted by plague (Griebel 2008b). Plague in Conata Basin continued into 2009 and removed approximately 5,000 additional acres (2,000 ha) of prairie dogs for a two-year reduction in occupied prairie dog acreage from 31,000 ac (12,600 ha) to 16,000 ac (6,500 ha) (Griebel 2009). Dusting at Conata Basin has continued annually to the present. Conata Basin and Badlands National Park ferret reintroduction sites have used techniques such as dusting and vaccination to actively manage ferret habitat in the midst of this plague outbreak and have maintained approximately 11,000 ac (4,455 ha) of ferret occupied prairie dog colonies (Griebel 2009). The precise extent of ferret mortality at Conata Basin is not known, but is presumed to be as much as 75 percent of the population, based upon recent surveys and the number of acres impacted at this site.

Sylvatic plague can be present in a prairie dog colony in either an enzootic (persistent, low level of mortality) or epizootic (high level of mortality over a shorter period of time) state. Most of the information we have regarding impacts from plague is from data collected during epizootic events. However, a recent study has expanded the understanding of enzootic plague and impacts to black-footed ferret recovery (Matchett et al. 2010). In that study, ferret survival significantly improved when plague vaccinations were given to ferrets or when Deltamethrin was applied to prairie dog burrows, even in the absence of a discernable die-off of prairie dogs. The researchers concluded that

increased ferret mortality associated with enzootic plague was hindering ferret recovery and fleas were a key component in transmission (Matchett et al. 2010).

In one instance, black-footed ferrets appear to have prospered despite the periodic presence of plague. In 1991, Shirley Basin, Wyoming, was the first site where ferrets were reintroduced. This site is occupied by white-tailed prairie dogs. Ferret releases at Shirley Basin were suspended in 1994 due to prairie dog population declines caused by plague. The small ferret population present at the site was expected to have been lost by the late 1990s. Only five ferrets were observed in 1997 (Grenier et al. 2007). However, 52 ferrets were observed in 2003. Thereafter, the Shirley Basin ferret population received additional augmentation and has grown rapidly (Lockhart et al. 2006, Grenier et al. 2007). White-tailed prairie dog complexes are less densely populated than typical complexes of black-tailed or Gunnison's prairie dogs. Apparently, scattered populations of prairie dogs avoided contracting plague and were able to sustain a small ferret population. However, ferrets and white-tailed prairie dogs at other reintroduction sites have not demonstrated similar resiliency, so Shirley Basin may be unique in this regard.

Rocke et al. (2006) are involved in research and development of vaccines to prevent plague in black-footed ferrets and prairie dogs. Ferrets immunized by a series of two subcutaneous injections had significantly higher antibody titers than un-immunized animals. Eleven of 16 vaccinated individuals survived when challenged with plague 6 months after immunization. All eight control animals died. The 11 survivors were again challenged by ingestion of a plague-infected mouse 2 months later and all survived. One vaccine under development may eventually be useful in protecting ferrets from habitat reduction due to plague, particularly if oral delivery to prairie dogs becomes feasible. Vaccine distributed via oral baits to protect prairie dogs has recently been shown to be effective in a laboratory setting (Rocke et al. 2008, Abbott and Rocke 2012). The use of a similar product in the field could protect habitat and prey base for ferrets, and provide long-term habitat stability. Most captive ferrets, including all of those provided for reintroduction, are currently vaccinated for plague. Many wild ferrets at Conata Basin are also vaccinated annually in an effort to minimize impacts from the ongoing plague epizootic. However, maximum protection is difficult to achieve in wild ferrets, which

must be trapped twice, two to four weeks apart, to receive an effective dose of the vaccine.

We consider sylvatic plague a medium magnitude, imminent threat to black-footed ferret recovery at the present time. Sylvatic plague affects the ferret both directly by causing mortality to ferrets and indirectly by causing mortality to prairie dogs. The recent encroachment of plague into South Dakota may pose a significant risk at reintroduction sites in that State. However, we believe that the threat from plague can be ameliorated by insecticidal dusting, ferret vaccine, prairie dog vaccine, and the maintenance of more reintroduction sites. Ferret recovery objectives could then be achieved despite periodic losses to plague. In the absence of ESA protections, management for plague would need to continue.

Predation: Natural levels of predation typically do not adversely impact overall population stability in healthy wildlife populations. However, if a population is vulnerable due to other factors, predation may become a contributing and ultimately limiting factor. Predation was a concern at early black-footed ferret reintroduction sites. Predation may have caused up to 95 percent of ferret mortality on some reintroduction sites without active plague before preconditioning became standard (Breck et al. 2006). Coyotes were a primary cause of predation-related death to ferrets at three reintroduction sites in Arizona, Montana, and South Dakota (Biggins et al. 2006). However, lethal control of coyotes may further impact ferret survival, possibly due to rapid rates of recolonization of coyotes after removal (Breck et al. 2006). Great-horned owls (*Bubo virginianus*) can also cause significant ferret mortality in some circumstances. Removal of predating great-horned owls benefited ferret survival in some instances (Breck et al. 2006).

Reintroductions into the wild of many captive-bred wildlife species are often less successful than reintroductions using wild-born individuals (Jule et al. 2008, Aaltonen et al. 2009, Maran et al. 2009). This lack of success is typically due to unsuccessful predator/competitor avoidance, starvation, and disease (Jule et al. 2008, Aaltonen et al. 2009, Maran et al. 2009). Behaviors critical to survival in the wild may be altered in

black-footed ferrets during generations in captivity. Trials showed increased boldness in ferrets through successive generations in captivity (Biggins 2000). This behavior could increase predation rates on released animals due to more time spent above ground. The author noted that quasi-natural rearing environments seemed to counteract some negative effects of captivity. Survival at several release sites from 1992–1995 was 10-fold higher for ferrets reared in outdoor pens than for ferrets raised in indoor cages (Biggins 2000). Increased preconditioning through outdoor pen rearing of captive-born ferrets in recent years has likely enriched learning of important natural behaviors. Outdoor pen rearing appears to have increased survival rates when those animals have been released in the wild (Biggins et al. 2011). Predation now has insignificant effects on ferrets at most sites, as evidenced by the reintroduction sites where ferret populations are apparently either stable or increasing, despite predators not being removed.

We do not consider predation a threat to black-footed ferret recovery at the present time because of the positive effects of preconditioning through outdoor pen rearing on survival of ferrets released into the wild. Predation no longer appreciably reduces ferret survival or reproduction. In the absence of ESA protections, recovered populations would be naturally sustained with wild-born kits, and predation would not be a threat.

Inadequacy of existing regulatory mechanisms

In analyzing whether the existing regulatory mechanisms are adequate, the Service reviews relevant Federal, State, and tribal laws, plans, regulations, memorandums of understanding, cooperative agreements, and other factors that influence conservation. Strongest weight is given to statutes and their implementing regulations, and management direction that stems from those laws and regulations. Other regulatory mechanisms (memorandums and agreements) are more voluntary in nature; in those cases we analyze the specific facts for that mechanism to determine the extent to which it can be relied on in the future. We consider all pertinent information, including the efforts and conservation practices of State and tribal governments. Existing regulatory mechanisms include all mechanisms that are pertinent to a comprehensive regime designed to conserve a wildlife population, whether or not they are enforceable.

Endangered Species Act: The ESA is the primary Federal law that provides protections for the black-footed ferret. It provides several tools to conserve the species. The establishment of multiple reintroduction sites throughout the species' range provides added resilience in the presence of threats such as sylvatic plague and poisoning that can periodically impact sites.

Section 4 of the ESA requires that, subsequent to listing, a review of the species be conducted to evaluate the status of the listed species. We completed the most recent 5-year review of the black-footed ferret in 2008. Section 4 also requires that we develop and implement recovery plans for the conservation and survival of listed species. This document is the second revision of a recovery plan for the ferret.

Section 6 of the ESA allows for cooperation between the Service and States in the management and funding of projects designed to enhance the conservation of federally listed species. Several States have received section 6 funding to either initiate black-footed ferret reintroductions or conduct monitoring at existing reintroduction sites. For example, in 2010, we funded section 6 proposals in Utah ($40,000 to support ferret releases and monitoring efforts) and Wyoming ($45,500 to support ferret recovery efforts).

Tribal wildlife grants (TWGs), administered by the Service, are used to provide technical and financial assistance to tribes for the development and implementation of programs that benefit fish and wildlife resources and their habitat, including species of Native American cultural or traditional importance and species that are not hunted or fished. A number of tribes have received TWG funding for black-footed ferret conservation. For example, in 2008-2009, we supported TWG projects for the Cheyenne River Sioux Tribe ($133,890 in 2008 to begin a ferret recovery program and $116,059 to survey for ferrets in 2009) and the Lower Brule Sioux Tribe ($200,000 in 2008 to conduct research and management on ferrets and prairie dogs and $24,450 in 2009 to protect ferrets from plague).

Section 7(a)(1) of the ESA requires Federal agencies utilize their authorities in furtherance of the purposes of ESA by carrying out programs for the conservation of listed species such as the black-footed ferret. Several Federal agencies, including the U.S. Bureau of Land Management (BLM), the USFS, and the NPS, have worked cooperatively with the Service to reintroduce ferrets onto lands they manage (more detailed information is provided in following paragraphs).

Section 7(a)(2) of the ESA requires Federal agencies to consult with the Service to ensure that any project funded, authorized, or carried out by such agency does not jeopardize the continuing existence of a listed species, or result in the destruction or adverse modification of designated critical habitat for the species. The black-footed ferret is exempt from critical habitat designation as it was listed prior to the critical habitat amendments to ESA. Numerous formal and informal section 7 consultations have been carried out in all States within the historical range of the ferret. The large number of informal consultations eventually led to the concept of block clearing large expanses of prairie dog occupied habitat to avoid redundant ferret surveys for each proposed project. All reintroduction sites in the United States require formal section 7 consultation. A formal section 7 was also conducted in 1994 with the U.S. Bureau of Indian Affairs regarding large-scale prairie dog control on Rosebud Sioux and Cheyenne River Sioux Reservations. A formal section 7 with the U.S. Environmental Protection Agency (EPA) regarding potential impacts to ferrets and other threatened and endangered species from the use of the pesticide chlorophacinone (trade name: Rozol) to poison prairie dogs was completed in 2012.

Section 9 of the ESA provides for direct protection of a federally-listed species by prohibiting “take” (i.e., to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct) by any person.

Section 10 of the ESA provides certain exceptions for otherwise prohibited actions. Most reintroduced black-footed ferrets have been released into nonessential experimental population areas as set forth in section 10(j). Under section 10(j), a listed species reintroduced outside of its current range, but within its historical range, may be

designated as “experimental.” This designation increases the Service’s flexibility and discretion in managing reintroduced endangered species and allows promulgation of regulation deemed appropriate for conservation of the reintroduced species. Additional management flexibility is possible if the experimental population is also designated “nonessential”. This tool has been successfully used to address concerns of other parties for reintroductions of California condors, gray wolves, whooping cranes, and many other species in addition to ferrets. Section 10(j) populations located in National Parks or National Wildlife Refuges are treated as threatened for the purposes of ESA section 7 consultations. Other section 10(j) populations are treated as a “proposed” species for the purposes of ESA section 7 consultations. Reintroduced ferrets in section 10(j) areas are protected by the specific regulations promulgated for the experimental population and section 9 of ESA.

Black-footed ferrets reintroduced into Canada and Mexico are regulated by their respective governments. Ferrets reintroduced at Espee Ranch, Logan County, Lower Brule Indian Reservation, Northern Cheyenne Indian Reservation, Vermejo, and Wind Cave National Park were authorized via scientific recovery permits issued by the Service under section 10(a)(1)(A) of ESA. Conditions stipulated under these permits and supporting ESA documents were developed to achieve State, tribal, and/or local support. Reintroduced ferrets in section 10(a)(1)(A) areas are protected by section 9 of ESA.

Timely establishment of wild ferret populations is critical in order to minimize deleterious effects resulting from too many generations of captive breeding. These effects include reduced reproductive fitness, physical abnormalities, behavioral abnormalities, and loss of natural selection. Many fewer black-footed ferret reintroductions would have been initiated during the past 20 years without the added flexibility of nonessential experimental designations. The Service is making progress toward achieving recovery goals. Progress toward downlisting and delisting will continue if active participation in reintroduction efforts by Federal, State, tribal, and local partners continues.

Without the protections and funding support provided by the ESA, progress toward black-footed ferret recovery would likely be much more limited than it is at present. However, once delisting criteria are achieved, we do not anticipate that the absence of ESA protections will reduce ferret survival or reproduction because the species will continue to be managed by other Federal, State, and tribal regulations.

National Environmental Policy Act (NEPA): NEPA requires all Federal agencies to participate in evaluations of Federal projects and their potential significant impacts to the human environment. Agencies must include a discussion of the environmental impacts of the various project alternatives, any adverse environmental effects which cannot be avoided, and any irreversible or irretrievable commitments of resources. Activities on non-Federal lands are also subject to NEPA if there is a Federal nexus. Cooperating agencies and the public can provide recommendations to the action agency for project modifications to avoid impacts or enhance conservation of the black-footed ferret or other wildlife species. NEPA provides an opportunity to negotiate conservation measures. However NEPA is a disclosure law, and does not require subsequent minimization or mitigation measures by the lead Federal agency. Evaluation of ferrets under NEPA would occur regardless of the species' listing status.

U.S. Bureau of Land Management: The BLM's mission is set forth in the Federal Land Policy and Management Act of 1976, which mandates that BLM manage public land resources for a variety of uses, such as energy development, livestock grazing, recreation, and timber harvesting, while protecting the natural, cultural, and historical resources on those lands. The BLM manages listed and sensitive species under guidance provided by their MS-6840 Manual - Special Status Species Management. The 6840 Manual directs BLM to proactively conserve special status and ESA-listed species and the ecosystems upon which they depend, ensure that all actions authorized or carried out by BLM are in compliance with the ESA, and cooperate with the planning and recovery of listed species. Four black-footed ferret reintroduction sites occur at least in part on BLM lands including: Shirley Basin in Wyoming, Coyote Basin in Utah, Wolf Creek in Colorado, and the BLM 40 Complex in Montana. Management of these reintroduction sites would likely continue regardless of the species' listing status.

U.S. Forest Service: Under the National Forest Management Act of 1976, as amended (16 U.S.C. §§ 1600-1614), the USFS shall strive to provide for a diversity of plant and animal communities when managing national forest lands. Conata Basin occurs on USFS land (Buffalo Gap National Grasslands) in South Dakota. Management of this reintroduction site would need to continue regardless of the species' listing status.

U.S. National Park Service: The NPS Organic Act (39 Stat. 535, 16 U.S.C. 1, as amended) states that NPS "shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations…to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." The black-footed ferret occurs in Badlands and Wind Cave National Parks in South Dakota, where they and their habitats are protected from large-scale loss or degradation due to NPS mandate. Management of these reintroduction sites would need to continue regardless of the species' listing status.

State Mechanisms: All States within the historical range of the black-footed ferret have produced State Comprehensive Wildlife Conservation Strategies. These strategies describe priorities for management of wildlife species, but do not result in any protection for the species. Three of the 12 States within the historical range of the species (Nebraska, New Mexico, and Oklahoma) do not identify the ferret as a management priority species. However, one of these States (New Mexico) supported a reintroduction effort in 2008. Management of these reintroduction sites would need to continue, regardless of the species' listing status.

Tribal Mechanisms: Black-footed ferrets have been reintroduced on five reservations since 1997 (Cheyenne River, Lower Brule, and Rosebud Sioux Tribes in South Dakota; Gros Ventre and Assiniboine Tribes in Fort Belknap, Montana; and Northern Cheyenne Sioux Tribe in Montana). In all instances all pertinent tribal fish and wildlife regulations have been followed by project managers. Any subsequent reintroductions on tribal lands

will adhere to this policy, and project proponents will be advised that all applicable tribal regulations must be followed during reintroduction activities.

Black-footed Ferret Recovery Implementation Team: The BFFRIT is a coalition of approximately 30 Federal and State agencies, tribes, and conservation organizations that was established in 1996. It is not regulatory in nature, but provides the Service with recommendations related to conservation and recovery of the black-footed ferret, with individual members often participants in ferret reintroductions. The BFFRIT consists of a policy and resource support body (the Executive Committee (EC)) and six technical subcommittees (the Conservation Subcommittee (CS), the Outreach and Information Subcommittee (OIS), the Incentives Subcommittee (IS), the Prairie Dog Management Subcommittee (PDMS), the Sylvatic Plague Vaccine Subcommittee (SPVS), and the SSP® Subcommittee). Functions of the EC include addressing broad-based policy issues, resource support, political problem-solving, review of overall organizational structural efficiency, and recommendations for Service decision-making purposes. The CS provides a forum for discussion and recommendations regarding field conservation issues. The OIS supports public relation and education efforts for the Black-footed Ferret Recovery Program. The IS supports the development of incentives that encourage private landowner participation in ferret recovery. The PDMS focuses on potential boundary control issues at recovery sites. The SPVS is investigating the development and application of vaccines to combat plague. The SSP® Subcommittee provides a forum for cooperation in the management of captive breeding programs.

The organization and activities of these committees have changed over time, and their effectiveness has varied. However, it is important to have a strong and effective BFFRIT to maintain overall coordination between program partners. Although BFFRIT is not directly involved in regulatory actions, many team members work with their respective agencies and constituencies on issues pertinent to ferret management and recovery. Without the BFFRIT, progress toward ferret recovery would likely be more limited than it is at present. Once delisting criteria are achieved, the BFFRIT would continue to maintain remaining captive breeding facilities and plan and conduct post-delisting monitoring.

Prairie Dog Management: Few protective regulations are in place for the prairie dog (which the black-footed ferret depends upon for food and shelter) in comparison to the ferret. The most recent reviews by the Service for the black-tailed prairie dog (74 FR 63343; December 3, 2009), white-tailed prairie dog (69 FR 64889; November 9, 2004), and Gunnison's prairie dog (73 FR 6660; February 5, 2008) all concluded that inadequate regulatory mechanisms were not likely to cause any of these species to become threatened or endangered within the foreseeable future. Prairie dogs appear able to persist in smaller, more fragmented populations than were common historically. However, most prairie dog populations may no longer be large and stable enough (due to plague, poisoning, and the lack of proactive management) to support recovery of the ferret, and the lack of regulatory mechanisms to support large prairie dog populations is a threat. More protective regulations for prairie dogs, particularly those related to poisoning (discussed below under Factor E) and maintenance of large prairie dog complexes, could improve opportunities for ferret recovery at sites with marginal potential at present. Ferret recovery is biologically possible; however, the restoration of adequate prairie dog habitats will take more time, patience, and commitment by Federal, State, tribal, and private land managers than has occurred to date.

Proactive management of prairie dogs, with regard to maintenance of sufficient quantity and quality of prairie dog habitat to support black-footed ferret recovery, is critical. Support is needed from Federal and State agencies and tribal governments for prairie dog conservation and management. For example, new recovery projects could be undertaken on National Grasslands in Colorado, Kansas, Nebraska, New Mexico, Oklahoma, Texas, and Wyoming. Tribal lands represent some of the best remaining potential habitat for ferrets due to the complexities involved with recovering ferrets on other land ownerships. In addition, many tribal lands offer larger, less-developed habitat for ferrets and are subjected to less frequent or intense prairie dog control efforts than lands managed by other entities. Development of additional cooperative tribal, State, and Federal partnerships for ferret recovery is needed. The development of partnerships, reintroduction projects, and prairie dog conservation on private lands is also essential for future ferret recovery. Prairie dog control programs may be necessary at the boundary of

ferret recovery areas in order to maintain local support. A prototype of such an effort has been initiated in Logan County, Kansas; similar efforts may be essential at other sites as well. Prairie dog management requires careful monitoring to maintain a balance between recovery needs and landowner needs.

Black-tailed, white-tailed, and Gunnison's prairie dogs are not threatened by inadequate regulatory mechanisms because they can continue to persist in smaller, more fragmented populations if they do not succumb to plague. However, we consider the lack of regulatory mechanisms that conserve stable, relatively large prairie dog populations a high magnitude, imminent threat to black-footed ferret recovery at the present time. It may be the single, most limiting factor regarding successful recovery of the ferret. Without large, stable prairie dog complexes, ferret recovery in the wild cannot be achieved. The lack of regulatory mechanisms for prairie dogs would persist regardless of the listing status for the ferret. However, we believe that this threat can be ameliorated through the development and implementation of adequate conservation measures by affected tribal, State, and Federal agencies. For example, a conservation plan for the black-tailed prairie dog has been developed and is supported by most States within the range of the prairie dog. It established objectives with regard to the size and number of prairie dog complexes that should be maintained by each State. However, at this point, only three States (Colorado, South Dakota, and Wyoming) have met those objectives. These objectives need to be supported and achieved by most States.

The successful establishment of black-footed ferret recovery sites that result in the eventual downlisting and delisting of the species will require coordinated management of prairie dogs including: (1) the successful control of flea vectors that transmit plague, including development of appropriate vaccines; (2) increased partner participation through regulatory assurances; (3) boundary control of prairie dogs as needed, and (4) grazing management assistance when necessary. In the absence of ESA protections, appropriate management of prairie dogs will need to remain in effect.

Memorandum of Understanding: A Memorandum of Understanding was recently signed by the Service, the Natural Resources Conservation Service (NRCS), USGS,

Animal and Plant Health Inspection Service (APHIS) Wildlife Services, and the Western Association of Fish and Wildlife Agencies (WAFWA). Its purpose is to facilitate cooperative conservation efforts among the parties in concert with willing landowners so as to maintain ranch land in prairie habitats, and to maintain the livestock operations that they support, while providing for the conservation and recovery of several wildlife species associated with prairie dogs, especially the ferret. While participation in this MOU is voluntary, it indicates the intention of several federal and state agencies to continue to contribute to ferret recovery.

Other natural or manmade factors

Other natural or manmade factors affecting recovery of the black-footed ferret include: poisoning of its principal prey (prairie dogs), climate change, and genetic fitness of the ferret.

Poisoning: Poisoning of prairie dogs is regarded as a major factor in the historical decline of prairie dogs and black-footed ferrets (Forrest et al. 1985, Cully 1993, Forrest and Luchsinger 2005). Similar to many of the other factors limiting ferret recovery, poisoning can affect the ferret directly, through inadvertent secondary poisoning of the ferret caused by consumption of poisoned prairie dogs, or indirectly, through the loss of the prairie dog prey base. The historical estimate of prairie dog occupied habitat was approximately 100 million ac (40 million ha). Concerns regarding competition for available forage between livestock and prairie dogs led to the development of extensive government sponsored prairie dog poisoning programs early in the 20th century. Organized prairie dog control gained momentum from 1916–1920, when prairie dogs were poisoned on tens of millions of acres of western rangeland (Bell 1921). By the 1960s, prairie dog occupied habitat reached a low of approximately 1.4 million ac (570,000 ha) in the United States (Bureau of Sport Fisheries and Wildlife 1961, Berryman and Johnson 1973). However, our most recent estimate of prairie dog occupied habitat is approximately 3.7 million ac (1.5 million ha) (74 FR 63343, December 3, 2009; 69 FR 64889, November 9, 2004; 73 FR 6660, February 5, 2008), an increase of 250 percent from its low point.

From the late 1800s to the early 1940s, strychnine was the primary substance used to poison prairie dogs (Bell 1921). Between World War II and 1972, Compound 1080 was the preferred poison for prairie dog control. In 1972, Executive Order 11643 prohibited the use of certain toxicants that might cause secondary poisoning on Federal lands or in federally funded programs. This order was revoked by Executive Order 12342 in 1982. However, poisoning prairie dogs with strychnine and Compound 1080 did not resume. Zinc phosphide became the preferred poison for prairie dog control by 1976, and its use continues to the present (Hanson 1993, Forrest and Luchsinger 2005). In recent years, manufacturers have promoted the use of the anticoagulant rodenticides chlorophacinone (Rozol) and diphacinone (Kaput) for control of prairie dogs (Bruening 2007, Lee and Hygnstrom 2007). These chemicals pose a much greater risk than zinc phosphide of secondary poisoning to non-target wildlife that prey upon prairie dogs, such as the black-footed ferret (Erickson and Urban 2004).

Poisoning on or adjacent to black-footed ferret recovery sites is of particular concern. The legal use of Rozol has occurred at one reintroduction site (Logan County, Kansas), and its illegal use occurred at another reintroduction site (Rosebud Indian Reservation, South Dakota). It is not known if any ferret mortalities occurred as a direct result of these two incidences. The ability to verify impacts to non-target species such as the ferret is quite limited due to the fossorial nature of ferrets, vegetative cover, possible consumption of poisoned ferrets by other predators, and delayed action of the rodenticide. Only a very small percentage of animals that die from secondary poisoning are ever located. However, the loss of prairie dog occupied habitat that resulted from these poisoning incidences reduced the quality and quantity of habitat available to support ferrets. In May, 2009, the EPA authorized the use of Rozol throughout the range of the black-tailed prairie dog via a Federal Insecticide, Fungicide, and Rodenticide Act Section 3 registration. We have recommended that the EPA withdraw its registration for Rozol and not issue a registration for Kaput (Gober 2006, Slack 2006, Arroyo 2009). The Western Association of Fish and Wildlife Agencies similarly requested that EPA reconsider use of anticoagulants for prairie dog control (Koch 2008). We have also funded two research projects to further investigate the secondary impacts from the use of anticoagulants for

control of prairie dog—one project is a laboratory study by the National Wildlife Research Center studying the retention time of Rozol in prairie dogs exposed to the poison; the other project is a study by the U.S. Geological Survey characterizing non-target hazards following poisoning of prairie dogs in the field. However, Rozol use to control prairie dogs is now legal in most of the western United States.

With the decline in prairie dogs, there was a concurrent decline in black-footed ferrets. Poisoning, if thorough enough, may result in permanent loss of prairie dogs, such as occurred in the extirpation of black-tailed prairie dogs in Arizona, though they were later reintroduced (Hoffmeister 1986, Arizona Game and Fish Department 1988). This loss can preclude ferret recovery opportunities. More typically, prairie dog numbers are reduced temporarily, but long enough for ferrets to disappear.

Prairie dog poisoning occurs on private, State, tribal, and Federal lands rangewide, but with more limited and localized efforts than occurred in past decades. The total acreage of prairie dog occupied habitat being poisoned annually has decreased dramatically since the 1960s. However, the amount of prairie dog occupied habitat available for poisoning has also been reduced, from approximately 100 million ac (40 million ha) historically to 3.7 million ac (1.5 million ha) at present. Consequently, the percentage of prairie dog occupied habitat being poisoned on an annual basis remains relatively high. For example, the South Dakota Bait Station, which is only one of several sources for zinc phosphide, has sold enough of this poison since 2004 (over 1 million pounds (400,000 kilograms)) to potentially poison all prairie dog occupied habitat in the United States (Kempema 2007, Larson 2008b). This scenario does not address the possibility of individuals stockpiling poison, re-applying poison at the same site, or applying poison at greater than the recommended rates. Poisoning of prairie dogs remains a concern with regard to impacts to black-footed ferrets.

Prairie dog control to address boundary encroachment issues from expanding prairie dog acreage at the Conata Basin black-footed ferret reintroduction site in South Dakota began in 2004 and peaked in 2006, with a 94 percent reduction in toxicant use by 2009 (Griebel 2010). The USFS, in response to local concerns about the impacts of drought and prairie

dogs, suggested a need to poison prairie dogs in interior portions of the ferret reintroduction area at Conata Basin in order to reduce alleged prairie dog damage to native grasslands and balance multiple use needs (U.S. Forest Service 2008). Proposed poisoning in the interior of the site could significantly reduce the viability of this ferret recovery site, reduce the number of wild-born kits available for translocation to other recovery sites, and slow progress towards the achievement of downlisting and delisting goals. The decision whether to allow expanded toxicant use on prairie dog colonies in the interior portion of Conata Basin has been deferred due to a recent plague epizootic.

We consider the poisoning of prairie dogs with zinc phosphide at black-footed ferret recovery sites a medium magnitude, imminent threat to ferret recovery at the present time due to the loss of habitat. We consider the poisoning of prairie dogs at ferret recovery sites with anticoagulants a high magnitude, imminent threat to ferret recovery at the present time due to the loss of habitat and the potential for secondary poisoning of the ferret. We consider large-scale poisoning of prairie dogs that curtails potential ferret habitat for future recovery sites a low magnitude, imminent threat to ferret recovery. The threat due to poisoning could be ameliorated by adequate regulatory mechanisms that provide management objectives for a sufficient amount of prairie dog habitat to achieve ferret recovery and limit the type of poison used at ferret recovery sites so as to preclude secondary impacts. In the absence of ESA protections, management of prairie dog poisoning would need to continue.

Climate change: Climate change could potentially impact the black-footed ferret. According to the Intergovernmental Panel on Climate Change (IPCC 2007), "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level." Average Northern Hemisphere temperatures during the second half of the 20th century were very likely higher than during any other 50-year period in the last 500 years and likely the highest in at least the past 1,300 years (IPCC 2007). It is very likely that over the past 50 years cold days, cold nights, and frosts have become less frequent over most land areas, and hot days and hot nights have become more frequent (IPCC 2007). It is likely that heat waves have become more frequent over

most land areas, and the frequency of heavy precipitation events has increased over most areas (IPCC 2007).

Changes in the global climate system during the 21st century are very likely to be larger than those observed during the 20th century (IPCC 2007). For the next two decades, a warming of about 0.2 degrees Celsius (°C) (0.4 degrees Fahrenheit (°F)) per decade is projected (IPCC 2007). Afterward, temperature projections increasingly depend on specific emission scenarios (IPCC 2007). Various emissions scenarios suggest that by the end of the 21st century, average global temperatures are expected to increase 0.6–4.0 ºC (1.1–7.2 ºF), with the greatest warming expected over land (IPCC 2007).

The IPCC (2007) report outlines several scenarios that are virtually certain or very likely to occur in the 21st century including: (1) over most land, there will be warmer and fewer cold days and nights, and warmer and more frequent hot days and nights, (2) areas affected by drought will increase, and (3) the frequency of warm spells/heat waves over most land areas will likely increase. The IPPC concludes that the resiliency of many ecosystems is likely to be exceeded this century by an unprecedented combination of climate change, associated disturbances (e.g., flooding, drought, wildfire, and insects), and other global drivers. With medium confidence, IPPC predicts that approximately 20–30 percent of plant and animal species assessed so far are likely to be at an increased risk of extinction if increases in global average temperature exceed 1.5–2.5 ºC (3–5 ºF).

The black-footed ferret, along with its habitat, likely will be affected in some manner by climate change. A shift in the species' geographic range may occur due to an increase in temperature and drought. Though drought could reduce vegetation and therefore prairie dog abundance in some locations, the net effect these changes will have on the distribution and abundance of ferret habitat is unclear. However, climate change would likely not pose as great a risk to ferrets and their habitat as it would to species in more restricted polar, coastal, or montane ecosystems.

A strong relationship between plague outbreaks and climatic variables has been established (Parmenter et al. 1999, Enscore et al. 2002, Stapp et al. 2004, Ray and

Collinge 2005, Stenseth et al. 2006, Snall et al. 2008). The key climatic variables appear to be maximum daily summer temperature (plague is enhanced by cooler summer temperatures) and late winter precipitation (plague is enhanced by increased precipitation).

Modeling efforts indicate that shifts in plague distribution may be a result of shifts of pathogen, vector, or host distribution following climate change (Nakazawa et al. 2007). The authors also suggest that the distribution of plague may expand north and east. The recent expansion of plague into South Dakota supports this theory. However, variables associated with climate change and increased plague activity conflict. Plague is enhanced by cooler summer temperatures and by increased precipitation. With climate change, summer temperatures are anticipated to be warmer rangewide and precipitation is anticipated to decrease throughout much of the ferret's historical range. Consequently, the extent to which plague may shift due to climate change versus expand or contract is supposition. The species is adaptable to a wide array of climes, as evidenced by a geographic range that includes 12 States, Canada, and Mexico. Unlike vulnerable species in polar, coastal, and montane ecosystems, we believe that the ferret could accommodate to a possible shift in climate change or to a possible shift in plague distribution.

We do not consider climate change a threat to black-footed ferret recovery at the present time. Although the ferret will likely be affected by climate change, and drought could reduce vegetation, prairie dogs, and consequently ferrets, it is not apparent that a net loss in occupied habitat or a significant impact to the status of the species will result. There is no indication that climate change has reduced ferret survival or reproduction.

Genetic fitness: Genetic fitness of the black-footed ferret has been a concern in the captive breeding program due to the extreme bottleneck that the species experienced (Groves and Clark 1986, U.S. Fish and Wildlife Service 1988, CBSG 1992, Hutchins et al. 1996, CBSG 2004, Garelle et al. 2006, Howard et al. 2006, Wisely 2006). The current captive breeding program began with the lineage of seven founder animals from the last wild population at Meeteetse, Wyoming (Hutchins et al. 1996, Wisely 2006). The magnitude of loss of genetic diversity was exacerbated by the especially isolated nature

of this last population. Meeteetse is located on the periphery of the historical ferret range and was likely a refugium during the last glacial period that subsequently remained isolated (Wisely 2006).

Two types of genetic effects can impact a population's survival: (1) inbreeding depression, caused by increased genetic homozygosity (uniformity) and the subsequent expression of deleterious genes; and (2) genetic drift, the random loss of genetic diversity in small populations (Clark 1989). In some species, genetic diversity of less than 90 percent of that in founder populations has been associated with compromised reproduction due to lower birth weights, smaller litter size, and greater neonatal mortality. Genetic diversity in the current black-footed ferret population is estimated to be 87 percent of that in the founder population (Garelle et al. 2006). Some periodic abnormalities observed in captive ferrets (reduced sperm viability, renal aplasia, and kinked tails) may be a result of inbreeding (Hutchins et al. 1996, Howard et al. 2006). A primary goal of the SSP® is to optimize genetic management of the captive population by maintaining 80 percent of the genetic diversity present in the founder population for the next 25 years (Marinari and Kreeger 2006).

The genetic uniformity of the black-footed ferret is unprecedented and rivaled by perhaps only one other carnivore, the African cheetah (*Acinonyx jubatus*) (Wisely 2006). However, carnivores typically have less genetic variability than other mammalian taxa (Kilpatrick et al. 1986). Felines are more susceptible to inbreeding than most taxa (Wisely 2006), and yet the cheetah continues to survive in the wild. The use of artificial insemination in ferret captive breeding programs has been effective and has helped preserve genetic diversity from an underrepresented male lineage (Howard et al. 2006). Approximately 7,500 ferret kits have been produced at captive breeding facilities (Marinari 2011). Ferret populations appear to flourish despite reduced genetic diversity where ample plague-free habitat exists (Wisely 2006). The species will likely persist with continued careful management of remaining genetic resources (Wisely 2006).

Successful reproduction has been documented in black-footed ferrets at almost all reintroduction sites. In 1999, a study detected no difference in genetic diversity between

captive-reared releases and their wild descendants at UL Bend, Montana and Conata Basin, South Dakota reintroduction sites (Wisely 2006). Nevertheless, the translocation of wild-born ferrets that have been exposed to natural selection processes that do not occur in a captive breeding program may aid with overall recovery and is being utilized in the establishment of new reintroduction sites. Ferret recovery has consistently emphasized releasing captive-bred animals to the wild as quickly as possible, as well as encouraging the translocation of wild-born ferrets to initiate new recovery sites.

Smaller populations are more susceptible to extinction from various causes (Shaffer 1981). In order to address the risks from loss of genetic diversity, and other possible threats such as disease, poisoning, and natural catastrophes, the downlisting and delisting criteria require a minimum number of black-footed ferrets at reintroduction sites, as well as multiple sites distributed throughout the historical range of the species. Captive ferret populations are also widely distributed at multiple facilities in order to protect against unforeseen events. These criteria are discussed in more detail in the following section on "Recovery."

We do not consider genetic fitness a threat to black-footed ferret recovery at the present time, inasmuch as successful reproduction has occurred in the wild at all reintroduction sites. Although the ferret experienced a severe bottleneck in the 1980s, the species will likely persist with continued management of remaining genetic resources. In the absence of ESA protections, efforts to maximize genetic diversity would continue through captive breeding policies developed by the SSP® Subcommittee.

The following table summarizes factors affecting the black-footed ferret and the magnitude and immediacy of any threats.

Table 4. Black-footed ferret threat matrix

Listing Factor	Stressor	Magnitude	Immediacy
Present or threatened destruction, modification or curtailment of habitat or range	Present or threatened destruction of habitat or range via conversion of rangeland to cropland or urbanization	Not a threat	Not a threat
Overutilization for commercial, recreational, scientific, or educational purposes	Commercial use of ferrets	Not a threat	Not a threat
	Scientific, educational, and recreational shooting of prairie dogs	Not a threat with continued management	Not a threat with continued management
Disease or predation	Canine distemper	Not a threat with continued management	Not a threat with continued management
	Sylvatic plague (both direct impact to ferrets and indirect impact of modification of habitat through loss of prairie dogs)	Medium, additional management needed	Imminent
	Predation	Not a threat	Not a threat
Inadequacy of existing regulatory mechanisms	Prairie dog management sufficient for ferrets	High, additional management needed	Imminent
	Other regulatory mechanisms	Not a threat with continued management	Not a threat with continued management
Other natural or manmade factors	Poisoning of prairie dogs at ferret sites (with zinc phosphide)	Medium, additional management needed	Imminent
	Poisoning of prairie dogs at ferret sites (with anticoagulants)	High, additional management needed	Imminent
	Present or threatened curtailment of potential	Low, additional management	Imminent

	habitat or range due to conflicts with large-scale poisoning	needed	
	Climate Change	Not a threat	Not a threat
	Genetic fitness	Not a threat, with continued management	Not a threat, with continued management

PART II. RECOVERY

This section presents a strategy to recover the black-footed ferret, including actions and specific tasks that must be undertaken.

RECOVERY GOAL

The goal of the actions proposed in this recovery plan is to recover the black-footed ferret to the point where the species can be reclassified to a threatened status (downlisted) and ultimately removed from the lists of Threatened and Endangered Species (delisted). Downlisting could be achieved by 2020 if aggressive reintroduction efforts continue and conservation measures produce positive responses at most reintroduction sites. We believe that delisting could be realized by 2040 if the tasks specified in the following section are accomplished. Moreover, we believe that delisting could occur by 2022, if current and additional recovery actions were accelerated to facilitate six new reintroduction sites per year annually for the next 10 years.

RECOVERY CRITERIA

The ESA establishes policies and procedures for identifying, listing, and protecting species of wildlife and plants that are endangered or threatened with extinction. The ESA defines an "endangered species" as "any species which is in danger of extinction throughout all or a significant portion of its range." A "threatened species" is defined as

"any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."

The goal of this plan is to recover the black-footed ferret such that it no longer meets the ESA definition of threatened and can be removed from the Federal List of Endangered and Threatened Wildlife (i.e., delisted). Changes in status require consideration of the same five categories of threats specified in section 4(a)(1) of the ESA. These factors are:

Factor A – the present or threatened destruction, modification, or curtailment of its habitat or range;
Factor B – overutilization for commercial, recreational, scientific, or educational purposes;
Factor C – disease or predation;
Factor D – the inadequacy of existing regulatory mechanisms; and
Factor E – other natural or manmade factors affecting its continued existence.

As required by section 4(f) of the ESA, this recovery plan includes objective, measurable criteria that, when met, will allow the species or populations to be removed from the Federal List of Threatened and Endangered Species. Section 4(f) of the ESA also requires that recovery plans include site-specific management actions thought necessary to achieve these criteria as well as provide time and cost estimates.

It is important to note that recovery plans are not regulatory documents and are instead intended to provide guidance to the Service, States, tribes and other partners on methods of minimizing threats to listed species and on criteria that may be used to determine when recovery is achieved. There are many paths to accomplishing recovery of a species and recovery may be achieved without all criteria being fully met. For example, one or more criteria may be exceeded while other criteria may not be accomplished. In that instance, the Service may judge that the threats have been minimized sufficiently, and the species is robust enough to reclassify from endangered to threatened or to delist. In other cases, recovery opportunities may be recognized that were not known at the time the recovery plan was finalized. These opportunities may be used instead of methods identified in the

recovery plan. Likewise, information on the species may be learned that was not known at the time the recovery plan was finalized. The new information may change the extent that criteria need to be met for recognizing recovery of the species. Recovery of a species is a dynamic process requiring adaptive management that may, or may not, fully follow the guidance provided in a recovery plan.

Downlisting Criteria: To reclassify the black-footed ferret from endangered to threatened status, the following criteria, originally established in the 1988 Recovery Plan, and expanded (as noted in italics) must be met:

- Conserve and manage a captive 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.
- *Maintain these population objectives for at least three years prior to downlisting.*
- *Maintain approximately 247,000 ac (100,000 ha) of prairie dog occupied habitat at reintroduction sites by planning and implementing actions to manage plague and conserve prairie dog populations.*

Delisting Criteria: Delisting may occur when the following recovery criteria are met:

- Conserve and manage a captive 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.
- Maintain these population objectives for at least three years prior to delisting.

- Maintain 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 dogs.
- Complete and implement a post-delisting monitoring plan, in cooperation with the States and tribes, to ensure recovery goals are maintained.

After Delisting:

- Conserve and manage a reduced captive breeding population of black-footed ferrets in order to maintain knowledge, incorporate developing technologies, and address potential population extinctions.

The following table describes which threats are addressed by each of the downlisting and delisting criteria and briefly summarizes how those threats will be ameliorated.

Table 5. Downlisting and delisting criteria and threats addressed

Criteria	Downlisting or Delisting	Threat Addressed	Explanation
Conserve and manage a captive breeding population among at least 3 facilities	Both	Factor C (Plague)	Multiple facilities minimize risk of plague outbreak affecting captive ferrets, provide ferrets for disease research, and provide ferrets for augmentation at plague impacted sites.
		Factor D (Prairie dog management)	Captive population provides ferrets for release as prairie dog management improves existing reintroduction sites and creates new sites.
		Factor E (Poisoning of prairie dogs)	Captive population provides ferrets for release as poisoning becomes better regulated.
		Factor B (Use for scientific or educational purposes)	Captive population provides excess ferrets under SSP® protocol.
		Factor C (Distemper)	SSP® protocol includes vaccination of captive ferrets.
		Factor E (Genetic fitness)	SSP® protocol addresses maximizing genetic diversity in captive populations.
Establish free-ranging ferrets of ≥1,500 adults, in ≥10 populations, in ≥6 States, with ≥30 breeding adults in any population	Downlisting	Factor C (Plague)	This number and distribution of ferrets would minimize likelihood of an epizootic affecting multiple populations simultaneously.
		Factor D (Prairie dog management)	This number and distribution of ferrets would maximize flexibility of various management options.
		Factor E (Poisoning prairie dogs)	This number and distribution of ferrets would minimize risk of affecting multiple populations simultaneously.

		Factor B (Recreational shooting of prairie dogs) Factor D (Other regulatory mechanisms) Factor E (Genetic fitness)	This number and distribution of ferrets would minimize risk of affecting multiple populations regulated by different States, tribes, and Federal agencies. This number and distribution of ferrets would increase flexibility of States, tribes, and Federal agencies using their authorities to manage ferrets on their lands. Multiple sites of adequate size distributed across the range will help maintain genetic diversity.
Maintain these population objectives for ≥ 3 years	Both	Factor C (Plague) Factor D (Prairie dog management) Factor E (Poisoning prairie dogs) Factor B (Recreational shooting of prairie dogs) Factor D (Other regulatory mechanisms)	This will provide evidence of population stability in the presence of plague. This will provide evidence of population stability under current management. This will provide evidence of population stability in the presence of any poisoning. This will provide evidence of continued active management by States, tribes, and Federal agencies. This will provide evidence of continued active management by States, tribes, and Federal agencies.
Maintain approximately 247,000 ac (100,000 ha) of prairie dog occupied habitat	Downlisting	Factor C (Plague)	Multiple sites of adequate size distributed across the range will minimize likelihood of an epizootic affecting multiple populations simultaneously and add management flexibility.

at reintroduction sites by planning and implementing actions to manage plague and conserve prairie dog populations.		Factor D (Prairie dog management)	Multiple sites of adequate size distributed across the range will provide adequate habitat for current and future reintroduction sites.
		Factor E (Poisoning prairie dogs)	Multiple sites of adequate size distributed across the range will add management flexibility by providing adequate habitat for current and future reintroduction sites.
		Factor E (Genetic fitness)	Multiple sites of adequate size distributed across the range will help maintain genetic diversity.
Establish free-ranging ferrets of ≥3,000 adults, in ≥30 populations, in ≥9 States, with ≥30 breeding adults in any population, and ≥10 populations with ≥100 breeding adults	Delisting	Factor C (Plague)	This number and distribution of ferrets would minimize likelihood of an epizootic affecting multiple populations simultaneously.
		Factor D (Prairie dog management)	This number and distribution of ferrets would maximize flexibility of various management options.
		Factor E (Poisoning prairie dogs)	This number and distribution of ferrets would minimize risk of affecting multiple populations simultaneously.
		Factor B (Recreational shooting of prairie dogs)	This number and distribution of ferrets would minimize risk of affecting multiple populations regulated by different States, tribes, and Federal agencies.
		Factor D (Other regulatory mechanisms)	This number and distribution of ferrets would increase flexibility of States, tribes, and Federal agencies using their authorities to manage ferrets on their lands.
		Factor E (Genetic fitness)	Multiple sites of adequate size distributed across the range will help maintain genetic diversity.

Maintain 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 dogs.	Delisting	Factor C (Plague)	Multiple sites of adequate size distributed across the range will minimize likelihood of an epizootic affecting multiple populations simultaneously and add management flexibility.
		Factor D (Prairie dog management)	Multiple sites of adequate size distributed across the range will provide adequate habitat for current and future reintroduction sites.
		Factor E (Poisoning prairie dogs)	Multiple sites of adequate size distributed across the range will add management flexibility by providing adequate habitat for current and future reintroduction sites.
		Factor E (Genetic fitness)	Multiple sites of adequate size distributed across the range will help maintain genetic diversity.
Complete and implement a post-delisting monitoring plan, in cooperation with the States and tribes, to ensure recovery goals are maintained	Delisting	All threats	A robust monitoring plan (including a regulatory framework) developed by the Service and State, tribal, and Federal partners will ensure recovery is maintained after the species is delisted.
Conserve and manage a reduced captive breeding population of black-footed ferrets in order to maintain knowledge, incorporate	Post-delisting	Factor C (Plague)	A post-delisting captive population will allow: (1) opportunity for continued research into better disease management and (2) ability to more quickly augment wild populations if needed following an epizootic or other unforeseen stochastic event.

developing technologies, and address potential population extinctions		Factor E (Genetic fitness)	Captive population will allow opportunity for continued research into maintaining genetic diversity.

Justification for the Downlisting and Delisting Goals

Captive Breeding Population: Captive black-footed ferret breeding populations are currently housed at the U.S. Fish and Wildlife Service National Black-footed Ferret Conservation Center near Wellington, Colorado; the Cheyenne Mountain Zoological Park in Colorado Springs, Colorado; the Louisville Zoological Garden in Louisville, Kentucky; the Smithsonian Biology Conservation Institute in Front Royal, Virginia; the Phoenix Zoo in Phoenix, Arizona; and the Toronto Zoo in Toronto, Ontario (Marinari and Kreeger 2006). The Henry Doorly Zoo in Omaha, Nebraska previously participated in captive breeding efforts. In addition to the principal captive populations, intermittent field breeding facilities have been managed by the Arizona Fish and Game Department in Seligman, Arizona, by the Turner Endangered Species Fund in Cimarron, New Mexico (Garelle et al. 2006), and by the Bowdoin National Wildlife Refuge in Malta, Montana. More than 50 percent of all captive ferrets are housed at the National Black-footed Ferret Conservation Center (Marinari and Kreeger 2006).

The 1988 Black-footed Ferret Recovery Plan set a goal of 200 breeding adults in captive populations by 1991 to ensure adequate genetic fitness of captive ferret populations and provide surplus animals for release. In 1996, the Small Carnivore Taxon Advisory Group (SCTAG) of the AZA recommended modification of this goal to at least 240 ± 35 breeding adults of optimum sex ratio (90 male:150 female), with surplus animals provided for reintroduction purposes (Hutchins et al. 1996). In 2004, the SSP® recommended that consideration be given to further increasing the size of the captive population in order to promote retention of gene diversity and increase production potential (CBSG 2004). Thereafter, SCTAG recommended a total target captive population of 350 individuals (Garelle et al. 2006). However, the target population of

350 includes non-reproductive display animals and the possibility of future increases in the number of breeding facilities.

The captive population has expanded to approximately 280 animals at present. We consider this number of animals necessary to ensure maintenance of the 240 animals previously specified. We believe that the emphasis of our recovery strategy should be on expanding black-footed ferret recovery in the wild. Therefore, further expansion of the captive population is not appropriate because it would result in fewer animals being released into the wild. The potential limited advantages of expanding the captive program are also offset by the added financial costs to the program. As previously explained, the more time that ferrets spend in captivity, the more that wild behaviors are lost, and the more difficult reintroduction becomes. Additionally, as wild populations continue to expand, the translocation of wild-born kits to developing reintroduction areas will become increasingly important. Survivorship of wild-born kits is much greater than that of reintroduced animals of captive origin. Therefore, the importance of maintaining a large captive population will diminish somewhat as the availability of wild kits increases. Consequently, we adopt a goal of a minimum of 280 captive breeding adults for the purpose of this recovery plan.

The black-footed ferret was considered possibly extinct twice in recent years. Therefore, we do not intend to immediately disband the captive breeding program following delisting. There will not be a need for as many captive ferrets after the species is delisted. However, a reduced number of animals should be maintained at some facilities to enhance opportunities for continued research, particularly related to plague and genetic fitness. Additionally, captive animals could be used to augment wild populations in the event of a plague epizootic or other unforeseen stochastic event.

Free-ranging Population: The goal of the 1988 Recovery Plan was to establish 1,500 breeding adult black-footed ferrets in the wild in 10 or more populations, with a minimum of 30 adults in each population. An additional qualitative goal was to space these populations as widely as possible across the historical range of the species. This distribution would provide for multiple recovery opportunities (and partners) and serve as

a risk management strategy to guard against adverse impacts and potential periodic population losses.

The goal of 1,500 breeding adult ferrets was derived based upon a general agreement among geneticists that populations require an effective size of approximately 500 breeding adults to retain genetic heterozygosity sufficient for evolution in an idealized or carefully controlled population (U.S. Fish and Wildlife Service 1988). The 1988 Recovery Plan further noted that in wild populations, which experience less control, the actual number of breeding adults ranges from 20-50 percent of all potential breeders. Consequently, we assume that approximately one-third of all potential breeders will actually breed in a given year due to adverse individual and population impacts. Therefore, a goal of 1,500 breeding adults was derived. This will ensure that at least 500 adult ferrets will actually breed in a given year. Due to habitat fragmentation, inter-population transfers of individuals will likely be necessary in perpetuity.

These downlisting goals are readopted for this revision of the species' recovery plan but are further refined. Specifically, jurisdictional entities by State are encouraged to provide contributions to recovery goals in proportion to the amount of historical ferret habitat (i.e., prairie dog colonies) that once occurred on these lands (see subsequent discussion of "Recovery Guidelines by State").

Reintroductions in Mexico and Canada are also important in reestablishing black-footed ferret populations across the species' historical range proportional to the distribution and abundance of historical prairie dog habitat. However, recovery opportunities outside of the United States are restricted due to limited potential habitat that is at the extreme periphery of the ferret's historical range. Based upon the most recent estimates of prairie dog habitat (74 FR 63343, December 3, 2009; 69 FR 64889, November 9, 2004; and 73 FR 6660, February 5, 2008), approximately 41,000 ac (16,600 ha), or one percent of the total prairie dog occupied habitat rangewide, occurs in Canada and Mexico. Additionally these lands are not managed under U.S. regulatory mechanisms; consequently, it is more difficult to engage agencies with regard to regulatory mechanisms. Therefore, we do not consider them in the numeric downlisting and delisting criteria for wild populations.

However, we do consider them with regard to maximizing recovery throughout the historical range of the ferret.

We believe that the 1,500 breeding adult black-footed ferrets downlisting criteria and 3,000 breeding adults delisting criteria are achievable with proactive management actions, including completion of the tasks proposed in the section, "Recovery Actions." These goals appear to be consistent with methodologies explored by both Gedir et al. (2004) and Ray (2006). These methodologies used guidelines established by the International Union for the Conservation of Nature to identify recovery needs for various species. For both of these methodologies, the degree of management effort needed was inversely proportional to the population size required to ensure conservation. In other words, lower, less stringent recovery goals are possible if more conservation assurances are provided. We believe the recovery criteria for the ferret strike a balance between the difficulties of establishing more large populations in the wild and the greater management needs associated with maintaining fewer and/or smaller wild populations.

The scientific community has debated whether a single large or several small reserves are more appropriate for conserving biodiversity in a fragmented habitat. Initially, a single large reserve was considered preferable; however, more recently, ecologists have concluded that either management approach can be appropriate (Soule and Simberloff 1986). The authors note that several small reserves can contain as many individuals as a single large one. Reserves should be large enough to sustain a population, and there should be many of them in order to minimize the probability of extinction due to any of threats facing the species (Soule and Simberloff 1986). Recovery criteria for the black-footed ferret address these concerns by requiring a minimum number of 30 breeding adults at each of many widely distributed sites. These scattered reintroduction sites will be managed as a metapopulation through immigration and emigration at a few adjacent sites as well as through translocation of wild-born ferrets at more widely separated sites.

Black-footed ferret reintroduction efforts started in 1991 and will continue in the future. There have been ferret reintroduction efforts at 20 different sites over the past 22 years. For the purpose of evaluating reintroduction efforts collectively, the relative success of

these sites was categorized in Table 2 as successful, improving, marginal, unsuccessful, or recent (too new to adequately assess). It is important to recognize that this basic categorization is current as of the date of this recovery plan, but can change quickly. Two reintroduction sites that were thought to be doing poorly in the past have shown substantial growth in recent years. The ferret population of Shirley Basin, Wyoming was regarded as unsuccessful a few years ago, but is considered large and successful today. Similarly, Badlands National Park, South Dakota has improved markedly in the past 2–3 years. Conversely, some successful sites could falter if disease or other factors affect habitat quality. Additionally, some currently unsuccessful sites may show promise in the future with progressing innovation, such as disease vaccines.

The availability of suitable reintroduction sites is a key limiting factor on the rate and success of black-footed ferret recovery. Estimates of large potential reintroduction areas available for ferret recovery efforts range from 3–5 (Lockhart et al. 2006, Luce 2006). However, Luce (2008) suggests that there are possibly 181 sites throughout the historical range of the ferret with intermediate potential (available in the next 3–10 years) for ferret reintroduction. These intermediate sites would require increased management to enhance occupied prairie dog habitat before ferrets could be reintroduced.

The precise total number of breeding adult black-footed ferrets currently extant in the wild is unknown because of monitoring limitations. However, we estimate that a minimum of 274 breeding adult ferrets occurred in the wild in 2012 (Table 3). Accordingly, it appears that downlisting efforts may be 40 percent complete with regard to establishing 10 successful populations and approximately 18 percent complete with regard to the goal of 1,500 breeding adults (see Tables 2 and 3). Approximately 1,230 additional breeding adults are needed at existing or new sites to meet the downlisting goals. It has taken 20 years of reintroduction efforts to reach this point in ferret recovery. Accordingly, we are modifying the year of achieving downlisting goals estimated in the 1988 Recovery Plan from 2010 to 2020. Additionally, we estimate meeting delisting goals by 2040. These estimates assume continued progress similar to what has been achieved in recent years. More aggressive recovery efforts could result in delisting by 2022.

To inform our recovery criteria, we determined the amount of prairie dog occupied habitat needed to achieve recovery of the black-footed ferret. Approximately 75 ac (30 ha) of black-tailed prairie dog occupied habitat or approximately 100–150 ac (40–60 ha) of white-tailed or Gunnison's prairie dog occupied habitat are required to support one female black-footed ferret (Biggins et al. 2006). Male ferrets have overlapping ranges with female ferrets and do not require additional prairie dog habitat beyond that considered for the females (Biggins et al. 2006). The male:female sex ratio in wild ferrets at Meeteetse was approximately 1:2 (Forrest et al. 1988). At Conata Basin, South Dakota, at least 146 adults (including 97 females) were estimated to occur on 21,000 ac (8,500 ha) in 2009. This approximates the previously reported sex ratio. However, this equates to 1 female per 216 ac (88 ha), which is nearly 3 times the acreage anticipated by Biggins et al. (2006). There are many possible explanations for this higher than anticipated acreage including undercounting ferrets, climatic factors, poisoning, and disease. In recognition of these variables, we suggest that a more conservative estimate of black-tailed prairie dog habitat required to support ferrets should be 225 ac (90 ha) per female ferret based upon the Conata Basin data, or 3 times the 75 ac (30 ha) estimated by Biggins et al. (2006). Using an average of 125 ac (50 ha) of white-tailed and Gunnison's prairie dog habitat required to support one female black-footed ferret (Biggins et al. 2006), a similar three-fold adjustment would result in an estimate of 375 ac (150 ha) needed to support a female ferret in white-tailed or Gunnison's prairie dog habitat.

A population of 1,500 wild adult black-footed ferrets could be assumed to contain approximately 1,000 females. Eighty-five percent of ferrets are anticipated to occur in black-tailed prairie dog habitat (850 females). Therefore, downlisting may require approximately 191,000 ac (77,000 ha) of black-tailed occupied prairie dog habitat (850 female ferrets x 225 ac/90 ha per female ferret) and 56,000 ac (23,000 ha) of white-tailed and Gunnison's habitat (150 female ferrets x 375 ac/150 ha per female ferret). This represents a minimum of 247,000 ac (100,000 ha) of prairie dog occupied habitat to achieve downlisting of the ferret. A similar calculation would result in a minimum of 494,000 ac (200,000 ha) of prairie dog occupied habitat to achieve delisting of the ferret. We recognize that these acreage figures may change if further monitoring determines that

ferrets require less habitat than our conservative approach estimates. To provide some perspective on the size of the area necessary for recovery, delisting could be supported by careful management of approximately 15 percent of existing prairie dog occupied habitat, which is 0.5 percent of lands within the ferret's historically occupied habitat, or 0.08 percent of lands within the ferret's historical range. The intent of this discussion is to point out that recovery of ferrets will not require that more lands be occupied by prairie dogs than at present, but it will require better management of existing prairie dog occupied habitat.

The following figure illustrates the past rate of recovery and the average future rate needed to achieve downlisting and delisting goals in the suggested timeframe. It should be noted that in a real world situation black-footed ferret and prairie dog populations will fluctuate from year to year due to sylvatic plague and other factors.

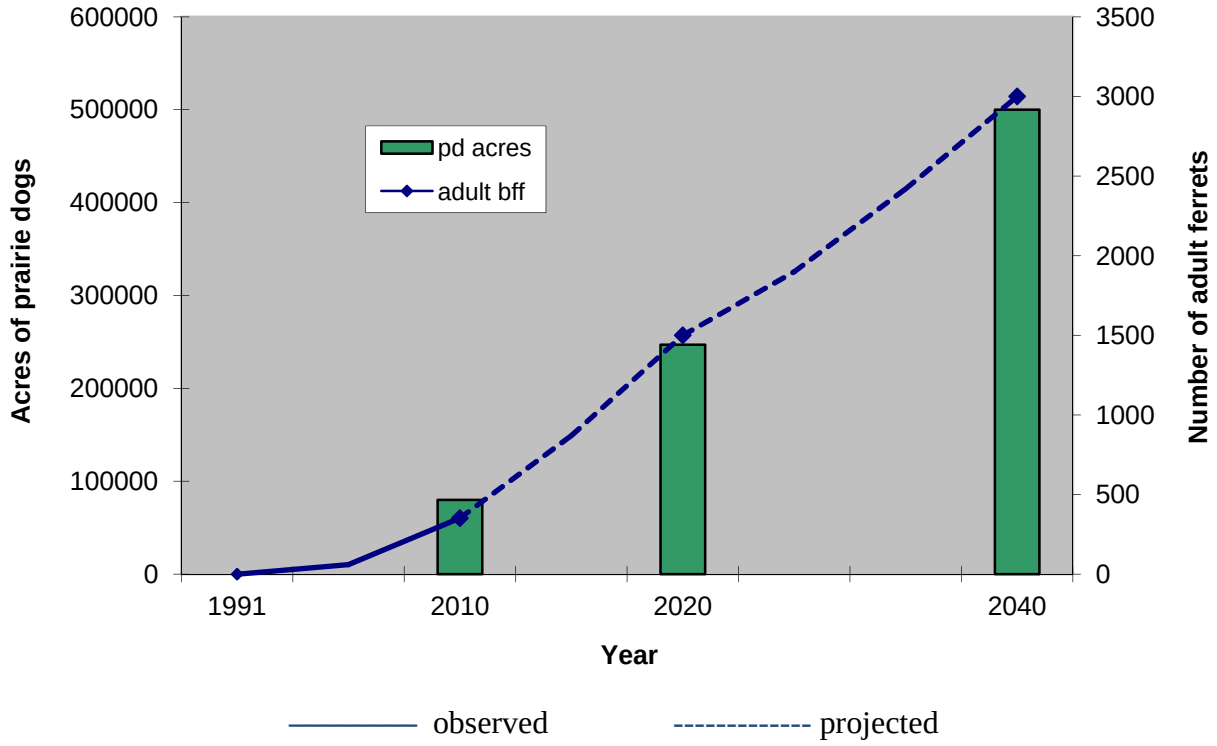

Figure 3. Number of adult black-footed ferret and corresponding acres of prairie dog occupied habitat at successful recovery sites in 2010 and projected requirements for downlisting (2020) and delisting (2040)

Meeting our downlisting goal of 1,500 breeding adult black-footed ferrets by 2020 will require significant population expansion at existing sites where habitat is unfilled and/or reintroduction into new sites. Realistically, the addition of approximately 1,300 breeding adult ferrets in populations with 30 or more breeding adults over the next 10 years would require large population increases at most existing sites in Arizona, western Colorado, Kansas, Montana, New Mexico, South Dakota, Utah, and Wyoming. Ferret populations at several existing sites have been established in habitat modified by disease and/or where there is likely to be ongoing political opposition to substantial prairie dog population increases. New sites will need to be initiated in States and portions of States not yet participating in reintroduction efforts (Nebraska, North Dakota, Oklahoma, Texas, and eastern Colorado). Downlisting by 2020 would require six additional successful sites in the next 10 years. Delisting by 2040 would require 20 additional successful sites or one new successful site achieved annually. We believe that this level of population expansion is possible, if aggressive management is pursued via prairie dog occupied habitat conservation and disease management. Failing these efforts, downlisting and delisting goals should be readdressed after 2020. However, even more aggressive recovery efforts could result in delisting much sooner.

Participation by all States within the historical range of the black-footed ferret is important to maximize the redundancy, representation, and resilience of the ferret and result in equitable recovery goals for all States. There are many uncertainties inherent in recovery projections. Therefore, we recommend that each of the 12 States within the historical range of the black-footed ferret consider initiating and maintaining some combination of the following types of reintroduction efforts, to provide the numbers of ferrets suggested to meet recovery guidelines:

- One or more large size ferret reintroduction sites with the potential for more than 100 adult breeding ferrets,
- One or more medium size ferret reintroduction sites with the potential for 50–100 adult breeding ferrets, and
- One or more small size ferret reintroduction sites with the potential for 30–50 adult breeding ferrets.

Furthermore, we recommend that at least two black-footed ferret reintroduction sites be initiated per year from 2021–2040 to successfully establish at least 20 additional sites for attaining the delisting goal of 30 successful populations. These efforts will require the continued success or expansion of existing reintroduction sites. Moreover, all initiated sites that prove successful must be maintained. If more partners and resources are provided for recovery, we recommend the establishment of six new reintroduction sites for each of the next 10 years, which could result in delisting the species by 2022.

The following table is adapted from Ernst (2008). It proposes recovery guidelines by State for the number of adult breeding black-footed ferrets required to meet rangewide recovery goals and the estimated amount of prairie dog habitat that would be needed to support that number of animals. Note that rounding of numbers results in downlisting and delisting goals slightly higher than 1500 and 3000 breeding adults respectively, as well as slightly higher acreage goals. Data from Canada and Mexico are not included. It should also be noted that breeding adults would not be counted toward a downlisting or delisting goal unless they are in a population of at least 30 breeding adults.

Table 6. Black-footed ferret recovery guidelines by State

State	Breeding adults established to date	Adults/acres to downlist	Adults/acres to delist
Arizona	35	74 adults/17,000 ac	148 adults/34,000 ac
Colorado	4	149 adults/29,000 ac	288 adults/58,000 ac
Kansas	13	123 adults/18,500 ac	246 adults/37,000 ac
Montana	11	147 adults/22,000 ac	294 adults/44,000 ac
Nebraska	0	134 adults/20,000 ac	268 adults/44,000 ac
New Mexico	2	220 adults/39,000 ac	440 adults/78,000 ac
North Dakota	0	38 adults/6,000 ac	76 adults/12,000 ac
Oklahoma	0	70 adults/10,500 ac	140 adults/21,000 ac
South Dakota	185	102 adults/15,000 ac	204 adults/30,000 ac
Texas	0	254 adults/38,000 ac	508 adults/76,000 ac
Utah	7	25adults/6,000 ac	50 adults/12,000 ac
Wyoming	100	171 adults/35,000 ac	341 adults/70,000 ac
Total	357	1,507 adults/256,000 ac	3,004 adults/512,000 ac

These guidelines are provided to assist planning needs and encourage broader recovery support across the black-footed ferret's historical range. The Service and BFFRIT regard such expanded participation as the most useful approach to overall species recovery and eventual State and tribal management of the ferret after delisting. These guidelines are a means of improving risk management and ensuring more uniform equity of recovery responsibilities across State boundaries. Species recovery has more likelihood of timely achievement if the currently non-participating or minimally-participating States engage in ferret reintroductions and recovery. However, recovery goals should not be subject to individual State efforts. The species may be downlisted and delisted if population and habitat objectives identified above are met by some other configuration than the one outlined above.

Management of Sylvatic Plague and Prairie Dogs: As previously noted, plague can impact the black-footed ferret directly via infection and subsequent mortality, and indirectly through the disease's effects on prairie dogs and the potential for dramatic declines in the ferret's prey base. Current management techniques include dusting prairie dog burrows with flea control powder and vaccinating ferrets prior to release. At Conata Basin in South Dakota, wild ferrets are also being trapped and vaccinated in the field as protection against the ongoing epizootic. Research is currently investigating the potential of supporting ferrets by providing vaccine to protect wild prairie dogs via oral bait. This has the potential to limit periodic plague cycles more effectively and economically than direct vaccination of ferrets. Specific tasks are described under "Recovery Actions." We believe that the threat from plague can be ameliorated by dusting, vaccines, and the maintenance of more reintroduction sites.

In addition to management of prairie dogs for better control of sylvatic plague, actions are needed to conserve prairie dogs in complexes of sufficient size and stability to support reintroduction of black-footed ferrets. We believe that in some cases control at the periphery of reintroduction sites may be appropriate to facilitate cooperation of adjacent landowners. However, the type of poison applied to control prairie dogs and the extent of its use can impact the ability of a prairie dog complex to sustain ferrets. As

previously noted, anticoagulant poisons can result in secondary impacts to any wildlife that consumes a poisoned prairie dog. In 2012, the Service completed formal consultation with the EPA to evaluate potential impacts to threatened and endangered species, including the black-footed ferret, from the use of the anticoagulant Rozol to poison prairie dogs. The final biological opinion prohibits application of Rozol within current and future ferret recovery sites.

RECOVERY STRATEGY

Key Facts and Assumptions

Recovery under the ESA is the process by which listed species and their ecosystems are restored and their future is safeguarded to the point that protections under the ESA are no longer needed. The primary biological constraint for the endangered black-footed ferret is its nearly complete dependency on prairie dogs, for both food and shelter. Consequently, if we safeguard prairie dogs, we will greatly facilitate ferret recovery.

Overarching Strategy

In preparing this revised recovery plan, we solicited extensive partner review from the BFFRIT. One of its guiding principles has been a focus on extensive and intensive involvement by many partners, including tribes, States, Federal land management agencies, and non-governmental organizations across the historical range of the black-footed ferret. Recovery will be achieved by establishing a number of ferret populations where appropriate habitat exists and by ameliorating threats impacting the species so as to allow the ferret's persistence. Although ferret habitat has been dramatically reduced from historical times, a sufficient amount of habitat persists, if its quality and configuration are appropriately managed. This management, for the most part, is likely to be conducted by traditional State, tribal, and Federal fish and wildlife and land management agencies. Additionally, private parties, including landowners and conservation organizations, must continue to support ferret recovery. Many partners

contributing to ferret recovery in many places will help minimize the risk of loss of all wild populations simultaneously from stochastic events such as disease.

Primary Objectives

There are two primary objectives for achieving recovery of the black-footed ferret, which to some extent overlap: (1) improve management of prairie dogs and (2) protect against sylvatic plague.

Other Considerations

The most expedient means of improving management of prairie dogs and protecting against sylvatic plague will require the continued active efforts of the BFFRIT. Cooperation between the many affected Federal, State, tribal, and private parties is essential to the eventual recovery of the black-footed ferret.

RECOVERY ACTIONS

Since the 1988 Recovery Plan, there have been several major reviews of black-footed ferret recovery efforts including reviews by the Conservation Breeding Specialist Group (CBSG) of the Species Survival Commission of the World Conservation Union (CBSG 1992), Hutchins et al. (1996), CBSG (2004), Ray (2006), and U.S. Fish and Wildlife Service (2008). There have been other reviews somewhat narrower in scope that also addressed recovery including COSEWIC (2000), Esch et al. (2005), and Garelle et al. (2006). The conclusions and recommendations of this recovery plan are generally consistent with the findings of these reviews. Ray (2006) addressed major reviews through 2006 in her descriptions of recovery actions and tasks. We relied on her evaluations to address conclusions from other review efforts. However, in some cases the Service has adopted positions which consider all viewpoints, but do not specifically endorse the precise conclusions of any particular evaluation.

The recovery goals should ameliorate threats to the black-footed ferret (see Table 5) if successful recovery is to be achieved. The following actions address these threats.

1. Conserve and manage a captive ferret population of reasonable size and structure to support genetic management and reintroduction efforts.
2. Identify prairie dog habitats with the highest potential for supporting future free-ranging populations of ferrets.
3. Establish free-ranging populations of ferrets to meet downlisting and delisting criteria.
4. Ensure sufficient habitat to support a wide distribution of self-sustaining ferret populations.
5. Reduce disease-related threats in wild populations of ferrets and associated species.
6. Support partner involvement and conduct adaptive management through cooperative interchange.

The specific listing factors addressed by each action are described in the text below. The actions and accompanying tasks outlined in this strategy represent a general consensus derived from several years of meetings, reviews, and comments by members of BBFRIT. The conclusions from these ongoing efforts are summarized below.

Action 1. Conserve and manage a captive ferret population of reasonable size and structure to support genetic management and reintroduction efforts. Demographic and genetic management of the captive population is carried out under the guidance of the AZA Black-footed Ferret SSP® and includes maintaining a core breeding population of 280 animals of optimum sex ratio (105 males:175 females) and age (1-3 years) for a stable captive population, with a high level of genetic diversity, and a sustainable source of ferrets for reintroduction. Six captive breeding facilities produce approximately 250 juvenile ferrets annually. Currently, approximately 80 juveniles (30 male:50 female) are retained annually in SSP® facilities for future captive breeding purposes. The remaining juveniles are considered excess to the SSP®, and are allocated annually for reintroduction, or occasionally for research.

This action and its associated tasks will promote management of a sufficient number of animals with maximum genetic diversity to maintain a captive breeding population that will provide animals for reintroduction into suitable habitat throughout the historical range of the black-footed ferret. This action addresses all of the factors considered a threat to the species by providing ferrets for reintroduction into habitat where it was previously extirpated due to the destruction, modification, or curtailment of habitat, disease, inadequate regulatory mechanisms for prairie dogs, or poisoning of prairie dogs.

1.1. Maintain a SSP® Husbandry Manual that provides up-to-date protocols for the care, propagation, preconditioning, and transportation of captive ferrets. A SSP® Husbandry Manual will be used at all captive breeding facilities participating in the black-footed ferret SSP®. Some variability in protocols is appropriate among facilities due to specific facility circumstances. Protocol adjustments are regularly discussed during conference calls and summarized during annual meetings. The protocols are dynamic and provide for development of adaptive husbandry procedures.

1.2. Ensure adequate facilities for breeding ferrets in captivity pursuant to Husbandry Manual guidelines. Approximately 55 percent of all captive black-footed ferrets are located at the Service's National Black-footed Ferret Conservation Center near Wellington, Colorado. The remaining captive breeding populations are housed at the Smithsonian Biology Conservation Institute in Front Royal, Virginia; Louisville Zoological Garden in Louisville, Kentucky; Cheyenne Mountain Zoological Park in Colorado Springs, Colorado; Phoenix Zoo in Phoenix, Arizona; and the Toronto Zoo in Toronto, Ontario.

1.3. Provide a description of research needs related to genetic and demographic management of captive populations. Research needs are discussed and prioritized at annual meetings of the BFFRIT and its subcommittees.

1.4 Minimize the potential for disease outbreaks and other potential catastrophes in captive ferret populations. Disease continues to pose a threat to ferret recovery. Protocols are in place at all breeding facilities to limit the prevalence of diseases such as coccidiosis and cryptosporidiosis that can sometimes impact captive populations. Canine distemper has also notably impacted ferret populations in the past. However, a commercial distemper vaccine has become available and is now widely employed in both captive and wild ferret population management. Sylvatic plague is considered a major threat to ferret recovery due to its devastating effects on both ferrets and their obligate prey (prairie dogs). Therefore, efforts to improve plague prevention and management such as vaccination of captive ferrets and research into field vaccination are ongoing.

1.4.1. Maintain multiple captive populations located in at least three separate geographic locations to avoid catastrophic loss at a single facility. As noted in Action 1.2, there are six SSP® breeding facilities.

1.4.2. Follow protocols for disease prevention described in the Husbandry Manual. All breeding facilities shall employ disease prevention protocols as specified in the SSP® Husbandry Manual.

1.4.3. Develop disease outbreak contingency plans. Guidelines for quick action in the event of a disease outbreak in a facility (evacuation, isolation, veterinary care, convalescence, disposal of tissues, and disease containment) are considered in the SSP® Husbandry Manual.

1.4.4. Maintain a list of disease research contacts. A list of plague researchers has been compiled with contact information. This list will be regularly updated. Contact lists for other diseases and concerns should also be updated regularly by the BFFRIT.

1.4.5. Support appropriate disease research. Plague vaccines are available or under development by the National Wildlife Health Lab for both reintroduced ferrets and prairie dogs. Plague vaccines are routinely used for some captive ferret populations. Potential outbreaks of other infectious diseases should be considered as appropriate to determine effects on ferret recovery.

1.5. Implement breeding strategies to maintain genetic diversity in the captive population while providing suitable genetic and demographic stock for reintroduction programs. Management goals for captive breeding have progressed from largely demographic (i.e., initial population expansion) to the optimal management of genetic, demographic, and institutional resources. The current core population bred annually under the SSP® should maintain 80 percent of the genetic diversity present in the founders of the captive population for at least 25 years. This genetic management strategy balances the need to maintain genetic diversity with the demographic demands of producing animals for reintroduction.

1.5.1. Conduct regular reviews of breeding strategies. Breeding protocols will be updated as necessary. Breeding vigor may be lower in captivity than in free-ranging ferret populations. Research to obtain information for improving breeding success is supported, such as consideration of costs and benefits of including wild ferrets in the captive breeding program, evaluation of sperm viability in captive vs. wild populations, and consideration of possible links between chronic stress and reproductive functioning in captive ferrets.

1.5.2. Conduct and evaluate efforts to improve reproductive output to support genetic management and reintroduction efforts. Increase the number of animals available for release from pen facilities through husbandry and management practices that promote reproduction and kit survival. These practices should consider improved breeding strategies

and enhanced artificial means of conserving the genetic contribution of individuals who do not reproduce by natural means.

1.5.3. Continue management efforts to balance the genetic representation of founders in the captive population. The genetic contribution of the 7 founders could be substantially reduced or lost if they are inadequately represented in future generations or are represented through only one sex. The genetic contribution of the 7 founders remains disproportionate. Efforts by the captive breeding program to balance representation of all founders will continue and periodically be evaluated. These efforts include minimizing genetic relatedness among mates, transferring ferrets between SSP® facilities to maintain heterozygosity, and continuing development of techniques for cryopreservation of ferret semen for use in artificial insemination.

1.5.4. Evaluate the reproductive fitness, genetics, and demography of the captive population. Reproductive fitness is evaluated annually and compared under different breeding scenarios. The SSP® includes adaptive genetic and demographic management strategies to maintain the reproductive fitness and productivity of the captive population. Records will be kept on all captive ferrets, as described in the Husbandry Manual.

1.5.5. Provide optimal stock for reintroduction purposes. The most genetically valuable ferrets will be retained for captive breeding. Animals intended for reintroduction should receive adequate preconditioning.

1.6. Establish policies for the use and handling of dead, non-reproductive, or otherwise excess ferrets. Use current Service guidelines to dispose of ferrets that are considered surplus to the SSP®. Surplus animals not suitable for reintroduction should be used for research or live educational exhibit. All carcasses should be made available for scientific research or educational display. Ferret tissue samples should also be made available for scientific research.

Action 2. Identify prairie dog habitats with the highest potential for supporting future free-ranging populations of ferrets. No remnant wild black-footed ferrets have been found outside of reintroduction areas since the extinction of the Meeteetse, Wyoming population in 1987. Searches of potential habitats are no longer considered a high priority given the extensive searches completed with negative results, the substantial resources required to continue such efforts, and the degraded and fluctuating status of remaining prairie dog habitat in North America. Therefore, targeted searches for remnant wild ferret populations have been discontinued. Consequently, some tasks related to searches that were described in earlier recovery plans have been discontinued. However, search methodologies originally designed to locate wild ferrets continue to be critical for selecting future reintroduction sites (described below) and monitoring reintroduced populations (described under task 3.6).

This action and its associated tasks address the threat from inadequate existing regulatory mechanisms by encouraging participation from State, tribal, and Federal governments.

2.1. Use recent prairie dog surveys to identify and prioritize habitats with potential as future ferret reintroduction sites. State wildlife agencies within the range of prairie dogs have agreed to complete prairie dog surveys at 3–5 year intervals. Results from these surveys can be useful in the identification of potential ferret reintroduction sites.

2.2. If a remnant ferret population is located, develop a plan to integrate any population into the recovery program. The likelihood of finding wild ferrets outside of reintroduction areas diminishes with time. However, if this occurred, the Service would immediately consult with members of the BFFRIT and take actions appropriate to the situation. Once discovered, new populations should be integrated into the monitoring and captive breeding programs to the extent possible.

Action 3. Establish free-ranging populations of ferrets to meet downlisting and delisting criteria. There have been 20 black-footed ferret reintroduction projects (see Figure 1, Tables 2 and 3). One of the downlisting objectives from the Recovery Plan is to establish a pre-breeding population of 1,500 free-ranging adults in 10 or more populations with no fewer than 30 breeding adults in any population by 2020. Current ferret reintroduction efforts are approximately 40 percent successful with regard to the number of established populations. A minimum of approximately 270 breeding adults occur in these four populations, which is 18 percent of the 1,500 free-ranging adult population goal. The geographic distribution of attempted ferret reintroduction effort is fairly well distributed across the species' historical range (with the notable exception of much of the eastern one-third of the range). The four successful sites are in Arizona, Wyoming, and South Dakota (contains two successful sites).

This action and its associated tasks will identify the sites best suited to maximizing black-footed ferret recovery, allocate animals for reintroduction accordingly, and require follow-up monitoring to facilitate adaptive management. This action addresses all of the factors considered a threat to the species by reintroducing ferrets into habitat where it was previously extirpated due to the destruction, modification, or curtailment of habitat, disease, inadequate regulatory mechanisms for prairie dogs, or poisoning of prairie dogs.

3.1. Maintain a list of research needs related to reintroduction and population monitoring. The most important research questions that remain, and their priorities, will be considered by the Service and technical subcommittees of the BFFRIT.

3.2. Maintain a standardized ranking procedure for allocating ferrets to candidate reintroduction sites. The Service uses a standardized ranking procedure for allocating ferrets to reintroduction sites. Reintroduction sites are ranked according to many site-specific criteria including project background and justification, involved agencies/parties, habitat conditions, ferret population information, predator management, disease monitoring and management,

contingency plans, potential for preconditioning of released ferrets, veterinary and husbandry support, and research contributions. Site-specific values for each criterion are entered into an allocation matrix that allows sites to be ranked based on overall contribution to ferret recovery efforts. Reintroduction proposals and the Service's rankings of the proposals are reviewed by BFFRIT members. The Service determines ferret allocations by mid-summer and incorporates site visit information to resolve any outstanding concerns regarding specific reintroduction projects.

3.3. Develop and approve new reintroduction sites. The limited number of ferrets available for release each year requires that they be efficiently allocated. The number of new sites will be carefully considered.

3.3.1. Work with site managers, landowners, and stakeholders to develop long-term site management assurances for potential new reintroduction sites. Management agreements are established for each reintroduction area. Land ownership patterns differ between sites. Agreements should stipulate the responsibilities of all parties for long-term commitments to ferret management. Management of candidate sites is necessary before recovery activities can proceed. The management of reintroduced populations is primarily the responsibility of the agency or tribe originally involved in establishment of the population.

3.3.2. Collect information for site screening and baseline data purposes. Habitat data are collected prior to evaluation of each reintroduction site. Data collection typically continues annually or on an intermittent basis over early project years and should include prairie dog occupied habitat and density, plague history, presence of canine distemper, and predator occurrence.

3.3.3. Include site-specific prairie dog management plans in evaluation of new recovery sites. Prairie dog colonies at existing and proposed

reintroduction sites should be characterized, managed at appropriate levels, monitored and managed for plague, and managed for grazing as appropriate.

3.3.4. Conduct site-specific monitoring of ferret populations and environmental variables. Post-release monitoring should identify causes and degree of mortality, characterize dispersal, and refine recovery strategies. Although the level of monitoring employed during initial reintroduction efforts may not be sustained on a permanent basis, some systematic monitoring of demographic, genetic, and environmental variables should continue throughout the duration of each recovery effort. Information from monitoring efforts is shared with the Black-footed Ferret Recovery Coordinator and members of the CS.

3.3.5. Standardize annual site monitoring and reporting to the extent practical. Standardization of survey methods increases opportunities for comparisons between sites and years. Standards are needed to: (1) define general requirements for future reintroduction sites, (2) provide consistent feedback from participants, and (3) refine methods (e.g., radio-telemetry, dog searches, aerial survey, and snow-tracking).

3.4. Complete site and ferret preparations for releases. Specific guidance appears below.

3.4.1. Comply with obligations of the ESA, NEPA, and other laws. State and Federal statutes, tribal statutes and resolutions, and other legal requirements will be evaluated and completed prior to implementing reintroduction projects.

3.4.2. Assess site conditions prior to ferret releases. Plague screening will be conducted prior to release. Allocation requests and site visits will be used to determine specific release locations.

3.4.3. Schedule and prepare ferrets for releases. Each ferret released will have a record of studbook identification number, transponder tag numbers, birth date, facility of origin, preconditioning treatment, and recommended schedule of release. To the extent possible, ferrets should be released in numbers and sex ratios that will optimize long-term survival and reproduction.

3.5. Release ferrets into approved reintroduction sites as capacity and production permit. Specific guidance appears below.

3.5.1. Release sufficient numbers of ferrets to meet downlisting criteria of establishing 1,500 free-ranging adults distributed among at least 10 populations, with no less than 30 breeding adults in each population. Based on the best information available, it appears that four reintroduction sites (Aubrey Valley, Cheyenne River Indian Reservation, Conata Basin, and Shirley Basin) currently meet these criteria. Reintroduction efforts will continue at other existing sites as appropriate and at new sites with downlisting criteria in mind.

3.5.2. Continue releases to meet the delisting criteria. The delisting criteria include the establishment of a pre-breeding census population of 3,000 free-ranging breeding adult ferrets in 30 or more populations with no fewer than 30 breeding adults in any population. Reintroduction efforts will continue following downlisting, with the goal of delisting the ferret.

3.5.3. Represent all founders as equally as possible in each released population. All founders are currently represented among animals released at reintroduction sites. However, founder genes may be lost from wild populations due to chance, selection, and natural breeding patterns. Genetic monitoring of reintroduced populations should be considered to

determine the rates at which diversity is lost, and to guide genetic management strategies.

3.5.4. Support the use of wild-born ferrets for reintroduction at other sites. All ferret reintroduction programs are authorized under the principle that if a population becomes established, contributions of excess ferrets will be used to manage other recovery sites. As reintroduced ferret populations grow, the translocation of wild-born ferret kits to new reintroduction sites is expected to become increasingly important as a tool for ferret recovery. Disease-prevention protocols for translocation of wild-born stock will be updated as needed based on protocols for transfer of captive-born stock.

3.6. Implement management and monitoring prescriptions for each reintroduction site. The Service and the BFFRIT support long-term monitoring of all ferret reintroduction sites to evaluate success and provide information of value to other reintroduction sites.

3.6.1. Monitor ferrets. Local recovery partners will maintain a high level of monitoring for five years following the last release (see task 3.3.4.). This should include analysis of annual reproduction and survival. Other parameters such as short-term survival, a pre-breeding census, recruitment, and home range size can be evaluated as resources permit. Thereafter, demographic and genetic surveys should be completed periodically to track population status.

3.6.2. Monitor and evaluate changes in prairie dog density and distribution. Monitoring habitat conditions is an ongoing requirement of reintroduction programs and is critical to the success of reintroduction efforts. Aspects of habitat conditions other than plague also should be considered.

3.6.3. Monitor disease dynamics. Readily available carcasses will be collected and submitted to the National Black-footed Ferret Conservation Center for

detailed necropsy when monitoring at reintroduction sites reveals deceased ferrets. Necropsy reports also should be held at this facility for subsequent data analysis and use by program participants.

3.6.4. Monitor and evaluate changes in the site environment. Environmental change associated with reintroduction may give valuable clues to recovery success and will be considered.

3.7. Use release and monitoring opportunities to improve ferret management. Preconditioning prior to release substantially increases ferret survival and is now a standard protocol. Efforts to breed ferrets in naturalistic pen environments have been undertaken in Arizona, Colorado, Montana, and New Mexico, but none are currently in operation. Several different release procedures have been employed, such as encircling release sites with temporary anti-predator (electric) fencing, which may increase ferret survival during the critical period immediately following release. At present, all releases are "hard releases" wherein ferrets are simply released into suitable habitat without protection from predators. Annual management plans should be developed by all reintroduction sites to determine whether additional ferrets are to be released. Allocation requests should be submitted as appropriate.

3.7.1. Continue the use of ferret preconditioning techniques. Research has demonstrated that preconditioning is beneficial to post-release survival.

3.7.2. Optimize release methods and timing. Release strategies continue to be refined and investigated. Release methods should be considered for publication in wildlife journals. New literature will be reviewed and incorporated into reintroduction plans and reports.

3.7.3. Continue to improve ferret monitoring techniques. Post-release monitoring is essential to judge the overall success of individual

reintroduction projects, and is a required element of all reintroduction projects.

3.7.4. Continue to improve survey techniques. Reintroduction partners should continue efforts to improve spotlight survey efficacy and investigate alternative survey techniques.

3.7.5. Continue to evaluate methodologies for counting or estimating ferrets at recovery sites. A method for accurately estimating ferret numbers is critical to assessing progress at each recovery site, which will in turn allow the reassessment of objectives, priorities and allocation of resources for each site. As recovery sites expand or resource availability changes, it is likely that methods or rigor for estimating ferrets at individual sites will change. The Service and BFFRIT will continue to refine survey methodologies and estimation parameters to assess progress towards recovery goals.

3.7.6. Continue to improve telemetry equipment and techniques. Radio-telemetry is the only technique that has provided meaningful data on causes of mortality for free-ranging ferrets. Nevertheless, telemetry is problematic due to costs, short transmitter life, and increased risks of injury to individuals. Improved telemetry should be considered to address specific questions at certain reintroduction areas.

3.7.7. Continue to improve techniques for habitat monitoring and habitat evaluation. The principal technique for determining how many ferrets can be supported by a given prairie dog complex is to survey active prairie dog burrows by standardized transects, estimate how many prairie dogs are present, and how many ferret families could exist. An understanding of the relationship of prairie dog density and the associated spatial use of prairie dog complexes by ferrets will continue to be evaluated.

3.7.8. Support disease monitoring and management capabilities. Methods of controlling plague in free-ranging populations through the use of vaccines, flea powders, growth inhibitors, or sterilants will continue to be explored. Regular monitoring for canine distemper in sympatric predators at reintroduction sites should continue.

3.7.9. Improve understanding of ferret demography and genetics. The benefits of translocation of wild animals into other recovery areas are important program considerations. Program partners need to ensure adequate monitoring of donor, recipient, and control populations and coordinate such activities with the Service through the Black-footed Ferret Recovery Coordinator.

3.7.10. Consider population viability, including potential effects of inbreeding, interspecific interactions, and disease. Data are accumulating from reintroduction sites that could be used to identify different habitat effects.

3.8. Enforce all laws protecting established populations. Most ferrets have been reintroduced in non-essential experimental population areas as set forth in section 10(j) of the ESA. More recently, ferrets have been released under provisions of recovery permits (section 10(a)(1)(A) of ESA). Other ESA tools such as Safe Harbor Agreements are under development and should be considered as potential ferret reintroduction options. All applicable State, Federal, and tribal laws regarding the protection of ferrets will be followed.

3.9. Review the reintroduction program annually. An evaluation of reintroduction success is required for each site on an ongoing basis. The ultimate measure of reintroduction success is the documented growth of a population through natural recruitment to a level that becomes self-sustaining and requires no further augmentation or fully occupies the available habitat. Success is evaluated via post-release monitoring of the reintroduced population and varies among

reintroduction sites. Post-release monitoring is necessary to identify causes and rates of mortality, characterize dispersal, and refine current recovery strategies. Information from monitoring efforts should be shared.

3.9.1. Produce annual site reports. Recovery partners will summarize monitoring data and research results, evaluate the efficacy and efficiency of their efforts, and make appropriate modifications to their procedures based on new information.

3.9.2. Include demographic and/or genetic manipulation needs for each population. Individual recovery partners should be involved with day-to-day management for established ferret populations. A broad management strategy should also be employed to ensure that ferrets are managed in a metapopulation context. Wild-born ferrets may be periodically exchanged between reintroduced populations to achieve demographic and/or genetic management goals. Demographic manipulations may include stocking, translocation, or removal of individuals from donor populations.

3.9.3. Evaluate and update site monitoring and research efforts. A routine level of periodic ferret population monitoring is required in a long-range management plan for each reintroduction site. The Service will periodically reviews site plans and monitoring efforts.

3.9.4. Update reintroduction strategy and protocols as needed. The Service will update the reintroduction program and protocols as necessary based upon successful results from individual reintroduction sites.

Action 4. Ensure sufficient habitat to support a wide distribution of self-sustaining ferret populations. Black-footed ferret habitat is synonymous with areas occupied by several species of prairie dogs. Ferret habitat has been destroyed, modified, and curtailed through conversion for agricultural use, eradication of prairie dog populations through poisoning, and introduction of sylvatic plague. These combined impacts have resulted in

the loss of approximately 96 percent of prairie dog occupied habitat and consequently the loss of approximately 96 percent of potential ferret habitat.

Since the early 1980s, program partners have invested considerable resources in the recovery of this species. To date, ferret reintroduction projects have predominantly occurred on Federal or tribal lands. The development of recovery partnerships with more private landowners is essential to recovery of the species. The Service and BFFRIT partners should continue to support and manage established ferret reintroduction sites, whether or not reintroduction efforts are presently active. In addition, new partnerships are encouraged, to expand reintroduction opportunities across the historical range of the species into additional sites in other States and on other tribal lands.

Some loss of breeding vigor may be occurring in the captive breeding program, in part due to the inherent limitations of captive breeding. Individuals breeding in the wild likely have a higher breeding vigor. Therefore, we believe it essential to the survival of the species to establish additional sites as quickly as possible to allow wild breeding. This will require use of sites in the near term that may not have yet gained sufficient size or may not yet have the potential for sufficient numbers of prairie dogs to support a viable self-sustaining ferret population over the long term.

This action and its associated tasks will identify and conserve current and potential habitat for the black-footed ferret. This action addresses all of the factors considered a threat to the species by managing habitat to minimize potential adverse impacts from plague, poisoning, and inadequate management; and by encouraging participation from Federal, State, tribal, and private landowners.

4.1 Estimate the amount and configuration of habitat required to support ferret populations that meet downlisting and delisting criteria. We estimate that a minimum of approximately 191,000 ac (77,000 ha) of black-tailed prairie dog occupied habitat and 56,000 ac (23,000 ha) of white-tailed and Gunnison's prairie dog occupied habitat will be required to meet downlisting criteria. Similarly, a minimum of 383,000 ac (154,000 ha) of black-tailed prairie dog occupied habitat

and 112,000 ac (46,000 ha) of white-tailed and Gunnison's prairie dog occupied habitat will be required to meet delisting criteria (see discussion on pp. 65–66). These estimates will be adjusted as necessary.

4.1.1. Improve guidelines for determining ferret habitat requirements. It is crucial to establish and maintain as many ferret populations as possible in native habitats. For example, in cases where the amount of available habitat is smaller, or subject to periodic effects of plague, more on-going human intervention and management may be required to maintain populations. The Service should consider the density of prairie dogs needed to support ferrets, the effects of territoriality on ferret density, and the effect of patchiness of prairie dog habitat on ferret density.

4.1.2. Assess progress toward meeting downlisting and delisting criteria. In order to estimate the amount of additional purposefully managed habitat required for recovery, partners will evaluate progress toward recovery objectives. This action will require estimates of purposefully managed habitat and an assessment of demographic data of reintroduced populations.

4.1.3. Estimate the amount and configuration of habitat necessary to support downlisting and delisting objectives. Analyzing ferret population growth based on data from each reintroduction site can provide a means for determining progress toward reintroduction goals and coordinating between ferret population objectives and supporting habitat objectives. Preliminary estimates of the amount of habitat required to downlist and delist the ferret are provided in Table 6.

4.2. Identify and manage ferret habitats to support recovery goals. Managing habitat for ferret recovery does not necessarily preclude other habitat uses. Efforts to fund incentive programs for expanding existing habitat on private and tribal lands will be identified and implemented.

4.2.1. Consult Federal, State, tribal, and private entities with jurisdiction over historical ferret habitats to develop jurisdiction-specific habitat goals and habitat management plans. In order to achieve recovery objectives for distributing sufficient numbers of ferret populations across the historical range of the species, large recovery areas that can be managed as long-term ferret reintroduction sites will be identified. Many sites currently supporting only small prairie dog populations could ultimately be expanded to create suitable ferret reintroduction areas. Other areas that historically supported prairie dog populations but are currently unoccupied could be restored via prairie dog translocations. State and Federal land and wildlife management agencies and tribes have ultimate authority and responsibility for implementing habitat conservation measures needed to recover the ferret. Close coordination will be maintained between the Service, the BFFRIT, and prairie dog management groups. The BFFRIT and land and wildlife management agencies will investigate opportunities to develop cooperative reintroduction efforts with private landowners.

4.2.2. Recover and maintain sufficient ferret habitat to support recovery goals. Ferret recovery depends on the conservation and management of prairie dog populations. Many State and Federal agencies and tribes have developed management plans to maintain viable prairie dog populations. Efforts to manage prairie dogs will continue to be evaluated. States and tribes should describe the impact of prairie dog population control activities on ferret management objectives. EPA label restrictions on rodenticide application should be enforced.

4.2.3. Engage relevant government agencies currently not participating in ferret recovery. A few State and Federal agencies have participated minimally in ferret recovery efforts. Fiscal or administrative constraints

may have kept some tribes, with suitable habitat, from participating more fully. The Service and other active members of BFFRIT will continue to reach out to these agencies and tribes. They will be invited to annual BFFRIT committee meetings and their input and review will be requested on potential recovery efforts within their jurisdictions.

Action 5. Reduce disease-related threats in wild populations of ferrets and associated species. Disease continues to be a primary factor inhibiting recovery of the black-footed ferret in the wild. The threat of catastrophic loss of prairie dogs and ferrets from sylvatic plague is significant. Plague may also periodically impact reestablished populations. Increasing evidence suggests that some levels of enzootic plague may result in negative growth rates for prairie dog and ferret populations. Ferret populations that are otherwise self-sustaining may require intervention where plague maintains a chronic effect. Other diseases such as canine distemper, coccidiosis, and cryptosporidiosis are less likely to threaten ferret persistence. There are several methods currently employed to monitor plague and other diseases.

This action and its associated tasks will improve plague management and encourage appropriate disease research. This action addresses the threat of modification of habitat due to plague and the direct threat of disease to ferrets and prairie dogs.

5.1. Maintain a clearinghouse for disease research and information related to ferrets and associated species. Currently, there are many agencies, institutions and individuals researching various aspects of plague. A clearinghouse/repository of plague-related data, possibly internet based, should be developed to promote continued coordination and define further research needs.

5.1.1. Develop a list of disease research needs. The coordination of ongoing studies and data sharing to further research needs will be considered by the BFFRIT.

5.1.2. Develop a list of bibliographies of relevant publications and projects relative to disease. As noted in task 1.4.4., a list of plague researchers has been compiled with contact information.

5.1.3. Synthesize relevant information and research results. Periodic literature reviews and syntheses regarding the ecology of sylvatic plague will continue.

5.1.4. Report epizootics to the Centers for Disease Control, the National Wildlife Health Laboratory, and other appropriate disease research facilities. Coordination will be maintained with research institutions to follow-up on any case histories of disease outbreaks in prairie dog populations and ferret recovery areas as noted in task 1.4.5. Field biologists should characterize the extent of impact and recovery of areas affected by any apparent diseases. Additional background investigations will be considered at sites experiencing significant losses.

5.2. Minimize the threat of sylvatic plague in ferrets and associated species. Plague remains a significant factor in the direct mortality of black-footed ferrets and the loss of habitat. Many plague issues need further research including flea ecology, mammalian reservoirs, management methods (e.g., vaccines), effects on ferrets (both direct and indirect), methods to control fleas (e.g. insecticides, growth inhibitors, biological factors), and effects of plague on different species of prairie dogs.

5.2.1. Develop and implement as appropriate prophylactic methods for controlling sylvatic plague. Methods for prophylactic control of plague now focus on flea control and protective vaccines. Flea control via use of Deltamethrin powder inserted into prairie dog burrows appears to provide an effective deterrent for transmission of both enzootic and epizootic plague, but the application of insecticidal dust is costly and highly labor-intensive. Recent testing indicates a prairie dog bait containing

Imidacloprid (insecticide) provided some flea reduction in prairie dogs. Research is ongoing to determine field management applicability of this product. An experimental plague vaccine based on the F1 and V antigens provides effective protection for ferrets. However, its delivery under field conditions is currently limited. Development of a bait-deliverable vaccine for prairie dogs is underway, and field trials have been conducted. Development of this vaccine has implications for future management of prairie dog habitats and recovery of the ferret. Obtaining funds for plague research is an ongoing effort.

5.2.2. Develop and implement ecological methods for control of sylvatic plague in ferret recovery areas, including methods based on manipulation of ferret habitats or associated species communities. Research into the ecology of plague in prairie dog communities should be expanded to help identify reservoir hosts, identify low levels of plague, determine factors in the geographic expansion of plague, measure transmission modes and speed, determine differential susceptibility among hosts, investigate the varying roles of different flea species in plague ecology, and determine the potential impacts from climate change. This task will require collaboration of partners from reintroduction sites and research institutions.

5.3. Continue to address the threat of canine distemper in ferrets and associated species and take management actions as appropriate. Canine distemper research will continue as part of ongoing widespread vaccination efforts.

5.3.1. Continue to implement prophylactic methods for control of canine distemper. An effective canine distemper vaccine has been developed and is in widespread use in the ferret recovery program, both in captivity and at some sites in the field. We will continue to employ vaccination as a management strategy unless the best available information indicates vaccination is no longer necessary or appropriate.

5.3.2. Continue to implement ecological methods for control of canine distemper in ferret recovery areas, including methods based on manipulation of ferret habitats or associated carnivore communities. Natural epizootics should be fully documented to provide a greater understanding of disease flow through ferret populations. Reintroduction sites should be regularly monitored for canine distemper through predator surveys.

5.4. Periodically synthesize available disease data and disease research results, and re-evaluate disease management strategies. Continue to adapt management procedures as new information becomes available.

5.4.1. Conduct periodic symposia and workshops to exchange information on diseases. Such workshops will encourage synergism between disease research being conducted on ferret habitat and research being conducted on other species worldwide. This is especially true of plague, which has received much attention in other countries.

5.4.2. Maintain public support for ferret reintroduction efforts at sites with disease issues. Public support can be lost due to confusion about why ferrets are being released into areas where they are at risk of being infected with diseases. Public education about the nature of the disease issues facing ferrets and other species in the prairie ecosystem, as well as humans, will help maintain support in the face of disease related mortalities.

Action 6. Support partner involvement and conduct adaptive management through cooperative interchange. This action addresses the need for continued development of recovery partnerships and strategies. Progress toward black-footed ferret recovery requires sustained program momentum. Among listed species, the ferret has one of the longest histories of endangerment and cooperative recovery efforts. The conservation of

sufficient habitat will require increased efforts by many Federal, State, tribal, and private entities. Continued public and private involvement should be encouraged through frequent communication of recovery program status. The historical ferret range included lands now within the jurisdiction of Mexico, Canada, 12 States, several tribes, several Federal agencies, many local governments, and myriad private landowners. Currently, ferrets have been reintroduced on Federal, State, tribal, and private lands within eight States, on private and communal lands within Chihuahua, Mexico, and on Federal and private lands in Canada.

This action and its associated tasks will encourage participation by Federal, State, tribal, private, and foreign entities. This action addresses the threat to the black-footed ferret from a lack of proactive management.

6.1. Engage partners in review, analysis, and updates to program direction on a regular basis. Participants in the recovery program will continue an open process for review of recovery activities.

6.1.1. Support review and analysis of program progress. Research objectives and priorities will be assessed and competitive proposals from outside groups will be encouraged and evaluated. Regular evaluation of the progress in captive breeding, disease monitoring and management, habitat recovery and management, reintroduced ferret populations, and outreach efforts will be conducted.

6.1.2. Coordinate program components and update program direction as appropriate based on reviews addressed in task 6.1.1. This revised recovery plan will provide a framework for adaptive management, based on rapid and reasoned response to population needs, rather than specific protocols. Communication between the Service, the SSP® and the BFFRIT to coordinate kit production and supply animals for reintroduction efforts will continue.

6.1.3. Formally report on progress toward recovery objectives on a five-year basis. Progress on the actions specified in this plan will be assessed on a regular basis. External review will occur at longer intervals. Responsibility of assigning tasks is left to the funding entities and is coordinated by the Service. The most recent 5-year review was completed by the Service in 2008.

6.1.4. Use the Black-footed Ferret Recovery Implementation Team to help identify problems and solutions. The Service consults with the BFFRIT to address specific problems and solutions. The structure and operations of the BFFRIT will be periodically reviewed and appropriate changes implemented. Annual meetings for the EC and all subcommittees are arranged by the Service.

6.1.5. Encourage the formation of jurisdictional and topical working groups to identify problems and solutions. State working groups are site-specific implementation teams that provide recommendations on the management of local ferret recovery projects. The establishment of the BFFRIT has promoted improved technical support and the exchange of information by both involved partners and interested/affected parties, including tribes. Partners and other interested parties will be updated as appropriate on activities undertaken by various subcommittees.

6.2. Communicate program status, direction, and needs to potential recovery partners. Communication is an important function of the Service. All partners should be kept informed of the latest developments and important issues facing the program. Public, political, and private support will be maintained to the extent possible through appropriate education and public relations efforts, including demonstration of progress toward ferret recovery. All ferret recovery activities will be organized on an annual basis. Recovery Program priorities and activities may change from year to year based on analysis of new data. Therefore, the organization and coordination of recovery activities may also change from

year to year. Administrators should be aware of these dynamics and be prepared to coordinate and administer the program accordingly.

6.2.1. Maintain an up-to-date website describing the ferret recovery program and partnership opportunities. Ferret-related websites are maintained by the Service as well as many other affected agencies and organizations. Current information regarding the ferret is available from websites maintained by the Service (*www.fws.gov/endangered/*) and by the BFFRIT (*www.blackfootedferret.org*).

6.2.2. Promote recovery partnerships through the formation of jurisdictional and topical working groups. Working groups will be organized to address local recovery efforts and specific research tasks as appropriate.

6.2.3. Encourage the exchange of scientific information and technical advice. The Service encourages sound experimental approaches and broad partner input to help ensure an effective and cost-efficient recovery program. Scientific exchange is facilitated by broad distribution of pertinent planning documents, recovery program progress, technical research results, and accurate information on the effect of reintroduction projects on area land uses and other points of program controversy. Technical meetings are conducted annually by each of the BFFRIT subcommittees. Workshops on disease management, field techniques, anesthesia, breeding techniques, etc. are regularly conducted to meet program needs.

6.3. Support site-specific ferret reintroduction efforts and develop an outreach plan to stakeholders that support ferret recovery. The BFFRIT OIS should facilitate the exchange of ferret recovery information through web sites, media contacts, and other means.

6.3.1. Support the efforts of States, tribes, and other organizations to recover the ferret. Community education and outreach programs have been established in most States that are active in ferret reintroductions. Partnerships among agencies and organizations can increase the visibility of ferret recovery efforts and will be encouraged.

6.3.2. Encourage public support for ferret recovery through strategically focused outreach efforts. Outreach activities provide information on the status of the ferret, its history and habitat, and the unique efforts to save it. Emphasis should be placed on generating interest, understanding, and appreciation among active recovery participants. Specific constituencies will also be targeted according to their proximity to and possible involvement in the Recovery Program (i.e., western States, tribes, ranchers, policy makers, and educators). Constituencies who are adverse to the Recovery Program should also be identified. The benefits of maintaining this ecosystem and the species it supports should be conveyed.

6.3.3. Provide ferret recovery information to Non-Government Organizations currently supporting recovery and solicit the assistance of other NGOs who could aid species recovery. Conservation organizations have participated in ferret recovery activities since before the discovery of the last wild population at Meeteetse and are vital to the continued success of ferret recovery. Other organizations with similar wildlife and habitat conservation charters could potentially become involved to help accelerate public awareness and physical recovery efforts. The Service and the BFFRIT should frequently update national conservation organizations through personal contact and seek additional support or assistance where warranted.

6.3.4. Support participation and coordination among government agencies with jurisdiction over programs related to ferret recovery. The

Service will encourage appropriate Federal, State, and tribal government agencies to participate in ferret recovery. All Federal government agencies should be aware of ESA section 7 responsibilities, including the affirmative conservation mandate found in section 7(a)(1) of the Act directing all Federal agencies to use their authorities to conserve listed species.

6.3.5. Maintain updated information on the contributions of SSP® captive breeding facilities. Annual assessment of the expenditures and contributions of animals in terms of SSP® management and field recovery efforts will be conducted.

6.4. Consider funding needs for national and international ferret recovery. Funding needs for ferret recovery will be prioritized and updated as appropriate.

PART III. IMPLEMENTATION SCHEDULE

The Implementation Schedule outlines actions and estimated costs for recovery of the black-footed ferret, as set forth in this recovery plan. It is a guide for meeting the recovery goals outlined in this plan. This schedule indicates action priorities, action numbers, action descriptions, duration of actions, parties responsible for actions (either funding or carrying out), and estimated costs. Parties with authority, responsibility, or expressed interest to implement a specific recovery action are identified in the Implementation Schedule. When more than one party has been identified, the proposed lead party is indicated by an asterisk (*). The listing of a party in the Implementation Schedule does not require the identified party to implement the action(s) or to secure funding for implementing the action(s).

Recovery priorities (column 1) are defined as follows:

Priority 1: An action that should be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.

Priority 2: An action that should be taken to prevent a significant decline in species population or habitat quality, or to prevent some other significant negative impact short of extinction.

Priority 3: All other actions to consider during reclassification and eventual full recovery of the species.

Responsible parties (column 4) include:

USFWS	U.S. Fish and Wildlife Service
BFFRIT	Black-footed Ferret Recovery Implementation Team (comprised of State and Federal agencies, tribes, and conservation organizations)
SSP®	American Zoo Association Species Survival Plan Partners
States	State wildlife agencies with ongoing or proposed reintroduction sites
Tribes	Tribes with ongoing or proposed reintroduction sites
NPS	U.S. National Park Service
USFS	U.S. Forest Service
BLM	U.S. Bureau of Land Management
USGS	U.S. Geological Survey – Biological Resources Division
APHIS	Animal and Plant Health Inspection Service

Table 7. Implementation schedule for the Black-footed Ferret Recovery Plan

PRIORITY #	TASK #	ACTION DESCRIPTION	LEAD* & RESPONSIBLE PARTIES	COST ESTIMATES ($1,000'S)			
				FY 10-20	FY 21-30	FY 31-40	TOTAL
1	1.1	Maintain an SSP Husbandry Manual that provides up-to-date protocols for the care, propagation, preconditioning, and transportation of captive ferrets	SSP®*, BFFRIT, USFWS	250	200	200	650
1	1.2	Provide adequate facilities for breeding ferrets in captivity, pursuant to Husbandry Manual guidelines	USFWS*, SSP®*	1400	1000	1000	3400
1	1.4.1	Maintain multiple captive populations located in at least three separate geographic locations to avoid catastrophic loss at a single facility	SSP®*, USFWS	1370	980	980	3330
1	1.4.2	Follow protocols for disease prevention described in the Husbandry Manual	SSP®*, USFWS*	400	300	300	1000
1	1.4.3	Develop disease outbreak contingency plans	SSP®*, USFWS, BFFRIT	550	400	400	1350
1	1.4.5	Support appropriate disease research	BFFRIT*, USFWS, USGS, APHIS	800	600	600	2000

PRIORITY #	TASK #	ACTION DESCRIPTION	LEAD* & RESPONSIBLE PARTIES	COST ESTIMATES ($1,000'S)			
				FY 10-20	FY 21-30	FY 31-40	TOTAL
1	1.5.5	Provide optimal stock for reintroduction purposes	USFWS*, SSP®	700	500	500	1700
1	2.1	Use recent prairie dog surveys to identify and prioritize habitats with potential as future ferret reintroduction sites	USFWS*	90	60	60	210
1	3.3.1	Work with site managers, landowners, and stakeholders to develop long-term site management assurances for potential new reintroduction sites	USFWS*, NPS, USFS, BLM, States, Tribes	300	240	240	780
1	3.3.3	Include site-specific prairie dog management plans in evaluation of new recovery sites	USFWS*, NPS, USFS, BLM, other Federal agencies, States, Tribes	1050	840	840	2730
1	3.3.4	Conduct site-specific monitoring of ferret populations and environmental variables	USFWS*, BFFRIT	300	240	240	780

PRIORITY #	TASK #	ACTION DESCRIPTION	LEAD* & RESPONSIBLE PARTIES	COST ESTIMATES ($1,000'S)			
				FY 10-20	FY 21-30	FY 31-40	TOTAL
1	3.4.2	Assess site conditions prior to ferret releases	USFWS*, BFFRIT	600	480	480	1560
1	3.5.1	Release sufficient numbers of ferrets to meet downlisting criteria of establishing 1500 free-ranging adults distributed among at least 10 populations, with no less than 30 breeding adults in each population	USFWS*, BFFRIT	1140	0	0	1140
1	3.5.2	Continue releases to meet the delisting criteria	USFWS*, BFFRIT	0	1140	1680	2820
1	3.5.3	Represent all founders as equally as possible in each released population	USFWS*, BFFRIT, SSP®	300	240	240	780
1	3.5.4	Support the use of wild-born ferrets for reintroduction at other sites	USFWS*, BFFRIT, SSP®	900	720	720	2340

PRIORITY #	TASK #	ACTION DESCRIPTION	LEAD* & RESPONSIBLE PARTIES	COST ESTIMATES ($1,000'S)			
				FY 10-20	FY 21-30	FY 31-40	TOTAL
1	3.6.1	Monitor ferrets	USFWS*, BFFRIT, NPS, USFS, BLM, USGS, States, Tribes	1500	1200	1200	3900
1	3.6.2	Monitor and evaluate changes in prairie dog density and distribution	USFWS*, BFFRIT, NPS, USFS, BLM, States, Tribes	300	240	240	780
1	3.6.3	Monitor disease dynamics	USFWS*, USGS, NPS, USFS, APHIS, BLM, States, Tribes	300	240	240	780
1	3.6.4	Monitor and evaluate changes in the site environment	USFWS*, BFFRIT, NPS, USFS, BLM, States, Tribes	300	240	240	780

PRIORITY #	TASK #	ACTION DESCRIPTION	LEAD* & RESPONSIBLE PARTIES	COST ESTIMATES ($1,000'S)			
				FY 10-20	FY 21-30	FY 31-40	TOTAL
1	3.7.7	Support disease monitoring and management capabilities	USFWS*, USGS, APHIS	400	920	920	2240
1	3.7.8	Improve understanding of ferret demography and genetics	USFWS*, BFFRIT, USGS, SSP®	350	280	280	910
1	3.7.9	Consider population viability, including potential effects of inbreeding, interspecific interactions, and disease	USFWS*, USGS, SSP®, BFFRIT	350	280	280	910
1	3.8	Enforce all laws protecting established populations	USFWS*, NPS, USFS, BLM, other Federal agencies, States, Tribes	300	840	840	1980
1	3.9.1	Produce annual site reports	USFWS*, BFFRIT	300	240	240	780
1	3.9.2	Include demographic and/or genetic manipulation needs for each population	USFWS*, SSP® BFFRIT, USGS	300	840	840	1980

PRIORITY #	TASK #	ACTION DESCRIPTION	LEAD* & RESPONSIBLE PARTIES	COST ESTIMATES ($1,000'S)			
				FY 10-20	FY 21-30	FY 31-40	TOTAL
1	3.9.4	Update reintroduction strategy and protocols	USFWS*, BFFRIT	300	240	240	780
1	4.1.1	Improve guidelines for determining ferret habitat requirements	USFWS*, BFFRIT, USGS	2000	1600	1600	5200
1	4.1.3	Estimate the amount and configuration of habitat necessary to support downlisting and delisting objectives	USFWS*, BFFRIT, USGS	1000	800	800	2600
1	4.2.1	Consult Federal, State, tribal, and private entities with jurisdiction over historical ferret habitats to develop jurisdiction-specific habitat goals and habitat management plans	USFWS*, BFFRIT, NPS, USFS, BLM, other Federal agencies, States, Tribes	10000	10000	10000	30000

PRIORITY #	TASK #	ACTION DESCRIPTION	LEAD* & RESPONSIBLE PARTIES	COST ESTIMATES ($1,000'S)			
				FY 10-20	FY 21-30	FY 31-40	TOTAL
1	4.2.2	Recover and maintain sufficient ferret habitat to support recovery goals	USFWS*, BFFRIT, NPS, BLM, USFS, other Federal agencies, States, Tribes	5500	4400	4400	14300
1	4.2.3	Engage relevant government agencies currently not participating in ferret recovery	USFWS*, BFFRIT, NPS, USFS, BLM, other Federal agencies, States, Tribes	4000	4800	4800	13600
1	5.2.1	Develop and implement prophylactic methods for controlling sylvatic plague	USGS*, USFWS, APHIS,	3800	2700	2700	9200

PRIORITY #	TASK #	ACTION DESCRIPTION	LEAD* & RESPONSIBLE PARTIES	COST ESTIMATES ($1,000'S)			
				FY 10-20	FY 21-30	FY 31-40	TOTAL
1	5.2.2	Develop and implement ecological methods for control of sylvatic plague in ferret recovery areas, including methods based on manipulation of ferret habitats or associated species communities	USFWS*, BFFRIT, NPS, USGS, USFS, BLM, other Federal agencies, States, Tribes	3500	1700	1700	6900
1	5.4.2	Maintain public support for ferret reintroduction efforts at sites with disease issues	USFWS*, BFFRIT, USGS	150	100	100	350
2	1.5.2	Conduct and evaluate efforts to improve reproductive output to support genetic management and reintroduction efforts	SSP®*, USFWS	270	180	180	630
2	1.5.3	Continue management efforts to balance the genetic representation of founders in the captive population	SSP®*, USFWS	450	300	300	1050
2	1.5.4	Evaluate the reproductive fitness, genetics, and demography of the captive population	USFWS*, SSP®	510	340	340	1190

PRIORITY #	TASK #	ACTION DESCRIPTION	LEAD* & RESPONSIBLE PARTIES	COST ESTIMATES ($1,000'S)			
				FY 10-20	FY 21-30	FY 31-40	TOTAL
2	3.1	Maintain a list of research needs related to reintroduction and population monitoring	BFFRIT*, USFWS	50	40	40	130
2	3.2	Maintain a standardized ranking procedure for allocating ferrets to candidate reintroduction sites	USFWS*, BFFRIT	50	40	40	130
2	3.3.2	Collect information for site screening and baseline data purposes	USFWS*, NPS, USFS, BLM, other Federal agencies, States, Tribes	225	180	180	585
2	3.3.5	Standardize annual site monitoring and reporting to the extent practical	USFWS*, BFFRIT	150	120	120	390
2	3.4.1	Comply with obligations of the ESA, NEPA, and other laws	USFWS*, NPS, USFS, BLM, USGS, other Federal agencies, States, Tribes	50	40	40	130

PRIORITY #	TASK #	ACTION DESCRIPTION	LEAD* & RESPONSIBLE PARTIES	COST ESTIMATES ($1,000'S)			
				FY 10-20	FY 21-30	FY 31-40	TOTAL
2	3.4.3	Schedule and prepare ferrets for releases	USFWS*, SSP®	150	120	120	390
2	3.7.1	Continue the use of ferret preconditioning techniques	USFWS*, SSP®	50	40	40	130
2	3.7.2	Optimize release methods and timing	USFWS*, BFFRIT	50	40	40	130
2	3.7.3	Continue to improve ferret monitoring techniques	USFWS*, BFFRIT, NPS, USGS, USFS, BLM, other Federal agencies, States, Tribes	50	40	40	130
2	3.7.6	Continue to improve techniques for habitat monitoring and habitat evaluation	USFWS*, BFFRIT, USGS, USFS, BLM, other Federal agencies, States, Tribes	50	40	40	130

PRIORITY #	TASK #	ACTION DESCRIPTION	LEAD* & RESPONSIBLE PARTIES	COST ESTIMATES ($1,000'S)			
				FY 10-20	FY 21-30	FY 31-40	TOTAL
2	3.9.3	Evaluate and update site monitoring and research efforts	USFWS*, BFFRIT, USGS	100	80	80	260
2	4.1.2	Assess progress toward meeting downlisting and delisting criteria	USFWS*, BFFRIT	500	400	400	1300
2	5.1.2	Develop a list of bibliographies of publications and projects relevant to disease	USGS*, USFWS	30	20	20	70
2	5.1.3	Synthesize relevant information and research results	USFWS*, USGS	30	20	20	70
2	5.1.4	Report epizootics to the Centers for Disease Control, the National Wildlife Health Laboratory, and other appropriate disease research facilities	USFWS*, BFFRIT	60	40	40	140
2	5.4.1	Conduct periodic symposia and workshops to exchange information on diseases	USFWS*, BFFRIT, USGS	150	100	100	350
2	6.1.1	Support review and analysis of program progress	USFWS*, SSP®, BFFRIT	4000	2900	2900	9800

PRIORITY #	TASK #	ACTION DESCRIPTION	LEAD* & RESPONSIBLE PARTIES	COST ESTIMATES ($1,000'S)			
				FY 10-20	FY 21-30	FY 31-40	TOTAL
2	6.1.2	Coordinate program components and update program direction as appropriate based on reviews addressed in task 611	USFWS*, BFFRIT, USGS, SSP®	1340	940	940	3220
2	6.1.3	Formally report on progress toward recovery objectives on a five-year basis	USFWS	60	60	60	180
2	6.1.4	Use the BFFRIT to help identify problems and solutions	USFWS*, BFFRIT	350	250	250	850
2	6.4	Consider funding needs for national and international ferret recovery	USFWS*, BFFRIT	290	210	210	710
3	1.3	Provide a description of research needs related to genetic and demographic management of captive populations	USFWS*, SSP®, BFFRIT, USGS	60	40	40	140
3	1.4.4	Maintain a list of disease research contacts	USFWS*, SSP®, BFFRIT, USGS	60	40	40	140
3	1.5.1	Conduct regular reviews of breeding strategies	SSP®*, USFWS, BFFRIT	120	80	80	280

PRIORITY #	TASK #	ACTION DESCRIPTION	LEAD* & RESPONSIBLE PARTIES	COST ESTIMATES ($1,000'S)			
				FY 10-20	FY 21-30	FY 31-40	TOTAL
3	1.6	Establish policies for the use and handling of dead, non-reproductive, or otherwise excess ferrets	USFWS	60	40	40	140
3	2.2	If a remnant population is located, develop a plan to integrate any population into the recovery program	USFWS	0	0	0	0
3	3.7.4	Continue to improve survey techniques	USGS*, USFWS	175	140	140	455
3	3.7.5	Continue to improve telemetry equipment and techniques	USGS*, USFWS	50	40	40	130
3	5.1.1	Consider development of a list of disease research needs	USGS*, USFWS	30	20	20	70
3	5.3.1	Continue to implement prophylactic methods for control of canine distemper	USGS*, USFWS	150	100	100	350

PRIORITY #	TASK #	ACTION DESCRIPTION	LEAD* & RESPONSIBLE PARTIES	COST ESTIMATES ($1,000'S)			
				FY 10-20	FY 21-30	FY 31-40	TOTAL
3	5.3.2	Continue to implement ecological methods for control of canine distemper in ferret recovery areas, including methods based on manipulation of ferret habitats or associated carnivore communities	BFFRIT*, USGS, USFWS	210	140	140	490
3	6.1.5	Encourage the formation of jurisdictional and topical working groups to identify problems and solutions	USFWS*, BFFRIT	60	40	40	140
3	6.2.1	Maintain an up-to-date website describing the ferret recovery program and partnership opportunities	USFWS*, BFFRIT	60	40	40	140
3	6.2.2	Promote recovery partnerships through the formation of jurisdictional and topical working groups	USFWS*, BFFRIT	60	40	40	140
3	6.2.3	Encourage the exchange of scientific information and technical advice	USFWS*, BFFRIT	120	80	80	280

PRIORITY #	TASK #	ACTION DESCRIPTION	LEAD* & RESPONSIBLE PARTIES	COST ESTIMATES ($1,000'S)			
				FY 10-20	FY 21-30	FY 31-40	TOTAL
3	6.3.1	Support the efforts of States, tribes, and other organizations to recover the ferret	USFWS*, BFFRIT	90	60	60	210
3	6.3.2	Encourage public support for ferret recovery through strategically focused outreach efforts	USFWS*, BFFRIT	440	300	300	1040
3	6.3.3	Provide ferret recovery information to Non-Government Organizations currently supporting recovery and solicit the assistance of other NGOs who could aid species recovery	USFWS*, BFFRIT	60	40	40	140
3	6.3.4	Support participation and coordination among government agencies with jurisdiction over programs related to ferret recovery	USFWS*, BFFRIT	60	40	40	140
3	6.3.5	Maintain updated information on the contributions of SSP® captive breeding facilities	USFWS*, BFFRIT, SSP®	60	40	40	140

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