Black-footed Ferret (*Mustela nigripes*)

5-Year Status Review: Summary and Evaluation

U.S. Fish and Wildlife Service
South Dakota Field Office
Pierre, South Dakota

November 2008

5-Year Status Review
Species reviewed: black-footed ferret (*Mustela nigripes*)

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1. GENERAL INFORMATION

1.1. Reviewers

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1.2 Methodology Used To Complete The Review

The U.S. Fish and Wildlife Service (Service/USFWS) initiated this 5-year review on July 7, 2005 (70 FR 39326). This notice initiated a 60-day public comment period. During the public comment period, five letters were received and considered for development of a draft 5-Year Review. This review was completed by biologists from the South Dakota Ecological Services Field Office with assistance from the National Black-footed Ferret Conservation Center. In addition to a formal peer review process and in-house reviews by Service staff, this document was provided to the Black-footed Ferret Recovery Implementation Team membership for input.

1.3. Background

1.3.1. Federal Register Notice Citation Announcing Initiation Of This Review:

70 FR 39326, July 7, 2005

1.3.2. Listing History

Original Listing under the Endangered Species Preservation Act
Federal Register notice: 32 FR 4001
Date listed: March 11, 1967
Entity listed: black-footed ferret
Classification: endangered rangewide

Revised Listing under the Endangered Species Act
Federal Register notice: 35 FR 8491
Date listed: June 2, 1970
Entity listed: black-footed ferret
Classification: endangered rangewide

1.3.3. Associated Rulemakings

Experimental, non-essential populations have been designated for several reintroduction sites in the United States including:

- Southeastern Wyoming (56 FR 41473, August 21, 1991),
- Southwestern South Dakota (59 FR 42682, August 18, 1994),
- North-central Montana (59 FR 42696, August 18, 1994),
- Aubrey Valley, Arizona (61 FR 11320, March 20, 1996),
- Northwestern Colorado/northeastern Utah (63 FR 52823, October 1, 1998),
- North-central South Dakota (65 FR 60879, October 13, 2000), and
- South-central South Dakota (68 FR 26498, May 16, 2003).

Other reintroduction efforts not utilizing experimental, non-essential designations were initiated in Chihuahua, Mexico (2001), Lower Brule Indian Reservation, South Dakota (2006), Wind Cave National Park, South Dakota (2007), northwest Arizona (2007), central Kansas (2007), and southeast Montana (2008).

1.3.4. Review History

A number of previous 5-year reviews for listed species have been initiated by the Service's Washington, D.C., office (44 FR 29566, May 21, 1979; 50 FR 29901, July 22, 1985; 56 FR 56882, November 6, 1991). The species' status also was considered in the 1978 and 1988 recovery plans (Linder et al. 1978; USFWS 1988).

1.3.5. Species' Recovery Priority Number At Start Of Review

At the start of the 5-year review, the Recovery Priority Number for the black-footed ferret was 2 on a scale of 1-18. This ranking indicated: (1) populations face a high degree of threat; (2) recovery potential is high; and (3) the entity is listed at the species level.

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

1.3.6. Recovery Plan

The current Black-footed Ferret Recovery Plan was approved in 1988 (USFWS 1988). An earlier recovery plan was drafted in 1978 (Linder et al. 1978), when no extant, wild black-footed ferrets were thought to exist. A revision to the recovery plan is in final preparation and should be completed in 2009.

2. REVIEW ANALYSIS

2.1. Application Of The 1996 Distinct Population Segment Policy

The black-footed ferret is not listed as a distinct population segment (DPS). At this time, there is no relevant new information that would lead to consideration of this species as a DPS. However, some partners have suggested that we may want to examine use of DPS policy to facilitate ferret recovery in different portions of its range. One concept being considered is to designate DPSs and target recovery based on host species of prairie dog.

2.2. Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

No. Section 4(f)(1)(B)(ii) indicates that "objective, measurable criteria" are those that, when met, would result in a determination that the species be removed from the Endangered Species Act (ESA). However, the 1988 recovery plan includes no delisting criteria and, therefore, does not meet this standard. Furthermore, downlisting criteria (discuss in more detail below) such as "encouraging the widest possible distribution" need refinement to meet the objective and measurable standard. Finally, the 1988 Recovery Plan focuses on demographic based recovery criteria with no consideration of threats. The tacit assumption has been that the species' population parameters serve as surrogate indicator of the status of the species, including control of threats. Therefore, we recommend a revision to the recovery plan (see section 4 below).

Nevertheless, downlisting criteria specified in the 1988 Recovery Plan and the status of the species relative to these criteria are discussed below to provide a frame of reference for the recovery progress made to date.

Downlisting Criteria:

1) Increasing the captive population to 200 breeding adults by 1991.

The Service's current goal is to maintain a core breeding population of at least 240 adults (90 males, 150 females) (Marinari and Kreeger 2006); the captive population currently numbers approximately 290 animals. Most of the tasks associated with criterion 1 have been achieved. A few related tasks are no longer relevant or have not been accomplished, such as locating additional wild populations.

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.

Tasks under criterion 2 have not yet been fully met, although several populations have been successfully established that have more than 30 breeding adults. Appropriate management of both black-footed ferrets and prairie dogs will be needed to ameliorate the effects of habitat loss, poisoning, and especially disease.

3) Encouraging the widest possible distribution of reintroduced populations.

Tasks under criterion 3 have not yet been fully met, although reintroduction efforts have occurred at 18 sites in 8 States and Mexico. Four populations have been successfully established in three States. Participation by more State, Tribal, and Federal agencies will be needed to lessen the potential risk of catastrophic loss due to disease at any given reintroduction site.

In the 1988 recovery plan, these three criteria were divided into 6 tasks and over 200 subtasks. Progress on these criteria is summarized under section 2.3.1.

Delisting Criteria:

No delisting criteria were included in the 1988 recovery plan. At that time, ensuring species survival, focusing attention on developing captive breeding methodology, and developing reintroduction techniques were the most pressing recovery tasks. The 1988 recovery plan acknowledged that such basic recovery steps were required before delisting could be considered. Delisting criteria will be included in the upcoming revised recovery plan.

2.3. Updated Information And Current Species Status

2.3.1. Biology and Habitat

The black-footed ferret is a medium-sized mustelid typically weighing 1.4 to 2.5 pounds (lbs) (645 to 1,125 grams) and measuring 19 to 24 inches (479 to 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. It is the only ferret species native to the Americas (there are no recognized subspecies). Other ferret species in the genus include the Siberian polecat (*M. eversmanni*) and the European ferret (*M. putorius*) (Hillman and Clark 1980, Anderson et al. 1986). The black-footed ferret was first formally described in 1851 by J.J. Audubon and J. Bachman (Clark 1986).

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

The black-footed ferret depends on prairie dogs (*Cynomys spp.*) for food and on prairie dog burrows for shelter (Biggins 2006). Historically, ferret habitat largely coincided with habitats of the black-tailed prairie dog (BTPD) (*C. ludovicianus*), Gunnison's prairie dog (GPD) (*C. gunnisoni*) and white-tailed prairie dog (WTPD) (*C. leucurus*), which collectively occupied approximately

100 million acres (ac) (40 million hectares (ha)) of intermountain and prairie grasslands extending from Canada to Mexico (Anderson et al. 1986, Biggins et al. 1997). Ernst (pers. comm. 2008) is currently updating earlier conclusions from Ernst et al. (2006), and estimates that, in the United States, this occupied habitat existed within an estimated 562 million ac (228 million ha) of potential habitat. Occurrence of the ferret has not been documented 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). Since the late 1800s, ferrets have been collected as museum specimens from Arizona, Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah, Wyoming, Alberta, and Saskatchewan (Anderson et al. 1986). Ernst (pers. comm. 2008) used a geographic information system database to predict the distribution of prairie dog habitat across the United States and concluded that historically 85% of all ferrets probably occurred in BTPD habitat, 8% in GPD habitat and 7% in WTPD habitat. We agree that most ferrets likely occurred in BTPD habitat.

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 habitat and numbers were dramatically reduced by the sequential and overlapping effects of habitat loss from conversion of native prairie to cropland, poisoning, and habitat modification due to disease. The North American ferret population declined precipitously as a result (Biggins 2006). Each of these effects is described in more detail in section 2.3.2.

The black-footed ferret was considered extinct or nearly extinct when a small population was located in Mellette County, South Dakota in 1964 (Henderson et al. 1969). Attempts at captive breeding with a few captured animals from the Mellette County population failed. The last wild ferret observed at the Mellette County site was in 1974 (Clark 1989). When the last captive animal died at Patuxent Wildlife Research Center in Laurel, Maryland in 1979 (USFWS 1988), the ferret was again presumed extinct.

In 1981, a second population was discovered in Meeteetse, Wyoming (Clark et al. 1986, Lockhart et al. 2006). Following disease outbreaks at Meeteetse, all surviving wild black-footed ferrets were removed between 1985 and 1987 to initiate a captive breeding program. No wild populations of black-footed ferrets have been found since the capture of the last Meeteetse ferret, despite extensive and intensive range wide searches. It is unlikely that any undiscovered wild populations remain (Lockhart et al. 2006).

In 1965, the Department of Interior issued a policy regarding black-footed ferrets. The purpose of the policy was to require surveys for ferrets prior to poisoning of prairie dogs (Berryman and Johnson 1973, Hanson 1993). This policy applied within the entire range of the ferret. Thousands of hours of pre-control surveys did not locate any ferrets (Hanson 1993).

Seven of the black-footed ferrets captured at Meeteetse successfully reared young, leading to a lineage of continuing captive reproduction (Hutchins et al. 1996, Garrelle et al. 2006). Extant populations, both captive and reintroduced, descend from these seven "founder" animals. Genetic issues are further discussed in section 2.3.2.5.

The 1988 Black-footed Ferret Recovery Plan set a goal of 200 breeding adults in a captive population by 1991. The Small Carnivore Taxon Advisory Group (SCTAG) of the American Zoo and Aquarium (AZA) Association recommended a goal of maintaining at least 240 animals of breeding age, while providing as many animals as possible for reintroduction purposes (Hutchins et al. 1996). More recently, SCTAG recommended a goal of 350 specimens in a captive population to maximize genetic diversity (Garelle et al. 2006). The current goal of the Service is to maintain a core breeding population of a minimum of 240 adults (90 males, 150 females) (Marinari and Kreeger 2006). This number (240) addresses genetic management of the captive population by maintaining genetic diversity and also provides an adequate number of surplus animals for reintroduction efforts. Although the captive population has expanded to about 290 animals, the Service has not endorsed the recommendation for a still larger captive population (this issue will be further evaluated in the upcoming recovery plan).

Captive breeding efforts were first initiated by the Wyoming Game and Fish Department, which operated the primary breeding facility at Sybille Research Center near Wheatland, Wyoming from 1986-1996. Thereafter, the Service assumed primary responsibility for captive breeding at the Sybille Center and eventually moved captive breeding operations to a new facility in northern Colorado in 2005. Captive breeding populations are currently housed in six locations including: the National Black-footed Ferret Conservation Center in Wellington, Colorado; the National Zoo's Conservation Research Center 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 (Marinari and Kreeger 2006). Henry Doorly Zoo in Omaha, Nebraska, also previously participated in captive breeding efforts. Additional field breeding facilities in excess of the current core captive population of 290 animals were managed by the Arizona Fish and Game Department in Seligman, Arizona, and by Turner Endangered Species Fund in Cimarron, New Mexico in earlier years (Garelle et al. 2006), but are no longer active. Over half of the captive black-footed ferrets are housed at the National Black-footed Ferret Conservation Center (Marinari and Kreeger 2006). More than 6,500 ferret kits have been produced in captivity since 1987 (Marinari pers. comm. 2008a) and over 2,300 kits have been released to date (Bunnell pers. comm. 2008; Larson pers. comm. 2008a).

Since 1991, 18 specific black-footed ferret reintroduction projects have been conducted across 8 States and Mexico. Figure 1 lists these projects in order of the year of their initiation.

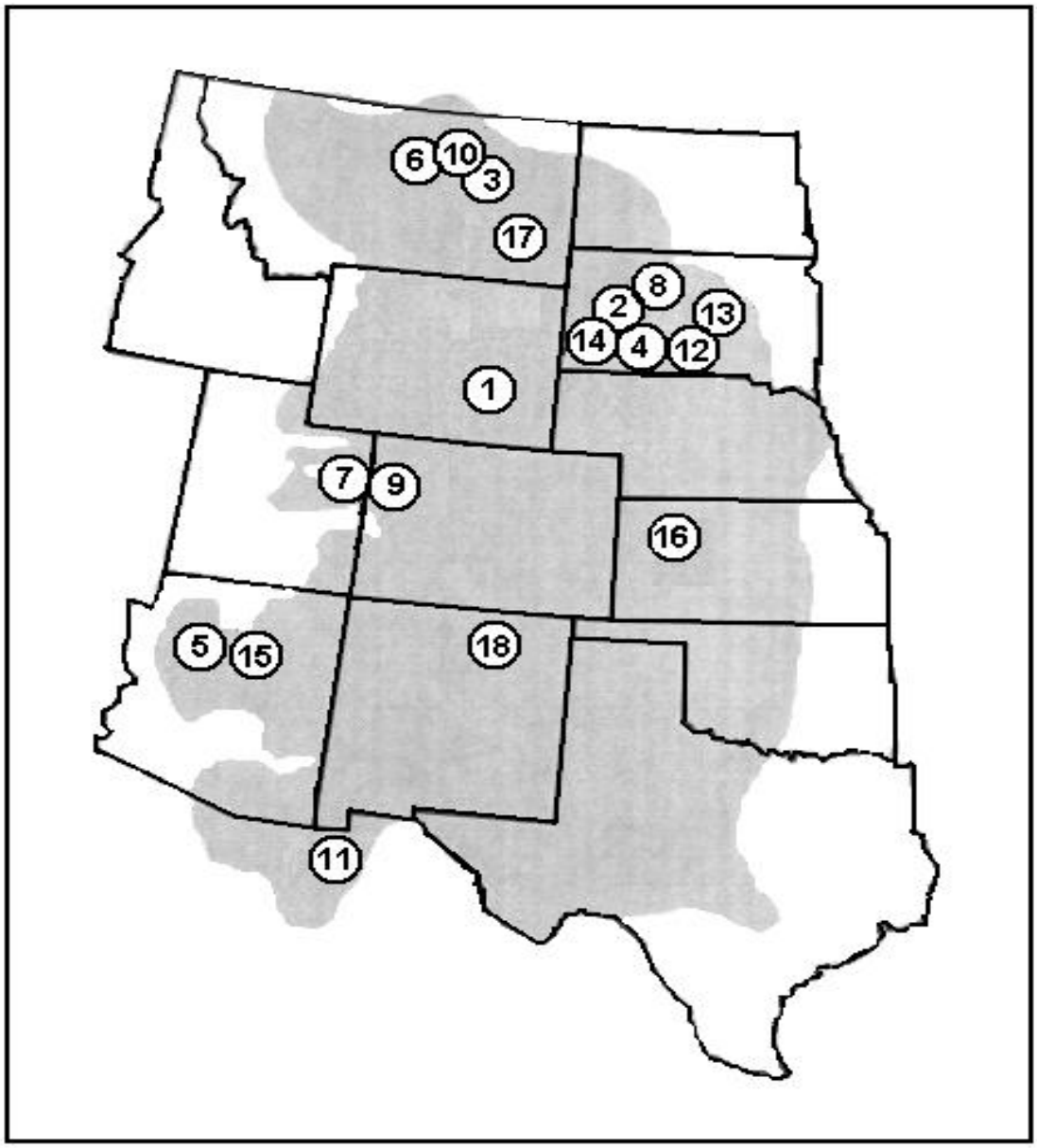

Figure 1. Probable historical range of the black-footed ferret and current reintroduction sites. The locations of reintroduction sites are portrayed in their chronological order of implementation as follows: 1) Shirley Basin, Wyoming (1991); 2) Badlands National Park, South Dakota (1994); 3) UL Bend National Wildlife Refuge, Montana (1994); 4) Conata Basin, South Dakota (1996); 5) Aubrey Valley, Arizona (1996); 6) Fort Belknap Indian Reservation, Montana (1997); 7) Coyote Basin, Utah (1999); 8) Cheyenne River Indian Reservation, South Dakota (2000); 9) Wolf Creek, Colorado (2001); 10) Bureau of Land Management "40 Complex", Montana (2001); 11) Janos, Chihuahua, Mexico (2001); 12) Rosebud Indian Reservation, South Dakota (2003); 13) Lower Brule Indian Reservation, South Dakota (2006); 14) Wind Cave National Park, South Dakota (2007); 15) Espee Ranch, Arizona (2007); 16) Logan County, Kansas (2007); 17) Northern Cheyenne Indian Reservation, Montana (2008); and (18) Vermejo Ranch, New Mexico (2008).

Table 1 describes the range of success at each of the 18 black-footed ferret reintroduction sites. In order to meet a particular classification, a site must meet the criteria specified. A site's classification may change over time. For example, both Badlands National Park, South Dakota and Shirley Basin, WY were considered unsuccessful for several years but are now considered as improving and successful, respectively.

Table 1. Black-footed Ferret Reintroduction Efforts Through October 2008

CLASSIFICATION	CRITERIA	SITE
Successful	• Self-sustaining • 30 or more breeding adults • Can support other sites with translocations	• Aubrey Valley, AZ • Cheyenne River, SD • Conata Basin, SD • Shirley Basin, WY
Improving	• Increasing population	• Badlands NP, SD • Rosebud, SD
Marginal	• Performing minimally, or at an unknown level	• Coyote Basin, UT • Janos, Mexico • UL Bend NWR, MT • Wolf Creek, CO
Unsuccessful	• Populations declining or extirpated • No recent litters documented	• Fort Belknap, MT • BLM 40 Complex, MT
Recent	• Initiated within the past 3 years	• Espee Ranch, AZ • Logan County, KS • Lower Brule, SD • Northern Cheyenne, MT • Vermejo Ranch, NM • Wind Cave NP, SD

One of the objectives from the 1988 Recovery Plan was to establish a pre-breeding population of 1,500 free-ranging adult black-footed ferrets in 10 or more populations with no fewer than 30 breeding adults in any population by 2010. Based on the best information available, it appears likely that, in the absence of additional augmentation, four of the reintroduction sites (Aubrey Valley, Cheyenne River Indian Reservation, Conata Basin, and Shirley Basin) currently meet the criteria. Accordingly, it appears that as of 2008, current reintroduction efforts are approximately 40% of the way towards our goal with regard to the number of established successful populations.

A minimum of approximately 700 individuals occur in these 4 populations Bunnell pers. comm. 2008; Larson pers. comm. 2008a). Assuming that approximately 50% of ferrets counted in end-of-year surveys are adults, there are approximately 350 adults at these 4 successful sites, or approximately 23% of the goal of 1,500 free-ranging adults.

2.3.2. Five Factor Analysis

2.3.2.1. Present or Threatened Destruction, Modification or Curtailment of Habitat or Range

The black-footed ferret's historical range coincided with the ranges of the BTPD, WTPD, and GPD. Ferret population declines mirrored the decline in prairie dog occupied habitat beginning in the late 19th century due to conversion from native prairie to cultivated crops, poisoning, and disease (Fagerstone and Biggins 1986; Cully 1993; Biggins 2006; Lockhart et al. 2006). No wild ferrets have been found following capture of the last Meeteetse ferret in 1987 and it is unlikely that any undiscovered wild populations remain (Lockhart et al. 2006).

Historically, BTPDs, WTPDs, and GPDs occupied approximately 100 million ac (40 million ha) of intermountain and prairie grasslands (Anderson et al. 1986, Biggins et al. 1997), within an estimated 562 million ac (228 million ha) of historical potential habitat (Ernst pers. comm. 2008). The most recent Service estimates of prairie dog occupied habitat range wide include 1,800,000 ac (729,000 ha) of BTPD occupied habitat (69 FR 51217, August 18, 2004), 841,000 ac (341,000 ha) of WTPD occupied habitat (69 FR 64889, November 9, 2004), and between 340,000 and 500,000 ac (136,000 to 200,000 ha) of GPD occupied habitat (73 FR 6660, February 5, 2008). This is a total of about 3,000,000 ac (1,200,000 ha) of occupied habitat; a decrease of approximately 97% from historically occupied acreage.

Much of the remaining prairie dog occupied habitat is highly fragmented and repeatedly impacted by poisoning and/or disease, with few complexes of a size adequate to support black-footed ferrets (Biggins et al. 1997, Lockhart et al. 2006, Luce 2006). Houston et al. (1986) recommended 10,000 to 15,000 ac (4,000 to 6,000 ha) of occupied prairie dog habitat to support a minimum viable population of 100 ferrets. Biggins et al. (1993) concluded that the factors to consider in predicting the number of ferrets that could be supported by a prairie dog complex include: 1) size of prairie dog colony, 2) density of prairie dogs, and 3) number of colonies within a complex. The maximum distance ferrets have been documented to travel in a night is 4.3 miles (mi) (7 kilometers (km)) (Biggins et al. 1993). Therefore, for the purposes of ferret reintroduction, the authors defined a prairie dog complex as all colonies within this distance from another colony. The authors further concluded that reintroduction sites for ferrets should be greater than 1,000 ac (400 ha).

The 1988 Recovery Plan (USFWS 1988) included as a downlisting objective (from endangered to threatened status), a pre-breeding black-footed ferret population of 1,500 free-ranging breeding adults in

10 or more populations with no fewer than 30 breeding adults in any population. No delisting (from threatened status to removal from list) objectives were addressed. The Recovery Plan estimated that an average of 124 ac (50 ha) of prairie dog occupied habitat was needed to support an individual ferret. This would require a total area of prairie dog occupied habitat of at least 185,000 ac (75,000 ha); or an average complex size of 18,500 ac (7,500 ha) per recovery site. In 1998, Lockhart (in litt. 1998) identified 10 large (> 10,000 ac/4,000 ha) prairie dog complexes potentially useful as ferret reintroduction sites. Although adequate quantity of prairie dog occupied habitat exists (approximately 3 million ac/1.2 million ha) to meet this downlisting goal, the quality of this habitat with regard to its configuration and ongoing adverse impacts, e.g., disease and poisoning, may limit reintroduction efforts, especially when socio-political considerations are taken into account (i.e., the willingness of local communities to accept endangered species reintroduction efforts).

Currently, the 18 sites in North America containing reintroduced black-footed ferrets are experiencing varying degrees of success, including 6 recently initiated reintroduction sites: Espee Ranch, Arizona; Logan County, Kansas; Lower Brule, South Dakota; Northern Cheyenne Indian Reservation, Montana; Vermejo Ranch, New Mexico, and Wind Cave National Park, South Dakota. These new sites are generally smaller than previous reintroduction areas, but provide an opportunity for: (1) new sites in plague-free habitat (see section 2.3.2.3), (2) cooperative efforts with new partners, and (3) potential refugia in the event of increased disease activity elsewhere. The number of additional large, potential reintroduction sites currently existing range from 3 (Luce 2006) to 4 or 5 (Lockhart et al. 2006). However, Luce (2008) suggests that 181 additional sites could be available in the next 3 to 10 years for ferret reintroduction if management is implemented to address social, political, and financial considerations. These 181 intermediate sites include Tribal and private lands in the southern Great Plains that may have extensive habitat, but have minimal recent survey information.

In addition to historical habitat loss due to the largely permanent conversion of native prairie to cropland, the quality of the remaining black-footed ferret habitat has been adversely impacted by the presence of disease and poisoning. These factors are addressed in sections 2.3.2.3 and 2.3.2.5, respectively.

We do not consider present or threatened habitat loss due to conversion of native prairie to cropland as significant as historical levels of impact. Approximately 3 million ac (1.2 million ha) of prairie dog occupied habitat are currently available. Furthermore, approximately 400 million ac (160 million ha) of potential prairie dog habitat (i.e., grasslands, pasture,

and range) currently exists in States within the historical range of the black-footed ferret (i.e., within the range of BTPDs, GPDs, and WTPDs) (U.S. Department of Agriculture 2005; Ernst pers. comm. 2008).

We consider other aspects of this factor to be a high magnitude, imminent threat, including: the present or threatened modification of habitat due to disease (see section 2.3.2.3) and the present or threatened curtailment of habitat due to poisoning (see section 2.3.2.5). Overall, we consider the present and threatened destruction, modification and curtailment of habitat a high magnitude, imminent threat to the black-footed ferret, unless poisoning is ameliorated by adequate regulatory mechanisms (see section 2.3.2.4) that provide management for a sufficient amount of prairie dog habitat to achieve ferret recovery objectives; and unless disease is managed by dusting, vaccines, maintanence of large sites, and/or maintenance of more sites (see section 2.3.2.3).

2.3.2.2. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

All black-footed ferrets are located either in captive breeding facilities or at managed reintroduction sites. We are not aware of any black-footed ferrets being utilized for commercial or recreational purposes. The captive ferret population is managed under an AZA Association Species Survival Plan (SSP) to maintain an annual breeding census of 240 ± 35 animals of optimum sex and age ratio. Ferrets in excess of SSP needs are allocated each year for reintroduction, or for scientific and educational purposes (USFWS 2002). Animals used for scientific or educational purposes are often older animals that are past prime breeding age, although some kits also have been allocated for research purposes. An example of a scientific purpose would be those ferrets used for research and vaccine development (Rocke et al. 2006). A few non-breeding individuals also are used for educational purposes at zoos.

Over the past decade, interest and intensity in recreational prairie dog shooting have increased dramatically. Depending on its intensity, shooting can impact local prairie dog populations, and the resulting loss in prey base could potentially affect black-footed ferret reintroduction sites (Reeve and Vosburgh 2006). Incidental take of ferrets by prairie dog shooters also is a potential, but as yet undocumented, threat. The Wolf Creek, Colorado, reintroduction site is the only 1 of 18 reintroduction sites that allows recreational shooting of prairie dogs without any restrictions that consider ferret recovery. We believe that ferret recovery at this site is limited by the shooting of prairie dogs, which has restricted prairie dog numbers and occupied habitat. This issue is further discussed in section 2.3.2.4. With the exception of the aforementioned site, prairie dog

shooting is presently managed at varying levels (seasonal to full closure) on all active reintroduction areas, and has not been intense enough to warrant suspension of recovery efforts at any site.

Overall, we do not consider overutilization for commercial, recreational, scientific, or educational purposes to be a current threat to the black-footed ferret.

2.3.2.3. Disease or Predation

Two diseases, canine distemper and sylvatic plague, have notably impacted both wild and captive-reared populations of the black-footed ferret. Additionally, several other diseases, including coccidiosis, cryptosporidiosis, and hemorrhagic syndrome sometimes affect captive populations (Hutchins et al. 1996).

Canine distemper can significantly impact the black-footed ferret and 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). It was believed at that time 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).

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 has made reintroduction of the ferret more difficult (Wimsatt et al. 2006). Efforts at Patuxent Wildlife Research Center in 1972 to breed black-footed ferrets from the Mellette population were unsuccessful due to vaccine-induced canine distemper (Lockhart et al. 2006). Although safe in domestic European ferrets, the vaccine induced fatal distemper in four of six vaccinated black-footed ferrets that were removed from the wild population for captive breeding purposes, demonstrating the extreme susceptibility of the species (Lockhart et al. 2006). However, more recently an efficacious and protective commercial distemper vaccine has become available and is widely employed in both captive and wild ferret population management (Marinari and Kreeger 2006). Canine distemper vaccination protocols will substantially reduce the threat of catastrophic population losses of ferrets, as long as a suitable commercial vaccine remains available.

Sylvatic plague is an exotic disease foreign to the evolutionary history of North American species, and did not exist on this 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), and by 2005 had been detected in prairie dogs in all States within the range of the black-footed ferret. The disease is present throughout the range of WTPDs and GPDs and is present in approximately the western b of the range of BTPDs (Barnes 1993; Lockhart et al. 2006). Figure 2 illustrates recent information available from the Center for Disease Control regarding plague occurrence in the United States.

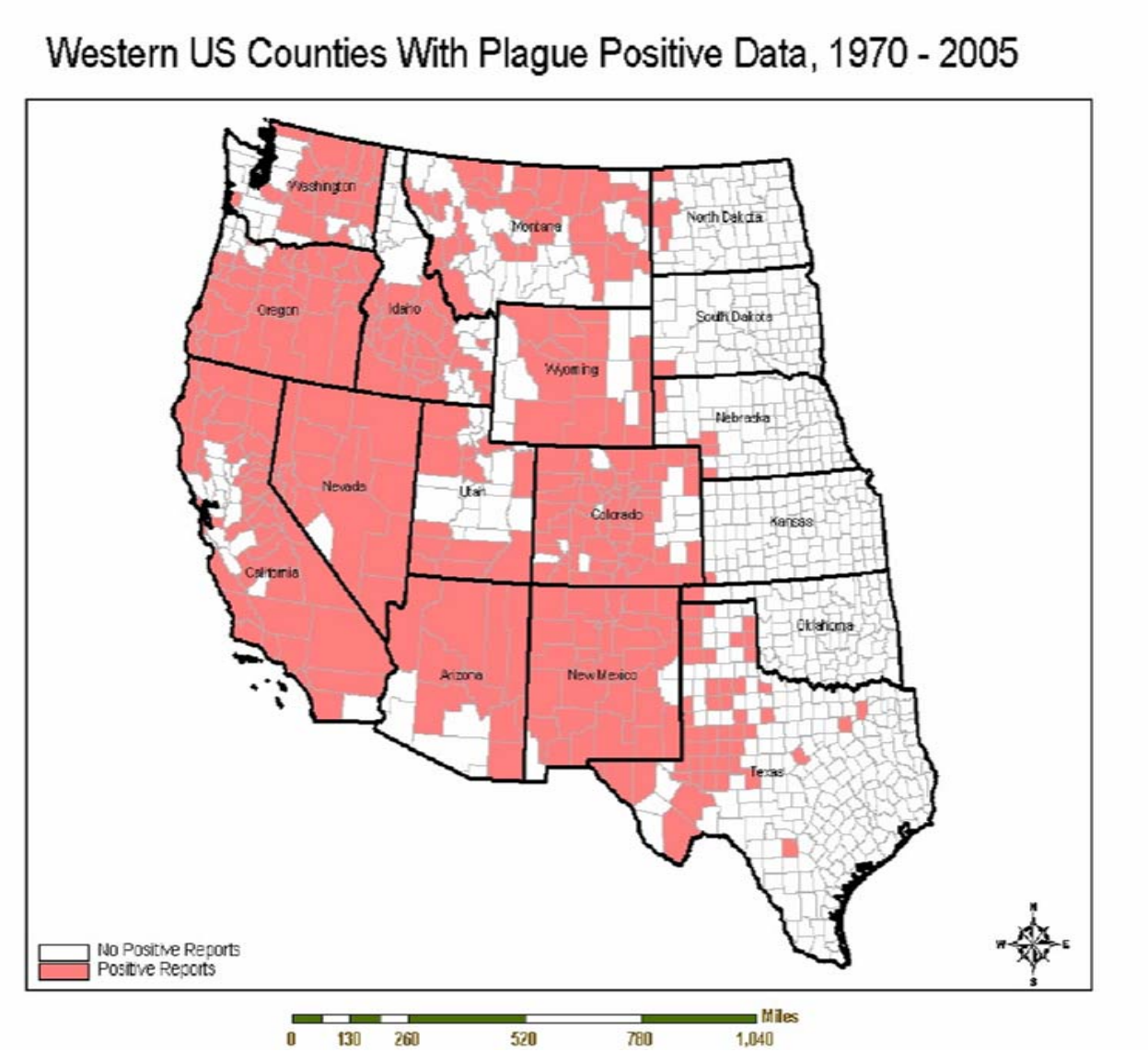

Figure 2. Center for Disease Control reported plague occurrence in the western United States.

Plague is caused by the bacterium *Yersinia pestis*, which fleas acquire from biting infected animals and can then transmit to other animals via a flea bite. The disease also can be transmitted pneumonically (spread through the air) among infected animals or via the consumption of contaminated food items (Godbey et al. 2006). Rodent species that are somewhat tolerant of plague may act as enzootic hosts or reservoirs, maintaining the disease at a static level of intensity where plague occurs (Barnes 1993; Cully 1993). If other species such as prairie dogs inhabit the same area, the enzootic host species may transfer plague to them, causing an epizootic outbreak that can lead to nearly 100% mortality among prairie dogs and black-footed ferrets. Plague can impact the black-footed ferret directly via infection and subsequent mortality. It also can indirectly impact the ferret through the disease's effects on prairie dogs and the potential for dramatic declines in the ferret's primary prey base.

Recovery efforts for the ferret are hampered because both ferrets and prairie dogs are extremely susceptible (Barnes 1993; Gage and Kosoy 2006). The higher densities and higher rates of social contact of BTPDs and GPDs particularly enhance the spread of plague (Cully 1993). The vagaries of plague impacts on black-footed ferret reintroduction efforts emphasize the value of the 1988 Recovery Plan risk management objective to establish wild populations across the widest possible distribution of the species' historical range.

Sylvatic plague in prairie dogs has been documented at or within 25 mi of all black-footed ferret reintroduction sites, except for two active sites in South Dakota (Lower Brule Indian Reservation and Rosebud Indian Reservation), the site in Janos, Mexico, and the Logan County, Kansas, site (Lockhart in litt. 1999, 2000, 2003, 2004; Lockhart pers. comm. 2001, 2002, 2005, 2006). Conata Basin is generally regarded as the most successful ferret reintroduction site. It supports the largest, self-sustaining ferret population that has existed since species listing in 1967, and perhaps for decades before. Since 2000, it has provided a surplus of kits for translocation to other reintroduction areas (Lockhart in litt. 2000, 2003, 2004; Lockhart pers. comm. 2001, 2002, 2005, 2006, 2007; Larson pers. comm. 2008a). However, in 2005 plague was documented in prairie dogs approximately 25 mi (40 km) south of Conata Basin. During the late summer and fall of 2005, approximately 3,500 lbs (1,600 kilograms) of the insecticide deltamethrin, a synthetic pyrethroid, were applied (dusted) on 7,000 ac (2,800 ha) of occupied prairie dog burrows in known ferret habitat in an effort to eliminate fleas, the most likely plague vector. Dusting has continued annually to the present date. In May 2008, plague was discovered in Conata Basin. Federal agencies undertook a dusting effort that targeted approximately 10,000 ac (4,000 ha) of prairie dog colonies on U.S. Forest Service lands (Griebel pers. comm. 2008).

Approximately 10,000 ac (4,000 ha) of prairie dog colonies not dusted were lost to plague (Griebel pers. comm. 2008). At this time, the extent of ferret mortality at Conata Basin is unknown, but is presumed to be less than a of extant ferrets, based upon what is known regarding preferred ferret habitat and the number of acres impacted at this site. Plague also has been detected on Cheyenne River Sioux Reservation, but not on the ferret reintroduction site.

In one instance, the black-footed ferret appears to have prospered despite the periodic presence of plague. In 1991, Shirley Basin, Wyoming was the first reintroduction site attempted. This site is occupied by WTPDs. Ferret releases there were suspended in 1994 due to plague and the small ferret population present was expected to be lost by the late 1990s. However, the population persisted through these plague events. Since 2002, the Shirley Basin ferret population has received additional augmentation and grown rapidly (Grenier et al. 2006; Lockhart et al. 2006). As previously noted, WTPD complexes are less densely populated than typical complexes of BTPD or GPD. Apparently, scattered populations of prairie dogs avoided contracting plague and were able to sustain a small ferret population. However, ferrets and WTPDs 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 ferrets and prairie dogs. Preliminary results found that after being immunized by a series of two subcutaneous injections, antibody titers were significantly higher in vaccinated ferrets. When challenged with plague 6 months after immunization, 11 of 16 vaccinates survived. All eight control animals died. Two months later, 11 survivors were again challenged by ingestion of a plague-infected mouse and all survived. Vaccines may eventually be useful in protecting ferrets from direct impacts of plague; particularly if oral delivery becomes feasible. Oral delivery would allow the vaccine to be applied as bait, rather than applied directly to captured animals, which could provide protection to wild-born ferrets. Vaccine distributed via oral baits for prairie dogs has recently been shown to be effective in a laboratory setting (Rocke pers. comm. 2008), and also would serve to protect habitat and prey base for ferrets, providing additional measures of long-term population stability.

In healthy wildlife populations, predation typically does not adversely impact overall population stability. However, if a population is vulnerable due to other factors, predation can become a contributing and ultimately limiting factor. Predation was a concern at early black-footed ferret reintroduction sites and may have caused up to 95% of ferret mortality on reintroduction sites without active plague (Breck et al. 2006). Coyotes (*Canis latrans*) 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 have inverse effects on ferret survival, possibly due to rapid rates of recolonization of coyotes after removal (Breck et al. 2006). Great-horned owls (*Bubo virginianus*) also can cause significant ferret mortality in some circumstances. Removal of predating great-horned owls can be beneficial (Breck et al. 2006).

Biggins (2000) suggested that behaviors critical to survival in the wild have been altered during generations in captivity. Trials showed increased boldness in ferrets through successive generations in captivity, which could increase predation rates, as these ferrets spend more time above ground. The author noted that quasi-natural rearing environments seemed to counteract some effects of captivity. Increased outdoor pen rearing of captive-born ferrets in recent years has likely enriched learning of important natural behaviors and appears to have increased survival rates when those animals have been released in the wild. For most sites, we believe predation now has insignificant effects, as evidenced by the reintroduction sites where ferret populations are apparently either stable or increasing (see earlier discussion in section 2.3.1).

We consider plague a high magnitude, imminent threat to the black-footed ferret. In particular, recent encroachment of plague into South Dakota may pose a significant risk at these sites. We believe that this threat can be ameliorated by dusting, vaccines, systemic flea control, maintenance of large sites, and/or maintenance of more reintroduction sites so that ferret recovery objectives can be achieved, despite periodic losses to plague. We do not consider predation a threat.

2.3.2.4. Inadequacy of Existing Regulatory Mechanisms

Captive black-footed ferrets are regarded as fully endangered under ESA. However, reintroduced ferrets have been afforded less protection, as described in section 1.3.3. These relaxed standards were originally necessary to acquire support for reintroduction efforts at the State and local level. Most reintroduced ferrets have been released into nonessential, experimental population areas as set forth in Section 10(j) of the ESA. The 10(j) populations that are not on National Parks or National Wildlife Refuges are not afforded the level of protection of an endangered species, but are treated as a “proposed” species for the purposes of ESA Section 7 consultations. Under Section 7(a)(2) of ESA, consultation with the Service is required by any Federal agency whose actions might jeopardize the continued existence of the species or adversely modify critical habitat. Reintroduced ferrets in 10(j) areas are protected from purposeful “take” via Section 9 of ESA (USFWS 2002).

Reintroduction sites in Janos, Mexico; Lower Brule Indian Reservation, South Dakota; Wind Cave National Park, South Dakota; Espee Ranch, Arizona; Logan County, Kansas; Northern Cheyenne Indian Reservation, Montana; and Vermejo Park Ranch, New Mexico, do not utilize Section 10(j). Ferrets reintroduced into Mexico are primarily regulated by the Mexican government. Ferrets reintroduced at Lower Brule Indian Reservation, Wind Cave National Park, Espee Ranch, Logan County, Northern Cheyenne Indian Reservation, and Vermejo Park Ranch were authorized via scientific recovery permits issued under Section 10(a)(1)(A) of the ESA by the Service. Conditions stipulated under these permits also were relaxed in order to achieve State, Tribal, and/or local support. Critical habitat has not been designated for the black-footed ferret.

All States within the historical range of the ferret have produced State Comprehensive Wildlife Conservation Strategies; however, 3 out of 12 States within the historical range of the species (Nebraska, New Mexico, and Oklahoma) do not identify the ferret as a management priority species. One of these States (New Mexico) has pursued reintroduction efforts.

The prairie dog, upon which the black-footed ferret depends for food and shelter, has fewer protective regulations than the ferret. The most recent reviews by the Service for the BTPD (69 FR 51217, August 18, 2004), WTPD (69 FR 64889, November 9, 2004), and GPD (73 FR 6660, February 5, 2008) all concluded that inadequate regulatory mechanisms did not rise to the level of a significant threat for any of these three species. Although it was concluded that this factor was not likely to cause any of these species to become threatened or endangered within the foreseeable future, most prairie dog populations may no longer be large or stable enough (due to plague and poisoning) to support ferrets. The prairie dog may be able to persist in smaller, more fragmented populations; however, these populations are often incapable of supporting ferrets. More protective regulations, particularly those related to poisoning and maintaining adequate prairie dog habitat, could improve opportunities for ferret recovery at what are now sites of marginal potential.

The Wolf Creek, Colorado black-footed ferret reintroduction site is the only site that allows recreational shooting of prairie dogs without any restrictions that consider ferret recovery. We believe that ferret recovery at this site is limited by the shooting of prairie dogs, which has restricted prairie dog numbers and occupied habitat. More protective regulations, regarding the recreational shooting of prairie dogs, could improve opportunities for ferret recovery at this site.

Recovery of the black-footed ferret cannot be achieved without more assertive restoration and management of sufficient prairie dog habitat. To date, 18 reintroduction projects have been undertaken across the United States and Mexico, with varying levels of success. Many of the high quality, large prairie dog complexes that exist today have been utilized for ferret recovery, and yet the numbers of adult ferrets at successful sites is only approximately 23% of that specified in the downlisting goal. The necessary components for ferret recovery are available, but 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.

The Black-footed Ferret Recovery Implementation Team is a coalition of approximately 30 State and Federal agencies, Tribes, and conservation organizations that provides the Service with input and recommendations on all matters related to the conservation and recovery of the ferret. Although the Team is not directly involved in regulatory actions, the team members can inform their respective agencies and constituencies of issues pertinent to ferret management and recovery.

We consider inadequate regulations, particularly with regard to prairie dog management, a high magnitude, imminent threat to the species. We believe this threat can be ameliorated through the development of regulatory mechanisms that provide strategic management objectives for both a sufficient quantity and quality of prairie dog habitat to achieve black-footed ferret recovery objectives despite periodic losses due to plague or poisoning.

2.3.2.5. Other Natural or Manmade Factors

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

Poisoning of prairie dogs is regarded as a major factor in the direct decline of prairie dogs and the decline of ferrets (Forrest et al. 1985; Cully 1993). Similar to the other factors limiting ferret recovery, poisoning can affect the black-footed ferret directly, through inadvertent secondary poisoning of the ferret, or indirectly, through the loss of the prairie dog prey base. As noted previously, the historical estimate of prairie dog occupied habitat was approximately 100 million ac (40 million ha). Concerns regarding the loss of livestock grazing forage due to consumption of that forage by prairie dogs were the primary reason for the development of poisoning programs. Organized prairie dog control gained momentum from 1916 to 1920 when prairie dogs were controlled on tens of millions of acres of western rangeland (Bell 1921). By the 1960s, prairie dog occupied habitat

may have reached a low of less than 2 million ac (700,000 ha) in the United States (Berryman and Johnson 1973). Our most recent estimate of prairie dog occupied habitat is about 3 million ac (1.2 million ha) (section 2.3.2.1).

Beginning in the late 1800s, strychnine was the primary substance used to control prairie dogs (Bell 1921). After World War II, and until 1972, Compound 1080 was the preferred poison to control prairie dogs. In 1972, Executive Order 11643 prohibited the use of certain toxicants, including Compound 1080, on Federal lands or in federally funded programs. By 1976, zinc phosphide had become the prescribed bait for prairie dogs, and its use continues to the present (Hanson 1993). In recent years, manufacturers have promoted the use of the anticoagulant rodenticides chlorophacinone (Rozol) and diphacinone (Kaput) (Bruening 2007; Lee and Hygnstrom 2007). These chemicals pose a much greater risk of secondary poisoning to black-footed ferrets than zinc phosphide (Erickson and Urban 2004). The legal use of Rozol has occurred at one reintroduction site and its illegal use at another site. We are currently encouraging the Environmental Protection Agency to re-address the use of anticoagulants for control of prairie dogs (Gober in litt. 2006; Slack in litt. 2006), as is the Western Association of Fish and Wildlife Agencies (Koch in litt. 2008). We also are undertaking research to further investigate the secondary impacts from the use of anticoagulants for control of prairie dogs.

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 potential habitat, such as occurred in the extirpation of BTPDs in Arizona (Hoffmeister 1986, Arizona Game and Fish Department 1988). More typically, prairie dog numbers are reduced temporarily, but long enough for ferrets to disappear. By the time intensive prairie dog poisoning abated in the mid-1900s, plague was extending throughout most of the ferret's range.

Prairie dog poisoning still occurs on private, State, Tribal, and Federal lands rangewide, but with generally less effective poisons than were used in past decades. The total acreage of occupied prairie dog habitat being poisoned has decreased in recent years. However, the amount of occupied prairie dog habitat available for control also has been reduced (from approximately 100 million ac/40 million ha to 3 million ac/1.2 million ha). Consequently, the relative percentage of occupied prairie dog habitat being poisoned on an annual basis remains 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 lbs/400,000 kilograms) to poison all prairie dog occupied habitat in the United States (Kempema 2007; Larson pers. comm. 2008b). This

scenario does not include the likelihood of individuals stockpiling poison, re-applying poison at the same site, or applying poison at rates greater than the recommended rate of 1/3 lb (150 grams) per acre. Nevertheless, control of prairie dogs remains a concern with regard to impacts to ferrets.

Recently, the U.S. Forest Service has indicated a need to balance multiple uses of the Conata Basin, South Dakota, black-footed ferret reintroduction site to reduce alleged prairie dog damage on native grasslands. Continued poisoning at the periphery of this site and proposed poisoning in the interior of the site could reduce Conata Basin ferret productivity, could reduce the number of wild born kits available for translocation to developing recovery sites, and could significantly impact progress towards achievement of the downlisting goal.

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 2 decades, a warming of about 0.2°C (0.4°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 to 4.0°C (1.1 to 7.2°F) 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 makes equally sobering predictions for ecosystems in their conclusion that the resilience of many ecosystems is likely to be exceeded this century by an unprecedented combination of

climate change, associated disturbances (e.g., flooding, drought, wildfire, insects), and other global drivers (IPPC 2007). With medium confidence, IPPC predicts that approximately 20 to 30% 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 to 2.5EC (2.7 to 3.5EF) (IPPC 2007).

Almost certainly the black-footed ferret, along with its habitat, 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. Additionally, 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). At this time we cannot quantify the potential magnitude or extent of change that climate change may cause the ferret.

Genetic fitness of the black-footed ferret has been a concern in the captive breeding program due to the extreme bottleneck that the species passed through (Groves and Clark 1986; USFWS 1988; Howard et al. 2006; Wisely 2006; Garelle et al. 2006; Hutchins et al. 1996). The current captive breeding program began with seven founder animals trapped at Meeteetse (Hutchins et al. 1996; Wisely 2006). The magnitude of loss of genetic diversity was exacerbated by the especially isolated nature of the last population at Meeteetse. 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). Gene diversity in the current black-footed ferret population is estimated to be 87% of that in the founder population (Garelle et al. 2006).

Two types of genetic effects that can impact a population's survival are: 1) inbreeding depression, caused by increased genetic homozygosity and the subsequent expression of deleterious genes, and 2) genetic drift, the random loss of genetic diversity in small populations (Clark 1989). Gene diversity of less than 90% of that in founder populations of some species has been associated with compromised reproduction due to lower birth weights, smaller litter size and greater neonatal mortality. 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% of the genetic diversity present in the founder population for the next 25 years (Marinari and Kreeger 2006). 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). Over 6,500 ferret kits have been produced at captive breeding facilities (Marinari pers. comm. 2008a).

Typically, carnivores have less genetic variability than other mammalian taxa (Kilpatrick et al. 1986), which may explain why more effects from inbreeding have not been manifested. Another carnivore species with comparable levels of genetic diversity is the African cheetah (*Acinonyx jubatus*) (Wisely 2006). Despite the fact that felines are more susceptible to inbreeding than most taxa, and the cheetah continues to survive in the wild. Wisely (2006) concluded that where ample, plague-free habitat exists, black-footed ferret populations appear to flourish despite reduced genetic diversity; and with careful management of remaining genetic resources, the ferret will likely persist. The successful reproduction documented for ferrets in the wild at all 18 reintroduction sites supports this conclusion. The reintroduction of wild born ferrets that have been exposed to natural selection processes into the captive breeding population may also improve genetic fitness of the captive population.

We consider poisoning a high magnitude, imminent threat to the black-footed ferret, specifically with regard to the indirect effect posed by control of prairie dogs and the resultant loss of adequate quality habitat for the ferret; unless ameliorated by adequate regulatory mechanisms (see section 2.3.2.4) that provide management objectives for a sufficient amount of prairie dog habitat to facilitate achievement of ferret recovery objectives. We are unable to quantify potential impacts to the species from climate change at this time. With proper management, we do not consider genetic fitness a threat at this time.

We believe that additive and synergistic effects (i.e., poisoning, plague, habitat destruction) have likely impacted the black-footed ferret and have rendered many areas unsuitable for future recovery; however, we are unable to adequately describe and quantify these effects.

2.4. Synthesis

In general, captive breeding of the black-footed ferret has been very successful. Although challenges remain for this part of the recovery program, other obstacles to establishing the species in the wild have emerged as the major recovery limitation.

As noted previously, the black-footed ferret depends on the prairie dog for both food and shelter. The historical range of the ferret coincided with the ranges of the BTPD, WTPD, and GPD. It is estimated that these three species of prairie dogs, as well as the ferret, occupied approximately 100 million ac (40 million ha) of intermountain and prairie grasslands, within an estimated 562 million ac (228 million ha) of potential habitat. By the 1960s, these same species of prairie dogs may have occupied less than 2 million ac

(700,000 ha); and the ferret had been reduced to one known population in the wild in Mellette County, South Dakota. When the Mellette population of ferrets disappeared in 1974, the ferret was considered extinct in the wild. A last wild population was found in 1981 in Meeteetse, Wyoming. By 1987, this population was reduced to 18 captive ferrets, 7 of which successfully reared a lineage of captive young and are considered species founders. No populations remained in the wild based on extensive, intensive, and incidental searches over the past 25 years. Reintroduction efforts began in 1991. To date, more than 2,300 ferrets have been reintroduced at 18 sites, which currently support ferrets with varying degrees of success. Tables 1 and 2 demonstrate the species' current status and abundance at each of these reintroduction sites.

TABLE 2. Current Status of the Black-footed Ferret in the Wild (Bunnell pers. comm. 2008; Larson pers. comm. 2008a; Marinari pers. comm. 2008b)

Site (year initiated)	Prairie Dog spp.	Ferrets Released	Minimum Fall Population	Estimated Breeding Adults
Shirley Basin, WY (1991)	WTPD	277	196	98
UL Bend National Wildlife Refuge, MT (1994)	BTPD	208	13	7
Badlands National Park, SD (1994)	BTPD	175	20	10
Aubrey Valley, AZ (1996)	GPD	173	66	33
Conata Basin, SD (1996)	BTPD	150	292	146
Ft. Belknap Indian Reservation, MT (1997)	BTPD	167	0	0
Coyote Basin, UT (1999)	WTPD	200	25	13
Cheyenne River IndianReservation, SD (2000)	BTPD	189	150	75
BLM 40-complex, MT (2001)	BTPD	95	3	3
Wolf Creek, CO, (2001)	WTPD	209	16	8
Janos, Mexico (2001)	BTPD	282	13	7
Rosebud Indian Reservation, SD (2003)	BTPD	99	30	15
Lower Brule Indian Reservation, SD (2006)	BTPD	62	14	7
Wind Cave NP, SD (2007)	BTPD	49	Recent release	No data
Espee Ranch, AZ (2007)	GPD	44	Recent release	No data
Logan County, KS (2007)	BTPD	24	Recent release	No data
N. Cheyenne Indian Reservation, MT (2008)	BTPD	8	Recent release	No data
Vermejo Ranch, NM	BTPD	53	Recent release	No data
Total		**2,464**	**838**	**422**

Factors causing the dramatic decline in the black-footed ferret are intertwined with factors causing a parallel decline in prairie dogs. In many cases it is difficult to separate individual factors that impact the species and its habitat (e.g., regulatory mechanisms and poisoning). It also is difficult to separate direct effects to the ferret from indirect effects

via the prairie dog (e.g., plague). Multiple factors limit the recovery of the ferret and could result in its extinction in the wild.

A loss of approximately 97% of suitable habitat available to the ferret from pre-European settlement times has occurred. Much of the remaining 3 million ac (1.2 million ha) of available habitat is either fragmented to the extent that its size is no longer adequate to support ferrets, or compromised by the occurrence of plague or poisoning. One of the downlisting objectives in the current recovery plan is to establish 10 or more self-sustaining black-footed ferret populations in the wild. At present, only 4 of 18 reintroduction sites attempted might be regarded as self-sustaining. More reintroduction sites are needed to reach the recovery goal, but only 3 to 5 additional suitable large sites may be available in the near future. However, as previously noted Luce (2008) suggests that 181 sites could be available with increased management to address social, political and financial considerations.

Black-footed ferrets can contract plague directly and perish. Plague also is fatal to prairie dogs in most instances. During an epizootic, prairie dog occupied habitat can be severely reduced or eliminated. At three reintroduction sites (Fort Belknap; BLM 40 Complex, Montana; and UL Bend, Montana), plague was so severe that reintroduction efforts were suspended. At two other sites (Coyote Basin, Utah and Wolf Creek, Colorado) plague has limited reintroduction successes. One site (Shirley Basin, Wyoming) has persisted in the presence of plague. Most likely, the scattered nature of the WTPD populations at Shirley Basin allowed enough prairie dogs to avoid contracting the disease to sustain ferrets. In 2008, plague was documented in prairie dogs at Conata Basin, South Dakota, the most successful ferret reintroduction site. Plague spread quickly through approximately 9,700 ac (4,000 ha) of high density BTPD populations at this site. We are still evaluating impacts to overall black-footed recovery.

Broad-scale poisoning of prairie dogs can result in the loss or curtailment of potential habitat for black-footed ferrets. Ferrets also can be directly impacted via secondary poisoning if they consume prairie dogs poisoned with anticoagulants such as Rozol and Kaput. Poisoning, if thorough enough, may result in permanent loss of potential habitat (i.e., the elimination of BTPDs in Arizona). More typically, habitat is temporarily lost or prairie dog numbers reduced to an extent that ferrets can't be supported.

Inadequate regulatory mechanisms are an overarching concern that can exacerbate or ameliorate the effects of the other factors. Improved regulations and/or management commitments could protect or restore habitat and ameliorate poisoning. Furthermore, if States established appropriate goals for the recovery of the black-footed ferret and reintroduction sites were distributed proportionally across the ferret's historical range, effects due to plague could be addressed through adaptive risk management efforts. Currently, some States have failed to identify any sites for ferret recovery. Many of these same States have plague-free areas that could be of particular benefit to ferret recovery (North Dakota, Nebraska, Oklahoma, and Texas).

The other factors discussed in this review (conversion of native prairie to cropland; overutilization for commercial, recreational, scientific, or educational purposes; diseases other than plague; predation; climate change; and genetic fitness) may result in localized or minor impacts to the black-footed ferret, but are currently not regarded as threats to the extent of endangering the species with extinction throughout all or a significant portion of its range.

Overall, the black-footed ferret remains one of the most endangered mammals in the United States. It continues to be threatened by a variety of factors including: habitat modification and curtailment, disease, poisoning of its prey, and the lack of adequate regulatory mechanisms or management commitments that could ensure the accomplishment of recovery objectives via established goals and adaptive management.

3. RESULTS

3.1. Recommended Classification

_____ Downlist to Threatened
_____ Uplist to Endangered
_____ Delist
__X__ No change is needed

3.2. Recovery Priority Number

The black-footed ferret's Recovery Priority Number should be at 2C. This ranking indicates: (1) populations face a high degree of threat; (2) recovery potential is high; (3) the entity is listed at the species level; and (4) the species is in conflict with economic activity.

4. RECOMMENDATIONS FOR FUTURE ACTIONS

We believe that the single, most feasible action that would be most beneficial for recovery of the black-footed ferret would be to improve regulations and/or increase management actions regarding prairie dog conservation. If an effort were undertaken to proactively manage certain areas of prairie dog habitat for ferret recovery, all other threats to the species could be more efficiently addressed. Many areas within the historical range of the species do not manage prairie dogs in a manner so as to allow for ferret recovery. Many of these same areas have large plague-free areas and would consequently be particularly valuable in ferret recovery. We recommend that the following actions be taken.

1) We recommend revising the recovery plan to reflect the best scientific and commercial information available (this task is currently underway). The revised recovery plan should include objective, measurable criteria which, when met, will result in a determination that the species be removed from the Federal List of Endangered and Threatened Plants. Recovery criteria should address all threats

meaningfully impacting the species. The recovery plan also should estimate the time required and the cost to carry out those measures needed to achieve the goal for recovery and delisting. The most recent plan is 20 years old. In 1988, when the plan was written, the objective was to ensure the immediate survival of the ferret. No reintroduction efforts had yet occurred. Tasks from the 1988 Plan associated with captive breeding have been or are being achieved and the immediate survival of the black-footed ferret is now assured. Additional specific efforts regarding recovery in the wild need to be addressed in a new recovery plan.

2) We recommend that further evaluation and consideration be given to the merits of adding multi-generational wild born ferrets (animals exposed to natural selection processes) into the captive breeding program, as a separate captive population, to ensure the continued genetic fitness of the species and to maximize the number of animals available for reintroduction in future years.

3) We encourage every State within the range of the species to assume more substantial commitments with regard to ferret recovery. Details of these recommended commitments will be outlined in the upcoming revised recovery plan.

4) We encourage States, Tribes, and Federal agencies to adopt the appropriate regulations necessary to manage ferrets and prairie dogs, and thereby achieve ferret recovery.

5) We recommend that Federal agencies more fully embrace ESA Section 7(a)(1) responsibilities to restore and manage viable prairie dog complexes to support ferret recovery.

- The Environmental Protection Agency should re-address the use of anticoagulants for control of prairie dogs.

- Both the Forest Service and Bureau of Land Management resource management plan amendment processes should fully consider development /management of habitats for ferret populations, wherever feasible.

- The National Park Service and Service should examine other opportunities for recovery on existing parks and refuges.

- To the extent practicable, the Service should secure properties via the refuge system and other means to maintain and manage prairie dog populations for sensitive, declining, and endangered prairie wildlife species, including the ferret.

6) We believe the species would benefit from the development of more effective land owner incentive and partnership programs to support habitat management on private lands.

7) The ferret recovery program is one of the Service's largest and most resource intensive recovery programs. Fiscal support has been, and will continue to be, critical

to the continued success of this program. Other forms of recognition have and will continue to benefit the program.

8) We recommend continued research with regard to disease management and the development of vaccines to better manage disease issues.

9) We recommend that we continue to explore alternative mechanisms to facilitate reintroductions under ESA. The administrative processes required to establish 10(j) experimental populations require approximately 2 years to complete as well as considerable investments of staff time and funding. Additionally, 10(j) does not provide long-term assurances of support. Refinement of the reintroduction administrative process is needed to provide sufficient resources and latitude for responsible agencies to develop more responsive, site-specific strategies for reintroduction.

10) We recommend support for the continued activities of the Black-footed Ferret Recovery Implementation Team, a coalition of State and Federal agencies, Tribes, and conservation organizations that provides the Service with input and recommendations on all matters related to the conservation and recovery of the ferret. Coordination of activities of the many partners contributing to ferret recovery is important for many reasons, not the least of which is the ongoing scrutiny and subsequent adjustments to current and proposed management actions.

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW OF THE BLACK-FOOTED FERRET

Current Classification: Endangered rangewide

Recommendation resulting from the 5-Year Review:

_____ **Downlist to Threatened**
_____ **Uplist to Endangered**
_____ **Delist**
__X__ **No change is needed**

Review Conducted by: Joy Gober, South Dakota Ecological Services Field Office

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve J Gober Date 10-28-08

REGIONAL OFFICE APPROVAL:

Lead Regional Director, Fish and Wildlife Service

Approve Richard A. Coleman Date 11/5/08

Cooperating Regional Director, Fish and Wildlife Service

__✓__ Concur _____ Do Not Concur

Signature [signature] Date 12/1/08

Regional Director, Region 2