FINAL REPORT

FEDERAL AID PROJECT E-49

Population Distribution of Swift Fox in Northwestern Oklahoma Using a Track Search Survey

JUNE 17, 1998 - NOVEMBER 16, 2001

FINAL REPORT

STATE: Oklahoma GRANT NUMBER: E-49

GRANT TYPE: Research

SEGMENT DATES: June 17, 1998 - November 16, 2001

PROJECT TITLE: Population Distribution of Swift Fox in Northwestern Oklahoma Using a Track Search Survey

I. Abstract:

The swift fox (*Vulpes velox*) monitoring survey was conducted in portions of six Oklahoma counties (Cimarron, Texas, Beaver, Harper, Ellis, and Woodward) in order to investigate the species' distribution within its historical range. Six personnel from the Oklahoma Department of Wildlife Conservation conducted the track search surveys. During 1998, tracks were found in 35 of the 57 townships, within two counties, that were surveyed for swift fox tracks. During 1999, the entire shortgrass High Plains area was surveyed, and swift foxes were detected in 43 of 114 townships. During 2000, swift foxes were detected in 36 of 101 townships surveyed. All townships where swift fox tracks were successfully detected were in the panhandle region of Cimarron, Texas and Beaver counties. Swift fox tracks were observed 59% of the time in the rangeland Land Use and Cover Type in 1998, 68% in 1999, and 74% in 2000. Habitat associated with track point data did not differ significantly from that available. Herbaceous rangeland comprised at least half of the 3 km radius home range buffer circles drawn around the track locations for all three years (range 50.8% to 59.6%), while croplands (including CRP lands) made up anywhere from 37.7% to 44.9% of the buffer circles. Nearly half of the shortgrass High Plains region within the Panhandle was comprised of cropland and the other half rangeland. Herbaceous range may be slightly higher in the buffer circles when compared to the availability because rangeland was surveyed for tracks when it was available.

II. Objectives:

1) Establish a track search survey to monitor population trends of swift foxes throughout the shortgrass prairie ecosystem.
2) Develop a baseline database of swift fox distribution and abundance in northwestern Oklahoma.

III. Introduction:

The swift fox (*Vulpes velox*) is native to the shortgrass and mixed-grass prairies, once occupying most of the Great Plains from west-central Texas to southern Alberta (Sovada and

Scheick 1999). Settlement of the prairies led to declines in swift fox numbers and constriction of their distribution. Currently, the swift fox's range is comprised largely of private land. Much of this land is used for cattle grazing or cropland production. Optimal habitat for swift foxes is believed to be shortgrass prairie with relatively level terrain and available holes for shelter and protection (Scott-Brown et al.1987).

The swift fox (*Vulpes velox*) is classified as a furbearer species in Oklahoma with a year-round closed season with regard to take. The swift fox is also designated as a state species of special concern in Oklahoma. The swift fox has been documented to occur in the panhandle region as well as in four counties in the northwestern corner of the body of the state. Historically, the swift fox was considered to occur throughout the Oklahoma panhandle counties of Cimarron, Texas and Beaver, and in the three northwestern counties; Harper, Woodward and Ellis (Caire et al. 1989, Duck and Fletcher 1945). Swift foxes were observed in Texas and Beaver counties during 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 region (Kocka 1988). Additionally, five verified swift fox sightings by ODWC biologists were reported from Cimarron, Texas, Beaver and Roger Mills counties (Hoagland 1996) between 1988 and 1994.

In 1992, the swift fox (*Vulpes velox)* was petitioned for listing as endangered under the Endangered Species Act of 1973. In 1995, the U.S. Fish and Wildlife Service (USFWS) indicated that listing the swift fox was warranted but precluded, and the species was given a listing priority of 8 (Federal Register / Vol. 60, No. 116 / June 16, 1995). State wildlife agencies, researchers, universities, and representatives from the U.S. Forest Service National Grasslands, Biological Resources Division of the U.S. Geological Survey (USGS), and the Canadian Wildlife Service formed a Swift Fox Conservation Team, committed to ensuring the preservation of this unique species (Kahn et al. 1997). The Team responded to the USFWS 12-month finding by developing and providing a Conservation Strategy intended to be implemented in lieu of listing. The Conservation Strategy provides a framework to develop and intensify current management of swift fox and coordinate future research and monitoring throughout its range.

The need to determine the current distribution of swift fox throughout Oklahoma, and the rest of the North American swift fox range, has been determined as the most important objective by the Swift Fox Conservation Team and the USFWS (Kahn et al. 1997). Because of the wide variety of habitats used by swift fox throughout their range, surveys need to encompass both shortgrass prairie and cropland habitats where swift fox commonly occur. This project complements other investigations underway in Texas, Colorado, Kansas, Wyoming, Nebraska, South Dakota and Montana (Allen et al. 1995, Luce and Lindzey 1996, Giddings 1997, Roy 1998). By replicating similar survey efforts in different locations we will gain a better understanding of the various parameters influencing swift fox populations including habitat characteristics and the presence of other carnivores potentially competing with or killing swift fox. The information acquired from this survey will allow a better understanding of the requirements for maintaining swift fox populations or expanding their distribution in suitable habitats.

To achieve this objective, survey methods to determine present distribution and abundance of swift fox needed to be tested to assess their efficiency and accuracy. A cooperative research project between the Kansas Department of Wildlife and Parks and the Northern Prairie Wildlife Research Center - USGS, was conducted in Kansas in 1996 to test various survey methods (Sovada and Roy 1996, Roy et al. 1997). Results of that research indicated that the most reliable survey technique to determine distribution and relative abundance of swift fox in shortgrass prairie and cropland habitats was a timed track search within the most suitable habitat per township. The survey requires minimal time and effort, yet provides accurate results that can be repeated over time, providing not only swift fox distribution but population trends as well.

Implementing a track search survey in northwestern Oklahoma allowed adequate monitoring of swift fox populations as well as other furbearer populations in the same region. Surveys accounted for all tracks observed with no extra effort, therefore detecting furbearers that may be swift fox competitors or predators. Monitoring the population trends of all furbearer species in northwestern Oklahoma is essential to understanding the various predatory mammal community components that may affect the population trend of swift fox and other potentially vulnerable species.

Another important objective identified by the SFCT in the Conservation Assessment and Conservation Strategy for Swift Fox in the United States was identifying and conserving suitable swift fox habitat. A review of numerous studies on swift fox indicated that range-wide habitat requirements have not been adequately identified. Published information about habitat use by swift foxes is largely descriptions and analyses of study areas or den sites from studies conducted in few select locations. A review of literature describing swift fox habitat associations, habitat selection, and den site selection was compiled by members of the SFCT (Harrison and Whitaker-Hoagland in-press, Whitaker-Hoagland 1997, A review of literature related to swift fox habitat use *in* B. Giddings 1997, Swift Fox Conservation Team Annual Report). This review revealed that swift foxes occupy a variety of habitats, yet are missing from large areas that appear to have suitable habitat. Recovery plans and efforts for swift fox conservation require a biologically sound basis for defining suitable habitats and the composition of habitats in landscapes that are optimal for swift foxes.

IV. Procedures:

Six ODWC personnel, four game wardens and two wildlife biologists, conducted the track search surveys. All ODWC personnel were knowledgeable in reading furbearer tracks and with the area and local wildlife to be surveyed. The study area was defined as the shortgrass High Plains ecoregion that occurred within the historical swift fox range in Cimarron, Texas, Beaver, Harper, Ellis, and Woodward counties. Every other township in the identified study area was surveyed for furbearer tracks. Survey sites within each township were carefully selected, based on areas with the highest probability of finding swift fox tracks if swift foxes were present. Thus, survey locations focused on areas with herbaceous range habitat, flat terrain, the best available substrate for tracks, little vehicle traffic, and a lack of human disturbance. The same tracking sites were used each year unless major changes occurred that required new sites to be selected.

All track surveys were conducted during the months of August and September, during all three years. Fifty-seven townships were identified to be surveyed for swift fox tracks during 1998 while 114 townships were targeted for track searches during 1999. Prior to the 2000 survey, 12 townships in Harper, Ellis and Woodward counties were re-evaluated for their potential as swift fox habitat and whether they occurred within the Shortgrass High Plains ecoregion. If more than 75% of the township was outside of the Shortgrass High Plains ecoregion with habitat unsuitable for swift fox, the township was eliminated from the 2000 survey. As a result, 105 townships were targeted for track searches during 2000.

Track searches were conducted with a minimum search time per township of 30 minutes and a maximum of 2 hours. Once a swift fox track was found, the time of search was recorded. The tracker continued searching if the track was found during the first 30 minutes of the search period, or moved on to the next township, after the initial 30 minutes. Since survey success was affected by time of day and weather conditions, track searches were conducted when possible during morning hours and 24 hours following a rainfall event, when possible.

For the purpose of selecting track search locations, broad habitat categories were delineated within the study area by using ArcView GIS 3.2a, based on United States Geological Survey (USGS) land use and land cover data at 1:250,000 (USGS 1990). Classification codes used in data analysis included urban/industrial, cropland (including Conservation Reserve Program grasses (CRP)), herbaceous rangeland, shrub rangeland, mixed shrub and herbaceous rangeland, deciduous forest, evergreen forest, and water/wetlands. Habitat categories were ground verified for the townships surveyed. The habitat type where swift fox and other furbearer tracks were located was recorded as range, CRP, fallow, winter wheat, irrigated crop (e.g. corn), other crop (e.g. milo, soybeans), and juniper mesa. All interpretation of digital coverages was done and its accuracy was verified by site visits comparing classified landscapes to actual vegetation.

To examine the habitat associated with the track location point data, a 3 km radius circle was drawn around all track locations. A 2km radius circle was equal to the 95% minimum convex polygon home range size for a family of swift fox, based on swift fox home ranges in Kansas (Sovada pers comm). To be sure to adequately survey habitat associated with the track location point data, a buffer of ½ the radius of the home range circle was added, resulting in a 3km radius circle. The area of each USGS land use and land cover category (USGS 1990) within the 3 km radius circles was measured by using ArcView 3.2a. All lands classified as cropland and tame pasture were ground verified to determine areas that were in Conservation Reserve Program (CRP) lands. This is the first stage in a process to determine what constitutes suitable or optimal swift fox habitat.

V. Results:

During 1998, 57 townships in Cimarron and Texas counties were successfully searched for swift fox tracks. Trackers drove an average of 35 miles per township and averaged 14 days to complete the surveys. Swift fox tracks were detected in 35 (61.4%) of the townships surveyed (Figure 1). For each township where swift foxes were successfully detected, it took an average of 39 minutes to detect the first track (range 4 to 105 minutes). Swift fox tracks were detected within the first 30 minutes in 17 of the 35 townships. In 29 townships, swift fox tracks were

found within the first hour. Only six townships found swift fox tracks during the second hour of tracking. Twenty-eight townships had only one set of swift fox tracks observed during the initial 30 minutes; six townships had two sets of swift fox tracks detected, and in one township swift fox tracks were observed up to four times within the initial 30 minute search interval.

During 1999, all 114 townships in the targeted study area were successfully searched for swift fox tracks. Trackers drove an average of 37 miles per township and averaged 8 days to complete the surveys. Swift fox tracks were detected in 43 (37.7%) of the townships surveyed (Figure 1). For each township where swift foxes were successfully detected, it took an average of 46 minutes to detect the first track; range 0 to 103 minutes. Swift fox tracks were detected within the first 30 minutes in 14 of the 43 townships. In 32 townships, swift fox tracks were found within the first hour. Swift fox tracks were found during the second hour of tracking in 11 townships. Forty townships had only one set of swift fox tracks observed during the initial 30 minutes; three townships had two sets of swift fox tracks detected within the initial 30 minute search interval.

During 2000, 101 of the 105 targeted townships were successfully searched for swift fox tracks. Trackers drove an average of 39 miles per township and averaged 8 days to complete the surveys. Swift fox tracks were detected in 36 (35.6%) of the townships surveyed (Figure 1). For each township where swift foxes were successfully detected, it took an average of 36 minutes to detect the first track; range 0 to 117 minutes. Swift fox tracks were detected within the first 30 minutes in 17 of the 36 townships. In 25 townships, swift fox tracks were found within the first hour. Swift fox tracks were found during the second hour of tracking in 11 townships. Thirty-four townships had only one set of swift fox tracks observed during the initial 30 minutes; two townships had more than two sets of swift fox tracks detected within the initial 30 minute search interval.

In Cimarron and Texas counties, where data were available for all three years, the number of townships where swift fox tracks were detected declined from 35 townships in 1998 to 24 townships in 1999 and 21 townships in 2000 (Table 1). The average time it took to detect swift fox tracks, if they were found, however fluctuated only slightly from 39 minutes in 1998 to 46 minutes in 1999 and back to 41 minutes in 2000. The number of townships where swift fox tracks were observed within the first 30 minutes declined from 17 townships in 1998 to five townships in 1999, but rebounded to 11 townships in 2000 (Table 1). Swift fox tracks were not found more than one time within the first 30 minutes in any township during 1999, compared to seven townships where more than one set of swift fox tracks was observed in 1998 and in two townships in 2000 (Table 1).

During 1998, 42% of sites where swift fox tracks were observed in Cimarron and Texas counties had soil tracking conditions that were considered good to excellent, while in 1999, this percentage dropped to 34% (Table 2). The summer of 2000 was an extreme drought year and this percentage dropped to 8% (Table 2). The percentage of surveys conducted within one to three days following a rainfall event also dropped from 74% in 1998 to 51% in 1999 to 5% in 2000, while the percentage of surveys conducted more than three days following a rainfall increased from 21% to 42% to 93% between 1998 and 2000 (Table 2). The percentage of track search surveys conducted while winds were between one and five miles per hour decreased between 1998 and 1999 from 68% to 44%, but increased to 53% in 2000. While the percentage

of surveys conducted when wind speeds were greater than five miles per hour increased from 32% to 56% between 1998 and 1999 but decreased to 47% in 2000 (Table 2).

Table 1. Comparison of swift fox track detection statistics in Cimarron and Texas counties from 1998 to 2000.

Swift Fox Tracking Variables Recorded	1998	1999	2000
Townships surveyed	57	57	57
Townships with swift fox tracks	35	24	21
Average time to first track in minutes	39	46	41
Townships with tracks observed within first 30 minutes	17	5	11
Townships with >1set of swift fox tracks observed	7	0	2

Table 2. Soil tracking conditions, days since last rain, and wind conditions recorded during swift fox surveys in Cimarron and Texas counties from 1998 to 2000.

Environmental Conditions	1998	1999	2000
Percentage of swift fox track sites with good to excellent tracking conditions	42%	34%	8%
Percentage of surveys conducted within 1 to 3 days following a rain event	74%	51%	5%
Percentage of surveys conducted greater than 3 days following a rain event.	21%	42%	93%
Percentage of surveys conducted with winds 1 to 5 mph	68%	44%	53%
Percentage of surveys conducted with winds > 5 mph	32%	56%	47%

During all three survey periods, swift fox tracks were detected most often throughout the three panhandle counties on two-track and dirt roads in rangeland land use and land cover types (Table 3). Rangeland was also the most prevalent land use and cover type searched in townships where swift fox tracks were not observed (Table 3). Cropland, including CRP lands, comprised 51.2% of the entire study area (Figure 2). Rangeland comprised 49.1% of the entire study area, with 83.5% of the rangeland existing as herbaceous rangeland, 0.0002% as shrub rangeland, and 16.4% as mixed rangeland (Figure 2). In the panhandle region, cropland comprised 49.9% of the area and rangeland 48.4%; with the rangeland existing as 92.2% herbaceous range, 0.0003% shrub range, and 7.7% mixed rangeland (Figure 2). The rangeland plant community consisted primarily of blue grama (*Bouteloua gracilis*)-buffalograss (*Buchloe dactyloides*), interspersed with sandsage (*Artemesia filifolia*). The mixed rangeland also consisted predominately of blue

grama and buffalograss, along with sandsage, yucca (*Yucca glauca*), and cholla cactus (*Opuntia imbricaria*). In the extreme eastern edge of the study area, eastern redcedar (*Juniperus virginiana*) encroachment was evident in the mixed range land use and cover category.

Home range buffer circles were drawn around the 114 track locations detected over the three years of the survey (Figure 3). Of the 35 track locations detected during 1998, 94,745 ha within the 3 km radius buffer circles were examined for land use and land cover. Herbaceous range comprised 56.1% of the home range buffer circles while 37.7% of the area contained agricultural land (Table 4). Within the agricultural lands, 32.5% consisted of CRP lands. The other 67.5% of the agricultural land included cropland, consisting primarily of winter wheat, milo, center pivot corn, or was fallow. During 1999, land use and land cover was examined in 122,373 ha surrounding 43 track locations. Half of the total area was comprised of herbaceous range while agricultural land made up 44.9% (table 4). CRP comprised 38.3% of the agricultural land with 61.7% made up of other types of cropland or fallow fields. For the 36 track locations found in 2000, 101,593 ha were examined within the 3km radius buffer circles. Herbaceous range comprised 59.6% of the home range buffer circles while agricultural land encompassed 39.0% (Table 4). While center-pivot crops and fallow fields made up 69.8% of the agricultural land, 30.2% of this land use category consisted of CRP lands.

Other furbearers detected with the survey in Cimarron and Texas counties during 1998 included, coyote (*Canis latrans*) in 55 townships (96.5%), badger (*Taxidea taxus*) in 28 townships (49.1%); raccoon (*Procyon lotor*) in 15 townships (26.3%), striped skunk (*Mephitis mephitis*) in 12 (21.1%) townships, domestic dog (*C. familiaris*) in 10 (17.5%) townships, domestic cat (*Felis catus*) in 5 (8.8%) townships, and bobcat (*Lynx rufus*) in 2 (3.5%) townships. Tracks of black-tailed jackrabbits (*Lepus californicus*) and eastern cottontails (*Sylvilagus floridanus*) were observed at 39 and 27 townships, respectively, and prairie dogs (*Cynomys ludovicianus*) were seen in 14 townships while surveying tracks. Information concerning jackrabbits, cottontail rabbits and prairie dogs, however, was only noted casually, and not specifically requested.

During 1999 and 2000 throughout the entire shortgrass High Plains study area, other furbearers detected included, coyote (*Canis latrans*) in 87% of the townships in both 1999 and 2000; badger (*Taxidea taxus*) in 37% of the townships in 1999 and 34% in 2000; raccoon (*Procyon lotor*) in 34% of townships in 1999 and 14% in 2000; striped skunk (*Mephitis mephitis*) in 34% of 1999 townships and 29% in 2000; bobcat (*Lynx rufus*) in 18% of townships in 1999 and 9% in 2000; domestic dog (*C.familiaris*) in 16% of townships in 1999 and 10% in 2000; and domestic cat (*Felis catus*) in 5% of 1999 townships and 3% in 2000. Tracks of black-tailed jackrabbits (*Lepus californicus*) were observed in 44 % of townships in 1999 and 2000. Eastern cottontail rabbits (*Sylvilagus floridanus*) were observed in 37% and 47% of townships in 1999 and 2000. Black-tailed prairie dogs (*Cynomys ludovicianus*) were seen in 9% and 18% of townships during 1999 and 2000 while surveying tracks. Information concerning jackrabbits, cottontail rabbits and prairie dogs, however, was only noted casually, and not specifically requested.

Table 3. Land use and land cover types with and without swift fox tracks in the panhandle counties (Cimarron, Texas and Beaver) 1998 - 2000.

Habitat Type	1998*		1999		2000	
	with tracks	no tracks	with tracks	no tracks	with tracks	no tracks
Range	59%	41%	68%	46%	74%	48%
CRP	14%	19%	7%	19%	14%	19%
Fallow	10%	14%	9%	13%	7%	14%
Other Crop	10%	14%	5%	8%	0	6%
Winter Wheat	2%	3%	9%	7%	2%	4%
Irrigated Crop	2%	7%	2%	5%	0	5%
Mesa	2%	3%	0%	1%	2%	4%

*only Cimarron and Texas counties included

Table 4. Habitat found within track buffer circles. CRP is the percentage of the total agricultural land.

Land Use and Cover Type	1998* (n=35)		1999 (n=43)		2000 (n=36)	
	Area (ha)	% Total	Area (ha)	% Total	Area (ha)	% Total
Agricultural Land	35,721	37.7%	55,060	44.9%	37,356	39.0%
CRP**	11,594	32.5%	7,914	28.3%	5,811	30.2%
Herbaceous Range	53,180	56.1%	62,223	50.8%	57,125	59.6%
Shrub Range	1,807	1.9%	2,348	1.9%	347	0.5%
Mixed Range	3,212	3.4%	1,983	1.6%	308	0.4%
Forest	210	0.2%	197	0.2%	223	0.3%
Water/Barren	516	0.5%	562	0.5%	423	0.6%
TOTAL	94,745		122,562		95,822	

* only includes Texas and Cimarron counties in 1998.

** only includes calculations for Texas and Cimarron counties

VI. Discussion

Results from track search surveys conducted for swift fox in Oklahoma confirm those from Kansas (Roy et al. 1997), indicating this method has been an effective technique for conducting landscape-scale presence/absence surveys for swift fox. Because track searches were restricted to habitat believed most suitable for swift fox and most favorable for finding tracks, costs were controlled and high detection rates were achieved. Data quality was enhanced by using experienced ODWC employees as trackers. The use of game wardens to conduct the survey aided tremendously in the ability to access private rangeland throughout the study area.

Swift fox tracks were detected readily throughout the shortgrass High Plains region. But, swift fox tracks were not observed using this survey outside the Panhandle region during 1999 or 2000. Tracks were observed in one township in Harper County in 1999, but the two-hour time limit for the track search survey had already elapsed. A road kill swift fox was also recorded from Ellis County during the spring of 1999, prior to the when track search survey was conducted. Although this information indicates the presence of swift fox in the main body of the state, the extent to which the species occurs in the far eastern reaches of the shortgrass High Plains ecoregion or beyond this ecoregion is unknown.

Swift fox tracks were encountered more often in herbaceous rangeland land use and land cover type than in other land use categories. But, herbaceous rangeland was the land use and cover type searched whenever it was available within a survey township. Swift fox tracks were observed in agricultural areas throughout the study area, but agricultural areas were not searched in proportion to their availability. If cropland and rangeland were both present in a township, only the rangeland was most likely surveyed. The proportion of rangeland existing as herbaceous rangeland in Panhandle was 92.2% while shrub and mixed range comprised only 7.7%. Outside the Panhandle, the percentage of the existing rangeland that occurred as herbaceous range dropped to 57.0%, while the mixed herbaceous/shrub range increased to 42.9%. Because of the increasing vegetation density and height in the mixed herbaceous/shrub range, this land use and cover type is not considered suitable for swift fox when compared to the relatively shorter, herbaceous rangeland vegetation that occurs in the shortgrass High Plains ecoregion.

Herbaceous range also comprised at least half of the 3 km radius home range buffer circles drawn around the track locations for all three years (range 50.8% to 59.6%), while croplands (including CRP lands) made up anywhere from 37.7% to 44.9% of the buffer circles. The proportion of the cropland that was comprised of CRP lands was consistent throughout all three years for Texas and Cimarron counties for which measurements were completed (28.3% to 32.5%). Nearly half of the panhandle region, where all track locations were recorded over the three years, was comprised of cropland and the other half rangeland, with the 92.2% of that rangeland existing as herbaceous range (Figure 2). This is just slightly different from the proportion of the land use and land cover found within the 3 km radius buffer circles of the track locations. Herbaceous range may be slightly higher in the buffer circles when compared to the availability because rangeland was surveyed for tracks when it was available. Further habitat evaluation studies will be conducted in the future to determine habitat characteristics at the landscape level that are necessary to support swift fox in the shortgrass High Plains ecoregion.

In general, the terrain in the Panhandle portion of the study area was flatter than that of the main body of the state (Figure 4). From west to east across the study area, a greater proportion of the available herbaceous range occurred in more rugged terrain where land conversion to cropland was not as economically feasible. On the flatter terrain in the Panhandle portion of the study area, winter wheat was the predominant land use, while in the main body of the state, a greater proportion of the flatter terrain occurred as mixed range rather than as winter wheat. Thus, the amount of optimal swift fox habitat decreases from west to east through the shortgrass High Plains ecoregion within in Oklahoma.

The swift fox track detection rate decreased from 1998 to 2000 in the two counties for which data were available for all years (Cimarron and Texas counties). During the 1998 tracking season, this region received above normal rainfall, allowing 74% of the tracking surveys to be conducted within three days following a rainfall event. In contrast, only 51% of the track search surveys conducted during 1999 were done within three days after a rainfall. And in 2000, only 5% of the track search surveys were conducted within three days after a rainfall. Conducting track searches following rainfall events resulted in better tracking conditions, and thus more swift fox tracks being observed within these counties during 1998 than in 1999 or 2000. The tracking substrate in Texas County was particularly affected by precipitation patterns, and track detection rates dropped from 57% in 1998 to 37% in 1999 to 27% in 2000.

The track search survey did indicate that swift foxes are relatively more abundant as you move east to west throughout the survey area. Since this survey was designed to determine only the presence of swift fox within the study area, it cannot be used to determine population density. The detection rates, however, indicate that swift fox are found readily throughout existing suitable habitat within the shortgrass High Plains region. Data from all three survey-years have supplemented previous information on the distribution of swift fox in Oklahoma. Information has been made available to all members of the Swift Fox Conservation Team and included in the Team's 1998 and 1999 annual reports to the USFWS. Results have also been provided to the Northern Prairie Wildlife Research Center for use in swift fox population model database. By combining data from all states where track search surveys have been used, it has been determined that this technique can detect changes in swift fox abundance among years by monitoring every third township every third year (Marsha Sovada pers. comm.).

VII. Prepared by: Julianne W. Hoagland

Julianne W. Hoagland
Oklahoma Department of Wildlife Conservation

VIII. Date: January 25, 2002

IX. Approved by: Harold Namminga

Harold Namminga, Federal Aid Coordinator
Oklahoma Department of Wildlife Conservation

X. Literature Cited

Allen, S. H., J. W. Hoagland, and E. D. Stukel. 1995. Report of the Swift Fox Conservation Team. Proc. Annual Swift Fox Conservation Team Meeting. 170 pp.

Caire, W., J. D. Tyler, B. P. Glass, and M. A. Mares. 1989. Mammals of Oklahoma. University of Oklahoma Press, Norman, OK. 567 pp.

Cutter, W. J. 1959. Notes on some mammals from north Texas. Southwestern Nat. 4:30-34.

Duck, L. G. and J. B. Fletcher. 1945. A survey of the game and furbearing animals of Oklahoma. Div. Wildl. Restor. and Res., Oklahoma Game and Fish Comm., Pitman-Robertson Ser. No. 2, State Bull. No. 3. Oklahoma City.

Giddings, B. 1997. Swift Fox Conservation Team Annual Report. Proc. Annual Swift Fox Conservation Team Meeting. 125 pp.

Glass, B. P. 1959. Status of the kit fox, *Vulpes velox*, in the High Plains. Proc. Oklahoma Acad. Sci. 37:162-163.

Hoagland, J. W. 1996. Oklahoma swift fox status report - 1996. Pages 30-49 *in* Luce, B. and F. Lindzey (eds.) Annual Report of the Swift Fox Conservation Team. 110 pp.

Kahn, R., L. Fox, P. Horner, B. Giddings, and C. Roy. 1997. Conservation Assessment and Conservation Strategy for Swift Fox in the United States. Swift Fox Conservation Team. 54 pp.

Kilgore, D. L., Jr. 1969. An ecological study of the swift fox *(Vulpes velox)* in the Oklahoma Panhandle. Amer. Midl. Nat. 81:512-534.

Luce, B. and F. Lindzey. 1996. Annual Report of the Swift Fox Conservation Team. Proc. Annual Swift Fox Conservation Team Meeting. 110 pp.

Roy, C. C., M. A. Sovada, and G. A. Sargeant. 1997. Swift fox (*Vulpes velox*) management and research in Kansas: 1997 annual report. Pages 88-93 *in* Giddings, B. (ed.). Swift Fox Conservation Team Annual Report. Proc. Annual Swift Fox Conservation Team Meeting. 125 pp.

Sovada, M. A. and C. C. Roy. 1996. Summary of swift fox research activities conducted in western Kansas - annual report. Pages 64-68 *in* Luce, B. and F. Lindzey. (eds.). Annual Report of the Swift Fox Conservation Team. Proc. Annual Swift Fox Conservation Team Meeting. 110 pp.

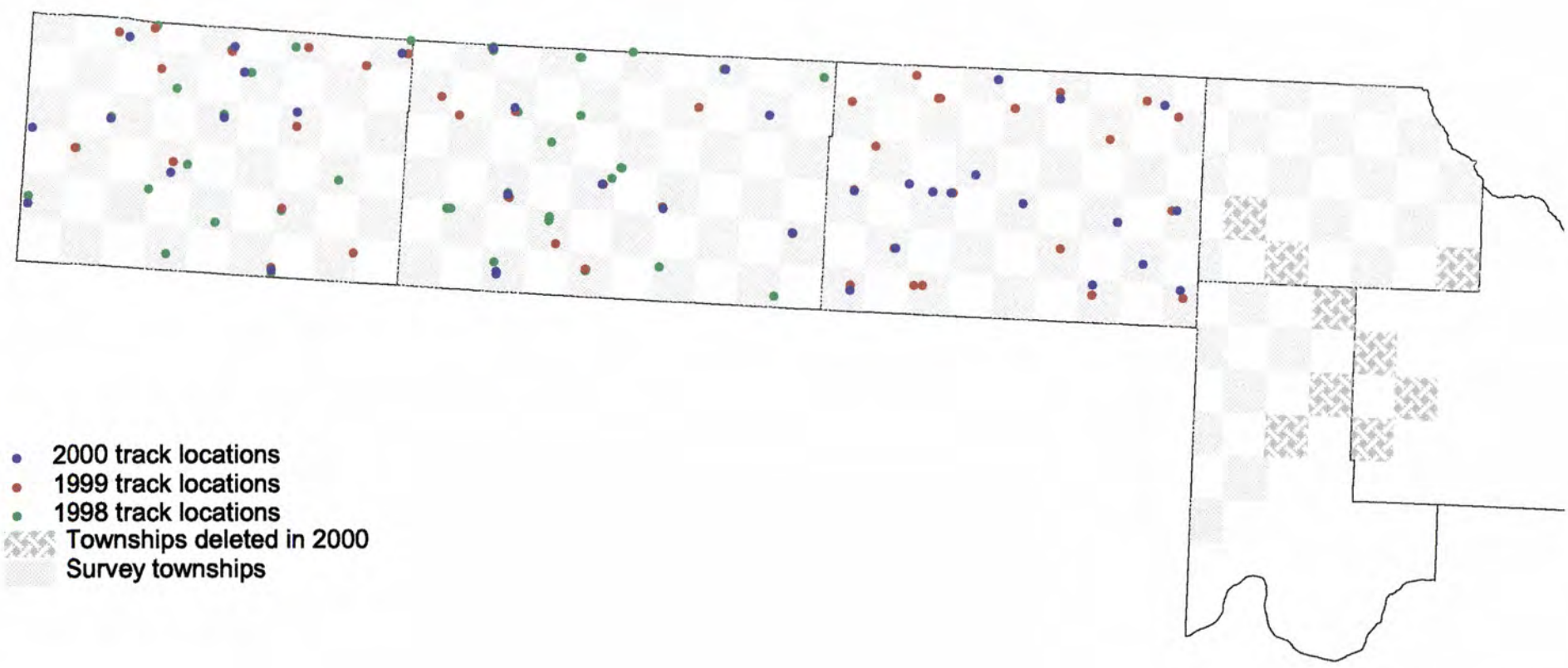


Figure 1. Swift fox track detection sites, 1998 - 2000 (only Cimarron and Texas counties were surveyed in 1998).

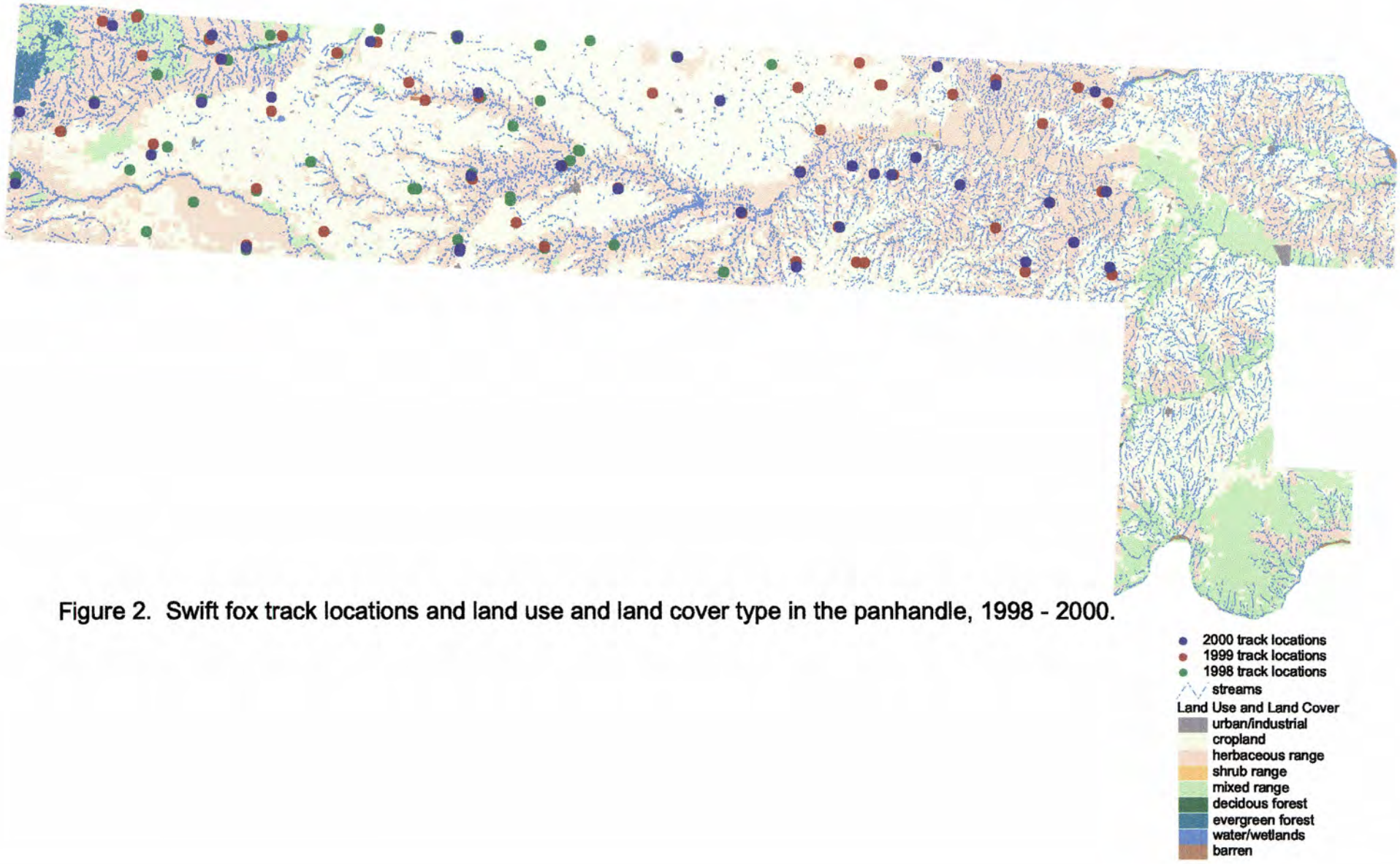
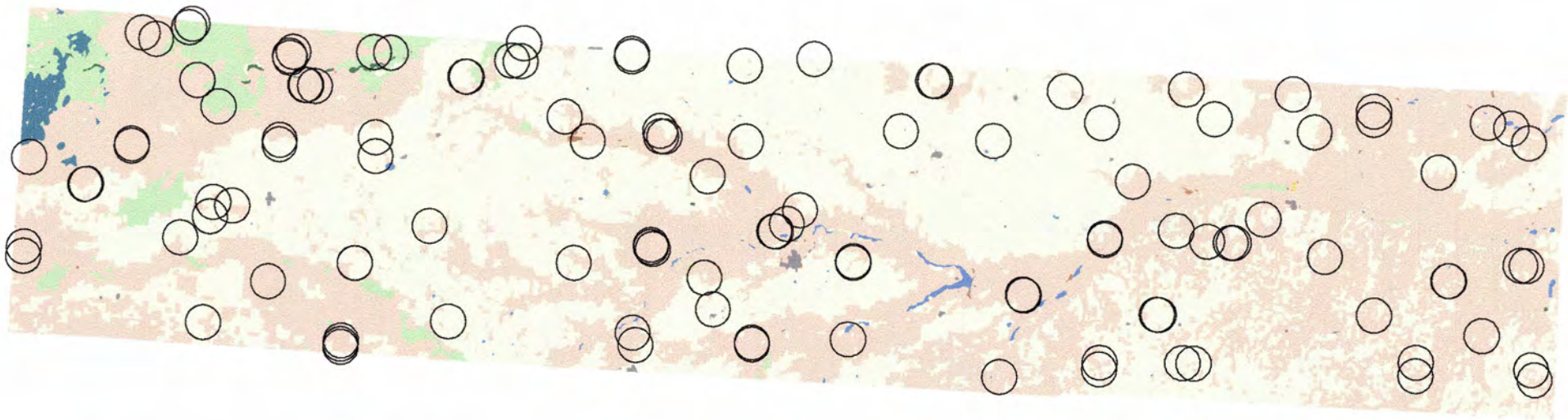


Figure 2. Swift fox track locations and land use and land cover type in the panhandle, 1998 - 2000.



Land Use and Land Cover Category
- urban/industrial
- agricultural land
- herbaceous range
- mixed range
- deciduous forest
- evergreen forest
- water
- barren

Figure 3. Swift fox track location 3km radius buffer circles and land use and land cover categories for all track locations detected 1998 - 2000.

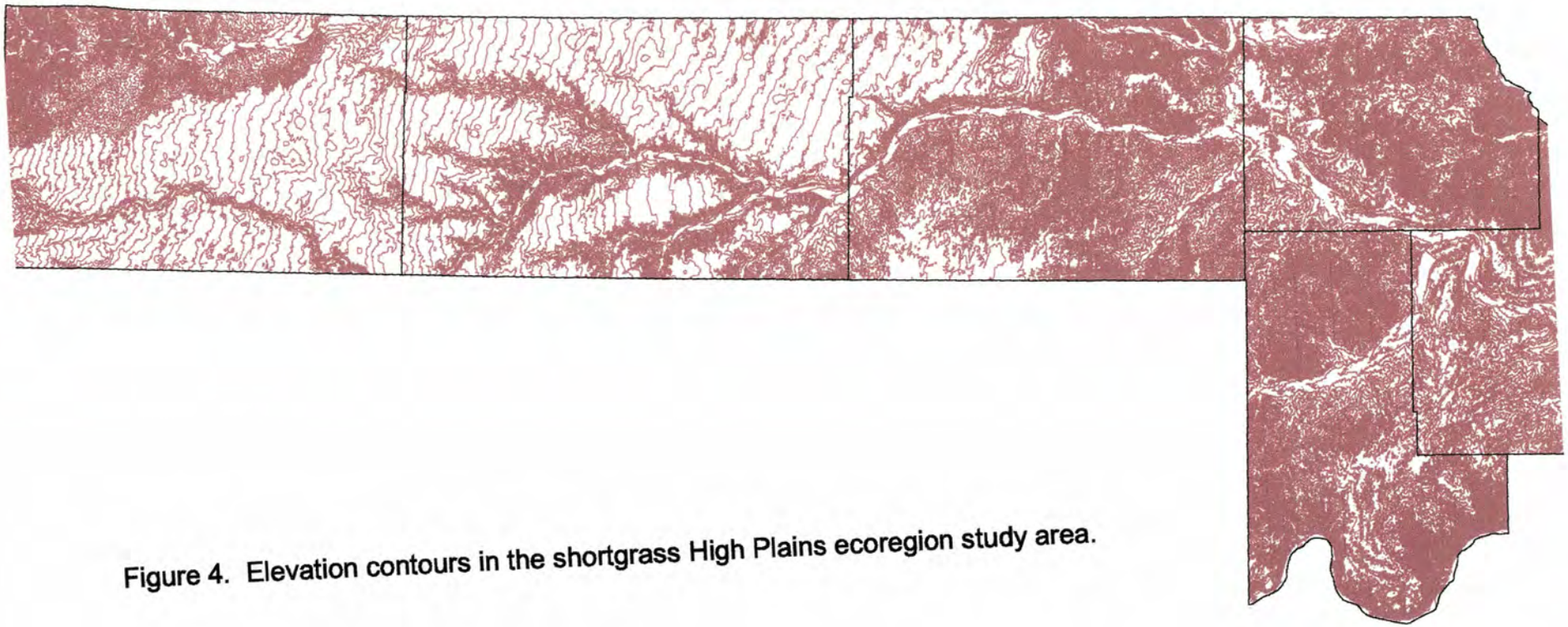


Figure 4. Elevation contours in the shortgrass High Plains ecoregion study area.