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December 15, 1999

Ms. Nancy Kaufman
Regional Director
U. S. Fish and Wildlife Service
P. O. Box 1306
Albuquerque, New Mexico 87103

Attention: Federal Aid Office

Dear Ms. Kaufman:

Please find enclosed performance report for segment one of Section 6 project E-43-1 "Population Status, Population Viability, and Habitat Use of the Swift Fox in New Mexico." We believe that this project is providing significant new information that will establish a biologically sound foundation for determining the status of the swift fox (*Vulpes velox*) in New Mexico.

Your support for this project is greatly appreciated. If you have any questions concerning this project, please contact me (476-0286) or C. Gregory Schmitt (827-9924) of our Endangered Species Program.

Sincerely,

A handwritten signature in cursive script that reads "Lisa B. Evans".

Lisa Evans

Federal Aid Coordinator

JAM/cgs
Att.

cc: Dennis Coleman (Ecological Services, USFWS)
Tod Stevenson (Conservation Services Chief, NMDGF)
Lisa Evans (Federal Aid Coordinator, NMDGF)
Mary L. Medina (Admin. Assistant, Conservation Services Division, NMDGF)
C. Gregory Schmitt (Endangered Species Biologist, NMDGF)



01676

PERFORMANCE REPORT

State: New Mexico Project Number: E43-1

Grant Title: Endangered Species

Study Title: Population Status, Population Viability, and Habitat Use of the Swift Fox In New Mexico.

Contract Period: October 1, 1998 To: September 30, 1999

I Project Statement

To determine the population status, population viability, and habitat use of the swift fox in New Mexico.

II. Project Objectives

1. Determine the method of population census most appropriate for swift foxes in New Mexico.
2. Determine demographic parameters necessary for assessment of population viability: natality, mortality, and sex ratios.
3. Determine whether or not and under what circumstances swift foxes will use cropland habitats.
4. Determine population density, home range size, diet, and den site selection within study area.
5. Assess threats to swift foxes.
6. Prepare a performance and completion report within 90 days after completion of this project.

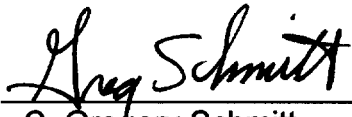
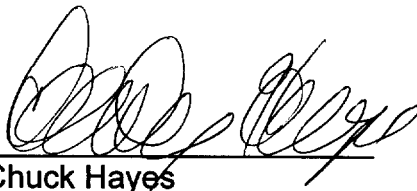
A. Procedures

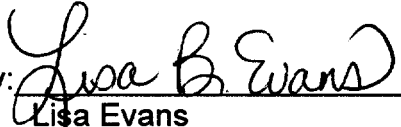
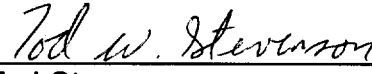
1. **Determine the method of population census most appropriate for swift foxes in New Mexico.** The first step involved in this project was to select a study area according to stipulations in professional services contract No. 99-516.52, Appendix 1, first year objective (No. 1): Select a study site with a mixture of cropland and rangeland and obtain landowner permission. A study site was selected and permission was obtained from private landowners to conduct research on swift foxes. Additional activities conducted

during the first segment of this project directed at determining an appropriate census method for swift foxes in New Mexico are detailed in Appendix 1, first year objective (No. 4): Begin assessment of census methods.

2. **Determine demographic parameters necessary for assessment of population viability: natality, mortality, and sex ratios.** Collection of demographic data on swift foxes consisted of live-capturing specimens and fitting them with radio collars. The target objective of capturing 15 swift foxes was not achieved; however, a total of eight swift foxes were live-captured and each fitted with a radio collar. It is anticipated that the objective of 15 radio-collared swift foxes will be achieved in late 1999 or early 2000. Additional detail concerning these activities is included in Appendix 1, first year objective (No. 2): Capture and radio collar 15 swift foxes. Additional activities directed at collection of data on natality, mortality, and sex ratios is provided in Appendix 1, first year objective (No. 5): Begin collection of data on natality, mortality, sex ratios, habitat use, home range size, diet, and den selection.
3. **Determine whether or not and under what circumstances swift foxes will use cropland habitats.** As a result of field investigations during the first segment of this project, no swift foxes have been captured in the vicinity of cropland habitats (Appendix 1, first year objective (No. 5): Begin collection of data on natality, mortality, sex ratios, habitat use, home range size, diet, and den selection.
4. **Determine population density, home range size, diet, and den site selection within study area.** Field activities included preliminary investigations to determine the absolute number of swift foxes within the study area. A discussion of what was done in this regard is provided in Appendix 1, first year objective (No. 3): Begin determining the absolute number of swift foxes within the study area. Additionally, activities were initiated to determine home range size, diet, and den site selection and are discussed in Appendix 1, first year objective (No. 5): Begin collection of data on natality, mortality, sex ratios, habitat use, home range size, diet, and den selection.
5. **Assess threats to swift foxes.** A preliminary assessment of threats to swift foxes was made during this segment. A discussion of potential threats to swift foxes is provided in Appendix 1, first year objective (No. 6): Begin assessing threats to swift fox on the study site with particular emphasis on radio-collared animals.

6. **Prepare a performance and completion report within 90 days after completion of this project.** A performance report for the first segment of this project was prepared.
-

Prepared by:  Approved by: 
C. Gregory Schmitt
Project Biologist
Chuck Hayes
Assistant Chief,
Conservation Services
Division

Approved by:  Approved by: 
Lisa Evans
Federal Aid Coordinator
Tod Stevenson
Chief, Conservation
Conservation Services
Division

APPENDIX 1

Population Status and Ecology of Swift Fox in New Mexico

Population Status and Ecology of Swift Fox in New Mexico

By

**Robert L. Harrison, Ph. D.
700 Roehl Rd, NW
Albuquerque, New Mexico 87107**

**Section 6 Project E-43-1
Population Status, Population Viability, and Habitat Use of the Swift Fox
in New Mexico**

**New Mexico Department of Game and Fish
Endangered Species Program
P. O. Box 25112
Santa Fe, New Mexico 87504**

Professional Services Contract 99-516.52

10 September 1999

Population Status and Ecology of Swift Fox in New Mexico

1999 Annual Report under Professional Services Contract No. 99-516.52

September 10, 1999

Prepared by: Robert L. Harrison, Ph.D.
700 Roehl Rd NW
Albuquerque, NM 87107

Swift fox research has progressed steadily toward the goals of this contract. No significant setbacks or problems have occurred. Activities this year included selecting a study area, mapping land ownership, obtaining permission to study on private and public land, updating landowners on the progress of the study, purchase and testing of telemetry and capture equipment, trapping and marking of foxes, telemetry, data entry, mapping of home ranges, scat collection, lure testing, testing of methods for surveys for tracks and scats, testing of scent stations with automatic cameras, location of dens, spotlighting, calling, and discussions and arrangements with genetics laboratories. Summaries of activities and results are presented below. This report describes activities prior to September 6, 1999, organized by objectives for the first year as listed in the contract. All conclusions regarding survey methods should be regarded as tentative at this time.

First year objective (1): Select a study site with a mixture of cropland and rangeland and obtain landowner permission.

The western unit of the Kiowa National Grasslands was selected for the study area, based upon the availability of swift fox, typical swift fox habitat, presence of cropland, public roads, and extensive public land. The study area is located northeast of Roy, NM, in Harding and Colfax counties. The extended study area covers approximately 484 square miles. Activities to date have been concentrated within a core area of approximately 128 square miles.

Land ownership and grazing permittees within the extended study area were identified and mapped through visits to the State Land Office, Kiowa National Grasslands, and Harding and Colfax County courthouses. Ninety individual landowners and permittees were identified. A letter was written to each landowner and permittee describing the project. All twenty-nine private landowners within the core area were then contacted by telephone or letter to request permission to enter their land. Permission was granted by all but two landowners. All landowners within the

study area have been identified. A second letter was written later to all ninety landowners and permittees updating them on progress of the study. Permission to use New Mexico State Trust land and Kiowa National Grassland was obtained after submission of the study proposal. In addition, permits to capture and handle swift fox were obtained from the New Mexico Department of Game and Fish and the University of New Mexico Main Campus Animal Care Committee.

First year objective (2): capture and radio collar 15 swift foxes.

After all necessary permission was obtained, field equipment was ordered, including traps, bait, radiocollars, antennas, sedatives, scat bags, etc. Initial tests of the telemetry system revealed that the initial design was inadequate. Further tests and reordering of equipment were necessary to achieve an acceptable arrangement. Tests of the current configuration indicate that under ideal conditions (ie, both transmitter and receiver on hilltops), the signal may be detected at 2.5 miles. Accuracy and precision tests using radiocollars at known locations (N = 24) revealed a systematic error of 1.0° and a random error of 1.18°. At one kilometer, with two observations taken at 90° to each other, the 90% error polygon is .0064 km², which represents approximately 0.04% of the average home range.

A total of sixteen trips to the study area have been made, not including pre-funding trips. Eight swift fox have been trapped. Each fox was dusted for fleas, examined for sex and condition, aged (juvenile or adult), and fitted with a radiocollar. Antennas of radiocollars were marked with a unique color code. Each fox was also marked with a unique pattern of fur dye. Attempts to take blood for disease and DNA analysis have been made, but without success to date.

Initially a combination of ketamine (25 mg/kg of body weight) and xylazine (2.5 mg/kg) was used, but this resulted in unnecessarily long sedation and depressed breathing and heart rates. Reduction of the dosage to 10 and 1 mg/kg, respectively, did not solve these problems. A new sedative, Telazol (10mg/kg) was used upon the last fox, but resulted in a short sedation and excessive salivation. Further modification of sedation procedures is required. No fox appears to have been harmed by capture.

Less than 15 foxes were trapped initially in order to establish telemetry procedures and to address other first year objectives. Trapping will be emphasized during the remainder of the first year in order to meet the contract goal of 15 captured foxes.

First year objective (3): begin determining the absolute number of swift foxes within the study area.

The absolute number of foxes will be determined by two methods: intensive

trapping combined with bait stations with automatic cameras, and DNA analysis of scat. Intensive trapping has begun. Automatic cameras at bait stations will provide information on unmarked foxes reluctant to enter traps. Marking foxes and equipping them with radiocollars will reveal whether or not foxes are alive when the absolute count is made. At present six marked foxes are known to occupy the core study area. Procedures and equipment for bait stations/automatic cameras have been established (see First year objective (4), below).

Technology for identifying species and individuals from DNA in scats has been published since this study began. These methods allow not only confident identification of the species producing a given scat, but also of the specific individual. Thus, both relative and absolute population estimates may be made. The technology has been developed for coyotes and other species, but not for swift fox. To develop this method for swift fox, five genetics laboratories were contacted (Smithsonian Institution, University of California at Los Angeles, University of Wisconsin, University of Montana, and University of New Mexico). Jerry Dragoo of UNM has developed much of the technology for swift fox and was chosen to conduct DNA analysis of swift fox scat. The U.S. Geological Survey in North Dakota agreed to provide scat and blood samples to Dr. Dragoo from their captive swift fox. Funding for Dr. Dragoo will not be provided from this contract.

A total of 168 scat have been collected for diet and DNA analysis. Scat have been collected both haphazardly when encountered and during systematic searches. Several methods for collecting scat have been examined, including foot and vehicle surveys of roadsides, inspecting conspicuous objects and locations (see below), and scenting known locations with a fox lure and then researching the location two weeks later. Foot and vehicle surveys along roads within known home ranges of marked foxes were very inefficient and produced few scats. Observations at 35 scented and 36 unscented locations did not reveal any enhancement of scat deposition at scented sites. The most efficient method for gathering scat appears to be examining conspicuous locations such as fence corners, cattle guards, and places where fences cross roads. Most scats were collected prior to systematic surveys, indicating that an accumulation was collected. In general, scat were easy to find during the first attempts at collection when an accumulation was present.

First year objective (4): Begin assessment of census methods.

Methods to census swift fox that are being tested include collecting scat (described above), searching for tracks, scent stations, spotlighting, calling, and trapping.

Searches for tracks have been found useful in other states. However, no swift fox tracks have been observed on the study area. Track survey methods have included

systematic road surveys, examination of conspicuous objects (see above), and haphazard examination of ponds and wet ditches. Track surveys will continue when conditions appear favorable, such as after snowfalls. Tentatively, however, soils in the study area, and probably in New Mexico in general, are too hard, dry, and sandy to take and hold identifiable swift fox tracks. Tracks have been observed only on prepared surfaces, such as scent stations.

Scent stations have been used successfully in New Mexico and other states to survey swift fox. Tests of scent stations were conducted within the home ranges of three marked foxes to date. The purpose of these tests is to determine what time period of observation and what spacing between stations is best to detect foxes in an area. Automatic cameras that took photographs when an object entered the station were used to determine if foxes visiting the stations were marked or unmarked. Five stations were set up in a transect within each fox's home range, and observed for six nights. A total of ninety station-nights of observation were conducted. Swift fox tracks were first observed on the transects after 1, 3, and 4 nights. On two transects, marked foxes left tracks and were photographed after 3 and 6 nights. On the third transect the marked fox was photographed on the first night, but did not leave tracks. Based upon this limited sample of marked foxes, observation of transects of five scent stations for six nights will result in 66% of foxes being detected.

Unmarked and marked foxes combined made 21 visits to stations. By subsampling the data, information was gained about the number of transects that would be visited as a function of the number of nights observed and the number of stations per home range (Figure 1). Detection rate increased smoothly as the number of stations per home range and the number of nights observed increased. Given the observed home range sizes (see first year objective (5), below) and assuming circular home ranges, five stations per home range is equivalent to a spacing between stations of approximately 0.4 mile, four stations is equivalent to a spacing of 0.5 mile, three is equivalent to a spacing of 0.6 miles, two is equivalent to a spacing of 0.8 miles, and one is equivalent to a spacing of 1.2 miles. In practice more than four nights of observation in any given area is impractical. Based upon this limited sample, to detect all foxes in an area, a spacing between stations of 0.4 miles and an observation period of at least four nights is required to detect foxes on all transects on which they are present. However, a spacing of 0.5 mile and an observation period of four nights will detect foxes on 87% of the transects on which they are present.

Spotlighting was conducted for 61 miles through the known home ranges of three foxes. No foxes were seen. Locations of foxes determined by telemetry during spotlight trails indicated that one fox was possibly close enough to have been observed. The area visible by spotlighting comprises a very small portion of a fox's home range and thus this technique is limited by the number of roads available. Spotlighting is a very inefficient technique. It is useful primarily as a supplement to

other methods, particularly during nighttime periods when other methods can not be pursued.

Six attempts to call foxes within view using recorded sounds were made. No foxes were observed even though telemetry locations indicated that they should have been able to hear the sounds. In open grassland habitat such as that of the study area, it is impossible to approach foxes by vehicle without being detected. Foxes appear to be wary of vehicles and may have been reluctant to approach. One homeowner was disturbed by the sound. Further trials of calling will be conducted, particularly during the mating season.

Eight swift fox have been trapped during a total of 241 trap-nights (3.3%). Trapping provides positive identification of the species observed, but it is too inefficient and labor intensive to be useful for a statewide survey.

At present it appears that the most efficient method of determining swift presence and relative abundance statewide in New Mexico is a combination of scat collection and scent stations. Scats may be relatively easily found and the species confirmed by DNA analysis. However, as shown by the road surveys, scat may not be found even though fox are actually present. Thus a supplemental method is necessary. Scent stations do readily detect swift fox although they are somewhat labor intensive. Spotlighting is very inefficient, but may be useful during nighttime periods when it is not possible to pursue other methods. Calling and track surveys appear to be worthless and trapping is too inefficient. Ideally, the first step of a statewide survey would be to search for scat. If scat is not found, scent stations would be set up while continuing to search for scat. During nighttime, the investigator would spotlight for foxes. This conclusion is only tentative at this time.

First year objective (5): begin collection of data on natality, mortality, sex ratios, habitat use, home range size, diet, and den selection.

Observations of pups have been limited due to the lack of marked females (see below). Observations at the den of one marked female did not reveal any pups, but two pups were observed at the den of an unmarked female.

Two marked foxes, both females, have died to date. Cause of death could not be determined for either. One pup was found dead due to a vehicle strike.

The sex ratio of captured foxes to date is 1:1 (four males, four females).

No foxes have been captured in the vicinity of cropland habitats and no data is available on cropland use.

Telemetry of swift foxes has produced a total of 221 independent locations during over 170 hours of observation. All data has been entered into the program CALHOME. Average 100% minimum convex polygon home range size for six foxes with over 20 location points is 6.1 mi² (1589 ha).

Radio contact with three foxes was lost shortly after capture. An arrangement was made for a pilot to conduct an aerial search, but the pilot failed to do the search. A second pilot located all three radio signals. Two foxes were still alive and monitoring was begun.

Scat collection to determine diet has begun and will continue (see First year objective (3), above).

Nineteen swift fox dens have been located with swift fox inside. Den site characteristics, including location, aspect, slope, number of entrances, and height of grass have been recorded. No significant trends in aspect, slope, or height of grass have been found.

First Year Objective (6): Begin assessing threats to swift fox on the study site with particular emphasis on radio-collared animals.

Potential threats to swift fox on the study site include trapping by U.S.D.A. Animal and Plant Health Inspection Service Wildlife Services agents, vehicle strikes, predation by coyotes and other species, and being shot. Wildlife Services activity occurs only in limited areas, and no swift fox have been reported killed. One swift fox pup was killed by a vehicle on state highway NM 39. The home ranges of two marked foxes cross NM 39 and they frequently are close to the highway, but they have not been killed. Two natal dens have been observed within a few meters of a secondary road, but no vehicle deaths were observed. No eagles have been observed on the study site and coyotes are only infrequently observed. Predation is a possible factor in the deaths of the two marked foxes which have died. Based upon conversations with ranchers, the attitude of local people toward foxes appears to be very positive and there has been no indication that they would shoot foxes for any reason. Hunting does occur in the study area. Hunters may shoot foxes for sport, but the hunting season is limited to a few days per year. No fur trapping or conversion of grassland to cropland has been noted on the study site yet.

During the remainder of the first year emphasis will be placed upon trapping additional foxes. Scent station and scat surveys will be conducted within the home ranges of marked foxes as these home ranges are determined.

Figure 1. Percent of scent-station transects visited by swift fox as a function of number of nights observed and number of stations per transect. Results are based upon subsampling of three transects of five stations each that were observed for six nights. Each transect was completely contained within a swift fox home range. These results are strictly preliminary.

PERCENT OF TRANSECTS VISITED v. NUMBER OF NIGHTS OBSERVED AND NUMBER OF STATIONS PER TRANSECT

