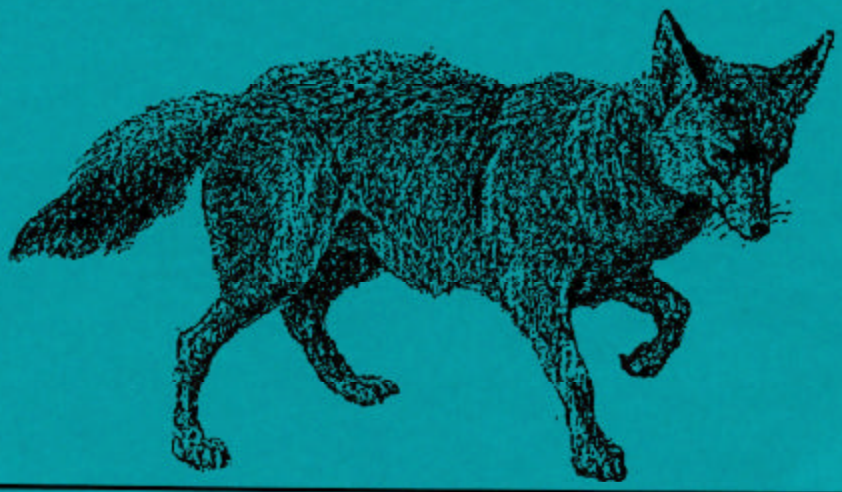
ANNUAL REPORT OF THE

SWIFT FOX CONSERVATION TEAM

1996



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INTRODUCTION

The swift fox (Vulpes velox), although often locally abundant, currently occupies only portions of its historic range which once included 10 states and 2 provinces. Colorado, Kansas and Wyoming apparently are the only states that continue to support viable populations. In 1992, the U. S. Fish and Wildlife Service (FWS) was petitioned to list the swift fox as endangered in the northern part of its historic, if not its entire range. The FWS's 12-month Administrative Finding in June 1995 concluded that listing was warranted but precluded. Concurrent with FWS's review state wildlife management agencies from the affected states and several federal resource management agencies formed the Swift Fox Conservation Team (SFCT) in December, 1994 to develop management objectives for the species as a constructive alternative to listing the species as endangered. The SFCT originally consisted of representatives of state wildlife management agencies from each of the 10 states within the historic swift fox range, representatives of the U.S. Forest Service, and representatives from Northern Colorado University and Colorado State University. A Habitat Conservation Assessment and Strategy for swift fox (HCAS) was drafted with the generalized objective to identify and reduce threats to the continued existence of the swift fox in the United States.

Since then, the USFWS, the USDA APHIS-Animal Damage Control (APHIS-ADC), the National Biological Service (NBS), and the Canadian Wildlife Service (CWS) have been added to the SFCT. The HCAS is equivalent to a recovery plan for a threatened or endangered species, but is being initiated by the SFCT as a pro-active alternative with fewer administrative complications and potentially greater cooperation compared to listing the swift fox as a federal endangered species.

The HCAS will provide the best means available to develop positive management decisions for the species to ensure that swift fox management is scientifically sound and has the best potential for success on private lands. This document was produced by a cross section of the best fur-bearer specialists in the Great Plains, and it contains the best state-of-the-art data and technology available for fur-bearer research and management. The objective of this annual report is to present the individual reports of the states and other management agencies conducting management and research activities in 1996 in accordance with the HCAS. The HCAS is a working document that will periodically be revised to reflect new information on swift fox genetics, distribution and limiting factors.

APPROACH

Specific objectives for the HCAS were developed in December 1994 by the SFCT and presently consist of the following: 1) to enhance the distribution of swift fox where ecologically and economically feasible, 2) to maintain genetic diversity and health within the species, 3) to maintain current areas of abundance and manage additional populations for increased abundance, 4) to elevate the management status of the species throughout the distribution, and 5) to develop incentives for private landowners to manage for swift fox. The success of the HCAS depends on the combined and coordinated efforts of all state wildlife management agencies, federal land management agencies, many research institutions and private landowners. Initial efforts to address objectives and test hypotheses will primarily be designed to evaluate various techniques for monitoring distribution of swift fox throughout the Great Plains.

A divergence of opinion exists regarding techniques and the relationship of survey results to actual population densities. Ultimately, swift fox biology will be sufficiently investigated so that the measurement of population sizes and densities can be accomplished, and periodic surveys conducted to measure and record trends in distribution and population size. Efforts will also be made to increase the knowledge of other aspects of swift fox ecology. For example, studies are contemplated to evaluate swift fox social and territorial behavior, reproductive performance, habitat preferences and requirements, survival rates; and population modeling and interspecific competition between swift fox and the other canid species that currently exist in the Great Plains.

DISCUSSION

All 10 state agencies involved in the Swift Fox Conservation Team (SFCT) conducted field studies on swift fox in 1996. These ranged from preliminary efforts to define the range of the species in the respective states to in-depth research projects designed to develop effective survey techniques or document movements and home range sizes. In addition to state efforts, the U.S. Geological Survey - Biological Resources Division, in a cooperative effort with the Kansas Department of Wildlife and Parks, conducted research in western Kansas to develop and improve survey techniques, and several National Grasslands conducted swift fox surveys. At present, field investigations by most states still includes at least some work to document presence or absence of the swift fox within its historic range. Field data collected over the last two years indicate the species is more widely distributed than previously thought, and occupies more habitat types than short and mid-grass prairies. Wyoming has found the present distribution of swift fox in the state is similar to that of the historic range, and may exceed it. All states except North Dakota and New Mexico have found evidence of the production of young swift fox, and all states except North Dakota have found evidence of swift fox presence in their jurisdiction beyond occasional sightings.

Population modeling is being closely examined as a means of preliminary investigation of population dynamics of swift fox. Field data available for input into computer models are limited (e.g. reproductive performance) or lacking (e.g. annual survival rates) for many parts of the range. The USGS-BRD/Kansas Department of Wildlife and Parks research project completed in 1996 significantly improved knowledge in these areas. Efforts to upgrade both the quality and quantity of model data, and field tests to evaluate results of the computer models, area a priority of the SFCT in the future.

Questions still persist regarding the taxonomic classification of swift fox. Among SFCT members, there appears to be some valid concern that swift fox and kit fox may not be separate species. Certainly the currently available data indicate there is disagreement on this important point by geneticists and taxonomists. New Mexico and Texas both have a real interest in this question as well as other southern plains states where both species may occur. Nebraska submitted a funding application to the USFWS for DNA testing for swift fox in 1995, but the funding was denied. Comments from the public in South Dakota also indicated the swift fox-kit fox taxonomic question should be resolved before any large amount of money is spent investigating an animal that is potentially not a true species. The SFCT concurs on this point. Given the current taxonomic disagreement on whether these animals are different species, a determination must be made as soon as possible. If the species are not separate, the case for a federal endangered species classification for swift fox is weakened.

Interspecific competition appears to be a potential limiting factor for swift fox populations in the Great Plains. Recent data from California indicate coyotes may limit kit fox survival, but red fox may be catastrophic to their survival. In Colorado,

31% of the radio-collared swift fox were found dead, and in Kansas, coyote predation is the most important cause of mortality on swift fox. North Dakota found very disparate proportions of coyotes, red fox, and swift fox reports since 1970, especially between numbers of red fox and swift fox. They believe interspecific competition, especially from very high densities of red fox, is the most important limiting factor on swift fox in North Dakota. We suspect interspecific competition may not be the only major limiting factor on swift fox populations in the Great Plains; however, the evidence (albeit circumstantial at this point) is mounting that it may be a very strong factor. The SFCT hypothesizes that other limiting factors to swift fox distribution and population size potentially include food base, particularly winter food, habitat composition and condition, diseases and parasites, and public attitudes, especially landowner resistance to government intrusion on private lands. These potential limiting factors will be investigated as funding and techniques become available.

The evidence collected from swift fox field investigations to date regarding distribution and densities contrasts sharply with the information provided in the original petition to list swift fox as an endangered species. Information presented in both the 1995 report, and in this report, clearly indicates the petition to list the swift fox is severely flawed due to a lack of quality field data from the entire swift fox range. Further, little of the data cited in the petition, or the administrative finding to list swift fox as an endangered species, were obtained from scientific journals that require critical review, and approval prior to publication. Most data cited are from unpublished reports and similar sources; thus those data may not have undergone objective scrutiny from other scientists.

This unfortunate circumstance resulted in a lack of scientific credibility for the data presented. The research efforts of the SFCT in 1995 and 1996 have significantly increased the amount of reliable, credible scientific data available for swift fox. Survey efforts planned for 1997 will allow the SFCT to present data to document current distribution from three years of research throughout the range of the species. These data will significantly aid in determining what differences in distribution and abundance of swift fox exist between pre-settlement times and the present. This information will allow management strategies to be devised which can insure long-term survival of the species and work toward an increase in both distribution and density throughout much of the original range.

The SFCT strongly recommends the Habitat Conservation Assessment and Strategy (HCAS) approach to swift fox management be allowed to proceed. Considerable progress has been made on documentation of current range, survival factors, and interspecific competition, and the SFCT is a functional vehicle for facilitating additional research and eventual management of the species over its entire range. This approach has the advantage of keeping swift fox management within the domain of agencies capable of effectively managing and monitoring the species and its habitat on a local and statewide basis while participating in a effort coordinated over the range of the species.

SWIFT FOX (*VULPES VELOX*) MANAGEMENT AND RESEARCH IN KANSAS: 1996 ANNUAL REPORT

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ABSTRACT

For the past three years, harvested swift fox have been tagged with Kansas Department of Wildlife and Park pelt tags. Harvest has remained low, with 90 % of the swift fox taken incidentally to coyote trapping. Information received from trappers indicate that foxes are harvested in both cropland and rangeland habitat throughout the state. Population surveys used to monitor swift fox population trend in Kansas include road side surveys, employee opinion survey, and furharvester survey. A combination of these results indicate a stable population of swift fox in Kansas. A research project on differential survival rates between swift fox inhabiting rangeland and cropland habitats, mortality causes, home range, and survey techniques to monitor swift fox populations was conducted in western Kansas in 1996. Results are presented in the research report by Marsha Sovada. Result from the den site characteristics study are summarized. No differences in den characteristics were detected between dens in rangeland and cropland habitats. Habitat characteristics surrounding den sites did however differ significantly between the two study sites. We investigated juvenile swift fox dispersal, home range, and causes of mortality during the fall 1996. Preliminary results on juvenile swift fox mortality indicate high mortality rates during the fall attributed to either automobiles in the cropland site or depredation in the rangeland site. Of the 24 juvenile swift foxes monitored that survived, only one female and one male juvenile swift fox dispersed beyond their parents home range successfully by the end of January 1997.

INTRODUCTION

For a historical account of swift fox in Kansas, refer to the 1995 Swift Fox Conservation Team annual report.

SWIFT FOX MANAGEMENT IN KANSAS

Swift fox were unprotected in Kansas until 1931 when red fox, grey fox and swift fox were added to the furbearer list. The season was then closed on swift fox harvest in 1956 and it was not until the 1982-83 season that the swift fox could be legally harvested again. No limits were set on the number of animals harvested, but harvest was restricted to the open furbearer harvest season. The opening of a swift fox harvest season in 1982-83 provided the opportunity to acquire harvest information on the swift fox. In 1983, a survey of Kansas Department of Wildlife and Parks (KDWP) employee opinion on the status of furbearer populations in Kansas was initiated. The 10 week raccoon roadside survey, initiated in 1980, was expended in 1986 to include swift fox and

other furbearers. Locations and number of swift fox sighted, or killed due to motor vehicle accidents, have been recorded since. Harvest estimates, based on our annual furbearer harvest survey, has varied from a low of 33 (1995-96 and 1996-97 seasons) to a record high of 1,200 swift fox during the 1986-87 season (Fig. 1). The decline in harvest corresponds with the decline in fur value for coyotes and the number of trappers. However, based on the annual employee opinion survey, the swift fox population has remained stable (Figure 2). Locations of swift foxes observed during the 1996 roadside survey are presented in Figure 3. In 1994, the KDWP adopted a swift fox pelt tagging program aimed at acquiring information on the number of animals harvested, the distribution of swift fox in Kansas, locations of harvest, and types of habitat utilized by swift fox.

Results from the mandatory tagging program indicate that swift fox are primarily harvested using leg hold traps and are accidental to coyote captures (Table 1). During the 1994-95 season, swift fox were primarily harvested in November and December after the opening of the season. During the 1995-96 season, swift foxes were harvested throughout the season ending on January 31. This past season swift fox were harvested through December and January. Furharvesters were also asked in which type of habitat swift fox were harvested. During the 1994-95 season, 71 % of the harvest were located in short-grass prairie and 29 % in dryland crop. Inversely, 94 % of the swift fox were harvested in dryland crop with some short-grass prairie and only 6 % in short-grass prairie during the 1995-96 season (Table 2). During the 1996-97 season, 58% were harvested in dryland cropland habitat and 37% in short-grass prairie. The statewide tagging program reflects similar findings obtained through our research effort, indicating swift fox utilize both short-grass prairie and dryland crop habitats.

RESEARCH PROJECTS

Research on swift fox den characteristics and habitat selection was conducted in 1995-1996 by Vicky Jackson, a graduate student from Fort Hays State University, Kansas. Study site and methodology are as described in the 1995 Swift Fox Conservation Team annual report. Presented here are an overview of her findings. Detailed results of den site characteristic in rangeland and cropland can be found in the authors final report (Jackson, 1996). Den sites located in both rangeland and cropland habitats were compared based on den characteristics and habitat selection. Den characteristics were evaluated based on size, shape, and direction of openings, distance between multiple openings, and dimension of tailings. Habitat selection was based on slope of surrounding terrain, surface roughness, surface ruggedness, surrounding vegetation, and soil type.

Of the 33 den sites identified in the rangeland, 4 were determined to be natal den sites, based on the visual observation of pups. Similarly, 6 of the 27 dens found in cropland were natal den sites. At each den site, an average of two den openings primarily oval or keyhole shape were found. The height of den openings in cropland averaged 22.4 cm with a width of 18.8 cm. Similarly rangeland den sizes averaged 25.1 cm X 21.9 cm. There was no difference in the number of openings, their shape, or their size between cropland or rangeland den sites.

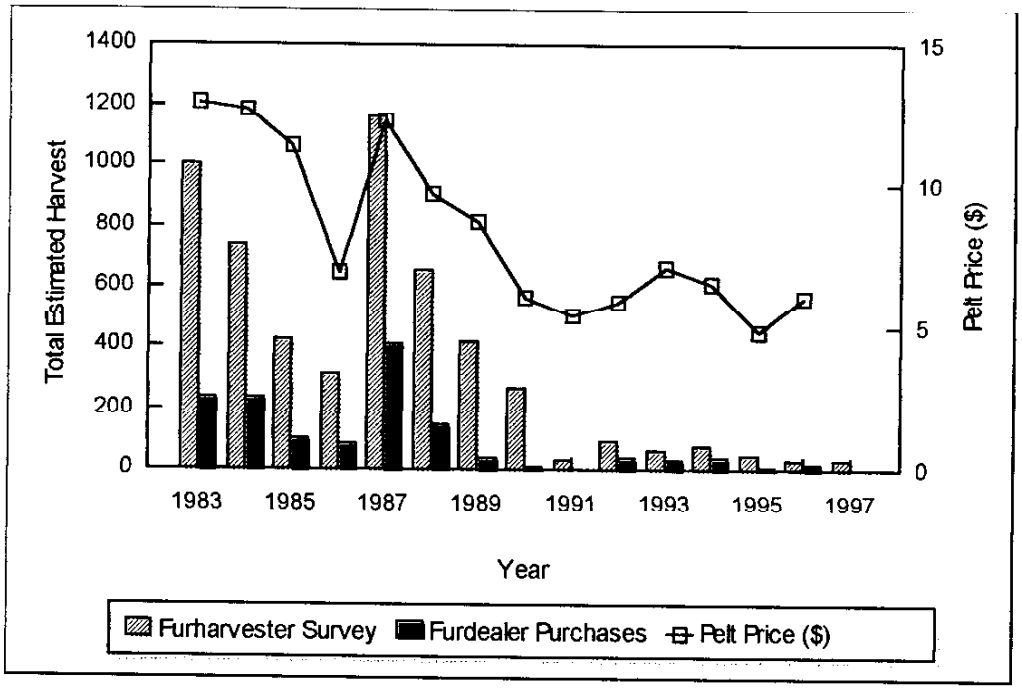

Figure 1. Swift fox harvest survey, furdealer purchase, and pelt price records since the reopening of the harvest season in 1983.

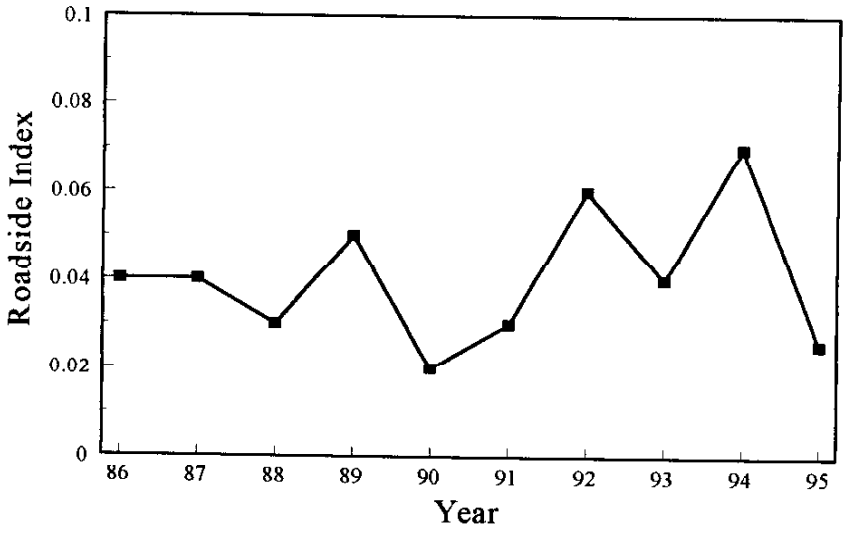

Figure 2. Kansas swift fox population trend based on summer roadside survey of furbearers. 1986-1995.

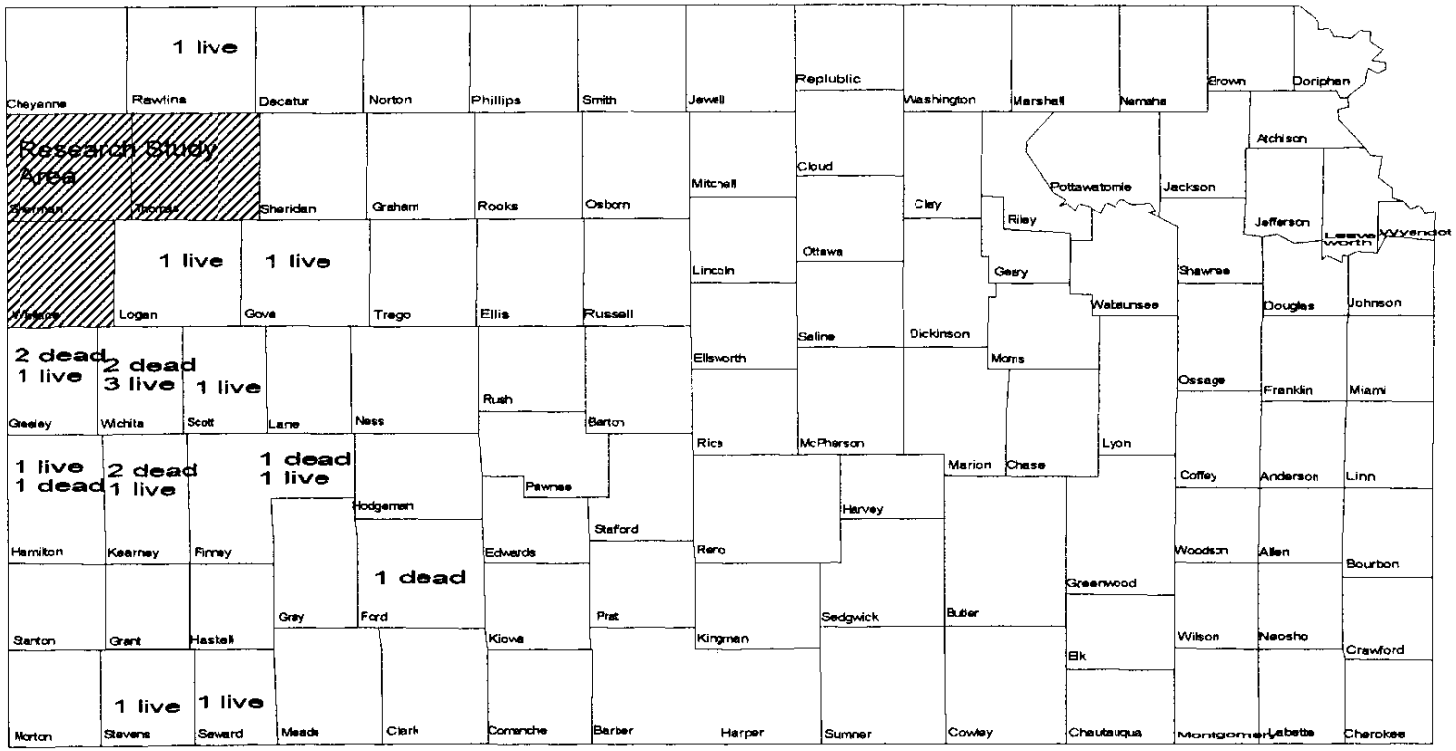

Figure 3. Location of the 1996 swift fox sightings in Kansas. Based on the summer roadside survey of furbearers.

Table 1. Method of take for swift fox since the onset of the tagging program in 1994.

	1994-95		1995-96		1996-97	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Method of take						
Leg hold trap	**43**	**89.6**	**30**	**90.9**	**31**	**93.9**
Rifle	1	2.1	1	3	1	3
Shotgun	2	4.2	1	3		
Salvage	2	4.2	1	3	1	3
Target Species						
Swift fox	7	14.6	13	56.5		
Coyote	**34**	**70.8**	**9**	**39.1**	**31**	**93.9**
Badger	5	10.4				
Roadkill	2	4.2	1	4.3	1	3
Unspecified					1	3

Table 2. Habitat characteristics where swift fox were harvested since the onset of the tagging program in 1994.

Immediate habitat of harvest / General Habitat	1994-95		1995-96		1996-97	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Short-grass prairie	2	4.2	2	6.1	9	**27.3**
Short-grass prairie / Short-grass prairie	**29**	**60.4**			6	18.2
Short-grass prairie / Dryland crop	1	2.1				
Short-grass prairie / Irrigated crop	2	4.2				
Dryland crop	3	6.3			**12**	**36.4**
Dryland crop / Short-grass prairie	1	2.1	**18**	**54.5**		
Dryland crop / Dryland crop	2	4.2	**10**	**30.3**	4	12.1
Dryland crop / Irrigated crop			1	3		
Dryland crop / CRP	4	8.3	1	3		
Irrigated crop / Irrigated crop	2	4.2				
CRP	2	4.2				
CRP / Dryland crop			1	3		
Unknown					2	6

There was significant differences in vegetative cover between den sites in both habitats. The large expanses of bare ground in cropland site along with taller vegetation differed from the short-grass prairie in rangeland habitats. This did not affect the swift foxes' ability to utilize both habitats successfully.

In the fall of 1996, juvenile foxes were captured from 10 known family units in order to follow their movements during the fall dispersal period. In the cropland habitat, 10 females and 8 males were radio-collared, and in the rangeland, 2 female and 4 male were collared. Foxes were monitored from August 1996 through the end of January 1997 using techniques described in this report in the section on the summary of swift fox research activities conducted in western Kansas. The data is currently being analyzed and will be published in a peer reviewed journal.

DISCUSSION

While a few studies (Kilgore 1969, Hines 1980, and Fitzgerald et al. 1983) have indicated swift fox inhabit areas with a mixture of agricultural use, no study has addressed the impact of agricultural practices and grazing on swift fox. It is generally believed swift fox require short-grass or mixed grass prairies (Samuel and Nelson 1982) and swift fox populations in agricultural lands occur at lower densities than in prairie. Furthermore, conversion of prairies to cropland has been implicated as an important factor in the decline of swift fox populations or their failure to recover (Cutter 1958, Kilgore 1969, Snow 1973, Hillman and Sharps 1978, Hines 1980, Fitzgerald et al. 1983). Based on the tendency for similar San Joaquin kit fox (*Vulpes macrotis mutica*) to exploit areas substantially modified by agriculture or other human activities (Fauna West Wildlife Consultants 1991), we suggest it is not necessarily the conversion of prairie to cropland which hinders swift fox recovery, but rather the management of the grasslands and the cropping patterns on the croplands, and how these practices influence potential prey and coyote populations. Tall and dense grassland, such as occur on CRP fields, may be unsuited for swift fox and increase escape cover for coyotes. Coyote populations may also be a key to current swift fox abundance and distribution. Until the use of radio telemetry it was frequently stated coyote predation was a natural mortality (Kilgore 1969), however, it was generally de-emphasized by stating there was little evidence of predation (Fauna West Wildlife Consultants 1991). Our research and other recent telemetry studies (Rongstad et al. 1989, Covell 1992, and Brechtel et al. 1993, Sovada and Roy unpubl. data) have shown that predation by coyotes is the most important mortality factor in adult swift foxes.

Agricultural systems on privately owned lands are crucial to swift fox conservation. For example, most Federal and State owned lands in Kansas are either too small or inadequate to support swift fox, or outside the historic distribution of the species. Management by private landowners during the previous 40 years has been sufficient to allow swift fox to survive and indirectly prosper from man's agricultural activities. Quantitative data are needed on the impact of grazing on swift fox habitat before management recommendations are formulated. Snow (1973) suggested control of grazing was a critical consideration in swift fox management. Quantitative data may show

intensive grazing is necessary to reduce visual obstructions. Cutter (1958) reported nearly 75% of the swift fox dens in his study occurred in areas he classified as overgrazed pastures. In western Kansas, dens are commonly found in both cropland and rangeland. Our preliminary findings suggest dryland wheat farming, and moderate to intense grazing pressure, may be compatible with swift fox management.

Funding Sources

Funding for swift fox in Kansas is primarily received through Federal aid grants to fish and wildlife management (Pittman-Robertson Act) and state agency funding. Swift Fox dispersal research was made possible through funds received from the Endangered Species Section 6 program.

1997 Research Activities

The following proposals were submitted for funding during 1996. All were denied funding.

USGS State Partnership program: Swift fox ecology in western Kansas

Challenge cost share proposal: Swift fox ecology and monitoring techniques

Species at Risk Funding Initiative: Determination of genetic variation among swift fox populations throughout their range.

Species at Risk Funding Initiative: Return of the swift fox and the saga of the short-grass prairie (funds for video and other educational material).

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SWIFT FOX INVESTIGATIONS IN COLORADO, 1996

Kahn, Rick and Tom Beck, Colorado Division of Wildlife, 317 W. Prospect, Ft. Collins, CO 80526 (970-484-2836; 970-490-6066 FAX). James Fitzgerald, Darby Finley, and Brian Roell, University of Northern Colorado, Greeley Co., 80639 (970-351-2923).

ABSTRACT

Forty plots were trapped in our eastern plains inventory in 1996-97. We captured 123 swift fox (56 males, 65 females, 2 sex unknown). Foxes were captured on 30 of the 40 plots. The effective area sampled in 1996-97 was estimated to be 800 square miles. Numbers of fox captured varied from 1-10/20 mi^2, with a mean of 5.5 foxes per 20 square miles for all plots with fox. Catch per 100 trap nights varied from 9.2 in October to 1.2 in June. Capture success was higher for trap nights 2 and 3 (4.6 and 5.6 fox/100 trap nights) than for nights 1 and 4 (2.9 and 3.0 fox/100 trap nights). Since March 1995 we have sampled 72 plots covering 1440 square miles. A total of 243 foxes (118 male, 122 female, 3 of undetermined sex) were captured from 51 (71%) of the plots. On plots with fox captures, success averaged 4.4 animals per 100 trap nights with an average of 4.8 foxes per 20 mi^2, about one "adult" fox per 4 miles. Studies continue on mortality, reproductive success, and movements of swift fox on 2 sites in northern Weld County. Since fall of 1994, 125 swift foxes (66 females, 59 males) have been trapped and marked or radio-collared. Eighteen females and 18 males (29% of marked animals) have been recovered dead. Seventy-one percent of mortality was from coyotes. Eight whelping females in 1996 produced 27 pups (3.4/female).

INTRODUCTION

The swift fox occurs on the eastern plains of Colorado. It is classified as a furbearer with a closed season on harvest. Kahn and Fitzgerald (1995) provided historical information and management and research objectives for the species in the state. In 1996 efforts continued to sample sites on the eastern plains for presence or absence of fox (extensive survey, 1995 report). Studies also continued at UNC on aspects of swift fox biology in northern Colorado (intensive survey, 1995 report).

METHODS FOR 1996 RESEARCH

The methods for the extensive live trapping project were reported by Kahn and Fitzgerald (1995). Methods for the intensive effort were appended to that report (Fitzgerald and Roell 1995). The intensive site effort included testing of use of hair dyes and colored collars to identify individual foxes. Foxes visiting bait stations were photographed with infra-red sensing camera systems. Cameras will be used in 1997 on an expanded study area to estimate total population using mark-resight techniques.

RESULTS

EXTENSIVE SURVEYS: Trapping of the 72 survey plots was completed in early 1997 with 2 plots trapped in January included in this report. In 1996-97 we trapped 40 plots capturing 123 swift fox (56 males, 65 females, 2 sex unknown) (Table 1). Nine animals (7%) were recaptured during the 4-day trapping sessions. Two ear-tagged foxes have since been recaptured by workers on the Pinyon Canyon military reserve. Foxes were captured on 30 (75%) of the 40 plots. The area sampled in 1996-97 was 800 square miles. Numbers of fox captured varied from 1-10/20 mi^2, with a mean of 5.5 foxes per 20 mi^2 for all plots with fox and 4.1 per 20 mi^2 for all plots. Catch per 100 trap nights varied from a high of 9.2 in October to 1.2 in June. Capture success was higher for trap nights 2 and 3 (4.6 and 5.6 fox/100 trap nights respectively) than for nights 1 and 4 (2.9 and 3.0 fox/100 trap nights) (Table 2).

Table 1. Numbers of swift fox captured by year and month in eastern Colorado for the 1996-1997 field season and for the total project effort. Trapping was not conducted in February or April.

1996-97 (40 plots)

	Jan	Mar	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Number	4		9	5	6	2	3	33	55	6	123
Trap Nights	100		400	400	300	60	180	360	700	520	3020
Catch/ 100 Traps	4.0		2.2	1.2	2.0	3.3	1.7	9.2	8.7	1.2	4.1 avg

1995-97 (72 plots)

	Jan	Mar	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Totals
Number	4	34	15	19	7	15	14	61	68	6	243
Trap Nights	100	280	560	1066	792	460	500	660	779	520	5717
Catch/ 100 Traps	4.0	12.1	2.7	1.8	0.9	3.3	2.8	9.0	8.7	1.2	4.2 avg.

Since March 1995 we have sampled 1440 square miles. A total of 243 foxes (118 male, 122 female, 3 of undetermined sex) were captured from 51 (71%) of the plots. No traps were placed

disperse or adults. Fox were observed but not captured on 2 plots. On plots with fox captures, success averaged 4.4 animals per 100 trap nights with an average of 4.8 foxes per 20 mi^2, about one "adult" animal per 4 miles.

Trap success varied with season. In winter (Dec-Feb) 620 trap nights resulted in capture of 6 male and 4 female foxes (1.6 fox/100 trap nights). In spring (Mar-May) 840 trap nights yielded 23 males and 26 females (5.8 fox/100 trap nights). Summer trapping (June-Aug) yielded 21 males, 18 females, and 2 of undetermined sex in 2318 trap nights (1.8 fox/100 trap nights). In fall (Sept-Nov) 1939 trap nights yielded 68 males, 74 females, and 1 of undetermined sex (7.3 fox/100 trap nights). Three months (March, October and November) yielded 163 of the 243 captures (67%) in 1719 trap nights of the 5717 total nights trapped (30%). One hundred one of the 243 (45%) animals were taken from 8 of the 51 plots (16%) on which foxes were captured.

INTENSIVE STUDY: Studies continued on mortality, reproductive success, and movements of swift fox on 2 sites in northern Weld County. Since October 1994, 125 swift foxes (66 females, 59 males) have been trapped and marked with 110 (88%) equipped with radio-collars. All captured animals have been ear-tagged. Eighteen females and 18 males (29% of marked animals) have been recovered dead. Twenty-five (71%) of the animals were killed by coyotes, 4 (11%) died from shooting and 3 (9%) from automobiles. Eight whelping females in 1995 and 8 in 1996 had respective totals of 14 (1.8/female) and 27 (3.4/female) pups.

Table 2. Fox captures by night of capture for the 1996-97 field season and for the total project length 1995-97

					1996-97				
Night	1	2	3	4	5	6	7	8	Totals
Capture	23	37	42	21					123
Trap Nights	800	800	720	700					3020
Catch/100 Traps	2.9	4.6	5.6	3.0					4.1 avg
					1995-97				
Night	1	2	3	4	5	6	7	8	Totals
Captures	41	73	83	39	3	4	0	0	243
Trap Nights	1435	1435	1355	1314	98	40	20	20	5717
Catch/100 Traps	2.8	5.1	6.1	3.0	3.8	10.0	-	-	4.2 avg

Results of mark-resight efforts using infra-red camera systems suggest the grid trapping system results in high capture success. Estimates of population have not been completed.

Summary of Expenditures - Total cost for the swift fox inventory and intensive site work for 1996 was approximately $100,000.

DISCUSSION

Finley and Roell will complete Master's theses on the 2 projects in 1997. Finley is still processing survey results comparing ground site conditions with GAP vegetation maps. He will also finish ground mapping contiguous blocks of short-grass prairie associated with the trapping plots. Trapping results confirm the pattern of swift fox distribution we anticipated based on GAP map estimates of short-grass prairie. Seventy-seven percent of fox captures came from 3 widely separated areas of the eastern plains. One area is in northern Weld county north of the South Platte River and west of intensive agricultural areas in Sedgwick and Logan Counties. Seven Weld County plots (10% of those sampled) accounted for 44 (18%) of the 243 fox captures. Seventy-one foxes (29%) were captured from 12 plots (17% of those sampled) in Lincoln, eastern Elbert and northern Crowley counties. These 3 counties harbor much of the remaining short-grass prairie found in central Colorado south of the South Platte River and north of the Arkansas River. South of the Arkansas River portions of southern Pueblo County, southern Otero County, northern Las Animas County, and eastern Huerfano County account for most of the short-grass prairie remaining south of the river. We captured 76 foxes (31%) from 17 plots (24%) in that area.

We did not capture many foxes on plots with large amounts of sand-sage prairie. We had little success in trapping foxes on areas with considerable amounts of crop lands or conservation reserve lands although mixed agriculture-prairie land is important habitat in Kansas (Fox and Roy, 1995).

Season of the year effects trapping success. Lack of success on some plots may be a factor of season of trapping. Fourteen of 21 plots (67%) on which we did not capture foxes were trapped May-July. On our intensive study site in Weld County we have had difficulty trapping foxes when pups were still in or not ranging far from natal dens. Other authors noted seasonal differences in scent station results which tend to support our findings. Woolley et al. (1995) remarked on bait at tracking plates being untouched during summer months while readily taken in winter and spring. Hoagland (1995) reported poor success at track stations in July but attributed low visits mostly to excessive rainfall. Her success improved in October. Studies on kit fox in California (Cypher and Scrivner 1992) suggest that winter indices are best for census of that species. We suggest the Swift Fox Conservation Team consider season of year an important factor when determining timing of census efforts. We suggest fall or late winter-early spring as times of the year that may yield the best success.

Fox and Roy (1995) reported live trapping success, however, their results combined capture and recapture. This study presents initial capture data only when calculating success per 100 trap nights. Fox and Roy (1995) also placed traps at sites they believed would result in the best chance of fox captures while our traps were evenly spaced regardless of site conditions. Despite differences in methods our respective yields average 4 animals per 100 trap nights. Kruse et al. (1995) reported 2.7 swift fox visits per 100 track plates (12/448) in South Dakota in July and August, not much different from our 0.9-3.3/fox per 100 trap nights in those same months. In Wyoming, Woolley et al. (1995) reported 37 swift fox occurrences in 994 miles of tracking plate transects and 1868 miles of spotlight survey transects conducted from March-September in 1995. In that same year our trapping grids yielded 120 fox captures over a 640 mi^2 trapping area. Our total effort yielded 243 captures over 1440 mi^2.

Our infra-red sensing camera work in Weld County has shown marked foxes travel as much as 2 miles in single night foraging episodes and as much as four miles over 2-3 nights to visit camera bait stations. Several individuals show a consistent pattern of "running" fence lines or roads to hit such stations. We suggest that this could bias "visits" to scent stations or track plates placed along roadways in swift fox habitat especially if stations are only 1 mile apart. Individuals using scent station lines should keep in mind the same fox can hit several baits on one run.

With respect to Colorado's swift fox management needs and the objectives of the Swift Fox Conservation Team we believe that we have clearly demonstrated that swift foxes still occupy much of the short-grass prairie in our state. We estimate we sampled about 10% of the large and medium sized blocks of short grass prairie on the eastern plains and found over 70% of our sampled plots to contain foxes. The results support the Colorado Division of Wildlife's initial response to the swift fox petition, i.e. the state has a good population of foxes widely distributed across the eastern plains. Results from the intensive site studies are not complete. However it appears that the population in northern Weld county is stable or slightly larger than it was in the late 1970's and early 1980's. Although coyote predation appears to be the main mortality factor it does not appear limiting to swift foxes in northern Colorado.

We have virtually no data regarding the degree of swift fox occupancy of agricultural-prairie habitats on the eastern border of the state. We also have raised the question of effectiveness of live-trapping in late spring and summer. These pose interesting questions for future study but we probably can make a case that we presently have fox populations occupying most large blocks of short-grass prairie in our state and that management of the species is not dependent on patchy agricultural habitats such as observed in Kansas.

LEGISLATIVE ACTION: Legislation enacted by the 1996 session of the Colorado Legislature gave exclusive authority for management of several species of depredating mammals to the Colorado Dept. of Agriculture. The swift fox was included, as were all foxes. General management authority of these species still remains with the Division of Wildlife. However, once a group of animals is involved in livestock depredation in an area, the authority for management of the species involved in that particular area goes to the Dept. of Agriculture. The Div. of

Wildlife worked with the Dept. of Agriculture to develop a set of appropriate action rules. Since swift fox are rarely involved in direct depredations, their greatest vulnerability will come as by-catch of coyote control actions. The Dept. of Agriculture is aware of our concerns with swift fox and possible consequences of potential Federal listing.

In a related, perhaps partly reactive, action a citizen ballot initiative was developed to severely restrict the use of leg-hold traps, body-grip traps, snares, and toxicants throughout Colorado. This initiative passed in the November 1996 election and will limit the hardware available for both private and government depredation control work. Essentially the above traps are banned statewide with limited exceptions for public health, wildlife research, and depredation control for a single 30-day period annually if the landowner can demonstrate that non-lethal procedures have been tried and found ineffective. The initiative was a Constitutional Amendment and required enacting legislation to be passed by May 1, 1997. The Colorado Legislature is currently debating such legislation. In the interim, the Div. of Wildlife and the Colorado Dept. of Agriculture approved a Memorandum of Understanding which established operational rules based on mutually agreed interpretations of the Constitutional Amendment.

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SWIFT FOX INVESTIGATIONS IN NEBRASKA, 1996

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ABSTRACT

Swift fox history, classification and other information on swift fox in Nebraska can be found in the 1995 Report of the Swift Fox Conservation Team.

Swift fox field investigations in 1996 involved the establishment of a contractual agreement between the Nebraska Game and Parks Commission, U.S. Forest Service and USDA-APHIS-ADC to live-trap and collect blood samples for genetic analysis. Trapping got underway in December and six animals were trapped. Blood samples were collected from each animal and will be analyzed as time permits. Additional trapping will be conducted in 1997 and samples will hopefully be analyzed in 1997.

INTRODUCTION

The draft Conservation Assessment and Conservation Strategy for Swift Fox in the United States (Kahn, et. al. 1996) identified the need to investigate swift fox genetic variation among state populations. An application for research funding to conduct genetic investigations was submitted to the U.S. Fish and Wildlife Service in 1995, but funding was denied. A cooperative agreement between the Nebraska Game and Parks Commission, U.S. Forest Service and USDA-APHIS-ADC to live-trap and collect blood samples for genetic analysis was established in October, 1996. Under the agreement, the U.S. Forest Service provided funding and USDA-APHIS-ADC conducted the trapping. The Nebraska Game and Parks Commission coordinated the effort and will analyze the blood samples.

STUDY AREA AND METHODS

Trapping and blood collection was conducted by USDA-APHIS-ADC personnel in western Sioux County, Nebraska in December, 1996, and will resume in northern Sioux County in 1997. Approximately 25 live traps, borrowed from Kansas and Colorado, were used for the live-trapping. Traps were baited with mackerel and bacon, with grouse or pheasant feathers used as an attractant in some traps. Blood was drawn from an artery in the front leg, and is being stored for analysis.

RESULTS

Because trapping is not yet complete and blood samples have not yet been analyzed, no results are available to report.

DISCUSSION

Although this project is not completed, trapping efforts have been quite successful. Previous investigations have shown swift fox numbers in Nebraska to be very low. Although most trapping was conducted in an area not considered the prime area for swift fox in Nebraska, trapping success has been respectable.

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Kahn, R., L. Fox, P. Horner, and B. Giddings. 1996. Draft Conservation Assessment and Conservation Strategy for Swift Fox in the United States. Published by the Swift Fox Conservation Team.

INVESTIGATION OF FURBEARER OCCURRENCE WITH SPECIAL REFERENCE TO SWIFT FOX AND PRELIMINARY MODELLING OF POSSIBLE SWIFT FOX POPULATION DYNAMICS IN NORTH DAKOTA-1996

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ABSTRACT

Sections were selected randomly and optimal quarter-sections within those sections were selected on site for survey (n=39). Furbearer occurrence was determined by identifying tracks to species. No swift fox were detected. Population modelling indicates that possibly 40% annual survival rates may be needed for a swift fox population to remain stable. Differential reporting rates for red fox and coyote harvests and confirmed swift fox observations indicate swift fox exist at extremely low densities if at all in North Dakota.

INTRODUCTION

Interest in swift fox (Vulpes velox) has increased greatly in recent years. Swift fox were common in North Dakota during pre-settlement times (Bailey 1926, Thwaites 1953); however, the species became very rare about 1880-1900 (Bailey 1926). Swift fox are known to be very rare in North Dakota; however, data are being collected annually with which to make inference concerning the occurrence of the species. Initially southwestern North Dakota has been selected for study, because of occasional reports of possible swift fox in these areas. In addition, laboratory exercises in population dynamics are being evaluated through computer population modelling utilizing both deterministic and stochastic models. The emphasis of the modelling is to ultimately determine the required size of a swift fox transplant into North Dakota that will increase to a genetically effective population size of 500 animals within 5 years after the transplant. The ultimate objective of a successful swift fox transplant in North Dakota is the addition of a native species that would eventually become available for fur harvesting. The objective of this report is to present the results of a survey to determine relative occurrence of all furbearer species in this area with special reference to swift fox and to report preliminary results of population modelling of possible population dynamics for 1996.

STUDY AREA AND METHODS

All survey effort in 1996 was concentrated in southwestern North Dakota. This area is primarily semi-arid prairie grassland with some intermixed cropland and hayland. Topography is generally rolling grassland to rough broken badlands; native hardwoods trees and shrubs occur in the many of the deeper coulees.

Climate in North Dakota is typical of sub arctic continental interiors with hot summers and cold winters.

Track surveys were conducted to determine relative occurrence of furbearers in The survey was modified from one developed by Sargeant et al. (1993). Timing of the survey minimizes errors in correctly identifying species caused by movement of young, especially in the canids.

Sections were selected randomly for study; within each section one quarter-section study area was selected at the site which had the best potential for identifying furbearer tracks. Some randomly selected sections had to be relocated to improve field logistics due to remoteness and inaccessibility of some of the original selections or proximity to human habitations. All study areas were surveyed no sooner than 48 hours after a rain. The search pattern consisted of visiting as many locations on each study area as possible on foot within 30 minutes that had potential to reveal furbearer tracks.

Data collected for each quarter-section visited consisted of relative abundance of tracks identified by species (none, scarce, common, abundant), predominant cover type (pasture, hayland, cropland, marsh, idle), relative amount of available track sites (many, moderate, few, almost none), relative soil condition for holding tracks (excellent, good, fair, poor), and the track accumulation period (1 day, 2-3 days, 4-6 days, 7 or more days). Coyote and red fox tracks were distinguished based on size (Allen, unpubl. data). Swift fox tracks are easily distinguished from other canids, because they average about 10 mm shorter than the smallest red fox tracks (Orloff et al., 1993). Data analysis consisted of the examining the number of study areas with furbearer track occurrence by species.

Population modelling of possible population dynamics was conducted using POP-2 population model (deterministic) and PD-45 (stochastic and deterministic) as developed by Grier (1980).

RESULTS

Densities of furbearer species were not determined in this study. Relative occurrence of furbearer species identified on the 39 study areas in 1996 (Table 1) consisted of coyotes (Canis latrans-16 areas), red fox (Vulpes vulpes-15 areas), raccoon (Procyon lotor-10 areas) and skunk (Mephitis mephitis-4 areas) . No swift fox tracks were identified on any of the 39 study areas. Visual observation of 1 red fox was made on 1 study area. Twenty-eight of the 39 study areas contained tracks of at least 1 furbearer species.

Other relative occurrence data for canids are also available in North Dakota. Since 1970 we have obtained 4 confirmed observations of swift fox in North Dakota. During that same time period there have been 687,928 red fox and 199,593 coyotes sold to North Dakota furbuyers.

Preliminary information obtained from population modelling indicates survival rates of approximately 40% may be needed for stability in swift fox populations. Further, previous work with red fox and coyotes in North Dakota indicates that changes in population size are more significantly affected by changes in survival rates than changes in reproductive performance. At present, this also appears to be the case in swift fox.

Funding for swift fox work in North Dakota is state and federal aid to fish and wildlife management (Pittman-Robertson). Total costs of swift fox work in North Dakota for calendar year 1996 are <$10,000.

DISCUSSION

Interspecific competition has been well documented between wolves (Canis lupus) and coyotes (Carbyn 1982) and between coyotes and red foxes (Sargeant et al., 1987) in the northern plains. Interspecific competition from other canids (especially coyotes) may be a significant limiting factor in currently existing swift fox populations in Kansas (L. Fox, 1994 Midwest Furbearer Workshop), and in efforts at reintroduction of swift fox in Saskatchewan (L. Carbyn, 1994 Midwest Furbearer Workshop). Ralls and White (1995) noted that although coyote predation on kit fox in California can be severe, they found indications that red fox predation on kit fox may be catastrophic to the population. Data collected in this study indicate that most all quarter-section study areas selected in North Dakota probably have red fox or coyotes or both species present. In addition, track surveys should represent a minimum distribution, because some quarter-sections with no canid tracks observed likely had canids present. Conditions for observing tracks in North Dakota are often far from perfect; however, a few good sites in most quarter sections are all that is often needed to identify one or more species of furbearer present. Considering the hypothesis the observations of Ralls and White (1995) suggest and the density and distribution of red fox and coyotes in North Dakota the potential for viable swift fox populations may be quite remote. This hypothesis certainly warrants further investigation.

Historically, interspecific competition may not have been as severe on swift fox prior to settlement in the region. At that time wolves were the dominant canid, and coyotes were probably very rare (Johnson and Sargeant 1977). With removal of wolves during and after settlement the canid composition changed and coyotes became more abundant, and conditions for swift fox survival may have deteriorated dramatically. If this hypothesis is correct, the probability for existence of

viable natural or reintroduced swift fox populations in this area is extremely limited without major alterations to the present canid community. Alteration of the current canid community to include wolves is not a viable management option in an agricultural environment due to conflicts with livestock. Alteration of the canid community to physically remove the coyotes or red fox is not a viable management option due to prohibitive costs of neutralizing canid dispersal into the control area (Allen, unpubl. data).

Numbers of red fox and coyotes sold to North Dakota furbuyers is the minimum number of these species taken, annually. Not all animals are sold after they are taken, and not all pelts sold are sold to North Dakota furbuyers. Given the magnitude of differences of red fox and coyotes taken as compared to confirmed swift fox observations, we again question if swift fox have very much potential for survival in North Dakota considering the number and distribution of these other canids at present.

The population modelling effort indicates survival rates >40% may be needed for a transplanted group of swift foxes to increase to a genetically effective long-term population size of 500 animals (Brussard, 1985). This may be almost impossible considering the hypothesis indicated by the interspecific competition observations of Ralls and White (1995) and the size and distribution of the red fox population in North Dakota. Nevertheless, for our population modelling efforts more refinement of input data are needed. For example, litter sizes in swift fox are currently being determined by counts of placental scars and observations of pup numbers at dens. In North Dakota red fox we found that pup observations at dens typically underestimate actual litter sizes (Allen, unpubl. data), and counts of placental scars often overestimate actual litter sizes (Allen, 1983). Thus, some obvious needs for representative population models include estimates of litter size determined from pregnant females by female age class, annual survival rates by age class and sex preferably determined from radio collared animals, and information on social behavior, territoriality to determine if family territories exist as in kit fox (Ralls and White, 1995) and other canids (Sargeant et al., 1987; Allen et al. 1987).

Costs incurred by North Dakota Game and Fish to gather data on swift fox are not prohibitive at this point. However, limitations may develop in the man-hours of Game and Fish Department time that will be expended on a species such as swift fox that provides no man-hours of harvest potential or furs for fur harvestors.

The present study also illustrates the paucity of data that is obtained from diurnal observations of live furbearers. Few are seen because of the secretive behavior of these species; however, most randomly selected quarter-section study areas with favorable conditions for locating tracks had furbearer tracks present indicating occurrence of one or more species. In the case of swift fox; however, a visual observation would be required in addition to a track

observation to confirm their occurrence, and to eliminate any possible error caused by misidentification of a red fox or coyote pup track. This experimental investigation indicates that various species of furbearers occur on almost all quarter-section study areas, and occurrence of coyotes or red fox or both species is likely on many areas. Other species such as swift fox may be present, but they appear to exist at extremely low levels.

The most pressing research need for North Dakota is identifying the role of canid interspecific competition on swift fox. If this behavior is as strong as expected (especially with red fox), the potential for a future population of swift fox in North Dakota is remote at best. Other data we will need to have determined from areas that have viable populations are detailed information on reproductive performance (litter sizes) by female age class, population age structure, and annual survival rates at least by pups and adults (several age class groups would be better).

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Table 1. Percent occurrence of furbearer tracks by species and county on randomly selected quarter-section study sites in North Dakota - 1996

Species and relative number of tracks	County		
	Golden Valley (n=10)	Slope (n=13)	Bowman (n=16)
Red Fox			
0 (none)	90.0	84.6	25.0
1 (few)	10.0	15.4	37.5
2 (moderate)			25.0
3 (many)			12.5
Coyote			
0	40.0	53.8	75.0
1	40.0	30.8	18.8
2	20.0		
3		15.4	6.2
Skunk			
0	90.0	100.0	81.2
1			12.5
2	10.0		
3			6.3
Badger			
0	100.0	92.3	100.0
1		7.7	
2			
3			
Raccoon			
0	100.0	61.5	68.7
1		15.4	6.2
2		15.4	18.8
3		7.7	6.2

DISTRIBUTION AND INVESTIGATIONS OF SWIFT FOX IN MONTANA

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ABSTRACT

The continued increase in frequency and intensity of swift fox occurrence reports between 1992-1996 indicate that a resident population occupies at least a portion of a four county area in northcentral Montana. A combination of these reports, which include multiple sightings and collected specimens, with data collected from a swift fox research project during 1996 have begun to provide sufficient information to delineate species distribution in northcentral Montana. Preliminary results of a research project to investigate several parameters of a resident swift fox population in the state are presented.

INTRODUCTION

Information on the status of swift fox (*Vulpes velox)* in Montana prior to 1978 is briefly discussed in Giddings and Knowles (1996). The species remains classified as a state furbearer, providing limited protection through a closed harvest season. Recent occurrence reports compiled since 1978 have provided 32 occurrence reports which represent a minimum of 53 single and multiple species observations, including six reports or 11 individual locations received from northcentral Montana in 1996.

Fish, Wildlife and Parks (FWP) and Montana State University (MSU) initiated swift fox research in 1996 in northcentral Montana to document a resident population and to investigate home range size, movements, and to identify natal den sites. Nine swift fox were captured or recaptured 18 times during 1,205 trap nights.

To address the swift fox conservation strategy objectives outlined in Kahn et al. (1996) FWP has conducted preliminary swift fox habitat surveys in central and eastern Montana (Giddings and Knowles 1996)(Objective 5) and initiated research in 1996 to assist in determining current species distribution in the state (Objective 2) and to investigate swift fox biology and ecology (Objective 10). Swift fox investigations in Montana are assisting Canada in understanding dispersal and species distribution resulting from their reintroduction effort (Moehrenschlager, pers. comm.).

METHODS

Swift fox observation reports were collected and compiled by FWP personnel and recorded on standard species occurrence/distribution report forms. Unsolicited reports and solicited information are received from private individuals (landowners, trappers, hunters) and

government agency personnel (FWP, BLM, USFWS). Occurrence/ distribution reports contain data on date, type of observation, site location, legal description, and county, with a remarks section to describe observation circumstances and identifying species characteristics.

Occurrence reports are categorized as confirmed (collected specimen, traded pelts, photographs, marked animals) or unconfirmed (visual observations, uncollected specimens). Occurrence records are compiled in a state species database and location data plotted on a state base map. An analysis of record frequency provides information on state species distribution.

Swift fox research was initiated in 1996 to investigate species distribution, home range size, movements and identification of natal den sites from a resident population in northcentral Montana. This two-year project is funded by FWP with graduate student support from MSU. Species occurrence reports were evaluated and landowner interviews were conducted to delineate a specific study area. Capture sessions involved systematic trapping of nine townships by placing live-traps in a modified grid pattern (depending on road access) of 1-2 traps at each corner of a four mile section block. This resulted in 16 trap sites per township. Tomahawk double door live-traps (No. 208, 42"x15"x15") were used to capture wild foxes and 50 gram radio collars with mortality sensors were provided from Advanced Telemetry Systems and Wildlife Materials. Determination of sex was by physical examination and age category by identifying morphological characteristics and/or tooth wear.

Capture sessions occurred between August 12 and November 15, 1996. Marked animals have been relocated by ground triangulation and aerial methods on an average of 10 days to two weeks. Limited species distribution surveys were conducted (track/scat searches) randomly in adjacent habitats.

RESULTS

Figure 1 indicates site specific occurrence locations and delineates the accumulation of reports in Montana for the 1978-1996 period. This includes six reports representing 11 individual locations in 1996 and nine live-trap capture location sites from the northcentral Montana swift fox research study. All occurrence reports and research locations compiled during 1996 were located in either Hill, Blaine, Phillips, or Valley counties in the northcentral portion of the state. Reports from these counties appear to be consistent, with an increasing incidence of confirmed reports. Six locations compiled during 1996 represent marked animals released in Canada and 14 locations are from undetermined or unmarked animals.

Live-trapping effort during the swift fox research project in a 324 mi2 area resulted in the capture of nine previously unmarked individuals (6 males, 3 females) and nine recaptures over 1,205 trap nights. This is a capture rate of 1 fox/67 trap nights for the total number of captures (n=18) or 1 fox/134 trap nights for initial captures (n=9). Three males were considered to be adults and three were considered to be yearling animals while all three females were considered to be adults. Radio collared animals are relocated approximately three to four times a month. Over 90 relocations have been received from the nine individual swift fox during 1996.

The current known estimated species distribution in Montana is presented in Figure 1. Swift fox distribution is based on occurrence reports and live-capture site locations compiled from 1985 to 1996 and locational data from dispersing Canadian animals reported through 1991 (Brechtel et al. 1993).

Funding for swift fox management and research activities is from trapper license sales and federal aid to fish and wildlife management (Pittman-Robertson). The estimated cost of swift fox management and research activities in Montana during 1996 was $30,000.

DISCUSSION

The series of swift fox reports since 1978 indicate that dispersing swift fox from the Canadian reintroduction areas and adjacent states (Wyoming) have recolonized portions of Montana. Brechtel et al.(1993) reported that seven townships in northcentral Montana provided relocations of Canadian released swift fox by either radio telemetry, recovered carcasses, or confirmed reports between 1987 and 1991. Additional records of swift fox released in Alberta or Saskatchewan that have been relocated or recovered in northcentral Montana are available but have yet to be compiled for the 1992-1996 period.

Although it is evident that some of the recent swift fox occurrence reports represent dispersing animals from established populations adjacent to Montana, swift fox investigations during 1996 provide new evidence that a resident population does exist in northcentral Montana. Frequency, intensity and persistence of species occurrence reports (13 years), the specimen collection and live-capture of unmarked and yearling animals, and locations of individual swift fox home ranges in northcentral Montana account for this evidence. Current known species distribution in Montana is apparently within the shortgrass prairie habitat available in the northcentral portion of the state.

The general areas of swift fox occurrence report locations since 1978, particularly from the 1992-1995 period, will serve as a starting point to initiate systematic surveys (presence/absence) to determine the extent of resident swift fox populations in Montana and to delineate statewide species distribution to meet Objective 2 outlined in Kahn et al. (1996).

The swift fox research effort initiated in 1996 will begin to address biological information needs from the northern portion of the species range, provide initial population density estimates, document the use of natal dens by resident foxes, and assist in delineating species distribution.

Priorities for 1997 are to address Objective 1 (state working group) and 2 (delineate state distribution) as outlined in the SFCACS. FWP management and research activities in 1997 will include completing the current swift fox research project, calculating initial density estimates for northcentral Montana, further define species distribution, compile relocation reports from Canadian marked animals located in Montana, and continue to collect swift fox occurrence reports. Anticipated expenditures for management and research activities during the 1997 calender year will be approximately $30,000 for personnel and operations.

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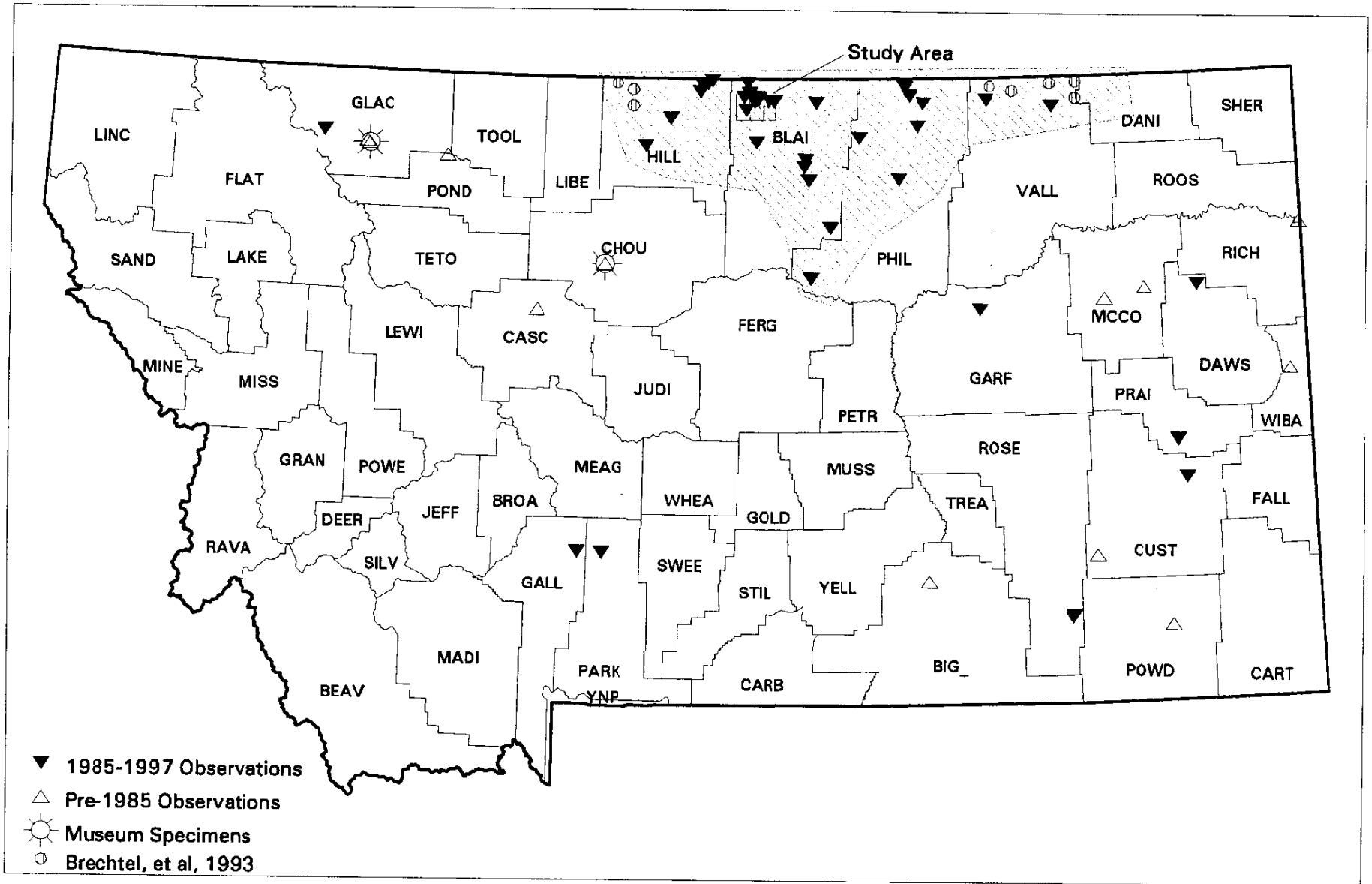
Kahn, R., L. Fox, P. Horner and B. Giddings. 1996. Conservation assessment and conservation strategy for swift fox in the United States. Helena, MT.

Figure 1. Distribution of Swift Fox in Montana



Montana Natural Heritage Program, March 13, 1997

AMAJA03030

OKLAHOMA SWIFT FOX STATUS REPORT - 1996

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ABSTRACT

Swift fox investigations in Oklahoma were limited to the second of a three-year Section 6 project investigating swift fox distribution and ecology in the Panhandle region of Oklahoma. Additionally, swift fox were detected 6 times during nine months of scent stations being conducted on the Packsaddle Wildlife Management Area in Ellis County, as part of an ongoing quail mortality study.

INTRODUCTION

The swift fox was considered to occur historically throughout the Oklahoma panhandle counties of Cimarron, Texas and Beaver, and in three northwestern counties; Harper, Woodward and Ellis (Caire et al. 1989, Duck and Fletcher 1945). Swift foxes have been observed in Texas and Beaver counties throughout the 1950s and 1960s by several researchers (Cutter 1959, Glass 1959, Kilgore 1969). A 1988 landowner survey conducted by the Oklahoma Department of Wildlife Conservation (ODWC) produced 21 swift fox sightings and eight den locations in the panhandle (Kocka 1988). Additionally, five verified swift fox sightings by ODWC biologists have been reported from Cimarron County (1 animal 1988), Texas County (1 animal 1988), Beaver County (1 animal 1989) and Roger Mills County (2 animals 1994). Between January 1993 and September 1996, swift fox tracks have been detected at 20 permanent scent stations established on the Packsaddle Wildlife Management Area (WMA) in Ellis County as part of a quail mortality study (Peoples and DeMaso 1996).

In December 1993, the ODWC submitted a proposal to determine the current range and population status of the swift fox in Oklahoma to the U.S. Fish and Wildlife Service (USFWS) for Section 6 funding. The ODWC received funding for the project in April 1994. The swift fox survey project was initiated in September 1994 and will continue through September 1997. The project was contracted by ODWC to the Oklahoma Natural Heritage Inventory (ONHI) at the University of Oklahoma. The project investigators are Dr. Mark V. Lomolino and Michael J. Shaughnessy of the ONHI. The 1996 Section 6 Annual Performance Report is attached as Appendix A.

The swift fox is classified as a furbearer species in Oklahoma with a year-round closed taking season. The swift fox is also a species of special concern in Oklahoma. The objective for 1996 was to continue to document the current distribution of swift fox within Oklahoma, primarily through the Section 6 study, and incidentally through the Packsaddle quail mortality study. The objectives of the Packsaddle quail mortality study were to determine causes and rates of bobwhite quail mortality and to investigate the effect of supplemental feeding on bobwhite survival rates on public hunting lands in western Oklahoma.

METHODS

The Packsaddle WMA is located in Ellis County (Fig. 1). The WMA is comprised of approximately 7,000 ha of mixed-grass prairie (Peoples and DeMaso 1996). The climate is semiarid, continental with average winter and summer temperatures of 2.1 and 27.0° C, respectively (Peoples and DeMaso 1996). Average annual precipitation is 53.3 cm with the majority arriving during spring and summer (Peoples and DeMaso 1996).

Primary soils in the area include Nobscot fine sand, Nobscot-Brownfield, and Pratt-Tivoli loamy fine sand (Peoples and DeMaso 1996). Herbaceous vegetation on these soils includes sand bluestem (*Andropogon hallii*), little bluestem (*A. scoparius*), indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), sand paspalum (*Paspalum stramineum*), blue grama (*Bouteloua gracilis*), hairy grama (*B. hirsuta*), and sand dropseed (*Sporobolus cryptandrus*). The primary forb species include western ragweed (*Ambrosia psilostachya*), Texas croton (*Croton texensis*), erect dayflower (*Commelina erecta*), and prairie sunflower (*Helianthus petiolaris*). Woody vegetation includes shinnery oak (*Quercus harvardii*), sand sagebrush (*Artemisia filifolia*) and sand plum (*Prunus angustifolia*) (Peoples and DeMaso 1995).

The presence or absence and relative abundance of mammalian predators on the Packsaddle WMA was estimated by using a modified scent-station survey established along existing roads dissecting the study area (Peoples and DeMaso 1996). These scent stations were composed of a 1 m diameter circle of smoothed substrate covered with a layer of agricultural lime. Fatty acid scent disks obtained from the USFWS' Pocatella Supply Depot were used as a scent lure. Stations were placed at 0.8 km intervals along dirt roads on the Packsaddle WMA, and were run for one night each month (Peoples unpublished data).

RESULTS

The Packsaddle WMA scent station surveys yielded 8 swift fox visits per 217 station-nights in 1993; 6 swift fox visits per 197 station-nights in 1994; 9 swift fox visits per 199 station-nights in 1995; and 6 visits per 159 station-nights in 1996 (Peoples unpublished data). Additionally, an ODWC biologist working on the quail mortality study observed two swift foxes in a winter wheat field 15 miles southwest of the Packsaddle WMA in Roger Mills County on 10 October 1994.

The Section 6 study and the incidental information from the Packsaddle quail mortality study have contributed toward reaching the objective of documenting the present distribution of swift fox in Oklahoma by recording swift fox presence/absence and relative abundance, primarily within the panhandle region of the state.

Funding for the quail mortality study has been provided through ODWC Pittman-Robertson Upland Game Investigations W-82-R. Funding for the Section 6 project was provided for by Section 6 funds. The ODWC provided $12,000 for the first year of the Section 6 project; $13,000 for the second year; and has committed $13,500 for the third year. The project is entering its third and final year.

DISCUSSION

The current knowledge of swift fox presence/absence and relative abundance has increased from information collected through both the Section 6 study and the quail mortality study. Future Section 6 survey routes in counties adjacent to the panhandle will further aid in determining presence/absence and relative abundance outside of the panhandle region of Oklahoma.

The current Section 6 study will be ending in September 1997. Section 6 funds have not been allocated for additional swift fox investigations in 1998. The ODWC's strategies for further swift fox research and management in Oklahoma are dependent upon the outcomes generated by the Swift Fox Conservation Team's (SFCT) technical committees charged with developing specific population monitoring techniques and rangewide habitat criteria. The prioritized research needs for Oklahoma beyond 1998 include: to coordinate and implement a periodic monitoring program for existing swift fox populations based on standardized techniques and protocols; to identify and delineate existing suitable swift fox habitat within Oklahoma based on developed criteria, and to use this information to evaluate the potential for swift fox population expansion and stability within Oklahoma; and to identify and delineate private land ownership patterns in occupied and suitable swift fox habitat so that habitat conservation and habitat management can be promoted on private land in areas of occupied and suitable swift fox habitat.

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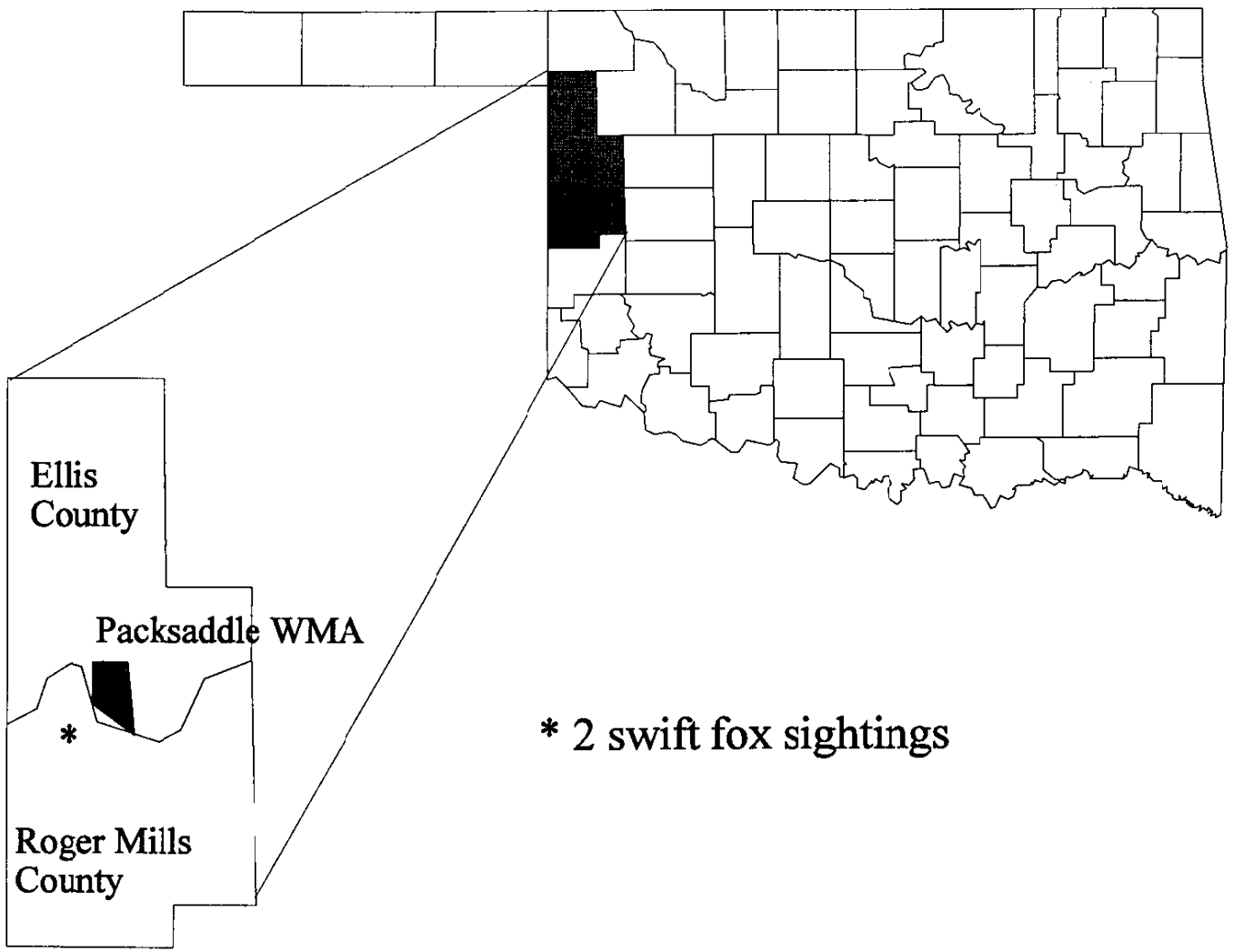

Figure 1. Location of Packsaddle Wildlife Management Area in Ellis County,and swift fox sightings in Roger Mills County.

APPENDIX A

Performance Report
Federal Aid Project E-35-2
Distribution and Ecology of the Swift Fox (Vulpes velox)
September 26, 1995 - September 29, 1996
Dr. Mark V. Lomolino and Michael J. Shaughnessy

PERFORMANCE REPORT

SECTION 6

ENDANGERED SPECIES ACT

FEDERAL AID PROJECT E-35-2

Distribution and Ecology of the
Swift Fox (Vulpes velox)

SEPTEMBER 26, 1995 - SEPTEMBER 29, 1996

Annual Performance Report

State: Oklahoma Grant Number: E-35-2

Project Type: Research

Project Title: Distribution and Ecology of the Swift Fox (Vulpes velox)

Segment Dates: 26 September 1995 - 29 September 1996

I. Job Objectives:

1. Evaluate the efficacy of various detection techniques including scent post surveys, spotlighting, and infrared triggered cameras.
2. Determine the current range and population status of the swift fox in Oklahoma.
3. Investigate habitat affinities and potential interspecific associations (e.g., with other canids) of the species and its dependence on particular landscape features such as prairie dog towns.
4. Assess the potential threats to any existing populations.
5. Conduct analysis and write the final report.

II. Summary of Progress:

First we must emphasize that this report, its results, analyses and statements are preliminary and we request that they not be published or reproduced in any report without our concurrence and without identifying us (M. V. Lomolino and M. J Shaughnessy) as its authors.

A. Methods:

The three counties in the Oklahoma panhandle (Cimarron, Texas and Beaver) were surveyed for the presence of swift fox and other canids. Presence and distribution were determined primarily through the use of baited tracking plates at pre-established tracking stations. The technique required that a 0.9144 m x 0.9144 m 26 gauge stainless steel tracking plate be set down and sprayed with a mixture of isopropyl alcohol and carpenters chalk (G.M. Fellers, National Biological Service, pers. comm.). The alcohol serves as a dispersant and the mixture results in a thick, uniform coating of chalk on the plate after the alcohol evaporates. In our design, each plate has a one inch hole drilled through its center, allowing it to be placed directly over a stake that permanently marks the tracking station. Bait was then placed in the middle of the plate or on the stake. The plate was recovered and checked for tracks after three nights (Egoscue, 1956; Hatcher, 1978; Orloff et al., 1986, 1993; Paveglio and Clifton, 1988; Pocatello Supply Depot progress report, 1981).

Ninety permanent tracking stations were established throughout the panhandle according to a stratified design. First, tracking stations were distributed through the panhandle according to county size. Next, macrohabitats were identified within counties and the area they covered determined. Tracking stations were assigned to these macrohabitats proportionally. In very small or excessively large macrohabitats, numbers of stations were set to ensure an adequate sample size (i.e., a minimum of no less than 12 stations per macrohabitat). The tracking effort assigned to each habitat within each county is reported in Table 1 (see "functional plate nights in that table). Lastly, the specific locations of the stations were determined according to land accessibility and distance from other established stations. A minimum linear distance of at least three miles was maintained between all tracking stations. Thirty-one tracking stations were established in Cimarron county, thirty-three stations were established in Texas county, and twenty-six stations were established in Beaver county.

Results of the tracking studies were reported as detection success which equaled the number of detections per 100 functional plate-nights. Note that this measure adjusts for differences in tracking efforts across counties and across habitats. Functional plate-nights is a measure of effort which is calculated as total number of plate nights (number of plates * number days tracking) - number of plate nights that were rained out. Results were then expressed as detection success (for swift fox or for all mammals combined) across counties or across macrohabitats.

Five broad habitat types, or "macrohabitats", were identified in the Oklahoma panhandle. These were as follows: rangeland (included grazed

and ungrazed rangeland), mesa, agricultural land (plowed and planted), riparian areas, and prairie dog towns. The dominant gross habitat feature in the Oklahoma panhandle is rangeland. Thirty tracking stations were placed in this habitat. Eighteen tracking stations were established in agricultural lands, sixteen stations were placed in prairie dog towns, fourteen in riparian areas, and twelve stations were placed in the Black Mesa area. The local land features of the panhandle are very uniform. Due to this, the designation of the macrohabitat that a station was placed in is usually very clear. The exceptions are agricultural lands and riparian areas. A track station was determined to be in agricultural land if no less then one half of the area at the crossroads where the station was established was active farmland. In riparian areas, tracking stations were placed in the middle of dry river beds or culverts, usually at a bridge. The requirement for an area to be considered riparian was that at some point in the year, it held water when other surrounding areas did not. A map is being constructed in a GIS indicating all of the established stations in relation to their surrounding habitat. This map will be available in the future.

As we reported in the FY 1994-1995 annual report, fatty acid scent disks proved less efficient than other attractants. Instead, canned mackerel combined with beef scraps proved an efficient attractant for a diversity of mammals and was used throughout the period covered by this annual report. The mackerel was placed in the centers of the tracking plates and a scrap of beef was placed on top of each stake at the tracking stations.

Infra-red triggered cameras also were used to detect and document the occurrence of swift fox and other mammals in the study area. The cameras consist of three units, the camera itself, the camera housing containing the automatic shutter trigger, and the infrared sensor. The sensor detects localized thermal changes in the immediate area of the camera and triggers the shutter. The sensor and the camera are set up within fifteen feet of the tracking plate. This technique allows for a visual record of endotherms visiting the tracking station and allows for verification of tracks recorded during the sampling period.

A total of 42 tracking sites was located in Harper (18 sites), Ellis (19 sites) and western Woodward (5 sites) Counties in preparation for studies to be conducted during October of 1996. The results of these studies will be presented in our report of activities for year three.

Spotlighting was conducted opportunistically in Cimarron on July 23 and October 17. The observer cruised along a section of road, stopping at five points spaced one mile apart, and then using predators calls to attract carnivores and identify them with a spotlight.

B. Results:

Three plate-tracking sessions were conducted during FY 1994-95. These sessions were conducted during the following periods: 1) October 13-17; 2) March 25-29; 3) July 29-August 1. Carnivore tracking was conducted at 90 sites located across the Panhandle (31 in Cimarron, 33 in Texas and 26 in Beaver Counties). After adjusting for periods when tracking plates were rained out, this effort totaled to 630 functional plate nights across the three Panhandle counties. Ten different species of mammalian carnivores were detected (Table 1). Overall, mammalian carnivores were detected 80 times over 630 functional plate nights (detection success = 12.7%). Detection success for swift fox was 3.65% (23 detections out of 630 plate nights). Swift fox were detected at 9 of 31 (29%) sites in Cimarron county, 3 of 33 (9%) sites in Texas County and 4 of 26 (15%) sites in Beaver County.

As Figure 1 illustrates, carnivore activity (as inferred from detection success) was not randomly distributed across the Panhandle. Carnivore activity, overall, was highest in Cimarron County (16.91% detection success), intermediate in Texas County (12.16%) and lowest in Beaver County (8.96%). Detection success of swift fox also was highest in Cimarron County (7.25%), almost three-times as high as it was in Beaver County (2.49%) and over five-times as high as it was in Texas County (1.35%; see Figures 1 and 3).

In a similar fashion, carnivore activity was not randomly distributed among macrohabitats of the Panhandle (Figure 2-a). Carnivore activity, overall, was highest at prairie dog towns (15.97% detection success) and decreased gradually from this macrohabitat to riparian sites (14.43%), agricultural land (13.29%), mesa habitats (11.11%) and rangeland (10.00%). As we reported above, a highly disproportionate number (15 of 23 or 65%) of the swift fox detections occurred in Cimarron County. Again, their distributions were not randomly distributed across available macrohabitats. Analyses of distribution data for swift fox in Cimarron County (Figure 2-b, Table 1) reveal the apparent importance of prairie dog towns to this species (detection success = 10.3% at plates in prairie dog towns, versus 8.8%, 6.2% and 3.3% at plates located in rangeland, mesa habitats and riparian sites, respectively).

During spotlighting activities, one bobcat was detected at a prairie dog town on October 17 and another was detected in mesa habitat on July 23. In addition, coyotes were detected with spotlighting five times in mesa habitats on July 23. Two swift fox also were detected incidental to other activities in Cimarron County once on July 22 and once on October 14. Finally, infra-red triggered cameras recorded swift fox in Beaver County on

March 27, and in Cimarron County on July 29, 1996.

This information, along with that from additional surveys conducted during Year III, spotlighting and all tracking plate sessions will be imported into a GIS file to facilitate summaries and analyses of spatial patterns for the final report.

III. Discussion, Evaluations, and Recommendations

Again, we caution that this study is still in its early stages, analyses are preliminary and inferences must remain tentative until additional data is collected and additional analyses are conducted. Therefore, we request that this information not be published or reproduced in any reports without our concurrence.

Objective 1: Evaluate the efficacy of various detection techniques including scent post surveys, spotlighting, and infrared triggered cameras.

As reported in our first annual report, we feel that the strongest technique used to assess swift fox presence and distribution in the Oklahoma panhandle has been the tracking station. We also feel that the tracking stations are performing well in effectively detecting swift foxes. In dry weather, they provide clear, easily readable tracks. Additionally, the tracking stations are not restricted to just foxes but any vertebrate that steps on the plate. There have already been several stations that have recorded swift fox tracks plus the tracks of other carnivores. The ability to record multiple station visits makes the tracking stations even more valuable. We strongly recommend that the use of tracking stations be continued and emphasized as the principal method of swift fox detection.

Objective 2: Determine the current range and population status of the swift fox in Oklahoma.

As discussed above and illustrated in Figure 1, swift fox activity was from three to five times as high in Cimarron County as it was in Beaver and Texas Counties. Again, we caution that these are preliminary results, however it appears that population densities of swift fox are much higher in

Cimarron County and that they may represent a source population while Beaver and Texas Counties may represent population sinks (i.e., those maintained largely by emigration of individuals from more densely population "sources").

This objective will not be completed until additional tracking surveys are conducted in the Panhandle region and in the three adjacent counties (Ellis, Harper and Woodward).

Objective 3: Investigate habitat affinities and potential interspecific associations (e.g., with other canids) of the species and its dependence on particular landscape features such as prairie dog towns.

As discussed above and illustrated in Figure 2, carnivore activity does not appear to be randomly distributed across macrohabitats of the Panhandle. Carnivore activity, in general tended to be highest at prairie dog towns and riparian sites. Detections of swift fox, however, tended to be highest in the mesa region of Cimarron County. Perhaps swift fox are avoiding sites frequented by other carnivores (i.e., competitors and potential predators of swift fox). Again, we caution that these results are tentative given the relative small sample size (i.e., number of detections of swift fox ranges from 2 to 8 among macrohabitats). Because both macrohabitats and swift fox activity appear to vary among the three Panhandle Counties, larger sample sizes are required to assess the independent influences of macrohabitat and geographic region (here county) on swift fox distributions.

Given sufficient data are collected during year three, analysis of our GIS data and spatial distributions of detections and macrohabitats across the study site should provide valuable insights into the influences of macrohabitat and interspecific interactions on distributions of the swift fox.

Objective 4: Assess the potential threats to any existing populations.

Information obtained from the above analyses (i.e., Objectives 2 and 3) should allow assessment of some of the potential threats to the extant population of swift, and should also identify directions for future research on this species.

Objective 5: **Conduct analysis and write the final report.**

Objective 5 will be completed during the final year of this study.

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Prepared by:

Mark V. Lomolino

Michael J. Shaughnessy

Oklahoma Natural Heritage Inventory
Oklahoma Biological Survey and
Department of Zoology
University of Oklahoma

Date: 15 December 1995

Approved

Oklahoma Department of Wildlife Conservation

By:

Harold Namminga
Federal Aid/Research Coordinator

Table 1. Summary of results of tracking plate studies conducted in Oklahoma's Panhandle between September 26, 1995 and September 29, 1996. Numbers indicate detections for each species.

County	Habitat	*Canis familiaris*	*Canis latrans*	*Felis domesticus*	*Lynx rufus*	*Mephitis mephitis*
Beaver	Agricultural land	0	2	0	0	1
	Prairie Dog Town	0	0	0	0	0
	Range	2	0	0	0	0
	Riparian	0	0	0	0	1
	Subtotal	2	2	0	0	2
Cimarron	Mesa	0	1	0	2	1
	Prairie Dog Town	0	2	0	0	0
	Range	0	1	0	0	0
	Riparian	0	1	1	1	0
	Subtotal	0	5	1	3	1
Texas	Agricultural land	0	5	0	0	1
	Prairie Dog Town	1	4	0	0	0
	Range	0	0	0	1	1
	Riparian	0	1	0	1	2
	Subtotal	1	10	0	2	4

All Counties combined	*Canis familiaris*	*Canis latrans*	*Felis domesticus*	*Lynx rufus*	*Mephitis mephitis*
Total	3	17	1	5	7

Table 1. Continued.

Odocoileus hemionus	*Procyon lotor*	*Spilogale putorius*	*Taxidea taxus*	*Vulpes velox*	*All spp*	Functional plate nights
0	1	2	1	3	10	65
0	0	1	0	0	1	35
0	0	1	0	1	4	70
0	0	1	0	1	3	31
0	1	5	1	5	18	201
0	0	0	0	5	9	81
0	0	3	1	4	10	39
0	0	2	1	5	9	57
0	0	3	0	1	7	30
0	0	8	2	15	35	207
0	0	0	2	1	9	78
1	0	2	0	0	8	45
0	0	2	0	2	6	63
0	0	0	0	0	4	36
1	0	4	2	3	27	222
1	1	17	5	23	80	630

Figure 1. Detections Across the Panhandle Counties.

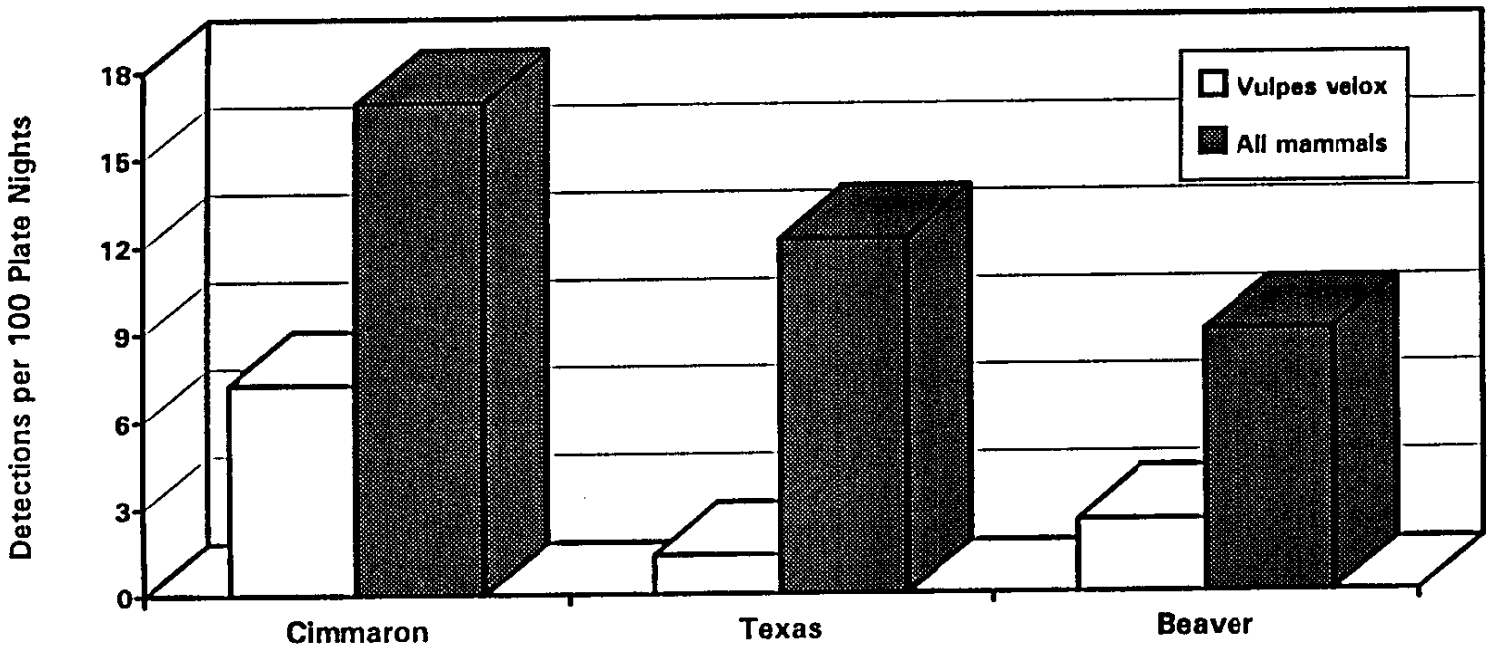


Figure 2-a. Detection Success for All Carnivores Across Macrohabitats of the Panhandle (3 counties combined).

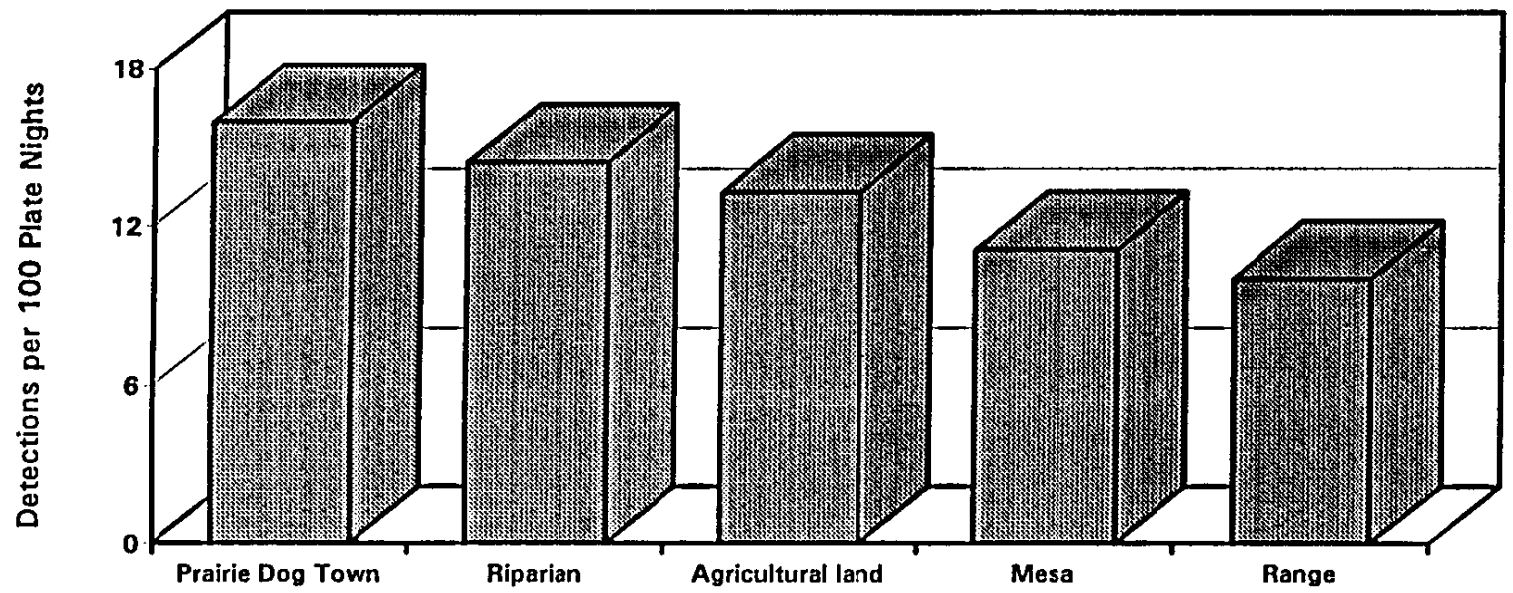


Figure 2-b. Swift Fox Detections Across Macrohabitats of Cimarron County.

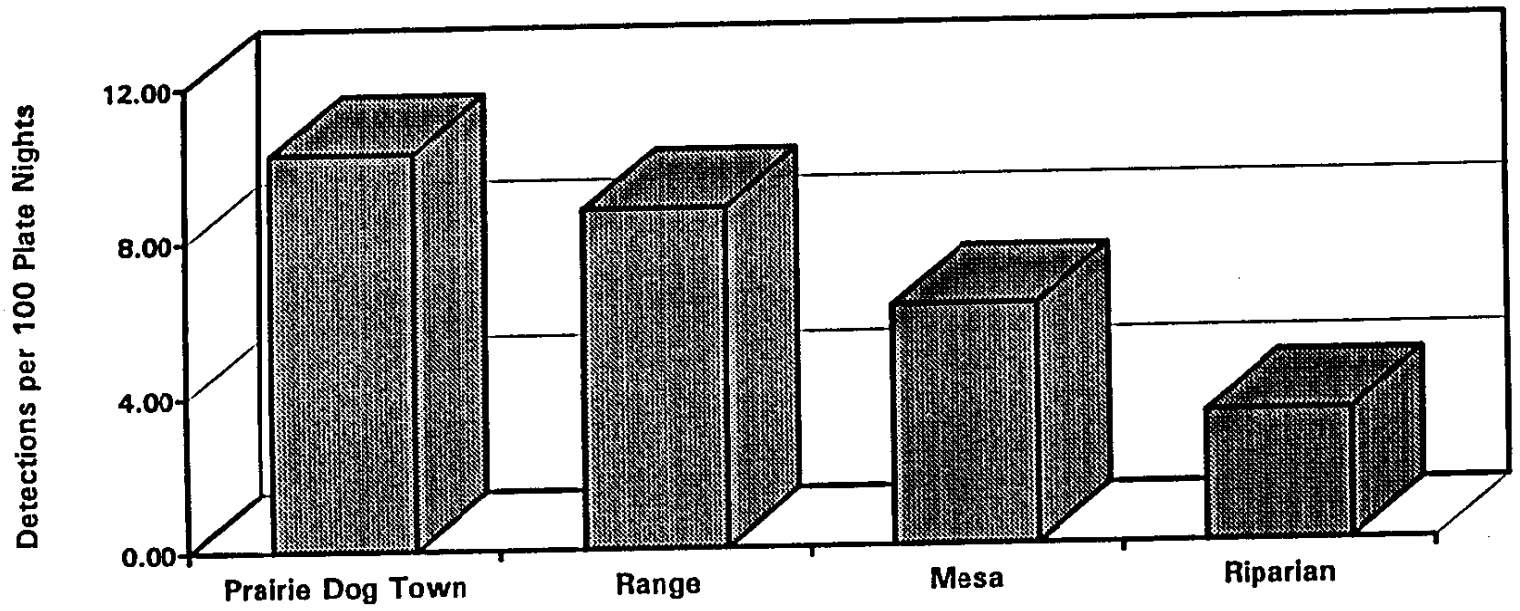
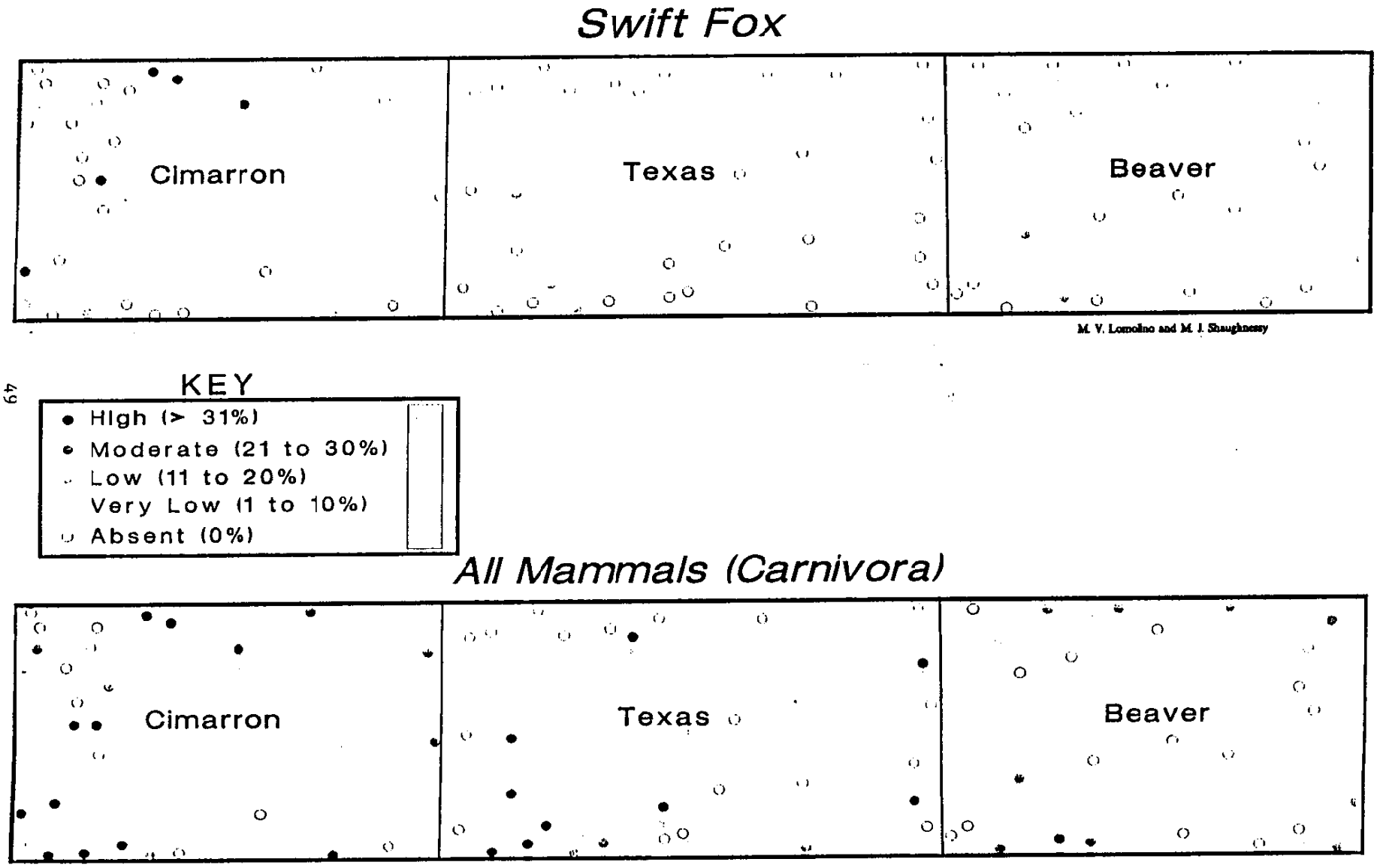


Figure 3. Detection success (# detections/plate night) for swift fox, and for all mammals combined across the three counties of Oklahoma's Panhandle.



SWIFT FOX INVESTIGATIONS IN TEXAS, 1996

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ABSTRACT

The goal for 1996 was to conduct field surveys for the presence swift fox throughout its historical range in Texas. Twenty-eight surveys were conducted in 25 High Plains counties . From these surveys swifts were found in 2 counties. Survey methodology is continuing to be modified to most effectively accomplish our goal on the Southern end of the swift's range. Future efforts will focus more on cooperation with private landowners in order to survey areas with the greatest potential for supporting swift fox populations.

INTRODUCTION

This information provided in the 1995 Annual Report of the Swift Fox Conservation Team.

METHODS

Surveys were conducted at 28 locations, involving 25 counties in the Texas Panhandle, to determine current swift fox distribution. Surveys transects were located along a 20-mile route of county and state roads. Metal track plates were placed at 1-mile intervals along each transect and were monitored for 2 consecutive nights. Blue or red carpenters chalk was used as tracking media and Plaster of Paris scent tabs soaked in fish oil were used as attractants. Additionally, spotlight or vehicle headlight surveys were conducted along the same 20-mile routes concurrent with track plate surveys. Spotlighting consisted of 1 person equipped with a 1million candle power light scanning 30 degrees to the left and right of the road. Vehicle speed was maintained between 25 to 35 mph. Vehicle headlight surveys were conducted by driving the transect route with only the vehicle headlights on high beam. Speeds were maintained between 35 to 45 mph. Live-traps were used to verify tracks or sightings obtained from initial surveys. Land cover types were mapped for ¼ mile strips along both sides of each transect. Surveys were also conducted on private land where landowner permission could be obtained.

Survey efforts for 1997-98 will focus on private property . Quarter mile track searches will be used in place of track plates and monitoring of known populations will be conducted annually to obtain population trend data.

Dr. Kathleen Blair from West Texas A&M University conducted live-trapping for swift fox on the Pantex Nuclear Facility in Carson Co., Texas. A description of this research project was provided in the 1995 SFCT Annual Report.

RESULTS

The goal of survey efforts in 1996 was to conduct field surveys for the presence of swift fox throughout its historic range. The presence of swift fox was identified on 2 of the 28 transects (Fig.1). Swift fox were found on private property in Sherman Co. and on the Rita Blanca National Grasslands in Dallam County. Track plate, spotlight, and live-trap techniques were all successful in identifying swift presence in Dallam Co. while only spotlight and live-trap techniques were successful in Sherman County. Overall swift tracks were obtained on 12/1056 plate nights. A total of 78 trap nights produced 4 female swifts. Three swifts were observed on 236 miles of spotlight surveys while 760 miles of vehicle headlight surveys produced no sightings.

In 1996, the staff member assigned to swift fox recovery (Kevin Mote) spent a total of 640 staff hours and an estimated $15,987 on this project. Funding was provided by TPWD and USF&WS Section 6 funding ($10,000) and money provided to the Swift Fox Conservation Team by USF&WS ($5,987).

In addition to surveys conducted by TPWD, Dr. Blair completed 1,200 trap nights on the Pantex facility with no swift foxes caught.

DISCUSSION

The goal for 1996 was to initiate survey/monitoring efforts for swift fox. Due to the vast area to be surveyed (30 Panhandle counties), these efforts were focused primarily on public access areas such as roads and public land. This allowed surveys to be done quickly over large areas by avoiding the time consuming process of contacting individual landowners. Unfortunately this method excluded large areas of potential habitat due to the lack of public access roads through large ranches. Therefore, results from 1996 surveys may not be a good indicator of swift fox distribution. In light of this fact, future surveys will not be restricted to public roads. Transects will be located in areas with the greatest potential (primarily private land) where permission can be obtained.

Results from these initial surveys have produced the first documented records of swift fox in Texas since 1987. Equally important, they have helped to refine survey methodology, identify new areas potentially occupied by swifts, and have helped to increase public awareness and private landowner involvement in conservation efforts on the High Plains.

The most important research need in Texas is to define suitable habitat quality and quantity. Although swifts have been found to use agricultural fields extensively in Kansas, none were found using this habitat in Texas although more than 50% of survey efforts were located in agriculturalized areas. Second, taxonomic issues regarding the kit and swift fox should be resolved.

Texas Counties Surveyed for Swift Fox in 1996

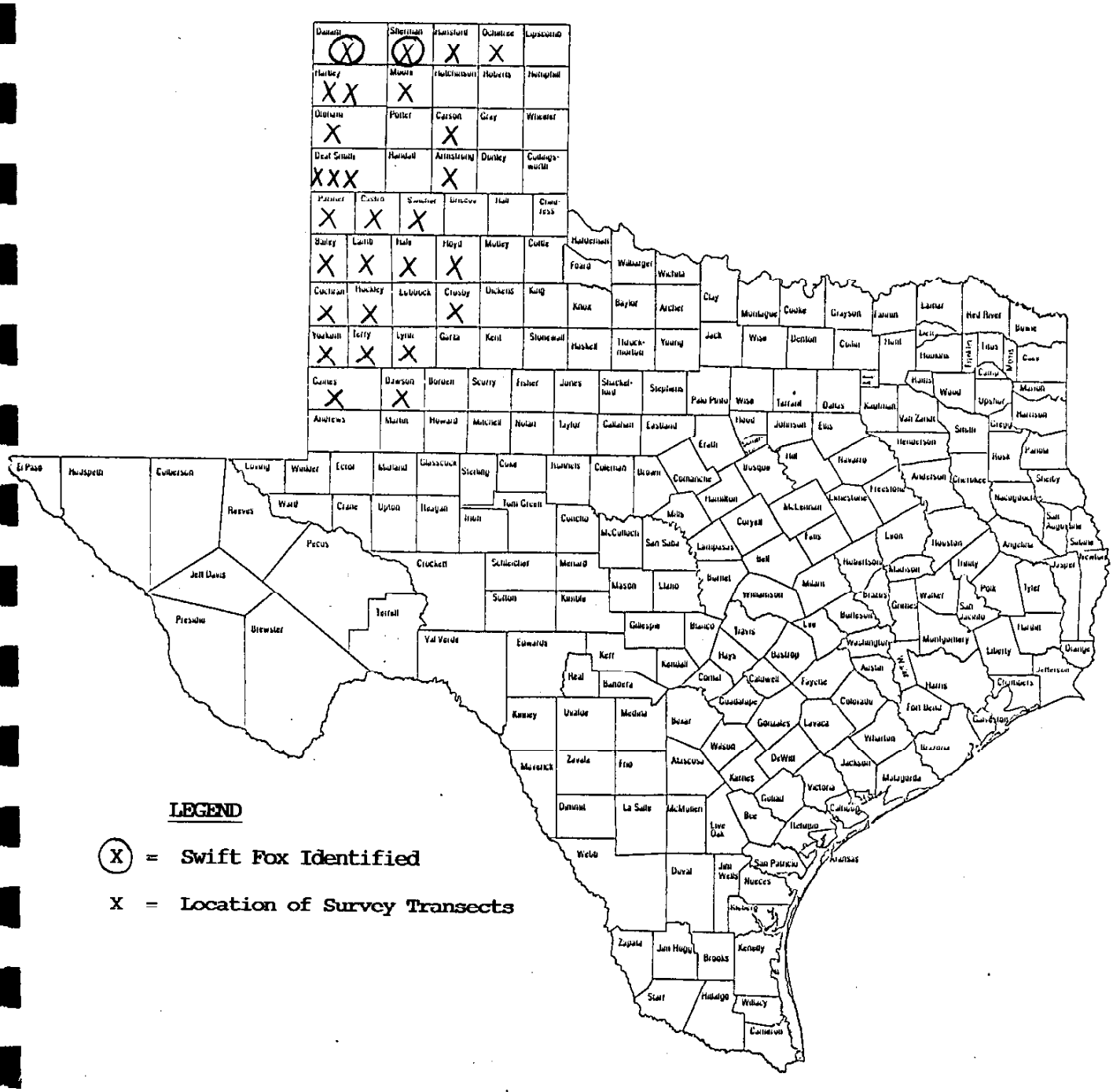

Figure 1