CONSERVATION ASSESSMENT AND CONSERVATION STRATEGY FOR SWIFT FOX IN THE UNITED STATES – 2011 UPDATE

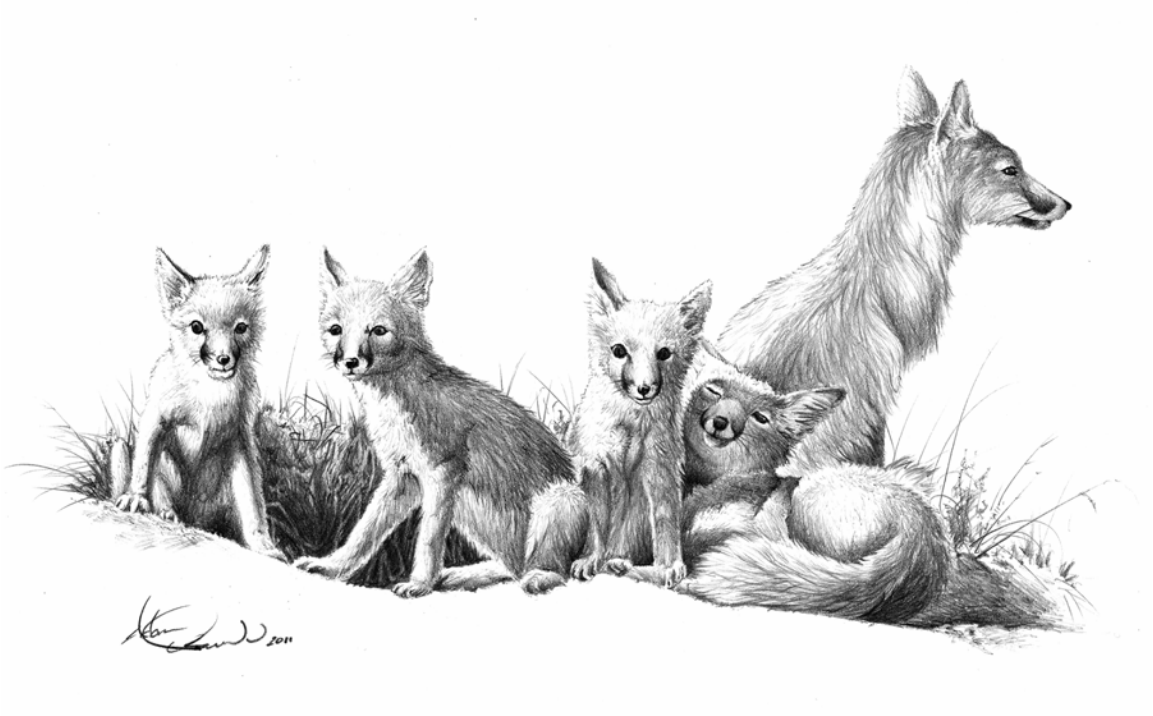

TABLE OF CONTENTS

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This document is dedicated to Kevin Honness for his enduring commitment to swift fox recovery.

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EXECUTIVE SUMMARY

In 1992, the U.S. Fish and Wildlife Service (USFWS) received a petition to list the swift fox under the authority of the Endangered Species Act in the northern portion of the species' range (Montana, North Dakota, South Dakota, and Nebraska), if not the entire range. In 1994, the USFWS concluded that listing was warranted in the entire range. Also in 1994, the 10 affected state wildlife management agencies and interested cooperators formed the Swift Fox Conservation Team (SFCT). The SFCT completed the *Conservation Assessment and Conservation Strategy for Swift Fox in the United States* (CACS) in 1997 to guide management and conservation activities. The USFWS' 12-month finding in 1995 designated the swift fox as a federal candidate species, with listing warranted but precluded by higher listing priorities. The 1997 CACS has guided activities of state, federal, tribal, and private entities to provide defensible data on swift fox abundance and distribution with a more coordinated approach to rangewide conservation and management. As a result of new information and improved coordination among partners, the USFWS removed the swift fox from the candidate species list in 2001.

The commitment of state and federal agencies, tribes, private organizations, and landowners in the U.S. and Canada to swift fox restoration continued following removal of the species from the candidate species list. The conservation strategy portion of the 1997 CACS was organized by 11 major objectives. This 2011 update summarizes accomplishments from 1995-2010 sorted by those 11 objectives, a process that helped the SFCT assess which strategies to consider in planning future activities. The USFWS evaluates species for listing or delisting activities according to specific listing factors. This document also includes a summary of accomplishments from 1995-2010 by the 5 listing factors, with an emphasis on work that has resulted in scientific, peer-reviewed publications.

This update includes a current conservation assessment of the 5 listing factors to long-term swift fox sustainability and concludes that none of the listing factors has risen to the level of a threat. This update also includes a revised conservation strategy section with associated objectives, strategies, and activities to provide a guidance framework for continued monitoring, research, and recovery for the next 10 years. Revisions to the previous conservation strategy section of the 1997 CACS reflect completion of a significant amount of work and reconsideration of remaining threats in light of current knowledge.

The overall goal of this updated conservation assessment and conservation strategy is to maintain or restore swift fox populations within each state to provide the spatial, genetic, and demographic structure of the United States swift fox population to ensure long-term species viability, to provide species management flexibility, and to encourage population connectivity. The SFCT has and will

continue to implement the conservation strategy and track progress in achieving the overall goal and associated objectives.

The 8 primary objectives for 2011-2020 are:

1. Maintain a Swift Fox Conservation Team, to include 1 representative of each of the state wildlife agencies within the historical range of the swift fox.
2. Maintain swift fox distribution in at least 50 percent of the suitable, available habitat.
3. Periodically evaluate the status of swift fox populations.
4. Identify and conserve existing native shortgrass and mixed-grass grasslands, focusing on those with habitat characteristics conducive to swift fox.
5. Facilitate partnerships and cooperative efforts to protect, restore, and enhance suitable habitats within potential swift fox range.
6. Identify and encourage research studies that contribute to swift fox conservation and management.
7. Promote public support for swift fox conservation activities through education and information exchange.
8. Maintain swift fox population viability such that listing under the U.S. Endangered Species Act is not justified.

LIST OF ACRONYMS

AFWA = Association of Fish and Wildlife Agencies
APHIS = Animal and Plant Health Inspection Service
AZA = Association of Zoos and Aquariums
BLM = Bureau of Land Management
BMP = Best Management Practices
CACS = Conservation Assessment and Conservation Strategy
COSEWIC = Committee on the Status of Endangered Wildlife in Canada
CRP = Conservation Reserve Program
CWCS = Comprehensive Wildlife Conservation Strategy
ESA = Endangered Species Act
FIFRA = Federal Insecticide, Fungicide, and Rodenticide Act
GAP = Gap Analysis Program
GIS = Geographic information system
HCA = Habitat Conservation Agreement
HCP = Habitat Conservation Plan
KDWP = Kansas Department of Wildlife and Parks
MFWP = Montana Fish, Wildlife and Parks
MSB = Museum of Southwestern Biology
MOU = Memorandum of Understanding
NPWRC = Northern Prairie Wildlife Research Center
NRCS = Natural Resources Conservation Service
NRI = National Resources Inventory
PVA = population viability analyses
SDGFP = South Dakota Department of Game, Fish and Parks
SDWAP = South Dakota Wildlife Action Plan
SFCT = Swift Fox Conservation Team
SSP = Special Survival Plan
TAG = Taxon Advisory Group
TESF = Turner Endangered Species Fund
TNC = The Nature Conservancy
TTU = Texas Tech University
USDA = U.S. Department of Agriculture
USFS = U.S. Forest Service
USFWS = U.S. Fish and Wildlife Service
USGS = U.S. Geological Survey
VOR = visual obstruction reading
WAFWA = Western Association of Fish and Wildlife Agencies
WGFD = Wyoming Game and Fish Department

LIST OF TABLES AND FIGURES

ACCOMPLISHMENTS FOR 1995-2010

ACCOMPLISHMENTS SUMMARIZED BY OBJECTIVES FROM SWIFT FOX CONSERVATION ASSESSMENT AND CONSERVATION STRATEGY, 1997

Background:

The swift fox (*Vulpes velox*) is native to the shortgrass and mixed-grass prairies of the Great Plains in the central United States, although the species has demonstrated adaptability to other habitat types. Settlement, unlimited harvest for furs, and indiscriminate use of pesticides intended for control of wolves and coyotes reduced the species' range from the late 1800s to the early 1900s. By the late 1980s, the swift fox recovered in southern portions of its historical range, although populations farther north did not (Allardyce and Sovada 2003, Sovada et al. 2009).

In 1992, the USFWS received a petition to list the swift fox under the authority of the Endangered Species Act in the northern portion of the species' range (Montana, North Dakota, South Dakota, and Nebraska), if not the entire range. In 1994, the USFWS concluded that listing was warranted in the entire range (Federal Register 1994). Also in 1994, the 10 affected state wildlife management agencies and interested cooperators formed the Swift Fox Conservation Team (SFCT), which in turn prepared a species conservation assessment and conservation strategy (CACS) document to guide management and conservation activities (Swift Fox Conservation Team 1997). The USFWS' 12-month finding in 1995 designated the swift fox as a federal candidate species, with listing warranted but precluded by higher listing priorities (Federal Register 1995). The CACS has guided activities of state, federal, tribal, and private entities to provide defensible data on swift fox abundance and distribution with a more coordinated approach to rangewide conservation and management. As a result of new information and improved coordination among partners, the USFWS removed the swift fox from the candidate species list in 2001 (Federal Register 2001).

Retaining management authority for this species was a major goal of state wildlife agencies. The commitment of state and federal agencies, tribes, private organizations, and landowners in the U.S. and Canada to swift fox restoration continued following removal of the species from the candidate species list. This document summarizes accomplishments associated with established strategies and objectives outlined in the *Conservation Assessment and Conservation Strategy for Swift Fox in the United States* (CACS). The SFCT has updated the 1997 document to reflect more recent information and reconsidered conservation needs. This update is designed to describe progress made since the 1997 CACS established coordinated objectives and strategies among the 10 states and partners.

Conservation Strategy:

The goal of the 1997 Conservation Strategy was to: "…maintain or restore swift fox populations within each state to provide the spatial, genetic and demographic structure of the United States swift fox population, throughout at least 50 percent of the suitable habitat available, to ensure long-term species viability and to provide species management flexibility." (Swift Fox Conservation Team 1997).

The Conservation Strategy portion of the CACS of 1997 included 11 objectives, with corresponding strategies and activities. State agency representatives on the SFCT were asked to summarize work in their respective states corresponding with the 11 objectives, with the assumption that they would be familiar with and summarize work by other cooperators.

This is not intended to be an exhaustive list of projects and surveys, since such information is already included in regular reports and newsletters produced by the SFCT and maintained on the team's website, which is hosted by the Colorado Division of Wildlife:

http://wildlife.state.co.us/WildlifeSpecies/GrasslandSpecies/SwiftFoxConservationTeam.htm

Several federal agencies have provided assistance across the species' range. These agencies include the U.S. Fish and Wildlife Service, USDA Forest Service, USDA APHIS-Wildlife Services, National Park Service, Bureau of Land Management, and Bureau of Indian Affairs. These agencies have played important roles in facilitating communication and providing help at local, state, regional, or national levels. A critical science partner in the SFCT's activities has been the USGS' Northern Prairie Wildlife Research Center (NPWRC), which has provided important technical expertise, research and survey design input, and assistance in coordinating and summarizing survey results.

The full CACS of 1997 is located at this site:
http://wildlife.state.co.us/NR/rdonlyres/BEE479C5-546F-471B-A052-E0B5E79554B6/0/SwiftFoxConserAssesmStrategy.pdf

Accomplishments toward CACS objectives and strategies are described from a broad SFCT perspective, followed by state-specific highlights of progress in achieving each objective, when relevant.

Table 1 summarizes the objectives, strategies, and activities contained in the 1997 CACS document. Strategies were prioritized by the following 4 categories to indicate the urgency with which the strategy should be accomplished:

Top – Have been completed or were initiated by 1996
High – Should be accomplished by 1999
Medium – Should be accomplished by 2002
Low – Should be accomplished by 2005

Table 1. List of objectives, strategies, and priorities from the SFCT CACS (Swift Fox Conservation Team 1997)

Objective	**Strategy**	**Priority**
1. Establish a Swift Fox Conservation Team	1.1 The SFCT is to coordinate and assist in directing management and research activities outlined in the conservation strategy. The SFCT will annually monitor the attainment of objectives and evaluate the completion of specific activities within each state. 1.1.1 Responsibilities of the SFCT are to: 1) determine priorities and set timetables for conservation strategy objectives and activities, 2) establish interteam technical committees that will address specific management or research needs to accomplish stated objectives, 3) draft habitat and species management guidelines when appropriate, 4) provide a forum for technical information exchange, and 5) promote state and federal funding support for specific activities. 1.1.2 The SFCT will generate an annual report to present state and regional progress toward attainment of conservation strategy objectives. An annual SFCT meeting is to be scheduled by the appointed chair to synthesize information and prepare the annual report, which will be produced each March. 1.1.3 Each state wildlife agency representative on the SFCT is to form a state swift fox working group.	Top
2. Determine current distribution	2.1 Document the present distribution of swift fox within each state utilizing various detection methods and/or species harvest data. Systematic presence/absence and population surveys or compiling site-specific harvest information should provide each state with adequate information to delineate statewide species distributions. 2.1.1 State wildlife agencies will collect and compile existing species distribution data internally and from cooperators. The SFCT will assign members to a technical committee to review techniques and standardize protocols for selected survey methods. 2.1.2 State wildlife agencies will generate initial statewide species distribution maps based on current information. Maps will be periodically updated or modified as species distribution changes or as new data become available.	Top
3. Monitor population status	3.1 Develop and implement statewide monitoring programs that provide population trend information and that detect changes in local distribution. 3.1.1 The SFCT will assign members to a technical committee for the purpose of reviewing techniques, scientific literature and findings from current swift fox research studies to develop recommendations for standardized population monitoring techniques. Results of this activity should be available by 1999.	High

	3.1.2 Each state wildlife agency will coordinate and implement a monitoring program for existing swift fox populations or newly established populations, in cooperation and with assistance of federal agencies and other interested parties. 3.1.3 The state wildlife agencies of Kansas, New Mexico and Texas which allow a legal harvest and Wyoming for incidental take of swift fox; will evaluate the feasibility of implementing a registration/pelt tagging program in addition to conducting mandatory carcass collections.	
4. Determine minimum viable population estimates and maintain genetic integrity	4.1 The SFCT is to identify, and then encourage research studies, that will address minimum viable population size estimates, monitor genetic diversity among populations and resolve species taxonomic issues. 4.1.1 Investigate minimum population viability through population monitoring, biological research and natal den studies. 4.1.2 The SFCT will assign members to a technical committee to resolve any taxonomic issue and investigate the genetic integrity of the United States swift fox population by 2005. 4.1.3 Conduct periodic testing and analysis of genetic variation among state populations.	Low
5. Identify existing native shortgrass/midgrass prairie ecosystem and other suitable swift fox habitats	5.1 Develop swift fox habitat criteria. These criteria are essential to define suitable habitat and to identify current habitat availability. 5.1.1 The SFCT will review scientific literature and incorporate findings from current swift fox research projects, particularly the Canadian swift fox reintroduction program, to develop rangewide habitat criteria.	High
	5.2 Identify and delineate existing suitable swift fox habitat within each state. This effort will form the basis for evaluating species restoration activities, and identify constraints and opportunities within each state. 5.2.1 Each state wildlife agency will coordinate with state and federal land management agencies and private landowners to conduct habitat inventories. 5.2.2 Each state wildlife agency will delineate available swift fox habitat on state cover maps utilizing the Geographic Information System (GIS) and Gap Analysis Program (GAP), report habitat acreage sizes, and describe land ownership patterns in an annual report.	High
6. Promote habitat conservation and management in occupied and suitable habitat.	6.1 Identify and delineate public lands under federal or state management control in occupied/suitable swift fox habitat. This is to be addressed initially on public lands. 6.1.1 Each state wildlife agency will coordinate with the federal and state land management agencies to evaluate current levels of legal protection of native grasslands located within federal and state ownership. 6.1.2 State and federal wildlife agencies will initiate	Medium

	habitat protection agreements with federal and state land management agencies, as habitat conservation needs are identified, by 2002. 6.1.3 Identify habitat corridors and surrounding areas between habitat blocks, based on the spatial location of suitable habitat that is available to be managed for swift fox.	
	6.2 Identify and delineate private land ownership patterns under individual or corporate control in occupied and suitable swift fox habitat. 6.2.1 State and federal wildlife agencies are to initiate land conservation or protection measures under current lands programs as limited by priorities and within funding ability, or are to consider creating a lands program with new or redirected funding sources. 6.2.2 Implement methods and techniques to gain and maintain cooperation with private landowners.	Medium
7. Expand distribution of US population to potentially occupy 50% of the available suitable habitat	7.1 Expand distribution of existing state populations and restore swift fox to unoccupied suitable habitat. Promote natural dispersal through species protection measures while developing methodology and priority areas for augmentation through wild-captured swift fox introductions. 7.1.1 State working groups will develop criteria and establish priority areas within their respective state. 7.1.2 State working groups will provide recommendations to state wildlife agencies, federal land management agencies and cooperators on priorities and timetables to implement population restoration efforts. 7.1.3 The SFCT will assign members to a technical committee to investigate and review the availability of wild/captive foxes and evaluate their potential success for releases. The SFCT will provide technical information and release protocol to state working groups and agencies considering releases.	Low
	7.2 Monitor and identify new, continued, or diminishing threats to population expansion. 7.2.1 The SFCT will assign members to a technical committee to review available scientific literature on interspecific competition and applicable control methods. 7.2.2 The SFCT and state working groups will review and incorporate information from scientific investigations that address the adaptability of swift fox to colonize non-native habitats and which evaluate the species ability to maintain itself in these habitats. 7.2.3 The SFCT and state working groups will identify and report new, continuing or diminishing threats to swift fox population expansion.	Medium

8. Integrate swift fox conservation strategy objectives with management and habitat objectives of other prairie ecosystem species	8.1 Provide swift fox distribution and suitable habitat information to other prairie ecosystem mapping efforts. 8.1.1 The SFCT and state working groups will coordinate information exchanges with similar prairie species working groups, cooperating agencies, universities and conservation organizations.	High
	8.2 The CACS for Swift Fox in the United States (CACSSF) may be subject to periodic revision to incorporate related objectives, strategies or activities which may be outlined in other prairie species conservation plans. 8.2.1 The SFCT will review the need to update or revise the CACSSF and incorporate new or changing information accordingly.	Low
9. Promote scientific swift fox management and a public education program	9.1 Provide a scientific basis for swift fox management and an avenue for technical information exchange. 9.1.1 The SFCT and state working groups will collect and compile current technical literature and management information for distribution through information requests from state and federal managers and other interested individuals. 9.1.2 The SFCT and state working groups are to provide recommendations on standard management guidelines, beneficial range management practices for swift fox, methods for data collection/database management, and current information on swift fox ecology, management, and research to wildlife and land managers, government entities, land planners, state and federal policy makers. 9.1.3 The SFCT will consider cooperating on a joint publication that promotes the scientific basis for conserving prairie species, including swift fox, for distribution to wildlife and land managers.	Medium
	9.2 Promote public support of swift fox conservation activities 9.2.1 The SFCT will develop informational and educational materials. 9.2.2 Each state working group will develop the structure for an information and education program in their state. 9.2.3 The SFCT and state working groups will jointly develop an informational package and educational initiative for private landowners, specifically addressing swift fox habitat and management needs.	Low
10. Implement research on swift fox biology and ecology	10.1 Investigate biological and ecological parameters of swift fox. 10.1.1 The SFCT is to assign members to a technical committee to review the current state of knowledge on the species and habitat requirements. 10.1.2 Each state wildlife agency and cooperators will address species/habitat needs in site-specific	Low

	areas identified as having special concerns for population maintenance. 10.1.3 Investigate the susceptibility of swift fox to common diseases and parasites in various parts of the species range.	
11. Removal of the swift fox from the ESA Category I species listing	11.1 The SFCT will initiate a cooperative effort with the USFWS to develop criteria for removal of the swift fox from candidate listing. 11.1.1 The SFCT and USFWS will evaluate current species and habitat information with developed criteria for the removal of the swift fox from the candidate species list.	Low
	11.2 States will develop a long-term management plan for swift fox. 11.2.1 Each state wildlife agency, with assistance of cooperators, will develop a comprehensive set of management guidelines which detail species and habitat conservation measures to assure species persistence.	Low

OBJECTIVES

1. Establish a Swift Fox Conservation Team (SFCT).

SFCT progress:
The SFCT was formally established in 1994 by way of a letter to the Regional Director for the USFWS Region 6 from 10 state wildlife agency directors (Colorado, Wyoming, South Dakota, Nebraska, Texas, Montana, Kansas, North Dakota, New Mexico, and Oklahoma). The state directors committed their agencies to development of a Swift Fox Conservation Strategy with specific objectives for conservation of the species and dedicated resources to achieve the strategy's goals. The team was formed under the leadership of the Western Association of Fish and Wildlife Agencies (WAFWA). In 2005, the swift fox conservation effort was incorporated into WAFWA's Grassland Initiative, which uses an ecosystem approach to species conservation and allows more direct coordination between WAFWA and the SFCT.

The SFCT is led by representatives of the 10 state wildlife agencies and includes additional representation from federal agencies and the Canadian Swift Fox Recovery Team. Participating cooperators include interested tribes, conservation and zoological organizations, universities, and state and federal agencies. The SFCT has met nearly every year since its formation in meetings that are open to the public. Team meetings provide a forum for information exchange and discussion and for distribution of annual reports, which document progress by each partner toward CACS objectives.

Individual state progress:
- Since the establishment of the SFCT, each state has provided a representative to the SFCT and, with few exceptions, representatives have participated in annual meetings (Appendix A).
- Several states formed state swift fox working groups (Kansas, Montana, and Oklahoma) to address issues specific to individual states; none of the working groups remains active. Other states incorporated swift fox issues into furbearer or grassland working groups (North Dakota, Wyoming). The Turner Endangered Species Fund formed a South Dakota Swift Fox Restoration Team in South Dakota; this group is not currently active.

2. Determine current swift fox distribution in the United States.

3. Monitor the status of swift fox populations.

SFCT progress:
Documenting distribution of swift foxes has been a major area of emphasis for the SFCT since the team's inception, partly in response to the needs of the

USFWS for their assessment of population status in the review process for potential listing. Objective 2 was accomplished by compiling existing information to produce a general distribution map. Existing information was analyzed or updated, while in other cases, surveys were conducted to accurately evaluate distribution. The initial product of known or easily acquired information was a general distribution map included in the 1997 CACS. Following that effort, the team's goal was to periodically update the estimates of distribution (Objective 3); a 5-year schedule for updates was agreed upon by team members. State agencies submitted results of surveys and other documentation of swift fox occurrences over 5-year periods to NPWRC. In turn, NPWRC compiled those submissions to produce an updated estimate of rangewide distribution (Sovada and Scheick 1999, Sovada and Assenmacher 2005, Sovada et al. 2009).

Objective 3 also recommended development of standardized data collection methods and survey protocols. The SFCT and others have examined this issue and concluded that any of several methods may produce adequate results for monitoring swift fox population trends. State agencies and other researchers have tested a variety of techniques to determine long-term feasibility. What has emerged is that a commitment to regular monitoring following protocols established for the chosen method is more important than use of a standard protocol across the species' range. Flexibility in application of specific methods for monitoring swift fox distribution allows states to tailor their monitoring based on resources available to them and the effort appropriate to their situation. For example, trapping surveys, which require significant effort, are not appropriate for North Dakota, a state with no evidence of a resident swift fox population. Also included in this objective is the SFCT's recommendation that states with legal harvest of swift foxes evaluate the feasibility of a pelt tagging program and the feasibility of mandatory carcass collection.

Individual state progress:

- Colorado conducted and published results of research that assessed trapping grids to calculate occupancy rates in eastern Colorado (Finley et al. 2005). Trapping grids is the method the state continues to apply for assessing distribution. The state statutorily defines swift fox as a furbearer species. Harvest was closed in early 1998; in 2009, responding to a petition from the public and with consideration of population estimates within the state, the Wildlife Commission reopened harvest. Presently, the harvest season is from November 1 through the end of February, with unlimited bag and possession limits.
- Kansas uses results of surveys of townships for tracks to monitor distribution, along with other detections, such as observations, road kills, and harvest records. Track surveys are conducted throughout the western part of the state over a 3-year period every 5 years (i.e., 1997-1999 and 2002-2004). Surveys are designed to allow application of Marcov Chain Monte Carlo analysis

methods to estimate distribution (Sargeant et al. 2005). In Kansas, the swift fox is managed as a furbearer, with pelt tagging required. An average of 55 swift foxes has been tagged annually since tagging began in 1994. Department personnel opportunistically collect swift fox location information year-round.

- Montana compiles location data from reported observations (e.g., observations, road kills) and from results of surveys conducted periodically for signs (e.g., tracks, dens) of swift foxes. Also, state and Canadian biologists conducted 2 capture-recapture censuses along the international border. A swift fox harvest season opened in 2010 for Region 6/Trapping District 6, which coincides with the general furbearer season from November 1 through March 1. Harvest is limited through a per-trapper limit of 3 swift fox and a Trapping District 6 quota of 20 animals in 2010. Harvest is monitored through 24-hour reporting using a Mandatory Reporting Response Entry System, a pelt-tagging period with registration requirement, mandatory hide and skull presentation for tooth/biological sample collection, and 48-hour season closure notice. The state is collaborating on a swift fox camera trapping survey in eastern Montana with the World Wildlife Fund, Bureau of Land Management, and St. Cloud State University. The project began in 2010 and is expected to be completed by the end of 2012.
- Nebraska has used several techniques to survey for swift foxes. Currently, scent station surveys are used, with a goal of surveying suitable townships every 5 years. Survey results, supplemented with road casualties and observation data, are used to estimate distribution in the state. Harvest is not allowed for this state endangered species.
- New Mexico has tested several detection techniques (Harrison et al. 2002, Harrison et al. 2004), but currently uses carnivore scat surveys with genetic analysis to confirm species identity. Results of these surveys, supplemented by information from roadkills, observations, and harvest records are used to estimate distribution in the state. The swift fox is managed as a furbearer.
- North Dakota searches for presence of swift foxes in the state with track surveys conducted in a sample of western counties. No resident population has been documented in the state, but there were 7 verified occurrences of swift foxes in the state since 2007 (i.e., road casualties and untargeted capture during fur harvest). Six of the 7 foxes had been radiocollared for study in South Dakota (see Sovada et al. 2009) and dispersed into North Dakota. North Dakota manages swift fox as a furbearer with no open season.
- Oklahoma conducted track surveys across the swift fox historical range between 1999 and 2000. These surveys revealed that swift foxes currently occupy most of their historical range in Oklahoma except for the eastern edge (about 15-20% of the range) where habitat alteration (increased tree and juniper cover) has reduced habitat suitability. Oklahoma continues to conduct track and sign surveys to estimate changes in distribution and relative abundance. Half of nearly 200 townships with suitable habitat are surveyed

for sign on a 3-year schedule, with ⅓ of the range surveyed each year. Similar to Kansas, surveys are conducted so that results can be analyzed with Marcov Chain Monte Carlo analysis methods (Sargeant et al. 2005). The swift fox is managed as a furbearer with no open season.

- South Dakota assesses presence of swift foxes in areas of its presumed or suspected range with several methods of presence/absence surveys, supplemented with incidental trapping and observation data. Four reintroductions have expanded distribution in the state, and additional monitoring continues at some of those sites. The swift fox is managed as a state threatened species and species of concern.
- Texas completed and published results of an assessment of distribution within portions of the historic range with suitable habitat by using scat surveys and live trapping (Schwalm 2007). Texas manages the swift fox as a furbearer species.
- Wyoming summarized known current distribution in 1997 and has refined the information in subsequent years. Wyoming currently surveys with track plates; transect surveys have been done in areas from which swift foxes were removed for reintroduction in South Dakota. Wyoming manages swift fox as a nongame species.
- NPWRC developed and described a cost-effective method of estimating distribution (Sargeant et al. 2005) and maintains distribution records submitted by state agencies and others; this information has been periodically summarized and displayed in distribution maps; the most current map and distribution data were published in a peer-reviewed journal (Sovada et al. 2009).

4. Determine minimum viable population size estimates and genetic integrity.

SFCT progress:
Following several discussions at SFCT meetings, the team has concluded that it is not appropriate to use population viability analyses (PVA), because the large amount of data necessary for precise estimates is not available. Moreover, Colorado and Kansas continue to support strong and stable swift fox populations. Several additional states have documented swift fox occupation of the known historical range. The successful Canadian reintroduction program has resulted in an expanding distribution of swift foxes in northern Montana, and more recent reintroductions have shown promising results in supplementing native populations in suitable habitats. Continued population monitoring across the species' range will help detect changes in abundance or distribution that merit specific conservation or management actions.

Regarding the genetic issue, the SFCT has concluded that these issues will not be resolved through the use of a technical committee, but through design and

publication of valid genetic examinations. SFCT members have cooperated in a recent genetics analysis being conducted at Texas Tech University (TTU; current graduate students Doni Schwalm and Safi Darden). The SFCT also developed a specimen collection protocol to take advantage of an offer from the University of New Mexico's Museum of Southwestern Biology (MSB) to store samples for future genetics study or other uses.

Individual state progress:

- Colorado continues to monitor its population; has submitted genetic samples to TTU; is exploring the use of lures to collect genetic materials.
- Kansas has collected materials opportunistically for TTU and for deposition at the NMMSB.
- Montana's results from the International Censuses indicate that the northern Montana/southern Canada population is viable and self-sustaining; has submitted genetic samples to TTU.
- Nebraska has submitted genetic samples to TTU and materials to NMMSB.
- New Mexico continues to monitor population; swift and kit foxes (*Vulpes macrotis*) hybridize in southeastern New Mexico.
- North Dakota has submitted genetic samples to TTU; these samples are presumably from animals that originated in South Dakota or Montana.
- Oklahoma – A study conducted by Oklahoma State University tested several population monitoring techniques, resulting in a recommendation to use scat deposition rates and time-to-track encounters to monitor populations in western Oklahoma.
- South Dakota – minimum viable population concept has been applied at the individual reintroduction area level; previously submitted samples to genetics study by Dr. Robert Wayne. South Dakota will opportunistically contribute genetic materials to TTU study.
- Texas - TTU research in progress to examine genetic relationships to patch occupancy in TX and throughout the species' range in the U.S.
- Wyoming – demography project conducted in Shirley Basin; genetic samples collected in association with swift fox trapping for TESF translocation project in South Dakota.

5. Identify the existing native shortgrass/midgrass prairie ecosystem and other suitable swift fox habitats.

SFCT progress:

This objective was written with the assumption, based on strong evidence, that shortgrass and mixed-grass prairies are the most important habitats for swift foxes. Research, particularly in Kansas and Oklahoma, has indicated that swift foxes are adaptable and able to thrive in some agricultural dominated landscapes. There is speculation that interactions with other canids, such as coyotes (*Canis latrans*) and red foxes (*Vulpes vulpes*), play important roles in

swift fox distribution and den site selection. Members of the SFCT have completed several reviews of swift fox habitat and den site selection, both within individual states and across the range. These summaries have been published in annual SFCT reports and in *The Swift Fox – Ecology and Conservation of Swift Foxes in a Changing World*, a book resulting from a swift fox symposium held in Saskatoon, Saskatchewan in 1998. The state of the art of habitat mapping continues to improve, and work on this objective will continue, both at state and rangewide levels.

Individual state progress:

- Colorado has reported swift foxes occupying the preferred shortgrass prairie, but foxes are also using marginal habitat. The Natural Diversity Information Source includes the swift fox range map and vegetation and landownership data.
- Kansas created GIS habitat maps in 1992 and 2002 as part of the GAP project.
- Montana used aerial surveys to delineate grassland habitat; larger blocks were integrated into the Natural Resources Information System to produce grassland and sagebrush habitat GIS layers.
- Nebraska created a GIS habitat map using soil type, slope and vegetative cover criteria; habitat information collected at all swift fox points to ground truth this map.
- New Mexico identified suitable habitat during preparation of CWCS using scat survey data and GIS data for shortgrass prairie; this is also used for multi-species habitat management.
- North Dakota – USGS completed a land-cover classification map in 2005 for North Dakota as part of the GAP project. The North Dakota Game and Fish Department completed a grassland habitat model for the state in 2010.
- Oklahoma has mapped and analyzed habitat within 3 km of swift fox track locations; mapped available habitat within historical range using several map sources; some habitat mapping was done in association with shortgrass high plains species of greatest conservation need habitat assessment project.
- South Dakota – habitat mapping was done in association with reintroduction projects; various ecosystem planning efforts (TNC, SDWAP) have involved habitat mapping exercises.
- Wyoming developed some predictive habitat modeling for habitats used by swift foxes.
- USGS estimated the area of potential occupancy based on current apportionment of suitable habitats within the historic range (Sovada et al. 2009). Land-cover data from GAP analyses (U.S. Geological Survey National Gap Analysis Program, http://gapanalysis.nbii.gov/portal/server.pt) and the National Land and Water Information Service (Government of Canada 2008; http://www4.agr.gc.ca/AAFC-AAC/display-

afficher.do?id=1226330737632&lang=eng) were used with suitable habitat defined by considering published research and expert opinion.

6. Promote habitat conservation and habitat management in occupied and suitable swift fox habitat.

SFCT progress:
This objective involves identifying swift fox habitats on public and private lands and, through a variety of methods and encouraging protection of habitats to benefit swift foxes. Formation of the SFCT and participation at annual meetings facilitated coordination among agencies. Achievements toward this goal have mostly occurred at the state or national grassland level. Attempts to engage the NRCS in a sustained way have been less successful, although coordination between individual state agencies and NRCS has occurred. Additionally, in 2005, the NRCS and the Wildlife Habitat Council jointly released a swift fox habitat management leaflet to describe species habitat requirements and to assist landowners and managers in developing strategies to enhance swift fox as a component of a grassland management plan (NRCS 2006). This resource is also available at this site:
(ftp://ftp-fc.sc.egov.usda.gov/WHMI/WEB/pdf/TechnicalLeaflets/SwiftFox.pdf)

Also, the NRCS Grassland Reserve Program has helped landowners to restore and protect grasslands, including rangeland and pastureland, while maintaining the areas as grazing lands. This program should benefit swift foxes. Many private organizations (e.g., The Nature Conservancy, American Prairie Foundation) are engaged in efforts to protect and rehabilitate shortgrass and mixed grass prairies. Because swift foxes have close association with these habitats, protection and restoration efforts could ultimately benefit swift foxes.

Individual state progress:
- Colorado has delineated landownership in suitable swift fox habitats through the agency's Conservation Plan for Grassland Species in Colorado.
- Kansas has identified public lands within the species' historic range; this is an ongoing task as part of the agency's larger mission.
- Montana has produced grassland GIS layers; important private lands have been identified in northcentral Montana; state conservation easements and federal programs have protected grassland habitat.
- Nebraska is aware of which public lands are within swift fox suitable habitat, but has not yet mapped them; they partner with public land agencies while conducting surveys and collecting carcasses; they also partner with private landowners through state and federal land management programs and through cooperation with TNC; swift fox is protected as a state endangered species.

- New Mexico has partially addressed mapping this priority habitat through its CWCS, an effort that will continue; land purchases and conservation easements have been made within the swift fox range for grassland species conservation.
- North Dakota has identified landownership within grassland habitat for the state.
- Oklahoma has identified landownership within the historic range. In 2003, the Landowner Incentive Program was created to provide technical and financial assistance to private landowners for the restoration, enhancement, and protection of habitats important to a wide range of at-risk species, including swift fox.
- South Dakota – swift fox is protected as a state threatened species; swift fox was identified as a species of greatest conservation need in the SDWAP; state has worked cooperatively with the Forest Service in conducting research and survey projects.
- Wyoming identified public lands during habitat mapping efforts; private lands are protected through efforts of the Landowner Incentive Program coordinator.

7. Expand distribution of the United States swift fox population to occupy 50 percent of the suitable habitat that is available.

SFCT progress:
The components of this objective are to enable expansion of swift fox populations where appropriate and feasible and to mitigate potential threats to swift fox expansion. Implementation is encouraged at the state level, but analysis has also been conducted rangewide. Grassland protection and restoration, reintroductions, and management practices that directly affect swift fox ability to pioneer in unoccupied areas (e.g., protective status from trapping and hunting) are management actions that enhance expanding distribution of swift foxes.

The SFCT established guidelines for reintroduction of swift foxes into suitable habitats that are not occupied. A number of entities have conducted swift fox reintroduction projects that have been successful. Reintroduction results are included in SFCT annual reports and in scientific journals. Discussions continue at SFCT meetings on future needs to help expand swift fox populations into suitable unoccupied habitat.

Individual state progress:
- Colorado – no population expansion needed; threats to grassland species are covered in the state's grassland plan and in TNC's Central Shortgrass Prairie Ecoregional Plan. The state of Colorado has encouraged discussion at SFCT meetings regarding the need to prioritize reintroduction sites and to encourage specific goal-setting for reintroduction projects.

- Kansas – suitable habitat is occupied; Kansas has provided swift foxes to Lower Brule Tribe, South Dakota, for reintroduction and is a potential source of foxes for future reintroductions.
- Montana has identified suitable habitats by land ownership; a number of grassland protection measures that will benefit swift foxes are ongoing, such as state conservation easements; swift fox population in northcentral Montana continues to expand as a result of successful Canadian reintroduction program; reintroduction projects have been undertaken by Blackfeet and Fort Peck tribes; evaluation continues regarding additional areas in southeastern MT for swift fox expansion.
- Nebraska protects swift fox as a state endangered species; this protected status facilitates natural expansion.
- New Mexico maintains swift fox and its habitat as priorities in its CWCS by maintaining existing habitat.
- North Dakota has not taken action on this objective.
- Oklahoma – Swift foxes occupy more than 75% of their historic range within Oklahoma. Within their occupied range in Oklahoma, track surveys are conducted in half of the townships (84 of 168 townships) on a 3-year cycle to monitor the population. Based upon track surveys at the township level, swift foxes are present in at least 62 of the 84 townships (74%). Of the townships where swift fox tracks have not been detected, most have limited suitable habitat. Based upon these monitoring surveys, most of the suitable swift fox habitat in Oklahoma is occupied.
- South Dakota protects swift fox as a state threatened species; 4 entities have undertaken reintroduction projects, including TESF, Badlands National Park, Lower Brule Sioux Tribe, and Oglala Sioux Parks and Recreation Authority; state worked with reintroduction partners to develop a protocol to facilitate reporting and retrieval of dead or lost foxes to help in data collection.
- Wyoming has established priority areas for swift fox in its state grassland management plan.
- USGS is a collaborative partner in a research evaluation of a swift fox reintroduction at Badlands National Park.

8. Integrate swift fox conservation strategy objectives with management and habitat objectives of other prairie ecosystem species such as bison (*Bison bison*), black-footed ferret (*Mustela nigripes*), burrowing owl (*Speotyto cunicularia*), mountain plover (*Charadrius montanus*), prairie-chicken (*Tympanuchus* spp.), and prairie dog (*Cynomys* spp.).

SFCT progress:
In addition to the integration and coordination component, this objective includes a strategy to evaluate the need for CACS revision. As described for other objectives, recent planning efforts by state, tribal, federal, and private entities have often been ecosystem-based, resulting in better accommodation of multiple

species that depend on a particular habitat, such as shortgrass or mixed-grass prairie. Conservation and management of native grassland habitats benefits a variety of species, both high-visibility species, such as the swift fox, and others that have not been studied extensively. This has been particularly important recently, as state wildlife agencies have completed state wildlife action plans. These plans were required to address the needs of all wildlife species. To accomplish this ambitious task, many state agencies used an ecosystem- or habitat-based planning approach. Continued attention to grassland-dependent species and escalating concerns about native grassland loss will certainly benefit swift fox. All 10 state wildlife agencies within the range of the swift fox identified this species as a species of greatest conservation need in their state wildlife action plans. The coordination role of the Western Association of Fish and Wildlife Agencies in management and recovery of prairie-dependent species has facilitated integration for the species listed above.

9. Promote scientific swift fox management and a public education program.

SFCT progress:
This objective encourages the SFCT and its partners to help fulfill information needs for management guidelines, range management practices, data collection methods, and current information to a variety of audiences and to consider cooperating on a multi-species prairie management publication to promote prairie species conservation. The SFCT has met nearly every year since its formation to exchange information and has produced 14 annual reports since 1995. These are available at: http://wildlife.state.co.us/WildlifeSpecies/GrasslandSpecies/SwiftFoxConservationTeam.htm. The SFCT and its partners participated in a swift fox symposium, held in Saskatoon, Saskatchewan, Canada in 1998, which led to the publication of the book *The Swift Fox – Ecology and Conservation of Swift Foxes in a Changing World*. NPWRC co-convened, with the Canadian Wildlife Service, the symposium and co-edited the book, which includes symposium papers and solicited chapters on key topics.

When reintroduction emerged as an issue, the SFCT prepared reintroduction guidelines to help partners plan and execute responsible and potentially successful projects. To reach a broader audience, the SFCT has produced 9 newsletters, which are available with annual reports and other documents at the SFCT website, hosted by the Colorado Division of Wildlife (see website address in previous paragraph). The SFCT assisted with the production of a Wildlife Habitat Council Fish and Wildlife Habitat Management Leaflet on swift fox, which was previously mentioned under Objective 6. No progress has been made on the idea of producing a joint publication to promote the scientific basis for conserving prairie species.

The Association of Zoos and Aquariums (AZA) has been an important partner in sharing information about swift fox to the zoo visitor community and in managing swift fox in AZA-member facilities. The swift fox falls under the AZA's Canid Taxon Advisory Group (TAG). The Canid TAG created a Species Survival Plan (SSP) for the swift fox, with Marilyn McBirney serving as the swift fox SSP coordinator. Marilyn McBirney, Pueblo Zoo and Kim Shotola, Houston Zoo, have represented the AZA at many SFCT meetings, interacting with the group on AZA needs for captive foxes and discussing educational opportunities associated with swift foxes and grassland ecosystems.

10. Implement research on swift fox biology and ecology.

SFCT progress:
This objective encourages investigation of biological and ecological parameters of swift fox, including formation of a research committee to develop and evaluate research ideas and to take advantage of research funding. The objective also encourages state-level swift fox research and investigation of susceptibility of swift foxes to diseases and parasites. Research entities successfully sought funds through a variety of sources and numerous research projects have been completed during the past 10 years. Results have been published either in SFCT annual reports or scientific journals. The SFCT successfully competed for National Fish and Wildlife Foundation funds to begin the compilation of distribution data and associated habitat characteristics work that contributed to the Sovada et al. 2009 publication. The NPWRC maintains a swift fox bibliography at the following site:
http://www.npwrc.usgs.gov/resource/literatr/swiftlit/index.htm

11. Removal of the swift fox from the ESA candidate species listing.

SFCT progress:
This objective recommends that the SFCT identify criteria for removal of the swift fox from the candidate list and recommends long-term state management planning for this species. The USFWS is required to evaluate listings based on 5 listing criteria. The SFCT has facilitated collection of survey and research information that helped provide sound biological justification for removal of the species from the federal candidate list in 2001. In addition, the proven, long-term commitment of the SFCT and its partners provided important justification for removal from the candidate list. Few states have developed single-species swift fox management plans. Many wildlife agencies have shifted their focus from individual species planning to broader ecosystem- or habitat-based planning, accommodating the needs of grassland-dependent species, including the swift fox. Overall the collective body of work of the SFCT provides a template for efforts to conserve and manage this species.

ACCOMPLISHMENTS SUMMARIZED BY ENDANGERED SPECIES ACT LISTING FACTORS

A significant amount of work has been accomplished and published since the publication of the CACS in 1997. Much of the work originated from the increased attention to this species by state, federal and tribal entities, and partners, in addition to long-term monitoring conducted by state and federal agencies as part of furbearer population monitoring or rare species recovery efforts. The following summary touches on recent studies and monitoring programs, with an emphasis on publication in scientific, peer-reviewed journals. This section is organized by the 5 listing factors considered by the USFWS for listing, delisting, and status changes under the Endangered Species Act. However, some studies are relevant to more than 1 listing factor.

An overview of swift fox ecology, distribution, and status as of 2003 presents helpful background information (Allardyce and Sovada 2003).

Present or threatened destruction, modification, or curtailment of the species' habitat or range.

Literature related to swift fox habitat and den-site selection was summarized as of 2003 (Harrison and Whitaker-Hoagland 2003).

Vegetative characteristics of denning and foraging areas were measured in southwestern South Dakota (Uresk et al. 2003b). Total vegetation visual obstruction reading (VOR) was higher at den sites than at random sites, and foraging areas had vegetation VORs greater than at random sites. The authors speculated that vegetation height-density was important to swift foxes in the study area.

Sovada et al. 2009 calculated the historical range for the swift fox in the U.S. and Canada at approximately 1.5 million km^2, which the authors considered a liberal estimate because of the inclusion of some unsuitable habitat. The authors also stated that a precise delineation of historical swift fox range may not be possible, due in part to the dynamic nature of grassland habitat. They also state that other authors may have overestimated historical swift fox range by as much as 20-25%, particularly in areas dominated by tallgrass prairie vegetation.

Sovada et al. 2009 calculated current swift fox distribution using presence or absence of occurrence records at the county level in the U.S. and based on blocks of 93 km^2 in Canada. Based on data collected from 2001-2006, the species occupies approximately 44% of historical range in the U.S. and 3% in Canada. Assuming that short-structured grasslands are the highest-quality habitat for this species, 39% of the historical range contains high-quality habitat.

Swift fox currently occupy 52% of the highest-quality habitat (565,926 km^2). The authors speculate on possible reasons for the lack of swift fox occurrence in areas with suitable habitat.

Population monitoring:

In addition to ongoing monitoring activities summarized in annual team reports, population monitoring results have been published in government publications and scientific journals.

The swift fox population in Canada and northern Montana was censused in 2000-2001 and 2005-2006 (Moehrenschlager and Moehrenschlager 2001, 2006). The 2000-2001 census resurveyed 108 Canadian townships from a census conducted in 1996-1997 and added 80 townships in Montana. Using a catch-and-release method, the census documented a 98.6% capture of unmarked foxes, a 3-fold increase in known distribution, and a sex ratio that favored females. Use of the population estimate technique from 1996-1997 indicated a total population size of 877 foxes. The 2000-2001 census revealed that the previous subpopulations now form a loosely-connected population in Canada and Montana.

A repeated census in 2005-2006 resulted in a population estimate of 1162.5 foxes, with an equal sex ratio. All captured foxes were wild-born. The population had greater connectivity than in 2001-2002, with fox captures separated by no more than 1 township. Population expansion continued in Montana (Moehrenschlager and Moehrenschlager 2006). Results of the 3 censuses contributed to the development of an analysis of habitat suitability and population viability analysis for swift fox in the Canadian-northern Montana population (Moehrenschlager and Moehrenschlager 2006). A related planning tool is a swift fox recovery plan for Alberta (Alberta Swift Fox Recovery Team 2007).

Eight habitat variables were examined at occupied and unoccupied natal dens near the Canadian reintroduction area in the early 1990s (Pruss 1999). Dens were located primarily on tops of hills with a gradual slope and tended to be closer to roads and in areas with higher grass than unoccupied dens. Selection of greater grass height may be explained by increased insect prey. Road proximity may be influenced by the availability of carrion, avoidance of roads by coyotes, and potential use of roads as swift fox travel corridors.

Swift foxes were radio-tracked near Medicine Bow, Wyoming in the late 1990s to assess home range characteristics (Olson and Lindzey 2002a). Home range size in this transition area between sagebrush steppe and grassland habitats was similar to that reported in other studies in grassland habitat. Swift fox pairs had overlapping home ranges, but overlap was minimal for adjacent pairs, possibly

indicating territorial behavior. Males had larger home ranges than females, but home ranges of both sexes were smaller during pup rearing.

The same authors reported on survival and production (Olson and Lindzey 2002b). Mean annual survival rate was 0.58. Coyotes were the main cause of death; half of the coyote-caused mortalities occurred outside the foxes' home ranges, potentially due to lack of familiarity with the area. Two swift foxes died of canine distemper, the first documented occurrence of the disease in this species. However, a number of animals had been exposed to the virus, leading the researchers to question whether canine distemper was causing serious harm to this population. Mean young per litter was 4.6, a higher figure than in other parts of the species' range, possibly due to higher prey abundance in sage habitat compared to grassland habitat.

A study at the same area in southeastern Wyoming examined home range size characteristics of 10 radio-collared swift foxes (Pechacek et al. 2000). Home range overlap was greater for paired animals than for unpaired animals, and home ranges overlapped those of neighbors. The small sample size did not allow the researchers to determine whether this population had a monogamous or polygynous mating system.

A summary of the status of swift fox in Montana as of the late 1990s described clustering of recent records in northcentral Montana (Knowles et al. 2003). A trapping-grid survey was conducted in the area to determine the extent of swift fox occupancy, which was presumably a result of swift fox expansion from the Canadian reintroduction project (Zimmerman 1998, Zimmerman et al. 2003). Zimmerman's study confirmed 3 litters in Blaine County, Montana.

A trap-grid survey was conducted in eastern Colorado to estimate swift fox population and predict occupancy (Finley et al. 2005). The best capture time was found to be September through March, and short-grass prairie habitat was an important determinant of detection probability and occupancy rate. The authors discuss drawbacks associated with such population indexing techniques as scent stations and spotlighting. Finley et al. (2005) suggest that this survey method could be improved with the use of radioed animals to determine whether trap sites attract certain individuals.

Researchers at the Piñon Canyon Maneuver Site in Colorado in the late 1990s followed movements of 90 radio-collared adult and juvenile swift foxes (Schauster et al. 2002b). Adjacent groups overlapped in seasonal areas, particularly at night, with less overlap of daytime denning areas, possibly indicating territoriality of denning areas. Adult dispersers had higher survival rates (100%) than juvenile dispersers (37.5%). Some females bred during their first breeding season. The authors found swift fox density to be negatively

associated with abundance of lagomorphs; in this area, black-tailed jackrabbits are associated with shrubby areas, which coyotes are more likely to inhabit than swift foxes. Swift foxes were positively associated with rodent abundance and negatively associated with coyote abundance. Juvenile males dispersed earlier than juvenile females, raising the question of whether pairs tolerate young females longer in case they have a role as a litter helper.

Fifty-nine social units were identified during a study at the Piñon Canyon Maneuver Site in Colorado during the late 1990s (Kitchen et al. 2005a). Pairs maintained closer contact during the breeding season than during pup rearing. Mates were farthest apart during the night, likely indicating separate foraging, a strategy that is more efficient when hunting smaller prey. Females spent more time in the core area of the pair's home range. Males appeared to spend more time maintaining their territory than did females, although males stayed closer to females during the breeding season, possibly indicating that they were guarding their mates. Females tended to stay in their territory following the loss of the mate, while 50% of males left after mate loss.

An earlier study at this site in the late 1980s estimated home range size, diets, annual survivorship rates, and mortality causes (Andersen et al. 2003). The authors concluded that coyote predation was a major source of mortality for swift fox. Also at the Piñon Canyon Maneuver Site in Colorado, researchers compared dens for radioed swift foxes to control sites (Kitchen et al. 2006a). Dens had no predominant orientation. More dens occurred in core areas, potentially as a strategy to avoid encounters with predators. The same study also examined genetic structure of the swift fox in the area (Kitchen et al. 2005b). The researchers found kin clustering, wherein neighbors were more closely related than nonneighbors, with female clusters more extensive.

Den characteristics were described from rangeland and cropland sites in northwestern Kansas (Jackson and Choate 2000). Few differences in den site characteristics between the habitat types illustrated the capacity of swift fox to exploit a variety of habitat types. Dens in cropland areas had multiple openings. They were quickly reopened if closed by farm machinery.

Swift fox patterns in rangeland and cropland sites were also compared in a study in western Kansas (Sovada et al. 2003). Home range sizes and core use areas did not differ between the 2 habitat types. The predominant cropland sites used were fallow/stubble and small grain fields. Grasslands were the primary rangeland sites used.

Another study comparing swift foxes in rangeland and cropland examined mortality, body size, and relative abundance (Matlack et al. 2000). The authors detected no difference by habitat or sex in the number of days of adult survival

following capture for radio instrumentation. Swift foxes in rangeland were killed more frequently by coyotes and vehicles. Swift foxes in cropland were killed more often from nontraumatic causes. Overall, coyotes accounted for 33% of mortalities. Adults in rangeland were 6-7% larger than animals in cropland. No difference was detected in relative abundance between rangeland and cropland.

Swift fox research in eastern New Mexico indicated that coyotes were the primary mortality cause and that diet was dominated by invertebrates and mammals (Harrison 2003). With the exception of a study in Nebraska, home range sizes were larger than those reported in other areas. This population exhibited rapid turnover, with animals generally living less than 5 years. Harrison (2003) cautioned against considering this area a “stronghold” for swift foxes without further study.

An examination of swift fox distribution in New Mexico indicated the species’ presence in nearly all historically occupied counties (Harrison and Schmitt 2003). Surveys did not detect swift foxes in areas converted to cropland and sites with abundant shrubs and taller grasses.

A study on Kiowa National Grassland in New Mexico in the late 1990s examined swift fox den site characteristics (Kintigh and Andersen 2005). Den sites had higher values for road density within 1 and 2 km and elevation index and lower values for distances to prairie dog towns and residential density within 1 and 2 km. Dens were found more frequently on soils with heavier texture than random sites. The authors offer a number of explanations for the relationship between swift foxes and prairie dogs.

Swift foxes in Colorado, New Mexico, and Texas were radio-collared to determine dispersal characteristics (Kamler et al. 2004). More adult males than females dispersed, and more juvenile males than females dispersed. Juvenile males showed bimodal dispersal peaks in September-October and January-February, corresponding to their initial independence in the fall and the breeding season, when adults may force juveniles to disperse. Adult dispersers had higher settlement rates than juveniles. Adult male dispersal may help reduce inbreeding with daughters. Males usually dispersed and abandoned pups after a mate’s death, while females typically remained in the territory to rear pups. Coyotes were the main cause of mortality. The authors caution that their results in shortgrass prairie habitats in the southern portion of the species’ range may not be applicable throughout the range of the swift fox.

A distribution survey in Oklahoma’s panhandle indicated that swift foxes were most concentrated in the westernmost portion of the area, with a wide but spotty distribution (Shaughnessy 2003). Highest detection occurred in areas with the lowest coyote detection rates.

A study in a fragmented landscape in western Texas showed strong swift fox selection for native prairie habitats, complete avoidance of irrigated agricultural fields, and nearly complete avoidance of Conservation Reserve Program grasslands (Kamler et al. 2003a). Mortalities to road kills were higher than losses to coyotes, although coyotes were heavily exploited in the study area. The authors discuss the adaptability and population increases of habitat generalist furbearers, such as coyotes, red foxes, and gray foxes, to human-caused environmental changes.

An examination of swift fox use of black-tailed prairie dogs in northwestern Texas indicated less use than expected of prairie dog towns (Nicholson et al. 2006). During the single period when swift foxes used prairie dog towns in proportion to their availability, coyotes had been reduced in the area as part of another research project. Swift foxes in the study area preyed extensively on grasshoppers, with a shift to prairie dog towns during the winter. Possible reasons for lack of overlap between prairie dogs and swift foxes in this study were swift fox avoidance of prairie dog towns to avoid encounters with coyotes and the fact that swift foxes typically hunt during the night and prairie dogs are diurnal. Prairie dog expansion in the study area resulted in disappearance of swift foxes from what was formerly a core use area.

Den use was studied at Rita Blanca National Grassland in northwestern Texas, particularly related to use of artificial escape dens (McGee et al. 2006a, McGee et al. 2007). McGee et al. (2007) documented some daytime use of escape dens. An average of 8 dens was used annually in the study area. McGee et al. (2006a) reported that recruitment rates did not differ between untreated areas and treated areas, where escape dens were added.

The critical role of den sites for swift, kit, and arctic foxes was addressed in an article that described such aspects as den site use, structure, location, and role in survival and recovery (Tannerfeldt et al. 2003).

Population monitoring techniques:

A major effort since finalization of the CACS in 1997 has been testing of various techniques to monitor swift fox populations. Although the idea of developing and using standard methodology throughout the species' range has been explored, the consensus of the SFCT has been that individual management entities must determine the most feasible and biologically defensible technique for their particular jurisdictions. The following section describes various studies to test individual and multiple population monitoring techniques.

Transects were searched for swift fox scat in New Mexico as an alternative to more time-consuming scent station surveys (Harrison et al. 2004). The authors concluded that the proportion of transects with scats and the total number of collected scats may be useful indices for determining relative population abundance. Scat-detection dogs were used to collect San Joaquin kit fox scat (Smith et al. 2005). The trained dogs were effective for finding scat under differing surface types, habitats, and population densities. Dogs detected scat in both core and satellite kit fox populations. This tool may be useful in areas with low kit fox density.

Scent-station survey results were compared for kit foxes in California and swift foxes in Kansas (Sargeant et al. 2003). Scent stations were not found to be cost effective or reliable for determining swift fox distribution. The authors detail a number of problems with this technique as it is typically operated and interpreted. Although the swift fox is not addressed, the effectiveness of scent-station surveys for furbearers in Minnesota further detailed cautions that should be associated with this method (Sargeant et al. 1998). If a scent station is the experimental unit, multiple visits by an individual to closely-spaced stations can confound results. Results from scent stations should not be used to compare abundance among differing habitat types. Scent station visits may be heavily influenced by human activity, weather, season, and habitat characteristics.

Tracking plate transects were tested as a swift fox detection method in southeastern Wyoming (Olson et al. 2003). Detection rates were calculated with the use of radio-collared animals. The authors propose that this method may be useful for detecting population declines.

Several studies have compared population monitoring techniques. Spotlight and scent-station surveys did not accurately reflect population changes in kit foxes in California (Warrick and Harris 2001). Swift fox pups typically do not emerge from the natal den until weaned at 5-7 weeks. Four methods to survey swift fox pups were examined in northwestern Texas – visual counts, night vision scope, den-probe system, and automated video monitoring system (McGee et al. 2005). Den probes did not work well. The automated video monitoring system was set up 40-70 meters from a den or radioed female and detected swift fox each time.

Techniques for determining relative and absolute abundance were compared in the Kiowa National Grassland, New Mexico (Harrison et al. 2002). Relative abundance methods included scent stations, track searching, spotlighting, and calling surveys. Absolute abundance methods were trapping followed by resighting with cameras and scat collection for DNA analysis. Track searching, spotlight surveys, and calling surveys were not efficient in this study. Scat collection was the most efficient, but also the most expensive relative abundance technique. Scat collection may not be useful in wetter climates, where scat may

mold and DNA become degraded. However, a wetter climate may make track searching a more feasible technique.

Trapping grids were used to determine swift fox occupancy rates in eastern Colorado as a follow up to a previous study (Martin et al. 2007). The authors failed to detect a population change and speculated that monitoring changes in shortgrass prairie may be a better swift fox monitoring tool, with the understanding that there will be a time lag in population response to habitat changes. The pros and cons of an invasive technique such as trapping and retrapping are discussed, along with a suggestion that scat collection for DNA be considered, despite the potential issue of gaining landowner access.

Ninety swift foxes were radio-collared at the Piñon Canyon Maneuver Site in Colorado to evaluate 6 survey methods (Schauster et al. 2002a). In order from best to worst predictors of swift fox density were mark-recapture estimates, scat deposition rate surveys, scent-post surveys, spotlight counts, and trapping surveys (catch per unit effort). Track searching (activity index) was not correlated to swift fox density. The authors include a discussion of various considerations in set up of monitoring techniques.

Smoked-plate scent stations and spotlighting were compared for swift fox detection in southwestern South Dakota (Uresk et al. 2003a). Spotlight counts were not analyzed because of insufficient numbers. Track plates counts were highest in September. The authors recommended 1-mile-long transects with baited plates every 0.3 mile, totaling 4 stations per transect, conducted for multiple nights from mid-August through September. To detect swift foxes in a rare population, spotlighting may be most useful to locate den sites and to estimate number of young produced.

Tracking plates, infra-red cameras, and spotlight surveys were used in a carnivore detection study in Oklahoma's panhandle (Shaughnessy 2003). Spotlight surveys were not time effective. Triggered cameras helped verify track identification at tracking plates, but the technique was expensive. Tracking plates were the most time and cost effective of the evaluated methods.

Wyoming Game, Fish and Parks Department (WGFD) evaluated infrared cameras, hair snares, and live trapping as potential survey methods for swift fox between May and November 2009 in southcentral Wyoming (Knox and Grenier 2010). Performance of these methods was compared using several metrics. The most efficient survey method for determining swift fox presence in southcentral Wyoming was infrared cameras. Cameras were easily deployed by 1 person and required minimal person-hours to set up and take down. Infrared cameras also effectively documented swift fox when other methods failed to do so. For future surveys the authors recommended that WGFD utilize the infrared camera

method with an array of 5 cameras per quadrat using a petroleum jelly-based skunk essence as the attractant. By using arrays of 5 cameras, more quadrats can be surveyed simultaneously, thus reducing costs and duration of the survey. Care should be taken to ensure that cameras are programmed to maximize data storage and battery life. Surveys should occur during the fall dispersal period (September–December) when swift fox detection rates are reported to be high.

Triggered infrared cameras were used during an assessment of an area in northeastern Montana to determine swift fox occupation (Bly et al. 2010). Cameras are also being used to survey swift fox presence or absence in eastern Montana (Alexander 2011).

A technique used to restore digital images was used to estimate swift fox distribution in western Kansas with results of track searching (Sargeant et al. 2005). The model estimated distribution, rather than plotting observed occurrences, which is often done for species distribution maps. With secretive, nocturnal species like the swift fox, occurrence outliers may skew distribution maps, and animals may also not be detected within core areas. The authors describe the conditions needed for this technique to be useful.

Related field techniques:

Additional recent publications relate to capture or handling techniques (Kamler et al. 2002, Kozlowski et al. 2003, Moehrenschlager et al. 2003), an aging technique (Richholt and Carbyn 2003), and the use of barking sequence analysis to classify individual captive animals (Darden et al. 2003).

Reintroduction:

In some areas, habitat may appear to be suitable for swift foxes, but the area may lack a source of animals for natural expansion. The generally successful results of the Canadian swift fox reintroduction project are well known (Carbyn et al. 1994, Herrero 2003). Parks Canada recently released an updated recovery strategy for the swift fox in Canada (Pruss et al. 2008). The population increase in Canada resulted in a change in status by the Committee on the Status of Endangered Wildlife in Canada from extirpated to endangered in 1998 (Carbyn 1998).

An experimental comparison was made between swift foxes translocated from Wyoming to resident Canadian swift foxes to determine the movement patterns of the translocated animals (Moehrenschlager and Macdonald 2003). Translocated animals did not exhibit homing toward Wyoming. They instead moved randomly from release sites for the first 50 days following release. Those with larger dispersal distances had lower survival, and translocated males had

higher survival rates than females. The authors recommended that future reintroductions use soft releases, favor females among released animals, and use juveniles rather than adults, to avoid negatively impacting experienced breeders in established home ranges.

Captive-reared swift foxes from the Cochrane Ecological Institute in Alberta were reintroduced on the Blackfeet Indian Reservation in Montana from 1998-2002 (Ausband and Foresman 2007b). Twenty-three radio-collared animals were followed to evaluate population status. Predators, mainly coyotes, caused 79% of mortalities. Raptors caused ⅓ of mortalities. Radio-collared females died at a higher rate than expected. Offering rewards for new den site location information was an effective tool.

Wild-born juveniles were captured and radio-collared on the Blackfeet Reservation to determine survival rates and dispersal tendencies (Ausband and Foresman 2007a). Most marked animals dispersed in September and October. Predation, primarily by coyotes and raptors, caused 80% of mortalities. The authors noted higher juvenile and first-year survival than in other studies, possibly due to availability of vacant swift fox habitat.

Potential impacts of juvenile dispersal from the Blackfeet Reservation to Canadian swift fox populations were described (Ausband and Moehrenschlager 2009). No Canadian animals were recovered in Montana, but a female from the Blackfeet Reservation was recovered in southeastern Alberta. Five radioed animals from Montana traveled relatively long distances, compared to other studies. The authors speculate that the relatively longer travel distances may be explained by a scarcity of prey or mates. Future reintroductions should consider the presence of small shortgrass prairie patches to aid dispersing animals.

The Cochrane Ecological Institute in Alberta, Canada, has provided captive-reared swift foxes for reintroduction (Smeeton et al. 2003). The history of the effort and protocols for captive breeding were described.

Swift fox reintroduction at Badlands National Park in South Dakota was evaluated by 2 research studies (Russell 2006, Schroeder 2007). Russell (2006) found that habitat characteristics that predicted swift fox presence were detectable at the landscape, rather than home range level. Swift foxes selected areas with less vegetation, and they were more vulnerable to coyote predation at locations with less visibility. Swift foxes used areas closer to prairie dog towns and closer to roads more than predicted randomly.

Schroeder (2007) evaluated the influences of coyote presence and release sites on translocated swift foxes. Of model variables tested, only mean distance moved from the release site contributed to the final model. The author

recommended that future releases continue to use translocated wild animals, be composed of equal sex ratios, and use short-term, soft-release enclosures. Coyotes were not removed prior to swift fox releases.

Disease or predation:

Disease:

A summary of known parasites and diseases that affect swift foxes indicated that fleas were the most abundant ectoparasites, that canine distemper has been rarely documented, but that limited study in this subject area has occurred (Pybus and Williams 2003). A disease survey in southeastern Colorado documented swift fox mortality from canine distemper and described seroprevalence in swift foxes and coyotes for several viruses and diseases (Gese et al. 2004). Disease analysis was conducted on swift foxes at Pawnee National Grassland in Colorado, in association with collection of animals for reintroduction at Badlands National Park in South Dakota (Salkeld et al. 2007). Fifteen of 61 foxes were seropositive for plague. *Pulex simulans* was a common flea on tested animals, although none of the fleas tested positive for plague. The study did not resolve whether swift foxes were facilitating plague outbreaks in this area. Swift fox parasites were surveyed in southeastern Colorado (Miller et al. 1998). The authors speculated that effects of parasites on swift fox reproduction or mortality are compensatory to other causes. The same senior author led a disease survey in swift and kit foxes from 7 western states (Miller et al. 2000). Prevalence rates for 12 infectious diseases are summarized.

The role of swift fox in plague transmission was also examined in New Mexico (Harrison et al. 2003). Flea species were identified on kit, swift, red, and gray foxes. All but 2 flea species found are known to carry plague, which occurs in all New Mexico counties. The authors concluded that any fox in the state is a potential plague carrier. A study in northwestern Texas documented 3 flea species and 1 tick species on swift fox (Pence et al. 2004). Swift foxes were captured at Rita Blanca National Grassland in northwestern Texas, in association with a sylvatic plague outbreak (McGee et al. 2006b). Although some of the swift foxes were seropositive for plague, none of the fleas tested positive for *Yersinia pestis*. The authors concluded that swift fox likely play a minor role in plague transmission and have the tendency to produce an immune response to *Yersinia pestis* without developing plague.

Predation:

Predator impacts were compared for swift foxes in Canada and kit foxes in Mexico (Moehrenschlager et al. 2007). Swift fox survival rates were lower than kit fox survival rates due to impacts of golden eagle (*Aquila chrysaetos*) and coyote

mortality. Canadian swift foxes had home ranges that were 3 times larger than Mexican kit foxes, potentially putting the Canadian animals in greater contact with coyotes at home range margins. Kit fox home ranges decreased as prevalence of prairie dog colonies increased, likely due to the escape cover and refuge provided by prairie dog burrows. The authors did not detect habitat partitioning between coyotes and either fox population.

San Joaquin kit foxes with home ranges that overlapped coyotes had an increased probability of death (Nelson et al. 2007). The 2 species partitioned prey; kit foxes preyed on rodents and insects, with coyotes focusing on rabbits and rodents. Although shrub habitats had higher prey availability, coyotes dominated these sites, causing kit foxes to occupy grassland habitats. Resource partitioning was also examined in Colorado (Kitchen et al. 1999). Radio-equipped swift foxes and coyotes at the Piñon Canyon study site in Colorado had overlapping home ranges and a high degree of dietary overlap, with some partitioning. Coyotes were more likely to attack swift foxes that were a substantial distance from den sites. The authors caution that results from a study site with a stable swift fox population may not be relevant to an area with a declining or recovering population.

Karki et al. (2007) studied impacts of coyote removal on swift fox at the Piñon Canyon site in Colorado. Swift fox and coyote home ranges overlapped. Coyote removal led to increased juvenile swift fox survival. However, swift fox densities were similar between areas with and without coyote removal, indicating that the dispersal rate was a compensatory factor among juvenile swift foxes. The authors speculate that coyote removal may aid swift fox recovery, even temporarily, but removal likely must be practiced long term and remove a large proportion of coyotes (Karki et al. 2007).

An estimated 56% of the coyote population was removed from a study site during the final year of a larger study on Rita Blanca National Grassland in Texas (Kamler et al. 2003b). Swift fox survival increased; deaths due to coyotes decreased; and fall swift fox density, relative abundance, and recruitment rate increased. The authors concluded that coyote reduction may enhance swift foxes in areas where the population is below the carrying capacity, but constant coyote reduction is needed. Other pertinent findings from the larger study included swift fox avoidance of coyote territories (Kamler et al. 2003c). Swift foxes often sited dens near roads, which coyotes tended to avoid. The extent of dietary overlap was also examined in the larger study, based on feces collection (Kamler et al. 2007a). Insects and rodents dominated the swift fox diet. Coyotes were more general in diet selection, but mammals dominated coyote diets year-round. Overlap was greatest during the winter and least during the summer. Although resources were partitioned by mammal prey size, the high degree of overlap may

contribute to the high rate of swift fox kills by coyotes and the displacement of swift foxes by coyotes on this study site and elsewhere.

Swift fox mortality was compared in cropland and rangeland in Kansas (Sovada et al. 1998). No difference was detected in mortality rates between the study areas for the adult or juvenile age class. Coyotes were the major mortality factor. Juveniles were vulnerable to vehicle collisions in the cropland study area, most likely because of the higher road concentration. No losses to disease or starvation were detected. The authors caution against automatic coyote reduction as a tool for enhancing swift fox populations because of the possibility that red foxes will increase in the area.

Inadequacy of existing regulatory mechanisms.

The 1997 CACS included a table summarizing the legal status and harvest seasons, if applicable, for states within the swift fox range. The following table presents updated information as of 2010. Note: All 10 state wildlife agencies within the range of the swift fox identified the swift fox as a species of greatest conservation need in their respective state wildlife action plans.

Table 2. State legal status and harvest seasons for swift fox, 2010

State	Legal Status	Harvest Season	Season Dates/Limits/Additional Comments
Colorado	Furbearer	Open	Season recently reopened (November 1 – end of February); unlimited bag and possession limits. Pelt tagging not required.
Kansas	Furbearer	Open	May be taken with legal hunting or trapping equipment by landowners or furharvester license holders. Open season mid-November – February 15. Pelt must be tagged by KDWP representative within 7 days of close of the season. No limit on take. Less than 100 animals/year harvested in recent years.
Montana	Furbearer	Open	Portion of Trapping District 6 open from November 1 – March 1. Quota of 20 animals. Season will close in 48 hours upon reaching trapping district quota or on the season closure date, whichever occurs first. Trappers may take and possess 3 swift foxes per season. Pelt tagging is required. Skulls must be turned in to MFWP personnel for processing and examination at the time the pelt is presented for tagging. Montana Fish, Wildlife and Parks Commission also approved an additional 20 swift foxes be available for live capture and translocation.
Nebraska	Endangered		N/A
New Mexico	Furbearer	Open	Statewide during open season (November 1 through March 15). Estimated sustainable harvest limit for swift fox is 2,231-3,702 animals. Estimated harvests for 2007-2009 are far below this limit for both swift and kit fox. Pelt tagging is not required.
North Dakota	Furbearer	Closed	Incidental capture or trapping must be reported and carcass turned over immediately to ND Game and

			Fish Department.
Oklahoma	Furbearer	Closed	N/A
South Dakota	Threatened		N/A; incidentally-taken carcass must be turned over to SDGFP immediately.
Texas	Furbearer	Open	Regulated take during September 1 – March 31 season. May also be taken if creating a nuisance or with a valid hunting license during regular hunting season (September 1 – late May). Pelt tagging is not required.
Wyoming	Nongame mammal protected from take by Chapter 52	Closed	Incidental take allowed under certain circumstances.

Other natural or manmade factors affecting its continued existence.

Food habits:

A study at the Piñon Canyon Maneuver Site in Colorado examined swift fox-coyote interactions (Thompson and Gese 2007). Swift foxes were negatively related to coyote abundance and vegetative structure. The authors concluded that their results supported the premise that top predators, such as coyotes, are aligned with resource availability (resource match) and that intermediate predators, such as swift fox, use resources under the influence of a predation risk (safety match).

The black-tailed prairie dog was the most frequently found prey item in scat collected from kit foxes and coyotes at and near prairie dog towns in northcentral Mexico (List et al. 2003). Other important food items included insects, kangaroo rats, small mammals, ground squirrels, and lagomorphs. Mammal and insect remains predominated swift fox scat collected at cropland and rangeland sites in western Kansas (Sovada et al. 2001). The authors detected no food habit differences between the 2 habitat types for mammals, arthropods, or carrion. Sunflower seeds were often eaten in cropland. Diet was assumed to reflect prey availability in this study.

Swift fox diets in continuous and fragmented prairie habitats in northwestern Texas were evaluated (Kamler et al. 2007b). Swift fox diet in continuous prairie sites contained more insect remains, with greater consumption of mammals, birds, and crops on fragmented prairie sites. Fragmented sites, particularly lands enrolled in the Conservation Reserve Program, offered a greater diversity of food items. However, these sites may favor coyotes, adding a predation risk to swift foxes.

Breeding strategies:

Swift foxes are presumed to be socially monogamous. Breeding strategies were examined at the Piñon Canyon Maneuver Site in Colorado (Kitchen et al. 2006b). The researchers identified 93% of social groups as male-female. They also identified and followed 4 stable trios, which were located in an area of high fox density. At least 1 trio member was highly related to at least 1 other member of the trio. The authors documented that 52% of offspring were sired by a male other than the female's mate. They also documented mate switching, typically to a younger partner.

Interbreeding and genetics:

Swift and kit fox interface in eastern New Mexico and western Texas, where 78 specimens were examined for 14 skull measurements (Rohwer and Kilgore 1973). The authors found some specimens to be intermediate in skull morphology, but suggested that selection continues to oppose intermediates in favor of separate forms. No recent shifts in the interface are suspected.

Taxonomic distinctions between kit and swift fox have long been debated (Dragoo et al. 1990) and much of the information was recently summarized (Dragoo and Wayne 2003). Dragoo and Wayne (2003) supported combining the 2 species into a single species and recommended that conservation focus on maintaining genetic flow between populations, unless they have been isolated for a long period of time.

CONSERVATION ASSESSMENT, 2011

Conservation Status:

In 1992 a petition was submitted to the USFWS to list the swift fox under the Endangered Species Act (ESA) in the states of Montana, North Dakota, South Dakota, and Nebraska, if not throughout its entire range. The USFWS published a 90-day finding in 1994 that concluded that a species listing may be warranted rangewide (Federal Register 1994). The 10 state wildlife management agencies affected by this decision and interested cooperators formed the Swift Fox Conservation Team (SFCT) in 1994 to develop a species conservation assessment and conservation strategy document that would provide a framework to direct conservation of the species as an alternative to a federally mandated recovery effort. In 1995, with the knowledge of this initiative, the USFWS published a 12-month finding of a warranted, but precluded to higher listing priorities (Federal Register 1995). The USFWS concluded that the magnitude of threats to the species was low to moderate although the immediacy of threats remained imminent. In 2001, the USFWS reviewed the status of swift fox populations and determined that the magnitude and immediacy of threats to the species were not such that warranted listing under the Endangered Species Act (Federal Register 2001).

The ruling stated that the continuity of populations indicated an apparent viability and vitality that demonstrated that the magnitude and immediacy of threats to the species was sufficiently reduced to a level that precluded the necessity of listing. However, vigilance in monitoring populations was recommended to ensure conservation of swift foxes. Recognizing the need for vigilance, state and federal agencies have reaffirmed their commitment to accomplishing the goals established by the SFCT and their support of necessary conservation actions that ensure healthy populations of the swift fox.

Risk Assessment:

In reviewing species' status for listing, USFWS is obligated by the ESA to analyze 5 factors in terms of their effects on (i.e. threats to) species:

A. Present or threatened destruction, modification, or curtailment of the species' habitat or range;
B. Overutilization for commercial, recreational, scientific, or educational purposes;
C. Disease or predation;
D. Inadequacy of existing regulatory mechanisms; and
E. Other natural or manmade factors affecting its continued existence.

In this risk assessment current information regarding threats is summarized followed by an evaluation based on our present understanding of each threat. This evaluation contributes to tailoring a framework for continued management and conservation of the swift fox.

A. Present or threatened destruction, modification, or curtailment of the species' habitat or range.

The National Resources Inventory (NRI) provides information on status and trends of land, soil, water, and related resources on nonfederal lands in the U.S. These lands may be privately owned land, tribal and trust lands, and lands managed by state and local governments. The most recent NRI summary allows comparisons at periodic intervals between 1982 and 2007 (U.S. Department of Agriculture 2009). Three broad habitat categories with some relevance to swift foxes in the U.S. are pastureland, rangeland, and CRP. Land cover in pastureland was 130,896,300 acres in 1982 and 118,615,700 acres in 2007. Land cover in rangeland was 417,899,500 acres in 1982 and 409,119,400 acres in 2007. CRP acreage cannot be compared for the same time period, because the program did not exist in 1982. From 1997 to 2002, CRP acreage declined from 32,690,500 acres to 31,990,300 acres.

Where native prairies remain, they are often fragmented into smaller and isolated areas, resulting in reduced available habitat and prey. These remnant prairies do not function as did the once expansive shortgrass ecosystems that swift fox occupied prior to the arrival of European settlers. Replacement of bison with domestic livestock and the suppression of fire have resulted in changes in plant community composition and landscape patterns (Bragg and Steuter 1996, Weaver et al. 1996). Agriculture, residential development, and other commercial developments have been pervasive in the shortgrass and mixed-grass prairies; yet swift fox populations have shown some ability to adapt, and populations are relatively widespread.

Sovada et al. 2009 estimated swift fox historical range and current distribution. For the estimate of historical range, the pre-settlement extent of the shortgrass and mixed-grass prairies was used as a base map from which unsuitable habitat types, such as large forests and shrub-dominated and montane areas, were removed (Figure 1). Numbers on Figure 1 correspond to marginal historic records described in Sovada et al. 2009 that help to define extent of distribution. This assessment estimated the historical area with swift fox habitat was approximately 1,448,057 km^2 in the U.S. and Canada. Based on survey information collected from 2001-2006, the authors estimated that swift fox occupied 44% of the species' historical range in the U.S. and 3% in Canada. Acknowledging short-structured grassland as the highest quality habitat for swift foxes, 39% of the estimated historical range remains as suitable habitat in the U.S. and Canada (Figure 2). Of these highest quality habitats, the authors estimated that 52% of the habitats are presently occupied by swift fox.

Distribution and occurrence have been confirmed in many counties throughout the species' historic range since 1995 (Sovada and Scheick 1999, Sovada and

Assenmacher 2005, Sovada et al. 2009), particularly in the states of Colorado, Kansas, New Mexico, Oklahoma, and Wyoming (Figure 3). These states contain the core of swift fox distribution and contribute to expanding distribution in adjacent states. The species' distribution is relatively widespread; however, distributions and associated densities are highly variable among the 9 occupied states (Swift Fox Conservation Team 1997). It is generally agreed that swift foxes evolved in the shortgrass and mixed-grass prairie ecosystems; numerous studies have provided supportive data to that assertion. However, swift foxes are surviving in some altered habitats, but we do not clearly understand what the requirements are to maintain viable swift fox populations in altered landscapes.

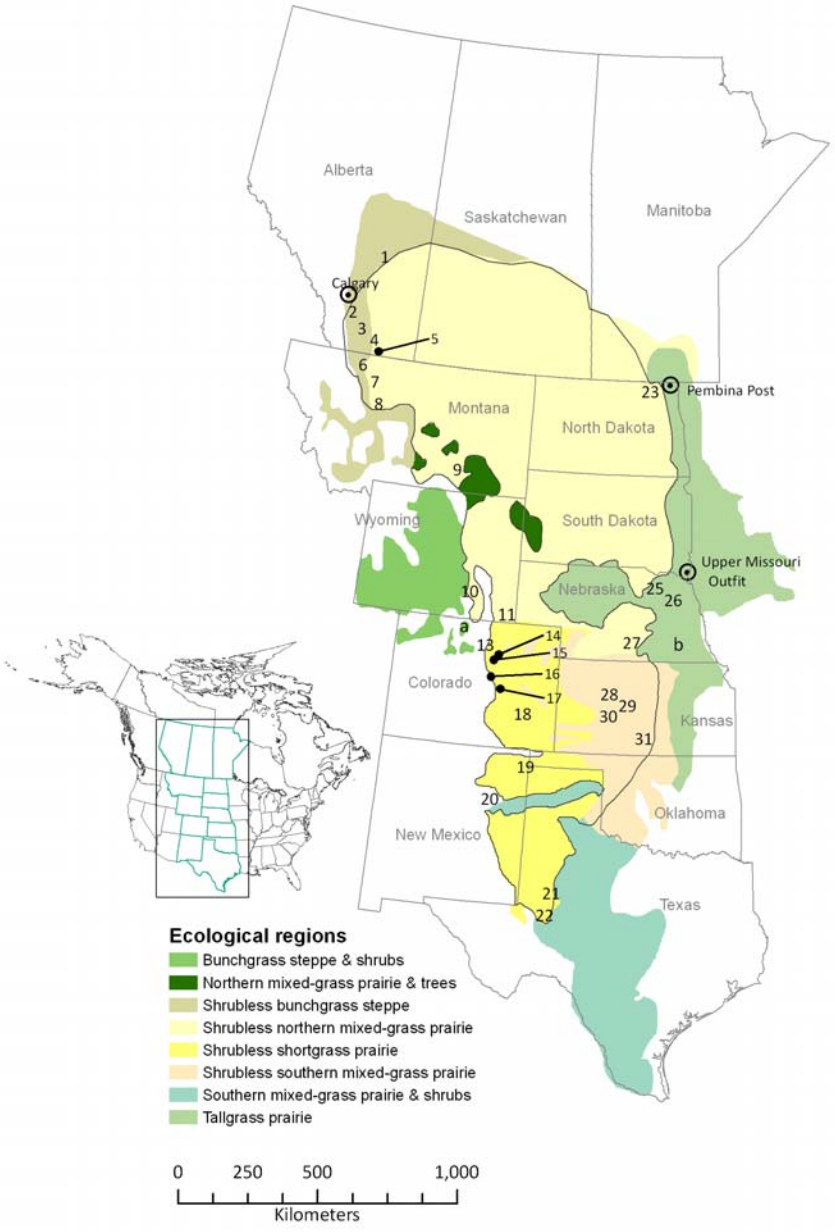

Figure 1. Ecological regions (modified from Risser et al. 1981) within the range of the swift fox in the U.S. and Canada (Sovada et al. 2009)

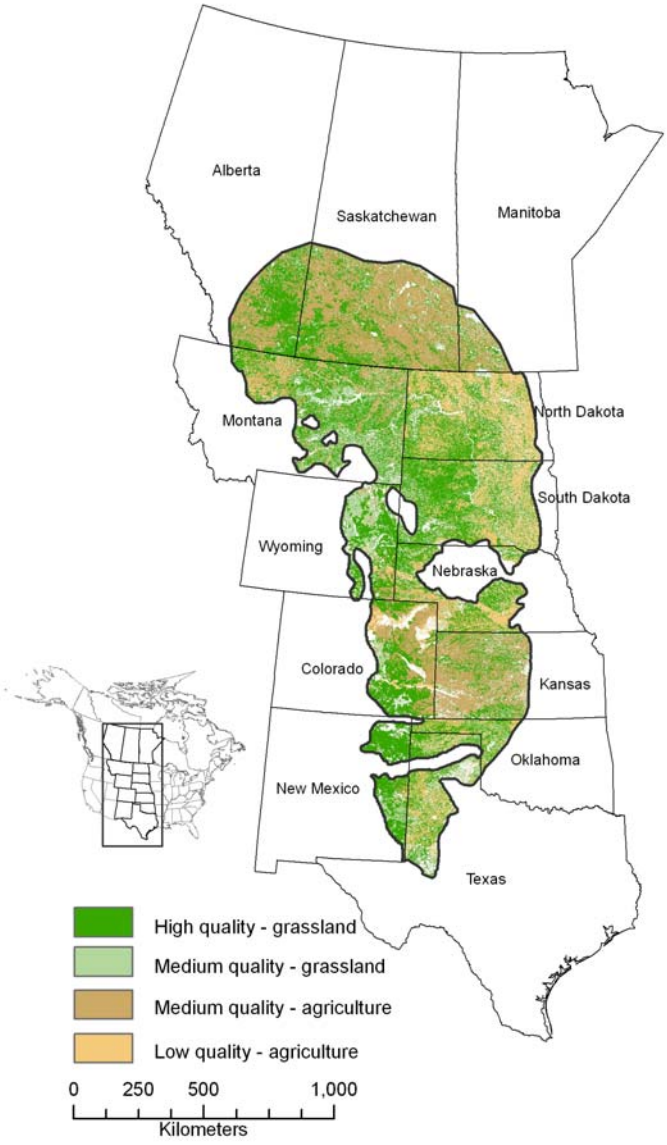

Figure 2. Delineation of high, medium and low quality swift fox habitat in the U.S. and Canada (Sovada et al. 2009)

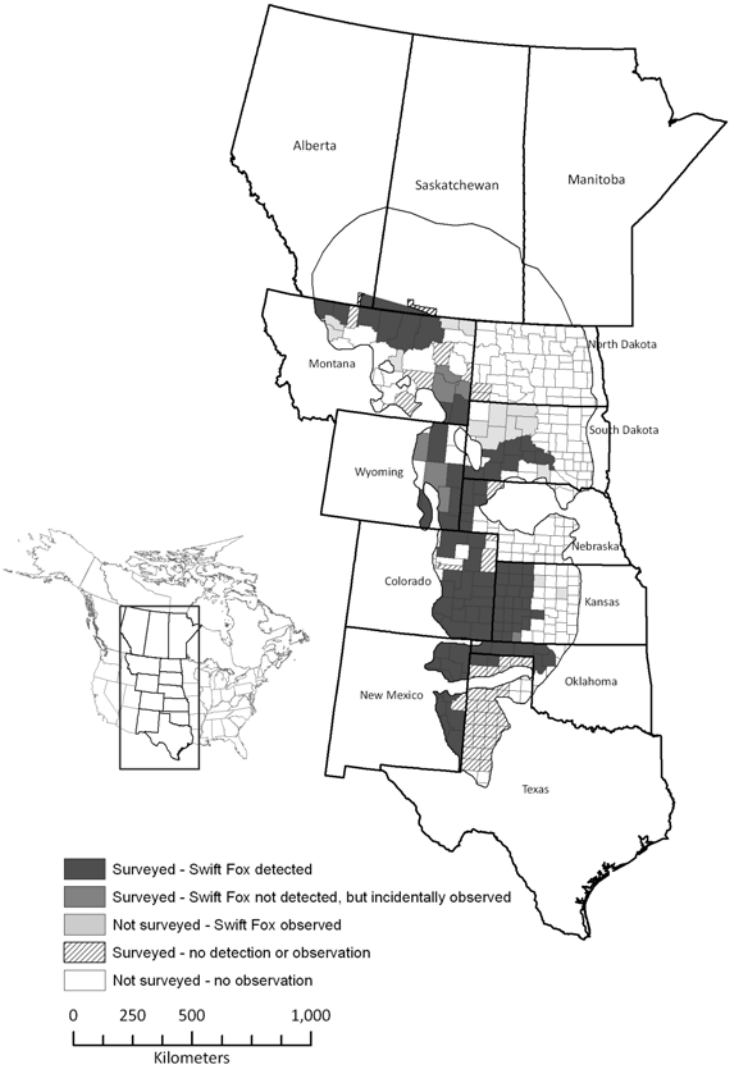

Figure 3. Swift fox occupancy by counties based on data collected from 2001 to 2006 (Sovada et al. 2009)

Habitats within the shortgrass and mixed-grass prairie ecosystems are recognized as providing: 1) the "essentials" of a diverse prey base, 2) level to slightly undulating topography which affords long viewing distances to allow detection of predators, and 3) firm and friable soils that are suitable for the excavation and maintenance of multiple den sites for year-round use. Habitats in today's altered landscapes can vary significantly, and their suitability for swift foxes is difficult to assign. Swift fox populations occupy a variety of habitat types, including the establishment of populations in a mixture of cropland and rangeland. Researchers in Oklahoma (Kilgore 1969) and Nebraska (Hines 1980) reported swift fox populations inhabiting habitats of mixed agricultural use in Oklahoma and Nebraska, respectively. In western Kansas, swift foxes are commonly found in cropland-dominated landscapes, which include fragments of shortgrass prairie, but are largely comprised of fallow cropland, wheat, sunflower, and irrigated crop fields (Fox and Roy 1995, Sovada et al. 1998, Jackson and Choate 2000). However, not all habitats are used by swift foxes in proportion to their availability (M. Sovada, unpublished data). Swift foxes have been documented denning in fallow cropland fields in Texas (Jones et al. 1987) and Kansas (Jackson and Choate 2000). Researchers in Wyoming found swift foxes in shortgrass, mixed-grass, sagebrush-grassland, and sagebrush-greasewood habitat types with topography ranging from flat to badlands-like terrain (Woolley et al. 1995). In Montana, no den sites were observed in any habitat other than native rangeland, but 1 capture out of 16 occurred in mixed habitat during the 1996 trapping efforts (Giddings and Zimmerman 1996). Paradoxically, a study in New Mexico did not document the use of mixed agricultural/rangeland habitats by swift foxes (Harrison and Schmitt 1997).

The conversion of native grassland prairies has been implicated as 1 of the most important factors for the contraction of the swift fox distribution (Hillman and Sharps 1978). We believe that alteration of the landscape likely influences local and seasonal prey availability. However, in Kansas and perhaps portions of Oklahoma and Colorado, a mixed agricultural/rangeland landscape does not appear to necessarily diminish the habitat value of associated grasslands from a forage availability standpoint. In fact, Kansas biologists believe that agricultural systems on privately owned lands are crucial to swift fox conservation because publicly owned lands in Kansas are either too small or inadequate to support swift fox populations (C. Roy, Kansas Department of Wildlife and Parks, personal communication). The SFCT has suggested that " . . . it is not solely the conversion of prairie to cropland that hinders current swift fox restoration efforts but also juxtaposition of the remaining prairies, management of rangelands, cropping patterns of farmlands, and changes in canid communities that occur in response to the conversion of prairie habitat to cropland" (Swift Fox Conservation Team 1997).

Just as farm policies of the past have encouraged conversion of native prairies to cropland (Baydack et al. 1996), farm policies of the future could impart restoration of habitat suitable for swift foxes. The Conservation Reserve Program (CRP) established under the 1985 Farm Bill and renewed under the 1996 extension has stimulated conversion of millions of croplands to perennial grassland cover (Young and Osborn 1990). However, in many areas of the shortgrass prairie, CRP fields were planted to tallgrass prairie species or non-native grasses (Sovada et al. 2009). When these fields are not grazed, mowed, or burned, they develop dense tall stands of grasses that are not suitable for use by swift foxes (Swift Fox Conservation Team 1997). Current regulations for CRP lands do not provide adequate habitat guidelines that would benefit swift foxes. New CRP guidelines could provide incentives for participants in the CRP to plant native shortgrass species that are better suited for use by swift foxes. However, with the reauthorization of the Farm Bill in 2008, and escalating commodity prices, even greater pressure will be put on producers to bring more acres into production. The reauthorization of the Farm Bill already lowered the cap from 39.2 million acres down to 32 million. While there are other provisions in the 2008 Farm Bill that could offset losses of CRP lands and potentially benefit swift fox conservation, it will be the juxtaposition and timing of implementing these other programs that will determine whether they will contribute to swift fox conservation. Another consideration related to CRP lands is the possibility that CRP fields previously planted to tallgrass species may be replaced by dryland agricultural uses, which may benefit swift foxes.

Habitat destruction and modification has occurred at local levels, although it appears not to have risen to the level of a threat throughout the species' range. Monitoring by the SFCT identified swift foxes as more flexible in their habitat requirements than originally believed. As the new Farm Bill is being implemented, continued habitat monitoring by the SFCT will be prudent. Information on changes in habitats and associated swift fox distribution might provide insight to swift fox response to landscape changes. It is the SFCT's view this factor has not risen to the level of a threat.

Potential topics for further research:

1. Monitor swift fox response to landscape level changes in habitats, such as restoration of native rangeland, shifts from dryland cropping systems to irrigated cropping, and changes in CRP enrollment.
2. Evaluate the effects of native prairie patch size and juxtaposition of agricultural lands and prairies on swift foxes.
3. Monitor swift fox populations in habitats dominated by cropland to determine if these populations are sustained long-term.
4. Examine why swift fox use of cropland is variable.

B. Overutilization for commercial, recreational, scientific, or educational purposes.

Determining the magnitude and significance of harvest on swift fox populations as a result of trapping, hunting, predator control, and other activities has been difficult due to limited data across the species' range. Although private predator control activities result in swift fox mortalities, it is unknown if these activities are a major source of mortality that directly impacts local populations. Predator control activities conducted by the U.S. Department of Agriculture - Animal and Plant Health Inspection Service - Wildlife Services targeting coyotes are responsible for a small number of incidentally-taken swift foxes. However, coyote control activities may in fact benefit some local swift fox populations. Many wildlife biologists concur that annual mortality resulting from these activities is a minor portion of total swift fox mortality (Swift Fox Conservation Team 1997). Studies conducted in different parts of swift fox range have confirmed predation by coyotes is the most significant mortality factor (Laurion 1988, Carbyn et al. 1994, Sovada et al. 1998, Kitchen et al. 1999). Additional interspecific competition with red foxes may exacerbate this problem, (e.g. Ralls and White 1995 report influences of red fox); M. Sovada, unpublished data). Several recent studies examined the impact of coyote control on swift fox populations (Kamler et al. 2003b, Karki et al. 2007).

There is insufficient information to directly assess the impact of harvest on swift fox distribution or population densities; therefore, the importance of harvest in limiting or regulating swift fox populations is uncertain. However, available evidence suggests that regulated harvest has had no impact in limiting swift fox populations. For example, swift fox populations in Colorado have remained widespread despite 55 years of regulated harvest. No noticeable reduction in distribution has occurred in Kansas since the opening of a trapping season on swift foxes in 1982. In comparison, swift foxes have been protected from harvest in South Dakota, Nebraska, and Oklahoma, with no apparent increase in distribution or population densities during the same period. Few furharvesters specifically target swift foxes, and most that are taken are incidental to coyote trapping (Peek 2002).

The SFCT continues to evaluate the genetic integrity of swift fox, monitor population status, and maintain a captive population managed by a Species Survival Plan, directed by the AZA. The states of Wyoming, Colorado, and Kansas continue to support strong and stable swift fox populations, and swift foxes continue to occupy historical range in other states. Reintroduction efforts have expanded swift fox distribution, with no detected impacted source populations. It is estimated that swift foxes occupy 44% of historical range within the U.S. and 3% of historical range in Canada (Sovada et al. 2009). Reintroductions continue to fill vacant habitat. The captive breeding program is

being maintained through careful management and incorporation of swift foxes that cannot be released back into the wild.

While swift foxes continue to be used for commercial, recreational, scientific, or educational purposes, populations appear to be stable throughout the range. It is the SFCT's view this factor has not risen to the level of a threat.

C. Disease and predation.

Although parasite and disease agents in wild swift fox populations have not been extensively studied, there is no indication that parasites or diseases are significant factors in the population dynamics of wild foxes. It is believed that swift foxes share a community of parasites and diseases with sympatric canids and have not developed a specialized suite of agents. Various disease agents have been documented serologically (e.g., sylvatic plague and canine distemper) (Pybus and Williams 2003); however, there are few cases of confirmed overt diseases in wild swift foxes. Two studies have documented canine distemper in swift fox (Olson and Lindzey 2002a, Gese et al. 2004). In the past 2 decades, sarcoptic mange has been a significant mortality factor for red foxes and coyotes in parts of North Dakota and South Dakota. If mange spreads to areas with established swift fox populations, mange could become a significant source of mortality in localized areas.

Predation by mammalian and avian predators, such as American badgers and golden eagles has been documented (Carbyn et al. 1994, Andersen et al. 2003). Predation by coyotes is the most important natural mortality factor for swift fox populations in the United States and Canada (Laurion 1988, Covell 1992, Carbyn et al. 1994, Sovada et al. 1998). The reported annual mortality rates (range from 0.47 to 0.57; Covell 1992, Sovada et al. 1998, Andersen et al. 2003) may seem high, yet they are similar to rates reported for other North American foxes (Lord 1961, Storm et al. 1976, Cypher and Schrivner 1992, Disney and Spiegel 1992, Ralls and White 1995). It has been suggested that potentially high reproductive rates may compensate for high mortality rates (Sovada et al. 1998). In some situations, control of coyotes may enhance distribution and abundance of swift fox populations. However, managers should carefully weigh the likelihood of significantly improved survival and dispersal to the costs of effectively controlling coyotes. Consider the results of a study by Cypher and Scrivner (1992), in which they attempted to reduce coyote numbers to increase kit fox survival. Despite reduction in the coyote populations, they were unsuccessful in reducing coyote numbers sufficiently to affect kit fox populations. Also consider the reintroduction of swift foxes to Badlands National Park and the surrounding grasslands; areas with a relatively dense coyote population. This reintroduction was successful despite no effort to control coyotes (Schroeder 2007).

The relationship between red foxes and swift foxes is unknown, although preliminary data analysis of an experimental study examining this relationship suggests that red foxes are a barrier to swift fox populations expanding into unoccupied, but suitable areas (M. A. Sovada, unpublished data). Ralls and White (1995) reported that although coyote predation on kit foxes can be severe, red foxes may pose an even greater threat to kit fox populations because where red foxes rapidly moved into areas occupied by kit foxes, the red foxes appeared

to displace the kit foxes. Based on known interspecific relationships between other canids, the red fox may be a substantial barrier to swift fox range expansion and may be more detrimental to swift foxes than coyotes (Ralls and White 1995). Although unraveling canid relationships is challenging, swift foxes are clearly impacted by interference competition from both red foxes and coyotes.

Undoubtedly, predation and disease have always been mortality factors impacting swift foxes. Overall, as with other species, the rangewide population should not be affected by reasonable rates of mortality. To safeguard against severe decline in the population, continued monitoring by individual states should detect widespread, unusual losses so management actions can be applied. At this time, it is the SFCT's belief that predation and disease are not threatening population stability.

Potential topics for further research:

1. Evaluate the influence of competitive exclusion by other canids on swift fox dispersal and potential growth.

D. Inadequacy of existing regulatory mechanisms.

Swift foxes are managed under state laws in all 10 states that encompass the species' historical range and are currently protected from harvest through laws or regulations in 5 of these states (Table 2). All 10 state wildlife agencies within the range of the swift fox have identified this species as a species of greatest conservation need in respective state wildlife action plans. Trapper education programs are becoming more available to fur harvesters and, in several states, certified completion of fur harvester education courses are required for purchase of a license. These measures should help reduce incidental harvest across the swift fox range. USDA APHIS-Wildlife Services personnel document annual incidental take of swift foxes that occurs during control of other predators; such take is minimal.

The Committee on the Status of Endangered Wildlife in Canada officially designated the Swift Fox as "extirpated" in Canada in 1978 (Committee on the Status of Endangered Wildlife in Canada (COSEWIC) 1978). A National Recovery Plan was developed with the mandate to increase swift fox populations to self-sustaining levels by the year 2000 (Brechtel et al. 1996). As a result of successful reintroduction efforts, in 1999 the status of the swift fox in Canada was upgraded to endangered.

Swift foxes continue to be managed throughout their range through a variety of existing regulatory mechanisms at both state and national levels. It appears these mechanisms allow for self sustaining swift fox populations throughout the species' range. It is the SFCT's view this factor has not risen to the level of a threat.

E. Other natural or manmade factors affecting its continued existence.

Livestock Grazing:

Grazing is one of the dominant land uses on public and private lands throughout the range of the swift fox. The evolutionary history of the shortgrass and mixed-grass prairie resulted in grassland-dependent species adapted to a mosaic of lightly to heavily grazed areas (Bragg and Steuter 1996, Knopf and Samson 1997). Grazing by wildlife or domestic livestock is essential for maintaining the health of native and restored grasslands and is necessary on a landscape scale to maintain a healthy grassland ecosystem. The impacts of grazing on swift foxes can vary widely, depending on climatic conditions, the state or health of range vegetation, and the type of grazing regime utilized. Drought tends to magnify grazing impacts, as both processes reduce plant cover (Giesen 2000). When forage is reduced by drought, what remains tends to be grazed more heavily unless animal numbers are reduced. As a result, some grazed areas may supply adequate habitat during periods of normal rainfall. Intensive and/or persistent grazing may create habitat in areas with tallgrass or exotic grass species. The Natural Resources Conservation Service has produced a pamphlet to provide an introduction to the habitat requirements of the swift fox and to assist landowners and land managers in developing management strategies that will benefit the swift fox as part of an overall grassland management plan (NRCS 2006). Management recommendations identified in this pamphlet can be carried out to maintain existing swift fox range and to create additional habitat. Land managers are encouraged to collaborate with wildlife professionals to identify and attain management objectives.

Potential topics for further research:

1. Potential impact of the loss of historic disturbance regimes on swift foxes.
2. Potential impact of the difference in grazing patterns of cattle and bison on swift foxes.
3. Influences of drought conditions on availability of food resources in rangeland-dominated landscapes.

Climate and Weather:

Global climate change will affect grasslands, and thus swift fox habitat through a variety of mechanisms. Increasing temperatures may result in a northward shift of the climatic conditions most suitable to the species, possibly resulting in the southernmost parts of the current range becoming unsuitable due to drier conditions. Such range shifts are already occurring in many species (Root et al. 2003). Fortunately, extensive habitats that are probably suitable for the species already exist to the north of the current swift fox range, particularly in the Dakotas, Montana, and Canada. Habitat fragmentation, however, could impede

or prevent swift foxes from gradually shifting into these more northern habitats as temperatures increase. In addition, climate change may increase the potential for swift foxes to encounter new pathogens, and new invasive species could affect their habitats (Inkley et al. 2004).

All state wildlife agencies have approved Wildlife Action Plans, which are required to maintain eligibility for a federal funding match source called State Wildlife Grants. Many states are presently revisiting and revising wildlife action plans, in part because of potential availability of climate change adaptation funding in the future. The swift fox is listed as a species of greatest conservation need by all states within the species' range. Impacts of climate change will likely be addressed in the revised Wildlife Action Plans being prepared by all or the majority of states within the species' range.

Poisoning:

The widespread use of strychnine-laced carcasses for controlling wolves and coyotes caused decline of swift fox populations in the 1800s and early 1900s (Scott-Brown et al. 1987). There is great concern about how the use of 2 recently-approved anticoagulants, chlorophacinone (Rozol) and diphacinone (Kaput), for control of prairie dogs will impact swift foxes. The anticoagulant chlorophacinone (Rozol) was approved in 2009 via Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Section 3 registration for poisoning prairie dogs in Kansas, Colorado, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming. A label modification in 2010 added Montana to the list of eligible states where Rozol can be used. The use of Rozol has been approved for prairie dog control by the state agriculture departments in Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming for their jurisdictions. The makers of Kaput are seeking to expand use of that product to include prairie dogs. It is currently approved for a variety of other rodents in some states within the range of the swift fox.

The risk of secondary poisoning to non-target species, such as swift fox, from exposure to Rozol and Kaput is much higher than from the commonly used rodenticide zinc phosphide. Anticoagulant use results in a more prolonged period of mortality for prairie dogs and also has a longer persistence in their body tissues. Consequently, contaminated prey is available to non-target species for a period of weeks for anticoagulants versus hours for zinc phosphide. The SFCT, through WAFWA, has requested the EPA to fully consult with the USFWS on this new use of these 2 pesticides on controlling prairie dogs and the inadequacy of the label restrictions in preventing take of non-target wildlife species.

Roadways:

Swift foxes are frequently observed along roadways. Several studies have indicated that swift foxes frequently use roadways as travel lanes and for foraging activities, and they may build dens nearby (Hines and Case 1991, Pruss 1999). These roadway associations can be major sources of vehicle-related mortality for juvenile foxes (Sovada et al. 1998). The significance of this mortality factor to the overall question of maintaining population viability has not been studied in any detail. Vehicle-caused mortality does not appear to be a significant adverse problem from a range-wide perspective. In Kansas, where road densities are fairly high, state biologists believe that factors such as road densities, distance traveled, and driver speed may increase the rate of swift fox mortalities. Kansas has for several years utilized vehicle-caused mortalities per unit time as a means to calculate a population trend index. However, annual road mortalities in Kansas do not appear to be affecting distribution and status of this species (C. Roy, personal communication).

Swift foxes continue to be affected throughout their range through a variety of natural or manmade factors at both local and landscape levels. However, despite these effects, there is still a self sustaining swift fox population throughout its range. It is the SFCT's view this factor has not risen to the level of a threat.

Potential topics for further research:

1. Potential impact of energy development (impacts from infrastructure and habitat loss) on swift foxes.
2. Potential impact of biofuels; i.e., habitat loss from conversion of native habitat to monoculture.

CONSERVATION STRATEGY, 2011-2020

Introduction:

The SFCT and its partners have crafted and revised this framework for swift fox conservation to reflect the paramount importance of cooperation with and participation by a broad spectrum of government agencies, private individuals, and nongovernmental organizations. The framework also acknowledges the importance of compatible rural livelihoods and activities (such as ranching, farming, and outdoor recreation, including hunting, fishing, and wildlife watching) to existence of swift foxes and the importance of participation by such stakeholders in wildlife conservation. Thus, the framework's focus is on voluntary collaborative conservation based on shared values and incentives rather than regulatory requirements.

Goal:

The goal of this conservation strategy is to maintain or restore swift fox populations within each state to provide the spatial, genetic, and demographic structure of the United States swift fox population to ensure long-term species viability, to provide species management flexibility, and to encourage population connectivity.

Objectives, strategies, and activities:

1. Maintain a Swift Fox Conservation Team (SFCT), to include 1 representative of each of the state wildlife agencies within the historical range of the swift fox.

    1.1 The SFCT is comprised of a single representative from each of the 10 state wildlife resource agencies (state), BLM (regional), USFS (regional), U.S. Geological Service (USGS) (regional), Animal and Plant Health Inspection Service (APHIS) (regional), and USFWS (regional). Interested cooperators are encouraged to participate with the team (other state and federal agencies, state universities, tribal governments, conservation organizations, research institutions, Canadian recovery team). The SFCT is to coordinate and assist in directing management and research activities outlined in the conservation strategy. The SFCT will annually monitor the attainment of objectives and evaluate the completion of specific activities within each state.

        1.1.1 Responsibilities of the SFCT are to: 1) determine priorities and set timetables for conservation strategy objectives and

activities, 2) establish interteam technical committees that will address specific management or research needs to accomplish stated objectives, 3) draft habitat and species management guidelines when appropriate, 4) provide a forum for technical information exchange, and 5) promote state and federal funding support for specific activities.

1.1.2 The SFCT will generate an annual or biennial report to present state and regional progress toward attainment of conservation strategy objectives. An annual or biennial SFCT meeting is to be scheduled by the appointed chair to synthesize information and prepare the annual or biennial report.

1.1.3 Ten years following publication of this revision, SFCT members and cooperators will evaluate progress in meeting objectives and completing activities. Evaluation of progress will include discussion of whether the SFCT may disband because it has accomplished its original purpose to design and implement a multi-state approach to assure long-term swift fox persistence.

2. Maintain swift fox distribution in at least 50 percent of the suitable, available habitat.

2.1 State wildlife agencies will periodically update statewide species distribution maps to monitor long-term changes in distribution and evaluate progress toward conservation strategy objectives. Maps will be updated or modified every 5 years. Sovada et al. 2009 should be updated and submitted for publication with new information 5 years following its publication date.

2.2 Expand distribution of existing state populations and restore swift foxes to unoccupied suitable habitat. Promote natural dispersal through species protection measures while developing methodology and priority areas for augmentation through wild-captured swift fox translocations.

2.2.1 The SFCT will work with state wildlife agencies, federal land management agencies and cooperators to prioritize potential restoration efforts in areas with a limited distribution and potentially suitable habitat, when needed.

2.3 Each state wildlife agency will maintain adequate regulatory mechanisms to promote a self-sustaining swift fox population.

2.3.1 The state wildlife agencies of Colorado, Kansas, Montana, New Mexico, and Texas, which currently allow a legal harvest, will evaluate the feasibility of implementing a registration/pelt tagging program in addition to conducting mandatory carcass collections.

3. Periodically evaluate the status of swift fox populations.

3.1 Monitor swift fox distribution within each state using various detection methods and/or species harvest data. Systematic presence/absence and population surveys or compiling site-specific harvest information should provide each state with adequate information to delineate and monitor statewide species distributions.

3.1.1 State wildlife agencies will continue to collect and compile existing species distribution data internally and from cooperators. State agencies and cooperators may need to collect additional information utilizing various sources such as: 1) species population surveys; 2) state and federal agency occurrence reports; 3) soliciting public participation; 4) scientific field investigations; or 5) trapper and hunter harvest data.

4. Identify and conserve existing native shortgrass and mixed-grass grasslands, focusing on those with habitat characteristics conducive to swift foxes.

4.1 Continue to identify, describe, and delineate existing suitable swift fox habitat within each state. This effort will form the basis for evaluating remaining species restoration activities and identify constraints and opportunities within each state for possible swift fox conservation efforts.

4.1.1 Each state wildlife agency will coordinate with state, tribal, and federal land management agencies and private landowners to conduct and continue habitat inventories and to describe land ownership patterns. Landscape analysis of suitable prairie habitat should utilize the best available landscape data, using supplemental map tools (soils, vegetation), Geographic Information Systems (GIS), and Gap Analysis Program (GAP), in addition to aerial or ground

surveys. This activity may include cooperation from the BLM, USFS, Natural Heritage Programs, NRCS, state universities, and other entities with GIS/Gap Analysis mapping capabilities.

5. Facilitate partnerships and cooperative efforts to protect, restore, and enhance suitable habitats within potential swift fox range.

    5.1 Identify and delineate lands under federal, state, or tribal management control in occupied/suitable swift fox habitat. The ability to maintain or restore state swift fox populations will depend on conserving open space in the existing grassland landscape. This activity will potentially be most effective when focused on major landscape-scale habitat initiatives.

        5.1.1 Each state wildlife agency will coordinate with the federal and state land management agencies to evaluate current levels of legal protection of native grasslands located within federal and state ownership. These areas are to be delineated as an additional cover layer with suitable habitat and current swift fox distribution. Protected sites are to be mapped and acreages determined within the 10 states. Spatial relationships, such as defining habitat corridors or habitat blocks, will be examined. Prairie habitat is to be classified as currently protected, in need of protection, or for special management needs based on maintaining or enhancing habitat quality for swift foxes.

        5.1.2 State and federal wildlife agencies will investigate habitat conservation agreements with federal and state land management agencies, as habitat needs are identified. Establish memorandums of understanding (MOU) and habitat conservation agreements (HCA) for habitat protection and management with land management agencies to conserve or enhance suitable prairie habitats under public ownership.

        5.1.3 Identify habitat corridors and surrounding areas between habitat blocks, based on the spatial location of suitable habitat that is available to be managed for swift foxes. This activity will identify where habitat conservation and management efforts should occur to protect, enhance, or improve suitable habitat. Each state is to identify and

delineate these areas through mapping to help conservation measures, agreements, or habitat enhancement efforts.

5.2 Identify and delineate private land ownership patterns under individual or corporate control in occupied and suitable swift fox habitat. The ability to maintain or restore state swift fox populations will depend on conserving existing prairie habitat.

5.2.1 State and federal wildlife agencies are to initiate land conservation or protection measures under current lands programs as limited by priorities and within funding ability, or are to consider creating a lands program with new or redirected funding sources. Agencies will investigate the feasibility of partnerships with the private sector. On identified critical private lands state agencies should utilize conservation easements or agreements, leases, donations, exchanges, or acquisitions. Federal wildlife agencies should consider habitat conservation plans (HCPs) and federal land management agencies should consider land exchanges and acquisitions. State wildlife agencies may use wildlife action plan implementation activities to assist with swift fox and native habitat management.

5.3 The SFCT should encourage investigation of opportunities to provide population connectivity through coordinated habitat mapping and reintroduction among partner states, tribes, agencies, and private landowners.

5.4. Integrate swift fox conservation strategy objectives with management and habitat objectives of other prairie ecosystem species such as bison (*Bison bison*), black-footed ferret (*Mustela nigripes*), burrowing owl (*Speotyto cunicularia*), mountain plover (*Charadrius montanus*), prairie chicken (*Tympanuchus* spp.), and prairie dog (*Cynomys* spp.).

5.4.1 Provide swift fox distribution and suitable habitat information to other prairie ecosystem conservation efforts through activities associated with the Western Association of Fish and Wildlife Agencies, Landscape Conservation Cooperatives, Association of Zoos and Aquariums, Joint Ventures, and other relevant conservation activities that cross state and agency boundaries.

6. Identify and encourage research studies that contribute to swift fox conservation and management.

6.1 Provide a scientific basis for swift fox management and an avenue for technical information exchange.

6.1.1 The SFCT will continue to provide recommendations on standard management guidelines, beneficial range management practices for swift foxes, methods for data collection/database management, and current information on swift fox ecology, management, and research to wildlife and land managers; government entities; land planners; and state and federal policy makers.

6.1.2 The SFCT will consider cooperating on a joint publication that promotes the scientific basis for conserving prairie species, including swift fox, for distribution to wildlife and land managers. If it is determined that this document is needed and jointly supported, funding will be solicited from cooperators and partners.

6.1.3 The SFCT is to identify and encourage research studies addressing interspecific interactions, climate change, energy development, and other factors that may affect swift fox conservation.

6.1.3.1 State wildlife agencies and cooperators will address species/habitat needs in site-specific areas identified as having special concerns for population maintenance. An example may be an evaluation of potential impacts of new energy development in an area with known swift fox occupation.

6.1.4 Encourage and participate in studies that define minimum viable population size estimates.

6.1.5 Conduct periodic testing and analysis of genetic variation among state populations to validate the basis of the metapopulation concept to ensure species persistence. Utilize state, federal, or institutional wildlife and veterinary laboratories that can support appropriate analysis. Publish results of genetic analysis 15 years following the publication of this Conservation Assessment and Strategy revision.

7. Promote public support for swift fox conservation activities through education and information exchange.

    7.1 The SFCT will continue to develop informational and educational materials to encourage support from an informed public. Such support will enhance funding opportunities and ease implementation of conservation strategy activities. Among publics to be targeted are trappers, hunters, wildlife viewers, livestock and farm groups, private landowners, conservation organizations, public schools, and city/county governments. Funding will be solicited, as needed, from participating states and cooperators.

        7.1.1 SFCT will continue to make use of SFCT website to post reports, annual newsletters, and other information of interest to partners and the general public.

        7.1.2 Implement methods and techniques to gain and maintain cooperation with private landowners that will influence range management practices, primarily through state extension agents, federal grazing leases, and NRCS range specialists. Efforts will be directed primarily at occupied habitat and secondarily at suitable habitat.

    7.2 The SFCT will coordinate with the Association of Zoos and Aquariums (AZA) to provide scientifically-supportable information or input on educational displays or other AZA information to help present the most accurate and current information on swift fox conservation and management.

    7.3 The SFCT will continue to support the AZA in its efforts to maintain a viable captive population.

8. Maintain swift fox population viability such that listing under the U.S. Endangered Species Act is not justified.

    8.1 States will continue to participate in cooperative information, monitoring, and research efforts to support swift fox sustainability and to facilitate management at a metapopulation level.

    8.2 This document may warrant periodic revision to incorporate related objectives, strategies, or activities that may be outlined in other prairie species conservation plans.

8.3 Each state wildlife agency, with assistance of cooperators, will continue to refine management guidelines that include species and habitat conservation measures to assure species persistence. These may involve a review of state legal classification and protection; long-term programs to monitor species distribution, population size, and habitat maintenance; and may include harvest strategies above target population levels.

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APPENDIX A. HIGHLIGHTS OF ACTIVITIES PRESENTED IN SFCT ANNUAL REPORTS

Meeting locations

1994	Fort Collins, CO	December 1-2, 1994
1995	Denver, CO	September 20-21, 1995
1996	Omaha NE	December 11, 1996
1997	Snowmass, CO	September 22, 1997
1998	Amarillo, TX	December 8, 1998
1999	Phoenix, AZ	November 29, 1999
2000	Albuquerque, NM	January 23-24, 2000
2001	Rapid City, SD	October 17-18, 2001
2002	Bismarck, ND	September 23, 2002
2003	Fort Collins, CO	September 16, 2003
2005	Kansas City, KS	March 22-23, 2005
2006	Great Falls, MT	April 4, 2006
2007	Rapid City, SD	April 17-19, 2007
2008	Fort Collins, CO	April 18-20, 2008
2010	Laramie, WY	March 30-April 1, 2010

These reports can be accessed at this website:
http://wildlife.state.co.us/WildlifeSpecies/GrasslandSpecies/SwiftFoxConservationTeam.htm

1995

Editors: S. H. Allen, J. Whitaker Hoagland, and E. Dowd Stukel. The overview section described the origin of the SFCT and its activities to date.

Special Feature: Each state agency representative was asked to include copies of state regulations pertaining to swift fox in their jurisdictions.

Swift fox investigations in Texas, 1995; P. Horner, TX Parks and Wildlife Dept.
This report describes the initiation of a Section 6 ESA project to establish swift fox surveys in the Texas panhandle to be coordinated by biologist Kevin Mote. The report also includes results of a swift fox survey at a U.S. Department of Energy site near Amarillo.

Swift fox investigations in New Mexico, 1995; C. G. Schmitt, NM Dept. of Game and Fish.
Schmitt summarizes the present state of knowledge of swift fox in New Mexico. Because of a lack of data to describe the current distribution, the agency plans to begin tracking plate transects in areas of known swift fox range and collection of swift and kit fox specimens.

Distribution and ecology of swift fox in Oklahoma; J. Whitaker Hoagland, OK Dept. of Wildlife Conservation.
Three methods, tracking stations, spotlighting, and predator calling, were used to detect swift fox in 3 panhandle counties. Future surveys will emphasize the use of tracking stations.

Swift fox management and research in Kansas: 1995 annual report; L. Fox and C. Roy, KS Dept. of Wildlife and Parks.

Swift foxes are described as occurring through most of the species' historical range in Kansas, with a stable population for the past 20 years. The species is monitored with a variety of methods, and several research projects are in progress. Dryland wheat farming and moderate to intense grazing pressure appear compatible with swift fox in Kansas. Native prairie conversion to CRP cover has reduced swift fox habitat, potentially exposing them to higher coyote predation.

Swift fox investigations in Colorado (1995); R. Kahn, Colorado Division of Wildlife and J. Fitzgerald, University of Northern Colorado.

The report describes 2 projects in progress. An analysis of swift fox ecology in and adjacent to Pawnee National Grassland yielded information about mortality, reproduction, and den site characteristics. The second project is a sampling of random sites in eastern Colorado to determine presence or absence of swift fox.

Swift fox survey in Wyoming; T. Woolley and F. Lindzey, WY Coop. Fish and Wildlife Res. Unit and R. Rothwell, WY Game and Fish Dept.

Spotlighting and tracking plates were used to sample 12 counties, leading to the conclusion that swift foxes still occur throughout their historic range in Wyoming. Other information sources indicated that they may potentially occur west of the historical range. Animals were documented in a variety of habitat types and topographies.

Swift fox investigations in Nebraska, 1995; F. Andelt, NE Game and Parks Commission.

The known distribution and a summary of recent efforts in Nebraska are described. One swift fox sighting and 1 active natal den were documented in 1995.

Presence of swift fox in southwestern South Dakota; K. Kruse and J. Jenks, South Dakota State University and E. Dowd Stukel, SD Game, Fish and Parks.

Tracking plates and spotlighting were used to detect swift foxes in portions of 2 southwestern counties. One active den site was located. Spotlight surveys did not detect swift foxes, although other mammal species were detected with this method.

Current status of swift fox in Montana; B. Giddings, MT Dept. of Fish, Wildlife and Parks and C. Knowles, FaunaWest Wildlife Consultants.

A recent increase in reports may indicate the presence of a resident population. A statewide habitat assessment identified nearly 8 million acres of prairie grasslands considered suitable habitat.

Investigation of furbearer occurrence with special reference to swift fox and preliminary modeling of possible swift fox population dynamics in North Dakota – 1994-1995; S. Allen, ND Game and Fish Dept.

Swift foxes occur at very low densities, if at all, in North Dakota. Random quarter-sections were surveyed for furbearer presence, with no swift fox detected. Population modeling indicates that 40% annual survival rates are needed for a swift fox population to remain stable.

NBS 1995 annual report for the swift fox conservation team; M. Sovada, USGS Northern Prairie Science Center.

The author describes plans to collect information on survey methods and results from throughout the species' range, an upcoming research project in western Kansas, plans for maintaining swift fox data on the Center's website, and an overview of research needs.

1995 Swift fox survey, Fall River Ranger District, Nebraska Natl. Forest – L. Hetlet, U.S. Forest Service.

Nearly 10,000 acres of previously unsurveyed acres plus 6,250 acres of established tracking plate survey routes were completed, with few swift fox detections. One active den was documented.

1996

Editors: B. Luce and F. Lindzey.

Swift fox management and research in Kansas: 1996 annual report; C. Roy, KS Dept. of Wildlife and Parks.

Information from pelt tags on harvested swift foxes indicated that 90% were taken incidental to coyote trapping and were harvested from both cropland and rangeland habitats. Research on den site characteristics indicated high fall mortality for juveniles. Den characteristics did not differ between rangeland and cropland habitats, but habitat characteristics differed between the 2 study sites.

Swift fox investigations in Colorado, 1996; R. Kahn and T. Beck, CO Division of Wildlife.

This report contains an update on an eastern plains inventory, where swift foxes were captured in selected plots, and an update on results of radio-collaring animals. Coyotes were responsible for 71% of mortality.

Swift fox investigations in Nebraska, 1996; F. Andelt, NE Game and Parks Commission.

A 3-agency agreement was signed to cover live-trapping and blood sample collection for genetic analysis. Six animals were trapped in 1996.

Investigation of furbearer occurrence with special reference to swift fox and preliminary modeling of possible swift fox population dynamics in North Dakota – 1996; S. Allen, ND Game and Fish Dept.

Random quarter-sections were surveyed for evidence of furbearer occurrence as indicated by tracks. No swift foxes were detected.

Distribution and investigations of swift fox in Montana. B. Giddings, MT Fish, Wildlife and Parks and A. Zimmerman, Montana State University.

Swift foxes are considered resident in a 4-county area of northcentral Montana. This report describes results of trapping efforts in a modified grid pattern.

Oklahoma swift fox status report – 1996; J. Whitaker Hoagland, OK Dept. of Wildlife Conservation.

This report provides an update on distribution surveys in the panhandle region and in 3 northwestern counties using scent station surveys. Work is being conducted by department staff and under contract to the Oklahoma Natural Heritage Inventory. Additional techniques include spotlighting and infrared triggered cameras.

Swift fox investigations in Texas, 1996; K Mote, TX Parks and Wildlife Dept.

Swift foxes were detected in 2 of 25 High Plains counties using metal track plates, as part of an effort to determine distribution in historical range. Supplemental techniques included spotlighting and live-trapping.

Swift fox density estimation and survey technique evaluation in southeastern Wyoming, 1996; J. Scott Dieni, F. Lindzey, and S. H. Anderson, WY Coop. Fish and Wildlife Research Unit and T. Woolley, R. Rothwell, and B. Luce, WY Game and Fish Dept.

Report describes mark-resighting project to estimate swift fox abundance in an area near Medicine Bow, Wyoming. Also describes results of comparison of 3 survey techniques; scat surveys, tracking plates, and spotlighting surveys. Seasonal differences for the techniques, advantages, and problems are addressed.

Summary of swift fox research activities conducted in western Kansas – Annual report; M. Sovada, Northern Prairie Science Center and C. Roy, KS Dept. of Wildlife and Parks.

Reports on status of study to evaluate 5 survey methods to estimate swift fox distribution and abundance. Study area in western Kansas includes cropland and range areas. Describes techniques and preliminary results associated with each survey method.

Survey of swift fox on Pine Ridge Oglala Sioux Indian Reservation, Shannon County, South Dakota; D. Dateo, J. Jenks, and C. DePerno, South Dakota State University and E. Dowd Stukel, SD Dept. of Game, Fish and Parks.

Carbon-plate stations and spotlight surveys were placed in potential swift fox habitat. One swift fox was detected for both techniques. Abundance of domestic dogs, coyotes, and red foxes may help explain the low detection rate for swift foxes in the surveyed area.

Swift fox investigations in New Mexico, 1996; C. G. Schmitt and K. Mower, NM Dept. of Game and Fish.

Describes results of track and spotlight surveys in northeastern New Mexico, resulting in documentation of 5 swift foxes. Also describes salvage of specimens from several counties.

This report also contained the meeting minutes from the 1996 SFCT meeting in Omaha, NE and results of Forest Service swift fox surveys for Fall River Ranger District, Nebraska National Forest; Douglas Ranger District, Thunder Basin National Grassland; and Pine Ridge Ranger District, Nebraska National Forest.

1997

Editor: B. Giddings. The overview section describes the completion or near completion of several strategies, including formation of a swift fox conservation team and determination of current swift fox range in the U.S. Several states have begun establishing monitoring programs to determine species status and have begun identifying existing suitable habitats.

Special Feature: Julianne Whitaker-Hoagland prepared a special report titled “A review of literature related to swift fox habitat use” in response to the issue of defining suitable habitat for this species.

Preliminary findings of swift fox studies in Montana; A. Zimmerman, Montana State University and B. Giddings, MT Fish, Wildlife and Parks

Describes results of graduate study to determine swift fox distribution in northcentral Montana, presumably present as a result of colonization from reintroduced animals in Canada. Used grid trapping design to determine presence and radio-collared captured animals (16). Estimated home range averages and survivorship percentages. Food habits analyses showed heavy dependence on mammals.

Investigation of furbearer occurrence with special reference to swift fox in North Dakota-1997; S. Allen, ND Game and Fish Dept.

No swift foxes detected during surveys of random and optimal quarter sections. Compared additional quarter-sections with non-paved roadways and found no difference in furbearer tracks by furbearer species between 2 site types.

Survey of swift fox in Bennett County, South Dakota; P. Althoff, J. Jenks and D. Dateo, South Dakota State University and E. Dowd Stukel, SD Dept. of Game, Fish and Parks.

Used spotlight surveys to detect furbearers in a southwestern SD county. No swift foxes detected on or between survey routes. Seven other mammal species detected.

Swift fox survey evaluation, productivity, and survivorship in southeast Wyoming; T. Olson, J. Scott Dieni, and F. Lindzey, WY Cooperative Fish and Wildlife Research Unit.

Describes results of a graduate study by Olson. Determined seasonal probability of detecting member of a swift fox pair with tracking plate transects. Also determined average litter size (5.25 pups) and estimated adult survivorship (43%) from March 1996 to November 1997. Surveyed 3 areas in northern and central Wyoming for swift fox presence, with negative results.

Swift fox investigations in Nebraska, 1997; F. Andelt, NE Game and Parks Commission.

Previous work continued to compile sighting reports. Completed contract with U.S. Forest Service and USDA/APHIS-Wildlife Services to live trap swift foxes in Sioux County and collect blood for genetic analysis.

Swift fox investigations in Colorado, 1997; J. Fitzgerald, B. Roell, D. Finley and J. Eussen, University of Northern Colorado and J. Seidel and T. Beck, CO Division of Wildlife.

Describes continuation of work in Weld County, including collection of data on mortality, survival, reproduction, and habitat characteristics. Includes discussion of trap modification for capture of swift foxes in dens. Used infrared-triggered cameras to estimate winter density using mark-resight methods and program NOREMARK. Results based on camera use are described.

Swift fox management and research in Kansas 1997 annual report; C. Roy, KS Dept. of Wildlife and Parks and M. Sovada and G. Sargeant, USGS Northern Prairie Science Center.

Developed systematic sample of alternate townships in 24 counties of western Kansas to determine swift fox distribution. Townships searched for swift fox evidence. Detected presence in 40.5% of townships surveyed in 16 counties. Report describes impediments to effectively using this method and favorable survey conditions for this landscape-scale presence/absence survey method.

Swift fox investigations in Oklahoma, 1997; J. Whitaker Hoagland, OK Dept. of Wildlife Conservation.

Tracking stations used in Panhandle region. Additional tracking plate stations added in 3 additional counties. Sampling limited due to lack of funds. Laid groundwork for future systematic sampling, using search methods similar to those used in Kansas.

Swift fox investigations in New Mexico, 1997; R. Harrison, University of New Mexico and C. Gregory Schmitt, NM Dept. of Game and Fish.

Describes surveys with scent stations and spotlighting and review of other sources of information on swift fox occurrence. Swift foxes occur throughout historic range in New Mexico, but not found in certain cropland areas of 2 counties within the historic range. Report describes habitat preferences and other determining factors to swift fox distribution in the state.

Swift fox investigation in Texas, 1997; K. Mote, TX Parks and Wildlife Dept.

Describes monitoring in known inhabited areas of 2 counties (Sherman and Dallam) and investigation into swift fox occurrence on private property, using spotlight surveys and trapping.

Summary of swift fox investigations on national grasslands; L. Hetlet and B. Hodorff.

Summarizes results from Pawnee and Buffalo Gap national grasslands, with additional sighting reports from Comanche and Buffalo Gap national grasslands. No surveys were conducted on 5 of the national grasslands. Results from Pawnee were comparative to previous years. Buffalo Gap NG surveys resulted in a reduced number of detected tracks, although population status on adjacent private lands is unknown.

1998

Editor: C. Roy. The overview describes the USFWS' intent to remove the swift fox from the list of species warranted but precluded from listing, the first Intl. Swift Fox Symposium, publication of the team's first newsletter, and the status of reintroduction projects. The overview also describes progress in meeting Conservation Strategy objectives.

Swift fox investigations in Colorado in 1998. J. Seidel, CO Division of Wildlife.

Track surveys were conducted in agricultural counties of eastern Colorado, with swift foxes found in all 3 counties (Kiowa, Kit Carson, and Yuma). Eric Geese, Utah State University, continued research at the Pinyon Canyon site, with 37 new foxes radio collared during 1998.

An improved method for determining the distribution of swift foxes in Kansas. C. Roy, KS Dept. of Wildlife, and M. Sovada and G. Sargeant, USGS.

The authors describe 2 years of fieldwork to test a search technique for detecting swift foxes over a landscape scale. After identifying suitable habitat, experienced observers searched a sample of townships for evidence of occupancy. Challenges associated with this technique are described. Based on 2 years of work, technique is considered a practical method of detecting swift fox occupancy over a large area.

Swift fox management activities in Montana. B. Giddings, MT Dept. of Fish, Wildlife and Parks.

MFWP hosted the first MT Swift Fox Working Group meeting in 1998. The Blackfeet Nation reintroduced 30 captive-reared swift foxes onto tribal lands. FWP committed to funding a statewide swift fox distribution survey in 1999.

Swift fox investigations in Nebraska, 1998. F. Andelt, NE Game and Parks Commission.

No specific surveys or research projects were conducted in 1998. The main ongoing activity was to compile swift fox sighting reports.

Investigation of furbearer occurrence in North Dakota with special reference to swift fox – 1998. S. Allen, ND Game and Fish Dept.

Describes track searching in random and optimal quarter-sections. No swift foxes were detected, and swift foxes continue to be suspected to occur at low densities if at all in the state. Describes impact of a major outbreak of sarcoptic mange in eastern and northern North Dakota.

Swift fox investigations in Oklahoma, 1998. J. Whitaker Hoagland, OK Dept. of Wildlife Conservation.

Describes a new monitoring survey in 2 panhandle counties of Cimarron and Texas. Swift foxes were detected in 35 of 57 townships.

Survey of swift fox in Pennington and Bennett counties, South Dakota. C. Zell and J. Jenks, South Dakota State Univ. and E. Dowd Stukel, SD Dept. of Game, Fish, and Parks.

Used track and spotlight surveys in portions of these 2 southwestern counties. No swift foxes were detected; potential reasons for these results are discussed. Most abundant canids in the study areas were coyotes, domestic dogs, and red foxes.

Swift fox investigations in Texas, 1998. K. Mote, TX Parks and Wildlife Dept., J. Kamler and W. Ballard, Texas Tech Univ., and R. Gilliland, USDA-APHIS-Wildlife Services.

Describes continuation of monitoring in the Texas panhandle and initiation of a swift fox/coyote interaction study. Annual monitoring techniques modified to accommodate research study; monitoring methods include spotlight surveys and prolonged saturation trapping with live-traps.

Swift fox detection probability in southeast Wyoming. T. Olson, F. Lindzey, and J. Scott Dieni, WY Coop. Fish and Wildlife Research Unit.

Reports on 2 years of results for research project to test techniques to detect changes in population size on study area in Shirley Basin near Medicine Bow, Wyoming. Study designed to estimate probability of detecting 1 swift fox of a pair with track plate transects within a pair's home range as a step toward developing a statewide monitoring program.

Summary of swift fox surveys conducted on Region 2 national grasslands in 1998.

Survey results covering 8 national grasslands are included. The majority of sites did not have formal surveys, but swift fox habitation is still reported if known.

This report also contained the meeting minutes from the 1998 SFCT meeting in Amarillo, TX.

1999

Editor: C. Gregory Schmitt. Overview reported on progress on proceedings of swift fox symposium and a summary of progress toward specific objectives from the Conservation Strategy document.

Summary of swift fox research near Medicine Bow, Wyoming – Summer 1999. T. Olson and F. Lindzey, WY Coop. Fish and Wildlife Research Unit.

Reported on third year of fieldwork to estimate probability of detecting swift fox presence using track plate transects. Repeated techniques used in 1997 and 1998 and monitored home range and habitat use of radio-collected foxes. Investigating assumption that home

ranges will be filled from year to year if population is not declining as premise for use of permanent tracking plate transects for long-term swift fox monitoring.

Swift Fox Completion Report. B. Luce, L. Hunt and J. Priday. WY Game and Fish Dept.
Used baited track plates in continuous transects to document swift foxes in areas with potential habitat but unknown population status. Also plan to begin baseline transects to monitor long-term population trends in areas with known swift fox presence.

Swift fox investigations in New Mexico, 1999. R. Harrison, Dept. of Biology, Univ. of NM.
Reported on start of research to determine most appropriate population census method for swift fox in New Mexico, with an emphasis on methods most practical for statewide surveys. Methods included radio telemetry, scat collection, scent stations, spotlighting, and calling.

Texas annual summary of swift fox. R. Sullivan, TX Parks and Wildlife Dept.
Includes summaries of a current and proposed research project by Texas Tech. Jan Kamler is studying the relationships of swift foxes and coyotes in northwest Texas, using radio telemetry, with plans to monitor impacts of coyote removal from 1 of the 2 study sites. Patrick Lemons plans to examine competition and interaction between swift foxes and coyotes, particularly related to diet differences between the 2 species and pup-rearing behavior of swift fox.

Swift fox investigations in Oklahoma, 1999. J. Whitaker Hoagland, OK Dept. of Wildlife Conservation.
Track search monitoring continued in 2 counties in the Oklahoma panhandle and began in 4 new counties. Townships with swift fox tracks occurred in Cimarron, Texas, and Beaver counties.

Swift fox conservation team action items for 1999 (Kansas). C. Roy, KS Dept. of Wildlife and Parks.
Progress is reported for specific Conservation Strategy objectives related to KS, including track survey monitoring, consideration of pelt tagging modifications, progress on Gap analysis projects, habitat preference findings, and improvements to CRP planting mixes in Kansas to benefit shortgrass prairie species.

Survey of furbearers in Fall River County South Dakota with emphasis on swift fox. R. Peterson, J. Jenks, SDSU, and E. Dowd Stukel, SDGFP.
Suitable areas in 2 areas of South Dakota's southwesternmost counties were searched for furbearer presence. Little swift fox sign was detected in quarter sections that also contained red fox sign.

Investigations of furbearer occurrence in North Dakota with special reference to swift fox, 1999. S. Allen, ND Game and Fish Dept.
Continued use of track searching within quarter sections. Four furbearer species detected, but no swift foxes detected. Compared furbearer occurrence adjacent to roads with other quarter sections and detected no difference.

National Grasslands swift fox report, 1999.
Results from Pawnee, Fort Pierre, Ogalala, Thunder Basin, Cimarron, Comanche, and Buffalo Gap are included. Only Pawnee and the west half of Fall River Ranger District conducted formal surveys in 1999.

1999 Annual report, preliminary report to the swift fox conservation team: Historic and recent distribution of swift foxes in North America. M. Sovada and B. Scheick, USGS.
The authors report on an ongoing effort to document historic and current species distribution, using a variety of sources. This effort will also result in a GIS database that can eventually link occurrences to habitat types. Records are itemized by county within states, and a variety of maps are included.

Swift fox reintroduction guidelines. E. Dowd Stukel, A. Moehrenschlager, L. Carbyn, J. Whitaker Hoagland, D. Allardyce, T. Wagener, and M. Fouraker.
In response to interest among several entities to reintroduce swift fox, a Reintroduction Subcommittee was formed. The resulting guidelines cover 7 facets of this topic, with a

variety of considerations prior to, during, and following reintroduction. The report also contains a summary of state legal requirements related to this topic.

Summary of the 1999 swift fox track survey in Nebraska. R. Bischoff, NE Game and Parks Commission.

Reports on track survey results from southwest Nebraska, following techniques used in Kansas. Swift fox tracks found on 1 site, which is associated with 3 earlier sightings during the 1980s.

Montana swift fox management activities. B. Giddings, MT Dept. of Fish, Wildlife and Parks.

Reports on completion of initial phase of statewide distribution survey, planning for cooperative international survey with Canada, release of swift fox on Blackfeet Reservation, and other state accomplishments related to national Conservation Strategy.

This report also contained the meeting minutes from the 1999 SFCT meeting in Phoenix, AZ.

2000

Editors: C. Gregory Schmitt and B. Oakleaf. Overview reported on U.S. Fish and Wildlife Service removal of swift fox from list of species warranted but precluded from listing under ESA and on subsequent letter to state wildlife agencies and others related to future commitment to activities described in national Conservation Strategy. Responses to these letters are contained in this annual report.

Special Feature: Robert Harrison, Dept. of Biology, University of New Mexico, submitted a literature review on swift fox diet and prey density studies.

Montana swift fox management activities. B. Giddings, MT Dept. of Fish, Wildlife and Parks.

Reports on completion of Montana's portion of international population census with Canada. Also developed statewide species distribution maps including land ownership and habitats. The Blackfeet Reservation completed its third year of reintroduction. The report also discussed the state's progress in meeting national Conservation Strategy objectives.

Swift fox completion report, State of Wyoming, Nongame Mammals. L. VanFleet and T. Spivey, WY Game and Fish Dept.

Reports on distribution surveys using baited track plates in a continuous transect in areas of potential swift fox presence. Surveys in 2000 were conducted in the Southeastern Plains Region and Powder River Basin. Also describes future plans for surveys to monitor long-term population trends.

Swift fox investigations in New Mexico, 2000. R. Harrison, UNM and C. Gregory Schmitt, NM Dept. of Game and Fish.

Describes results of second year of a 3-year study on population and general ecology; continued testing and analysis of potential tools for use as population census method for statewide use.

Swift fox investigation in Oklahoma. J. Whitaker Hoagland, OK Dept. of Wildlife Conservation.

Describes monitoring in 6 counties within the species' historical range in Oklahoma using track search surveys. All detections occurred in 3 counties in the panhandle region; 74% of tracks observed in rangeland land use in 2000.

Annual report: Status of swift fox in Texas. R. Sullivan, TX Parks and Wildlife.

Includes progress reports on 2 research projects in progress; Jan Kamler's study on interactions between swift foxes and coyotes and Patrick Lemons' study on diet overlap, population viability, and den site ecology. Also summarizes Texas' progress in helping to

meet national Conservation Strategy objectives and current state laws and regulations related to swift fox and other furbearers in Texas.

Swift fox status on National Park Service lands, 2000. D. Licht, NPS.

Fourteen of 24 NPS units within the swift fox historical range considered as potential habitat. Badlands National Park in SD thought to have the best potential to support a self-sustaining population. Discussed Badlands' interest in swift fox reintroduction and plans to cooperate with Turner Endangered Species Fund's planned reintroduction at Bad River Ranches.

National grasslands swift fox reports.

Results of formal surveys are included. As usual, the majority of national grasslands did not conduct formal surveys.

2001

Editor: M. Peek. Overview reported on continued commitment to swift fox management, following U.S. Fish and Wildlife Service removal of swift fox from list of candidate species. SFCT received funding from National Fish and Wildlife Foundation for project to determine relationship between swift fox distribution data and habitat characteristics. SFCT also expressed support for 2 reintroduction projects in South Dakota.

Special Features: Copy of the third edition of Swift Fox News was included.

Status of swift fox in Colorado, April 2002. F. Pusateri, CO Division of Wildlife.

Reports on current population estimates indicating an increase in swift fox ranges in shortgrass prairie on the eastern plains during the past 25 years, with an estimated population of 7,000 – 10,000 swift fox in that area, as well as occupation of other habitats in eastern Colorado. Describes plans to resurvey eastern plains beginning in 2002 and a Commission decision to not reopen the swift fox trapping season.

Kansas swift fox pelt tagging analysis, 1994-95 through 2001-02 seasons. M. Peek, KS Dept. of Wildlife and Parks.

Describes requirements and data collected during pelt tagging. During the seasons analyzed, 181 swift foxes taken by 38 furharvesters. Foothold traps for coyotes captured the majority of swift foxes. Half of the swift foxes were taken in dryland crop areas.

Montana swift fox management activities, 2001-2002. B. Giddings, MT Dept. of Fish, Wildlife and Parks.

Describes completion of international swift fox census, in association with Canada, and completion of second year of statewide surveys, which indicate continuing expansion. Also reports on state activities related to national Conservation Strategy.

Swift fox status on National Park Service lands, 2001. D. Licht, NPS.

Reports on status of plan to reintroduce swift foxes to Badlands National Park, SD. Swift fox not known to inhabit any other NPS lands.

Nebraska swift fox scent station survey, 2001. R. Bischof, NE Game and Parks Commission and M. Lavelle, USDA/APHIS/Wildlife Services.

Scent station survey conducted in certain counties in the Nebraska panhandle; 7 of 18 transects contained swift fox sign.

Final report of investigations of swift fox survey methods, demography, and ecology in New Mexico. R. Harrison, Univ. of NM and C. Gregory Schmitt, NM Dept. of Game and Fish.

Reports on conclusion of 3-year study to evaluate population survey methods. Scat collection was most efficient method for presence/absence surveys. Trapping and resighting with cameras was best method for absolute abundance surveys. Also reports on findings related to demography and ecology of swift foxes in northeastern New Mexico.

Swift fox investigation in North Dakota, 2000. J. Gerads, ND Game and Fish Dept.

Reports on track search surveys, in which no swift foxes were detected, although 4 other furbearer species were documented.

Population distribution of swift fox in northwestern Oklahoma using a track search survey. J. Whitaker Hoagland, OK Dept. of Wildlife Conservation.

Describes track search survey in portions of 6 counties within historical range. All detections were in OK panhandle region. Habitats associated with track points (herbaceous rangeland and cropland) did not differ from available habitat.

Characteristics and behavior of swift fox at den sites in Fall River County, South Dakota. T. Stokeley and J. Jenks, South Dakota State University and E. Dowd Stukel, SD Game, Fish and Parks Dept.

Search methods included den site surveys and track searching on public and private lands. Twenty percent of located dens were used by swift foxes; others used by coyotes, badgers (*Taxidea taxus*), and red foxes.

Status of swift fox in Texas (2002). R. Sullivan, TX Parks and Wildlife.

Contains highlights of swift fox surveys conducted during recent years in Dallam and Sherman counties, description of goals and progress related to the agency's swift fox conservation and management plan, and updates from 2 research projects (Swift fox and coyote interactions in the short-grass prairie of northwest Texas: Population viability, den site ecology, and diet overlap and Den site ecology of swift foxes in northwestern Texas).

U.S. Forest Service, National Grasslands of Region 2: 2001 annual reports.

Summaries provided for 7 national grasslands, 2 of which conducted surveys (Pawnee and Fall River Ranger District of Buffalo Gap National Grassland).

Swift fox completion report. M. Grenier and L. Van Fleet, WY Game and Fish Dept.

Describes track plate transect surveys within suitable swift fox habitat in 3 study regions in eastern Wyoming as part of a long-term monitoring program.

This report also contained the meeting minutes from the 2001 SFCT meeting in Rapid City, SD.

2002

Editor: M. Grenier. Overview reported on relevance of SFCT accomplishments to removal from candidate species list, including development of long-term monitoring programs, development of rangewide baseline habitat model map, increased information efforts, reintroduction success, and generally better coordination and management. Remaining challenges include taxonomic distinction between swift and kit foxes, impacts of funding shortfalls, and competition between swift and red foxes.

Status of swift fox in Colorado, April 2003. F. Pusateri, CO Division of Wildlife.

Provides updates on mark/recapture monitoring project to begin in 2003, shortgrass prairie funding provided through the Great Outdoors Colorado Trust Fund, and first meeting of Colorado's Grassland Species Conservation Working Group.

Swift fox investigations in Kansas, 2002. M. Peek, KS Dept. of Wildlife and Parks.

Provides an update on 2 monitoring efforts in Kansas, pelt tagging program and track survey. Track surveys were conducted as first year of a 3-year project, and challenges with this method are described. A record number of swift fox pelts were tagged during the 2002-2003 furbearer season, possibly due to favorable fur prices.

Swift fox investigations in Oklahoma, 2002. J. Whitaker Hoagland, OK Dept. of Wildlife Conservation.

Describes analysis of track plate surveys, with fairly even distribution of track location buffer areas between herbaceous rangeland and cropland.

Management activities for swift fox in Montana. B. Giddings, MT Dept. of Fish, Wildlife and Parks.

Describes results of third/final year of statewide distribution survey and activities of state working group related to meeting national Conservation Strategy objectives.

Nebraska swift fox report, 2002. R. Bischof, NE Game and Parks Commission.

Scent station surveys conducted in Nebraska panhandle, with no swift fox detections, although swift foxes were known to occur nearby. Track searching was also tried, with little success due to dry, dusty tracking conditions. Future monitoring will include scent station surveys run for longer durations.

Swift fox investigations in North Dakota, 200. J. Gerads, ND Game and Fish Dept.

Continued track surveys in randomly selected sites, with no swift fox detections.

2002 Annual report: Status of swift fox in Texas. H. Whitlaw, TX Parks and Wildlife Dept. and W. Ballard, Texas Tech Univ.

Four topics covered – status of swift fox-coyote interaction research (Kamler and Lemons); new research on role of artificial escape dens to increase swift fox populations; funding investigations for current and future research needs; and development of guidelines for swift fox conservation and management in Texas panhandle.

Wyoming swift fox completion report. M. Grenier, L. Van Fleet, M. Martin, and M. Purcell, WY Game and Fish Dept.

Reports on results of transect surveys conducted in 3 study regions. Among hypotheses for declines in 2 of the regions is the increase in detections of nontarget species, particularly striped skunk, domestic cat, and raccoon. Results may indicate impacts of changing habitats in these areas.

Status of swift fox on National Park Service lands. D. Licht. NPS.

Describes absence of swift foxes from these lands and plans by Badlands National Park to reintroduce swift foxes.

Summary of swift fox information for the national grasslands 2002. B. Hodorff, U.S. Forest Service.

As in previous years, a small number of national grasslands conducted swift fox surveys, Pawnee and Fall River Ranger District. Thunder Basin NG has a resident population, and Fort Pierre NG had 2 reintroduced animals on their lands from the adjoining Bad River Ranches.

2003

Editors: M. Grenier and H. Whitlaw.

Special Features: This report includes a protocol for swift fox specimen submission for storage, in the event that materials are needed for genetic or disease analysis. The University of New Mexico has offered to store these materials. Target regions for sample collection were identified. This report also contains information about the importance of coordinating with the Association of Zoos and Aquariums regarding status and use of captive swift foxes. The report contains a summary of expenditures on swift fox work, as submitted, and 2 letters of support for continued involvement of Marsha Sovada, USGS, and commending the Montana Fish, Wildlife and Parks Dept. on easement acquisition on Gordon Cattle Company lands in northcentral Montana.

Swift fox investigations in Kansas 2003. M. Peek, KS Dept. of Wildlife and Parks.

Reports on continued use of 3 techniques; roadside track surveys, pelt tagging, and employee observations, which have collectively documented swift foxes in 22 Kansas counties since 1999.

Swift fox investigations in Oklahoma, 2003. J. Whitaker Hoagland, OK Dept. of Wildlife Conservation.

Reports on project to digitize historic plat maps and digital orthophotos based on vegetation classification as part of shortgrass High Plains rare species habitat assessment project. Also describes new study to examine abundance and habitat associations of swift foxes in Oklahoma panhandle.

Monitoring population status of swift fox in Montana. B. Giddings and R. Rauscher, MT Dept. of Fish, Wildlife and Parks.

Reports on information collection of observation reports and surrendered swift fox specimens from incidental capture during coyote trapping. Other activities included survey of Montana trappers in northcentral Montana regarding swift fox population trend in their area.

Nebraska swift fox report, 2003. R. Bischof, NE Game and Parks Commission.

Describes scent station surveys, most of which were run for 3 consecutive days, resulting in swift fox detection in 5 townships in 3 different counties, including 1 location with no previous record of occurrence.

2003 New Mexico swift fox completion report. T. Enk, NM Dept. of Game and Fish.

Reports on completion of roadway transects for scat along 10-mile transects in eastern New Mexico. Scat samples were submitted to the University of New Mexico for genetic analysis.

Detection of swift fox in furbearer surveys in Fall River County, South Dakota. Z. Olson and J. Jenks, South Dakota State University and E. Dowd Stukel, SD Dept. of Game, Fish and Parks.

Describes use of track searching and scent station transects on public and private lands. Both methods yielded swift fox evidence. Scent stations yielded more tracks, and drought conditions likely contributed to the small number of tracks detected during track searching.

2003 Annual report: Status of swift fox in Texas. H. Whitlaw, TX Parks and Wildlife Dept.

Report includes abstracts from 2 studies (Importance of artificial escape cover for increasing swift fox populations in northwest Texas; Swift fox occurrence in black-tailed prairie dog towns in the northwestern panhandle of Texas) and a description of a future project (Distribution of swift foxes in Texas).

Swift fox in Wyoming completion report 2003. M. Grenier and L. Van Fleet, WY Game and Fish Dept.

Reports on continuation of baited track plates to monitor long-term population trends in 3 regions. Describes results and potential reasons for differing detection probabilities and nontarget species detections.

Status of swift fox on National Park Service lands. D. Licht, National Park Service.

Includes project description for reintroduction project on Badlands National Park, SD, which began during the fall of 2003.

Summary of swift fox information for the national grasslands 2003. B. Hodorff, U.S. Forest Service.

Formal surveys again conducted at Pawnee NG and Fall River Ranger District. Fort Pierre NG has seen some use of their lands by reintroduced animals from Bad River Ranches.

Swift fox track survey methods and analysis – Guidelines for implementation. M. Sovada and G. Sargeant, U.S. Geological Survey.

Describes benefits, drawbacks, and typical results associated with use of time-constrained track surveys as a method of estimating swift fox distribution.

Swift fox reintroductions on the Blackfeet Indian Reservation, Montana: Determining success. D. Ausband, University of Montana-Missoula.

Includes highlights of 1998-2002 reintroductions of 123 captive-reared swift foxes. Describes methods used to determine population growth rates and fecundity and public involvement activities. Assume population is growing.

Turner Endangered Species Fund summary of swift fox activities on the Bad River Ranches, South Dakota, 2003. K. Kunkel, TESF.

Describes methods and results of swift fox translocation in 2002 and planned alterations in techniques to enhance success.

This report also contained the meeting minutes from the 2003 SFCT meeting in Fort Collins, CO.

2004

Editors: J. Stuart, NM Dept. of Game and Fish and S. Wilson, NE Game and Parks Commission.

Monitoring swift fox populations in eastern Colorado. F. Pusateri, CO Division of Wildlife.
Reports on 3 activities; cooperation with Badlands National Park in reintroduction project, population monitoring with cage traps on random grids to produce a population index, and disease monitoring for plague, tularemia, canine parvovirus, and canine distemper virus.

Swift fox investigations in Kansas, 2004. M. Peek, KS Dept. of Wildlife and Parks.
Reports on continuation of use of 3 techniques to monitor population, including roadside track surveys, pelt tagging records, and observation records of agency employees. Swift foxes documented in 23 of 24 counties based on 2004 track search surveys.

Swift fox monitoring activities in Montana. B. Giddings, MT Dept. of Fish, Wildlife and Parks.
Occurrence reports helped document population expansion into areas that had not been occupied for a century, likely resulting from reintroductions. Four counties added to state distribution map. Also describes distribution of BLM grant funds to support international census analysis and USGS Northern Prairie Wildlife Research Center habitat modeling project.

Nebraska swift fox report, 2004. S. Wilson, NE Game and Parks Commission.
No surveys conducted in 2004, but scent station surveys will resume in 2005. Swift fox is state endangered and listed as species of greatest conservation need in Nebraska Natural Legacy Project.

Swift fox research in New Mexico: 2004 Update. J. Stuart, NM Dept. of Game and Fish.
Reports on recent results of scat collection along road transects in 12 counties of eastern NM and recent harvest data. No pelt tagging is required in NM. Swift fox and its habitat are conservation priorities in NM's Comprehensive Wildlife Conservation Strategy.

North Dakota swift fox annual report, 2004. J. Ermer, ND Game and Fish Dept.
Swift fox surveys conducted every 3 years; 2004 was not a survey year, and no incidental observations or catches were reported. Swift fox is a Species of Conservation Priority in North Dakota's comprehensive wildlife planning effort.

Swift fox investigations in Oklahoma, 2004. J. Whitaker Hoagland, OK Dept. of Wildlife Conservation.
Reports on results of track search surveys in shortgrass High Plains region and on new study by OSU to examine abundance and habitat associations in the Oklahoma panhandle.

South Dakota swift fox report, 2004. E. Dowd Stukel, SD Dept. of Game, Fish and Parks.
Swift fox listed as a species of greatest conservation need in state's comprehensive wildlife planning effort. Agency has provided needed permits for 2 reintroduction projects and has submitted a State Wildlife Grants proposal to assist with reintroduction at Bad River Ranches.

Texas swift fox report 2004. H. Whitlaw, TX Parks and Wildlife Dept.
Reports on new project to be conducted by Donelle Schwalm to determine species distribution in Texas and examining influence of habitat fragmentation on distribution, habitat utilization, and genetic diversity. Refers to completed studies by Brady McGee and Kerry Nicholson, which are discussed elsewhere in this annual report.

Wyoming swift fox completion report. M. Grenier, L. Van Fleet, R. Stephens, T. Filipi, and D. Webber, WY Game and Fish Dept.
Describes baited track plate surveys in 2 counties in southcentral Wyoming. Swift foxes were the most commonly detected species, possibly due to public land ownership, making the surveys easier to conduct, and contiguous habitat in the area.

Report of APHIS Wildlife Services nontarget take of swift fox and kit fox in 2004. J. Green, APHIS Wildlife Services.
Reports nontarget take of 18 swift foxes and 34 kit foxes by APHIS Wildlife Services personnel in 9 western states during 2004.

Swift fox in National Park Service units. D. Licht, National Park Service.
NPS lands generally do not support swift foxes, with the exception of a reintroduction experiment at Badlands National Park, SD. Includes a summary of that project, based on

Marsha Sovada et al. report; a highlight was successful breeding of 3 pairs in first year of reintroduction.

Summary of swift fox information for the national grasslands 2003. B. Hodorff, U.S. Forest Service.

As in previous years, formal surveys were conducted at Pawnee NG and Fall River Ranger District, and Fort Pierre NG is home to animals reintroduced on adjoining Bad River Ranches.

Ensuring restoration of swift fox on the Fort Peck Indian Reservation and in northeastern Montana. K. Kunkel, Univ. of MT and R. Magnan and L. Bighorn, Fort Peck Fish and Wildlife Dept.

Describes project to assess recolonization potential; work includes mammal surveys, trapping for foxes, and landscape suitability assessment. Only 1 fox was captured and radiocollared during reporting year.

Swift fox reintroductions on the Blackfeet Indian Reservation, Montana: Determining success. D. Ausband, Univ. of Montana-Missoula.

Preliminary findings presented. Techniques include radio-collaring adults and juveniles to assess population growth rates, searching for natal dens, and public information efforts on and around the reservation. Coyotes accounted for 54% of mortality of radio-collared swift foxes.

Kainai (Blood Tribe) swift fox reintroduction programme. C. Smeeton, Cochrane Ecological Institute.

Describes preparation and coordination related to reintroduction project that began with release of 5 radio-collared animals. Also reports sighting of pair of uncollared animals at the reintroduction site in 2005.

Swift fox reintroduction feasibility study – Lower Brule Sioux Tribe. S. Grassel, Lower Brule Sioux Tribe.

Describes feasibility study, which includes data collection on population levels of swift fox prey and predators, determination of amount of suitable habitat, and determination of disease presence in furbearers.

Influence of habitat fragmentation on swift fox distribution, habitat utilization, and genetic diversity in Texas. D. Schwalm, W. Ballard, E. Fish, and R. Baker, Texas Tech University and H. Whitlaw, TX Parks and Wildlife Dept.

Describes graduate research project to identify potential habitat in TX panhandle, to identify factors influencing patch occupancy, to identify genetic patterns within the study area, and to identify factors influencing regional genetic diversity.

Importance of artificial escape cover for increasing swift fox populations in northwest Texas. B. McGee, W. Ballard, and K. Nicholson, Texas Tech University.

Reports on first year of study to compare impact of artificial escape dens on swift fox mortality from coyotes. Artificial escape dens helped increase swift fox survival in areas with high coyote abundance, but had little effect in areas with few coyotes.

Swift fox occurrence in black-tailed prairie dog towns in the northwestern panhandle of Texas. K. Nicholson, W. Ballard, and B. McGee, Texas Tech University.

Describes results of study to determine importance of black-tailed prairie dog colonies to swift fox. Found that swift foxes in study area used prairie dog towns proportionately less than their availability, based on swift fox capture locations and radio telemetry.

This report also contained the meeting minutes from the 2005 SFCT meeting in Kansas City, KS.

2005-2006

Editors: E. Dowd Stukel, SD Dept. of Game, Fish and Parks and D. Fecske, ND Game and Fish Dept.

Status of swift fox activities in Colorado, 2005-2006. E. Odell, CO Division of Wildlife.

In eastern Colorado, occupancy rates of swift foxes were estimated by cage-trapping and marking captured animals from 51, 3 x 4 mi^2 -area grids from 31 August 2004 to 12 February 2005. For each gridded area the percentage of short-grass prairie was determined using GIS technology. A total of 136 swift foxes were captured (including 12 recaptures) from 40 grids, and 71% of the captures occurred in grids containing >50% shortgrass prairie. Based on the results of the survey, the proportion of grids in eastern Colorado occupied by swift foxes was estimated to be 0.71. There was no evidence that occupancy in the region declined from surveys conducted during 1995 though 1997.

Swift fox investigations in Kansas, 2005-2006. M. Peek, KS Department of Wildlife and Parks.

Although track surveys were not conducted in Kansas during 2005-2006, the population was monitored by pelt tagging and observation records. During this time period, the Kansas Department of Wildlife and Parks (KDWP) documented 84 reports of swift foxes, of which 54 were road-killed animals. Additionally, during the 2005-06 season, pelts of 58 harvested swift foxes were tagged. Observation and harvest records documented the species in 15 counties in western Kansas. In addition to population monitoring, the KDWP agreed to provide animals (30-40 swift foxes each year for the next 3 to 5 years) for a reintroduction effort project being carried out by the Lower Brule Sioux Tribe in South Dakota. During late September 2005, 23 male and 17 female foxes cage-trapped in Kansas were soft released on tribal lands in South Dakota.

Monitoring resident swift fox populations during 2005 and 2006 in Montana. B. Giddings, MT Fish, Wildlife and Parks.

The agency continues to assess the population status of Montana's expanding swift fox population. Several cooperative efforts have recently been accomplished, including an international census in cooperation with Canada, translocation of swift foxes to the Fort Peck Indian Reservation, and various monitoring efforts.

Nebraska swift fox report, 2005/2006. S. Wilson, NE Game and Parks Commission.

During a 2-week period in July 2005, scent station surveys were conducted in 34 townships in Sioux, Box Butte, Scotts Bluff, and Banner counties of northwestern Nebraska. Swift foxes were detected in 2 townships, 1 each, in Sioux and Box Butte counties.

Swift fox research in New Mexico; 2005-2006. J. Stuart, NM Dept. of Game and Fish.

This agency continued its use of scat collection on road transects, using an established protocol in the 12 counties known to be inhabited by swift foxes. The species was identified as a species of greatest conservation need in the state's Comprehensive Wildlife Conservation Strategy. Other activities included furbearer harvest data analysis and a cooperative project with the Forest Service to install artificial den structures on Kiowa National Grassland.

Swift fox investigations in Oklahoma. J. Whitaker Hoagland, OK Dept. of Wildlife Conservation.

This submission was a completion report on a study conducted by the Department of Zoology at Oklahoma State University, focused on gaining a better understanding of swift fox distribution and habitat relationships in the Oklahoma Panhandle. Study results supported previous findings regarding the importance of continuous, native shortgrass prairie to swift foxes in the Oklahoma Panhandle and within the Southern Great Plains.

Survey of swift fox in Fall River County, South Dakota. J. Jenks, South Dakota State University and E. Dowd Stukel, SD Dept. of Game Fish and Parks.

Researchers from South Dakota State University conducted a scent-station survey to detect swift fox presence on Buffalo Gap National Grassland in southwestern South Dakota. From May through August 2005, 143 scent station readings were recorded, of which 83 (58%) were swift fox tracks. An increase in swift fox sign during this survey compared to past surveys could be due to a recent mange epizootic that reduced coyote density in the region.

Current distribution of the swift fox population in Texas. D. Schwalm and W. Ballard, Texas Tech University and H. Whitlaw, TX Parks and Wildlife Dept.

This report described a number of cooperative efforts with Texas Tech University. Surveyors used scat transect and live trapping surveys in 35 counties of northeastern Texas. They detected swift foxes in only 2 counties, likely due to continued habitat loss and fragmentation. Work continues on gaining a better understanding of the species' relationship to habitat fragmentation, coyote densities, and patch occupancy, including the use of genetic analyses of swift fox tissue collected throughout the species' range.

Swift fox activity report for Wildlife Services during 2005 and 2005. K. Gustad, USDA APHIS-Wildlife Services.

This update provided information on incidental take of swift foxes by USDA staff and other swift fox conservation efforts by the agency.

U.S. Forest Service reports.

Pawnee National Grassland, S. Kittrell. Staff continued standard swift fox spotlighting surveys on this grassland. They have seen a general downward trend since 2000, but an increase in swift fox sightings in 2006. Fall River Ranger District, Buffalo Gap National Grassland, L. Hetlet. Staff continued swift fox surveys using bait stations. They saw increased swift fox visitations from 2004 to 2005 and from 2005 to 2006, but the causes for these increases are uncertain.

Summary of Bureau of Land Management swift fox activities. G. Sitter, BLM.

BLM in Montana has made several monetary contributions to cooperative efforts, and staff have participated in various environmental review efforts to accommodate swift foxes.

Pine Ridge Indian Reservation swift fox survey report for 2005-2006. T. Ecoffey and R. Goodman.

Surveys were conducted in 2005 and 2006 using scent stations and spotlighting to determine existence of swift foxes on Pine Ridge Reservation and to evaluate reintroduction feasibility. They concluded that a viable swift fox population does not presently exist on the Reservation, existing animals are likely related to reintroduction at Badlands National Park, and reintroduction should be conducted if funding can be secured.

Restoration of swift fox on the Fort Peck Indian Reservation and northeastern Montana. K. Kunkel, Univ. of Montana and L. Bighorn and R. Magnan, Fort Peck Fish and Wildlife Dept.

This summary report describes site evaluation and preparation prior to the translocation and soft release of 10 swift foxes onto the Fort Peck Indian Reservation in September 2006. Survival and retention were higher than expected. Evaluation continues of proactive measures that will aid in long-term swift fox persistence.

2006 Lower Brule Sioux Tribe swift fox reintroduction summary. S. Grassel, Lower Brule Sioux Tribe.

This summary report describes the first year of a reintroduction project in which 40 swift foxes captured in Kansas were soft released in September 2006. Animals were penned as male-female pairs or as a group of 1 male and 2 females in areas with excavated artificial dens. Staff are currently radiotracking 17 animals. The majority of known causes of death were due to coyotes.

Badlands National Park swift fox summary data for 2005-2006. G. Schroeder, Badlands National Park.

Two years of a reintroduction experiment are summarized. Using animals captured in Colorado, 30 swift foxes were released in 2005 and 26 in 2006. Litters and pups were documented in both years. Staff are currently tracking 58 radio-collared animals and anticipate that 18-20 breeding pairs will produce 80-100 pups during 2007. They are planning a second 3-year project to begin in 2008 to examine swift fox population viability in western South Dakota.

Swift fox restoration in west central South Dakota: 2006 Annual programmatic report. K. Honness, Turner Endangered Species Fund.

This summary report describes results from 2006, the fifth year of swift fox releases. Four wild litters and 21 pups were documented in 2006. Staff used ITIs on some pups and radio collars on others. Evaluations included comparison of results from hard and soft release techniques. The highest cause of known mortality was coyotes. Net population growth during 2006 was 12 swift foxes.

Synopsis of "Population census of reintroduced swift foxes in Canada and northern Montana 2005/2006." A. Moehrenschlager, Calgary Zoological Society and C. Moehrenschlager, Wildlife Preservation Canada.

This summary report describes the results of the third comprehensive catch-and-release census of reintroduced swift foxes in Canada and northern Montana. Nearly 200 animals were caught and released. For the first time, no swift fox from the original reintroduction was captured. Townships with swift fox captures increased to 52.1%, mainly due to population expansion in Montana. They also documented increased connectivity of populations. Population abundance estimates in 2006 were 647.3 in Canada and 516.2 in Montana.

This report also contained the meeting minutes from the 2006 SFCT meeting in Great Falls, MT.

2007

Editors: B. Krueger and M. Ewald, WY Game and Fish Dept.

Status of swift fox activities in 2007. E. Odell, CO Division of Wildlife.

Reports on publication in peer-reviewed journal of 2005 monitoring results, CDOW hosting of SFCT website, status of Montana State University research project in eastern Colorado, cooperation in translocation of animals from Colorado to Bad River Ranches, SD, and CDOW hosting of SFCT meeting in 2008. Also includes CDOW's objection and related explanation to speculative statements in 2005-06 Pawnee National Grassland (PNG) SFCT report regarding negative impact of swift fox removal from PNG for Bad River Ranches reintroduction project.

Swift fox investigations in Kansas, 2007. M. Peek, KS Dept. of Wildlife and Parks.

Reports on continued use of 3 techniques to monitor populations and harvest, including roadside track surveys, pelt-tagging records, and observation records submitted by agency personnel. Track surveys not conducted in 2007. Agency approved permit to allow Lower Brule Sioux Tribe to remove swift foxes for reintroduction, which is anticipated to continue for 2-4 additional years.

Swift fox populations in Montana, 2007. B. Giddings, MT Dept. of Fish, Wildlife and Parks.

Reports on continued monitoring, which in 2007 included collection of observation reports and surrendered specimens for 6 new records. Montana has 2 self-sustaining populations, in northcentral and northeastern Montana, with additional reports from southeastern Montana.

Nebraska swift fox report, 2006-2007. S. Wilson, NE Game and Parks Commission.

Reports on scent station surveys in Sioux County, with detection in 1 township.

Swift fox surveys and other activities in New Mexico, 2006-2007. J. Stuart, NM Dept. of Game and Fish.

Presents 2005 scat survey results and harvest data. Scat surveys were negatively impacted by wet weather, which delayed field work and potentially caused scarcity of scat on transects. Mandatory reporting requirement began in 2006; yielded less than 60 harvested swift foxes, far below estimated sustainable harvest for swift foxes in New Mexico. Also reports on installation of artificial swift fox den and escape structures on Kiowa National Grassland. Swift fox is a state species of greatest conservation need, and several prairie habitat types used by swift foxes are priority habitats in the state's comprehensive wildlife conservation strategy.

North Dakota swift fox report, 2006-2007. D. Fecske, ND Game and Fish Dept.

Update includes description of vehicle-caused deaths of 3 radio-collared swift foxes from reintroduction projects in South Dakota and trapping of a single animal in southwestern North Dakota, with evidence of additional animals in the area. Describes coordination efforts with USGS Northern Prairie Wildlife Research Center to develop monitoring strategy.

Swift fox monitoring update – Oklahoma, 2007. M. Howery, OK Dept. of Wildlife Conservation.

Continued use of timed track searching in Oklahoma panhandle counties. Detected swift fox presence in 42 of 45 surveyed townships, with most detections in rangeland.

State swift fox activities in South Dakota. E. Dowd Stukel, SD Dept. of Game, Fish and Parks.

Presented protocol developed between SDGFP and the 3 reintroduction entities in South Dakota to address what is expected of SDGFP staff regarding swift fox sightings, carcasses, injured animals, or animals in need of relocation.

Current distribution of the swift fox in Texas. D. Schwalm and W. Ballard, Texas Tech University and H. Whitlaw, TX Parks and Wildlife Dept.

Reports on effort to determine current distribution in 35-county study area using live trapping, where possible, and a modified scat transect technique. Documented swift foxes in 2 counties, indicating that current distribution is reduced from historic distribution. Potential explanations are included.

2007 Swift fox survey, Fall River Ranger District, Buffalo Gap National Grassland, Nebraska National Forest. L. Hetlet, U.S. Forest Service.

Again used baited scent stations to detect furbearers; detected swift foxes, striped skunks, American badgers, and coyotes.

Restoration of swift fox on the Fort Peck Indian Reservation and in northeastern Montana-Final Phase One Summary Report. K. Kunkel, Univ. of Montana and L. Bighorn and R. Magnan, Fort Peck Fish and Game Dept.

Conducted 4 years of feasibility study and searching for swift foxes. Concluded that resident population did not exist, but area was suitable for translocation. Ten animals translocated from northcentral Montana; retention, survival, and reproduction were subsequently documented.

Status of swift fox in National Park Service units in 2007. D. Licht and G. Schroeder, National Park Service.

Reports on lack of suitable habitat on most of these properties, with the exception of Badlands National Park. Update on Badlands' reintroduction project includes highlights on reproduction (29 litters near park and 109 pups), status of translocations, and long-distance dispersals.

Swift fox behavioral ecology in relation to a bubonic plague event in northeastern Colorado. A. Anderson, M. Antolin, and K. Crooks, Colorado State University.

Reports on research project examining swift fox home range and habitat use, diet, and den site selection relative to prairie dog colonies seasonally and before and after major plague epizootics in northeastern Colorado. Using radio telemetry to monitor adult swift foxes.

Effects of four-lane highways on swift fox: Inferences for the San Joaquin kit fox population. A. Kociolek and A. Clevenger, Montana State University.

Update on research project to monitor swift fox movements near Interstate 70 near Limon, Colorado. Failure of telemetry equipment resulted in few conclusions; modifications planned for second year of study. Documented use of culverts by swift foxes to cross this major highway.

This report also contained the meeting minutes from the 2007 SFCT meeting in Rapid City, SD.

2008

Editor: P. Isakson, ND Game and Fish Dept.

Special Features: Updated map of Association of Zoos and Aquariums institutions holding swift fox is included.

Status of swift fox activities in Colorado, 2008. E. Odell, Colorado Division of Wildlife.
Reports on continued agency support in hosting the SFCT website; mention of 2 research projects in Colorado, 1 of which is summarized in this report (Lebsock et al.). Kociolek study of swift fox movements near a major highway will resume fieldwork in 2009. Agency is in early stages of coordination with the Oglala Sioux Tribe regarding translocation of swift foxes from Colorado to South Dakota.

Swift fox behavioral ecology in relation to a bubonic plague event in northeastern Colorado. A. Lebsock, M. Antolin, and K. Crooks, Colorado State University.
Research project hypothesis is that black-tailed prairie dogs provide important swift fox habitat and food resources, and that swift foxes will shift to remaining prairie dog colonies following a plague outbreak. Continuation of monitoring by a previous researcher, S. Darden (19 individuals monitored prior to plague, 17 individuals monitored following plague). Presently conducting GIS analyses.

Swift fox investigations in Kansas: 2008. M. Peek, KS Dept. of Wildlife and Parks.
Reports on continued use of roadside track surveys, pelt tagging records, and agency observation reports to monitor populations and harvests in Kansas. Also reports on state participation in swift fox trapping effort coordinated by the Association of Fish and Wildlife Agencies to develop best management practices for trapping; foothold traps and lethal body-gripping traps used. Continued to permit the Lower Brule Sioux Tribe to translocate swift foxes from Kansas to South Dakota.

Montana annual swift fox report. B. Giddings, MT Dept. of Fish, Wildlife and Parks.
Describes monitoring of resident population with collection of sighting observations, vehicle-killed specimens, and incidentally-trapped specimens. Suspect 2 self-sustaining populations in the state have some genetic exchange via dispersing animals. Plan continued work in eastern and southeastern Montana to further define occupied areas and to assess potential for in-state translocation.

Nebraska swift fox report, 2008. S. Wilson, NE Game and Parks Commission.
Reports on track plate survey conducted by consulting firm in association with proposed wind power project in Kimball County; swift fox detections at 2 of 145 track plates. Three counties known to be inhabited by swift foxes in 2008; Dawes, Kimball, and Sioux. Scent station surveys will resume in 2009.

Swift fox conservation activities in New Mexico: 2008. J. Stuart, NM Dept. of Game and Fish.
Reports on continuation of use of scat survey road transects in 12 counties of eastern New Mexico. Samples from 2008 currently being analyzed to species by genetic analyses. Species remains a harvestable furbearer; species and its habitat are conservation priorities in state's Comprehensive Wildlife Conservation Strategy.

North Dakota swift fox report: 2008. P. Isakson, ND Game and Fish Dept.
Samples from a road-killed specimen found in Bottineau County, along North Dakota's northern border, were sent to Texas Tech University for genetic analysis. Discussions continued with USGS Northern Prairie Wildlife Research Center staff to develop survey strategies.

Swift fox monitoring update – Oklahoma 2008. M. Howery, OK Dept. of Wildlife Conservation.
Reports on continued use of timed track survey searches as state population monitoring tool. Searches completed on 11 townships in 2008, or ⅓ of planned surveys. Swift fox tracks found in 10 of 11 sampled townships. As in previous years, most detections found in rangeland habitats.

Swift fox activities in South Dakota. E. Dowd Stukel, SD Dept. of Game, Fish and Parks and M. Phillips, Turner Endangered Species Fund.

Summary reproduced from TESF's completion of State Wildlife Grants-funded project on Bad River Ranches in South Dakota for 2005-2007 activities. Highlights include translocation and release of 180 animals plus 45 pups born in soft-release pens, documentation of 90 pups born in 25 wild litters, and documentation of movement and reproduction between translocated populations in the state. Also describes important contributions of cooperating private landowners.

Investigating genetic structure in swift fox populations. D. Schwalm and W. Ballard, Texas Tech University, H. Whitlaw, TX Parks and Wildlife Dept., and L. Waits, University of Idaho.

Reports on results of study to characterize swift fox genetic composition by studying relationship between gene flow, genetic structure, and landscape at a broad scale. Did not use samples that may have been influenced by translocation projects. Two methods used to detect populations; the first described 2 populations, the second described 7 populations. Analysis of additional samples will continue at the University of Idaho.

2008 Swift fox survey, Fall River Ranger District, Buffalo Gap National Grassland, Nebraska National Forest. L. Hetlet, U.S. Forest Service.

Reports on continued use of baited survey stations, which yielded evidence of swift foxes, striped skunks, and coyotes.

2008 Summary of swift fox activities at Badlands National Park and western South Dakota. G. Schroeder, Badlands National Park and J. Jenks, South Dakota State University.

Reports on results of reintroduction project at Badlands National Park; 114 animals released from 2003-2006; a minimum of 41 litters with 155 pups detected in 2008. Also describes new research project to assess effectiveness of scent station surveys as a survey technique in western South Dakota by comparing resident and restored populations. Report contains listing of recent swift fox reports or deaths from areas outside the 3 reintroduction sites in the state.

This report also contained the meeting minutes from the 2008 SFCT meeting in Fort Collins, CO.

2009-2010

Editors: K. Bly, WWF and Brian Giddings, MT Fish, Wildlife and Parks

Status of swift fox activities in Colorado, 2009-2010. J. Apker, CO Division of Wildlife.

Swift fox season resulted in an estimated take of 153 animals in 2009. Habitat occupancy surveys should be completed in 2011, following methods of 2 previous surveys. Safi Darden's post-doc research continues on swift fox communication and behavior. Reorganization of Division of Wildlife resulted in swift fox, as a hunted species, moved to Terrestrial Section.

Swift fox investigations in Kansas, 2009-2010. M. Peek, KS Dept. of Wildlife and Parks.

Reports on results of monitoring through mandatory pelt tagging of harvested swift foxes during 2008-2009 and 2009-2010 seasons; 98 and 40 animals harvested, respectively. KDWP participated in AFWA's BMPs for trapping. Other information sources included observations by Dept. employees, reports from reliable non-Dept. people, and road kills.

Montana swift fox report 2009-2010. B. Giddings, MT Fish, Wildlife and Parks.

During 2009 FWP collected numerous swift fox observations in eastern Montana, and facilitated a translocation of 30 foxes from northcentral Montana to the Fort Peck Indian Reservation to establish a new population. In 2010 the BLM, FWP, Defenders of Wildlife, and World Wildlife Fund funded the first year of a graduate student project through St. Cloud State, MN to survey various counties in southeastern Montana to detect the presence of swift fox. Also the first swift fox season was allowed in a portion of northcentral Montana with

a harvest quota of 20 animals while also allowing for the translocation of an additional 20 foxes to the Fort Peck Reservation to augment the recently established population.

Nebraska swift fox report, 2009-2010. S. Wilson, NE Game and Parks Commission.

Reports on scent station survey in 2010; other techniques included carcass collection, sign, photographs, and observations. Plan to continue scent station surveys in 2011 in high priority areas.

Swift fox conservation activities in New Mexico, 2009-2010. J. Stuart, NM Dept. of Game and Fish.

Continued use of scat collection for genetic analysis along established road transects. Samples collected in 2008 were not analyzed until 2009; many samples were not usable, likely because of the time lag between collection and analysis. Swift fox identified in 7 of 12 surveyed counties. Swift fox is a conservation priority in NM's CWCS. Swift and kit foxes likely taken mainly as incidental to coyotes. Consider swift and kit fox harvests to be well below sustainable levels. Do not require pelt tagging, but will review annually. Next scat surveys tentatively planned for 2013.

North Dakota swift fox report 2009. S. Tucker, ND Game and Fish Dept.

Monitor this non-breeding species by occurrence reports and track surveys. Since first recent documentation in 1984, have documented 7 additional swift fox mortalities from 5 counties. In the process of discussing sampling options with NPWRC.

Swift fox monitoring update – Oklahoma 2009-2010. M. Howery, OK Dept. of Wildlife Conservation.

Reports on continued use of timed track surveys in occupied range, which is nearly identical to historical range in the state. Located swift fox tracks in 17 of 20 townships surveyed in 2009. Most detections made in areas dominated by rangeland, with 24% (6) of detections in agricultural areas.

State swift fox activities in South Dakota. E. Dowd Stukel, SD Dept. of Game, Fish and Parks.

Reports on several ongoing agency activities, including agency personnel protocol to help assure that reintroduction entities have the opportunity to obtain data from swift fox observed alive or recovered dead. Presents abstract from SD State Wildlife Grants-funded project to analyze and summarize data from the TESF swift fox project at Bad River Ranches, SD. Study objectives were to evaluate resource selection during pup rearing and to refine existing habitat suitability model for the pup-rearing period.

Swift fox summary. J. Young, TX Parks and Wildlife Dept.

Reports on proposal in preparation to change swift fox trapping regulations for Division Director's consideration and agency efforts to secure funding for a swift fox reintroduction program.

Evaluation of swift fox survey techniques – Completion Report. L. Knox and M. Grenier, WY Game and Fish Dept.

Report on testing 3 techniques for possible use in future swift fox surveys – infrared cameras, hair snares, and live trapping. Infrared cameras were the most efficient tool. Describes some technical difficulties and their proposed solutions. Recommend use of infrared cameras in an array of 5 cameras per quadrat using petroleum jelly-based skunk essence as the attractant during fall dispersal period.

2009 Swift fox survey, Fall River Ranger District, Buffalo Gap National Grassland, Nebraska National Forest. L. Hetlet, USFS Fall River Ranger District.

Describes 2009 survey effort on 8,300 acres using scent stations baited with sand substrate mixed with vegetable oil and baited with canned jack mackerel. Survey hindered by rainy conditions and grasshopper infestation, resulting in presumed underreporting of mammals. Detected 30 swift fox tracks on 195 bait station-nights.

Tokala Society – Kit fox (Swift fox) society on the Pine Ridge Indian Reservation – 2009 and 2010 SFCT report. T. Ecoffey and R. Goodman, Oglala Sioux Parks and Recreation Authority.

Report on preparation and implementation of swift fox releases on reservation during 2009 (54 released) and 2010 (25 released). Animals followed via radio telemetry; as of June 2010, 15 foxes detected with live signals and 13 foxes never detected. Nineteen pups documented in June 2010. Four of 25 animals released in 2010 found via mortality signals; 12 detected by live signals.

2009 Summary of swift fox activities at Badlands National Park and western South Dakota. J. Delger, Badlands National Park.

Reports on status of expanding population in southwestern SD, resulting primarily from successful reintroduction at Badlands National Park. Progress on research project to assess long-term viability of swift fox in this area is described, with testing of scent stations as the potential future monitoring tool. Also using mark-recapture via live trapping and continued use of passive identification tags to build mark-recapture database.

Restoration of swift fox on the Fort Peck Indian Reservation and northeastern Montana. K. Kunkel, Univ. of MT and L. Bighorn and R. Magnan, Fort Peck Tribe Fish and Wildlife Dept.

Report on results of 3 translocation efforts in fall 2006, fall 2009, and fall 2010. Population remains very small. Continue to monitor pup production and survival and adult survival. Worked with MT Fish, Wildlife and Parks to exclude the reservation from swift fox harvest. Have confirmed 10 pups.

Swift fox SSP 2009-2010 annual report. M. McBirney, Pueblo Zoo.

Provides background on captive breeding program and relationship to AZA structure. Nineteen AZA zoos presently have 64 swift fox specimens, which originated from research animals used at NPWRC. AZA Canid TAG recommended that captive swift fox population be capped at 75 animals, with the opportunity to secure additional wild animals via coordination with the SFCT. Requests that cooperators contact Marilyn regarding whether nonreleasable animals can be provided to diversify the captive swift fox bloodline.

World Wildlife Fund swift fox projects in Montana. K. Bly, World Wildlife Fund.

Reports on use of camera trapping to detect swift fox in 2 areas of Montana. Neither survey detected swift fox. Plan a second survey in 2011 in 6 different counties of southeastern Montana. Constructed swift fox habitat suitability model to help direct a research project involving WWF, Saint Cloud State University, MFWP, and the BLM.

This report also contained the meeting minutes from the 2010 SFCT meeting in Laramie, WY.